EVALUATION OF THE ROLE OF KADUNA STATE ENVIRONMENTAL PROTECTION AUTHORITY (KEPA) IN MUNICIPAL SOLID WASTE MANAGEMENT AND CONTROL:

A STUDY OF UNGWAN DOMA DUMPSITE IN CHIKUN LOCAL GOVERNMENT AREA OF KADUNA STATE

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A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, AHMADU BELLO UNIVERSITY, ZARIA

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JULY, 2017

DECLARATION

I declare that the work in this Dissertation entitled "Evaluation of the Role of Kaduna State Environmental Protection Authority (KEPA) in Municipal Solid Waste Management and Control: A Study of Ungwan Doma Dumpsite in Chikun Local Government Area of Kaduna State" has been carried out by me in the Department of Local Government and Development Studies. The information derived from the literature has been dully acknowledged in the text and a list of references provided. No part of this dissertation was previously presented for another degree or diploma at this or any institution.

_____	_____	_____
Name of Student	**Signature**	**Date**

CERTIFICATION

This Dissertation entitled EVALUATION OF THE ROLE OF KADUNA STATE ENVIRONMENTAL PROTECTION AUTHORITY (KEPA) IN MUNICIPAL SOLID WASTE MANAGEMENT AND CONTROL: A STUDY OF UNGWAN DOMA DUMPSITE IN CHIKUN LOCAL GOVERNMENT AREA OF KADUNA STATE by AKINGBEHIN RACHAEL AISHA meets the regulations governing the award of the Master of Science degree in Policy and Development Studies of Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This Dissertation is dedicated to God Almighty, the giver and sustainer of life, who gives wisdom and understanding to His children. My ever caring husband, Mr.Sunday Akingbehin and my lovely children Michael, Funmilayo and Moses.

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ABSTRACT

Refuse dumpsites are found both within and in the outskirts of cities in Nigeria. Due to poor and ineffective management, the dumpsites turn to sources of health hazards to people living in the vicinity of such dumps. When waste disposal sites are in close proximity to residential structures, such environment is adversely affected as organisms that thrive in such dirty places are also agents of disease outbreak. Therefore, the aim of shelter as a place where people live and play in a hygienic manner is defeated when the stench from the nearby dump sites is a constant menace. In addition, these dumpsites can contaminate ground water which in turn affects the purity of the water fetched from wells, hence, if residents of a city are devoid of access to portable water, it will take its turn on their health. . This study was designed to evaluate the role of the regulatory agency (KEPA) in the management of municipal solid waste at Ungwan Doma dumpsite of Chikun LGA of Kaduna state. It will also identify the challenges of KEPA and examine the policy options in addressing these challenges. The survey research was adopted for data collection in the course of this study. It involved the administration of questionnaires, conducting key informants interviews; Focus group discussion as well as direct observation. Chi-square non-parametric test was used in testing the reliability of the proposition. The cradle to cradle theory by William Mcdonough guided this study. The result from the analysis carried out using the statistical packages for social science (SPSS 20, version) showed that there is a significant relationship between the effective implementation of KEPA policy on solid waste and waste management in Kaduna state, and also a significant relationship between the performance of KEPA and the quality of its personnel. Among the findings, it was revealed that KEPA lacks sufficient funds to function effectively. As such the study recommended that Kaduna state government should increase the financial allocation to KEPA to enable them function effectively.

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LIST OF ABBREVIATIONS

ANOVA	-	Analysis of Variance
API	-	American Petroleum Industry.
CIBI	-	Council of Independent Black Institutions
DEE	-	Director of Environmental Engineering
DFS	-	Director of Finance and Supply
DLS	-	Director of Laboratory Service
DPHS	-	Director of Public Health Service
DPM	-	Director of Personnel Management
DPMEC	-	Director, Planning, Monitoring, Enforcement and Compliance
EPEA	-	Environment Protection and Enhancement Act
FME	-	Federal Ministry of Environment
GM	-	General Manager
KASUPDA	-	Kaduna State Urban Development Agency
KASUPEPA	-	Kaduna State Urban Planning and Environmental Agency
KEPA	-	Kaduna State Environmental Protection Authority
MAN	-	Manufacturing Association of Nigeria

MBDC	-	McDonough Braungart Design Chemistry
MSW	-	Municipal Solid Waste
PAN	-	Peugeot Automobile Nigeria
PRB	-	Population Reference Bureau
SDG	-	Sustainable Development Goals
SPSS	-	Statistical Package for Social Sciences
UNEP	-	United Nation Environmental Program
UNCHS	-	United Nations Conference on Human Settlement
UNTL	-	United Textile

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The environment in which we live in is constantly being manipulated by man to achieve maximum output from it. In doing so, human beings have not only degraded it but have also destabilized the once stable and dynamic physical environment. The increasing technological advancement over the past years has resulted in a corresponding growth in industrialization. Thus, the establishment of industries around the world combined with the processes involved has produced a lot of solid, liquid and gaseous wastes which in turn constitute environmental menace in the form pollution injurious to plants, animals including man.

The echoes that had predominated in 'modern' times has been one of develop now, minimize associated costs and clean up later. Since 1960's, there has been a shift towards a more environmentally appropriate development, and the tendency to damage the environment in the name of progress is being questioned more often. To minimize problems, maximize benefits and increasingly involve the public and win their support, Geographers, Planners and Decision Makers need to access how human activities have affected or might affect the environment.

Many of the generally acknowledged global environmental problems are directly or indirectly caused by the creation, operation, or distortion of the built environment undertaken by man. If man is responsible for many environmental disasters in which human kind is threatened, can his activities be regulated and conditioned by law? This question poses a view towards what should be the role of the regulating authority (government) in environmental sustainability. Environmental sustainability is the sixth goal in the scheme of the Sustainable Development Goals (SDGs). Before the objectives of environmental sustainability can be achieved, there must be someone at the helm of affairs who

has a vast knowledge of what ought to be. According to Oduwoye and Lawanson (2012), some of the critical problems facing cities of the developing world are deteriorating living conditions, increase in death rates and diseases caused by pollution and poor sanitation. Thus, these authors argued that the environmental and social consequences of urbanization are quite visible such as conversion of environmentally fragile areas to shanty towns by indigent migrants highlights the inextricable relationship between environmental degradation and poverty. Environmental degradation is both a cause and consequence of poverty and the challenges of environmental degradation moves beyond resultant effect of poverty.

The living situations of many Nigerians are not what it supposed to be. According to the Population Reference Bureau (PRB 2015), the average life expectancy of Nigerians living in Nigeria is 54. This is due to many social and environmental factors which are not far from the discussion of environmental sustainability

Solid waste management is an area of global concern for both developed and developing world. The issues of waste and sanitation have been a recurring agenda in most public health and environmental discourses. As more countries develop and population growth rates increase around the world, the amount of wastes produced becomes a major environmental issue. Such environmental issues have assumed a global character as environment is said to be beyond people's immediate surroundings, sometimes assuming international dimensions.

In many parts of the African continent, environmental problems have been revealed to create a great challenge. This is especially witnessed in the section of solid waste management in different countries of the region. While the quantity of waste produced in cities continue to increase daily, the effectiveness of the means of handling waste in terms of collection and disposal remains undesirably

low. According to the World Bank estimates, between 0.7 and 1.8 Kg per capita of waste is produced everyday in developed countries, urban areas and approximately 0.4 to 0.9 kg is produced in the cities of developing countries (World Bank,1992).

The cities of third world countries are growing at very rapid rates compared to those in the developed nations. For instance, a UN-Habitat report observed that Africa is the fastest urbanizing continent having cities like Cairo, Lagos, Nairobi, Kinshasa among others growing at fast rates that would make them triple their current sizes by the year 2050 (UN-Habitat, 2010). Such high rate of growth of cities has implications for the provision of urban infrastructural services to prevent the proliferation of urban slum. The increasing growth of cities, therefore, has implications for solid waste management among other social services required in the urban communities. Data from many of the cities shows inadequacy in urban social services like shelter, provision of safe drinking water and inefficient management of solid wastes. The cities are therefore littered with 'mountains' of rubbish in landfills and open (in most cases illegal) waste dumps which are covered with flies and thus serve as breeding grounds for rodents and mosquitoes which are carriers of diseases..

Oreyomi, (1998) maintained that improper disposal of solid waste poses serious danger to the handlers and the people living around the wastes as disposal sites carry along rodents, insects and other vermin, which could transmit diseases such as typhoid fever, dysentery, diarrhea, cholera, yaws, and other diseases. The failure of succeeding governments at various levels in Nigeria to effectively manage solid wastes has remained a national embarrassment and a cause of concern. Waste management deficiencies remain one of the major health and development problems in the country. It is also a major cause of mortality especially of vulnerable population groups in the country as it exposes people to disease causing organisms and various pollutants from water and the physical environment. A strong association has long been established between the spread of

communicable diseases and poor refuse management system. A look at most of the urban towns and villages in the country pictured a grossly deficient system of waste collection management and disposal-a sharp departure from what obtains in most developed countries of the world. The problem has thus become a complex one in Nigeria which requires urgent attention at all levels of policy initiation and implementation. The lack of capacity on the part of government and/or its agency has largely been responsible for this ugly situation.

The World Bank (1995) identifies the lack of enforcement of environmental laws as one of the greatest problems of the Nigeria environment. Enforcement agencies lack the mechanism for monitoring and evaluating the impacts of solid waste with a view to controlling them (Ibaba, 2010). The isolation of the environmental laws from the development programs and policies of the state, faults in implementation strategy or techniques, inadequate penalties for violation, the non-involvement of citizens in the formulation and execution of the laws, and the lack of a clear focus, are also seen as factors which have become obstacles to the proper execution of the laws.

The continuous growth of mountains of refuse in our cities has being acknowledged by the government of Nigeria as evident in budgets and policies formulated by them. Huge amounts of financial resources from budgetary allocations have been continuously earmarked to solve the problem of waste and general environmental degradation. The government has also gone further to establish agencies for environmental protection in all the states of the federation and at the federal level. In Kaduna state for instance, the state government instituted various agencies for city planning and developmental control such as Kaduna State Environmental Protection Authority KEPA) and Kaduna State Urban Development Agency (KASUPDA)

The Kaduna State Environmental Protection Authority (KEPA) was established by KEPA Edict of 1994 and later revised in 1998. The authority is charged with the responsibility of addressing all environmental problems in the state. In spite of efforts by the Kaduna State government in terms of policies and regulations, waste management is still a serious environmental challenge as many parts of the urban areas and towns across the state do not benefit from any organized waste management services and therefore wastes are unattended to, buried, burnt or disposed haphazardly thereby posing potential hazards to the environment and human health (FME, 2005). The paradox between the Kaduna State Environmental Policy and solid waste management cannot be allowed to continue or be simply ignored. If ignored, it can pose potential hazards to the environment and human health. This in turn will undermine productivity and reduce national income, there by perpetuating the vicious cycle of poverty.

1.2 Statement of the Research Problem

The issues of waste collection, disposal and dumpsites management are of immediate importance particularly when this is combined with rapid urbanization. Butu *et al* (2013) states that between one-third and one-half of the solid wastes generated within most cities in Nigeria are not collected. They usually end up as illegal dumps on streets, open spaces and waste land. This buttresses Ajibuah‘s (2013) claims that indiscriminate disposal of wastes along Kaduna Metropolis is the main factor influencing susceptibility of residents along Kaduna River to floods annually.

The prevalence of solid waste in Chikun LGA has adversely affected urban residents, especially the poor who make up about 65% of the urban population (Ekpe 2001).This is because the urban poor live mostly close to the sporadic refuse dumps. They are more prone to the dangers of pollution and the health hazards associated with it.

When waste disposal sites are in close proximity to residential structures, such environment is adversely affected as organisms that thrive in such dirty places are also agents of disease outbreak. Therefore, the aim of shelter as a place where people live and play in a hygienic manner is defeated when the stench from the nearby dump sites is a constant menace. In addition, these dump sites can contaminate ground water which in turn affects the purity of the water fetched from wells, hence, if residents of a city are devoid of access to portable water, it will take its turn on their health. This is a precarious situation and it adversely affects the residential environment. The waste disposal sites are often close to residential areas and human scavengers make their living from there and in the process expose themselves to Hazardous wastes.

KEPA'S dump site that is located at kilometer 5, Kaduna-Abuja express way in a community known as Ungwan Doma is a threat to the members of that community. Solid wastes are dumped indiscriminately at the dump site which is just a few meters away from households. The fence that is expected to protect the dumpsite from affecting the community is broken, and as such made it very easy for rodents, reptiles, flies etc to find their way into the community.

KEPA's responsibility is to endeavor to achieve a sustainable development in the state through Securing the quality of the environment, adequate for the health and well being of the residents of the state, Conserving the quality of the environment and its natural resources for the benefit of the state, Minimizing the impact of the physical development on the ecosystems of the state, Raise public awareness and promote understanding of essential linkages between the environment and development within the state and Co-operate with the federal environmental protection agency and other states Environmental Protection Agencies to achieve effective prevention of abatement of trans-boundary movement of waste. (KEPA's Edict.1998).

Based on the above therefore, locating a dump site close to a residential area is contrary to the content of KEPA's laws. This study is set to evaluate the effectiveness of KEPA most especially as it concerns its man-power in the management of solid waste in the study area and give recommendations where necessary.

1.3 Research Questions

This study set to proffer answers to the following questions;

1. What is the role of KEPA in Solid waste management and control?
2. How well have these roles been carried out or implemented in relation to Unguwan Doma dumpsite?
3. What challenges does KEPA face in the implementation and discharge of these roles in the study area?
4. What are the policy options in addressing these challenges?

1.4 Objectives of the Study

The aim of this study is to examine the role of Kaduna State Environmental Protection Authority (KEPA) in solid waste management and control in Ungwan Doma dumpsite. The specific objectives of this study are as follows:

1. Identify the role of KEPA in solid waste management and control.
2. Assess how these roles have been carried out or implemented in to Unguwan Doma dumpsite.
3. Identify the challenges KEPA faces in the implementation and discharge of its roles in the study area.
4. Examine the policy options in addressing these challenges.

1.5 Research Hypotheses

$H0_i$ There is no significant relationship between the effective implementation of KEPA policy on solid waste and waste management in Kaduna metropolis.

HO_{ii}: There is no significant relationship between the performance of KEPA and the quality of its personnel.

1.6 Significance of the Study

Waste management deficiencies remain one of the major health and development problems in Nigeria. It is also a major cause of mortality especially of vulnerable population groups in the country as it exposes people to disease causing organisms and various pollutants from water and the physical environment.(Ibaba 2010). A strong association has long been established between the spread of communicable diseases and poor refuse management system. A look at most of the urban towns and villages in the country pictured a grossly deficient system of waste collection management and disposal-a sharp departure from what obtains in most developed countries of the world. The problem has thus become a complex one in Nigeria which requires urgent attention at all levels of policy initiation and implementation. This research therefore is aimed at reducing the negative effects of indiscriminate dumping of waste on the environment as well as the improper management of the dumpsite located at the study area by suggesting better methods for the management of waste.

The research will assessed the effectiveness of the agency saddled with the responsibility of protecting the environment (KEPA) most especially as it concerns solid waste management at the Ungwan Doma dumpsite. It will also assess the human resource of the agency in terms of their capacity to be very effective in their responsibilities.

This study is also necessary because waste collection improves the quality of life of residents and makes the area cleaner and more acceptable as places to live and work. Waste collection activities create jobs and provide opportunities for the creation of small businesses. A cleaner environment also encourages investment in a community.

The study on the role of KEPA in solid waste management and control in Kaduna state is timely because as humanity develops, the magnitude of waste increases. There has been a spontaneous increase in the population of people migrating from the Northern to the Southern part of the metropolis which has led to a corresponding increase in the quantity of waste generated and disposed in the environment, hence the need for an effective waste management strategy.

Furthermore, the study will assist policy makers by pointing out the obvious lapses in policy implementation and help redefine or redirect strategies for a more purposeful management of solid waste. This study will further constitute necessary input for more effective strategies and decision making towards effective policy implementation and monitoring of waste management agencies. . It will also be of great importance to stakeholders especially the private sector by exposing the level of opportunities in the sector. Above all, the study will call the attention of government to her fiscal responsibility to the waste sector through adequate budgetary provision.

1.7 Scope and limitations of the Study

The focus of this study is on the role of KEPA in solid waste management at Ungwan Doma dump site, and also assesses the effectiveness of KEPA's staff in solid waste management.

The dumpsite is located at kilometer 5, Kaduna-Abuja express way in Chikun LGA of Kaduna state, while KEPA's Head office is at 10, Link road, Kaduna south, Kaduna state.

The study covered a period of between 2010-2016 (7 years).This is as a result of the massive movement of people from the northern part to the southern part of Kaduna state within the stated period, most especially those residing very close to the dumpsite, and also because of constant floods that kept occurring in the state metropolis within the last four years which also has to do with the improper waste management that has blocked most of the water ways.

The justification for the choice of the Kaduna State Environmental Protection Authority is hinged on the fact that it is the only comprehensive and state-driven agency that has the statutory right to handle environmental issues in the state.

The study faced the limitation of resources such as materials, finance and logistics. The time frame for the study was prolonged because some of the respondent deliberately delayed the process.

1.8 Definition of concepts

In order to enhance a clear understanding of this research work, the following terms have to be conceptually and operationally defined as follows;-

1. Environment

According to Akinbode (2002), environment is the totality of the places in which we live, work and interacts with other people in our cultural, religious, political and socio economic activities for self fulfillment and advancement of our communities.

Operational definition of environment

i. Surrounding
ii. Total space around man
iii. Physical environment

2. ***Solid Waste***

Okecha (2000) defined solid waste as comprising all wastes arising from human and animal activities that are normally solid, discarded as useless or unwanted. Also, included are by-products of process lines or materials that may be required by law to be disposed off. However, for the purpose of this study, solid waste is operationally defined as unused, unwanted or discarded papers, plastics, rubbers, textiles, leathers, glasses, metals, ceramics, dusts, stones, woods, market debris like thrown vegetables and fruits, crop debris like hay and straw, food debris such as disposed food remnants or scrap

Operational definition of Waste

Garbage

Refuse

Disposable

Debris

Dirt

Sludge

Unwanted substances

3. Waste Management

Agwu (2012) defined Solid waste management as the process of collecting, storing, treatment and disposal of solid wastes in such a way that they are harmless to humans, plants, animals, the ecology and the environment generally.

Operational definition of waste management

The process of directing and facilitating the efforts of KEPA, Private sector, local governments and the general public in the collection, transport, treatment and final disposal of unused, unwanted or discarded papers, plastics, rubbers, textiles, leathers, glasses, metals, ceramics, dusts, stones, woods, market debris like thrown vegetables and fruits, crop debris like hay and straw, food debris such as disposed food remnants or scrap in order to have a clean and a healthy environment.

4. Effective implementation of policy directives of KEPA

Enacting and enforcement of state regulations control criteria for solid waste management, adherence to the content of the policy document, effective utilization of funds allocated for waste management, as well as Preventing and stopping any act of omission whose consequences are likely to adversely affect the environment.

5. Quality personnel

Educational qualification, Experience, Skills, Training acquired, Physical fitness, Performance, Productivity and Code of conduct.

1.9 Outline of Chapters

This study is divided into six chapters. Chapter one commences by providing a background to the subject matter, statement of the problem, research questions, and objectives of the study, research hypotheses, and justification for the study, scope and limitation of the study as well as operational definitions of concepts.

Chapter two presents related literatures on the concept of waste management and empirical studies as well as a theoretical framework which guide the study.

The research methodology is outlined in chapter three where emphasis is given on the type of research, population of the study, sample size and sampling techniques, sources of data, and methods of data presentation and analysis.

The overview of KEPA in terms of roles, functions and its efforts toward waste management are discussed in chapter four.

Data presentation and analysis, hypotheses testing and summary of major findings are in chapter five.

Concluding comments in chapter six reflected on the summary of findings of the study, and recommendations based on the findings.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

For the purpose of this study, this section considers the review of related literature in uncovering relevant information to this study. Various scholars who have done research in the areas of waste management have been consulted and where found relevant, have been used to support the findings of this study.

2.2 Conceptualizing waste and waste management.

Waste management constitutes a major problem to man and his living environment, and of course is a major contributor to the degradation of life in biosphere. The cumulative negative effect of industrial growth, coupled with population explosion in most of the cities of the world has called for a concerted universal effort to address and check its consequences on environmental degradation. All technological and Industrial innovations create risk as well as benefits, but the true balance between these two is not always apparent. (Alani, 2000). According to UNEP's Global Environmental Outlook report (1997), the quickening of our assault on the environment has continued to be dramatic. Global warming, Ozone depletion, the loss of soil and forests, the contamination of our fresh water supply and even the great oceans, the toxic substances entering our environment and our bodies and threatening our health are signals that we continue to make excessive demand on the global environment that sustains us, this is as a result of the rapid and accelerating increase in world population since the beginning of the 19^{th} century.

Waste has in fact become such an important part of human ecological footprint, that our very existence is threatened by its contribution to global warming and the associated environmental

degradation. The leading industrial countries in the world have recognized that continued waste generation cannot be offset by improved land filling techniques, but that alternative policies, practices and technologically advanced disposal methods need to be developed and implemented (Spamer,2009). A lot has been said, written, and demonstrated about the inadequacies in solid waste management and its associated problems. According to the United Nations Conference on Human Settlement (UNCHS) report, one third to one-half of solid waste generated within most cities in low- and middle-income countries, are not collected. They usually end up as illegal dumps on streets, open spaces, and waste lands (UNCHS 1996).The problem of solid waste has become the nation‘s most serious environmental problem. In recent years, the problem has become so aggravating that between 1977 and 1982, a total of nine conferences and meetings of local governments, commissioners were organized in various States across the nation to discuss problems of refuse collection and disposal (FME, 1983).

Waste may be defined as substances or objects discarded, worthless, unwanted, and defective or of no value from a consumption or manufacturing process (Ayuba, 2005).

The UK Environmental Protection Act 1990, indicated that waste includes any substances which constitutes a scrap materials, an effluent or other unwanted surplus arising from the application of any process or any substance or article which requires to be disposed of which has been broken, worn out, contaminated or otherwise spoiled, this is supplemented with anything which is discarded..

Karibo (2008) stated that the word “Waste” is a highly subjective notion. While some persons see waste as a risk to public health and the environment, some find it as a mere necessary inconvenience and nuisance, necessary because it must be generated as long as man exits in the world to carry out day-to-day activities and a nuisance in that a sight of a huge waste dump, is not only unsightly but

generates offensive odour apart from its attendant environmental consequences. He further stated that the growing global awareness on sustainable development as well as poor implementation of relevant environmental laws/regulations and the complete absence of waste management resources/facilities within and around major urban cities in developing countries and Nigeria in particular has promoted waste in bad or negative effects.

Waste has been defined as a resource in the wrong place (Adewumi, 2001). Waste refers to lack of use or value or useless remains. It is a by-product of human activities. Solid waste encompasses diverse nature and constituents. It is generally classified as household, market or commercial, industrial, medical, construction, etc. All these could either be wet or dry in nature. It has therefore being advocated that the best way to deal with wastes is to restore value to it (Adewumi, 2001) to the point at which it ceases to be a waste. The lack of value in many cases can be related to the mixed and in many cases unknown composition of wastes which also compound management problems. The provision of solid waste services is a costly and vexing problem for local authorities everywhere.

Chandrasekar (2002) on the other hand defines waste as substances or objects discarded as worthless or unwanted, defective or of no other value from a manufacturing or production process. This definition is restricted to the manufacturing or production process. It does not cover other human activities like domestic and commercial activities, which also contribute to the generation of wastes. Given the complex and interdependent activities that go on in the urban centers, urban waste cannot be said to be completely without any value. Ludwig *et al* (2003) defines waste as any unavoidable material resulting from domestic activity or industrial operations for which there is no economic demand and which must be disposed off. While this definition covers both domestic and industrial activities, it does not cover the commercial aspect. Furthermore, it gives the impression that waste

has no other value. Hence, Chandrasekar (2002) definition of waste as materials which though may no longer be needed here, but may become a feedstock or raw material elsewhere fills this gap. This conceptualization is inclusive as waste is seen as material or substances or objects resulting from domestic, commercial and industrial activities, which may not be needed by the primary generator, but may become raw material or of economic value elsewhere. Industrial hazardous waste is excluded from municipal waste because it is typically dealt with separately based on environmental regulations. Waste of any sort constitutes a worrisome nuisance if not physically removed.

Waste can be classified in many different ways such as according to its origin (for example, domestic, industrial, commercial, clinical, construction, nuclear, agricultural etc. or its properties (for example, inert, toxic, inflammable). Without suitable treatment, such waste become a source of contamination of the environment at large, leading to air pollution, water pollution and oil pollution.

Waste is classified in categories such as municipal solid waste (MSW), agricultural and animal refuse, industrial residues, extraction and mining waste, construction and demolition debris and sewage sludge among others.

Hopskinville (1976) explained that solid wastes are residuals from homes, businesses and institutions, and referred to it as trash, garbage, rubbish, refuse, discards and throwaways that enter a local system for collection and disposal. He explained that solid waste can be classified in different ways. The first is the division of solid wastes or refuse into two broad groups; domestic and industrial solid waste. Secondly, simple system that recognizes three categories of solid wastes namely animals, vegetables and minerals.

Adeibu,(1983) stated that solid wastes are non- gaseous and non-liquid wastes resulting from a wide range of community, industrial, commercial and agricultural activities. Solid Waste

Disposal, disposal of normally solid or semisolid materials, resulting from human and animal activities that are useless, unwanted, or hazardous.

A research on the evaluation of solid waste management policy in Benin, by Kalu *et al* (2009) stated that Solid waste disposal constitutes a nuisance and creates a breeding ground for pests and diseases in Benin metropolis. Study was undertaken to assess how the policy on solid waste management had failed in waste disposal. The findings revealed that solid waste policy had not fared well in Benin metropolis despite the fact that there is a considerable level of awareness among the public on the unpleasantness of filthy environment. In conclusion, *Kalu et al* said that awareness campaign, payment of bonus for well sorted out disposed solid wastes and technically desirable managed dump sites should be the main strategies of environmental solid waste policy in Benin City.

2.3 Waste Management

Waste management is the "generation, prevention, characterization, monitoring, treatment, handling, reuse and residential disposal of solid waste." Also according to Omuta, (1988), Solid waste management concerns the interplay, among generation, storage, collection and final disposal. Waste is introduced into the environment due to the day-to-day activities of humans. There are various types of solid waste including municipal (residential, institutional, commercial), agricultural, and special waste (health care, house hold hazardous waste, sewage sludge). The term usually relates to materials produced by human activity, and the process is generally undertaken to reduce their effect on health, the environment or aesthetics. Waste needs to be managed in order to prevent contact with humans and their immediate environment. Therefore, the main purpose of waste management is to isolate waste from humans and the environment, and consequently, safeguard individual, family and community health. In addition the aesthetic value of a better outlook and a clean physical environment is important for our emotional wellbeing.

Rodgners (2011), contends that waste management is a systematic control of generation, storage, collection, transportation, separation, processing, recovery and disposal of solid waste. In the smallest of places, solid waste management is accepted as a major aspect of the indigenous community organization and traditional home management; hence every house, compound has a designated area for solid waste collection/disposal and or incineration (Sanda, 2008). There is a wide array of issues relating to waste management and those areas include: Generation of waste, waste minimization, waste removal, waste transportation, waste treatment, recycling and reuse, storage and collection, landfill disposal, environmental considerations, policy and regulations, education and training, planning and implementation.

There are a number of concepts about waste management which vary in their usage between countries or regions. Some of the most general, widely used concepts include: Waste hierarch**y;** the waste hierarchy refers to the "3Rs" reduce, reuse and recycle, which classify waste management strategies according to their desirability in terms of waste minimization. The waste hierarchy remains the cornerstones of most waste minimization strategies. The aim of the waste hierarchy is to extract the maximum practical benefits from products and to generate the minimum amount of waste, (Barbalace, 2003).

Generally, waste could be liquid or solid waste. Both of them could be hazardous, and solid waste types can be grouped in to organic, re-usable and recyclable waste as stated below

Liquid Type: Waste can come in non-solid form. Some solid waste can also be converted to a liquid waste form for disposal; Examples of liquid waste include wash- water from homes, liquids used for cleaning in industries and waste detergent.

Solid Type: Solid waste predominantly, is any garbage, refuse or rubbish that we make in our homes and other places. These include old car tiers, old news papers, broken furniture and even food-waste.

Hazardous Type: Hazardous or harmful waste are those that potentially threaten public health or the environment. Such could be inflammable (can easily catch fire), reactive (can easily explode), corrosive (can easily eat through metal) or toxic (poisonous to human and animals. Examples include fire extinguishers, old propane tanks, pesticides, mercury- containing equipment (e.g thermostats) and lamps (e.g fluorescent bulbs and batteries).

Organic Type: Organic waste comes from plants or animals sources. Commonly they include food waste, fruit and vegetable peels, flower trimmings and even dog poop can be classified as organic waste. They are biodegradable (this means they are easily broken down by other organisms over time and turned in to manure).

Recyclable Type: Recycling is processing used materials (waste) in to new, useful products. This is done to reduce the use of raw materials that would have been used. Waste that can be potential recycled is termed "Recyclable waste."Example are Aluminum products (like soda, milk and tomato cans), plastics (grocery shopping bags, plastic bottles), Glass products (like wine and bear bottle broken glass), Paper products (used envelopes, news papers and magazines, cardboard boxes), can be recycled and fall in to this category.(wikipedia.org. 2008)

2.4 Methods of Solid Waste Management

Solid waste management practices can differ from developed and developing nations, for urban and rural areas, and for residential and industrial producers. Management of non-hazardous metropolitan areas is usually the responsibility of the local government authorities, while management of non-hazardous commercial and industrial waste is usually of the responsibility of the generator subject to local, national or international authorities (Hoornweg, Lan and Chandhry, 2005).Waste management simply means the collection, transportation, processing or disposal, managing and monitoring of

waste materials to minimize its consequences on humans and the environment. There are several methods of managing all the various types of waste, (Hoornweg et al, 2005).

The growth of human population couple with increased economic activities in cities and communities had resulted in high rate of solid waste generation. A fundamental attribute of solid waste is that, it is inevitable as almost every human activity involves the generation of waste in solid, liquid and gaseous forms. Social dynamics such as modernization and economic resource allocation had forestalled a mismatch between the rate of waste generation, rate of collection and disposal (Johnson, 2010).

According to Tchobanoglous et al (1993: 17-18), the most commonly recognized methods for the final disposal of solid wastes were: dumping on land, canyons and mining pits, dumping in water, ploughing into the soil, feeding to hogs, reduction and incineration. Some of these unwholesome practices of solid waste identified during the early disposal practices still exist in cities, towns and villages today. Indiscriminate dumping on opened land and dumping in gutters particularly are clearly evident in towns and cities, while dumping in water especially people living in coastal towns is common place.

Burning of dumps is also common in semi-urban and rural communities in Ghana and in many other less developed countries. A study carried out in Ado-Ekiti in Nigeria by Momoh and Oladebeye (2010) showed that the methods of solid waste disposal include dumping of waste in and burning of wastes on unapproved dumping sites during the dry season. This has gone to confirm that the practices of solid waste disposal in the 1950s still exist today and the study area is not an exception. On the other hand, Momoh and Oladebeye‘s (2010) assessment of waste situation in Ado-Ekiti in

Nigeria is questionable, as they did not further explain what brought about the indiscriminate dumping.

Cities are regarded as the most efficient agents of production (Hardoy, Mitlin and Satherthwaite, 2001) with increase in population. This population increase compounds the problems of solid waste management. The large migrant components of our cities and the novelty of the urban culture create situations in which many of the cherished rural values and cultural norms are abandoned whereas new urban values are not internalized but replaced by the foreign values (Hardoy et al 2001). The relevance of this ambivalence to environmental quality is that the cities are regarded more or less as a geographic 'no man's business'. Worse still, agencies responsible for managing solid wastes, especially in urban areas are either nonexistent or in effective. Urban land use becomes complex as the city grows in population and physical size and so does the solid waste generation increase in volume and varieties. Urban land uses vary from residential, commercial, industrial, institutional; and others, with each category generating its own peculiar type of solid waste. Because of the complexity of the household wastes, the socio-economic structure of the urban population becomes a major determinant of the spatial structure of solid waste problems in our cities. Uwadiegwu (2003) in a study noted that the quantity of solid waste produced depends upon the living standard of the residents, urbanization and industrialization.

Okoye (2004) identified household size, income level, level of technological advancement and socio-economic status as factors that affect the quantity of solid waste generation, but however, noted that a single factor may not on its own constitutes a difference in the quantity of waste generated by a household. Igbodobe and Anyata (2009) identify the problems of insufficient available data, funding, poor understanding of solid waste management and residents' attitude. It is common for most of the solid waste generated in urban areas to be collected and dumped

indiscriminately within or on sites outside the city without site preparation. Sule, (2001), however observes that the type of waste disposal method adopted in any particular area depends largely on the prevailing local conditions such as availability of open space, accessibility and attitude of the people.

2.5 Significance of Waste Management

Waste management generates carbon dioxide and methane which is both greenhouse gases. Everyday waste contains readily biodegradable carbon based organic matter such as kitchen waste, garden waste and paper, and slowly biodegradable organic materials such as wood like material. Some products such as plastics contain carbon derived from fossil fuels which are used as a feedstock. (Oil).The treatment and disposal of these wastes has a direct influence on the emission of these greenhouse gases (Nabegu, 2010).

Recycling reduces the need for raw materials, and keeps valuable resources from being disposed of, and further contributing to greenhouse gas emissions. Recycling does require an energy input to reform the materials into different products, and this energy usually comes from burning of fossil fuels and the release of carbon dioxide to the atmosphere .The composting of garden and sometimes kitchen waste produces carbon dioxide as part of aerobic decomposition process. Anaerobic digestion of organic waste produces methane and carbon dioxide which is collected through the process and can be used as a fuel. The recycling of biodegradable organic wastes is central to meeting the requirements of the Landfill directives (Nabegu, 2010).

Further down the hierarchy, incineration, or energy recovery, converts energy stored within the materials to useful energy, reducing fossil fuel requirements and so saving on carbon dioxide emissions and other harmful pollutants. The original materials is converted to ash and

gases, implying the need for more extraction manufacturing and transportation of materials Incineration without energy recovery is mainly a volume and toxicity reduction process, and has the benefit of preventing materials decomposing in a landfill with the possible uncontrolled release of gases.

When we manage the treatment and disposal of our wastes we are also managing the method by-which the carbon will be released back to the environment: similarly the changing climate impacts on the way waste will need to be stored, treated and disposed of, and will also alter the risks associated with waste (e.g. pests and diseases).When materials are broken down by organisms in the presence of air, the gas released is carbon dioxide. Methane is also produced when the material decomposes in the absence of air. These when properly done by the will help in protecting the environment from harmful effects thereby ensuring a sustainable environment.

2.6 Waste Disposal Methods

Before the 1980s, most of the waste generated was either land filled or burned. More than 90% of the municipal solid waste was land filled or disposed with less than 7% materials recovery during the 1960s and 70s. This trend started changing after the 1980s when landfill disposal declined to about 54% and resource recovery increased to more than 33%.The most recent numbers from the EPA indicate that in 2012 the US municipal solid waste recycle rate was 34.5%.This section describes the common methods of solid waste disposal practiced worldwide.

Landfills: These are technically designed areas where waste is disposed scientifically. They are characterized by liners that prevent seepage of lichgates into the groundwater. There are different

designs for landfills used for municipal solid waste or household waste, construction & demolition waste, and hazardous waste.

Combustion or Incineration: Combustion or incineration of waste reduces the amount of landfill space needed by burning waste in a controlled manner and also generates electricity through waste-to-energy technologies such as gasification, paralysis', anaerobic digestion, fermentation, etc.

Transfer Stations: Transfer stations are intermediate facilities where the collected municipal solid waste is unloaded from collection trucks, compacted to reduce the volume of the waste, and held for a short time before it is reloaded onto larger, long-distance trucks or containers for shipment to landfills or other treatment and disposal facilities.

Recovery & Recycling: Wastes are also good sources of raw materials. Recovery and recycling of wastes can help to reduce the use of virgin materials for producing new goods.

Composting: Composting is a way to return nutrients back into the environment by allowing microorganisms to turn the waste into manure. Applying this manure to agricultural land can improve the fertility of the soil providing it essential nutrients. (Wikipedia 2008).

2.7 Waste Hierarchy

Every subject, whether in academics or a matter of civic planning like waste management, needs some guiding principles based on which the different countries develop their own methodologies of management. Waste management is also one such area which has some common underlying principles based on which the waste management for a country or region is decided upon. The waste hierarchy is one such waste management concept. The United Nations Environment Program (UNEP) defined integrated waste management as a framework of reference for designing and

implementing new waste management systems and for analyzing and optimizing existing systems‖ (Seadon, 2006: 1327).

This hierarchy is based on the three or four Rs which signify reduce, reuse, recycle and more recently, the word recover which has been added to this waste management concept. The Rs are arranged in a hierarchical manner whereby the first step signifies reduce or waste minimization.

Reduction

This step talks about reducing the possibility of waste generation by looking at the different ways in which producers and consumers can reduce the possibility of generating wastes in their daily lives and daily operations.

Re-Use

This is whereby products which, having exhausted their primary means of purpose, a secondary purpose is found for continuing the use of items, for instance, empty cans or bottles can be found secondary uses around house or even in offices, many local craftsmen are finding innovative ways to design and sell various household items in used containers and other products.

Recycling

The third step talks about recycling. Communities are encouraged to segregate their wastes amongst bio degradable and recyclable. The latter type of wastes are then transported to recycling plants whereby the items are subjected to shredders and their base materials are taken out and sent to respective industries for reclaiming them into further use.

Recover

In Europe two more additional steps have been added to the waste hierarchy – recover and disposal. Disposal thus comes last on the hierarchy list since it shows depletion of the earth's resources, possible means of contaminating the environment and loss of energy on the face of the earth. Again, proper disposal of wastes is the most expensive step for society while waste minimization, reduction and reuse are cheaper and less costly methods than recycling, recovering and disposal.

In many countries the Polluter Pays Principle is adopted in many instances. Here, the government or private parties levy an additional cost or tax on people whose actions cause a polluting impact on the environment. Charges being levied on plastic bags in most countries and in many places, taxes being levied on the volume of wastes generated are some of the ways this principle is put into practice.

2.8 Benefit of Waste

Waste is not something that should be discarded or disposed of with no regard for future use. It can be a valuable resource if addressed correctly, through policy and practice. With rational and consistent waste management practices there is an opportunity to reap a range of benefits. Those benefits include:

Economic - Improving economic efficiency through the means of resource use, treatment and disposal and creating markets for recycles can lead to efficient practices in the production and consumption of products and materials resulting in valuable materials being recovered for reuse and the potential for new jobs and new business opportunities.

Social - By reducing adverse impacts on health by proper waste management practices, the resulting consequences are more appealing settlements. Better social advantages can lead to new sources of

employment and potentially lifting communities out of poverty especially in some of the developing poorer countries and cities.

Environmental - Reducing or eliminating adverse impacts on the environment through reducing, reusing and recycling, as well as minimizing resource extraction can provide improved air and water quality and help in the reduction of greenhouse emissions.

Inter-generational Equity - Following effective waste management practices can provide subsequent generations a more robust economy, a fairer and more inclusive society and a cleaner environment.

2.9 Challenges of Waste Management

According to Egun, (2009) Challenges in waste management service delivery include;

1. Lack of comprehensive legal framework and enforcement of the existing regulations
2. Low investment (private) in infrastructure
3. Inadequate human capacity for administrative and technical issues
4. Wrong attitude of the public towards solid waste disposal
5. Financing -Cost recovery is low in most States and no funding
6. Poor Planning -low data management and uncontrolled urbanization
8. Uncoordinated institutional functions
9. Low academic research and industry linkages
10. Lack of the needed political will.

2.10 Review of Empirical Studies

Many scholars have written on waste management all over the globe. Sulaiman I (2013) in a study titled '' The Assessment of Waste Management and Control strategies in Katsina State Metropolis'' reveals that residential quarters generates the largest percentage of waste in the metropolis mainly due to the rapid urbanization and increasing population growth. . The data for the study was gathered through Interviews and field work, which was subjected to descriptive statistical analysis using percentages and averages. The study also revealed that the state environmental Agency has not been very effective in the management and control of waste in the state due to lack of capacity which includes funding and human resources.

This work is not very comprehensive because it concentrated only on residential quarters as the main source of waste generated.

A similar study carried out on ''the Assessment of the level of recycling and waste management in Delta State'' by Nkonyesua K.(2009) identified the fact that an appreciable effort has been made by the state government in the area of collection and disposal of waste. The major towns and cities in Delta state accounts for the bulk of waste materials generated. these wastes includes papers, plants and vegetables wastes, metal scrap, glass materials, broken bottles and plastic rubber products. Of these waste materials, plastic rubber and polythene products pose a great challenge to the state in terms of proper disposal as it is the most widely used packaging material and its long degradable lifespan. The state government provided waste collection bins/containers at strategic points, as well as the provision of waste collection trucks whose duty is to transport the waste generated in the metropolis to the landfill site. There is also a public awareness in various forms in the media on the need for proper waste disposal, setting aside of the last Saturday of every month as a sanitation day

with the aim of keeping the environment clean. Furthermore, there is the setting of an 11-member committee on waste management charged with the responsibility of proffering solutions to waste management challenges. Despite this effort, the issue of waste management is still on the increase. The study recommends the establishment of recycling plants by the state government, or through partnership with the private sector. This will reduce the volume of waste disposed as well as lead to job creation of both the skilled and unskilled labor force. The study lagged behind in the sense that concentration is mainly on households waste without looking at the industrial waste management system.

Also, Pattern and Disposal Methods of municipal waste generation in Kaduna metropolis is another piece of work in the area of waste management by Ajibuah B and Terdoo F. (2013). The study examined the pattern and techniques of municipal waste disposal and its consequences on the health of the population. An in-depth and holistic review of population growth and sequence development of Kaduna metropolis, Qualitative spatial locations collection and dumping sites of wastes in the metropolis were assessed and purposive sampling method of semi-structured questionnaire were administered to key stakeholders, and resident. Simple descriptive statistics was employed for data analysis. Findings revealed that unprecedented waste generation in Kaduna metropolis were spurred by emergent historical population growth. The waste generated in the metropolis are not properly handled, they are deposited openly in trenches, gutters, footpaths and undeveloped lands or abandoned residential structure. Some of the wastes are dumped at the bank of river Kaduna while only a few use the designated dumping sites located at the outskirt of the town. The study revealed that uncollected or waste not properly handled from household and other activities posses serious threat to health which could be manifested in the spread of infectious diseases and other health challenges. To ameliorate these unacceptable scenarios, the writers suggested that waste

management that is people inclusive must be formulated. This can be achieved through mobilization and capacity building intervention programs of the people. Recycle mechanisms must be introduced to reduce the quantity of waste produced in the metropolis.

The problems of waste generation and management have become a serious issue of concern to many scholars in environmental studies. This study critically examined the attitude of urban dwellers to waste disposal and management in Calabar. The work was written by Afangideh A and Joseph K). This study was conducted in Calabar municipality local government area of Cross River State. Six major streets were randomly selected for this study which includes,Akim road, Akim barracks, Mekenge layout, Odu-Ika, Akim-Ikang and Ita- Asu streets. Data such as waste classification, waste disposal, and frequency of waste and evacuation methods were obtained from the questionnaire administered to the residents in the area. A sample of population of 1,000 people was used, of which 150 respondents were randomly drawn from the sample population in 75 households. However, the data obtained were analyzed using the One-way ANOVA while the independent T-test was used to evaluate the degree of significant of the variables under investigation. Findings revealed that the residents disposed their waste behind their houses which shows a poor attitude in the side of the people in waste management and disposal. This negative attitude can attract rodents such as rats, mosquitoes to the surrounding environment, hence causing various health challenges. Therefore, the following measures are hereby recommended if the negative attitude of the people to waste disposal and management must be averted. Effective campaign should be carried out for men to see the necessity of consciousness with regards to waste disposal and management. Government should re-introduce the monthly sanitation in order to make a lot of urban dwellers become more conscious of the purity of their surroundings. Government should provide adequate funds for proper execution of environmental programs. This would help secure new modern waste management technology that

could help correct the negative attitude of citizens towards waste disposal and management. Open dump sites should be declared out of bound as they are always in a state of abuse This study did not mention the role of the agencies saddled with the responsibility of waste management in the state, emphasis is also on household waste neglecting other sources of waste.

2.11 Theoretical Framework

The Cradle to cradle theory was adopted to guide the research work.

2.11.1 Cradle to Cradle Theory

This work is anchored on Cradle to cradle theory developed by William McDonough (2002}. It is designed to stop the cycle of use-waste-pollute, which suggests that certain products could be reused endlessly to make similar products (cradle to cradle), rather than recycled into lower-grade products until the last stop is a landfill (cradle to grave).

Cradle to Cradle design (also referred to as Cradle to Cradle, C2C, cradle 2 cradle, or regenerative design) is a biometric approach to the design of products and systems. It models human industry on nature's processes viewing materials as nutrients circulating in healthy, safe metabolisms. It suggests that industry must protect and enrich ecosystems and nature's biological metabolism while also maintaining a safe, productive technical metabolism for the high-quality use and circulation of organic and technical nutrients. Put simply, it is a holistic economic, industrial and social framework that seeks to create systems that are not only efficient but also essentially waste free. The model in its broadest sense is not limited to industrial design and manufacturing; it can be applied to many aspects of human civilization such as urban environments, buildings, economics and social systems.

The term Cradle to Cradle is a registered trademark of McDonough Braungart Design Chemistry (MBDC) consultants. Cradle to Cradle product certification began as a proprietary system; however, in 2012 MBDC turned the certification over to an independent non-profit called the Cradle to Cradle Products Innovation Institute. Independence, openness, and transparency are the Institute's first objectives for the certification protocols. The phrase "cradle to cradle" itself was coined by Walter R. Stahel in the 1970s. The current model is based on a system of "lifecycle development" initiated by Michael Braungart and colleagues at the *Environmental Protection Encouragement Agency* (EPEA) in the 1990s and explored through the publication *A Technical Framework for Life-Cycle Assessment.*

Currently, many human beings come into contact or consume, directly or indirectly, many harmful materials and chemicals daily. In addition, countless other forms of plant and animal life are also exposed. C2C seeks to remove dangerous *technical nutrients* (synthetic materials such as mutagenic materials, heavy metals and other dangerous chemicals) from current life cycles. If the materials we come into contact with and are exposed to on a daily basis are not toxic and do not have long term health effects, then the health of the overall system can be better maintained. For example, a fabric factory can eliminate all harmful *technical nutrients* by carefully reconsidering what chemicals they use in their dyes to achieve the colours they need and attempt to do so with fewer base chemicals.

Another effective example is a shoe that is designed and mass-produced using the C2C model. The sole might be made of "biological nutrients" while the upper parts might be made of "technical nutrients." The shoe is mass-produced at a manufacturing plant that utilizes its waste material by putting it back into the cycle; an example of this is using off-cuts from the rubber soles to make more soles instead of merely disposing of them (this is dependent on the technical materials not losing their quality as they are reused). Once the shoes have been manufactured, they are distributed

to retail outlets where the customer buys the shoe at a fraction of the price they would normally pay for a shoe of comparable aspects; the customer is only paying for the use of the materials in the shoe for the period of time that they will be using the shoe. When they outgrow the shoe or it is damaged, they return it to the manufacturer. When the manufacturer separates the sole from the upper parts (separating the technical and biological nutrients), the biological nutrients are returned to the natural environment while the technical nutrients are used to create the sole of another shoe.

Another example of C2C design is a disposable cup, bottle, or wrapper made entirely out of biological materials. When the user is finished with the item, it can be disposed of and returned to the natural environment; the cost of disposal of waste such as landfill and recycling is eliminated. The user could also potentially return the item for a refund so it can be used again.

This means that products can be used, recycled, and used again without losing any material quality-in cradle to cradle cycles. Therefore, it could be the good way for reducing the waste from the raw materials of the products instead of using more and more virgin materials. Hence, when we face the problems of solid waste, this theory can bring us the possibility for the breakthrough. All in all, "cradle to cradle" plays an important role to develop the China's waste treatment hierarchy and implement the China's waste management system.

2.11.2 Application of the Theory to this Study

Using cradle to cradle theory, it is important to note that as much as possible, one should aim at waste minimization or reduction, reuse, and recycling before dumping the wastes into a dust bin. Recycling the non-biodegradable will help the individual and also the local industry. In recent years, many industries are starved of raw materials. For recycling to be successful, separation should start at household level. If paper, plastic, aluminum, iron and glass can be separated and kept in separate

bins or baskets, it is normal that our waste will be reduced for the clearing agent and we will pay less for his services. Besides saving some money from the agent, one makes some extra money from the sale of these recyclables. Simply put, waste can be used for wealth generation thereby preserving the environment for a healthy living. As it can be seen in the case of KEPA and Unguwan Doma dumpsite, it is very obvious that the waste can be recycled which will serve as a source of revenue thereby preserving the health condition of the people living in that area. The proposed recycling plant and the organic fertilizer plant under construction in the dumpsite will reduce the quantity of solid waste disposed at the site if fully utilized. It will create jobs, reduce the threat the scavengers are exposed to on a regular basis, and also bring revenue to the state government which can be used in the provision of social services for the benefit of all.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

Research is any organized enquiry that aims at providing information for solving identified problems. Basically, methodology deals with the method used in collecting data for the research work. In this chapter therefore, we will be discussing research design, population and sample size, sampling technique, sources of data, administration of instruments and method of data presentation and analysis.

3.2 Research Design

The survey research was adopted for data collection in the course of this study. It involved the administration of questionnaires, conducting key informants interviews; Focus group discussions as well as direct observation was used in evaluating the role of KEPA in Solid waste management and control; A study of Ungwan Doma dumpsite in Kaduna state.

According to Odoh (1995), surveys are systematic ways of gathering information from a large number of people who themselves constitute a sample by asking them questions. This method focuses on population of the study in which data collected were used for intensive study and analysis. A sample from a subset of population is carefully selected to represent the characteristic of the population. This provides the opportunity to generalize the findings of the study for the whole population of the study

3.3 Population of the Study

The populations for this study consist of the following category of people;-KEPA staff, Contractors, staff of KASUPDA, Community members and the staff of the health department of Chikun Local government area. The table below showed the breakdown of the population.

Table 3.1: Population of the study

Population	Number
KEPA Staff	98
Contractors	83
KASUPDA Staff	100
Ungwan Doma Community Members	7957
Chikun LGA Health Department	29
Total	8267

Source;- Field Survey, 2016

3.4 Sample Size and sampling technique

Sampling is the process of drawing the sample size from the total population. In determining the sample for this study, Kreicie and Morgan (1970) method of determining sample size was used and we arrived at 368 respondents as sample size. For the details of the sample size for the respondents check appendix ii.

The sampling techniques adopted for this research work are the simple random technique, purposive (judgmental) and the stratified sampling techniques.

The purposive random technique was adopted for sampling the community members in order to administer the questionnaires. Houses located close to the dumpsite were purposefully sampled for this research. It was also used to select the women for the focus group discussion. The simple random technique was used in the selection of the respondents at KEPA, and the staff of the health department of Chikun LGA. The purposive random technique was used in selecting the contractors

to be interviewed. The contractors who dump their waste at Ungwan Doma dumpsite were selected and interviewed. KEPA staff were also stratified into senior and junior staff. The researcher interviewed only the management staff while the questionnaires were administered to both categories.

3.5 Sources of data

For the purpose of evaluating the role of KEPA in solid Waste Management and control; A study of Ungwan Doma dumpsite, the research work adopted the use of two instruments of social science investigation or enquiry which are the primary and the secondary sources.

Primary Sources

Primary sources of data (questionnaires, interviews, focused group discussions and observation) Questionnaires were administered to the selected sample size in other to generate information on the issue under study. Also interviews were conducted with some key stakeholders in other to compliment the questionnaires as well as provide in depth knowledge on the problem under investigation. A focus group discussion was also organized with the community affected and observation of waste disposal site was used to enhance a pictorial understanding of the research focus.

Secondary sources (documented sources)

The secondary sources consists of data generated by persons, government and non-governmental agencies and provided additional information other than those received from the field study. They include books, maps, theses, texts, journals, libraries and visits to websites.

3.6 Administration of Instruments

Kreicie and Morgan (1970) method of determining sample size was used to determine the sample size. From the population of 8267, we arrived at a sample of 368. A total of 368 questionnaires were administered to both staff of KEPA and Ungwan Doma community where the dump site is located. The questionnaires were designed differently to elicit their responses on the subject matter. 98 questionnaires were administered to KEPA staff while 279 were distributed to Ungwan Doma community.

Also, interviews were carried out on the issue under study. . The interviewees were purposefully selected from the sample size. The table below is showing how the interview was carried out.

Table 3.2: The type and number of people interviewed.

Interviewees	Number
KEPA Staff	3
Health Department Of Chikun LGA	2
Key Informant Of KASUPDA	1
Contractors	2
Key Informants Of Ungwan Doma	2
Focus Group Discussion	10
Total	20

Source;- Field Survey , 2016.

Furthermore, observation was carried out especially on the dump site and pictures were also taken to have a clearer view of the dumpsite.

3.7 Method of Data Analysis and Presentation

Data collected for this study was analyzed using both qualitative and quantitative methods where we employed both descriptive and inferential statistical tools. The descriptive statistics tool include frequency tables and percentages while the chi-square non-parametric test was used to test hypotheses raised for this study using the Statistical Package for Social Sciences (SPSS) version 16. However, the chi-square non-parametric test was calculated at 5% level of significance with 95% confidence level to enable the researcher test the reliability of the proposition. Simple percentage was used in the computation of the respondent's opinion so as to guide the researcher in the discussions. Tabulations were drawn to identify how data were collected and to guide in the calculation of the percentage. After tabulation has been properly drawn and the percentage appropriately calculated, the researcher used the information to interpret, analyze and discuss the findings based on the responses of the respondents.

CHAPTER FOUR

AN OVERVIEW OF KEPA

4.1 Introduction

This chapter presents the historical background of KEPA, their functions, objectives and its organizational structure. It also discussed the activities of KEPA in Kaduna metropolis, National Policy on the environment as well as the roles of the state and local governments in solid waste management and control.

4.2 Historical background of KEPA

The creation of the Federal Environment Protection Agency by Decree No 58 of 1988 is a land mark achievement for Nigeria as a country. The Federal Environmental Protection Agency (FEPA) gave the instruction to all states to have its own body in 1993. Then the state had the Kaduna State Urban Development Agency (KASUPDA) and so, following the orders of FEPA, KASUPDA transformed to Kaduna State Urban Planning and Environment Agency (KASUPEPA). By the year 1994, the state assembly passed a bill to the military administration that KEPA should be an agency of itself, as an authority that is going to oversee the edit No. 1 of 1994 signed by his Excellency, the former military Administrator of Kaduna State Col. Ja'afaru Isah.

The first Chief executive Manager of the organization was Dr. Augustine Baba Hyuwa. Mr. Lukas Bulus Achi was appointed as the executive Manager (1995-1997) followed by Mr. Raymond M. Angani. KEPA was established by KEPA edit of 1994 and later revised in 1998. The authority is charged with the responsibility of addressing all environmental problems in the state including but not limited to organizing programmes aimed at changing people's negative attitudes towards environmental management for sustainable development.

KEPA under the supervision of the ministry of environment and natural resources has its head office situated at No. 10, link road, Kaduna South L.G.A of the state with zonal offices in Zaria, Kafanchan and Birnin Gwari Local Government Areas of the state.

4.3 Functions of KEPA

The Kaduna State Environmental Protection Authority (KEPA) was established by KEPA Edict of 1994 and later revised in 1998. The authority is charged with the responsibility of addressing all environmental problems in the state. The functions of KEPA relating to the environment are;

1. Enact and enforce state regulations procedures guidelines and environmental standards for effective prevention, remediation, control and monitoring of point and non-point source of pollution and degradation.
2. Implement and review environmental policy in the state and in particular to demand and review environmental impact assessment
3. Prepare in accordance with the State policy and Law on the environment periodic master plans for the development and financial requirements for implementation of such plans.
4. Prevent or stop any act of omission which consequences are likely to adversely affect the environment and to generally deal with any discharge either solid, liquid or gaseous materials deposited willfully or otherwise in the environment, and to deal generally with any violation which the authority may deem hazardous to the environment and the ecosystem.

4.4 Functions of the Authority

Subject to the Edict, the general objectives of the organization are as follows:

Enact and enforce state regulation, control criteria, procedures, guideline and environmental standards for effective prevention, remediation, control and prevention of point and non-point sources of pollution and degradation.

Formulate, implement and review environmental policy in the state and in particular to demand and review environmental impact assessment and statements for new development projects and to also demand and review environmental audit reports for existing developments and such other operations which are deemed to have significant impact on the environment.

Prepare in accordance with the state policy and law on the environmental periodic master plans for the development and the financial requirements for implementation of such plans.

Prevent or stop any act or omission which consequences are likely to adversely affect the environment and to generally deal with any discharge, either solid, liquid or gaseous materials deposited willfully or otherwise in the environment, and to deal generally with any violation which the authority may deem hazardous to the environment and the ecosystem.

In section 11, of the KEPA Solid Waste Management Regulation NO.1 of 2009, it is stated that;-

1. The landfill dump site shall be underlain with an impermeable layer which is designed and constructed in such a manner as to prevent the migration of liquid in and out of the landfill dump site. A leachate detection, collection and removal system should be constructed and operated to remove accumulated liquid from the system as quickly as possible.

2. The Authority shall specify in the permit any other requirement and operating practices that are necessary in the day to day operation of the landfill/ dump sites.
3. The Authority may operate and maintain landfill/ dump sites and give directives to local authority or licensed refuse contractors where such landfill/ dump sites are located, to transport and where to dispose their solid waste to these landfill/ dump sites owned by the authority.
4. The Authority may charge fees for every kilograms of solid waste to be disposed off in landfill/ dump sites owned by the authority.

The objectives of KEPA are as follows;

The Authority shall endeavor to achieve a sustainable development in the state and shall

1. Secure the quality of environment adequate for the health and well being of the residents of the state.
2. Conserve the quality of environment and its natural resources for the benefit of the state.
3. Minimize the impact of the physical development on the ecosystems of the state. Raise public awareness and promote understanding of essential linkages between the environment and development within the state and Co-operate with the federal environmental protection agency and other states Environmental Protection Agencies to achieve effective prevention of abatement of trans-boundary movement of waste.

4.5 Functions of the Development

1. General Manager (G.M) The general manager shall be responsible for the day to day execution of policy and the general management of the business of the authority and shall carry out other functions as may be directed by the governing council from time to time.

2. Internal Auditors (Internal Control System of the Organization): They are responsible for checking all the financial record, making sure all the necessary financial procedure are being followed.

3. Director of Finance and Supply (D.F.S) all the financial records of the organization are kept in their custody.

4. Director of Personnel Management (D.P.M.) This unit deals with the management/welfare of the workers in the organization. They are also responsible for staff discipline.

5. Director Panning, Monitoring, Enforcement and Compliance (D.P.M.E.C). The unit handles matters arising from the day to day activities of the organization outside the establishment. Approval is given under this unit for erection of structure; license is also given to companies and industries for waste management system (liquid or solid) and the enforcement of the building principles of the organization.

6. Director of Environment Engineering (D.E.E) This unit supervises all construction works being carried out by the organization or its agencies to ensure that master plans are duly followed.

7. Director of laboratory service (D.L.S) Every scientific research concerning the environment is carried out by this unit within the organization.

8. Director of Public Health Service (D.P.H.S) This unit which is in charge of public health has been scrapped. It was faced out in the year 2000.

4.6 The Structure of the State Committee

There shall be a state committee established by the authority on environment.

This committee shall consist of a chairman who shall be the general manager of the authority, and the following members:

1. All Local Government Council Chairmen.
2. Representative of Manufacturers Association of Nigeria (MAN).
3. Representatives of National Association of Chamber of Commerce, Industries, Mines and Agricultural.
4. Representatives of an NGO relevant to environmental matters.
5. Four eminent scientists to be appointed by the executive Governor.
6. A secretary to the committee who shall be a staff of the authority.

4.7 Functions of the State Committee

1. Assist and advice the governing council on the policy formation and implementation.

2. Assist and advice the authority (KEPA) on the technical environment matters.

3. To hold consultations with the management of the authority for the purpose of compiling and submission to the governing council for onward transmission to the executive Governor annual report on the state of the environment, this shall reach the Governor not later than 31st of December of each year.

4.8 Kaduna State Environmental Protection Authority Solid Waste Management Regulation No.1 of 2009

It shall be the duty of the Authority to;-

a) It shall be the duty of every owner or occupier of any premises (public or private) to clear and keep free from all overgrowth, weeds, filth, rubbish and refuse of any description, the street at the front, back, both sides and inside the premises.

It shall be the duty of the owner of any premises to provide drainage system at the front, back and both sides of the premises together with gutters and channels in and around the premises.

The owner or occupier of any premises shall clean and maintain the drainage system in the premises in such a manner as to prevent or avoid blockage of the drains.

No person shall;-

Throw , lay or deposit on any street, gutter, open space, drain, or any premises , whether occupier or not, any litter, refuse, waste matter of whatever description, or any unwholesome matter, except at such places as may be authorized by the authority.

Abandon, dump, or deposit any refuse upon the highways or other public property except in a sanitary landfill site approved by the authority.

Abandon any vehicle in any public place or facility that will be a nuisance to the public or an impediment to transportation.

Every owner or occupier of premises shall provide and maintain refuse receptacle, made of galvanized iron or plastics, of not less than 20 inches in diameter, 3 feet high, and having an

effective capacity of not less than 5 cubic feet, with tight fitting cover, for the purpose of storing refuse prior to removal by authorized persons or to an authorized collection site.

It shall be the duty of each local government authority to;

Locate, construct, and maintain public refuse receptacles in strategic places, where residents in its area may deposit their household waste.

Collect the waste from such public refuse receptacles in strategic places, where residents in its area may deposit their household waste.

Permanently station at least one laborer to maintain and tidy each public refuse receptacle in its area.

a. No person shall establish or operate any household waste collection business without first obtaining a license to be issued by the authority.

b. a local government authority which proposes to enter into any contract for the collection of household waste shall comply with the following requirements before making the contract , and if it does not, any contract made by it shall be null and void;-

--the local authority shall publish at least two publications circulated among the waste collection contractors, a notice containing a brief description of the contract work.

----a statement in the notice that any person who wish to submit a tender for the contract must notify the local authority of his wish to submit a tender for the contract must notify the local authority of his wish within the specified period of time.

All private waste contactors should ensure they renew their licences on a yearly basis. Any officer of the authority may be authorized to enter into at all reasonable hours, the office of any private waste contractor for the purpose of inspecting his license or refuse collection equipment.

It shall be the duty of any person or body corporate, while transporting waste of whatever description, sand or gravel to cover the vehicle in such a way that the waste , sand or gravel do not escape from the transporting vehicle or plant, thereof litter the highway or any street.

It shall be the duty of the authority to ;-

Arrange for the collection and disposal of commercial and industrial solid waste in the state.

Arrange for places at which industries or facilities may deposit their solid waste prior to collection by authorized persons to any authorized landfill site.

Specify the design, size and number of refuse receptacle each industry or facility shall provide and where to locate such receptacle in their premise.

Enter into any contractual agreement with any persons for thecollection and disposal of commercial and industrial solid waste in the state.

c. It shall be the duty of the authority to;-

Acquire waste with a view to its being recycled.

Make arrangement with licensed waste contractors for them to use waste for the purpose of producing from it heat, electricity or both.

Make arrangement with licensed waste contractors for them to recycle waste.

Use, sell, or otherwise dispose of waste as respects anything produced from such recycled waste

4.9 National Policy on the Environment (1999).

The purpose of the National Policy on the Environment is to define a framework for environmental governance in Nigeria. As a framework document, it articulates a management structure to achieve this objective. It also prescribes sectoral and subsidiary components needed to undertake or execute tasks necessary for the attainment of the ideals encapsulated in the doctrine of sustainable development.

The fundamental obligation for the protection of the environment is as stated in section 20 of the Constitution of the Federal Republic of Nigeria 1999 which provides that the "State shall protect and improve the environment and safeguard the water, air and land, forest and wild life of Nigeria". In addition, Nigeria is party to several international treaties and conventions governing environmental issues. It is on the combined thrust of these instruments that the National Policy on the Environment rests.

Policy

Nigeria is committed to ensuring that the country's natural and built environment is safeguarded for the use of present and future generations. This commitment demands that efficient resource management and the minimization of environmental impacts must be the core requirements of all development activities. Accordingly, this Policy will seek to promote good environmental practice through environmental awareness and education.

Policy Goal

'The goal of the National Policy on the Environment is to ensure environmental protection and the conservation of natural resources for sustainable development.'

Strategic Objectives

The strategic objective of the National Policy on the Environment is to coordinate environmental protection and natural resources conservation for sustainable development. This goal will be achieved by the following:

i) Securing a quality of environment adequate for good health and well being;

ii) Promoting sustainable use of natural resources and the restoration and maintenance of the biological diversity of ecosystems;

iii) Promoting an understanding of the essential linkages between the environment, social and economic development issues;

iv) Encouraging individual and community participation in environmental improvement initiatives;

v) Raising public awareness and engendering a national culture of environmental preservation; and

vi) Building partnership among all stakeholders including government at all levels, international institutions and governments, non-governmental agencies and communities on environmental matters.

Secondary Policies

The need for secondary environmental policies and guidelines required for carrying forward the detailed tasks of everyday environmental governance cannot be gainsaid. However, the National Policy on the Environment is an overarching environmental framework policy. Accordingly, all secondary policies, guidelines, action plans or other instruments relating to the environment will fall within the general intendment of this Policy.

Guiding Principles

The following principles are central to the attainment of the strategic objectives of this Policy:

1. The Public Trust Doctrine which recognizes that the State is a trustee of all natural resources, the enjoyment of which is subject to a measure of control necessary to protect the legitimate interest of all sections and stakeholders in the larger framework of strategic national interests;

2. Environmental Offsetting which requires that where for exceptional reasons of overriding public interest, the general obligation to protect threatened or endangered species and natural systems that are of special importance to sustaining life, providing livelihoods, or general well-being cannot be provided, such cost-effective offsetting measures must be undertaken by the proponents of an activity to restore as nearly as may be feasible the lost environmental services to the community;

3. The Polluter Pays Principle which prescribes that the polluter should bear the cost of preventing, and remediating pollution;

4. The User Pays Principle in which the cost of a resource to a user must include all the environmental costs associated with its extraction, transformation and use (including the costs of alternative or future uses forgone);

5. The Precautionary Principle which holds that where there are threats of serious or irreversible damage, the lack of full scientific knowledge shall not be used as a reason for postponing cost-effective means to prevent environmental degradation;

6. Pollution Prevention Pays Principle which encourages Industry to invest positively to prevent pollution;

7. The Principle of Inter-generational Equity which requires that the needs of the present generation are met without compromising the ability of future generations to meet their own needs;

8. The Principle of Intra-generational Equity which requires that different groups of people within the country and within the present generation have the right to benefit equally from the exploitation of resources and that they have equal right to a clean and healthy environment; and

9. The Principle of Participation which requires that decisions should, as much as possible, be made by the people or on their behalf by representatives chosen by them.

4.10 The Role of Local and State Government in Waste Management in Nigeria

Afon (2007) asserts that although the state and local governments are empowered constitutionally to protect and improve the environment and safeguard the water, air and land, forest and wildlife of Nigeria, solid waste management is the responsibility of the local government. The state government steps in to complement the efforts of the local government to achieve the goal of waste management in many cities especially state or regional capitals. Ogu (2000) claims that up till the mid-eighties, the state government was responsible in Enugu and Kaduna while the responsibility shifted frequently between state and local government in Ibadan, while Ayotamuno and Gobo (2004) confirm that all states have set up environmental agencies and laws to carry out this responsibility in addition to state ministries that have resulted in co-ordination being an issue. Furthermore, some states formulate laws and edicts in conflict with the federal policy and hence increase the confusion of the management system.

Afon's position that solid waste management is the function of the local governments is quite affirmative because the 1999 constitution clearly states that solid waste management is one of the primary functions of local governments in Nigeria. But due to financial and technical limitations of

local governments in Nigeria, states step in to complement the efforts of local governments. It is in line with this that the Kaduna State government established the Kaduna State Environmental Protection Authority in 1996 to complement the efforts of the 23 local governments in the state.

4.11 KEPA'S Role in Solid Waste Management in Kaduna State

KEPA under the supervision of the ministry of environment and Natural resources has been able to achieve so much in terms of making Kaduna state an environmentally friendly state.

KEPA ensures that industries operating within the state comply with its rules and regulations. Some of its achievements are highlighted below:

KEPA was able to get itself two dump sites in Kaduna metropolis whereby both domestic and industrial solid waste are disposed. The first is located at kilometers 5, Kaduna- Abuja Express Road and the second is at Buruku in Igabi Local Government area of the Kaduna state. The dump site at kilometer 5 Kaduna- Abuja Express way has a very wide land mass, well fenced in a very good location which is not easily being noticed. The site has two entrances; the first entrance is for domestic waste which is dumped openly, while the second gate is the entrance for industrial wastes which are for land filling. The waste are always burnt down to reduce its quantity. A KEPA staff is stationed at the site to monitor and secure the dumpsite.

KEPA also constructed a recycling plant inside the dumpsite which will soon begin operation.

KEPA also ensures that companies own a treatment plant/recycling plant. Those who do not own one are encouraged to have one, most especially those who could afford one. Years back, most of the textile industries operating within the state did not have a treatment plant and as such affected the neighboring communities negatively. A community called down quarters in Kakuri Kaduna which is

located close to the textile industries could not dig well (shallow), the surface water was so polluted that it affects the health of the members of the community. When KEPA stated operation in 1994, it pressured the textile industries to construct treatment plants; it was able to convince two out of the many textile industries to set up a treatment plant each. The two are United textile (UNTL) and super Tex. Although the Industries are not in existence now, the treatment plants could still be useful anytime the need arise.

Below is the list of some companies that were convinced by KEPA to set up treatment plants.

S/NO	NAME OF INDUSTRY	YEAR
1.	Nigerian Bottling Company	2009 – 2010
2.	C.I.B.I	2008 – 2009
3.	Nigerian Breweries Ltd	2002 – 2004
4.	British America Tobacco Company	2009 – 2010
5.	Oando (lube plant)	2002 – 2004
6.	Wabeco	2002 – 2003
7.	A.P.I	2002 – 2003

Source: www.kepadkad.ng

Table 4.1: Data on Solid Waste Management in Kaduna City (2015)

S/NO	Source	Waste Generated (tons)	Waste collected (tons)	Private collections
1.	Domestic	23,532.0	8,236.0	5,883.0
2.	Industrial	7,500.0	7,350.0	6,375.0
3.	Commercial	12,600.0	11,592.0	3,780.0
4	Hazardous	5.0	4.5	0.5
5.	Others	450.0	-	157.5
	Total	44,087.0	27,187.5	16.196.0

Source: www.kepadkad.ng

KEPA organizes workshops and training for staff of industries to educate and enlighten them on the best and current methods of waste management and disposal.

KEPA also organizes essay competition for secondary school students in the state to speak about the environment .The best schools are been compensated with awards.

Peugeot Automobile Nigeria Ltd (PAN) was convinced by KEPA to change its painting process to a more environmentally friendly process which reduced the pollutants and the waste water discharged.

Plastic and metal drums are situated in front of household were solid waste are dumped, and KEPA staff or the private waste collection companies allotted to such areas go round with their vehicles to collect the waste. A token is paid at the end of every month to pay for the services.

CHAPTER FIVE

DATA PRESENTATION AND ANALYSIS

5.1 Introduction

In this chapter, data collected through primary and secondary sources are presented and analyzed. Data collected through the questionnaire were presented in nineteen tables and analyzed using frequency counts and percentages. The data from the questionnaire were measured and further interpreted using descriptive statistics. Based on the presentation, analysis and interpretation of data, the hypotheses postulated were tested using chi-square. The data collected through the interview conducted and secondary data were analyzed to complement the responses from the questionnaire. Inferences were also made on our observations. These data were used to further substantiate the hypotheses tested. Also in this chapter, the major findings of the study were summarily highlighted.

5.2 Administration of Questionnaire, Report of Interviews, Focus Group Discussion and Observation.

A total of 368 copies of questionnaire were administered for the study. 98 copies of questionnaire to KEPA staff and 270 for Unguwan Doma Community members. Out of these total, 270 were found to be filled, returned and used as depicted on table 5.1 below.

Table 5.1 Return Rate of Questionnaires

Category	**No. of Questionnaires Administered**	**No. of questionnaires filled and Returned**	**Percentage Returned %**
KEPA staff	98	60	61
Community members	270	210	76
Total of Returned	**368**	**270**	

Source: Field Survey, 2016

The table 5.1 clearly shows that 60 out of 98 questionnaires were administered representing 61% where dually completed and returned by the staff of KEPA while 210 out of 275 questionnaires were administered indicating 76% where dually completed and returned by the community members.

From the analysis above, it shows that decision can be taken from questionnaires that were dully completed and returned.

5.2. Questionnaires Administered to KEPA Staff

Out of the 98 questionnaires administered to KEPA Staff, Only 60 was returned and was used for this analysis.

SECTION A: Characteristics of Respondents (KEPA STAFF)

Table 5.2 (Distribution of Respondents by Sex)

Responses	**Frequency**	**Percentage %**
Male	48	80
Female	12	20
Total	**60**	**100**

Source: Field Survey, 2016

The table above shows that 48 out of the 60 KEPA Staff that responded are male, while the remaining 12 are female. However, it does not affect the outcome of this research.

Hypothesis one

There is no significant relationship between the effective implementation of KEPA policy on solid waste and waste management in Kaduna metropolis.

Table 5.3: Qualifications of Respondents (KEPA staff)

Responses	**Frequency**	**Percentage %**
Primary	7	12
Secondary	20	33
Post secondary	19	32
Postgraduate	14	23
Total	**60**	**100**

Source: Field survey, 2016

Findings from the table above indicates that 33% of the of the respondents are graduates of secondary school, 32% went beyond the secondary school, 23% have postgraduate certificates while the remaining 12% attended only primary school.

This implies that most of the KEPA staff should posses' requisite knowledge needed for discharging its duties.

Table 5:4 Role of KEPA in Solid Waste Management in Kaduna State

Response	No. of Respondents	Percentage%
Supervisory	32	53.3
Enforcement	10	17
Management	6	10
All of the above	12	20
Total	**60**	**100**

Source: Field Survey, 2016

The above table 5;4 shows that 53.3% of KEPA Staff agreed that KEPA's main role is supervisory, 17% went for enforcement, 20% says they perform managerial roles while the remaining 10% says KEPA perform the three roles of supervision, enforcement & management. It then shows that for KEPA to be effective, they must ensure that the three roles of supervision, enforcement of its policies as well as management are strictly adhered to. If there is lapses in any of these, it will affect the entire activities.

Table 5:5 The Effectiveness on the Implementation of the Policy by KEPA on Solid Waste

Response	No. of Respondents	Percentage%
Very effective	12	20
Effective	32	53.3
Ineffective	16	27
Total	**60**	**100**

Source: Field Survey, 2016

The implementation of KEPA's policies has not been very effective looking at the table above. Only 20% of the total population said they are very effective, 53% which is the highest said they are just effective while the remaining 27% said KEPA are Ineffective.

To substantiate on the table above, a similar questioned was asked during the interview session with some key informants of KEPA on their levels of compliance to policy directives as an agency whose responsibility is the protection of the environment. They agreed that KEPA have not complied fully to policy directives as a result of the Nigerian factors which includes political instability (frequent change of the G.M) which affects continuity in policy formulation and implementation, shortage of quality personnel, insufficient funds and equipments etc.

Furthermore, the lack of support from the private sector which is supposed to be the engine room of every economy is a problem. Also, lack of cooperation from members of the public has not made them to be very effective. So in spite of the beautiful policy formulation regarding solid waste management by KEPA, the implementation is a challenge.

Table 5:6 Management of Solid Waste Generated Within the Metropolis

Response	**No. of Respondents**	**Percentage%**
It is recycled	4	7
Open dumping at the dump site	44	73
Land fillings	12	20
Others	0	0
Total	**60**	**100**

Source: Field Survey, 2016

The table above attest to the fact that open dumping of waste at the dump site is the practice in Kaduna metropolis, this is because about 73% of KEPA's Staff agreed to that fact, 20% said the waste are used for land filling while only 7% said it is recycled. Little wonder the indiscriminate dumping of the waste at the dumpsite which is an eye-sore.

The responses from the key informant's interview are in agreement with the table above. Investigation by KEPA affirms that about 125 tons of solid wastes (simple and toxic) are generated and disposed off daily into the environment. The bulk of the waste is from domestic activities and the rest from industries. The waste collected from household, Industries and markets are collected directly by KEPA's staff or private collection companies working with KEPA. The wastes are dumped openly at the dumpsites.

Also, the researcher took photographs of the dumpsite to further add value to this point. They are added to the appendix.

Table 5:7 How Solid Wastes are Dumped at the Specified Dump Site by KEPA

Response	**No. of Respondents**	**Percentage%**
Monitor the process	22	37
Partner with the private sector	6	10
All of the above	32	53
Total	**60**	**100**

Source: Field Survey, 2016

The table above gives us a clear understanding that KEPA in order to ensure that waste are dumped at the specified dump site monitor the process and equally partner with the private sector. This is the views of 53% of the respondents. The remaining 47% think otherwise.

The interview with the key informants of KEPA gave us an insight into the operation of the agency. It partners with the private sector in the collection and disposal of solid waste from households and industries operating in the metropolis. A security man who is a KEPA staff is permanently stationed at the dump site to ensure that the wastes are properly dumped .KEPA staff also goes out to monitor these activities regularly.

However, in spite of the fact that they (KEPA) monitor the process, solid waste are still dumped in open land, street corners and other un- specified spaces in the state.

Table 5:8 Rate of Compliance of People in the Metropolis to Environmental Laws

Response	**No. of Respondents**	**Percentage%**
Adequate	10	17
Inadequate	40	66
Undecided	10	17
Total	**60**	**100**

Source: Field survey 2016

The table above reveals that 40 people, who are 66% of the respondents are of the view that the level of compliance of the people to environmental laws are inadequate, 17% said it is adequate while the other 17% have not decided. This can be seen at the way people discard their wastes without minding the consequences on their health or on the environment.

Table 5:9 Gravity of Waste in Ungwan Doma community

Response	No. of Respondents	Percentage%
Very high	176	84
High	24	11
Low	10	5
Total	**210**	**100**

Source: Field Survey, 2016

From the table above, 84% of the community members of Ungwan Doma which are176 in number says the gravity of waste in their community is very high, 24 respondent which are11% said it is just high while 5% who are only 10 in number said it is low.

From observation which is also one of the instruments used in this study, it is very easy to see the degree of the waste as a result of the location of the dumpsite in the community. In fact pictures were taken to further add value to this point. The researcher also took time to observe heavy trucks coming in and out of the dump site on many occasions. Constant burning of the waste and the offensive smell at the site was also observed as it affects the quality of air.

The responses from the interviews with the community leader, the women leader as well as the focus group discussion carried out with the women also affirms that the gravity of waste is very high in Ungwan Doma community, and is a serious threat to the members of Ungwan Doma.

Table 5:10 The Extent You Feel Threatened by the Dumpsite in Ugwan Doma

Response	**No. of Respondents**	**Percentage%**
To larger extent	182	87
To lesser extent	13	6
I am not threatened at all	15	7
Total	**210**	**100**

Source: Field survey, 2016

The table 5:13 indicates that 183 respondents(87%) of the community members of Ungwan Doma are threatened by the dump site in their community to a larger extent, 13 respondents (6%) are threatened to a lesser extent while the remaining 15 respondents (7%) are not threatened at all.

All the key informants and the participants of the focus group discussion feel threatened to a larger extent with the location of the dump site in their community.

The community leader as a matter of emphasis said he is the most affected because the welfare and safety of his people are his greatest priority. He said the dump site scare away investors into the community. The prices of landed properties are lower because of the presence of the dump site.

Table 5:11 Ineffective Waste Disposal Mechanisms could affect the Environmental Negatively

Response	**No. of Respondents**	**Percentage%**
Agreed	170	81
Disagreed	15	7
Undecided	25	12
Total	**210**	**100**

Source: Field Survey, 2016

The table above indicates that 170 (81%) respondents agreed that ineffective waste disposal mechanism could affect the environmental negatively,15 (7%) respondents disagreed while the remaining 25 (12%) have not decided.

The interviewees and those that participated in the focus group discussion all agreed that ineffective waste disposal mechanism will surely affect the environment negatively. This can be seen in the frequent prevalence of malaria and cholera in Ungwan Doma.

To further substantiate this point, the staff of the health department of Chikun LGA was asked about their roles in public enlightenment campaigns towards promoting effective management of solid waste, and they said they have serious challenges that have prevented them from performing these roles. Some of which are shortage of man power and insufficient funds.

Table 5:12 Malaria fever, Typhoid fever and dysentery are the prevailing ailments in your community

Response	**No. of Respondents**	**Percentage%**
Agreed	185	88
Disagreed	5	2
Undecided	20	10
Total	**210**	**100**

Source: Field Survey, 2016

The table above also indicates that 88% of the respondents agreed that malaria, typhoid fever and dysentery are the prevailing ailments in their community; only 27% disagreed while the other 10% said nothing.

The key informants interviewed and the focus group discussion are in agreement with the table above. The women and their children who are the most vulnerable in the society are prone to the ailments mentioned above. In fact, some had lost their children during outbreaks of cholera in the community in the past.

The community leader said the constant burning of the waste at the dump site affects the quality of air they inhale. Some people even become asthmatic. The quality of water they drink is also threatened since there is nothing put in place to prevent the leakage of water into the shallow wells of the members of his community.

The researcher also interviewed two staff of the health department in Chikun LGA of Kaduna state as to what the local government is doing to provide a primary health care unit to that community. This is because there is not even a single primary health care unit in Ungwan Doma, nor any close to

it. They were also asked when and how they carry out enlightenment campaigns in communities to create awareness on the proper management of the environment so as to safeguard the health and well being of the people. The responses the researcher got is in the negative. Insufficient funds to the local government are the major constraint to achieving the above.

Table 5:13 Complain to the regulatory agency (KEPA) of the Challenges you are facing with the Dumpsite in your Community

Response	**No. of Respondents**	**Percentage%**
Yes	68	32
No	142	68
Total	**210**	**100**

Source: Field Survey, 2016

Table 5: 17 depicts that 68% of the respondents based on the table above said they have never complained to KEPA about the challenges they are facing with the dumpsite in their community, while only 32% said they have reported to KEPA one time or the other.

This further confirms our findings from the focus group discussion we had with the women in the community whereby only one out of the ten women interviewed told us she personally went to KEPA to complain. The key informants in the community told us they have reported to KEPA severally, but little or nothing has been done.

The community leader said he had met with the General Manager of KEPA severally, but the outcome is yet to produce the desired result. He said KEPA instead of relocating the dump site as promised by the former G.M have only succeeded in providing temporary solution to the problem. They now use laterite to cover the waste, but this is easily washed away any time it rains. The new

General Manager of KEPA who came in 2015 promised to meet with the governor over the issue, they are still waiting for the outcome of the meeting.

Furthermore, the community leader said they have met with commissioner of health, and other key officers of KEPA previously, but little have been achieved.

On the measures taken especially at individual level to reduce the effect of the waste from the dump site, the community members said they use treated mosquito nets on their beds, doors and windows, frequent use of insecticides and rodents killers, others say they sprinkle kerosene in their premises to scare away flies and other strange insects they see in their community. However, some say they don't do anything.

The foregoing analysis thus shows that the dumpsite is one of the major causes of pollution, which in turn can be linked to the state of health of respondents in this study. In addition to the dumpsite, there are other pollution sources in the area. Some of these are pollutions caused by auto vehicles, method of refuse disposal that litters the environment as well as well as the existence of the local/community markets in the area which are major sources of solid waste generation to the environment.

HYPOTHESIS TWO

There is no significant relationship between the performance of KEPA and the quality of its personnel

Table 5:14 Achievements of KEPA as an Agency between 2010-2016

Response	**No. of Respondents**	**Percentage%**
Excellent	10	17
Good	38	63
Poor	12	20
Total	**60**	**100**

Source: Field Survey, 2016

KEPA Staff from the finding in the table above have not done excellently well as only 10 respondents (17%) said they did excellently well, 38 respondents (63%) of the people said they are good, while the remaining 12 respondents (20%) said they did poorly.

We therefore deduce from the table that KEPA have not done up to expectation. The interviews with KEPA staff on their level of achievement compliment the table above. They admitted that they have not done excellently well, but they are working towards perfection. They have been able to evacuate waste directly with the support of members of the public whereby a drum is stationed in front of most of the households and markets, and KEPA's trucks or that of the contractors goes round to collect their wastes. A token is paid at the end of every month for the services to the company

collecting the wastes. This has assisted in the reduction of waste that is dumped indiscriminately on the environment.

The researcher also interviewed two contractors working with KEPA in the metropolis, and they said there has been a great improvement in their relationship with members of the public. The non challant attitude of people in the past in the management of their waste has drastically reduced, most especially since the present administration of Governor El Rufai met with the major stakeholders in 2015, and promised his support in the provision of machineries which he has started doing. In spite of these achievements, some members of the public refuse to cooperate with them. Other challenges also have to do with shortage of man-power, equipments and finance.

Table 5:15 Rate of Visitation of the Dumpsite at Ungwan Doma to Ensure that Waste Dumped Follow Specifications

Response	**No. of Respondents**	**Percentage%**
Yearly	0	0
Quarterly	10	17
Monthly	36	60
Others	14	23
Total	**60**	**100**

Source: Field Survey, 2016

The table 5.10 above shows that (36) respondents (60%) of the respondents agreed that KEPA visit the dump site monthly, while the remaining 24 respondents (40%) think otherwise. That is to say KEPA's visit is not regular.

The responses from the interview with KEPA staff differ a little from the table above, as they said a KEPA staff is permanently stationed at the dump site to monitor the activities as they occur. Other key officers of the agency are sent regularly to inspect the site.

The researcher went further to ask the interviewees if the dump site at ungwan Doma is a threat, they said it is a threat because humans are habiting the community. Further more,it was also gathered that as at the time the site was located in that community more than ten years ago, the location was just a fallow area, but the reverse is the case now because there is a mass influx of people in to the area now as a result of the development in the southern part of the state. Although KEPA is planning to relocate the site, the location is yet to be ascertained. The only thing they do is to provide temporary succor by covering the waste with laterite. A plastic recycling plant has been built at the site, and a mini organic fertilizer plant has also been constructed in order to utilize the wastes, but they yet to start operation. In fact, the recycling plant has been built in the dump site since 2010.

Furthermore, a staff of KASUPDA was asked about the plight of residents in ungwan Doma community as per the relocation of the dump site since they receive revenue from them. The officer said of a truth, the first settlers came in illegally. But government became interested when they saw the influx of people in that community, and the huge revenue they could make from the sale of land. They took over the process and made everything legal. As for the dumpsite, KEPA is in charge of the dump site and as such can only appeal to KEPA to find an alternative place for the site because of the safety of the community members

Table 5:16 The Performance of KEPA is a Function of Quality Personnel

Response	No. of Respondents	Percentage%
Agreed	46	77
Disagreed	12	20
Undecided	2	3
Total	**60**	**100**

Source: Field Survey, 2016

From the table 5:11 above, we can deduce that 46 respondents (77%) which are the largest number of respondents agreed that there is a significant relationship between KEPA's personnel and the performance of KEPA as an organization.12 respondents (20%) disagreed while only 2 respondents (2%) have not decided. For KEPA to achieve its objective as an agency responsible for the protection of the environment, they need skilled and qualified man power.

The key informants of KEPA also agreed that the success of any organization is the quality of its personnel. Furthermore, they attested to the fact that KEPA, like every public organization has some challenges which include shortage of staff, and has some staff that are not qualified to work in the organization.

On the areas that KEPA is facing challenges as an agency, the respondents pointed to political instability, shortage of funds, shortage of staff (qualified), lack of equipment as some of the challenges they are facing.

Furthermore, on how to addresses these identified challenges, the respondents suggest that the state government should make more funds available. Others said KEPA should be allowed to make her

own policies and implement them without interference from the state. Also, only personnel's that are qualified should be employed to enable the agency to be effective.

Table 5:17 Awareness of the Environmental Protection Laws

Response	**No. of Respondents**	**Percentage%**
Yes	121	58
No	89	42
Total	**102**	**100**

Source: Field Survey, 2016

About 121 respondents (58%) of the community members are aware of the environmental protection laws while the other 89 (42%) are ignorant of its existence.

To substantiate the table above, the key informants and a large number of the women interviewed said they are aware of the environmental laws, but it is just that they don't take advantage of it. As a result of the attitude of the community members, it has delayed the response they are getting from the regulating agency who should have acted faster under intense pressure.

5.3 Hypotheses Testing

Chi-square non-parametric test was used to test the formulated hypotheses with specific interest on the Chi-Square Pearson's correlation to examine the extent of relationship among the variables compared. The decision rule under the test procedure is that when P-value is $\leq$ 0.05; the null proposition is invalidated else the study fails to reject the null proposition if P-value is $\geq$ 0.05.

5.3.1 Hypothesis one

$H0_i$ There is no significant relationship between the effective implementation of KEPA policy on solid waste and waste management in Kaduna metropolis.

Table 5:18 Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	60.000[a]	6	.000
Likelihood Ratio	65.193	6	.000
Linear-by-Linear Association	30.843	1	.000
N of Valid Cases	60		

Source: (SPSS Output, 2016)

Pearson chi-square measures the association that exists between two or more variables compared. Two table items ranging from table 5.16 and table 5.8 were selected to test for Pearson-chi-square significance level and the likelihood ratio of occurrence of the variables of our study (effective implementation of KEPA policy and waste management). Drawing inference from the above result obtained from the chi-square non-parametric test using SPSS 16.0, Pearson chi-square value of approximately 60.000 significant at 2-tailed significance level with asymptotic significance value of 0.000 indicate that a significant relationship can be inferred from effective implementation of KEPA policy on solid waste and waste management in Kaduna metropolis. This implies that the more effectively implemented, the more the chances of sustainable waste management system, we therefore conclude that there is significant relationship between effective implementation of KEPA policy and solid waste management in Kaduna metropolis. This is further substantiated by the

likelihood ratio of occurrence put at 65.19% which is as well significant at 2-tailed significance level.

5.3.2 Test of Hypothesis two

HO_{ii}: There is no significant relationship between the performance of KEPA and the quality of its personnel.

Table 5:19 Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	37.297[a]	1	.000
Likelihood Ratio	47.284	1	.000
Linear-by-Linear Association	36.676	1	.000
N of Valid Cases[b]	60		

Source: (SPSS Output, 2016)

Summary of table 4.8 and 5.11 were used to test the second hypothesis. The computed Pearson chi-square value of 37.297 as well signify that in the interaction of KEPA's performance and the quality of its personnel, a significant association can be deduced at asymptotic 2-tailed significance level with a likelihood ratio of 47.28% significant at 2-tailed significance level as well. This implies that the interaction of KEPA performance and the quality of its personnel is significant at 2-tailed level with p-value computed at 0.000 given the likelihood ratio and degree of freedom.

Table 5:20 Summary of tested Hypotheses

Hypotheses	Chi-square coefficient	p-value	Decision
$H0_1$	37.297[a]	0.000	Reject
$H0_2$	60.000[a]	0.000	Reject

Based on the above therefore, we summarize that there is significant relationship between the effective implementation of KEPA policy on solid waste and waste management, and that there is a significant relationship between the performance of KEPA and the quality of its personnel in Kaduna Metropolis.

5.4 Discussion and Summary of Major Findings

Findings revealed that KEPA is charged with the responsibility of addressing all environmental problems in Kaduna state. It is the duty of KEPA to arrange for the collection and disposal of Solid waste in the state. Arrange places at which industries or facilities may deposit their solid waste prior to collection by authorized persons to any authorized landfill site. It shall enter into contractual agreement with any persons for the collection and disposal of commercial and industrial solid waste in the state. It shall also make arrangement with licensed waste contractors for them to recycle waste.

But it has been revealed that KEPA have not done much in ensuring that solid waste are properly managed.

KEPA has not been very effective in the discharge of its duties .Looking at the objective of KEPA which is to ensure the safety of the environment most especially as regards to solid waste management, because solid waste are still dumped in open land, street corners and other un specified places in the state. The dumped site which is supposed to provide succor is not properly managed as the fence is broken which make it easy for reptiles and rodents to access the community. The

location of the dumpsite in a residential area is also contrary to KEPA's objective of protecting the environment including man. Also, the waste are not been recycled in spite of the presence of a recycling plant at the dump site that is yet to be activated

Findings also reveal that KEPA has so many challenges militating against them from achieving their objectives. Some of the challenges are shortage of personnel, shortage of funds, political instability which affects continuity in policy formulation and implementation, which occurs because of the frequent change of the general manager.

Furthermore, the lack of support from the private sector in solid waste management is a problem and also little cooperation from the members of the public in their attitude towards waste management is a threat to KEPA's operation.

Therefore ,in order to achieve its objective as an agency, KEPA need to return to the contents of the solid waste management regulation and ensure it adhere to every detail.

From the data analyzed and the two hypotheses tested for this study, the following are the major findings, we therefore summarize that there is significant relationship between the effective implementation of KEPA policy on solid waste and waste management because the policy formulation and its implementation on solid waste management in Kaduna state has a direct effect on waste management, and also that there is a significant relationship between the performance of KEPA and the quality of its personnel in Kaduna Metropolis.

Therefore, the following are the major findings

1. KEPA is fully responsible for the management of solid waste from its collection, treatment and final disposal, but they have not been effective.

2. The political instability which leads to the frequent change of the General Manager of KEPA by the state governors in Kaduna state affects policy formulation and implementation. It also affects sustainability of many projects. Lack of autonomy limits the activities of KEPA as an agency. The state government also interferes with most decisions made by the agency. KEPA has good policies on paper, but they are limited when it comes to implementation because they must get approval from the state government through the ministry of environment. It delays the process and affects their effectiveness
3. The state government subvention at the end of the month is not sufficient for KEPA to operate effectively. The need for machineries and other equipments is capital intensive. These affects the quality of service rendered. They also lack skilled and qualified personnel to carry out their operation.
4. KEPA has not fully complied fully to the contents of the edict that established it, towards ensuring that solid wastes are properly managed.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter presents the summary of the study and conclusions reached on the basis of the hypotheses tested. Recommendations were also proffered on the basis of these findings.

6.2 Summary

A study on the role of KEPA in municipal Solid waste management and control in Kaduna state; a study of Ungwan Doma dumpsite is very timely, because as humanity develops new technologies, the magnitude and severity of waste increases. When computers were developed, it was widely believed that the need for paper will be eliminated, but on the contrary it was proven false because we are now utilizing more paper than before.

Refuse dumpsites are found both within and on the outskirts of cities in Nigeria and due to poor and ineffective management, the dumpsites turn to sources of health hazards to people living in the vicinity of such dumps. It is in recognition of this fact that the researcher decided to assess the effectiveness of the regulatory agency in the management of solid waste in Kaduna and the dump site at Ungwan Doma community of Kaduna state.

The literature review in chapter two of this thesis captured the various definitions of waste , solid waste, waste disposal methods, and empirical studies from works related to the study were analyzed. Cradle to cradle theory by Wiliam McDonough (2002) was used in adding value to this piece of work. The theory suggests that certain products could be reused endlessly to make similar products (cradle to cradle) rather than recycled into lower grade products until the last stop is a landfill (cradle to grave).

The data obtained from the field representing the views of the respondents were presented in tables and analyzed using frequencies and percentages. The views of the respondents were also

complemented with secondary data. From the data presented and analyzed, the study finds out that there is a significant relationship between the effective implementation of KEPA policy on solid waste and waste management in Kaduna State, and KEPA in order to function effectively needs qualified and skilled personnel to run its affairs as a result of the technical nature of its operation.

6.3 Conclusion

Many Nigerians have gotten increasingly mindful of the quality of food they eat, the water they drink as well as the benefit realized from the production of goods and services, but care less about the wastes they generate from these activities.

It is true that we live in a throw -away society, but protecting the environment is essential for the quality of life of current and future generation. If we are to protect Kaduna metropolis from the negative effect of waste, the state, communities and individuals must actively pursue an integrated waste management approach that will be most cost effective, efficient and safest for the environment.

When we manage the treatment and disposal of our wastes, we are also managing the method by which the carbon will be released back to the environment. Similarly, the changing climate impacts on the way waste will need to be stored, treated and disposed off and will also alter the risks associated with waste (e.g. pests and diseases).

In protecting future generations, government must be willing to lead the way. Public policy is the most effective way to fight waste and all forms of pollution. Government must ensure that the environmental regulatory agencies get the needed support to enable them function effectively.

6.4 Recommendations

The recommendation offered in this study if fully utilized will assist in solving waste management problems in Kaduna metropolis.

Based on the findings made and the problems uncovered in this work, the study recommends the following:

1. KEPA should monitor the management of solid waste from collection to the final disposal.
2. KEPA as an agency should be given full autonomy to function. The state government interference through the Ministry of Environment should be discouraged. If that is achieved, it will make the agency to function better and act faster most especially during emergencies. Sustainability of polices and projects can only be achieved when there is no frequent turnover of people at the helm of affairs. The General Managers of KEPA should be allowed to complete their tenure before they are replaced.
3. KEPA should be well funded to enable it carry out its assigned functions. The capacity of the agency in waste management and control should be increased to boost the number of personnel, machineries and facilities for its activities.
4. KEPA must adhere strictly to the contents of the edict that established it as well as the policies put in place for its operations..
5. Waste collection activities create jobs and provide opportunities for small businesses; the public should be enlightened so as to utilize this opportunity to make a living. KEPA should ensure that the recycling plant and the mini organic fertilizer plant located at the dump site starts operation.
6. As an item in the sustainable Development Goals (SDG), issues relating to the environment must be seriously addressed by the government and all its agencies so that the world we bequeath to the future generation will be better, healthier and a more resourceful world to live in.

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APPENDIX I

RESEARCH QUESTIONNAIRE

Introduction

The researcher, a postgraduate student of the Department of Local Government and Development Studies, Ahmadu Bello University, Zaria is currently carrying out a research on the topic ***"Evaluation of the role of KEPA in Solid Waste Management and control, A study of Ungwan Doma Dumpsite in Chikun LGA of Kaduna State''***.

The research forms an essential part of my work towards the award of Masters Degree in Policy and Development Studies (M.Sc). This questionnaire is therefore only meant to test the stated hypotheses to obtain result for analysis of the research topic. Information given will be solely used for the purpose of this research and will be treated confidentially. Please tick appropriately the options in the Questionnaire and comment where applicable.

Thank you for the anticipated cooperation.

Yours faithfully,

Rachael Aisha Akingbehin

QUESTIONNAIRE (STAFF OF KEPA)

SECTION A: PERSONAL DATA OF RESPONDENTS

Instructions

Please you are required to kindly tick [√] as appropriate.

1. Rank/Designation: Please specify ……
2. Age [ ] juviln
3. Sex: Male [ ] Female [ ]
4. Highest educational qualification
    (a) Primary [ ]
    (b) Secondary [ ]
    (c) Post Secondary [ ]
    (d) Degree [ ]
    (e) Postgraduate [ ]
5. Number of Years in Service [ ]

SECTION B

6. What is your role in solid waste management in Kaduna state?
    a. Supervisory [ ]
    b. Enforcement [ ]
    c. Management [ ]
    d. All of the above [ ]
7. How effective is the implementation of the Policy on Solid waste?
    a. Very effective [ ]
    b. Effective [ ]
    c. Ineffective [ ]

8. How do you manage the solid waste generated within the metropolis?

   a. It is recycled [ ]

   b. Open dumping at the dump site [ ]

   c. Land filling [ ]

   d. Others----------

9. How do you ensure that solid wastes are dumped at the specified dump site?

   a. monitor the dumping process [ ]

   b. partnership with the private sector [ ]

   c. all of the above [ ]

10. How would you rate the level of compliance of people within the metropolis to environmental laws?

   a. Adequate [ ]

   b. Inadequate [ ]

   c. Undecided [ ]

11. How would you rate your achievement as an agency in the last five years?

   a. Excellent [ ]

   b. Good [ ]

   c. Poor [ ]

12. How often do you visit the dump site at Ungwan Doma to ensure that waste dumped follow specifications?

   a. Yearly [ ]

   b. Quarterly [ ]

   c. Monthly [ ]

   d. Others (specify) [ ]

13. Do you agree that the performance of your organization is a function of quality personnel?

a. Agreed [ ]

b. Disagreed [ ]

c. Undecided [ ]

14. Mention the areas you are facing challenges as an agency

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15. What are the solutions to the above identified challenges if any?

APPENDIX II

INTERVIEW GUIDE

INTERVIEW PROMPTS TO KEY INFORMANTS OF KEPA (SENIOR STAFF)

1. How do you manage solid waste in Kaduna state?
2. Have you achieved your objective as an agency? If yes how and where?
3. What is the level of your compliance to policy directives?
4. What has been your challenge so far within the last five years?
5. Looking at the location of the dump site at kilometer 5, Kad-Abuja express way, don't you think it is a threat to community members?
6. What measures have you taken to reduce that threat?

FOCUS GROUP DISCUSSION PROMPTS (WOMEN IN THE COMMUNITY)

1. How do you manage your waste?
2. Do you feel threatened by the location of the dump site close to your residence?
3. What is the prevailing ailment affecting members of your community most especially your children?
4. Are you aware of environmental laws?
5. As mothers, what measures have you taken to ensure that the dumpsite is relocated?

INTERVIEW WITH THE PRIVATE WASTE COLLECTION COMPANIES

1. How long have you been working with KEPA?
2. Where exactly do you dump your waste?
3. Do you treat the waste before it is finally disposed?

4. What are the challenges you are facing in the discharge of your work?
5. Do you agree that ineffective waste disposal could affect the environment negatively?
6. What measures do you take to protect your staff from the negative effects of waste as they carry out their responsibilities?

INTERVIEW SCHEDULE TO STAFF OF CHIKUN LGA

1. What are the public enlightenment strategies put in place by your local government to promote effective management of solid waste?
2. How have these strategies helped the Primary Health Care Department (PHCD) in creating public awareness on the need to stop the indiscriminate dumping of solid waste?
3. Is there any significant effect of these public enlightenment strategies on solid waste management?
4. Who are the stakeholders that your local government partner with in the area of solid waste management?
5. How will you describe their level of participation in the management of solid waste?

INTERVIEW SCHEDULE WITH THE COMMUNITY LEADER OF UNGWAN DOMA

1. As the community leader of Ungwan Doma, are you threatened by the dump site that is in your community?

2. What measures have you taken towards ensuring that the dump site is relocated?

3. What are the prevailing ailments affecting members of your community. Is there a correlation to the dumpsite?

4. What further action do you intend to take to ensure that the site is relocated?

QUESTIONNAIRES TO COMMUNITY MEMBERS OF UNGWAN DOMA, CHIKUN LGA KADUNA.

1. What is the gravity of waste in your community?
   (a) Very high ( )
   (b) High ( )
   (c) Low ( )
2. To what extent do you feel threatened by the dumpsite in your community?
   (a) To a larger extent ( )
   (b) To a lesser extent ( )
   (c) I am not threatened at all ( )

3. Are you aware of the environmental Protection laws?
   (a) Yes ( )
   (b) No ( )
4. Do you agree that ineffective waste disposal mechanism could affect the environment negatively/
   (a) Agreed ( )
   (b) Disagreed ( )
   (c) Undecided ( )

5. Malaria fever , typhoid fever and dysentery are the prevailing ailments in your community
   (a) Agreed ( )
   (b) Disagreed ( )
   (c) Undecided ( )

6. Have you complained to the regulatory agency (KEPA) of the challenges you are facing with the dumpsite in your community?
   (a) Yes ( )
   (b) No ( )
   If yes what was their response?

7. As an individual, what measures are you taken to reduce the effect of the waste from the dump site?

CHECKLISTS OF OBSERVATION

- Sanitary landfills
- Dumpsites
- Incinerators
- Machineries and equipments for the collection and transportation of solid wastes

APPENDIX 111

LIST OF THE INTERVIEWEES

(NAMES, DESIGNATION, DATE AND TIME OF INTERVIEW)

KEPA STAFF.

S/NO	Names	Designation	Date	Time
1.	Mallam Sulaiman Dauda	(Director, Planning and Research	11:00 am	4th May, 2016
2.	Mrs Mary	Director of Finance and Supply DFS	9.30am	4th May, 2016
3.	Mrs Maureen Oyedoja	Chief Environmental Officer	1:00pm	3rd May, 2016

UNGWAN DOMA COMMUNITY MEMBERS

S/NO	Names	Designation	Date	Time
1.	Mr. Gideon Ayanda	Community leader	7:00pm	5th,June.2016
2.	Mrs Faith Femi	Women leader	8.30am	4th May, 2016

CONTRACTORS

S/NO	Designation	Date	Time
1.	Beedee Multilinks Ltd	10:00am	11th,July.2016
2.	The symbol ventures.	11:00am	11th July,2016

HEALTH DEPARTMENT OF CHIKUN LGA

S/NO	Designation	Date	Time
1.	Deputy Director, Primary Health Care (PHC)	11.30am	4th, July. 2016
2.	Focal person (Gonigora)	10:00am	4th, July, 2016

KASUPDA

S/NO	Designation	Date	Time
1.	Deputy Director	12.00pm	4th, June, 2016

APPENDIX IV

KREICIE AND MORGAN TABLE FOR DETERMINING SAMPLE SIZE

Table for Determining Sample Size from a Given Population

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size.
S is sample size.

APPENDIX V

PICTURES TAKEN AT UNGWAN DOMA DUMPSITE



A broken fence at the site



A proposed recycling plant at the dumpsite,



The front view of the dumpsite



Solid wastes at the dumpsite



The plastic recycling plant and an organic fertilizer plant under construction inside the dumpsite



The closeness of the dumpsite to residential houses in the community.



The researcher and a key officer of KEPA during the interview session at KEPA's premises.



Front view of KEPA's Head office.10, Link road, Kaduna south, Kaduna.



The community leader of Ungwan Doma completing the Questionnaire.



The researcher and some community members completing the questionnaires

APPENDIX VI

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	₦	Percent	N	Percent
Achievements of KEPA as an agency in the last five years * the effectiveness on the implementation of the policy by KEPA on solid waste	60	100.0%	0	.0%	60	100.0%

Achievements of KEPA as an agency in the last five years * the effectiveness on the implementation of the policy by KEPA on solid waste

Count

		the effectiveness on the implementation of the policy be KEPA on solid waste		
		Effective	Very effective	Total
Achievements of KEPA as an agency in the last five years	Good	30	7	37
	Excellent	0	23	23
Total		30	30	60

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	37.297[a]	1	.000		
Continuity Correction[b]	34.125	1	.000		
Likelihood Ratio	47.284	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	36.676	1	.000		
N of Valid Cases[b]	60				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.50.

b. Computed only for a 2x2 table

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.788	.067	9.761	.000[c]
Ordinal by Ordinal	Spearman Correlation	.788	.067	9.761	.000[c]
N of Valid Cases		60			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Tests of Homogeneity of the Odds Ratio

	Chi-Squared	Df	Asymp. Sig. (2-sided)
Breslow-Day	.	.	.
Tarone's	.	.	.

Tests of Conditional Independence

	Chi-Squared	df	Asymp. Sig. (2-sided)
Cochran's	37.297	1	.000
Mantel-Haenszel	33.556	1	.000

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.788	.067	9.761	.000[c]
Ordinal by Ordinal	Spearman Correlation	.788	.067	9.761	.000[c]
N of Valid Cases		60			

a. Not assuming the null hypothesis.

Under the conditional independence assumption, Cochran's statistic is asymptotically distributed as a 1 df chi-squared distribution, only if the number of strata is fixed, while the Mantel-Haenszel statistic is always asymptotically distributed as a 1 df chi-squared distribution. Note that the continuity correction is removed from the Mantel-Haenszel statistic when the sum of the differences between the observed and the expected is 0.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	₦	Percent	₦	Percent	N	Percent
Do you agree that the performance of your organization is a function of quality personnel? * Qualifications of respondents	60	100.0%	0	.0%	60	100.0%

Do you agree that the performance of your organization is a function of quality personnel? * Qualifications of respondents

Count

		Qualifications of respondents				
		Primary	Secondary	Post secondary	Postgraduate	Total
Do you agree that the performance of your organization is a function of quality personnel?	Undecided	0	0	0	2	2
	Disagreed	0	0	0	12	12
	Agreed	7	20	19	0	46
Total		7	20	19	14	60

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	60.000[a]	6	.000
Likelihood Ratio	65.193	6	.000
Linear-by-Linear Association	30.843	1	.000
N of Valid Cases	60		

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	60.000[a]	6	.000
Likelihood Ratio	65.193	6	.000
Linear-by-Linear Association	30.843	1	.000

a. 8 cells (66.7%) have expected count less than 5. The minimum expected count is .23.

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	-.723	.042	-7.971	.000[c]
Ordinal by Ordinal	Spearman Correlation	-.762	.058	-8.954	.000[c]
N of Valid Cases		60			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.