EFFECTS OF POOR WASTE MANAGEMENT ON HIGHWAYS: A CASE STUDY OF ABUJA-KEFFI EXPRESSWAY

BY

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DECLARATION

I hereby declare that this dissertation has been written by me and it is a report of my research work. It has not been presented in any previous application for the award of Master of Science in Environmental Resource Management, Faculty of Social Sciences, Nasarawa State University, Keffi. All quotations are indicated and sources of information specifically acknowledged by means of references.

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CERTIFICATION

The dissertation "Evaluation of the Role of Environmental Audit on the Performance of Selected Industries, Federal Capital Territory (FCT), Nigeria" meets the regulations governing the award of Master of Science of the school of Postgraduate Studies, Nasarawa State University, Keffi, and is approved for its contribution to knowledge.

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DEDICATION

To Almighty God and my family.

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ABSTRACT

Effective management of wastes on Nigerian highways has emerged as one of the greatest challenges being faced in the country. The generation of wastes in the country has increased considerably with its adverse effects as the hazard posed by this problem cannot be over-emphasized. The paper analyses the effects of poor waste management on highways with a focus on the Abuja-Keffi expressway. It also identified the sources of wastes, solid waste types and categories, collection, disposal, management methods and factors hampering effective solid waste management. The study reviewed the current solid waste management practices in Nigeria. Data gathered from the study shows that, improper disposal of municipal waste has serious and dangerous impacts on the environment, humans, plants and animals. Environmental hazard, health hazard, depletion of the ozone layer, flooding, ugly scenario of the environment, human injury etc. were identified as some of the effects of poor waste management. Findings however revealed that, ineffective solid waste management on highways is characterized by improper disposal, inefficient collection methods, laziness, ignorance and insufficient coverage of the collection system while reduction, reuse and recycling are some of the strategies that could be employed for an effective waste management on highways. The paper in conclusion makes succinct recommendations for government, professionals, highway managers and the general public on the need to brace up for the challenge posed by this menace.

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(Latifah *et al.,* 2009; Zamorano *et al.*, 2009; Jalil, 2010; Adekunle *et al.*, 2011). Mankind naturally depends on the environment to sustain their lives but solid waste is one of the three major environmental problems in Nasarawa, and many other developing and even the developed countries are threatened by this (Ogu, 2000; Latifah*et al.*, 2009; Jalil, 2010).

Waste is defined as any solid, liquid or gaseous substances or materials which being a scrap or being super flows, refuse or reject, is disposed off or required to be disposed as unwanted (FEPA, 1988). Waste management or the management of waste as the case may be is a matter of national and international concern. The volume of waste does not actually constitute the problem but the ability or inability of governments, individuals and waste disposal firms to keep up with the task of managing waste and the environment. There is no doubt that a dirty environment affects the standard of living, aesthetical quality, health of the people and thus the quality of their lives.

Nasarawans are permanently accustomed to dirt. The evidence of this can be seen everyday by way of indiscriminate discharge of garbage into drains and at times on the highway.In urban areas, Nasarawan cities have been described as one of the dirtiest, the most unsanitaryand the least aesthetically pleasing in the world (Mabogunje 2001). It is unpleasant to see a man defecating in broad

daylight on the side of the high way or where a man throws waste on the street. Then, one begins to wonder the reason(s) behind those dirty habits of our people. In Nasarawa, the quantity and generation rate of solid wastes have increased tremendously over the years with lack of efficient and modern technology for the management of the wastes (Adewole, 2009). The generation rate, collection and disposal of solid wastes are functions of several factors which if well considered and appropriated could bring the desired solution to the waste management problems in Nasarawa. The factors influencing the generation, solid waste types and categories, collection, disposal, reuse and recycling, and the environmental problems associated with poor waste management were investigated in this study.

The challenge of waste management has been a rising concern for the Federal government, local authorities, environmentalists, researchers and the communities at large. Throughout Nasarawa there has been an increase in the amount of waste generated at household level yet there has not been the requisite collection and disposal services, let alone an effective waste management strategy to meet the growing challenge. Wastes if not properly managed has resultant effects which centers on pollution of land, air and water. These resultant effects shall be vividly studied in the subsequent paragraphs.

1.2 Statement of Problem

The improper disposal of municipal waste has a serious and dangerous impact on a wide range of areas. Garbage thrown in the street or in open spaces creates a public health hazard, while waste dumped near rivers, lakes and streams contaminates the water supply. 32% of the respondents agree that it is a major cause of ineffective waste management along the highway.

The residents and traders along the Abuja-Keffi highway are expected to store their refuse neatly in a bag for onward collection by the waste management board but the collection method adopted on this highway is inefficient as the board rarely come for the collection. Sometimes, they complain of bad vehicles for collection or inadequate funding. Although, the vehicles generally are too old and too few in number. This problem is primarily due to poor maintenance and the lack of a vehicle replacement policy. 20% of the respondents identified inefficient collection method as a major cause of poor waste management on the highway.

1.3 Aim and Objectives

The aim of this project is centred on the effects of poor waste management on highways, To realize this aim, the study will achieved through the following objectives:

i. Evaluate the existing method of waste disposal
ii. Examine the effects of waste disposal on Health environment
iii. Suggest suitable wastes disposal method

1.4 Research Questions

i. How can we evaluate the existing method of waste disposal?
ii. What are the effects of waste disposal on Health environment?
iii. What method fits for wastes disposal?

1.5 Scope of the Study

The study is focused on investigating the domestic solid waste management strategies in Keffi, Karu Local Government Area, Nasarawa State. It was based on the analysis of data from selected households along Abuja-Keffi Expressway, the study area. According to Nasarawa State Environmental Protection Agency, Keffi-Abuja Expressway is made up of the following areas: Sabon gari, Gora, Angwan zakara, Tudun wada, masaka, Nyaya Gwandara, mararaba. Thus,

structured questionnaires that included information on the socioeconomic characteristics of the respondents, the types of domestic solid wastes generated, waste management strategies and the frequency of disposal using these strategies were drafted and administered to residents in these areas. This is because all households produce domestic solid wastes and therefore have an equal chance of being selected to provide answers to the research questions. This research took place between October, 2014 and March, 2015.

1.6 Justification for the Study

The 2006 National Population Census (NPC) reported that the population of Keffi and Karu Local Government Area as 201,429 and 237,815 1/3rd of the target population live in the study area (Nasarawa State Planning Commission, 2011). This therefore shows that the study area is residential in nature. It is in view of this fact that the study seeks to analyze the domestic solid waste management strategies in place along Keffi-Abuja expressway. Humans produce waste in their residents or at places of work. Rapid urbanization, industrialization, population growth, poor living standards in developing countries have generated refuse that pose health hazards to communities. Dashe, (1997) noted that without the perception of a guide into the future environmental program, a crash is inevitable. Therefore, there is need to understand the various

ways individuals participate in environmental protection and waste management especially at the house hold level with a view to integrating them into the environmental management program since it is generally believed and accepted that domestic solid waste constitutes the second most contributing source of waste generated anywhere, anytime worldwide. The study would be relevant to decision and policy makers on environment, stakeholders and the general public because it is expected that the domestic solid waste management strategies in the study area is adequately analyzed. These studies serve as a reference material to researchers, NGO"s and public institutions. The study would however open up areas that were not fully covered by this research to those willing to undertake further studies.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

Municipal solid waste management is a global issue and has proven a key challenge facing African countries. Municipal solid waste management constitutes one of the most crucial health and environmental problem facing African cities. Most cities spend 20-50% of their annual budget on solid waste management and only 20-80% of the waste is collected (Achankeng, 2003). The UNEP (2009a) states „"The World Bank estimates that in developing countries, it is common for municipalities to spend 20-50 % of their available budget on solid waste management (open dumping with open burning is the norm), even though 30-60% of all the urban solid wastes remain uncollected and less than 50% of the population is served. . In low-income countries, collection alone drains up 80-90% of municipal solid waste management budget. In mid-income countries, collection costs 50-80 % of total budget. In high-income countries, collection only accounts for less than 10% of the budget, which allows large funds to be allocated to waste treatment facilities". One of the consequences of population growth and globalization is increased waste generation (Zamorano *et al.*, 2009).

Generation varies between cities and city part in Africa, with reliable data being difficult to come by (Achankeng, 2003). This has become a concern for developing countries and is one of the greatest challenges facing environmental protection agencies in developing countries (Olufayo & Omotosh, 2007; Gomez *et al.*,2009; Ogwueleka, 2009; Zamorano*et al.*, 2009).

2.1 Waste

The Lagos State Environmental Edicts 1985 Section 32 defines waste as any substance, which constitutes scrap materials or an effluent or other unwanted surplus substances arising from the application of any process. Also, the United Kingdom's Environmental Protection Act 1990, re-enacting an earlier U.K statue, took this statutory definition a step further in section 75(2), it defines waste as any substance or article, which requires to be disposed of as being broken, worn out, contaminated or otherwise spoiled. Solid wastes could also be defined as non-liquid and nongaseous products of human activities, regarded as being useless. It could take the forms of refuse, garbage and sludge (Leton and Omotosho, 2004). Cities in Nasarawa, being among the fast growing cities in the world are faced with the problem of solid waste generation (Onibokun and Kumuyi, 1996). The implication is serious when a country is growing rapidly and the wastes are not efficiently managed. Waste generation scenario in Nasarawa has been of great concern both globally and locally.

In this section, the study tries to explain some of the basic concepts and theories used. These include environment, environmental security, waste, solid waste disposal, globalization, etc. the advantages of this section is that it enables the study to explain how the various concepts are used in the course of the study as against their general usages. To begin with, what do we mean when we talk about the environment and how is the concept used in this study? By environment, the study refers to all of the external factors affecting an organism. It could also mean all the circumstances, people, things, and events around an organism, a person, a community, etc that influence an organism's life. These factors or circumstances may be other living organisms (biotic factors) or nonliving variables (abiotic factors), such as temperature, rainfall, day length, wind, and ocean currents. The interactions of organisms, people, societies, etc with biotic and abiotic factors form an ecosystem, a community, an environment, etc. Even minute changes in any one factor in an ecosystem, a community, etc can influence whether a particular person, plant or animal species will be successful in its environment or not.

Having examined environment as a concept, what then is environmental security? To facilitate a better understanding, the study first looks at security and later environmental security. Security is traditionally regarded as largely a matter of a state's military or a state's defense by military means. At its most

fundamental level, security is believed to connote the effort to protect a population and territory against organized force while advancing the state's interests through competitive actions. When this definition of security gained currency, the state was considered as the sole entity capable of guaranteeing a nation's security. As such, state-centered definition of security dominated discussions in international relations, diplomatic, and other related studies, especially since the end of the World War II. This perspective, needlessly, led to a conception of threats and crisis as mainly military challenges and has traditionally been countered with police or military actions. This narrow perspective meant that other issues outside the purview of the military are not regarded as security issues.

However, the oil crises of the 1970s led to a paradigm shift from the traditionalist conception of security to a more liberal view. As a fall-out of the oil crisis, issues of economic, environment and resource scarcity became acceptable as security issues. Further advancement in security scholarship came with the collapse of the Soviet Union, as Western economies began to focus on trade and economic competition, thereby making economic competition one of the security fortes of the 21st century. This refocusing was hinged primarily on the fact insecurity describes anything that is capable of increasing the stress-level of the society, cause panic and could affect a people's well-being.

Therefore, it has been widely accepted that issues such as population growth or decline in developing nations, competition over scarce resources, and trans-boundary migration, erosion, pest invasion, drought, landslide, etc could result in severe security -threatening situations like conflicts, wars, displacement, etc.

Waste is capable of different interpretations and meanings. Waste could be any material which has been used and is no longer wanted, for example because the valuable or useful part of it has been taken out. Waste could also mean an opportunity not taken i.e. when one does not take advantage of an opportunity when it is available. Such opportunity is said to have been wasted. It could also mean when something is surplus to requirement; such thing is said to have lie in waste. From these and many more ways through which the term could be understood or used, it is in the first sense - as any material which has been used and is no longer wanted, because the valuable or useful part of it has been taken out – that waste is used in this paper.

From the foregoing, a waste disposal or a waste disposal unit is therefore the act of taking away a disused waste. This could be, in a kitchen sink, a small machine that chops up vegetable waste. Or in a society, a unit, usually part of a local government, that oversees the elimination or a proper disposal of waste. Invariably, a waste disposal could be trash-can each individual used in stowing

away disused items or a unit of an organized society that sees to the stowing away of disused items.

By solid waste, we imply that there are different kinds of waste; some in solid state while others are in soluble or solvent state. As far as this study is concerned, emphasis is placed on solid waste. Solid wastes, as it is mostly used, solid waste refers to human and animal excrement or faces. Solid waste disposal therefore refers to how individuals, societies, or organization stow away human and animal excrement or faeces. This could be done individually by erecting toilets in houses, offices, public squares and in buses. Alternatively, it could be centrally planned by providing sewage disposal vehicles that go about collecting and dumping away such waste in safer places.

Poverty can be said to refer to specific forms and levels of deprivation, which impose major limitations on normal human functioning and existence (Akinyele, 1994). Poverty is inseparably linked to lack of control over resources including land, skills, knowledge, capital and social connections. (United Nations, 1996).Section 38 of the Federal Environmental Protection Agency Act defines the environment as including water, air, land and all plants and human beings or animals living therein and the inter-relationships that exist between and among them. Degradation connotes reducing the quality of a thing (Oxford Advanced Learners Dictionary). Environmental Degradation can thus be described as the

process of reducing the quality of the environment. Koleosho and Adeyinka (2006) refer to environmental degradation as those activities that render the environment unhealthy and unsustainable over time.

Environmental degradation and poverty are inextricably intertwined, resulting in a vicious cycle in which poverty causes environmental stress, which in turn perpetuates more poverty. When the physical environment in and around cities deteriorates, those most affected are the urban poor.

2.2 Waste Management in Nasarawa

Nasarawa have promulgated various laws and regulations to safeguard the environment. These include Federal Environmental Protection Agency Act of 1988. The Federal Ministry of Environment administers and enforces environmental laws in Nasarawa. It took over this function in 1999 from the Federal Environmental Protection Agency (FEPA), which was created under the FEPA Act. Pursuant to the FEPA Act, each state and local government in the country set up its own environmental protection body for the protection and improvement of the environment within its jurisdiction. Municipal solid waste management is a major responsibility of state and local governments.

Nigeria is presently experimenting with the privatization of this sector. The Federal Government has instituted National Integrated Municipal Solid Waste Management Intervention Programme in seven cities of Nigeria. The seven cities

are Maiduguri, Kano, Kaduna, Onitsha, Uyo, Ota, and Lagos. Lagos state government established municipal solid waste management policy to encompass private sector participation in waste collection and transfer to designated landfill sites.

Human and industrial wastes are not only toxic but they are also in the league of silent killers. An editorial in the *Punch* online edition of Sunday, March 1, 2009, noted quite rightly that Nigeria "has now become a big dumping ground for all manner of items from used clothes and cars to second-hand televisions, refrigerators and computers. Some of these items that are not serviceable are further disposed off in waste dumps where they could pose a pollution threat to the environment and people". Improper waste disposal is significantly harmful to human health and the environment. In Nasarawa, the commonest way of disposal of unserviceable items is to set them on fire. This could lead to the escape of dioxins into the atmosphere. Dioxins are carcinogenic and are capable of causing endocrine disruptions. Other chemical contents could percolate into the soil and contaminate sources of water supply and edible plants (Punch Newspaper, 2009).

Rapid urbanization and industrial diversification has led to generation of considerable quantities of municipal, plastic, hazardous and biomedical waste. Improper disposal of waste often results in spread of diseases and contamination

of water bodies and soils. The impacts of these wastes on the economy cannot be ignored and managing them has become a major problem. Waste management is therefore the organized and systematic channeling of wastes through practically economically and technically appropriate recovery or disposal route in accordance with acceptable public safeguards. The post-independence era in Nigeria has witnessed series of political and socio-economic development (Adewole, 2009).

Today, the nation comprises of 36 states and a Federal Capital Territory compared with initial four regions at independence in 1960 there is continuous increase in population, industrialization and enhanced research and commercial activities since petroleum was discovered in Nigeria, yet this growth has not been comparatively matched by an improvement in the quality of the urban environment. Instead, we have huge mounds of refuse and astronomical increase in the volume and diversity of solid waste that are generated and disposed any how in Nigeria, these have been unprecedented reports of coastal water, land and air pollution world-wide, but with developing countries like Nigeria thereby creating a serious detrimental effects in many carefree, slow responding thereby creating a serious disposal problem and a major source of environmental pollution.

2.3 Sources of Waste

The sources of waste are categorized in the table below:

Table 1: Sources of waste

S/N	Source	Typical waste generators	Types of solid wastes
1.	Residential	Single and multifamily dwellings	Food wastes, paper, cardboard, plastics, textiles, leather, yard wastes, wood, glass, metals, ashes, special wastes (e.g., bulky items, consumer electronics, white goods, batteries, oil, tires), and household hazardous wastes).
2.	Industrial	Light and heavy manufacturing, fabrication, construction sites, power and chemical plants.	Housekeeping wastes, packaging, food wastes, construction and demolition materials, hazardous wastes, ashes, special wastes.
3.	Commercial	Stores, hotels, restaurants, markets, office buildings, etc.	Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes.
4.	Institutional	Schools, hospitals, prisons, government centers.	Same as commercial.
5.	Construction and demolition	New construction sites, road repair, renovation sites, demolition of buildings	Wood, steel, concrete, dirt, etc.
6.	Municipal services	Street cleaning, landscaping, parks, beaches, other recreational areas, water and wastewater treatment plants.	Street sweepings; landscape and tree trimmings; general wastes from parks, beaches, and other recreational areas; sludge.
7.	Process (manufacturing, etc.)	Heavy and light manufacturing, refineries, chemical plants, power plants, mineral extraction and processing.	Industrial process wastes, scrap materials, off-specification products, slay, tailings.
8.	Agriculture	Crops, orchards, vineyards, dairies, feedlots, farms.	Spoiled food wastes, agricultural wastes, hazardous wastes (e.g., pesticides).

Source: Hoornweg, D. and Laura, T. (1999).

2.4 Types and Causes of Waste

The UK Environment Agency classifies waste as either controlled waste or non-controlled waste. Controlled waste includes waste generated from households (municipal solid waste), commercial and industrial organizations and from construction and demolition. Non-controlled waste includes waste generated from agriculture, mines and quarries and from dredging operations.

Solid waste can be classified into different types depending on their source:

i. Household waste is generally classified as municipal waste.

Municipal solid waste consists of household waste, construction and demolition debris, sanitation residue, and waste from streets. This garbage is generated mainly from residential and commercial complexes. With rising urbanization and change in lifestyle and food habits, the amount of municipal solid waste has been increasing rapidly and its composition changing.

ii. Industrial waste as hazardous waste.

Industrial and hospital waste is considered hazardous as they may contain toxic substances. Certain types of household waste are also hazardous. Hazardous wastes could be highly toxic to humans, animals, and plants; are corrosive, highly inflammable, or explosive; and react when exposed to certain things e.g. gases. Household wastes that can be categorized as hazardous waste include old batteries, shoe polish, paint tins, old medicines, and medicine bottles. Hospital

waste contaminated by chemicals used in hospitals is considered hazardous. These chemicals include formaldehyde and phenols, which are used as disinfectants, and mercury, which is used in thermometers or equipment that measure blood pressure. In the industrial sector, the major generators of hazardous waste are the metal, chemical, paper, pesticide, dye, refining, and rubber goods industries. Direct exposure to chemicals in hazardous waste such as mercury and cyanide can be fatal.

iii. Biomedical waste or hospital waste as infectious waste.

Hospital waste is generated during the diagnosis, treatment, or immunization of human beings or animals or in research activities in these fields or in the production or testing of biologicals. It may include wastes like sharps, soiled waste, disposables, anatomical waste, cultures, discarded medicines, chemical wastes, etc. These are in the form of disposable syringes, swabs, bandages, body fluids, human excreta, etc. This waste is highly infectious and can be a serious threat to human health if not managed in a scientific and discriminate manner.

2.5 Waste Collection and Disposal

Collection and disposal of waste are some of the more visible signs of successful or unsuccessful solid waste management systems. If successful, the result is clean surroundings and good public sanitation; if unsuccessful, litter and poor public sanitation are everywhere which can be seen with the naked eye. Good

public sanitation begins with a properly designed and operated waste collection and disposal system.

Domestic waste management, collection and disposal have always been a universal problem. Therefore, it is not associated only to developing countries like Nigeria. Lately however, a lot of concern has been expressed by the well-meaning residents that the battle against refuse, especially on the streets, roads, and avenues is not being prosecuted in a way to guarantee a healthy environment (Adewole, 2009). In some states of the federation, private sector waste disposal operators diligently visits homes and carry away filled refuse bags, load them into waiting trucks and cart them away for final delivery. This is the system that is being practiced in Lagos State. In some states where there are no private disposal operators, the state government makes provision for the collection and disposal through the waste management board. Such states include; Ondo, Ogun, Nasarawa etc. In states where the waste management board is not efficient, refuse are dumped in open spaces, road sides, drainages and at times inside the river. Waste disposal in some states, the disposal method employed includes; landfill, incinerators and recycling.

2.6 Methods of Waste Management

Waste management is now tightly regulated in most developed countries and includes the generation, collection, processing, transport and disposal of waste. In addition the remediation of waste sites is an important issue, both to reduce hazards whilst operational and to prepare the site for a change of use (e.g. for building). The major methods of waste management are:

i. Recycling - the recovery of materials from products after they have been used by consumers.

ii. Composting - an aerobic, biological process of degradation of biodegradable organic matter.

iii. Sewage treatment - a process of treating raw sewage to produce a non-toxic liquid effluent which is discharged to rivers or sea and a semi-solid sludge, which is used as a soil amendment on land, incinerated or disposed of in land fill.

iv. Incineration - a process of combustion designed to recover energy and reduce the volume of waste going to disposal.

v. Landfill - the deposition of waste in a specially designated area, which in modern sites consists of a pre-constructed 'cell' lined with an impermeable layer (man-made or natural) and with controls to minimize emissions.

Table 2: Advantages and disadvantages of the methods of waste management

Option	Advantages	Disadvantages
Recycling	Conservation of resources Supply of raw materials to industry Reduction of waste disposed to landfill and incineration	Diverse range of processes Emissions from recycling process May be more energy used for processes than original manufacture Currently low demand for products Requires co-operation from individuals
Composting	Reduction of waste to dispose to landfill and incineration Recovery of useful organic matter for use as soil amendment Employment opportunities	Odours, noise, vermin nuisance Bio-aerosols—organic dust containing bacteria or fungal spores Emits volatile organic compounds Potential pathway from use on land for contaminants to enter food chain
Sewage treatment	Safe disposal of human waste Protects sources of potable water supply	Discharges may contain organic compounds, endocrine disrupting compounds, heavy metals, pathogenic microorganisms Odour nuisance
Incineration	Reduces weight and volume of waste, about 30% is left as ash which can be used for materials recovery Reduces potential infectivity of clinical waste Produces energy for electricity generation	Produces hazardous solid waste Discharges contaminated waste water Emits toxic pollutants, heavy metals, and combustio products
Landfill	Cheap disposal method Waste used to back fill quarries before reclamation Landfill gas contributes to renewable energy supply	Water pollution from leachate and run off Air pollution from anaerobic decomposition of organic matter to produce methane, carbon dioxide nitrogen, sulphur and volatile organic compounds Emission of known or suspected carcinogens or teratogens (e.g. arsenic, nickel, chromium, benzene vinyl chloride, dioxins, polycyclic aromatic hydrocarbons) Animal vectors (seagulls, flies, rats) for some disease Odour, dust, road traffic problems

Source: Lesley R. (2003).

2.7 Stages in Waste Management

The various stages involved in Waste management are:

i. **Generation:** This is the stage when materials becomes waste and is discarded. The generation rate is often defined as the weight of material discarded as solid waste by one person in one day

ii. **Storage:** House storage, keeping solid waste in place or containers which is the responsibility of the individual members of the household while, Command storage, is the responsibility of the refuse collection agency.

iii. **Collection:** This has to do with transportation of the solid waste from the point of storage to the point of disposal, two stages are involved in the collection stages; The direct collection, which makes use of only one means of transportation i.e. the Solid waste is picked up from the point of storage in a truck that takes it to the disposal site, The second stage collection carries the solid waste from the storage facility to the Transfer station, at the transfer station, the waste is loaded into the secondary stage, to transport the refuse to the Disposal site.

iv. **Disposal:** The final destination of solid waste, usually it is dumped on land at a tip, this may be done in an engineered and hygienic Way: - sanitary landfill or controlled tipping, or in a careless Way: - open tipping or crude dumping.

2.8 Causes Of Waste Disposal

Abuja, since its establishment as a Federal Capital, has experienced a huge population growth. Population explosion in Abuja owes primarily to labour migration, which resulted from the movement or relocation of headquarters of private and public organizations to the city.

According to official estimates, Abuja has been growing at 20 – 30% per year. Urban development problems in Abuja could therefore be viewed from both socioeconomic and environmental perspectives. As noted earlier, the location and relocation of government and private companies' headquarters have forced majority of workers to become resident in Abuja. The increasing socio-economic opportunities made available by the fact that the city is still under construction, facilitate ever increasing number or influx of young, unemployed men and women into Abuja. This development has spurred high economic cost of most services in the city. Cost of renting or leasing houses, shops, offices and spaces are higher in Kefri-Abuja expressway than anywhere else in Nigeria. Increasing population in Kefri-Abuja has resulted in the proliferation of slums and shantytowns, most especially in adjourning villages. Therefore, squatter settlements and shanty-towns spread rapidly in and outside the city limits.

The government is committed to reducing the amount of waste and has set targets for waste reduction. A new strategy for cutting waste was published in 2007 looking for at least 40 per cent of household waste to be recycled or composted by 2010, rising to 50 per cent by 2020.

Local authorities are responsible for waste disposal and the government has introduced legislative targets for local authorities. The Municipal Waste Management Statistics for 2008/9 show that the total amount of municipal waste is decreasing with an increase in the proportion of municipal waste being recycled or composted, increasing to 37.6 per cent in 2008/09, up by 3 per cent on 2007/08. For information on individual local authorities see Waste Data Flow.

Waste watch estimate that at least half of the contents of our dustbins could potentially be recycled. In addition, we could compost the 20% of vegetable peelings and other organic waste that we throw away. Despite this potential to recycle or compost around 60% – 70% of our waste, we are only recycling or composting 12%. A total of 80% of municipal waste is landfilled and 8% is incinerated to produce energy. For in depth information go to Waste Online.

The Women's Environment Network waste prevention campaign focuses on preventing waste at source, rather than recycling. They have developed and

promote a wide range of waste-avoiding goods and services such as composting, refills, repair shops, reduced packaging and leasing schemes.

Recycling is only one aspect of waste reduction. There are other steps which can be taken. Only recycle things if you are sure they cannot be repaired or reused.

2.9 Effect Of Waste Disposal

Disposing of waste has huge environmental impacts and can cause serious problems. In the UK much is buried in landfill sites – holes in the ground, sometimes old quarries, sometimes specially dug. Some waste will eventually rot, but not all, and in the process it may smell or generate methane gas, which is explosive and contributes to the greenhouse effect. Leachate produced as waste decomposes may cause pollution. Badly-managed landfill sites may attract vermin or cause litter.

Incinerating waste also causes problems, because plastics tend to produce toxic substances, such as dioxins, when they are burnt. Gases from incineration may cause air pollution and contribute to acid rain, while the ash from incinerators may contain heavy metals and other toxins. Because of these problems there are active campaigns against waste incineration. Greenpeace actively worked on these issues and some information, including a map of UK waste incinerators, can be found by searching the Greenpeace website for waste incineration.

However, burning waste can generate energy and there are operational schemes. The Renewable Energy Association website provides more information including a map of biomass and energy from waste projects.

Throwing away things wastes resources. It wastes the raw materials and energy used in making the items and it wastes money. Reducing waste means less environmental impact, less resources and energy used and saves money.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Study Area

Keffi-Abuja It falls within latitude 7° 25' N and 9°20° North of the Equator and longitude 5° 45' and 7° 39'(www.fct.gov.ng).Abuja has a gentle undulating terrain rising from 305m above sea level in the west to 610m above sea level in the east.Interlaced by riverine depressions of the Usman River and its tributaries (Abuja-Citiserve, 2004). The study area covers Nyayan –Mararaba, Ado, New Nyanya,Masaka Axes of the road. These road axes fall under Karu and Keffi Local Government area of Nasarawa State respectively. Nasarawa state was created from Plateau State on 1st October, 1996 with the State capital being Lafia. It has an approximate landmass of 27,116.8 square kilometers. It is located in the middle belt region of Nasarawa. Nasarawa State is bounded in the North-West by the Federal Capital Territory (FCT) Abuja, in the North-East by Plateau State, in the North by Kaduna State, in the South by Benue State, in the South-West by Kogi State and in the South-East by Taraba State.

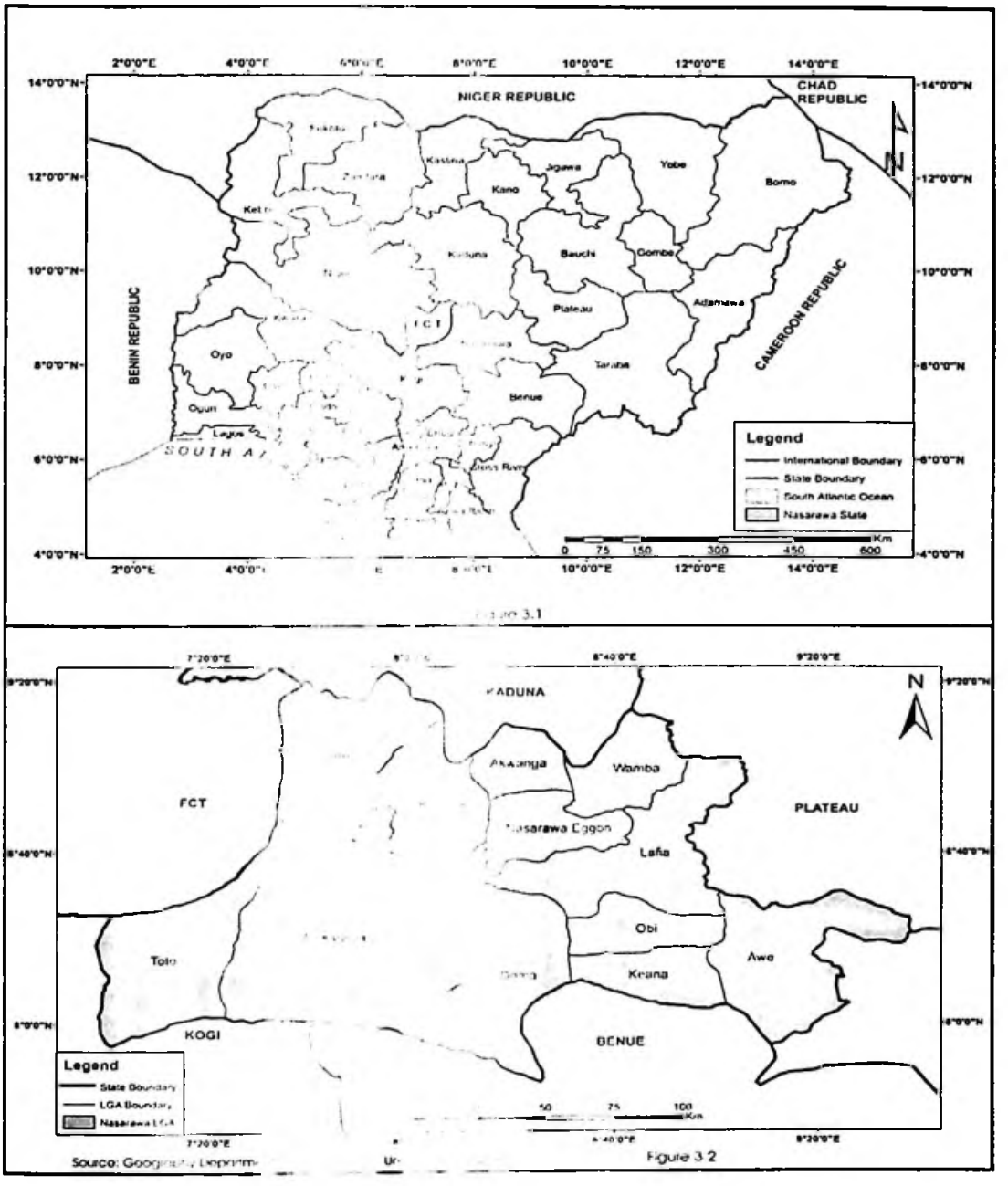


Figure 3.2

Fig 3.1: showing of N

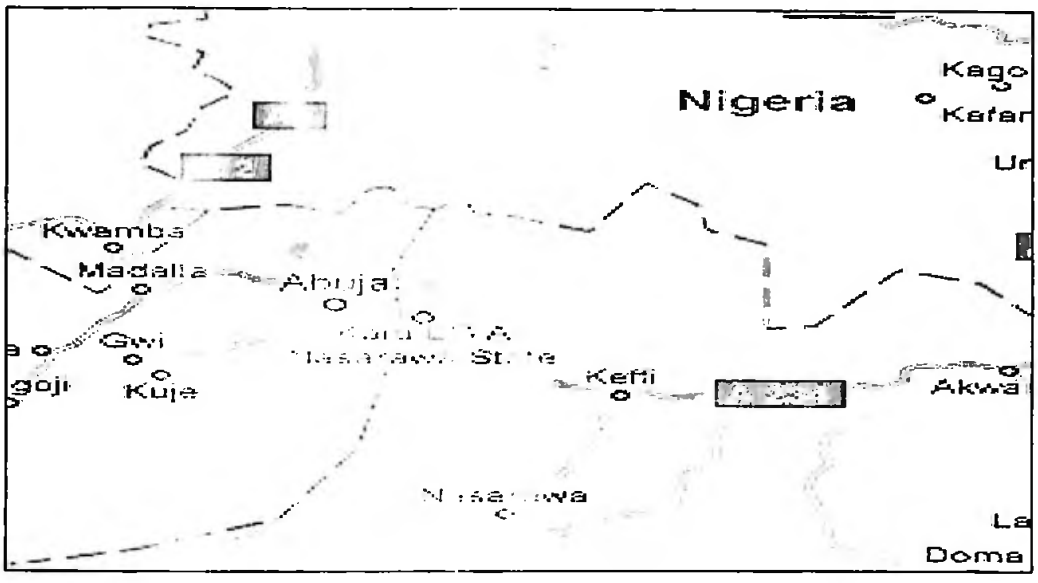


Fig 3.2: Road map showing Abuja-Keffi road.

Source: www.google-earth.com

3.1.2. Geology

In Nasarawa state. the basement complex rocks cover 60% of the total surface area of the state. The migmatite-gneisses intricately associated with the older granite occupy all the areas of Nasarawa LGA (Obajee/ul..2007). The study area is geomorphologically underlined by igneous rocks particularly the younger granites. the older granites which are mainly biotic granites and metamorphic rocks of the basement complex. with massive outcrops of ridges and elevated areas which are rugged, shallow and steep sided.

3.1.3: Relief and Drainage:

The area lies between 300 900 metres above mean sea level. The topography is gentle and undulating. There are however. steep escarpments doting in the study area. The elevation is about 30metres with the lowest point slightly less than 290metres and the highest point slightly above 320 metres above sea level. The surface drainage of the study area is related to its relief whereby most of the streams have their sources from ridges and highlands in the study draining into the River Benue in the southern pan of the study area.

3.1.4. Climate:

Tropical humid climate characterized by two distinct seasons is experienced in the area. The wet (rainy) season lasts from about the beginning of April and ends in October. The dry season is experienced between November and April. Annual rainfall figures of the area ranges from 1100mm to about 2000mm and about 90% of the rain falls between May and September (Ajeagbu et al.. 2001).

Temperatures are generally high during the day particularly between the months of March and April. The mean monthly temperature in the area ranges between ZOOC and 340C with the hottest months being lVlarch ~ April and the coldest. December -~ January. The climate controls the natural forces that affect all components of the ecosystem. It modifies the structural differences between

them and maintains a balanced equilibrium for the macro environment. Annual rainfall is characterized by a single maximum and in the range of .400mm per annum. The number of rainy days ranges between 43 and 87 days with the highest values are recorded in July. Average relative humidity is about 60.9%. The climate of the study area is typically tropical continental in nature. Consequent upon apparent movement of the sun across the tropics is the major factor besides the prevailing winds and the relative stability of the Inter-Tropical Convergence Zone (ITCZ) are responsible for the stability of temperature in the study area. though variations are experienced between the dry and the wet seasons.

3.1.5: Vegetation and Soil:

The vegetation of the study area is that of the central southern guinea savannah type. The vegetation is characterized by grass. weeds. shrubs and leguminous fauna which provide dry season grazing grass. due to general vegetation degradation through burning. over cultivation. and over grazing. The major soil units of the study area belong to the category of ferruginous soils, which are derived mainly from the basement complex of the old sedimentary rocks. Hydromorphic soils are also found in the flood plains.

3.2 Methodology

3.2.1 Research Methods and Techniques

The sample frame consists of individuals residing within both case study areas. Data was collected using questionnaire survey and field survey. The construction of the research instruments is using ISWM as an assessment tool, which is used to outline the areas of assessment and the content of the survey. Klundert &Anschutz (2001) in their study used the integrated solid waste management as an assessment/analysis tool for critical assessment. The residential questionnaire is closed, the study employed several statistical test meant for analysis and interpretation of data. he social package for social sciences (SPSS) version 20. The overall results based on the scope of the data; tabular and graphical format is used to illustrate and project various details (UNEP, 2009b).

Data for this study were collected through a structured questionnaire for residents, travelers and traders along Abuja-Lafia expressway. Fifty (50) questionnaires were administered for effective analysis.

The research design objectives are to:

i. Identify the causes of poor waste management along the highway.

ii. Analyse the effects of poor waste management on the highway.

3.4 Sampling Strategies

The sample frame consists of individual residing within both case study areas the areas was stratified based on municipalities and districts. The questionnaires was distributed using simple random sampling within each stratus and distributed to households, within public places and parks in both cities. This sampling method was selected due to the large area, aimed at covering all the municipalities of the state; to enable a holistic and accurate assessment of the sample unit (Kumar *et al.*, 2009b).

Hypotheses

i. H_i. There is no significant difference between the frequency of waste generated and the frequency waste disposed in the study area.

ii. H_{ii}. There is no significant difference in the effectiveness of the domestic solid waste management Strategies in the study area

CHAPTER FOUR

DISCUSSION OF FINDINGS

4.1 Existing Method Of Waste Disposal

Demographic assessment is carried out using variables including; gender, occupation, age group, number of individuals per household, level of education and total family income. In Abuja 55.4% of the population comprises of males and 45.6% females. 59.8% of the population consist of government workers and 40.2% nongovernment workers. In terms of age groups, 12.4% were between the ages of 16-26yrs, 38.8% between 27-37yrs, 32.5% between 38-48yrs, 14.1% between 49-59yrs and 2.2% for 60yrs and above. In terms of level of education 2.9% of respondents has no educational qualification, 1.9% of respondents had primary school as their highest qualification, 9.1% of respondents had secondary school education, 18.7% had college education and 67.5% of respondents had university education. In terms of income level 8.5% of respondent earn between USD100-below monthly, 16.9% earn between USD 101-200 monthly, 25.6 earn between USD201-400 monthly, 18.6% earn between USD401-500 monthly and 30.4% earn USD501-above monthly. In terms of number of individuals per household 5.3% of respondents live single, 10% of respondents have two individuals per household, 9% of respondents have three individuals

per household, 16.5% of respondents have four individuals per household, 16.7% of respondents have five individuals per household, 14.8% of respondents have six individuals per household , 10.4% of respondents have seven individuals per household, 6.8% of respondents have eight individuals per household and 9.8% of respondents have nine individual and above per household.

4.2 Comparison of Solid Waste Management Practices among Residents

Solid waste management practice among residents consist of different categories; storage, recycling, reduction, collection, separation at source, disposal, composting and general services. Proper disposal of solid waste constitutes a major problem in Abuja. Figure 9 is a bar chart showing the percentages of responses based on the different solid waste management practises.In Abuja 27.6% of respondents practise solid waste separation at the source of generation, 78.9% store their solid waste before collection or disposal, 26.4% dispose their solid waste by burning, 7.9% of respondents dispose their solid waste by burying, and 65.7% of respondents dispose their solid waste by dumping in the neighbourhood.

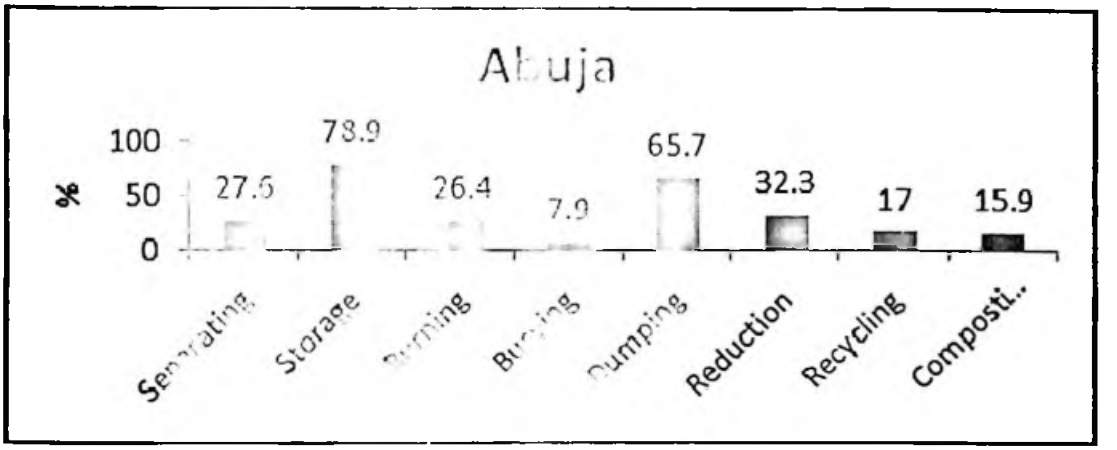


Figure 4.1: Frequency Based on Solid Waste Management Practices

In a study by Nabegu (2010) carried out in Kano State, Nasarawa. It was observed that wastes were dumped in the open space on the street at close proximity to the houses and public places and some were dumped very close to the river, while others were dumped right into the river, especially in the city and the suburban zones. The study found 66.25% of residents dispose their waste by dumping in unauthorized areas within neighborhoods and 3.75% burn their solid waste. Bangaet *al.* (2011) in their study of solid waste collection in Kampala, Uganda found 11.9% of the respondents dispose their waste by dumping in the neighborhoods and burning, 18.9% bury their solid waste and 22.8% have their solid waste collected by the municipality. Sumukwo*et al.* (2012) in their study found 47% respondents dispose their waste in open dumps within their neighbourhood, 3% burn their solid waste and 49% bury their solid waste.In terms of waste minimization practices as shown in Figure 9, in Abuja 32.3% of

respondents practice waste reduction, 17% of respondents recycle and 15.9% of respondents compost organic waste.

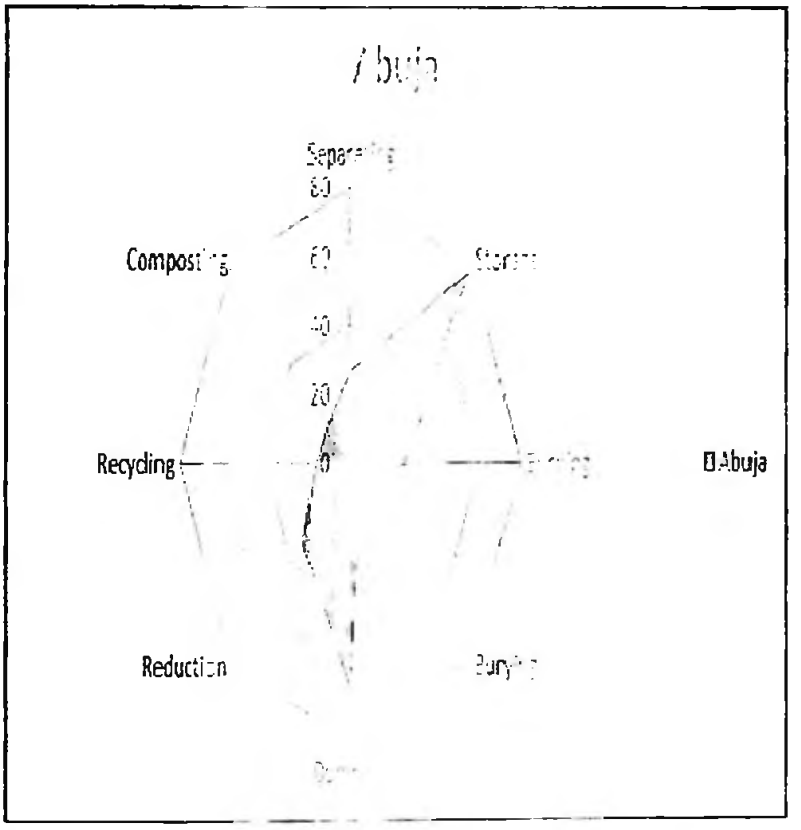


Figure 2: Radial Diagram Showing Pattern of Solid Waste Management Practises

Rahji and Oloruntoba (2009) in their study of urban residents of Ibadan, Nasarawa found about 14% of the households use municipal dumps. The most common disposal method is the empty plots/uncompleted buildings by 75% of the households, dumping by highway bushes/streets 60% and disposal by private firms 2%. About 53% of the households used any drainage/streams/ponds and

55% of the households used recyclable collectors to dispose of some household waste materials which had economic value. Results indicate that households had more than one illegal and unhygienic refuse disposal dump within the neighborhood. Nabegu (2010) found only 20% of the residents in Kano State, Nasarawa received solid waste collection services by the municipality.

4.3 Data Presentation

This section of the paper presents the result and analysis of the data obtained from the questionnaires distributed.

Table 3: Major causes of poor waste management on highways

S/N	Cause	Frequency	Percentage
1.	Improper disposal	16	32%
2.	Inefficient collection method	10	20%
3.	Laziness	2	4%
4.	Ignorance	5	10%
5.	Insufficient coverage of the collection system	14	28%
6.	Increased population	3	6%
7	**Total**	**50**	**100%**

Source: Author's archive, 2018.

i. **Improper disposal:** This refers to the indiscriminate discharge of garbage in illegal places. The improper disposal of municipal waste has a serious and dangerous impact on a wide range of areas. Garbage thrown in the street or in open spaces creates a public health hazard, while waste dumped near rivers,

lakes and streams contaminates the water supply. 32% of the respondents agree that it is a major cause of ineffective waste management along the highway.

Plate 1: Picture showing improper disposal of waste along Abuja-Keffi Expressway

Source: Author's Field Survey, 2015.

ii. **Inefficient** collection method: The residents and traders along the Abuja-Lafia highway are expected to store their refuse neatly in a bag for onward collection by the waste management board but the collection method adopted on this highway is inefficient as the board rarely come for the collection. Sometimes, they complain of the vehicles for collection or inadequate funding. Although, the vehicles generally are too old and too few in number. This problem is primarily due to poor maintenance and the lack of a vehicle

replacement policy. 20% of the respondents identified inefficient collection method as a major cause of poor waste management on the highway.

Plate 2: Pictu[illegible] collecti[illegible] of waste along Abuja-Keffi Expressway

Source: A[illegible] 13.

iii. **Laziness:** [illegible] and traders along the highway find it difficult to w[illegible] e disposal bins in their area to drop their refuse. What [illegible] or an alternative which at times is on the highway, [illegible] ainage canals.This is an act of laziness on the part of [illegible] sers of the highway. Only 4% of the respondents a[illegible] aziness affects waste management on the highway.

iv. **Ignorance:** [illegible] poverty may be adduced to the habit of most people [illegible] in the densely populated states. It beats one hollow to see people dump [illegible] eir refuse on the side of the highway in

broad daylight or commuters throwing biscuit wrapper, pure water nylon etc. while on transit 10% of the respondents agree that ignorance is a factor in poor waste management on the highway.

Plate 1: [illegible] woman disposing wastes along Abuja-Keffi Expressway

Source: Author's field survey, 2018.

v. **Insufficient [illegible] collection system:** This is the situation where some a[illegible] collection. This is as a result of inadequate number [illegible], dearth of fund, poor technical known–how, poor m[illegible]ient funding and lack of motivation which has b[illegible] responsible for effective and safe waste manage[illegible]te. 28% of the respondents identified insufficient [illegible] of the collection system as a major cause of poor waste manage[illegible]

vi. **Increased** [illegible]: The population in major cities in Nigeria keeps increasing. The explosion in population growth has negatively impacted on the management of solid domestic waste in the country. Population growth goes hand in hand with increased pollution and environmental decay. Therefore, increased population of the towns along the highway affects the management of the waste generated. Only 6% of the respondents are of the opinion that increased population is a factor in poor waste management on the highway.

Table 4: Effects of poor waste management on highways

S/N	Effects	Frequency	Percentage
1.	Environmental effects	16	32
2.	Health effects	20	40
3.	Social effects	9	18
4.	Economic effects	5	10
5	**Total**	**50**	**100%**

Source: Author's Archive, 2015.

(1) Environmental effects: The environmental effects on the highway include air pollution (odour, smoke, noise, dust, etc.), Waste pollution – pollution from disposal site via flooding because of blocked drains and land degradation. Contamination of waste causes severe problems for humans and animals. It causes the depletion of the ozone layer as well. These impacts are not confined merely to the disposal site. On the contrary, they

pervade the [illegible] surrounding the site and wherever the wastes are generated, spread, or [illegible]ulated. Unless an organic waste is appropriately managed, its adverse [illegible]act will continue until it has fully decomposed or otherwise stabilised. [illegible]% of the respondents are of the view that poorly managed wastes on the highways causes environmental hazards.

(2) **Health effects** : The health effects of poorly managed wastes are numerous on man. It [illegible] in form of health problems such as convulsion, dermatitis, irritation of the throat, aplastic anaemia, skin burns, chest pains, blood disorders, [illegible] aches, vomiting diarrhoea, lung cancer and death. Other health effects includes: injuries from glass, razor blades, syringes, tissue damage or infection through respiration, ingestion or skin contact. The environmental effects lead to the health effects. 40% of the respondents identified [illegible] health related problems as the major effect of poor waste management on the highways.

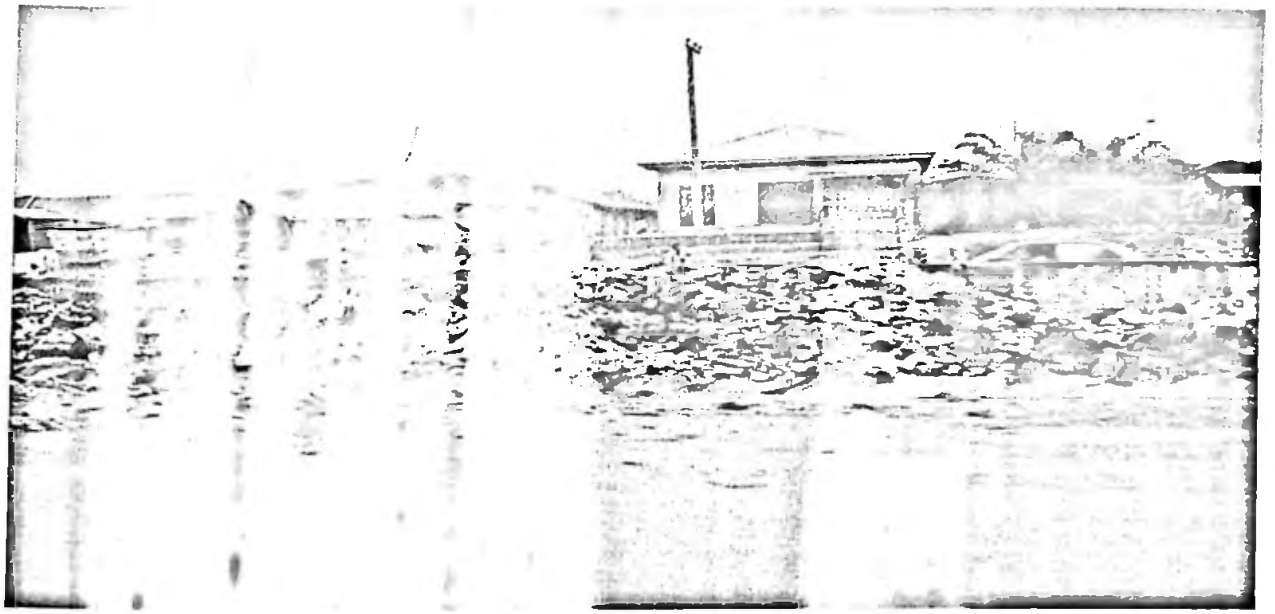
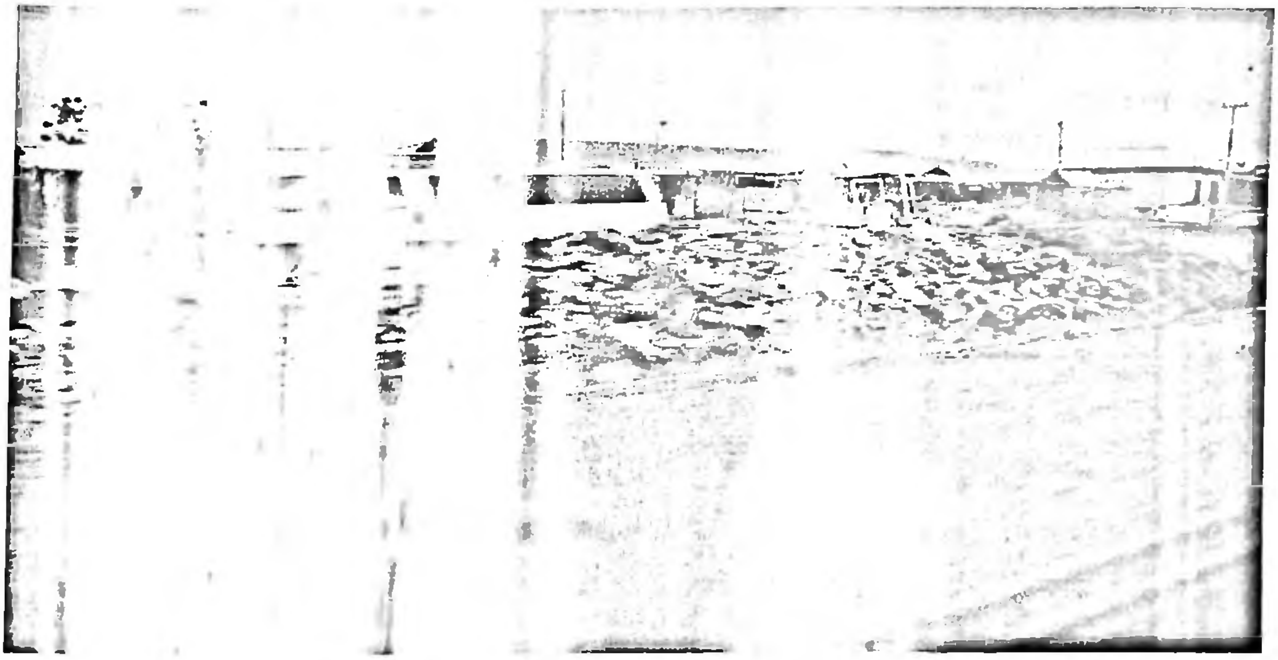


Plate ... of refuse at Ado along Abuja-Keffi Express ...
Source ... 2018.

(3) Social ... dents said the poor waste management on the ... king their environment dirty and therby creating ... ocial effects are enormous. For example, people living near the refuse ... be seen as being dirty even when they are not. ... they may be reluctant to invite friends to their house due to the ... are countless stories of social effects on people living ...



Pla**te** ... ng ... -Keffi Expressway being decorated with ref**u**se

So... ... 18.

(4) Econ... of ... pondents are of the opinion that poor waste manag... ... economic effects on them. Some say it has affec... ... as ... get less patronage due to the refuse. They com... ... st... d that, they can not withstand the odour so they h... ... ew ... do their businesses.

4.4 Summary of Findings

In terms of solid waste management practises, in Abuja only 42% of residents have collection services available to them provided by the municipality. Recycling is also not well advanced in 17% of population recycle. In Abuja residents practice more unsustainable waste management practices; waste burning and dumping with neighbourhoods, Abuja residents show a higher percentage for waste separation and waste reduction which is more reflective of the harsh economy of the country. Where waste separation is carried out towards encouraging recycle through selling the items in demand to scavenger and waste reduction is carried out due to the scarcity and high cost of food. Waste minimization still has an issue that has not been addressed in Abuja and strategies need to be implemented to increase the rate of recycling, composting and reduction of waste that requires final disposal. Open dumping within neighbourhoods is a common practise in Abuja at 80%. The open dumps in FCT can be attributed to the irregular frequency of waste collection and waste collection services are not available in all districts. The frequency of daily waste collection by the municipality is 13.3%.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

Environmental hazards of varying magnitude dangerously threaten human and animal lives in most urban centers in Nasarawa. As the case of Abuja-keffi expressway, used in this study revealed, rapid urbanization, rural-urban migration, little or no town planning efforts coupled with attitudinal irresponsibility, lack of political will, ineptitude and graft have independently and collectively created environmental challenge in Nasarawa. With human/solid waste decorating street corners and public space everywhere in Nasarawa, the study teased out the institutional measures taken to confront waste management in Nasarawa. Can Nasarawa cope with the consequences of the avalanche of solid waste its citizens produce daily? What values of cleanliness abound amongst the people and why do we have solid waste all around? By adopting the sociological approach, the study answered these and many other questions using archival and survey research methods. As the study found, solid waste management has overwhelmed Nasarawan government. Besides, the spirited efforts to combat the problem, which began, for Abuja, in 1999 under President Olusegun Obasanjo has since been relaxed under the incumbent, President Umaru Yar'Adua.

5.2 Conclusion

Municipal solid waste management is fast becoming an environmental issue in Abuja, with current practises being unsustainable resulting in visible environmental hazards. Agwu (2012) also found similar finding in his study which concluded Port-Harcourt city residents" waste management practices are unsustainable. There is no clear system for waste management in Abuja. Many issues and problems have been identified in the course of this research study. It is of importance for a basic waste collection service to be established and available in districts of the federal capital with a separate management system for hospital waste. This will prove a difficult task when the institutional body is not integrated and laws are not clearly stated or comprehensive guideline needs to be adopted or formulated, modified for each aspect of waste management processes. There are enabling statutes to follow clearly stated duties and procedures. This paper has looked into the effects of poor waste management on highways, the methods of waste management, stages in waste management and the causes of poor waste management. The issue of solid waste management is no longer new in Nigeria as the government is making efforts at solving the problem which has now become an eye-sore on our highways. Attempts at solving this issue should be a collaborative effort between the government and the citizens as

the government alone cannot solve the problem. The growth and development of Nasarawa as a nation is strongly dependent on her ability to tackle the issue of waste management. This issue is of international concern as it affects not only developing countries but the developed countries as well. However, it should be realized that as important as waste management is to the government, it cannot be sustained without adequate contribution from the city dwellers and travelers plying the highways. Therefore, all hands must be on deck to ensure an effective management of wastes on our highways and in the country as a whole.

5.3 Recommendations

The following recommendations are being proposed to enhance effective management of wastes on our highways.

- There is need for a vigorous public campaigns to be launched by the Government, Non-Governmental Organization (NGO), Agencies and others stakeholders to sensitize the general public on the need to have a clean environment.
- Proper funding of the various agencies responsible for effective and safe waste management should be the priority of the Federal and State Government to ensure a clean environment.
- The government should encourage private support programme on the highways as it is being done in Lagos state.

- The users of the highway and the general public need to be sensitized on the need to keep the highways clean by desisting from improper disposal of wastes on the highways
- It should be mandatory for all commercial vehicles to have a wastedisposal basket in their vehicle
- There have been several laws enacted on the subject matter but there is need for strict adherence and policies that will be implementable.
- There is an urgent need on the highways for well trained staff (highway managers), vehicles, trucks tippers, pay loaders, waste bins and bulldozers which must be backed up with well stocked maintenance store provided for spare parts of all equipment.
- Professionals in the industry should brace up for this challenge by working on other means of tackling the issue of poor waste management.
- For effective management of wastes on highways, the three (3) "R"s which are Reduce, Reuse and Recycle must be put in place.

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