STUDY OF INFLUENCING FACTORS OF DOMESTIC SOLID WASTE MANAGEMENT IN FEDERAL CAPITAL TERRITORY, ABUJA- NIGERIA

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A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, UNIVERSITY OF ABUJA, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF ENGINEERING, (M.ENG) CIVIL ENGINEERING

JUNE, 2023

DECLARATION

"I hereby declare that the work is the product of my research efforts; undertaken under the supervision of Professor T. C. Ogwueleka, has not been presented and will not be presented elsewhere for the award of a degree or certificate. All sources have been dully acknowledged".

Signature & Date

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CERTIFICATION

"This is to certify that the research work for this thesis and subsequent preparation of thesis by (**Umar Faruk Yakubu**) were carried out under my supervision".

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PROF. T.C. OGWUELEKA

APPROVAL

"This Dissertation has been examined and approved for the award of Master of Engineering (M.Eng.) (Civil Engineering), by the Dissertation Examination Committeee".

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DEDICATION

This study is dedicated to teachers, who continually strive to be the best at what they do for the common good of the children they teach.

ABSTRACT

The study is on the influencing factors of domestic Solid Waste Management in Federal Capital Territory, Abuja - Nigeria targeted at investigating and studying the factors influencing domestic waste management in Abuja, Historically, the amount of wastes generated by human population was insignificant mainly due to the low population densities, coupled with the fact that there was very little exploitation of natural resources. the problem associated with the management of solid waste in most urban cities in Nigeria, like Abuja, does not completely appear to be a problem of absence of legislative framework for solid waste management owing to the fact that at Federal, States, and Local governments levels, there exist some form of sanitation legislations or the other, but some other factors have come to play with the crises experienced in the management of wastes in the Nigerian urban centers. The research procedures involve the following: research design, population of the study, sample and sampling techniques, instrumentation, validation of the instrument, administration of the instrument and data analysis techniques, while the result of the study to determine the social factor affecting the management of domestic waste: Location have great effect on waste management, not that everyone should leave in that location, but amenities available in that location should be considered in other locations too. There's is inadequate waste bin located across the location of study. To determine the economic factor affecting the management of domestic waste: The key economic factor affecting waste management is the poor economy of the nation. Poor or bad technological concept lack of facilities, insufficient man power and more affect the waste management. To determine the natural factors affecting household waste management in Abuja. Top on the natural factor that affects waste management in Abuja is the wind, topography and flooding. Which made the management of this waste difficult by the waste management companies. Rain have a slight stand out as during rainy seasons waste management team don't go into all sessions to extract waste. Further finding solving the research questions shows that the social status of Abuja residence affects the disposal of waste. The lack of finance or poor economic condition result to poor waste management. Some natural element has significance on waste management in Abuja. Some other factor that have significant effect on household waste management, e.g. corruption, bad economy, lack of sensitization and lack of funds.

LIST OF FIGURES

Figure 1.1: Municipal Solid Waste Quantities (Hoornweg and Bhada-Tata, 2012) 2

Figure 1.2: Municipal Solid Waste Source (Mihelcic and Zimmerman, 2010) 3

Figure 1.3: Percentage of Various Materials that Compose MSW on a Mass Basis (U.S. EPA, 2006b) 4

Figure 1.4: Municipal Waste Composition by Region and Country (Zero waste, 2012; EEA 2013a; EEA 2013b; Ayuba 2013; EASA, 2012; IPCC, 2006) 5

Figure 1.5: Development of MSW Treatment and Disposal (Gaber, 2014) 7

Figure 1. 6: Management Practices of MSW (Fischedick et. al., 2014) 8

Figure 2.1: Estimated volumes of Municipal solid waste generated in some Nigerian cities 40

Figure 2.2: Average waste composition (percentage) for the seven fractions generated by the three socio-economic groups. 41

Figure 2.3: .Average composition of solid waste at source in Abuja. 43

LIST OF TABLES

Table 2.1: Composition (% by weight) of household waste in Abuja. 44

Table 2.2: Mean values of daily per capita household waste generation in different days during the survey (kg). 45

Table 4.1: Data Summary 53

Table 4.1: Gender 53

Table 4.2: Religion 54

Table 4.3: Age 54

Table 4.4: Level of Education 55

Table 4.5: Marital Status 55

Table 4.6: Resident Location 56

Table 4.7: Knowledge of what is Domestic Waste. 57

Table 4.8: How should collected waste be handled? 58

Table 4.9: How should collected refuse be finally disposed of? 59

Table 4.10: Is the waste bin adequate for the quantity of refuse being generated in your residence? 60

Table 4.11: How do you organize yourself to keep your surrounding clean? 61

Table 4.12: Are there refuse heaps near of your house? 61

Table 4.13: Residential details: 62

Table 4.14: Number of occupant in the building 62

Table 4.15: Where do you dispose your refuse after storage? 63

Table 4.16: What type of vehicle(s) is/are used in refuse collection from your house? 64

Table 4.17: Is the refuse bin often allowed to overflow before collection? 64

Table 4.18: Possible Factors influencing waste disposal 65

Table 4.19: Poor economy affects both residence and waste management body in handling waste. 66

Table 4.20: Recycling companies are few to non in the land 67

Table 4.21: Poor financing affect all stakeholders in waste management. 67

Table 4.22: Natural factors affecting domestic waste 68

Table 4.23: Prevention and correction in waste management 69

Table 4.24: Do you have any additional comments or suggestions regarding domestic waste management? 71

Table 4.25: What do you think are the shortcomings of the present system of waste management in your area? 72

Table 4.26: The correlation table code interpretation. 73

Table 4.27: Correlation Matrix for Social Factors 74

Table 4.28: Correlation Matrix for Economic and Natural Factors 76

LIST OF ABBREVIATIONS

MSW	Municipal Solid Waste
EPA	Environmental Protection Agency
FCT	Federal Capital Territory
WD	Waste Disposal
PPP	Public and Private Partnerships
ANOVA	Analysis of Variance
SF	Social Factor
EF	Economic Factor
AEPB	Abuja Environmental Protection Board
NGO	Non-Governmental Organization

TABLE OF CONTENTS

DECLARATION iii

CERTIFICATION iv

APPROVAL v

ACKNOWLEDGEMENT vi

DEDICATION vii

ABSTRACT viii

LIST OF FIGURES ix

LIST OF TABLES x

LIST OF ABBREVIATIONS xii

TABLE OF CONTENTS xiii

CHAPTER ONE 1

INTRODUCTION 1

1.1 Background of the Study 1

1.2 Statement of the Problem 10

1.3 Research Questions 11

1.4 Aim and Objectives of Study 11

1.5 Investigating the factors 12

1.6 Significance of Study 14

1.7 Scope of Study 14

1.8 Definition of Concept 15

CHAPTER TWO 16

LITERATURE REVIEW 16

2.1 Introduction 16

2.2 Conceptual Literature 20

2.3 Solid Waste Management Approach in Some Nigerian Cities 24

2.4 Household Size and Solid Waste Disposal 29

2.5 Empirical Study 32

2.6 Theoretical Framework of the Study 37

2.7 Process of Municipal Solid Waste Management in Nigeria 39

3.8 Identifiable issues in SWM in Developing Countries 46
3.9 Influencing factors hierarchy 51
2.10 Conclusion and Identification of Research Gap 52
CHAPTER THREE 54
RESEARCH METHODOLOGY 54
3.1 Introduction 54
3.2 Research Design 54
3.3 Population of the Study 55
3.4 Sampling and Sample Size 55
3.5 Data Collection Instrument and Validation 58
3.6 Method for Data Collection 59
3.7 Method of Data Analysis 59
CHAPTER FOUR 60
RESULTS AND DISCUSSION OF RESULTS 60
4.1 Data Presentation, Analysis and Interpretation 60
4.2 Response Rate 60
4.3 Data Analysis 61
4.4 Relationship test between variables 83
4.5 Resolutions to Research Questions 89
CHAPTER FIVE 91
CONCLUSION AND RECOMMENDATION 91
5.1 Introduction 91
5.2 Conclusion 91
5.3 Recommendation 92
REFERENCES 94

CHAPTER ONE

INTRODUCTION

The study is on the influencing factors of domestic solid waste management in Abuja targeted at investigating and studying the factors influencing domestic solid waste management in Abuja, the concept on this chapter is to slate back ground of the study giving a brief knowledge of the study, statement of the research problem a quick touch on the possible challenges in the cause of the study with the positive mind of overcoming them. Statement of the research questions covering possible questions to be addressed by the study, derived from the aim and objectives of the study, also the justification of the study, a statement for the reason of the study, slating observations and finds resulting to this study.

1.1 Background of the Study

Historically, the amount of wastes generated by human population was insignificant mainly due to the low population densities, coupled with the fact that there was very little exploitation of natural resources. Common wastes produced during the early ages were mainly ashes and human & biodegradable wastes. Biodegradable waste is a type of waste, typically originating from plant or animal sources, which may be broken down by other living-organisms, whereas waste that cannot be broken down by other living organisms may be called non-biodegradable. These were often released back into the ground locally, with minimal environmental impact.

Figure 1.1: Municipal Solid Waste Quantities, (Adapted from (Hoornweg and Bhada-Tata, 2012)

In Figure 1.1, the total amount of Municipal Solid Waste (MSW) generated globally is estimated at about 1,300 million tonnes per year, and it is expected to increase to approximately 2,200million tonnes by 2025 (Hoornweg and Bhada-Tata, 2012). Figure 1.2 shows that the major sources of MSW are the residential and commercial sectors (Mihelcic and Zimmerman, 2010). The quantities of food wastes, garden wastes, paper, plastic and glass generated from both sectors contribute most to solid waste over all. Then the waste quantities vary among the remaining sectors, with construction and demolition having the highest contribution percentage after the residential and commercial sectors. This is due to the generation of concrete, metal, wood, asphalt, wallboard and dirt-predominant wastes.

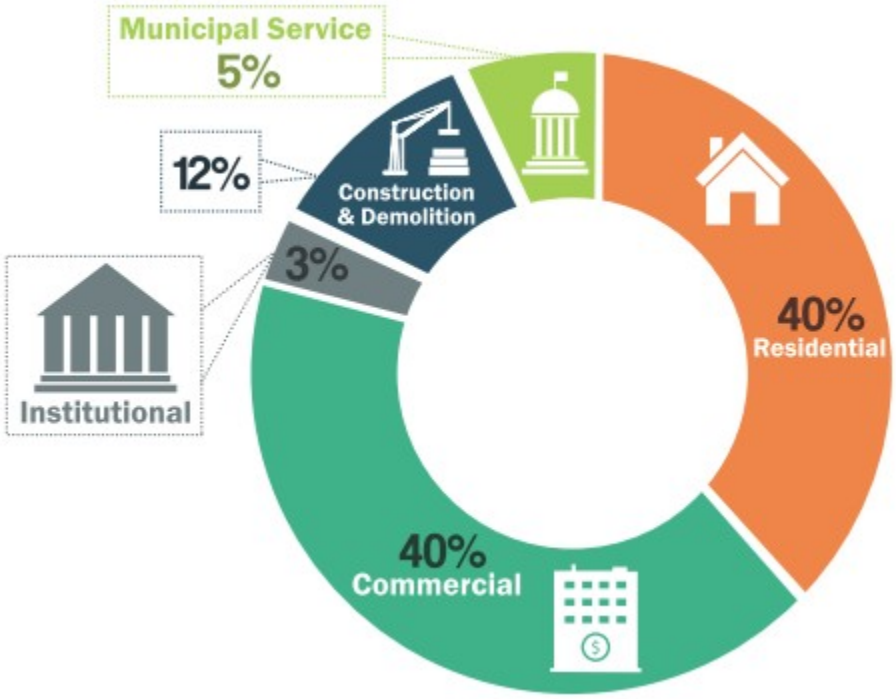

Figure 1.2: Municipal Solid Waste. (Adapted from Mihelcic and Zimmerman, 2010)

1.1.1 Municipal Solid Waste Identification

Identification of municipal solid waste is a complex task as the composition and quantity vary greatly within the region and over time. Estimates of solid waste composition are always uncertain. Three methods are commonly used to characterize solid waste.

Literature survey, input-output analysis, sample survey. Percentage of various materials that make up municipal solid waste on a US EPA bulk basis, 2006. It is known that organic waste makes up the largest percentage of municipal waste in most countries, while paper and cardboard make up the largest percentage by mass. This is followed by garden waste, food, plastic, and other components (see Figure 1.3). Typical MSW composition by region based on income level and economic criteria suggests a shift from organics to higher plastics and paper as GDP grows. On the other hand, it is worth noting that high-income households in developing countries tend to produce more inorganic waste, and low-income households tend to produce a larger proportion

of organic matter. Some high-income households in developing countries still produce the same amount of organic waste as ordinary households in low-income countries. Wealth is a powerful driver of the MSW generation.

Figure 1.3: Percentage of Various Materials that Compose MSW on a Mass Basis (U.S. EPA, 2006b)

According the display in Figure 1.4, the solid waste generation rate in developing countries and BRICS in 2012 was lower than in G8 countries as seen in (World Fact Book, 2015; EEA, 2015; IPCC 2006).

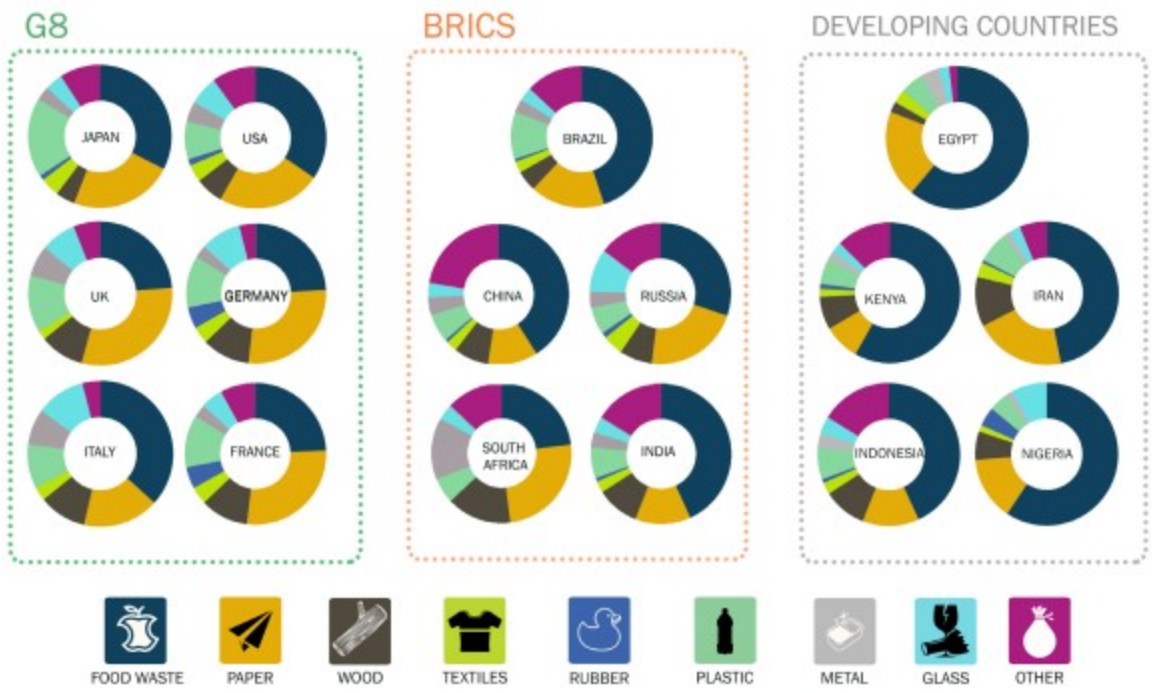

Figure 1.4: Municipal Waste Composition by Region and Country (Zero waste, 2012; EEA 2013a; EEA 2013b; Ayuba 2013; EASA, 2012; IPCC, 2006) [7, 8, 9, 10, 11, 6]

Before the wide spread use of metals, wood was widely used for most applications. However, re-use of wood has been well documented. Nevertheless, it is once again well documented that reuse and recovery of such metals have been carried out by earlier humans. With the advent of industrial revolution, waste management became a critical issue.

There was a consequent increase in industrial and domestic wastes posing threat to human health and environment. The generation and disposal of waste is an intrinsic part of any developing or industrial society. Waste, both from domestic and commercial sources has grown significantly in Nigeria over the past decade. Every time a householder shops at the Store and open market, contributes to the mountain of waste. It is possible to quote figures which show that the production of waste amounts to millions of tons.

The percentage of Nigeria's population living in cities and urban areas has more than doubled in the last 15years (Jimoh, 2005). The cities and urban areas experience continuous growth which contributes to enormous in generation of solid and liquid waste. The management of waste is a matter of national and international concern. Studies have shown that the volume of waste does not actually constitute the problem but the ability or inability of governments, individuals and waste disposal firms to keep up with the task of managing waste and the environment. There is no doubt that a dirty environment affects the standard of living, aesthetic sensibilities, health of the people and thus the quality of their lives. The corollary is that improper disposal or storage of this waste can constitute hazards to the society through the pollution of air, land and especially water.

1.1.2 Solid Waste Management Practices

Advances in waste-to-energy conversion technologies, gasification, and more sophisticated recycling mechanisms are leading to a mix of products, along with achieving higher levels of efficiency and sustainability. Although the waste hierarchy adequately describes the common options of developed countries, some countries have yet to switch to using artificial landfills (considered as the last resort in developed countries). However, it should be noted that well-designed landfills can provide important representation. Improving uncontrolled dumping of waste to unscheduled landfills. Figure 1.5 shows the development of general waste treatment and disposal. Most developed countries have reached stage 4 or 5 of the development process. Most developing countries are still in Stage 2. Figure 1.6 shows the proportion of different municipal solid waste management practices in several countries. More than half of the household waste generated worldwide ends up in landfills or in unsanitary landfills. Only about 20% of the total waste generated is managed for MSW recycling. The remaining solid waste is

used for energy recovery. In developed countries, landfill options are declining compared to other options. This may be attributed to low land availability and high community expectations for proper management of secondary resources.

Figure 1.5: Development of MSW Treatment and Disposal (Gaber, 2014)

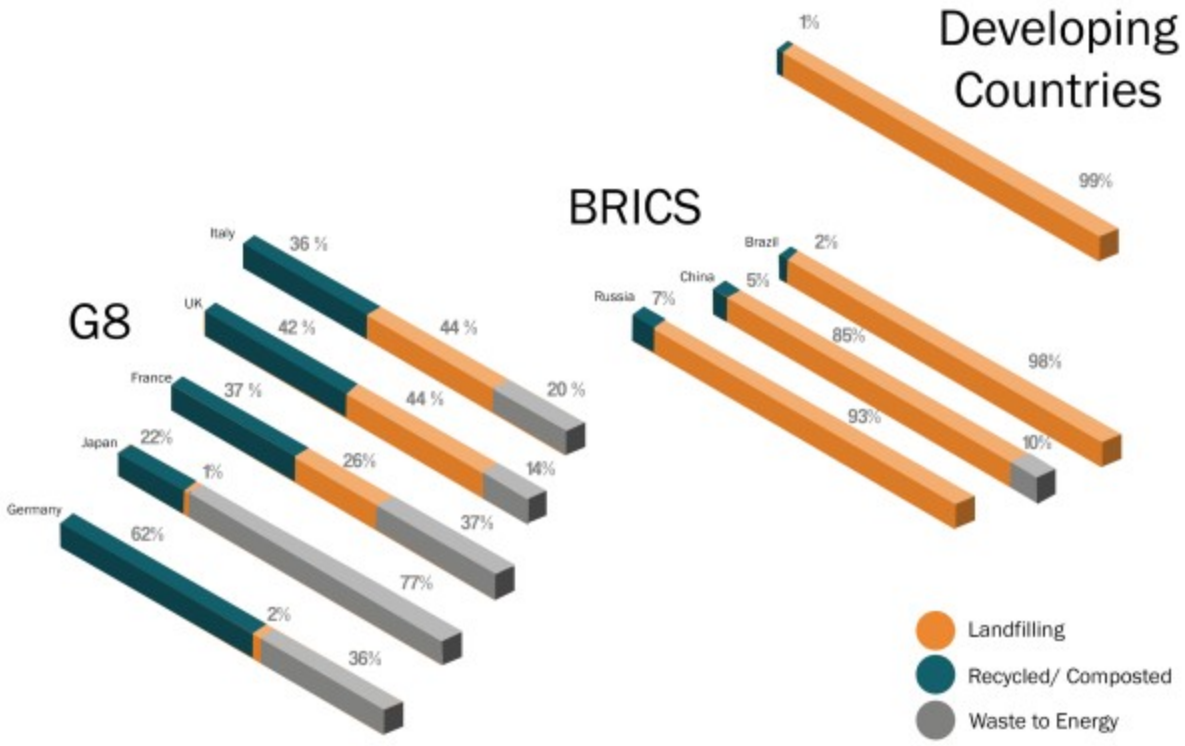

Figure 1.6: Management Practices of MSW (Fischedick et. al., 2014)

Waste management, especially in Nigeria's urban areas, remains highly problematic. Governments, non-governmental organizations and individuals have all been involved in waste management in different ways. Urban solid waste management has moved from purely public management to private management and now involves public and private participation. Issues related to waste management are further complicated by the presence of non-degradable wastes (such as polyethylene materials). Indiscriminate disposal and dumping of waste is a common practice in Nigerian cities. Most landfills are located near residential areas, markets, farms, roadsides and streams. The composition of landfills varies widely, as many human activities are located near them. A well-known example is household and industrial waste. Industrial waste is generated from industrial activities such as chemicals, pesticides, paints, oils and fats, inorganic substances, and oil sludge. Abuja, like most other urban centers in the developing world, is

experiencing rapid and uncontrolled growth characterized by poor planning, rapid population growth, inadequate facilities and poor sanitation (Hardoy and Satterhwaite, 1989).

Rapid growth of Abuja city has brought the city's waste management problems Solid waste management remains a major challenge in urban areas around the world, especially in rapidly growing cities in developing countries (Foo, 1997). Rapid population growth and rising per capita incomes generate enormous amounts of solid waste, posing a serious threat to environmental quality and human health (Snigdha, 2003). Access to sanitation and clean water is therefore considered vital to people's health and well-being. It is generally accepted that solid waste disposal is a global problem. This problem is even more pronounced in developing countries such as Nigeria, where solid waste disposal is a major concern. Adeyemi et al. (2001) found that solid waste is a major problem in most developing countries. They added that waste management is one of the most persistent problems facing city governments and environmental agencies. Ogwueleka, (2009) reports that waste management is one of the greatest challenges facing national environmental agencies. As a result of administrative challenges, Adefemi and Awokunmi (2009) reported the breakdown of law and order regarding waste management. They observed accelerated environmental degradation in urban centers as a result of indiscriminate dumping of solid waste.

Imam, et al., (2008) reported that garbage piles are dumped on roadsides and other open spaces, thereby creating environmental risks. In response to these shortcomings (Imam et al., 2008) argued that solid waste has indeed become a significant problem in Nigeria. Izugbara and Umoh, (2004) report that the country's waste management crisis is already visible in support of

these claims. They added that waste management is a major contributor to social, political and environmental costs. These costs are believed to have a large impact on the economy and population (Izugbara and Umoh, 2004). The introduction of private companies in waste management has become necessary as a result of environmental degradation due to inefficient waste management practices (Ogu, 2000).

Ogbonna et. al, (2007) reported that in response to the enormous challenges pose by municipal solid waste management, the Government is taking steps to address these problems by engaging local contractors to evacuate waste. Ogbonna et.. al., (2007) observed that cities are divided into sections for the local contractors. However, inefficiency still thrives due to the lack of coordination on the part of the Government and the lack of expertise on waste management issues by the environmental agencies. The reasons behind inefficient waste management practice in Nigeria have been well researched. For example, Agunwamba, (1998) reported that there is a general lackadaisical attitude on the part of the government towards waste management. In addition, Adeyemi et al, (2001) observed that in Nigeria the management of municipal solid waste revolves mainly around open burning, open dumps, land filling, reuse/recycling and waste conversion.

1.2 Statement of the Problem

Factors influencing the disposal and management of solid waste are enormous hence solid Waste Management has become an area of major concern in Abuja today. It appears to be a losing battle against the harmful consequences of unguided waste and the attainment of a clean healthy environment for all indigenes of the state. All sides of residential apartments, the drains, the highways, corners of major or and minor streets, undeveloped plots of land have all become waste dumps form any households .As one writer puts it, waste increases in a geometrical

progression while collection and disposal increase at an arithmetical progression (Akinwale, 2005), this is a pointer that there should be a relative measure in controlling waste, in which its best that waste be recycled, especially solid waste. The problem associated with the management of solid waste in most urban cities in Nigeria, like Abuja, does not completely appear to be a problem of absence of legislative frame work for solid waste management owing to the fact that at Federal, States, and Local governments levels, there exist some form of sanitation legislations or the other, but some other factors have come to play with the crises experienced in the management of wastes in the Nigerian urban centers. From the background of this study, it appears that the Abuja Waste Management Authority (AWMA) requires more techniques on dealing with waste management within the Federal Territory, which is only possible when the factors affecting this waste management are determined.

1.3 Research Questions

The specific research questions for the study are stated below as follows:

Question 1: Does the social status of Abuja residence affect the disposal of waste?

Question 2: Do the lack of finance or poor economic condition result to poor waste management?

Question 3: does natural element have significance on waste management in Abuja?

Question 4: Is there any other factor that have significant effect on household waste management?

1.4 Aim and Objectives of Study

1.4.1 Aim

This work is aimed at investigating the factors influencing domestic solid waste management in Abuja and possible ways of enhancing the waste management service in Abuja Federal Capital of Nigeria.

1.4.2 Objectives

Hence the specific objectives of the study are;

1. To determine the social and economic factors affecting the management of domestic solid waste.
2. To determine the natural and cultural factors affecting household solid waste management in Abuja.
3. To examine other factors (such as physical and technical as well as institutional) factors and their effect on domestic solid waste management.

1.5 Investigating the factors

1.5.1 Social and economic factors

Social factors affecting the management of domestic waste, which covers from domestic waste in terms of sources, these social factors are; class of employment wherein the head of an household is working in a well-paid organization it will be easier for such to pay the bills attached to waste disposal or even hire or subscribe to a waste management agency to help ensure proper management of their household waste, this might not be possible for someone whose monthly take home does not even pay his family meals, light bills or water bills. The family size is another key player in the increase of waste and management of it, at single it may be easier to control waste, when married waste generation increases and as the family increase there is an increase in the quantity of waste generated therefore managing such maybe become difficult or unaffordable. The level of awareness may stand as a social factor in affecting the

management of these waste as residents may have poor knowledge on how to manage these waste even by themselves or even know that there is an agency for waste management, information may be limited reaching them, the knowledge of the policies guiding domestic waste might be out of their knowing, A sought of knowledge gap.

Economic factors affecting the management of domestic waste another key consideration which involves the unavailability of funds and technologies, high interest rates, tax rates, policies, wages, and governmental activities. Though an individual may have the knowledge and desire to ensure all waste generated from his/her household be properly disposed or utilized properly, but when considering the billing system discouragement sets in, low income high expenditure check comes in, company responsible for picking up waste from residence increase tariff as fuel increase, as cost of management increase, thereby discouraging those who want to subscribe for their service, thereby taking to local disposal resulting to drainage blockage, unhealthy disposals and lot more, the government policy or activities may likewise not be in favor of the company or household as the change in government may result to change in operation as a government may not see much interest in waste management, while another have interest in waste recycling. The unavailability of facilities may also be an economic factor wherein the generators of these wastes are unable to dispose their waste properly due to lack of facilities like the central waste extraction point or even a domestic waste separator, the unavailability of funding may affect the management of waste as due to poor funding companies pay less to staff, staff not deriving joy in duties carries out function with poor performance not reaching all extraction points, also company over working available staff in other to meet up demand instead of employing more work force.

1.5.2 The Natural Factor

Natural factors is outside the full control of man but can be limited, affecting household waste management this factor are wind and rain wherein the locals have their open field waste ground and keep to it for the agency to come evacuate the waste, the arrival of wind or rain may be rechanneling this waste into wrong locations like the drains and its environ thereby making it difficult for agencies to collect.

Other factor affecting household waste management in Abuja may not be directly defined but will be slated and noted in the cause of the project. Though this factor maybe traditional, behavioral or hereditary

1.6 Significance of Study

The results of this study will be important to the residents and commercials of Abuja who have been grappling with waste disposal issues in the estates and by extension which have posed a health as well as environmental degradation concerns to the residents. The waste management board will also gain from the study in that it can know the factors that influence waste disposal in the town and the challenge so as to deal with the factors as well as the challenges in order to ensure that the environment is clean and the health of its residents is assured. Furthermore, waste reuse will not be out of place hence the territory moves closer to a zero waste level, where all said waste are recycled and reused by the host communities.

1.7 Scope of Study

The study is restricted to (Federal Capital Territory) Abuja urban center the study will be covering the factors affecting household waste management in Abuja. To determine if it were the social factor, nor the economical factor, nor the natural factor that have influenced the waste management system of the Federal Capital Territory. The findings may not reflect the situation

in the whole of Abuja, but by and large, there is a strong belief that what happens in Abuja urban center can be said to apply to other urban centers within the territory.

The study may likely be affected by lack of time, material, and money resources to see to the whole of the State.

1.8 Definition of Concept

Influencing Factors: are those factors that can affect some features of target object. Influencing factors can be used as control variables to determine the key influencing factors of an object. In the field of waste management as in this study the factors to be considered are social, economic, natural and other factors.

Domestic waste: is waste that is generated as a result of the ordinary day-to-day use of a domestic premise and is either:

Taken from the premises by or on behalf of the occupier who generated the waste; without consideration (e.g. payment, reward or other benefit); or

Collected by or on behalf of a local government as part of a waste collection and disposal system.

Management: the process of administering and controlling the affairs of the organization, irrespective of its nature, type, structure and size. It is an act of creating and maintaining such a business environment wherein the members of the organization can work together, and achieve business objectives efficiently and effectively.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter provides an overview of the waste management situation in developing countries, in particular Abuja, Nigeria, and draws on research by various researchers in academic books, journals and journals, published and unpublished works, and electronic media. Summarized critically. This literature review helps identify appropriate methods to achieve the goals of this study. Furthermore, source separation, a relatively unexplored concept, has been identified and recommended by many researchers as a way to reduce waste. Besides collection and disposal, it is also proposed to provide alternative means to implement proper waste management (Cointreau-Levine & Gopalan, 2000; Imam al, 2008).

This study on institutional waste management aims to identify the dynamics that affect/influence the source segregation in on-campus households, and to identify the appropriate options for waste reduction and waste management options. Provides a means to address enforcement. According to UNEP (2005), a logical starting point for proper solid waste management is the disposal of waste either informally at the power plant or formally by another organization (external) to reduce the amount of waste managed. This reduces the amount of waste collected or managed.

Waste management has emerged as one of the major challenges facing Nigeria's state and local environmental protection agencies. The amount of solid waste generated continues to grow at a rate that exceeds the ability of authorities to improve the financial and technical resources needed to meet this growth. This is due to factors such as rising rates of urbanization, illegal urban construction and development, rapid population growth, rapid development, and changing

consumption patterns. These are directly (and indirectly) associated with the generation of vast amounts of waste, ranging from biodegradable to synthetic waste (Abuja-Citiserve, 2004 and Zamorano et al., 2009).

In Abuja, the problems of rapidly increasing waste generation and high costs of waste disposal, depletion of landfill space, and acquisition of new landfill sites leading to open landfills remain unresolved issues. This makes it difficult for waste management authorities to find and develop solutions (Gomez et al., 2009). Several MSW management policies and programs have been implemented but have proven ineffective due to financial and personnel limitations (Abuja Citi-serve, 2004). Community involvement plays an essential role in the success of waste management systems. This has received a lot of recognition lately. In Asia, lack of environmental ethics and awareness has led to failure of solid waste management plans (Visvanathan and Trankler, 2003).

Environmental knowledge, education and awareness play an important role in the successful implementation of effective municipal solid waste management systems. Awareness and environmental education about the potential hazards of contaminated environments is still very low (Ogbonna et al., 2002). This is an area that seems to be neglected in Abuja's current municipal solid waste management system. The ultimate goal is environmental sustainability and individuals need to understand the importance of the issue before the plan can be successfully implemented. Proper management of solid and liquid wastes is important for public health, economic, environmental and political reasons, and therefore has a negative impact on public health, the environment and natural resources (Klundert & Anschutz, 2001). The above issues have led to the need for an overview and analysis of the current situation.

This research will bridge the gap in the existing body of knowledge with regards to waste management in Nigeria by giving a holistic assessment into the current status of solid waste management practice in Abuja. This study is an initial effort to fill the gap between theoretical solid waste management in the country and practical solid waste management towards achieving a more sustainable and effective solid waste management in the Federal Capital. The results from this research will act as an initial framework toward strategic planning and periodic follow up assessment is required to further improve the system. In orders to achieve this, relationships will be examined thus from which recommendations developed. This will overall advance the concept of sustainability and sustainable waste management in Nigeria. The general objective is to assess the influencing factor of solid waste management practice of residents in Abuja municipalities (Nigeria).

2.1.1 Brief description of Nigeria

Nigeria is one of her sub-Saharan countries in western Africa. The country runs a federal government system and the people are governed by her three tiers of government. These are federal, state and local governments (Afon, 2007). The country is diverse both in terms of its people and its landscapes. The south is dotted with beaches, dense vegetation and hills like the Obudu Hills. Other notable geographic features are the rainforests in the central and southwestern part of the country, the Lagos estuaries and savannas, and the Sahel to the eroding Sahara in the north (Ogwueleka, 2009). The country has a land area of approximately 1 million square kilometers (Nwaka, 2005). The Atlantic Ocean in the south and the Sahel zone in the north influence the climatic conditions of the country.

Adejuwon, (2006) reported a clear contrast in climatic conditions when moving from the southernmost to the northernmost part of the country. He added that about 25% of the country is

wetlands. These areas are tropical rainforest zones. About 35% is semi-dry. These are the Savannah and Sahelian regions of Sudan. Sub-wetlands cover 40% of the land area. These areas are the savannah zone of Guinea. Olaniran (1991) reported differences in precipitation patterns between the south and north. The study found that the moist south-westly winds from the Atlantic Ocean, which bring moisture into Nigeria, decrease northward.

Nigeria is the most populous country in Africa with about 37 States. The country's has an average population growth rate of about 3%. More than 125 million people currently live in the country, with an estimated 50% of the population living in cities (Nwaka, 2005).

2.1.2 A brief description of Abuja

Abuja was founded in 1976. It is the capital of Nigeria and part of the Federal Capital Territory (FCT). It was initially developed according to a master plan devised in 1979. This apportioned 2.0% of the FCT area for government activities/use, 49.0% for residential development, 32.5% for open/green/recreational areas to improve urban aesthetics, and the remaining Land (16.5%) is used for purposes. Ancillary services, light industry and other infrastructure and commercial activities. Abuja's master plan was designed to provide an opportunity to foster growth and avoid many of the problems associated with unplanned growth associated with other cities in Nigeria.

Federal Government establishments relocated to Abuja during the 1990s and all embassies, the headquarters of many national and multinational companies, and many national newspapers are located in Abuja. This rapid expansion has far exceeded what was anticipated in the master plan, and Abuja's population now exceeds its original planned capacity. In 1991 he had a FCT population of 378,671, but this number had increased to 1,724,205 by 2001. The projected population of the Abuja region assumes a significant increase of 5.8 million by 2026

(Federal Ministry of Environment report, 2004). Unfortunately, with the city's growth and lost opportunities to expand infrastructure (including waste management) in line with a pre-agreed master plan, Abuja now faces many of the same problems as other cities in Nigeria.

2.2 Conceptual Literature

2.2.1 The Concept of Waste

Nigel Bell in Akinwale, (2005) defines waste as waste or material that is not wanted and cannot be used economically without further treatment. Here Nigel emphasizes that something must be economically useless as waste. However, Nige's position could be questioned.

Those that are economically unusable, perhaps most needed, and economically significant to other parties. That is, it can turn out to be garbage in one place and not in another. For example, after drinking the liquid contents of a bottle of champagne, the empty bottle is considered waste by the person who drank the liquid contents and may be discarded. However, another person can retrieve it from the disposal site and reuse or recycle the empty bottle to contain another liquid substance or economically significant item.

The bone of contention here is that it is not clear when an item becomes waste. Ogwueleka, (2009) argued that there is no definitive list of what is waste and what is not. It can be said that it is a question to be decided on the basis of facts and interpretation of law. Whether a material is disposed of as waste depends on the one hand on the manufacturer or owner of such material and on the other hand on such regulations or laws. On 26 March 1991, the Council of the European Community defined waste as any substance or object in the categories listed below which the owner discards, intends or is required to be discarded. The categories include:

- ✓ Production or consumption residues not otherwise specified below
- ✓ Off-specification products

- ✓ Products whose date for appropriate use has expired
- ✓ Materials spilled, lost or having undergone other mishap, including any materials, equipment, etc. contaminated as a result of the mishap
- ✓ Materials contaminated or soiled as a result of planned actions (e.g. residues from cleaning operations, packing materials, containers, etc.)
- ✓ Unusable parts (e.g. reject batteries, exhausted catalysts, etc.)
- ✓ Substances which no longer perform satisfactorily (e.g. contaminated acids,
- ✓ Contaminated solvents, exhausted tempering salts, etc.)
- ✓ Residues of industrial process (e.g. slags, still bottoms, etc.)
- ✓ Residues from pollution abatement processes (e.g. scrubber sludge's, bughouse dusts, spent filters, etc.)
- ✓ Machining/finishing residues (e.g. lathe turnings, mill scales, etc.)
- ✓ Residues from raw materials extraction and processing (e.g. mining residues, oil field slops, etc.)
- ✓ Adulterated materials (e.g. oils contaminated with PCBs, etc.)
- ✓ Any materials, substances or products whose use has been banned by law
- ✓ Products for which the holder has no further use (e.g. agricultural, household, office, commercial and shop discards, etc.)
- ✓ Contaminated materials, substances or products resulting from remedial action with respect to land.
- ✓ Any materials, substances or products which are not contained in the above categories.

The holder ,in this context, shall mean the producer (anyone whose activities produce waste and/or anyone who carries out pre-processing, mixing, or other operations resulting in a change

in the nature or composition of this waste) of waste or the natural or legal person who is in possession of it. It may worth our while to re-emphasize here that waste is sometimes a subjective concept, because items that some people discard may have value to others. What the Council of the European Communities listed as waste may differ from what constitutes waste in Nigeria or in any other territory.

The 2009 model Encarta soft dictionary, highlighted seven aspects of waste, they include waste as an (a):

- ✓ Act of Wasting: a failure to use something wisely, properly, fully, or to good effect. Example; a complete waste of money.
- ✓ Unwanted Material: unwanted or unusable items, remains, or byproducts, or household garbage. Example; chemical waste
- ✓ Excrement: the undigested remainder of food expelled from the body as excrement.
- ✓ Used or Contaminated Water: used or contaminated water from domestic, industrial, or mining applications.
- ✓ Rock associated with mineral: enclosing rock mined with a mineral, or ore with insufficient mineral content to justify further processing.
- ✓ Wild area: an uncultivated, desolate, or wild area (often used in the plural) as in the frozen wastes of Antarctica.
- ✓ Destroyed area: a place or region that has been destroyed or ruined.

Contributing to the subject matter, the Basel convention cast its vote to the school of thought that believes that wastes are "substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law". While the United Nations Statistics Division (UNSD) stated that "Wastes are materials that are not prime products

(that is products produced for the market) for which the generator has no further use in terms of his/her own purposes of production, transformation or consumption, and of which he/she wants to dispose. Wastes may be generated during the extraction of raw materials, the processing of raw materials into intermediate and final products, the consumption of final products, and other human activities. Residuals recycled or reused at the place of generation are excluded". Attah K.D (2009) noted that the Federal Environmental Protection Agency Act of 1988 did not define waste. Only some sate statues attempt to do so. For example, section 32 of the Lagos State Environmental Sanitation Edict has a definition similar to the UK Environmental Protection Act, 1990, as any substance which constitutes a scrap material, an effluent or other unwanted surplus substance arising from the application of any process. He further states that waste is usually classified according to:

(a) Its source,

(b) Its harmful effect on humans and the environment, and

(c) The control which are appropriate to deal with it.

2.2.2 Waste classification according to source

Domestic waste, commercial waste, and industrial or factory waste. Domestic waste can be categories into hazardous domestic and nonhazardous domestic waste. Depending on the effect to human body, commercial waste includes; Biodegradable waste, chemical waste, electronic waste, demolition waste, electrical waste, construction waste, food leftovers from commercial or industrial properties.

2.2.3 Waste classification according to its harmful effect on humans and the environment

Hazardous wastes; Substances unsafe to use commercially, industrially, agriculturally, or economically and have any of the following properties- ignitability, corrosively, reactivity and toxicity. Non-hazardous Substances safe to use commercially, industrially, agriculturally, or economically and do not have any of those properties mentioned above. These substances usually create disposal problems.

2.2.4 Waste classification according to the control which are appropriate to deal with it.

This covers solid waste, liquid waste and gaseous waste. Also waste that can be recycled, non-recycled waste, bio fuel waste, and waste for agricultural uses.

With regards to the source classification, it either comes out of the shop (market) or office - commercial waste or, out of the factory- industrial waste, or out of the home – household or domestic waste.

Pongracz and Pohjola, (2004) proposed four perspectives by which wastes could be interpreted. To them, wastes are:

- ✓ Non-wanted things created, not intended, or not avoided, with no purpose.
- ✓ Things that were given a finite purpose thus destined to become useless after fulfilling it.
- ✓ Things with well-defined purpose, but their performance ceased being acceptable
- ✓ Things with well-defined purpose, and acceptable performance, but their users failed to use them for the intended purpose.

2.3 Solid Waste Management Approach in Some Nigerian Cities

Waste management practices in Nigeria are poor. Numerous studies reported a similar pattern of management at the states and city level. There are about 37 states in Nigeria including

the Federal Capital Territory, most of these states are faced with the same waste management challenges.

2.3.1 Ibadan city, Oyo state

Adeoye et al, (2005) observed that there are illegal solid waste dumps in several parts of the city. He found that these waste dumps undergo physical and chemical changes under the intense heat of the sun thereby posing the risk of pollution to the ecosystem. A study of market waste in Ibadan shows that the environmental conditions in most of the city markets are poor (Bammeke and Sridhar, 1989). Their study stated that, while waste is continuously being generated, arrangements are not made for their effective collection, transportation and disposal.

Ayininuola and Muibi, (2008) pointed out that heaps of solid wastes including abandoned vehicles are common in some parts of Ibadan. Ibadan is the capital city of Oyo state. A survey of 648 households in the city reveals that the per capital solid waste generation is estimated to be 0.129kg per day (Afon and Okewole, 2007). The survey revealed that about 75.4% of the total wastes generated are organic materials. They pointed out that there are potentials for reuse and recycling through composting or anaerobic digestion of waste produced in the state. Similarly, Bammeke and Sridhar, (1989) noted that about 68% of market wastes are putrescible. They suggested composting as the best form of treatment.

Rahji and Oloruntoba, (2009) noted that most waste materials generated in Ibadan especially household waste are mainly made up of food waste. They advised that it is important that the waste should be disposed of using the best means possible as they may constitute environmental hazard during decomposition. They pointed out that a good disposal practice will avoid the creation of a breeding ground for flies, vermin and ground or surface water pollution through leaching and flooding. However, Ayininuola and Muibi, (2008) reveals that the

collections system in some parts of the city is grossly inadequate as only a fraction of the wastes generated are collected and only a fraction of the collected waste are properly disposed of. They pointed out that changes in the day to day activities in some parts of the city, especially in demographic expansion have led to an increase in the volume and diversity of solid waste. Bammeke and Sridhar, (1989) cited unplanned development as a major cause of the current waste management practice in the city. They went on to say that one other major cause of indiscriminate dumping in the city is the inability of the authorities to provide effective waste management service.

2.3.2 Port Harcourt

Ayotamuno and Gobo, (2004) reported that once the city of Port Harcourt was referred to as the garden city of Nigeria. This was due to its cleanliness and beautiful vegetation. These days, however, refuse from various sources forms litter in various parts of the city. Igoni et al., (2007) indicated that although large quantities of the refuse generated in Port Harcourt are collected, some are left to form litters in some parts of the city.

Ogbonna et al., (2007) added that householders deposit their waste at designated collection centers which are usually located along major roads and public markets. These wastes are then collected by the local contractors working in partnership with government agencies. Despite this arrangement, Ayotamuno and Gobo, (2004) reported that indiscriminate dumping still persists in the city. Other disposal methods such as burying and open burning are also used (Igoni et al., 2007).

Ogbonna et al, (2007) noted that the old Port Harcourt Township once had a good level of infrastructure with good drainage system and waste disposal centers. However, the rapid population growth that accompanied the discovery of oil and the lack of government control on

new development gave rise to housing shortages and unplanned road network in the city. Omuta, (1987) suggests that uncontrolled development and poor urban structure can poses a big constrains on solid waste management as they create difficulty and accessibility problems.

2.3.3 Lagos

An examination of the current solid waste management in Lagos reveals a similar trend to other regions of Nigeria. However, some improvements have been made in the city. Ezeah and Roberts, (2013) noted that Lagos state has made some significant progress in growing institutional capacity for solid waste management. Solomon, (2009) observed that Lagos is one of the few states in Nigeria that provide collection service from house to house and communal collection points. He reported that the state commissioned a transfer loading system, to serve several areas of the state. The project will see waste being compacted before transferring them to dump sites. However, Adewole, (2009) reveals that there are several areas that still need to be improved upon, if the objectives of sustainable developments must be achieved. He pointed out that most of the industries around the Isolo area of Lagos still do not have pollution abatements programs in place. Hence, the Lagos lagoon absorbs 10,000 m3 of industrial effluent daily. Despite attempts to organize a collection system in Lagos, Kofoworola, (2007) argues that there are still inadequate facilities for waste management in the state. He found that, some inhabitants of the state use illegal disposal route such as dumping along the streets and motor ways. A study (Afon, 2007) from two Local Governments in Lagos state reveals that residents store waste in small containers. Some of the containers include plastic and metal unused buckets, bowls, polythene and nylon bags. The study pointed out that the use of such small storage containers helps residents to get a good bargain by paying less to informal waste collectors for the disposal

of their waste. He added that this storage system attracts disease carrying vectors such as flies and rats.

Kofoworola, (2007) observed that Lagos does not have an integrated approach to waste management and the problems associated with the current system of management are obvious. Afon (2007) reveals that dumping of waste into the drainage channels and in public places are common practices among residents. Currently no treatment exists for collected wastes, which are transported to landfill sites and burnt for volume reduction. Kofoworola (2007) added that this burning process releases harmful gases to the ecosystem. Hence, Longeetal. (2009) advised that a management approach that emphasizes waste reduction, recycling and reuse should be adopted.

Another major problem with waste management in Lagos is that wastes are not separated. A study (Ogundiran and Afolabi, 2008) of leachate characteristics in a Lagos landfill reveals that industrial and household waste are dumped together at the Olusosun landfill. This is particularly hazardous to the environment as the wastes are dumped on the landfill without treatment. Adewole, (2009) argues that since most landfills in Lagos are not engineered, leachate will percolate into streams and groundwater sources. He also suggests that an approach with an organized system of collection from industrial and domestic sources should be adopted. Solomon, (2009) suggested that there is a need for landfills in Nigerian cities to be built to the required standard.

Furthermore, Solomon, (2009) observed that some progress is being made in terms of solid waste in Lagos. He stated that, since a large percentage of solid waste generated in Lagos is put risible, a private company recently established a composting plant capable of treating 1500 tons of solid waste per day. In addition to this, Ezeah and Roberts (2013) stated that the Lagos state agency responsible for waste management was recognized for its effort by the Federal

ministry of commerce and industry in 2010. They added that other organizations such as United Nation Development Program, Clinton Foundation and USAID have recognized the effort of the body through awards or sponsorships. However, they noted that there are still some governance issues in the state as regards waste management.

2.4 Household Size and Solid Waste Disposal

The waste generating potential of households is dependent on several factors. The most important is household size, i.e. the number of persons present in the household. This influences the rate of generation of several categories of waste, including packaging wastes, put rescible kitchen waste, miscellaneous plastic waste and miscellaneous combustible waste. Its effect is the same in each case; as the number of persons in the household increased, so the amount of such waste produced by the household increased (Jones Alan, 2008).

Logically, large households would be expected to generate much more solid waste than small households. This is because they consume more in terms of food and other items (Naing, 2009). As family size and income are the most significant factors affecting the quantity of solid waste from household consumption, as study on the relationship among these is vital in the decision making on waste management strategies (Sivakumar, 2012). Concerns about the environmental impacts of consumption and production, such as loss of natural resources, climate change and other environmental damage caused by emissions and waste, have been addressed at the global level by the United Nations since the 1992 Earth Summit, in Rio de Janeiro. The 2002 Johannesburg World Summit on Sustainable Development called for the development of a 10-year frame work of programs to promote sustainable consumption and production patterns.

2.4.1 Influence of Location of Household on Solid Waste Disposal

Municipal solid waste collection systems in cities in developing countries generally serve only a limited portion of the urban population. Garbage collection services are typically unavailable to low-income people living in suburban areas. One of the main reasons is the lack of financial resources to deal with the increasing amount of waste generated in rapidly growing cities. Fees are often inadequate and funding from local government central budgets is insufficient to fund adequate levels of service. However, economic issues are not the only factors affecting the availability and sustainability of waste collection services. The operational inefficiency of municipally operated SW services can be attributed to inefficient institutional structures, inefficient organizational procedures, or inadequate management capacity of relevant agencies, as well as the use of inappropriate technology (Zurbrugg, 2003). Developing countries often use 'traditional' collection approaches developed and adapted in developed countries. Used cars are sophisticated, expensive, difficult to operate and maintain, and often unsuitable for developing country conditions. After a short period of operation, only a small portion of the vehicle fleet is typically operational.

There is currently a great deal of interest in involving the private sector in waste management in many countries. This may be due to community systems failing to provide adequate services, or due to pressure from national governments and international organisations. Not all agreements with private companies have been successful, and as a result there is current resistance to private sector involvement. A key component of successful private sector engagement is the client's or client's (usually local government's) ability to create and implement effective contracts. Many municipalities do not know the costs of providing services, so they cannot assess whether private sector provision is adequate. Contract documents should be well-written to quantify the services required and to indicate the penalties and other sanctions that will be imposed in case of non-

compliance. Monitoring and enforcement must be effective. It is also important that the rights of both parties are protected by the courts. His three key ingredients for a successful deal are competition, transparency and accountability. (Zurburg, 2003). Instead of large companies (often international) that can provide most or all solid waste services in a city, micro-enterprises or small and medium enterprises (MSEs) or community-based organizations (CBOs) provide community-level services (neighbourhoods region). or administrative districts) small towns). In many cases, simple equipment and labour-intensive methods can be used to collect waste where conventional trucks from large companies cannot go. KKU can be established as an income and job generating business or started by community members who want to improve their neighbourhood. A problem with reuse of collection systems operating at the community level is that these systems typically collect waste and travel relatively short distances to transfer points. From there the waste is collected by another organization. Reconciliation and billing issues often result in waste remaining at transfer points for long periods of time and poor hygiene. Another approach is the local (decentralized) recycling of large volumes of waste, with little need for ongoing transportation of collected waste. (Zurbrugga, 2003).

2.4.2 Education and Household Waste disposal

Education is an important factor in the disposal of solid waste at the household level. A person who has had some knowledge regarding the importance of natural environment will not throw away garbage in an unsustainable manner. The most important landmark for environmental education at an international level was without a doubt the International Conference on Environmental Education organized by UNESCO and UNEP at Tbilisi informer USSR in 1977.

The goals of environmental education were defined as creating environmental awareness, impart general knowledge for a basic understanding of environment, acquiring environmental friendly attitudes and values and to generate new patterns of behavior towards environment. The more recently held United Nations Conference on Environment and Development in Rio de Janeiro, Brazil in 1992, popularly known as the Earth Summit, adopted an action plan for Sustainable Development, Agenda 21. Chapter 36 which is devoted to education, states that "Education is critical for promoting sustainable development and improving the capacity of people to address environment and development issues “Education without communication is simply impossible.

Communication in turn will only work with an appropriate medium. In the case of environmental education at educational establishments classes at school, college or universities level serve as this medium. As far as environmental education outside educational establishments are concerned mass media and traditional media like family, neighbors and colleagues have the role of the medium that enables people to communicate successfully. In the following paragraph these three different kinds of media (institutional, mass and traditional media) will be examined to find out on their efforts made in creating environmental awareness and how more or less successful they are.

2.5 Empirical Study

2.5.1 Public Training

Public training is a key component of waste management as a form of awareness raising. Inadequate staffing leads indirectly to lack of awareness, but directly to poor quality waste management. In order to implement effective and high-quality projects, it is important to allocate

appropriate human resources at the planning stage and conduct appropriate public training. Required personnel and waste disposal should be considered part of the total cost of delivering the agreed result, not as additional costs. Proper implementation requires human, physical and financial resources. In most regions, especially poor and developing countries, waste management is non-functional due to poor or inadequate education. Adequate staffing is essential to develop effective implementation of waste management projects in community structures (Lippiti, 2007).

Effective implementation of a waste project requires a qualified individual capable of performing solid waste disposal services. These tasks primarily include designing the overall design of the implementation system, setting up and operating the supporting computerized system, facilitating learning in retrospective sessions, and managing the communication of monitoring and evaluation results included. Participatory qualitative delivery methods are rarely used due to their limited capacity and little recognition of the need for such methods. Effective public training promotes accurate documentation and improved record keeping related to solid waste management, thereby addressing management issues at hand. Project contributors with insufficient relevant skills and experience make little effort to fill gaps created by underlying problems in the community setting (Kotler, 2006).

Kenneth, (2006) points out that an important principle to consider when prioritizing project implementation is to pay close attention to human resources. There is an urgent need for effectively qualified project delivery personnel who can be relied upon for technical support when needed. Especially in large programs that require a lot of work, understaffing usually leads

to poor implementation. Public training is important to support the implementation structure. If the staff's ability to handle the project is an issue, there should be room to outsource better staff to perform the same duties. This means that from the outset you need competent and capable people with different skills than statisticians, data managers and project implementers. Public training is one of the essential components of any solid waste management system. There are several terms used in human education related to waste management practices such as: B. Monitoring and evaluation training, education and staff development for monitoring and evaluation. Involvement of qualified personnel with different skills at all levels of waste management project implementation ensures high-quality execution of the tasks. Staffing is a particular concern in project implementation as it requires a combination of professional training and research and project management.

Furthermore, the effectiveness of monitoring and evaluation work often depends on the support of staff and volunteers who work closely with monitoring and evaluation professionals. Public training is paramount to effective waste management and staff should be trained in the basics of waste management. Not only do we need dedicated and qualified staff to carry out the project, it is also important that these staff have the right skills for the job. With effective role assignments, responsibilities in the implementation of waste management projects should be based on the competence and ability of individual employees to achieve all project objectives in a timely manner. Therefore, there should be a clear division of responsibilities so that qualified personnel are reserved for implementation and administration.

2.5.2 Public and Private Partnerships

JICA, (2010) argued that solid waste collection and transportation, and overall management, should be managed by the private sector because of the way the private sector

works, the transparency of its financial suggests that it can only be improved through the involvement of

Many countries fail to provide basic services related to waste management. County governments appear to be responsible for collecting and managing waste, but they also face challenges ranging from financial and inadequate management to lack of proper planning. This is where partnerships that foster the expansion of qualitative and quantitative services beyond private and purely public institutions come into play.

According to UNESCAP, (2011), public and private partnerships alone are not the solution for providing a holistic service delivery to a particular problem, but project for desirable solution options. It is a proven method of implementation mechanism (UNESCAP, 2011). Public-private partnerships are long- or medium-term arrangements between the public and private sectors in which the public sector delegates some of its responsibilities to the private sector (World Bank, 2011). Private schools typically perform better than public schools. Services provided by private companies perform better than public institutions, especially when private companies have service contracts. A public-private partnership means that a public official has delegated the performance of public duties to the private sector or has delegated operations on behalf of the public sector. Performance is improved as the private sector takes advantage of improved and innovative working methods to perform tasks on behalf of the public sector. The private sector is much more cost-effective and productive, and most work with competent and skilled staff. What does this at lack is waste management by skilled and highly dedicated staff, which in turn improves and protects the environment. Most private sectors have the capacity to manage solid waste as they have access to capital to improve their infrastructure.

Solid waste remains the prerogative of the county council, and public cleanliness issues are everyone's concern. When many factors have to be considered in waste management, the issue of private sector involvement cannot be overlooked due to its efficiency, accountability and overall management issues. Public-private partnerships should be used as tools for the active and continuous delivery of public services. This is because too much solid waste is generated on a daily basis and needs to be managed. At this point, the private sector is heavily involved as it has what it takes to manage waste as the population grows. These contracts range from rental contracts, service contracts, and management contracts to operation and maintenance contracts. These various levels of partnerships are undertaken to improve the efficiency and effectiveness of public service delivery.

Cooperation with these sectors can be long-term or short-term, depending on the nature of the work at hand. Several other actors are involved in waste management.

They range from the public, private, commercial, civil and informal sectors to other donor organizations. Public participation consists of providing to the private sector through monitoring regimes and enabling the waste to be collected.

2.5.3 Institutional structures

Hackman, (2005) points out that individuals with effective institutional skills are seen as good leaders and that organizations are therefore driven to thrive by their leadership. To determine the impact of management skills on the success of community-based projects involving solid waste management, leadership should consider funding allocated for the purpose of waste collection and treatment.

Organizational managers need to influence everything they interact with to achieve project success. Therefore, not only good management skills, but also leadership skills are dearly needed. The issue of integrity, the application of leadership qualities also ensures that the people you lead can successfully carry out all the tasks assigned to them. Hambrick, (2005) calls for the need to coordinate the institutional management of projects so that all stakeholders are involved. If a project needs to be sustainable, priority must be given to the immediate beneficiary community. Where an agency needs efficiency, the resources allocated to carry out such community or public projects should be staffed so that the integrity of the agency can attract more other resources. It must be placed and used appropriately. There is an urgent need to share the responsibilities of the various agencies and available structures in solid waste management. Society expects defined public institutions to have goals and priorities related to environmental protection and that all services are provided equally by all. Governance approaches to waste management and planning include the development and implementation of action plans and policies, or legislation involving local communities and other key stakeholders, and institutions from all sectors (Yousif and Scott, 2007).

The agency responsible for county budget allocations should ensure that the financial aspects of waste management are fully considered. Solid waste programs should take this into account, especially in low-income areas where the majority of the population resides and where households need to allocate the highest amounts.

2.6 Theoretical Framework of the Study

2.6.1 Behavioral Finance Theory

Jung, (2003) asserts that behavioral finance theory is focused on relevance to service providers of investment management. Service providers learning from behavioral finance ought to learn to make out their own mistakes and those of others, comprehend those mistakes, and take mitigation strategies where necessary and applicable.

In the County government in question, if service providers lack effective behavioral mannerisms in their service provisions then solid waste management lacks effective managerial control hence poor services in the City County government in question.

2.6.2 Institutional Theory

Public policy is indomitable by government institutions, enforcement bodies which provide services and provide policy legitimacy (Bantel, 2001). The policy enforcer applies guidelines to all people of society and monopolizes the strength of the applying policy; for instance, the legislature, executive and judicial branches of government are examples of institutions that enact, amend and enforce policies both that govern assets and provision of services. Anderson, (2002) considers policy as an institutional yield. Government institutions have long been an epicenter focus on service provision. The author further asserts that the policy is commandingly determined, put into effective use and enforced by the governing institutions.

Walker, (2004) asserts that the affiliation between policies and government institution is shut because a public policy cannot become a communal policy until it is opted, put into effect and enforced by government institutions. Boyne, (2004) asserts that public institutions give public policy legitimacy, legal duty that authorizes loyalty of the people through universality that is only government policies enlarge to all people in the society and has the legitimate liberty to imprison violators of public policy. The ideology of maximum social gains implies no policy

should be embraced if its costs surpass its payback and among policy alternatives, policy makers should choose the policy that yields the greatest benefits over costs. So, a policy is cogent when it serves the intended purpose. Therefore, in this regard the government as the constitutional mandate to enforce the Polluter Pays Principle (PPP) to the violators of this guide line in solid waste management.

2.6.3 Kolb's Experiential Learning Theory

The attention and focus are on the learning process for the individual so as to produce effective service providers. Further, Edmondson, (2006) asserts that this study is coined on the ideology of a cyclic all earning theory. The first stage is the concrete learning involving field experience, while the second one involves observation. The third one involves mindful thinking while the last one focuses on ideas and experiments.

Garbage collectors and service providers who lack the experience or fail to actively implement their learning, technical know-how and expertise in solid waste service provision will definitely provide compromised services if not substandard.

2.7 Process of Municipal Solid Waste Management in Nigeria

The process of municipal waste management involves several compounding and multifaceted procedures, which includes but not limited to; segregation, packaging/storage, collection, transportation, processing, resource recovering, recycling and disposal. However, the commonest method of waste disposal, are landfill system, incineration, composting and anaerobic digestion and recycling

Unfortunate, in most developing nations adherence to this procedure are not wholesomely adhered to, as wastes are usually dumped precariously in the bush or along the road. A study in 2003 by the Health and Demography Department of Nigerian National Population Commission indicated that only 14% of Nigerian have access to reliable household waste disposal system, for instance household waste are usually incinerated or used to feed domestic animals. Figure 2.1 shows the estimated volumes of MSW generated in some Nigerian cities.

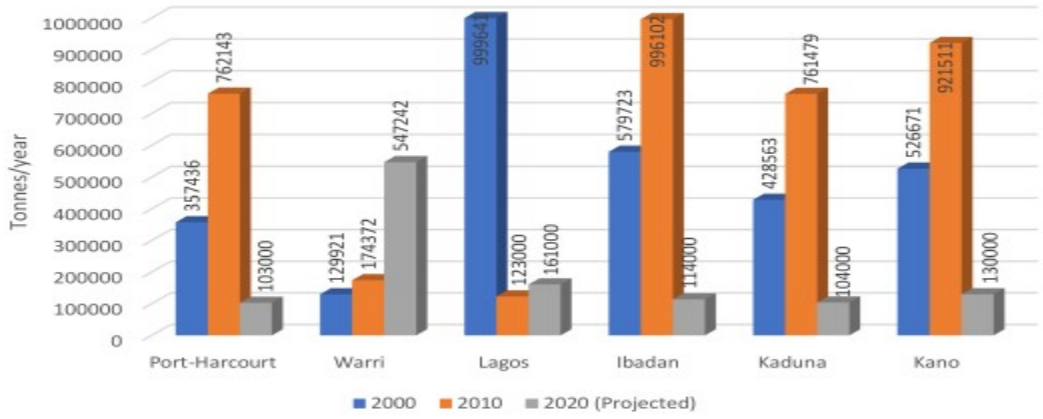

Figure 2.1: Estimated volumes of Municipal Solid Waste (MSW) generated in some Nigerian cities

Besides the fact that there are lesser technological and industrial activities in rural settings, waste generated in rural communities are often degradable or bye products of agricultural origin. Unfortunately, due to maintenance cost, inadequate sensitization on danger posed and poor legislation, the commonest method of waste disposal and management in Nigeria has become, open dumping. Efficient and effective waste management in Nigeria should be implemented without much ado, this is broadly dependent on the three Rs policy (Reduce, Re-use, and Recycle). In Nigeria, there is no formal recycling sector as solid waste, which majorly

includes scrap metals and plastic are usually selectively recycled by scavengers based on their economic value.

2.7.1 Waste Generation in Abuja

According to a research carried out by Ogwueleka, ((2013), on survey of household waste composition and quantities in Abuja, Nigeria Five hundred and eighteen samples were collected from 74 households involving a population of 404, corresponding to 1825 kg of solid waste produced. The quantity of household wastes collected during the short period was 508.1 kg, 679.4 kg and 637.6 kg, respectively, for each socioeconomic group studied. The wastes generation rate 0.717 kg/capita/day was highest in the high-income group. The high-income group generates more waste than in the other two groups. The average amount of household waste generated per capita was 0.595, 0.626 and 0.717 kg/capita/day for low-, medium- and high-income groups, respectively. The weighted average amount of waste generated in Abuja is

$$= \frac{(0.595 \times 36.49\%) + (0.626 \times 41.89\%) + (0.717 \times 21.62\%)}{100\%}$$

$$= 0.634\, kg/capita/day$$

This average per capita house hold waste generation rate is 0.634 kg/capita/day, which are more than 0.54 kg/capita/day reported by Imam et al. (2008). From the survey in Abuja, the total daily waste generation is 492.17 tones. The waste generation rate estimated for Abuja falls at the lower end of the range reported for middle income countries (0.5–0.9 kg/capita/day). Figure 2.2 shows the result of average waste composition (percentage) for the seven fractions generated by the three socio-economic groups.

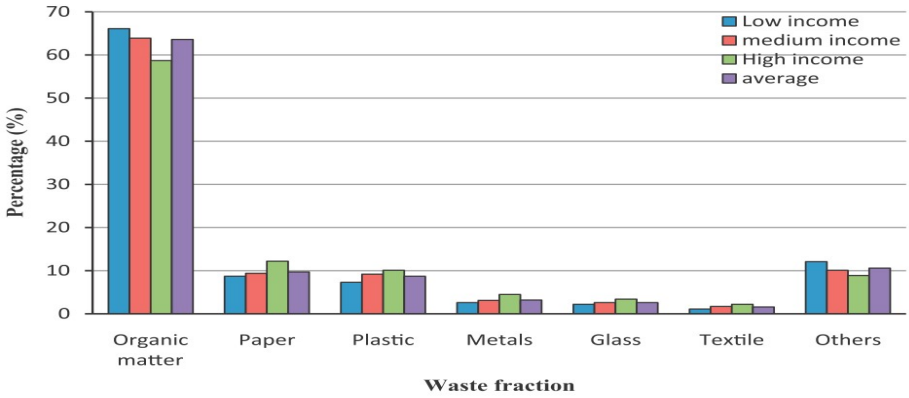

Figure 2.2: Average waste composition (percentage) for the seven fractions generated by the three socio-economic groups.

2.7.2 Waste Composition in Abuja

Composition of household solid waste depends on food habits, collection of recyclable materials, the residents' wealth, in-house composting and climate conditions. The twelve solid fractions arranged in seven groups: organic, paper (including non-recyclable, recyclable papers); plastic (non-valuable, low valued, high valued plastics); metals (including metal and aluminum cans); glass (including clear and coloured glass);textile, others (ashes, fine waste, ceramic, and unclassified). The waste composition analyses give information about the composition of the waste stream in percentage. The highest amount of waste generated at low, medium and high groups respectively is organic waste with 66.1%, 63.9% and 58.7%, then paper, with 8.7% and 9.4.1%,12.2%, followed by plastics with 7.3%, 9.2% and 10.1% then metals, with 2.6%, 3.1% and 4.5%, glass with 2.2%, 2.6% and 3.4%, then textile1.1%, 1.7% and 2.2%.

The organic wastes are the largest unmarketable portion of the waste stream. The recyclable materials (paper, metals, glass, and plastic) in Abuja were 13.175%, 15.92% and 19.795% for low, medium and high-income groups, respectively. The household waste generated in Abuja

contained up to 16.29% recyclable materials (paper, metals, glass, and plastic) on average. Fig.1 shows the composition results as a percentage of the seven main fractions, weighed for the three socio-economic groups studied.

The organic fractions of waste stream vary considerably among income groups. The organic fractions made up the largest amount at all three groups due to use of unprocessed foods in the daily diet of residents. High-income families generate most organic per capital among the three socioeconomic groups because of their high purchasing power. Organic wastes are not usually scavenged by waste pickers. The paper fraction contained all sorts of non-recyclable paper (tissue paper, disposable diaper, etc.) and recyclable paper (newspaper, magazine, cartons, office paper etc.). High-income group shows the largest amount of magazine, newspaper, because their purchasing power (capacity to afford these products) allows them to buy a greater variety of products packaged in cardboard.

High and medium income groups use drinking water and milk packed in disposable plastic containers. Middle and high-income group produce 9.2% and 10.1% of plastic respectively. Low-income group buys sachet water. Low income generates the highest percentage of unclassified wastes. The low-income group utilizes solid fuel for cooking, resulting in ash addition to inert waste content. Figure 2.3 shows the average composition of solid waste at source in Abuja.

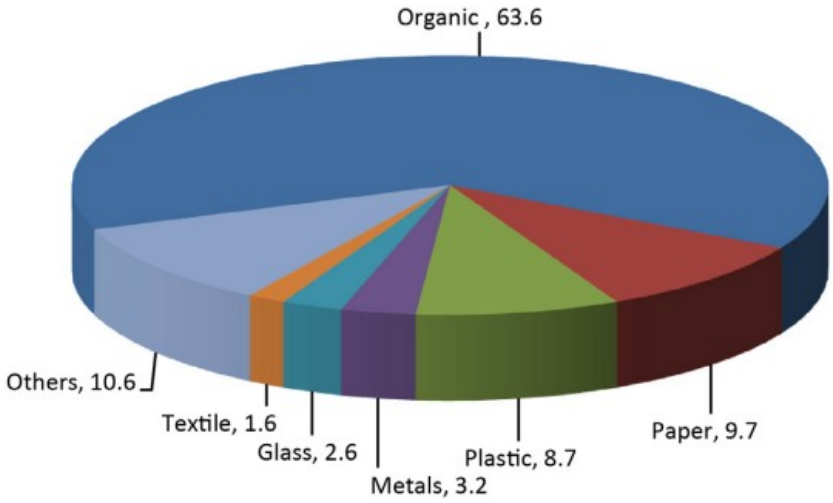

Fig. 2.3: Average composition of solid waste at source in Abuja.

The recovery and reuse of valuable materials in Abuja are conducted in a very primitive way, by scavengers. Scavengers salvage plastic, metals, papers. Scavengers have no facilities or equipment for sorting valuable materials from the solid waste. There is no data on the number of scavengers or on the amount of materials salvaged by them. Itinerants' buyers purchase from resident's items such as bottles, papers, cans, etc. The average weighted household waste composition at sources (in percent) is shown in Figure 2.3. The composition of the waste at source is 63.6% organic waste, 9.7% paper,8.7% plastics, 3.2% metal, 2.6% glass, 1.6% textile and 10.6% others (unclassified).

The changes in the main categories (2004–2012) are presented in Table 2.1. The results showed significant difference between the two studies. It can be concluded that the percentage contribution of organic waste had changed significantly, from what reported. The percentage of organic in low income increased from 52% to 58.7%. The decrease in percentage of plastic in waste stream, may probability be due to awareness by the residents that plastic containers could be reused. The paper fraction was slightly lower than figures reported (Ogwueleka, 2013). The

"others" increased to between 8.9% and 12%. The possible explanation for the difference in proportion of composition of solid waste between the present study (Ogwueleka, 2013) and previous study (Imam et al 2008)] may be due to the period of season that the study was carried out; difference in years and family income, number of samples analyzed and survey methodology.

Table 2.1: Composition (% by weight) of household waste in Abuja.

Waste fraction	Components (%)[a] (2004)	Components (%)[b] (2012)
Organic	52–65.3	58.7–63.6
Paper	6.9–13.6	8.7–12.2
Plastic	15.1–20	7.3–10.1
Metals	4.9–6.7	2.6–4.5
Glass	4.1–5.5	2.2–3.4
Textile	0.1–4.7	1.1–2.2
Rubber	0.19–3.4	–
Others	1.1–2.8	8.8–12

Source: Imam et al. (2008) and Ogwueleka (2013)

From Table 2.2, the One-way Analysis of variance (ANOVA), the results showed that during weekends, Friday to Sunday the highest quantity of household waste were generated compared to other days of the week. The probability of people staying at home during week-ends was higher and the consumption of food and generation of different kinds of waste increased.

Table 2.2: Mean values of daily per capita household waste generation in different days during the survey (kg).

Day	Daily per capita household waste
Monday	0.602
Tuesday	0.626
Wednesday	0.615
Thursday	0.627
Friday	0.650
Saturday	0.691
Sunday	0.731
Total	0.654
Standard deviation	0.085

3.8 Identifiable issues in SWM in Developing Countries

2.8.1 Policy, Institutions, and Macroeconomics

It is asserted in the 2005 UNEP Annual Report (cited in Périou, 2012) and buttressed in Pan et al, (2022) that in many developing countries, the greatest impediments to efficient and environmentally effective handling of solid waste are managerial rather than technical. Improving the operational and management capabilities of individuals and institutions involved in SWM at the local level is therefore extremely important. According to an article looking at SWM in the developing world, operational inefficiencies of solid waste services operated by municipalities can be due to inefficient institutional structures, inefficient organizational procedures, or deficient management capacity of the institutions involved, as well as the use of inappropriate technologies (Zhu et al., 2008). That same study also points to the lack of enforcement of waste management legislation as a major impediment to effective and sustainable waste management in the developing world.

2.8.2 Infrastructure and Technology

Rapid growth of population has created a number of extreme land use planning and infrastructural challenges that have crippled the capability of national and municipal

governments in developing countries in increasing SWM service levels at the rate that they are demanded (Périou, 2012). In the municipal solid-waste management system (SWMS) of developing countries typical problem areas can be identified. These can be described as: 1) budgetary constraints, 2) inadequate service coverage and operational inefficiencies of services including unskilled manpower, 3) ineffective technologies and equipment, 4) inadequate landfill disposal, and 5) limited utilization of waste reduction activities such as recycling.

2.8.3 Budgetary Constraints

Budgetary constraints are often felt in developing countries where resources are limited and distribution of these limited funds are mismanaged. Many municipalities are struggling to achieve acceptable quality and coverage of service due to these financial constraints. A study conducted in Palestine stated that on average, up to 50 percent of residents lack collection services in urban areas of low and middle-income countries (Al-Khatib et al., 2010). Han et al., (2017), emphasized on the limited budgets by government on waste management and suggested an upward review of budget allocation for solid waste management. The authors made four broad classification of the influencing factors: (1) social factor which is dictated by population, education and culture; (2) economic factor which is based on the household income and expenditure, energy and fuel structure and industry types; (3) natural factor which depends on the climate and geography of the area and; finally, other factors which are administrative level and survey methods.

There are limited opportunities for the development of sustainable SWMS, as government budgets are limited and proper waste collection is overlooked (Al-Khatib et al., 2010). Another study conducted in Kenya found that much of the municipal budget for waste management is directed to pay for an over-staffed and under-qualified workforce (Henry et al., 2006), and not

allocated to make improvements within their own infrastructure. The data from another study suggests that the inadequacies of vehicles, supervisors, and solid waste collection crews were the major obstacles to the management of solid waste in the country (Mwanthi and Nyabola, 1997). These problems were attributable to financial constraints and possibly to misappropriation of finances within the offices that manage waste.

2.8.4 Inadequate Service and Operational Inefficiencies

Inadequate service coverage and operational inefficiencies of services including an unskilled workforce is another major set of challenges faced by municipalities in providing sufficient waste services to citizens. Municipal solid waste collection schemes of cities in the developing world generally serve only a limited part of the urban population. The people remaining without waste collection services are usually the low income population living in urban and rural areas (Zhu et al., 2008). One of the main reasons is the lack of financial resources to cope with the increasing amount of generated waste produced by the growing cities.

A study conducted in Kenya found that resources were often centralized in the more affluent areas because there was not enough man-power to cover entire cities and these areas were more likely to pay for the services (Henry et al., 2006). Dwellings with courtyards may have space for storing waste for several days, but compact housing with no space for storage may necessitate that some waste is taken outside the property as soon as it is generated. Narrow streets may not have space for locating storage containers and may be so narrow, treacherous or irregular that motorized collection vehicles cannot be used. Houses that are considerable distances from the nearest accessible road also pose particular problems in receiving adequate waste services. In another study conducted by Mwanthi and Nyabola (1997), it was also concluded that the lack of skilled and technical human resources along with poor management of finances and resources,

and laxity among employees (leading to inconsistent service) were major contributing factors to mismanagement of solid waste in Nairobi City.

When talking about recycling habits of citizens, a case study in India found that the location of recycle bins seemed to be ill situated and not readily available. The author concluded that location and convenience are important determinants in acceptance or rejection of the activity (Venkateswaran, 1994). Irregularity of services such as street sweeping and collection were also observed. He found that the lower the socio-economic level of the residents of an area, the lower the frequency of collection. This was also found to be true in a study in the poorer parts of Nairobi City where the majority (91percent) of the residents interviewed had no storage receptacles. Of this group, 84 percent resorted to either burning the waste in their backyards or to indiscriminate dumping; 90 percent of the time they discarded waste indiscriminately (Mwanthi and Nyabola, 1997).

2.8.5 Ineffective Technologies and Equipment

Ineffective technologies and equipment has been another source that may contribute to the inadequate service coverage and operational inefficiencies discussed above. In a study looking at SWM in the developing world, many sources of waste might only be reached by roads or alleys, which may be inaccessible to certain methods of transport because of their width, congestion, and elevation. This is especially critical in unplanned settlements such as slums or low-income areas and thus largely affects the selection of equipment (Zhu et al., 2008). Another study done in India found that poor conditions of containers and inadequate maintenance and replacement of worn-out collection vehicles contributed to behaviors such as littering and illegal dumping by

citizens who felt they could not properly dispose of trash because trash bins and waste services were not properly maintained (Hazra and Goel, 2009).

Another major constraint is the misuse of technology, which has been documented in numerous cases where sophisticated and expensive technological recycling and composting plants as well as other waste management systems in developing countries have failed (as cited in Yousif and Scott, 2007). Reasons for a breakdown include a failure to adequately and extensively consult the public and relevant stakeholders, adoption of inappropriate technology characterized by imported mechanical and electrical parts which are too expensive to replace or too difficult to maintain, a failure to conduct economic and financial assessments, limited development of a market for recyclables, financial constraints, and absence of skilled technical personnel to manage these systems have been observed in many developing countries (as cited in Yousif and Scott, 2007). Techniques that have often proven effective in developed countries prove to be ineffective in many situations in developing countries that do not have the needed infrastructure, need, or know-how to properly implement these technologies. The lack of overall plans for SWM at the local and national levels results in solid waste technologies that are often selected without due consideration to their appropriateness in the overall SWM systems.

2.8.6 Inadequate Landfill Disposal

Inadequate landfill disposal is the next factor that contributes to infrastructural challenges. Al-Khati et al, (2015) noted that there was a lack of proper disposal sites in the country. Unprotected and uncontrolled dumps, which pose a danger to the public health, environmental health, waste renewable resources, and jeopardize residential development in these areas, are a commonality found in many developing countries. Unlike developed nations, third world countries lack sanitary landfills and oftentimes disposal sites are located at a considerable distance from

communities. This ultimately creates even more financial constraints because costs to collect, transfer, and dispose of waste are more than many municipalities can afford. Rapid population growth and urbanization have put limits on the location of future landfills, and this reality is something that many of these developing countries confront. Finding ways to minimize waste such as recycling are excellent tools to combat this waste issue.

2.8.7 Limited Utilization of Waste Reduction Activities

Information collected in a study in Botswana found that the absence of 'visible' recycling centers and receptacles was found to limit participation in recycling initiatives (Bolaane, 2006). This brings us to the last contributor to the infrastructural constraints on waste management systems in the developing world. Researchers often cite limited utilization of recycling programs as a main infrastructural issue in sustainable waste management. The lack of access to recycling facilities was cited as a major reason for households in developing countries not to participate in recycling (O'Connell, 2011). Oftentimes when recycling programs are introduced to a community either by NGOs or municipalities, these programs are found to be unsupportable either because of financial constraints or poor participation by community members.

3.9 Influencing factors hierarchy

Abir et al, (2023) found that socioeconomic, cultural, physical and technical and institutional factors have influence on affecting the effective solid waste management in the study area. On the other hand, environmental factors have no significant influence on affecting the effective solid waste management in the study area. The result of reliability analysis shows that all of the constructs got a high reliability and more than 0.70 except Environmental Factors (EF). Overall, the result shows that all alpha values of the study instruments are reliable and exhibit appropriate

construct reliability. And from the hypothesis testing this study found that socio-economic factors, cultural factors, physical and technical factors, institutional factors, have a strong positive significant relationship with effective solid waste management because the correlation is significant at the 0.01 level among four factors (this is in line with hypotheses tested in their article) and effective solid waste management and the hypotheses are accepted in their study. The hypotheses for the variables environmental factors have no significant relationship with effective solid waste management however, rejected as the correlation is not significant at the 0.01 level.

2.10 Conclusion and Identification of Research Gap

The collection of municipal solid waste is a public service that has important impacts on public health and the appearance of towns and cities. However, increasing population has caused severe pressure on basic infrastructure and amenities, creating large areas underserved by public services. Unfortunately many urban administrations seem to be losing the battle of coping with the ever-increasing quantities of waste. The predominantly technology-oriented nature of waste management systems, without due ***social, ecological, and economic considerations***, has been responsible in large part for many of the constraints and inefficiencies experienced in solid waste management.

Financial constraints, inadequate service coverage and operational inefficiencies, ineffective technologies and equipment, inadequate landfill disposal, and limited utilization of recycling initiatives are all found to be challenges to the infrastructure of waste management systems in developing countries. These gaps in service relate not merely to availability of infrastructure and investments, but also to inappropriate management of the service. Major interventions need to

take into account the circumstances and needs of the communities for which they are implemented.

Improvements to infrastructure and technology within the waste management system need to be accompanied with community involvement and participation as well as educational and awareness campaigns in order to be successful in creating sustainable waste management systems.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter is designed to describe the procedures adopted in this research. The procedures involve the following: research design, population of the study, sample and sampling techniques, instrumentation, validation of the instrument, administration of the instrument and data analysis techniques. This research will cover the study of solid waste management in the Federal Capital Territory municipalities using Integrated Solid Waste Management (ISWM) as an assessment tool. The area of this study is confined to the five area councils and one municipal area council that makes up Abuja. The focus of the survey aspect of the research will include all residents residing within these areas. Primary data will be collected through questionnaires using random sampling for the residential questionnaire. The field survey will be inclusive of all areas within research scope. The research boundaries of the study include the system elements of the integrated solid waste management system.

3.2 Research Design

This study adopts survey research design to study the influencing factors of domestic solid waste management in Abuja. According to Nworgu, (2006), survey research design insurance that a group of people or items is studied by collecting analyzed data from only a few people or items considered to be representative of the entire group. It uses a questionnaire to determine the opinions, preferences, attitudes and perceptions of people about issues that concern them. As in this study this parameter would be used.

3.3 Population of the Study

The population of the study consists of 2,440,000 people, from the Federal Capital Territory of Abuja based on influences of domestic waste management Abuja metropolis. The metropolitan city of Abuja will be selected as the study area because it's the center of interest for both local and international personnel, hence availability of littered environment will be a wrong interpretation of Nigeria. The metropolitan city will be chosen considering the level of the knowledge of the population on waste management.

3.4 Sampling and Sample Size

In the sampling, since the researcher choose to undergo a quantitative research, a probability sampling technique is adopted under which a simple random technique is considered suitable for the study. The Yaro Yamane formula below will be used to determine sample size to be used at 0.05 confidence level (level of significance):

The sample size will be obtained using formula

$$n = \frac{N}{1+N(e)^2} \qquad (3.1)$$

Where:

n = expected questionnaire

N = Target population

1 = Constant

e = level of significance

Now having n =? N = 2,440,000, and e = 0.05

Using the relation in equation 3.1, $n = \frac{2{,}440{,}000}{1+2{,}440{,}000(0.05)^2}$

$$n = \frac{2{,}440{,}000}{6101}$$

Therefore, $n = 399.93$

Approximately 400 questionnaires are admitted to the metropolitan city at random order. In other to have equal distribution the researcher will use the calculation to get the expected questionnaire per area, as the metropolitan city is divided into 6 areas. In order to avoid insufficiency in quantity or questionnaire 50 more questionnaire were added to the calculated 400 questionnaires making it a total of 450 questionnaire distributed.

$$Expected\ number\ of\ questioniare = \frac{calculated\ number\ of\ questioniare}{number\ of\ areas}$$

$$Expected\ number\ of\ questioniare = \frac{450}{6} = 75$$

Having the above result, the expected number of questionnaire distributed is 75 questionnaires to six areas of the metropolis.

3.4.1 Study Area Characteristics

Abuja is the capital city of Nigeria. It is located in the center of Nigeria, within the Federal Capital Territory. It falls within latitude 8.28^o and 9.20^{o}North of the Equator and longitude 6.45^o and 7.39^o east of the Greenwich Meridian. It occupies an area of about 250km^2 within the Gwagwa Plains in the northeast quadrant of the FCT. At the 2006 census, the city of Abuja had a population of 776,298 (NBS Census, 2006), making it one of the top ten most populous cities in

Nigeria. The FCT is bounded on the north by Kaduna State, on the west by Niger State, on the east and south-east by Nassarawa State, and on the south-west by Kogi State.

The physical development of Abuja is planned to progress in four operational phases. It is being developed in phases (four phases in all) over an area of 250 square kilometers. Each of the phases is divided into districts and each district is further subdivided into neighborhoods for planning and development purposes. The physical development of Abuja is planned to progress in four operational phases. Phase 1 consists of seven districts: The Central Area, Garki I, Garki II, Wuse I, Wuse II, Asokoro, and Maitama. Phase II consists of 14 residential districts and four sector center. Phase III consists of eleven districts. The spiraling economic and sociopolitical activities, with the attendant strains on housing and living conditions, contributed largely to the upsurge of squatter settlements in the territory. These settlements (with the exception of Garki Village within Garki II District of the city) are predominantly situated in the city suburbs, otherwise known as satellite towns. These suburban areas generally are densely populated and lack good infrastructure, basic social services and amenities. Poor unemployed persons and low-income workers who live in shanty and poor accommodation structures mainly constitute the suburban population.

3.4.2 Sample Techniques

Probability Sampling Techniques will be chosen for the research, under which a simple random technique is considered suitable for this study, the questionnaire will be administered from one area to another within the metropolitan city, filled by respondents in which after a period of two days to one week, it will be retrieved by the researcher, since simple random techniques under probability sampling technique is will be used, there are no fixed or limited parameter in the administration of the questionnaire.

3.5 Data Collection Instrument and Validation

Questionnaire is widely used for data collection in social research, particularly in surveys. It is fairly reliable tool for gathering data from large, diverse, varied and scattered social groups; it is used in obtaining objective, data as well as in gathering information of quantitative natureA questionnaire is a list of questions send to a number of persons or institutions for their answers and which obtains standardize results that can be tabulated and treated statistically. It is defined as "group of sequence of questions designed to elicit information upon a subject or sequence of subject from information". (Sharma, Prasad & Satyanarayana, 1983).

The quality of the questionnaire will be determined by the project supervisor. The judgment will have sought to guarantee that each of the items in the instrument measured what it will supposed to measure.

In this method a questionnaire is sent to the persons concerned with a request to answer the questions and return the questionnaire. The questionnaire consists of a number of questions and sectioned to meet the objectives of the study. The short-structured questionnaire is sent to the society. The questionnaire focus on above aims and objectives with a demographic data:

Section A: Demographic

Section B: social factor

Section C: economic factor

Section D: natural factor

Section E: prevention and correction

3.6 Method for Data Collection

3.6.1 Primary Data Collection Methods

Primary data collection methods are divided into two groups: quantitative and qualitative. In this study the quantitative data collection methods are used which is based in mathematical calculations in various formats, it includes the use of questionnaires with closed-ended questions, analysis of correlation and descriptive to make comparisons of findings.

A structured questionnaire is used for data collection. The questionnaire is designed in line with the objectives of the study. It has sections with information on how to fill the research questions, which is the introductory part of the questionnaire where the researcher introduces herself to her respondents and the purpose for which the questionnaire will be used. Each section gave instructions on how to answer the questions. These sections sum up to give a total variable/questions of 26, where available options ranges from 2 – 5 options across the questions.

3.7 Method of Data Analysis

A simple descriptive test will be used to describe the result has gotten from the field work, with the aid of the questionnaire, this is shown in tabular format and further interpreted. The analysis is carried out using an analytical software known as Statistical Package for Social Sciences (SPSS) version 22, this is done in about 5 known stages.

CHAPTER FOUR
RESULTS AND DISCUSSION OF RESULTS

4.1 Data Presentation, Analysis and Interpretation

This chapter is devoted to the presentation, analysis and interpretation of the data gathered in the course of this study. The data are based on the number of copies of the questionnaire completed and returned by the respondents. The data are presented in tables and the analysis is done using t-Test. The primary data collection method was used in the validation of the hypothesis, where in it's based on the aims and objective of the project. The data imputed from 391 respondents who submitted the question after careful response to the question, the respondents per variable which is the questions are noted by frequency or percentage over 100%. Out of 450 questionnaire given out, 59 is confirmed invalid, among which 28 was not returned and 31 was not properly filled. Hence 391 is used for the analysis, interpretations and conclusion. Note that the actual intended number of questionnaire to be distributed was 400, a total of 391 was finally used for the study, giving a percentage validity of 97.75% which is above significant level for the research work.

4.2 Response Rate

The response rate which is the frequency rate is the number of respondent per head count, where the nature of response of respondent to each question asked is seen directly and understood, as it is either above average or shows the minimum response or the maximum response over 100%.
As seen in the table below that there are no missing data and the valid number of respondents are 391 across the field work. Due to the number of variable involved in the study, Table 4.1 shows a summary of the research data used and it ranges from Gender to SE42 which is the last research question. Between SB9 and SE42 are SB10SB11 SB12 SB13 SB14 SB15 SB16

SB17 SB18 SB19 SB20 SB21 SB22 SB23 SB24 SB25 SB26 SB27 SC28A SC28B SC28C SC28D SC28E SC29 SC30 SC31 SD32 SD33 SD34 SD35 SE36 SE37 SE38 SE39 SE40 SE41 each represent the questions on the research tool used (see **Table 4.26** for definitions of (SB,SC, SD and SE).

Table 4.1a: Data summary

	gender	religion	age	Level of education	Marital status	Resident location	SB7	SB8	SB9	SB…	SE…	SE…	SE42
Valid	391	391	391	391	391	391	391	391	391	391	391	391	391
Missing	0	0	0	0	0	0	0	0	0	0	0	0	0

4.3 Data Analysis

The data is analyzed using a statistical package called Statistical Package for Social Sciences [SPSS], result where gotten and discussed as follows in sections according to the objective.

4.3.1 Demographic Factors

Table 4.1b: Gender

	Frequency	Percent	Cumulative Percent
Male	70	58.3	58.3
Female	50	41.7	100.0
Total	120	100.0	

The study of influencing factors of domestic solid waste management in Abuja, shows in Table 4.1b that the most engaging gender for this study are the male having a score frequency of 70 respondents making about 58% of the entire participants in the study. The remaining percentage

is attributed to the female.

Table 4.2: Religion

	Frequency	Percent	Cumulative Percent
Christianity	101	84.2	84.2
Islam	17	14.2	98.4
Others	2	1.7	100.00
Total	120	100.0	

The religious participant of the Islamic sect and Christianity were in the ratio of 1:6 of the total 120 respondents who participated in the study. In Figure 4.2, a negligible few of 1.7 percent was seen to be from other religious practice. Outside the two main religion in Nigeria. Reason for this 60.9 percent of the Islamic region might be due to the availability of the research participants (respondent).

Table 4.3: Age

	Frequency	Percent	Cumulative Percent
20 – 30years	42	35	35
31 – 40years	18	15	50
41 – 50years	52	43.3	93.3
51 above	8	6.7	100.0
Total	120	100.0	

The group displayed in Table 4.3 is a supporting result for Table 4.5. The topping age group of the study are within the age group of 41 – 50 years, followed by 20-30 years while the rest participating group split the remaining 21.7% of the study population. Meaning the results acquired is more qualitative, as the participants are more of age. A good percentage of the study are youth between 20 – 40 years constituting the 60% the population.

Table 4.4: Level of education

	Frequency	Percent	Cumulative Percent
Primary	10	8.3	8.3
Secondary	22	18.3	26.6
Tertiary	82	68.3	94.9
Illiterate	6	5.0	100
Total	120	100.0	

The tertiary participants are more in the study authenticating the status of result gotten, and validating the situation of waste management practice in Abuja, the Table 4.4 shows that about 68% of sample population have the tertiary level of education covering from first degree and above. The level of illiteracy is significantly low (5%).

Table 4.5: Marital status

	Frequency	Percent	Cumulative Percent
Single	51	42.5	42.5
Married	60	50	92.5
Divorced	3	2.5	95
Others	6	5.0	100
Total	120	100.0	

Most of the participants are seen to be in the married category, half of the total study population. Although a few of the participants are divorced, while about 43% are still single. This result support or validate that of Table 4.4 and Table 4.3 where it is seen that the age group of the participants are within 41 to 50 years of age and the level of education is that of the tertiary confirming the quality of the research being from a knowledgeable and qualified persons or residence. The 42.5 % single can be accounted for to be the few youths or less than 40years

participants though some may still be from the tertiary level of education.

Table 4.6: Resident location

	Frequency	Percent	Cumulative Percent
Maitama	20	16.7	16.7
Asokoro	21	17.5	34.2
Lugbe	18	15	49.2
Kubwa	21	17.5	66.7
Wuse	20	16.7	83.4
Dutse	20	16.7	100.0
Total	120	100.0	

Though as seen from the above Table 4.6 the distribution seems to be uniformly distributed. The percentage variation in the respondent is insignificant.

4.3.2 Social Factor

Table 4.7: Knowledge of What is Domestic Waste.

Domestic waste is found where?	Frequency	Percent	Cumulative Percent
Bush	10	8.3	8.3
Industries	8	6.7	15.0
Around Us	100	83.3	98.3
Nation	2	1.7	100
Total	120	100.0	
Proper waste disposal should be encouraged to keep the environment clean.	Frequency	Percent	Cumulative Percent
Yes	120	100.0	100.0

In the test of the knowledge of domestic waste from the participants it is seen that they have the knowledge of the term domestic waste, seen from the initial question of where domestic waste is found and a good sum of 100 respondents out of 120 agrees to the fact that it is found around us, 98.3 percent of the entire study population.

Table 4.8: How should collected waste be handled?

Should be dumped around the house	Frequency	Percent	Cumulative Percent
Yes	4	3.3	3.3
No	116	96.7	100.0
Total	120	100.0	
Should be stored in refuse bins	Frequency	Percent	Cumulative Percent
Yes	112	93.3	93.3
No	8	6.7	100.0
Total	120	100.0	
Should be dumped in refuse dumpsites around	Frequency	Percent	Cumulative Percent
Yes	104	86.7	86.7
No	16	13.3	100.0
Total	120	100.0	
Should be transported to distant dumpsites by residents	Frequency	Percent	Cumulative Percent
Yes	113	94.2	94.2
No	7	5.8	100.0
Total	120	100.0	
Should be buried around the house	Frequency	Percent	Cumulative Percent
Yes	65	54.2	54.2
No	55	45.8	100.0
Total	120	100.0	

The Table 4.8 below shows the result for ways waste can be collected within the environment, this proves that the first place of contact is refuse bin (waste bin) shown by a total of 120 respondents, the absence of this refuse bin will result to further mismanagement of waste, beside these this practice is personal among residence and have no interest of the government nor private waste management body, hence it is expedient to be available among resident which number per residence is determined by the waste generated in that building. Next to this acceptance is the waste been dumped on the refuse dumpsite which might be after been collection from the refuse bin at various houses.

Table 4.9: How should collected refuse be finally disposed of?

Should be left to decay into manure	Frequency	Percent	Cumulative Percent
Yes	82	68.3	68.3
No	38	31.7	100
Total	120	100	
Should be burnt	Frequency	Percent	Cumulative Percent
Yes	98	81.7	81.7
No	22	18.3	100
Total	120	100	
Should be left for AEPB to collect	Frequency	Percent	Cumulative Percent
Yes	109	90.8	90.8
No	11	9.2	100
Total	120	100	
Should be cleared by those living nearby	Frequency	Percent	Cumulative Percent
Yes	82	68.3	68.3
No	38	31.7	100
Total	120	100	
It is not my business	Frequency	Percent	Cumulative Percent
Yes	65	54.2	54.2
No	55	45.8	100
Total	100	100	
Is the waste bin adequate for the quantity of refuse being generated in your residence	Frequency	Percent	Cumulative Percent
Yes	70	58.3	58.3
No	50	41.7	100
Total	120	100	

Table 4.9 deals with the final disposal or destination of waste gotten at domestic level, the respondents stand more to the fact that Abuja Environmental Protection Board (AEPB) should be responsible to the final destination of the waste generated from communities, the result proved

from 98 respondents out of 120 who took to yes that the waste should be left for Abuja Environmental Protection Board (AEPB) to collect and decide on, this also support the acceptance in Table 4.8 where the transportation of the waste is said to be left for waste management board or organizations. Though a huge sum also said this waste should be cleared by those living nearby, maybe an act of organizing the waste for Abuja Environmental Protection Board (AEPB) to come takeaway to final destination. This statement was supported by 68 % of the participants. supporting the result of Table 4.8 where the population disagreed that the waste be buried, decisions on if the domestic waste should be left to decay into manure was checked in the above table where 351 said no it should not be allowed reason may likely be same as previous table.

Table 4.10: How do you organize yourself to keep your surrounding clean?

	Frequency	Percent	Cumulative Percent
By organizing groups of women in the house	1	0.8	0.8
By organizing the children/servants in the house	7	5.8	6.6
By organizing men in the house	1	0.8	7.4
By rotating the cleaning among households in the house	23	19.2	26.6
By contributing money to employ people to clean	78	65	91.6
There is no formal organization	5	4.2	95.8
Any other specify	5	4.2	100
Total	120	100	

In Table 4.10, majority of the residence preferred to engage cleaners to sanitize their

environment. It is followed by rotational cleaning while the rest took the 15.8% sanitation approaches.

The method or organization of residence in keeping the surroundings clean is another pointer on their social status. It is seen that 78 respondents across the study employ people to help them manage their waste which is likely to fall under the categories of private waste management organizations or individuals who are responsible for such. 23 respondents do rotate the cleaning of the environment within their self as they might not be resourceful enough to employing someone or contributing money to ensure clean surroundings. 5 out of 120 respondents have no formal arrangement, meaning they clean at will or when waste is overflown, reaching the non-acceptable limit, that's when they clean (Table 4.10).

Table 4.11: Are there refuse heaps near of your house?

	Frequency	Percent	Cumulative Percent
Yes	58	48.3	48.3
No	62	51.7	100.0
Total	120	100.0	

This result in the table 4.11 above shows the social status of the respondents as to know if a refuse dump site or heap is located near their house a pointer of the highbrow area, mid-brow and low-brow areas of the research field. The above shows that 48.3 participants declared the availability of dump site near their residence, this result might have been grossly affected by them in low brow or mid brow areas.

Table 4.12: Residential details

	Frequency	Percent	Cumulative Percent
Flat rental	16	13.3	13.3
Flat owned	21	17.5	30.8
Bungalow/Duplex Rental	9	7.5	38.3
Bungalow/Duplex Rental owned	57	47.5	85.8
One room apartment	9	7.5	93.3
One storey/two storey rental	8	6.7	100
One storey/two storey rental owned	0	0	100
Total	120	100.0	

The residential details of the research participant result is seen above in Table 4.12 giving that the participants are nearly evenly distributed, in the following order: Bungalow/Duplex rental (9 out of 120) a percentage of 7.5, Bungalow/Duplex owned (57 out of 120) a percentage of 47.5 and one room apartment likely rented (9 out of 120) a percentage of 7.5, only 78 of the entire population own their residence themselves, and pay no rent to anyone hence there is a certainty that they have good arrangement for their waste management. 8 respondent of the entire research population leaves in one story rental which like may have sound arrangement too for waste management.

Table 4.13: Number of occupant in the building

	Frequency	Percent	Cumulative Percent
5 below	40	33.3	33.3
5 – 10	38	31.7	65
11 above	42	35	100
Total	120	100.0	

The number of occupant in the building is a major contributor to the waste generated per building, the check here shows that in this study we have 5 to 10 persons per building proven by 38 respondents where 42 buildings have 11 and above persons building, this result shows that the bulk of the respondent have an average population per building, though a little above as the standard per room should be two per room, this shows that the social standard of the participants are below expectation. Only a few of 76 live with 40 below number of occupants in the building. Hence their waste generation would be low (Table 4.13).

Table 4.14: Number of year in the neighbourhood

	Frequency	Percent	Cumulative Percent
5 below	33	27.5	27.5
6 – 10	34	28.3	55.8
11 - 15	33	27.5	83.3
16 - 20	18	15	98.3
21 - above	2	1.7	100
Total	120	100.0	

In Table 4.14, it can be observed that majority of the respondent owned the apartment. Staying in an apartment for 6 to twenty years is an indicator of ownership from my own point of view.

Table 4.15: Where do you dispose your refuse after storage?

	Frequency	Percent	Cumulative Percent
At the refuse heap/dump nearby	81	67.5	67.5
Behind the house	6	5	72.5
AEPB carries house to designated dumpsite	21	17.5	90
Solid Waste Management Contractor are responsible for the collection	6	5	95
Any other specify	6	5	100
Total	120	100.0	

The location to which refuse is been dispose is of interest, hence, Table 4.15 addresses that where it is seen that after storage the solid waste management team/contractors are responsible for the dismissal or extraction of waste from the residents as shown by 21 respondents who declare private contractors as more pronounced to AEPB. Though next supporting group are the AEPB with 6 respondents to that effect, saying the waste is managed or extracted by the AEPB from their residence, only a few of 81 respondents say the often use the back of the house for disposal of waste after gathering/storing it around their immediate environment in the waste bin, its further gathered behind their houses to be burnt, decay and otherwise.

The Table 4.16 below shows that open back truck is the most used vehicle for extraction of waste from residents with a score of 60 (50%) out of 120 respondents in the study, this result was supported by a 18 respondent who said compactor ttuck is the vehicle used by contractors or AEPB to extract their domestic waste, this is a pointer of a low social standard, the mini truck and open skip truck pick 21.1% of the refuse collection while 4.2% of the respondent experience the use of rear loader to extract or evacuate waste from their environment.

Table 4.16: What type of vehicle(s) is/are used in refuse collection from your house?

	Frequency	Percent	Cumulative Percent
Compactor Truck	18	15	15
Side Loader	6	5	20
Rear Loader	5	4.2	24.2
Mini Truck	14	11.8	36
Tipper	7	5.8	41.8
Skip Truck	10	8.3	50.1
Open back truck	60	50	100

Others (specify)	0	0	100
Total	120	100.0	

The result in Table 4.17 shows bulk of the resident do allow the waste bin to be overflow before calling for extraction, this might be intentional or unintentional, but is a show of their social behavior, which might have been affected by the income ability, hence they device a means to ensure the waste management contractors are properly utilized. 79.6% respondent stand with making refuse bin full before extracting while the remaining respondent said no they don't allow overflow before a call for routine extraction.

Table 4.17: Is the refuse bin often allowed to overflow before collection?

	Frequency	Percent	Cumulative Percent
Yes	276	70.6	70.6
No	115	29.4	100.0
Total	391	100.0	

4.3.3 Economic Factor

Considering the Possible Factors influencing waste disposal, five key areas were considered. Among which is visibly seen that the Technology used in solid waste disposal might be outdated less productive, insufficient, as to which result to 368 respondent agreeing to the fact that technology plays a vital role on waste management, recalling that in Table 4.4 the study bulk population are schooled persons and are vibrant, hence, they might have been informed of the better technology to be used in waste disposal or management, availability of facility for waste

management or control is not readily available resulting to other factors affecting waste management, the funding of the facilities for this call score the next highest among the check tools, with a sum of 96 out of 120 respondents meaning the community might be willing to ensure a safe and clean environment but the supporting facilities are absent, hence they cannot carry out their good will.

Table 4.18: Possible Factors influencing waste disposal

The manpower in waste disposal	Frequency	Percent	Cumulative Percent
Yes	71	59.2	59.2
No	49	40.8	100
Total	120	100	
Technology used in solid waste disposal	Frequency	Percent	Cumulative Percent
Yes	49	40.8	40.8
No	71	59.2	100
Total	120	100	
The facilities available to the municipal council	Frequency	Percent	Cumulative Percent
Yes	92	76.7	76.7
No	28	23.3	100
Total	120	100	
The funding for waste disposal programs	Frequency	Percent	Cumulative Percent
Yes	96	80	80
No	24	20	100
Total	120	100	
Attitude of the residents towards waste disposal	Frequency	Percent	Cumulative Percent
Yes	93	77.5	77.5
No	27	22.5	100
Total	120	100	

Next to this is factor is the attitude of residents having a score of 93 (77.5%) out of 120 respondents that participated in the research, it may be supportive to the fact of the absence of facility that boost the attitudes of residence into poor waste management practice, though the

technology adopted for waste disposal seems to be of close relative as they score close figures where funding of waste is poorly rated.

Table 4.19: Poor economy affects both residence and waste management body in handling waste.

Poor economy affects both residence and waste management body in handling waste	Frequency	Percent	Cumulative Percent
Yes	73	60.8	60.8
No	47	39.2	100
Total	120	100	

Under the economic factor that may be affecting or contributing to waste disposal, it is also seen in Table 4.19 that a key factor influencing the management of waste as in this case affects both the residents and the service providers, bad economy is a major challenge. For the residence would not be able to meet the demand of the service providers and the service provider can't reach the wellbeing of their staff talk more of carrying out their duties appropriately. Hence both parties are affected due to poor economy, note that when the field staff are not earning satisfaction from the job, even if the required tools are provided they may not perform, due to operator's job satisfaction.

Table 4.20: Recycling companies are few to non in the land

Recycling companies are few to non in the land	Frequency	Percent	Cumulative Percent
Yes	105	87.5	87.5
No	15	12.5	100
Total	120	100	

Recycling is a vital tool in developed countries in management of waste, as it helps reduce the work load at various waste management and recycling face/level, the Table 4.20 above shows that there are few to non-recycling companies in the land either private or government owned to the capacity of waste generated. The statement was supported by 87.5% of the study, whereas 12.5% accept the availability of recycling company around the city.

Table 4.21: Poor financing affect all stakeholders in waste management.

	Frequency	Percent	Cumulative Percent
Yes	105	87.5	87.5
No	15	12.5	100
Total	120	100	

In Figure 4.21, poor financing which is caused from lack of fund at both side, either the residence or the service provider due to economic hardship experienced from both side, residence is not financially motivated from their place of work, as the returns (allowance, wages, salary, stipend, etc.) is not enough for feeding talk more of payment or subscription for waste management, hence affecting the fund generated by service providers. Noting that the residence are also stakeholders. 87.5 percent of the total study population declares that there is poor financing which affects all stakeholders in waste management. Though 12.5 percent disagree to that, saying there is no poor finance.

4.3.4 Natural Factor

The natural factors are factors beyond human creation, though can be controlled or managed by human from human activities, the Table 4.22 display the result of the effect of location on waste

management. The agreement was 65% and 35% respectively for assertion that location a role and unlike wise.

Table 4.22: Due to the location of my residence waste management team don't often come around?

	Frequency	Percent	Cumulative Percent
Yes	78	65	65
No	42	35	100
Total	120	100	

The Table 4.23 indicated that the topographical nature of building play a significant role in the management of solid waste. About 68% of the sample population were in favour of it

Table 4.23: The topographical nature of my residence affects disposal of waste?

	Frequency	Percent	Cumulative Percent
Yes	81	67.5	67.5
No	39	32.5	100
Total	120	100	

From Table 4.24, the effect of wind play an insignificant role as about 80% of the respondent agreed that wind effect is not predominant.

Table 4.24: There is constant winding in my location hence waste are often blown away?

	Frequency	Percent	Cumulative Percent
Yes	25	20.8	20.8
No	95	79.2	100
Total	120	100	

In Table 4.25, majority of the respondent (75%) concurred to the significant effect of raining season on refuse collection. This is more severe during the peak rainfall period of August and September, in which flooding is inevitable.

Table 4.25: During rainy season, flooding occur along the area of refuse?

	Frequency	Percent	Cumulative Percent
Yes	90	75	75
No	30	25	100
Total	120	100	

4.3.5 Cultural Factors

The Table 4.26 indicated the how worrisome the residents are regarding the management of solid waste in their areas. About 89% of the sample population indicates their worries regarding the poor management of solid waste.

Table 4.26: As a resident, do you have concern for waste management in your area?

	Frequency	Percent	Cumulative Percent
Yes	106	88.3	88.3
No	14	11.7	100
Total	120	100	

From Table 4.27, the improper management of solid waste can be traced to the government while the residents and the local authority maintain equal responsibilities.

Table 4.27: Who do you blame for improper waste management??

	Frequency	Percent	Cumulative Percent
Resident	23	19.2	19.2
Government	74	61.7	80.9
Local Authority	23	19.2	100
Others	0	100	
Total	120		

The Table 4.28 pointed out clearly the interest of the residents to partake in the management of solid waste.

Table 4.28: Are the residents/citizens willing to participate in the management?

	Frequency	Percent	Cumulative Percent
Yes	62	51.7	51.7
No	58	48.3	100
Total	120	100	

From Table 4.29, the willingness of the residents to participate in any public awareness programme is not encouraging has the probability of the event is 50%. Hence, more enlightenment is required on the part of the government to allow the residents to know the importance attached to sanitation through the health implication.

Table 4.29: Are the residents willing to participate in public awareness programme?

	Frequency	Percent	Cumulative Percent
Yes	60	50	0
No	60	50	100
Total	120	100	

Table 4.30 shows that the flat rate billing system dominate rather than charging based on the weight or volume or weight of the solid waste generated. The weighted billing system would have provide some insight into the level of commitment to water management on the side of the residents. However, the technology required remains an issue.

Table 4.30: Is the cost of collection based on weight or flat rate?

	Frequency	Percent	Cumulative Percent
Weight	48	40	40
Flat rate	72	60	100
Total	120	100	

4.3.6 Physical and Technical Factors

This section considers the influence of the physical and technical factors on solid waste management in Abuja. From Table, the inadequacy of the road and infrastructure to manage the solid waste is evident, especially in the suburb areas.

Table 4.31: Are the road and infrastructure to manage solid waste in good conditions?

	Frequency	Percent	Cumulative Percent
Yes	31	25.8	25.8
No	89	74.2	100
Total	120	100	

However, to the disadvantage found in the Table 4.31, the collection of the solid waste on regular basis still remain intact (Table 4.32) as above the mean value of the respondents.

Table 4.32: Is waste collection approach regular?

	Frequency	Percent	Cumulative Percent
Yes	79	65.8	65.8
No	41	34.2	100
Total	120	100	

Table 4.33 buttressed the finding in Table 4.31.About 83% of the respondents complained about the condition of infrastructure and vehicles adopted for the management of the solid waste in the Abuja municipalities.

Table 4.33: Inadequate infrastructure, poor roads and vehicle?

	Frequency	Percent	Cumulative Percent
Yes	99	82.5	82.5
No	21	17.5	100
Total	120	100	

Table 4.34 indicated the drastic need for training and retraining of staff members of the sanitation team towards up-skilling of the technical knowledge of their work as the percentage of 75% possess a challenge.

Table 4.34: Technical know-how of the municipal workers?

	Frequency	Percent	Cumulative Percent
Adequate	30	25	25
Inadequate	90	75	100
Total	120	100	

4.3.7 Institutional Factors

On this institutional point of view, a general agreement of very high degree suggested that the job requires skilled personnel (Table 4.35).

Table 4.35: Do you think the management job requires skilled personnel?

	Frequency	Percent	Cumulative Percent
Yes	108	90	90
No	12	10	100
Total	120	100	

It is however strange, on the neutrality of the respondent on the perception of the institution of the municipality. Table 4.36 proved that no good relationships exist between the workers/management and the residents on the way forward towards a better service delivery.

Table 4.36: What is the perception of the institution of the municipality?

	Frequency	Percent	Cumulative Percent
Good	16	13.3	13.3
Bad	34	28.3	41.6
No. Idea	70	58.3	100
Total	120	100	

In the Table 4.37, the general comment on the efficiency of the solid waste management is very inadequate as about 70 percent supported ‘bad’.

Table 4.37: What is the view about the efficiency of solid waste collection system of the municipal authority?

	Frequency	Percent	Cumulative Percent
Excellent	7	5.8	5.8
Very Good	11	9.2	15
Good	34	28.3	43.3
Bad	68	56.8	100
Total	120	100	

Based on the findings from Table 4.37, the respondents advised on the need for awareness campaign. About 89% of the respondents supported the motion (4.38).

Table 4.38: Do you think there is need for more awareness campaign about SWM?

	Frequency	Percent	Cumulative Percent
Yes	107	89.2	89.2
No	13	10.8	100
Total	120	100	

4.3.8 Prevention and Correction

Section G: Prevention and Correction

The Table 4.38, indicated the support of the respondents for the individual home waste cabinet as a way to introduce sanity into the management of solid waste in Abuja and environs.

Table 4.38: A simple home waste cabinet should be introduced?

	Frequency	Percent	Cumulative Percent
Yes	114	95	95
No	6	5	100
Total	120	100	

In Table 4.39, the introduction of the domesticated recycler was highly encouraged with about 93% vote. The concept could enhance the management of solid waste as well being good way of employment creation for the ever growing population of Abuja.

Table 4.39: Domesticated recyclers should be encourage?

	Frequency	Percent	Cumulative Percent
Yes	111	92.5	92.5
No	9	7.5	100
Total	120	100	

According to the Table 4.40, the continuous training and awareness campaign has been favoured as the route towards a better solid waste management in the Abuja and its environ.

Table 4.40: Continuous training and awareness should be carried out?

	Frequency	Percent	Cumulative Percent
Yes	117	97.5	97.5
No	3	2.5	100
Total	120	100	

Table 4.41, showed the position of the respondents with over 93%, on the design of waste curriculum in our educational system to further act as a catch them young policy for the Abuja and the nation at large.

Table 4.41: A waste/evergreen curriculum should be incorporated into education system?

	Frequency	Percent	Cumulative Percent
Yes	112	93.3	93.3
No	8	6.7	100
Total	120	100	

In Table 4.42, the support for the positioning of waste collector at strategic positions received over 85% favored as the way to further improve the efficiency of the system.

Table 4.42: More waste collector should be strategically positioned to avoid wrong waste drops?

	Frequency	Percent	Cumulative Percent

Yes	103	85.8	85.8
No	17	14.2	100
Total	120	100	

In terms of the additional comments to further strengthening the administered questionnaire by the respondents, no any form of further comments or suggestions were received from the respondents. This indicated their satisfaction with the explicit of the administered questionnaire.

Table 4.43: Do you have any additional comments or suggestions regarding domestic solid waste management?

	Frequency	Percent	Cumulative Percent
Yes	0	0	0
No	120	100	100
Total	120	100	

4.4 Relationship test between variables

A correlation analysis was done to check for the effect of one potential variable on another, this is to enable detection of the relationship and the intensity of such relationship between variables (Table 4.44).

Table 4.44: The Correlation Table Code Interpretation.

Section B: social factor	
How should collected waste be handled?	
SB6	Residential Location
SB7	Domestic waste is found where?
SB11	Should be dumped in refuse dumpsites around
SB9	Should be dumped around the house
SB12	Should be transported to distant dumpsites by residents
SB13	Should be buried around h house
How should collected refuse be finally disposed of?	
SB14	Should be left to decay into manure
l.SB15	Should be burnt
SB16	Should be left for AEPB to collect
SB17	Should be cleared by those living nearby
SB19	Is the waste bin adequate for the quantity of refuse being generated in your residence
SB20	How do you organize yourself to keep your surrounding clean
SB21	Are there refuse heaps near of your house
SB22	Residential details:
SB23	Number of occupant in the building:
SB24	Number of years in the neighborhood
SB25	Where do you dispose your refuse after storage
SB26	What type of vehicle(s) is/are used in refuse collection from your house
SB27	Is the refuse bin often allowed to overflow before collection

Section C: Economic Factor	
SB6	Residential Location
SC28A	The manpower in waste disposal
SC28B	Technology used in solid waste disposal
SC28C	The facilities unavailable to the municipal council.
SC28D	The funding for waste disposal programs
SC28E	Attitude of the residents towards waste disposal
SC29	Poor economy affects both residence and waste management body in handling waste.
SC30	Recycling companies are few to non in the land
SC31	Poor financing affect all stakeholders in waste management.

Section D: Natural Factor	
SD32	Due to the location of my residence waste management team don't come around
SD33	The topographical nature of my residence affects disposal of waste.
SD34	There is constant winding in my location hence waste are often blown away
SD35	During rainy season, flooding occur taking along the refuse area.
Section E: Prevention and Correction	
SE36	A simple home waste cabinet should be introduced.
SE37	Domesticated recyclers should be encouraged
SE38	Continuous training and awareness should be carried out
SE39	A waste/evergreen curriculum should be incorporated into educational system
SE41	Do you have any additional comments or suggestions regarding domestic waste management
SE40	More waste collector should be strategically positioned to avoid wrong waste drops
SE42	What do you think are the shortcomings of the present system of waste management in your area?
PC	Pearson Correlation

Table 4.45: Correlation Matrix for Social Factors

Correlations																				
		SB6	SB7	SB11	SB9	SB12	SB13	SB14	SB15	SB16	SB17	SB19	SB20	SB21	SB22	SB23	SB24	SB25	SB26	SB27
SB6	PC	1																		
SB7	PC	.105*	1																	
SB11	PC	.034	.060	1																
SB9	PC	.152**	.150**	.214**	1															
SB12	PC	.133**	-.019	-.460**	-.344**	1														
SB13	PC	.550**	-.096	.143**	.253**	-.285**	1													
SB14	PC	.105*	.119*	.163**	.029	.014	.188**	1												
SB15	PC	.554**	-.004	.137**	-.077	-.279**	.150**	-.258**	1											
SB16	PC	.136**	.168**	.613**	.243**	-.532**	.173**	.117*	.351**	1										
SB17	PC	-.097	.093	.274**	-.118*	-.212**	.072	.137**	.042	.216**	1									
SB19	PC	.787**	.227**	.025	.147**	-.090	-.424**	.060	-.317**	-.048	-.142**	1								
SB20	PC	.308**	.001	-.065	-.184**	-.353**	-.007	-.234**	.278**	.066	.034	-.098	1							
SB21	PC	.421**	.161**	-.054	.046	-.093	.319**	.179**	.251**	.159**	.089	-.296**	.251**	1						
SB22	PC	-.624**	.020	-.108*	.145**	.007	-.391**	.018	-.405**	-.139**	-.224**	.607**	-.028	-.353**	1					
SB23	PC	.625**	-.004	.098	-.060	.237**	-.440**	.004	-.345**	-.004	.112*	.320**	-.501**	-.327**	.186**	1				
SB24	PC	.798**	.136**	.047	.257**	.126*	-.549**	.020	-.257**	.022	-.187**	.711**	-.242**	-.374**	.523**	.395**	1			
SB25	PC	.167**	-.132**	-.002	.094	-.020	.234**	.028	.092	.145**	-.141**	-.116*	-.118*	-.013	-.166**	-.203**	-.056	1		
SB26	PC	.605**	.181**	.021	.068	.032	-.451**	.036	-.447**	-.043	.230**	.506**	-.224**	-.212**	.415**	.481**	.496**	-.328**	1	
SB27	PC	-.321**	-.078	-.390**	.011	.003	.045	-.218**	.222**	-.266**	.180**	-.232**	.225**	.118*	-.108*	-.340**	-.131**	-.131**	.031	1
*. Correlation is significant at the 0.05 level (2-tailed).																				
**. Correlation is significant at the 0.01 level (2-tailed).]																				

4.4.1 Determination of social factors affecting domestic solid waste in Abuja

The findings from the Table 4.45 shows a strong correlation positive correlation between residential location and the adequacy in the number of waste bin allocated for refuse collection (SB6 and SB19). This implies that some locations were allotted waste bin per building while some were allocated with four or five per street based on responses from the questionnaires.

The same applied to (SB6 and SB22; SB23, SB24), (SB19 and SB24) and (SB19 and SB22). This implies that population of the building as well as number of years of residents in the neighborhood are highly correlated with waste bin adequacy, hence, e play a significant role in domestic waste management.

4.4.2 Determination of economic factors affecting domestic solid waste in Abuja

From Table 4.46 below, a perfect correlation exist between (SE34 and SC28C) and (SE36 and SC28C). This indicates that more facility(s) should be provided to the municipal council to accommodate the increase in domestic waste by providing high and medium densities areas more waste cabinets rather than putting few on the street. More so, the frequency of collection should be correlated to the charges imposed with emphasizes on the density of the area.

4.4.3 Determination of natural factors affecting domestic solid waste in Abuja

The correlation between SB6 and SD35 is relatively high indicating that wet season have significant effect on domestic waste collection and management as a whole. Also, provision of waste bin that can withstand the effect of wind (SD34 and SE36) and localized areas for dumping waste for onward collection should be discouraged.

Table 4.46: Correlation Matrix for Economic and Natural Factors

Correlations																				
		SB6	SC28A	SC28B	SC28C	SC28D	SC28E	SC29	SC30	SC31	SD32	SD33	SD34	SD35	SE36	SE37	SE38	SE39	SE41	SE42
SB6	PC	1																		
SC28A	PC	-.085	1																	
SC28B	PC	-.042	-.158**	1																
SC28C	PC	-.105*	.171**	-.067	1															
SC28D	PC	.088	.093	.077	.378**	1														
SC28E	PC	.328**	.062	-.139**	.481**	.287**	1													
SC29	PC	-.335**	.135**	-.007	.066	-.056	-.070	1												
SC30	PC	.338**	.076	.203**	.111*	.061	.129*	-.159**	1											
SC31	PC	-.186**	.005	-.133**	-.018	-.047	-.003	.727**	-.213**	1										
SD32	PC	.236**	-.212**	.181**	.020	.087	.106*	-.063	.041	.231**	1									
SD33	PC	.483**	.054	-.104*	.206**	.347**	.328**	-.256**	.265**	-.048	.154**	1								
SD34	PC	.105*	.171**	-.067	1.000**	.378**	.481**	.066	.111*	-.018	.020	.206**	1							
SD35	PC	.629**	.142**	.121*	.162**	.013	-.165**	-.025	-.155**	-.077	.296**	-.273**	.162**	1						
SE36	PC	-.105*	.171**	-.067	1.000**	.378**	.481**	.066	.111*	-.018	.020	.206**	1.000**	.162**	1					
SE37	PC	.189**	-.108*	-.043	.327**	.077	.124*	-.104*	.138**	-.090	.214**	.190**	.327**	-.111*	.327**	1				
SE38	PC	-.251**	.181**	-.065	.560**	.148**	.348**	.309**	-.002	.240**	-.100*	-.109*	.560**	.172**	.560**	-.044	1			
SE39	PC	.269**	.238**	-.130*	.514**	.258**	.331**	-.038	.293**	.026	-.206**	.434**	.514**	-.134**	.514**	.139**	.376**	1		
SE41	PC	.333**	.026	.131**	-.214**	-.085	.053	-.288**	.183**	-.348**	.053	.112*	-.214**	-.070	-.214**	.089	-.378**	-.098	1	
SE42	PC	.238**	-.154**	-.056	-.345**	-.063	-.217**	-.193**	-.121*	-.065	-.132**	.136**	-.345**	-.186**	-.345**	-.021	-.357**	-.154**	.268**	1
*. Correlation is significant at the 0.05 level (2-tailed).																				
**. Correlation is significant at the 0.01 level (2-tailed).																				

4.5 Resolutions to Research Questions

The specific research questions for the study are stated below as follows:

Question 1: Does the social status of Abuja residence affect the disposal of waste?

The social status of Abuja residence affects the disposal of waste as seen in Table 4.45, SB6 shows a strong relationship between the variable, at significance of 0.05 and 0.01 respectively where the ** shows significance at 0.01 and * shows for 0.05. This implies that where the respondent leave affects the manner in which they handle their waste, as resident location is a social variable. The act on how waste are to be also have relationship to how it should be disposed, meaning the ideology of the participant are influenced based on their location and how they handle waste.

Question 2: Do the lack of finance or poor economic condition result to poor waste management?

Yes, the lack of money often affects things, in this case the poor economic status of the society went a long way to affect the management of waste, as residence cannot afford to pay for service, and service providers cannot afford to deliver service appropriately. The table 4.46 above shows that there is a significant relationship between the economic factors that affect the management of waste, where the relationship between possible factors influencing waste disposal are seen to have relationship with that poor financing affecting all stakeholders in waste management at a significant point of 0.01 and 0.05, seen at SB28A, B, C, D and E as against SB29, 30 and 31.

Question 3: does natural element have significance on waste management in Abuja?

Though the topography has no strong relationship, but its significant to the management of waste in the study areas, this result draw a strong support to Table 4.23, where during rainy seasons,

wind and other factor displaces the waste from waste dump site (Table 4.25). The location of resident also plays a vital role here, as the shown in SB32 and SB33 relationship which is significant at 0.01. SB35 and SB32 shows a strong relationship.

Question 4: Is there any other factor that have significant effect on household waste management?

Some other factors that could be a challenge to the management of waste in the study area are lack of sensitization, Corruption, poor technology, lack of fund and bad economy.

Conclusively, based on the research questions, the population of Abuja city is increasing tremendously every year and so does its waste generation also increased. In this study, Abuja city was selected to analyze the factors that affect effective municipal solid waste management. The results of the study showed that socio-economic, cultural, institutional, physical, and technical factors have a positive relationship with the effective solid waste management because the correlation value is highly positive and the significant level is less than 0.05% level (Table 4.45) which means that these factors affect managing the effective solid waste in the study area. On the other hand, environmental factors have no relation with effective solid waste management in the study area because the correlation value is negative and the significant level is high more than 0.05% level in the aspects of environmental factors. So the hypotheses in the socio-economic, cultural, institutional, physical, and technical factors have been accepted while the hypothesis in the environmental factors can be subjected to further study.

CHAPTER FIVE
CONCLUSION AND RECOMMENDATION

5.1 Introduction

The findings in Section 4.4.1 through 4.4.3 are presented as conclusion and recommendations are made for further study.

5.2 Conclusion

1. On the socio-economic factors, it has been found that population and the (high, medium and low) density of estates/municipality should determine the number of waste bin to accommodate the quantity of domestic waste generated. More so, on the economic factor, the frequency of collection should be correlated to the charges imposed with emphasizes on the density of the area.
2. On natural factors, seasonality should play a role in the solid waste management, it was found that wet season have significant effect on domestic waste collection and management as a whole. Hence, a strategic management approach that linked waste collection and weather forecast should be considered. Also, provision of waste bin that can withstand the effect of wind should be provided and localized areas for dumping waste for onward collection should be discouraged.
3. Others factors; Financial constraints, inadequate service coverage and operational inefficiencies, ineffective technologies and equipment, inadequate landfill disposal, and limited utilization of recycling initiatives are all found to be challenges to the infrastructure of waste management systems in Abuja. These gaps in service relate not merely to availability of infrastructure and investments, but also to inappropriate management of the service. Major interventions need to take into account the

circumstances and needs of the communities for which they are implemented. Improvements to infrastructure and technology within the waste management system need to be accompanied with community involvement and participation as well as educational and awareness campaigns in order to be successful in creating sustainable waste management systems.

5.3 Recommendation

The study recommends that:

1. Further study should be done on domesticated waste carbine as it will help reduce the quantity of waste generated in the community, and it will help simplify the management of waste by the waste management team and recycling companies.
2. The domesticated waste machine or chamber should be further studied as it will be of interest to the economic growth of the nation, reduce social irresponsibility, and improved hygiene.
3. Socio-economic characteristics (especially wealth) may determine attitudes such as the perceived ability or willingness to recycle municipal solid waste, but these attitudes may be positively influenced by awareness-building campaigns and educational measures. This can be achieved using a variety of factors such as the integration of environmental education centered on SWM and the environment into the school curriculum beginning with the elementary schools. Public awareness can also be improved through some low cost methods such as seminars, workshops, newsletters, speeches, and church bulletins. Solid waste planners can also make the best use of all available community resources which include elected officials, the news media, interested groups and community

organizations, all of which have the ability to generate community support. Although municipalities generally deliver urban SWM services, efficient and effective service delivery is difficult to achieve without the active participation of and support from local communities.

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Appendix

QUESTIONNAIRE

The Department of Civil Engineering
Faculty of Engineering,
University of Abuja.
Dear Respondent,

LETTER OF INTRODUCTION

I am a student of the above institution carrying out a research on "STUDY OF INFLUENCING FACTORS OF DOMESTIC WASTE MANAGEMENT IN ABUJA". Your information will be used solely for the purpose of this study and will be treated with confidentiality.
Please endeavour to respond to the entire questionnaire as sincerely as possible.
If you consent to participate in this study kindly tick this box [√]

Yours faithfully,
UMAR FARUK YAKUB

ID No.

Section A: Demographic Factors

1. Gender: Male [ ] Female [ ]
2. Religion: Christianity [ ] Islam [ ] Other [ ]
3. Age: 20 – 30years [ ] 31 – 40years [ ] 41 – 50years [ ] 51 above [ ]
4. Level of education: Primary [ ] Secondary [ ] Tertiary [ ] Illiterate [ ]
5. Marital status: Single [ ] Married [ ] Divorced [ ] Others [ ]
6. Residential Location:_____ Occupation: _____

Section B-1: social factor

7. Domestic waste is found where? Bush ( ) Industries ( ) around us ( ) Nation ( )
8. Proper waste disposal should be encouraged to keep the environment clean. Yes ( ) No ( )

How should collected waste be handled?

9. Should be dumped around the house Yes ( ) No ( )

10. Should be stored in refuse bins Yes ( ) No ( )

11. Should be dumped in refuse dumpsites around Yes ( ) No ( )

12. Should be transported to distant dumpsites by residents Yes ( ) No ( )

13. Should be buried around h house Yes ( ) No ( )

How should collected refuse be finally disposed of?

14. Should be left to decay into manure Yes ( ) No ( )

15. Should be burnt Yes ( ) No ( )

16 Should be left for AEPB to collect Yes ( ) No ( )

17. Should be cleared by those living nearby Yes ( ) No ( )

18 It is not my business Yes ( ) No ( )

19. Is the waste bin adequate for the quantity of refuse being generated in your residence?

Yes ( ) No ( )

20. How do you organize yourself to keep your surrounding clean? (Pls. tick as appropriate)

a) By organizing groups of women in the house ( )

b) By organizing the children/servants in the house ( )

c) By organizing men in the house ( )

d) By rotating the cleaning among households in the house ( )

e) By contributing money to employ people to clean ( )

f) There is no formal organization ( )

g) Any other (specify) _____

21. Are there refuse heaps near of your house? Yes ( ) No ( )

22. Residential details: Flat rental ( ) Flat owned ( ) Bungalow/Duplex rental ( ) Bungalow/Duplex owned ( ) One Room Apartment ( ) One storey/Two storey rental ( ) One storey/Two storey owner ( )

23. Number of occupant in the building: 5below ( ) 5 – 10 ( ) 11above

24. Number of years in the neighbourhood: 5yrs below ( ) 6 – 10yrs ( ) 11 – 15yrs ( ) 16 – 20yrs 21yrs above

25. Where do you dispose your refuse after storage?

a) At the refuse heap/dump nearby ( )

b) Behind the house ( )

c) The Abuja Environmental Protection Board (AEPB) carries it from the house to designated dump site ( )

d) Solid Waste Management Contractors are responsible for collecting the refuse ( )

e) Any other (specify) _____

26. What type of vehicle(s) is/are used in refuse collection from your house?

a) Compactor truck ( )

b) Side loader ( )

c) Rear loader ( )

d) Mini truck ( )

e) Tipper ( )

f) Skip truck ( )

g) Open back truck ( )

g) Others (Specify) _____

27. Is the refuse bin often allowed to overflow before collection? Yes ( ) No ( )

Section B-2: Economic Factor

28. Possible Factors influencing waste disposal

a). The manpower in waste disposal Yes ( ) No ( )

b). Technology used in solid waste disposal Yes ( ) No ( )

c). The facilities available to the municipal council. Yes ( ) No ( )

d). The funding for waste disposal programs Yes ( ) No ( )

e). Attitude of the residents towards waste disposal Yes ( ) No ( )

29. Poor economy affects both residence and waste management body in handling waste. Yes ( ) No ( )

30. Recycling companies are few to non in the land Yes ( ) No ( )

31. Poor financing affect all stakeholders in waste management. Yes ( ) No ( )

Section C: Natural Factor

32. Due to the location of my residence waste management team don't come around.

Yes ( ) No ( )

33. The topographical nature of my residence affects disposal of waste. Yes ( ) No ( )

34. There is constant winding in my location hence waste are often blown away. Yes ( ) No ( )

35. During rainy season, flooding occur along the area of refuse. Yes ( ) No ( )

Section D: Cultural Factor

36. As a resident, do you have concern for waste management in your area?

Yes ( ) No ( )

37. Who do you blame for improper waste management?
Residents ( ) Government ( ) Local Authority ( ) Others ( )

38. Are the residents/citizens willing to participate in the management? Yes ( ) No ( )

39. Are the residents willing to participate in public awareness program? Yes ( ) No ( )

40. Is the cost of collection based on weight or flat rate? Weight ( ) Flat rate ( )

Section E: Physical and Technical Factors

41. Are the road and infrastructure to manage solid waste in good conditions? Yes ( ) No ( )

42. Is waste collection approach regular? Yes ( ) No ( )

43. Inadequate infrastructure, poor roads and vehicles Yes ( ) No ( )

44. Technical know-how of the municipal workers. Adequate ( ) Inadequate ( )

SECTION F: Institutional Factors

45. Do you think the management job requires skilled personnel? Yes ( ) No ( )

46. What is the perception of the institution of the municipality? Good ( ) Bad ( ) No idea ( )

47. What is the view about the efficiency of solid waste collection system of the municipal authority? Excellent ( ) Very good ( ) Good ( ) Bad ( )

48. Do you think there is need for more awareness campaign about SWM? Yes ( ) No ( )

SECTION G: Prevention and Correction

49. A simple home waste cabinet should be introduced. Yes ( ) No ( )

50. Domesticated recyclers should be encouraged Yes ( ) No ( )

51. Continuous training and awareness should be carried out. Yes ( ) No ( )

52. A waste/evergreen curriculum should be incorporated into educational system.

Yes ( ) No ( )

53. More waste collector should be strategically positioned to avoid wrong waste drops.

Yes ( ) No ( )

54. Do you have any additional comments or suggestions regarding domestic waste management?

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42. What do you think are the shortcomings of the present system of waste management in your area?

Thank you for participating.