

**ANALYSIS OF THE CHARACTERISTICS AND COMPOSITION OF
SOLID WASTE IN KPAKUNGU, MINNA, NIGER STATE, NIGERIA**

BY

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M.TECH/SSSE/2006/1491**

**DEPARTMENT OF GEOGRAPHY
FEDERAL UNIVERSITY OF TECHNOLOGY,
MINNA, NIGER STATE**

JUNE, 2009

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**A THESIS SUBMITTED TO THE POSTGRADUATE SCHOOL,
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, IN PARTIAL
FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF
MASTER OF TECHNOLOGY (M.TECH) DEGREE IN
GEOGRAPHY (ENVIRONMENTAL MANAGEMENT)**

JUNE, 2009

DECLARATION

I hereby declare that this research project has been conducted solely by me under the guidance of Dr A.S. Abubakar of Department of Geography, Federal University of Technology, Minna and I have neither copied someone's work nor has someone else done it for me. Credit has been given to writers whose works have been referred to in the project.

Mohammed Lawal Audu

Student Name

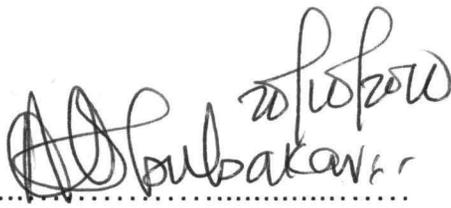
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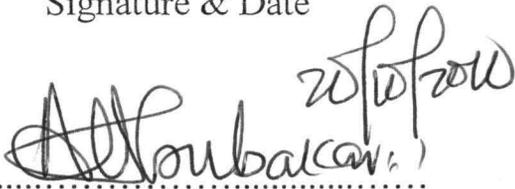
CERTIFICATION

This thesis titled: Analysis of the Characteristics and Composition of Solid Waste in Kpakungu, Minna, Niger State, Nigeria by: Audu, Mohammed Lawal (M.Tech/SSSE/2005/1491) meets the regulations governing the award of the degree of M.Tech of the Federal University of Technology, Minna and is approved for its contribution to scientific knowledge and literary presentation.

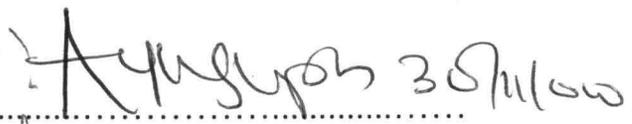
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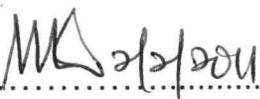
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DEDICATION

This project is dedicated to my beloved daughter Nana Asma'u.

ACKNOWLEDGEMENTS

I wish to thank almighty Allah for giving the chance to write this project. My sincere gratification goes to my able supervisor Dr. A.S Abubakar, who, without his dedication, this would have not been possible. Same gesture goes to other members of staff of the Department of Geography, Federal University of Technology, Minna. My colleagues for the Masters degree programme, such Abbas Tayo Iyanda, Cordelia, Col. Fagge Awwal Jibrin, Monsoor Aderoju Laide, Askira Zikwi Adamu, Binta Ankuma, Tsado Faith, Atiku Abubakar Musa and a host of others. My thanks go to my parents Alhaji B.M. (CON) Audu Marafan Tsafe and Hajiya Tambaw Hajara Audu for giving me all the moral support. My wives Hajiya Hannatu and Hajiya Hadiza for enduring my absence during my time in the University. My kids Maryam, Sadiq, Aisha and Asma'u, for really supporting me. My General Manager Alh. Mamman Bawa for giving me all the support and encouragement I needed.

ABSTRACT

Urban waste generation and accumulation constitute one of the major problems in and around many of the cities of the Third World. These wastes have different characteristics and compositions, which could have different affects, both to the environment and the residents. Thus, analyzing the different compositions and characteristics forms an important step in the process of managing these wastes, in order to achieve a sustainable urban living. Kpakungu is one of such suburb area of Minna being affected by solid waste problems in its various sections. There were lot of open dump sites harbouring different rodents and insects, offensive smells, litters of paper, polythene bags, plastic and organic matter. This work, therefore, aimed at analyzing the various compositions and characteristics of solid waste in Kpakungu suburb of Minna, so that appropriate waste management strategies could be identified and proffered in solving the solid waste problems. Data used for the work is primary data, collected through the use of questionnaire, on the nature of domestic household waste generated, disposal methods, availability, sufficiency and accessibility of public waste disposal sites, and common diseases related to vectors harbouring the waste disposal sites. Method of data analysis include the use of descriptive analysis, such as summarizing the questionnaire responses to obtain percentages and proportions of the various variables used in the questionnaire. Results obtained showed that high volumes of refuse are generated in the area, having high moisture contents from organic refuse, which serves as a suitable condition for disease vectors like rodents and insects. It was also indicated that the method of waste disposal in the area was majorly through disposal at public dump sites, which were not regularly being evacuated by the authorities concerned. The most common illnesses among the residents of the area includes such as malaria, diarrhea, typhoid and dysentery, which are attributed to the lack of efficient evacuation of dumpsites, where the disease vectors thrive. It was further recommended that regular evacuation of the refuse, provision of access roads for the evacuation of the refuse, and public enlightenment on the health risks posed by the refuse accumulation be adopted in managing the problem.

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CHAPTER ONE

INTRODUCTION

1.0 Background of the Study

Solid waste can cause pollution to air, land and water (including underground water through leaching). About 85% of all refuse is dumped with no prior treatment other than the almost random removal of large desirable items, e.g. masses of metal from it. (Henstock et al. 1975). A more scientific study carried out by the then Federal Environmental protection Agency (FEPA) in 1989, shows that toxic substances like Polychlorinated Biphenyls (PCBs), gammalin 20, and heavy metals like lead, iron and copper are wastes from dumpsites into receiving surface and groundwater, thereby constituting great health hazards to plant and animal lives (Ologe 1992).

Solid waste dump sites are ugly sights. They produce, in most cases, bad, uncomfortable odour and also block drainages. The dump sites, especially when unchecked, take up street spaces. Some wastes decompose and leach into streams and underground water and those that leach into the water are poisonous and so poison both water and aquatic life. They also generate airborne diseases and other health hazards. Most inhabitant of

Kpakungu are faced with many health problems as a result of un-effective management of solid waste. There can be contraction of respiration diseases like asthma, bronchitis, and other health problems. There can also be poor visibility and eye irritation due to air pollution, there is also littering of refuse on major roads which cause road accidents and blockage of drainage systems in the area. Accumulation of solid waste serve as a breeding place for various rodent and other disease carrying vectors. Population growth, rising standard of living and the rapid pace urbanization and industrialization pose many environmental challenges for large cities. They have contributed to an increase in the amount and type of solid waste generated by different human activities. Solid waste management has continued to be a major development challenges. Nigerians, particularly those living in the urban areas, are now having constant memories of huge heaps of garbage in open spaces, especially if they have to cover their noses against all forms of odour when passing by the heaps. There is a general concern that a lot of heterogeneous waste is generated and the volume and types have been on the increase in the country.

By 1989, an estimated 2.2 million tones of garbage per year was being generated in Nigeria, equivalent to about 20kg of solid waste per capita. It is estimated that by the year 2010, Lagos metropolis alone may be generating more than one million tones of solid waste per year (NEST, 1991). There is clear evidence that the volume of solid waste is overwhelming urban administrator's capacity to plan, evacuate and dispose waste. Yet we are running out of space to put all the trash we generate. In view of the constant land area and increased urbanization which may be reducing vacant lands, there is the justified fear that if appropriate measures are not put in place for sustainable waste management, Nigeria may be overwhelmed if not consumed by waste.

The management of solid waste generated within our urban centers has become one of the most intractable problems of development. In the last two decades, there has been a phenomenal increase in the volume and range of waste produced in Nigeria. This is due to tremendous increasing rate of population growth, urbanization, and industrialization, as well as generation economic growth. It is not uncommon to find urban waste blocking streets roads and water ways there by contributing to the problem of flood disaster in cities like Lagos and Ibadan. Thus there is the need to keep

talking about waste and its management for sustainable development. Because humanity is responsible for its generation, waste management is also our responsibility. Solid waste pose significant threats to public health and the general environment if they are not stored, collected, and disposed of properly. The most serious effects of improper solid waste management includes air pollution, contamination of drinking water sources and the spread of environment-related diseases. These problems suggest the need for decision-makers to find appropriate solutions to the problems of waste management in our urban centers.

Although Niger State has not been mentioned prominently as a state with acute waste management problems, there is, however, a growing evidence that the little that is being generated is not been properly managed. This has raised some concern among planners and decision-makers. To further consolidate its efforts in getting rid of solid waste in its urban centers, the government of United Nations Development Programme (UNDP) to facilitate a process that would lead to the development of a sustainable strategy for proper solid waste management in the main urban centers of the state. The main objective of the support was in preparation of a state strategy for waste management.

The process followed from the development of the strategy included:

- i. Undertaking a survey of waste generation and management.
- ii. Evaluating the current institutional arrangement for waste management in the state.
- iii. Developing a training module on waste management;
- iv. Sensitizing critical stakeholders (e.g. state Environmental Protection Agency, waste management organizations, local government, private sector operator, NGOs and individuals) on roles and responsibilities for waste management, as well as on the critical elements of waste management strategy;
- v. Guiding the stakeholders on the preparation of a state strategy for waste management.

1.2 Statement of the Problem

Despite various efforts, it is becoming clear that present system of waste management have not been able to satisfy community needs for an acceptable cleaning level, as well as in reducing the general health and environmental impacts of waste to improve the general aesthetic appearance of city landscapes. Evidences of increasing frustration for Kpakungu area of Minna are reflected in:

- i. Persistent waste accumulation that is evident in various locations of the urban areas. These locations are consistently liable to various vectors (rodents and insects) and foci to serve environmental pollution, repulsive and very bad smells and disgusting appearance. When these wastes are burnt on dump locations, these accumulations have negative environmental and health impacts and implications.
- ii. Ineffective and environmentally unsound handling, treatment and recycling of waste that often result in health risks to workers.
- iii. Indiscriminate and open dumping with its attendant high environmental and health risks.
- iv. Free access to collection centers.
- v. Public awareness.
- vi. Skilled public Health risks.
- vii. Public awareness.
- viii. Inadequate coordination among the agencies responsible for environmental cleaners.

1.3 **Aim and Objectives**

This project was aimed at examining the characteristics and compositions of solid waste in Minna metropolis, using Kpakungu as a case study. The specific objectives to be pursued include:

- i. Identification of solid waste characteristics and composition in Kpakungu area of Minna.
- ii. Examination of the health impacts of solid waste on the residents, and availability of healthcare facilities in Kpakungu.
- iii. Providing appropriate waste management strategies for Kpakungu area.

1.4 **Geographical Location of the Study Area**

1.4.1 **Location:** Minna is located approximately on longitude $6^{\circ}38'E$ and latitude $9^{\circ}35'N$.

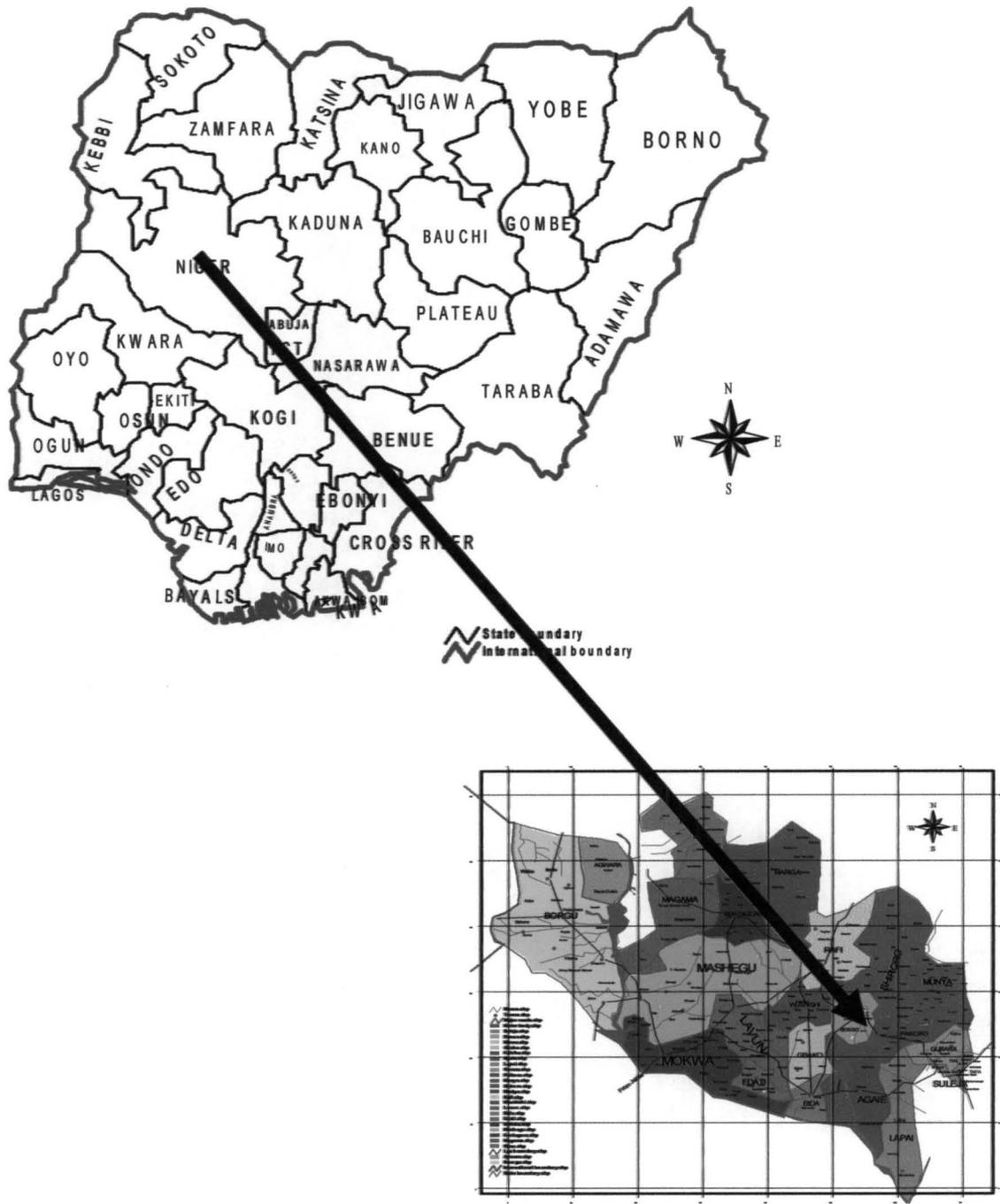


Fig. 1.1: Locational Map of Niger State, Nigeria



Fig. 1.2: Locational Map of Minna, Niger State

1.4.2 Climate

Adefolalu (1992) has summarized the rainfall characteristics of the study area from January to December. Rainfall between January to March is very low ranging from 5mm in January to about 40mm in March. Between April, May and June the rainfall increases from 60mm to 170mm. Rainfall between July, August and September is very high (from 220mm to 300mm). Rainfall starts decreasing from October (100mm) to December (5.0mm).

1.4.3 Terrain Features and Geology

The topography is gently undulating and varied in heights. Isolated hills are common. The study area is underlain by the rocks of the Precambrian Nigerian basement complex with metamorphic and igneous rocks.

1.5 Justification

Like in many developing countries where services are inadequate, waste disposal is a major problem in many urban areas of Nigeria. Rapid urban growth, increasing per capital production of solid waste

and non-availability of land conveniently suitable for waste disposal are further aggravating the situation. In most cases, less than half the waste generated in urban areas are collected by municipal authorities who are entrusted with their disposal. Kpakungu area of Minna is a complete slum with refuse dump sites scattered all over.

In the absence of a functional solid waste collection system, waste is dumped in open spaces, on access roads and along watercourses. An emerging trend in Nigeria is the invasion of dumps by scavengers and animals that scatter the waste, and so serve as breeding grounds for disease vectors. Leachate from decomposing and putrefying garbage percolate into soil and nearby water sources. The resultant contamination of food, water and soil could be responsible for the transmission of many disease. Uncollected blocked, and thereby, promote flooding and breeding mosquitoes, as evident in Kpakungu main drainages.

Many financial, institutional, technical, and socio-cultural factors are responsible for the low level of waste disposal being witnessed in many urban areas of Nigeria. They include the following.

- i. Poor municipal resources compounded by inadequate resources mobilization strategies,
- ii. Over-reliance on imported equipment,
- iii. Inappropriate methods of finance in view of the fact that many waste collection equipment have short lifespan that are not suitable for financing under very long-term soft loan,
- iv. Use of inappropriate technology, and
- v. Failure to invoice the people in the management scheme, including paying for the services.

CHAPTER TWO

REVIEW OF RELATED LITRATURE

2.1 Waste Generation

Solid waste, especially in the developing world, comes from different sources. The sources are classified into domestic institutional, commercial, agricultural and industrial (Onianwa, 2002), each of which can further be examined based on the socio-economy and culture of the society that determines the composition of the refuse. FMHE (1982) survey revealed from the study of six (6) Nigerian cities that refuse generation from Abuja had 65.5% as ash /dust / stone while Warri had the least of 5.9% in the quantity of food remnant, Port-Harcourt had the highest of 30.3% and Ibadan recorded the least with 6.0% for bottle and glass, Lagos recorded 15.4% against Kano's 4.6%. Tins/metals constituted 20.6% of waste in Warri against 6.0% for Abuja. Other constituents include rags for which Ibadan recorded 4.5%.

The major indicator and determinant of waste generation is the level of economic activity of particular country (UDBN, 1998). It has been noted that per capita rate of solid waste generation increases as the standard of living improves (UNCH Habitat 1984). The generation rate is influenced

by factors such as climate, cultural and economic status and to some extent population size and level of economic development. The rate of generation also varies by ecological zones with the highest value of 49kg/day in the tropical rain forest and lowest value of 0.37kg/day in the mangrove forest. The corresponding rates for Guinea and Sudan Savannah are 0.4kg/day and 48kg/day respectively. Oyinlola (1998), in a study in Kaduna (which was the area of concern), have shown to generate 280,925 Kg in 1985, 324, 084 in 1990 and was projected to generate 4,031, 314 in the year 2000 (FMHE, NEST 1991). It is therefore established that waste generation is daily on the increase as population and per capital income of individuals increase.

2.2 Collection and Storage

Solid waste collected by household and its storage either by individual household or community is a very important determinant of a successful waste management system. The storage system of refuse in any society is determined largely by the available technology, the socioeconomic status of the society, by and large the role government plays in waste management are related. The efficiency and effectiveness of collection is

intimately related to the method of household or communal storage selected (Sridar 1994).

There are basically two categories of storage systems considered, that is, the household separated unit and communal storage. The former constitute the most common and are determined by individual themselves such as cardboard cartons, plastic bags, crates which are mostly temporary, while plastic or metal bins mostly are permanent in future. The standardized containers bare usually plastics or metal bins with lids plastic bag are generally considered in appropriate for standardized application in less developing countries, they are subject to being torn by scavenging animals and the interfere with some resource recovery system (SANDEC 1996).

The communal storages are usually determined by government or the community itself. The point serve as determined by the population of the community, space available and its distance to the beneficiaries. Observations in China and Africa have shown most beneficiaries seem prepared to carry the waste 50-100 meters to a communal storage point but not more than 250 meters (SANDEC 1996).

2.3 Indiscriminate Dumping

Olaniran (1995) stated that “one of the major environmental health problems facing Nigeria especially in the major cities, is poor solid waste management at the municipal, (local government), state and national levels”. Apart from the huge tons of solid waste generated, a much more serious and intractable problem is the attitude of some Nigerians with regards to solid waste (refuse), which is the order of the day in most urban areas. Refuse is dumped on the road sides, in the streets, gutters (drainage system), markets, open spaces and around residential areas. This attitude makes it difficult for any management authority to have an organized system of collection and disposal since the dumping is indiscriminate. Therefore the cost of its evacuation increases, extenuating the scarce resources available for solid waste management.

2.4 Characteristic and Sources of Solid Waste

The type of living area determines the nature and characteristics of waste produced in a community. Solid waste generation varies from place to place and also from season to season. According to the survey carried out in sectors, the area population that are living in the slums generate

more organic contents such as combustible debris like leaves, vegetable matters and agricultural wastes (SANDEC 1996).

2.5 Health Problems Associated with Solid Waste

The presence of waste indiscriminately in urban areas has not only posed a threat to public health but it is also a source of pest and vermin breeding ground and source of fire out-break, it also constitutes problems to traffic flow. A more scientific study carried out by the federal environmental protection agency (FEPA) in 1989, shows that toxic substances like polychlorinated biphenyls (PCBs), Gammalin 20 and heavy metals from lead, iron and copper are wasted from dump sites into receiving surface and groundwater, thereby constituting great health hazards to plant and animal lives (Olokesusi 1994).

Solid waste dump sites are ugly sties. They produce in mast cases bad, uncomfortable odour, they also block drainages. The dump sites especially when unchecked, take up streets spaces. Some waste decompose and leach into streams and underground water, etc. some that lead, in to water are poisonous and so poison both water and aquatic life. They also generate air borne disease and other health hazards. Solid

waste in particular and waste in general cause a lot of environment problems that directly or indirectly affect human beings.

2.6 Cause of Indiscriminate Disposal of Waste

The management of municipal solid waste in Niger State has not been effective. The management of municipal solid waste has with government. There are a lot of problems that have been militating against municipal waste management in the state. These includes:-

- a. Inadequate financial resources
- b. Lack of public awareness
- c. Lack of incentives
- d. Inadequate human and material
- e. Inadequate training on the part the local government staff.

Most of these problems can be solved by making available enough financial resources. There is also the need for capacity building and finally, in order to ensure that the provision of the policy on municipal solid waste management is successfully achieved, proper monitoring, and evaluation of all municipal waste programmers should be carried out.

2.7 Management of Solid Waste

Olaniran (1995) stated that one of the major environmental health problems facing Nigeria especially in the major cities is poor solid waste management at the municipal (local government), state and national levels. Waste management authorities are faced with the task of choosing the best options for managing solid waste. Sridhar and Adeoye (1999) suggest three principal methods of refuse disposal. They are the sanitary landfill (or land reclamation), incineration and composting.

2.8 Stakeholders in Solid Waste Management

For sustainable management of municipal solid waste, it is important to recognize the diverse interests and roles of various actors and partners including households, community groups, NGOs, governments organized and informal private sector enterprises.

2.8.1 Residential Household are mainly interested in receiving effective and dependable waste collection service at affordable prices. In general, disposal is not normally a priority demand of service users, unless their quality of life is threatened by dumpsites. It is, therefore not surprising to find that where waste management services are not

satisfactory, solid waste is commonly dumped onto nearby open sites, along main roads or railway tracks, or into drains and waterways. Thus, it is imperative to note that pressure to improve waste collection and disposal will increase when poor people become more aware of the environmental and health implications of poor waste collection service.

Poorly served residents can also form community-based organizations that when sufficiently organized have considerable potential for managing and financing local collection services and operating waste recovery and composting activities.

2.8.2 Commercial and Industrial Establishment

Are interested in effective waste collection and, in many cases, waste minimization. Because of their usually keen interest in reducing waste generation, industrial enterprises, in particular, could play an active role in managing waste collection, treatment and disposal in collaboration with governments and/or specialized private enterprises.

2.8.3 Non-governmental Organizations (NGOs)

NGOs may help to increase the capacity of communities for sustainable waste management by contributing to:

- i. People's awareness of waste management problems
- ii. Organizational capacity and formation of CBOs;
- iii. Liaison between CBOs and government authorities;
- iv. People's voice in planning and implementation process for waste management; and
- v. Technical know-how of locally active CBOs.

In addition, NGOs may provide important support to informal sector waste workers and enterprises, assisting them to organize themselves, to improve their working conditions and facilities increase their earning and extend their access to essential services.

2.8.4 Organized Private Sector Enterprises are primarily interested in earning a return on their investment by selling waste collection, transfer treatment, recycling and/or disposal services. They are in position to provide capital, management and organizational capacity, labour and/or technical skills, and can, provide ISWM services more

effectively and at lower costs than that of the public sectors. To decide whether to have private sector participation in municipal solid waste services, many factors need to be analyzed, such as cost recovery, efficiency, public accountability, management, finance, economies of scale, legislation, institutions and cost. Methods of private sector participation most common to solid waste management are contracting, concession, franchise, and open competition. This makes the involvement of the private sector in waste disposal and management imperative.

2.8.5 Private Sector Actors. The basic motivation of the informal Private Sector Actors is self-organized revenue generation. This sector is made up of unregistered, unregulated activities carried out by individuals often driven by poverty to work waste collectors.

2.8.6 Governments. Governments, by their nature and constituted disposition, are generally responsible for the provision of solid waste collection and disposal services. This is due to the fact that they become legal owners of waste once it is collected or put out of collection. Responsibility for waste management is usually specified

by laws and the 1999 Nigeria Constitution, the authority to enforce bylaws and regulations, and to mobilize the resources required for solid waste management is in principle, conferred upon local governments. On the other hand, federal and state governments are responsible for the waste management institutional and legal framework. In this regard, problems can arise when local government authority is not commensurate with its solid waste management responsibilities.

2.9 Determinants for Sustainable Solid Waste Management

The effectiveness and sustainability of solid waste management system depend on a number of factors that need to be adapted to the prevailing content of the local conditions in which they operate. Some of these are outlined below, and they concern political, socio-cultural, economic and environmental aspects of waste management.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Data Collection

The data set obtained for the research is by reconnaissance survey and administration of questionnaires. The data collected was presented using the pie chart form, and later discussed using the responses of the majority to judge in each case. 500 questionnaires were developed by the researcher and administered, 325 were returned. The set of data obtained include land use characteristic, health data on prevalent diseases, and composition of solid waste generated in Kpakungu area of Minna.

3.2 Methods of Analyses

The relevant information gathered throughout the various methods stated were properly presented and analyzed using the descriptive analysis methods. The computations were based on the returned questionnaires for all the items. The results obtained from the administration and analysis of questionnaires and reconnaissance survey were summarized and tabulated. The Kpakungu area has been divided into three sectors for easy reference and identification. In the Minna area and suburbs, about 14 private

companies are engaged in the evaluation, transportation and deposition of solid waste with specific areas of coverage (See Table 3.1).

Two dumping sites have been allocated for dumping of collective refuse in Minna. One is located along Bida Road behind compost plant while the other one is located along Kuta Road at Maitumbi. The two have burrowed pits. The registered companies vested with the responsibility of refuse collection and disposal to these two sites are given in Table 3.1

Table 3.1 Registered private companies involved in refuse collection and disposal in Minna.

N	NAME OF COMPANY	AREA OF COVERAGE
	Alif Maintenance Solution	Tunga, Farm Center, Old Custom Quarters, Tunga Intermediate Quarters
	Tacho Investment	Bay Clinic, NITECO, Kolawole Road, Talba Investment
	Oi' grien Environmental Service	Barikin Sale, David Umar Quarters and environ
	Aglow Global Concept	All business premises within major roads in the state capital
	AFHMA Environmental Services	Sabon Gari
	Symbol Update	F-Layout, Bosso Estate
	A.Q.S.A Clears	Bosso Lowcost , Nassarawa A Ward

S/N	NAME OF COMPANY	AREA OF COVERAGE
3	Upcbare Environmental Pharmacy	Central Market Oduoye Quarters and Police Barrack
9	Kagera Enterprises	Kpakungu and Soje A and B
0	Roller Holdings	123 quarters and Barikin Sale
1	A and J Formulation International	Limawa and Makera
2	BIZMA	Old Secretariat, Nassarawa B
3	Tsabta Ventures	GRA, Type A and Type B quarters
4	Mai Shara Investment	New Secretariat and Shango

The impacts of these 14 private companies are not much at all. In fact, some of the companies listed only exist on paper, such as Kagere Enterprises that is supposed to service Kpakungu area.

CHAPTER FOUR

RESULTS

Waste management in Nigeria remains an environmental problem that is becoming more complex on daily basis. The current challenge calls for all stakeholders (government, private sector actors, civil society organization and people) to harmonize their activities to promote sustainable management of waste. This chapter therefore sets out the current situation in household solid waste in Kpakungu area of Minna. It identifies a number of factors critical to sustainable waste management in the area.

An overarching strategy can provide a framework within which different actors and stakeholders (e.g. generators, collectors and managers of waste) can move towards more sustainable solutions in a coordinated way. Based on the reconnaissance survey and questionnaire analysis in the area, the following are the summary results on the solid waste composition and characteristics obtained for Kpakungu area of Minna:

4.1 Volume of Solid Waste Generated in Kpakungu

Table 4.1 represents the result of survey of the different sectors of Kpakungu on the volume of solid waste generated yearly, for the different sectors A, B and C. Generally, the waste has low per capita level and high aggregate levels.

Table 4.1 Volume of Solid Waste Generated in Kpakungu

Sector	Volume (m ³ /yr)	Weight (tones/yr)
A	102,000	64
B	120,000	80
C	121,000	83

4.2 Characteristic and Composition of Solid Waste in Kpakungu

Table 4.2 represents the result of survey of the different sectors of Kpakungu on the composition of solid waste, for all the sectors under study.

Table 4.2 Characteristic and Composition of Urban Solid Waste in Kpakungu (from Low, Medium and High Income Earner Households)

Characteristics	Volume/Density Type		
	Low	Medium	High
Paper	12.6	33.7	81.3
Leaves	13.2	11.3	2.5
Garbage	65.3	41.6	8.2
Tin	4.6	6.2	3.4
Glass	2.1	2.5	0.1
Rag	1.6	3.4	4.3
Dust	0.6	1.3	0.2
Density	256kg/m ³	280kg/m ³	296kg/m ³
Moisture content	64.8%	61.4%	49.7%

4.3 Method of Solid Waste Disposal in Kpakungu

Table 4.3 represents the result of survey of the different sectors of Kpakungu on the various methods to which they dispose their domestic solid wastes.

Table 4.3 Method of Solid Waste Disposal in Kpakungu

	Dump Site	Dustbin	Ponds and Gutters	Burning
Number of Respondents	80	120	60	40
Percentage (%)	24.6	36.9	18.5	12.3

4.4: Sources of Solid Waste Generated

Table 4.4 represents the result of survey on the residents of Kpakungu on the sources of solid waste.

Table 4.4: Sources of Solid Waste

Type of solid waste	General Compound	Sources
1. Garbage	Waste from preparation of cooking, left over, markets etc	Household, kitchen restaurants stores and markets
2. Rubbish	Combustible paper, carbon, rags, etc.	Office, household and markets
3. Ashes and Dust	Resides from fire used in cooking, carpentry	Kitchen, Market
4. Street trash	Leaf, litters, cans cobs and fruit peels	Restaurants, stores
5. Abandoned vehicles	Unwanted cars, motor cycles bicycle part other metal	Road side mechanics etc.

4.5: Percent of Households Enjoying Regular Solid Waste Collection in Kpakungu

Table 4.5 represents the result of survey of the different sectors of Kpakungu on the percent of households enjoying regular solid waste collection.

Table 4.5: Percent of Households Enjoying Regular Solid Waste Collection in Kpakungu.

Sector	Male Headed Household (%)	Female Headed Household (%)
A	36.3	18.5
B	10.0	14.0
C	10.0	4.7

4.6: Number and Average Size of Households

Table 4.6 represents the result of survey of the different sectors of Kpakungu on the average size of households, for the different sectors A, B and C.

Table 4.6: Number and Average Size of Households

Sector	Total Number of Households	Average size of Households
A	33,105	6.7
B	20,304	5.2
C	50,450	8.4

4.7: Households Income Distribution

Table 4.7 represents the result of survey of the different sectors of Kpakungu on household monthly income distribution, for the different sectors A, B and C.

Table 4.7: Households Income Distribution

Sector	Lowest (₦)	Highest (₦)	Average (₦)
A	16,000	2,300,000	36,000
B	3,600	320,000	8,000
C	5,000	840,000	12,000

4.8 Communicable Diseases Associated with Solid Waste Disposal in Kpakungu

Table 4.8 represents the result of survey of the different sectors of Kpakungu on the communicable diseases associated with solid waste.

Table 4.8 Communicable Diseases Associated with Solid Waste Disposal in Kpakungu

	Malaria	Diarrhoea	Typhoid	Dysentery
Number of Respondents	80	120	60	40
Percentage (%)	24.6	36.9	18.5	12.3

4.9 Availability of Healthcare Centres in Kpakungu

Table 4.9 represents the result of survey of the people's opinion in Kpakungu on the availability of Healthcare centres.

Table 4.9 Availability of Healthcare Centres in Kpakungu

	Yes	No
Number of Respondents	283	40
Percentage (%)	87.7	12.3

4.10 Affordability of Healthcare Delivery

Table 4.10 represents the result of survey of the people's opinion in Kpakungu on the availability of Healthcare centres.

Table 4.10 Availability of Healthcare Centres in Kpakungu

	Affordable	Fairly Affordable	Not Affordable
Number of Respondents	206	104	15
Percentage (%)	63.4	32	4.6

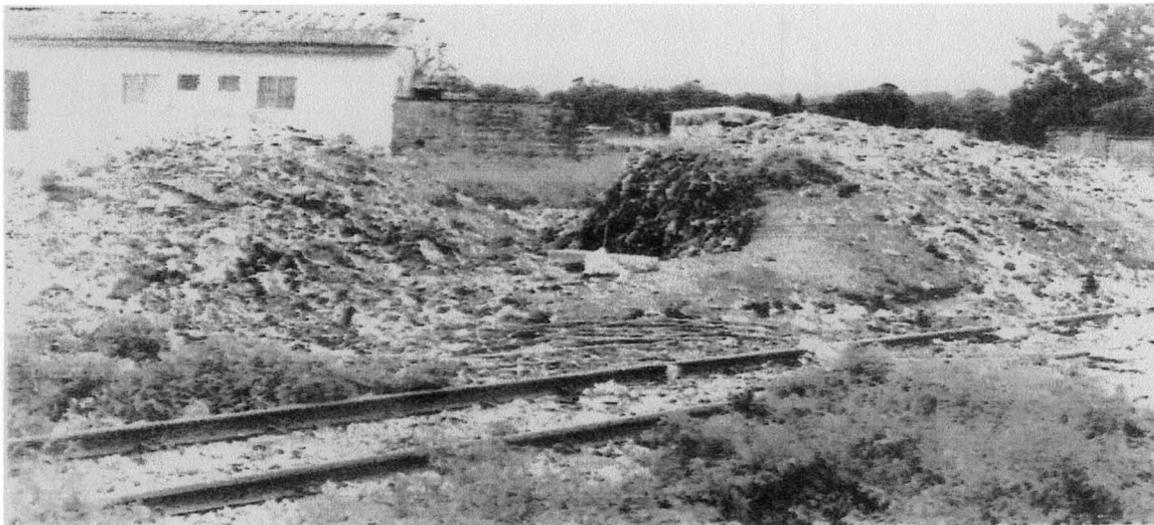


Plate I: Dump Site in Kpakungu Encroaching a Major Rail Track



Plate II: Refuse Dump on a Seasonal Stream around Kpakungu



Plate III: Refuse Dump Claiming a Major Road along Minna-Bida Road



Plate IV: Refuse Collection Trucks Provision not Adequate Enough

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

Based on the questionnaire analysis and reconnaissance survey in Kpakungu area, the following summary of results typifies the characteristics and compositions of solid waste in Kpakungu area of Minna. Information about waste source, generation rate and composition are important as they help in the general planning for an integration waste management system.

5.1.1 Volume of Solid Waste Generated in Kpakungu

Table 4.1 gives the volume of waste generated by each of the sectors in the area. Generally, the waste has low per capita level and high aggregate levels. Because of the social behaviour of the people in the area and high food content, waste in this area is of high organic and moisture content, as well as low combustible matter.

5.1.2 Characteristic and Composition of Solid Waste in Kpakungu (from Low, Medium and High Income Earner Households)

Typical of a low income area, the characteristics and compositions of urban solid wastes in the locality are depicted in Table 4.2. The high moisture

content of the wastes is because of high percentage of food wastes and because they are often stored on the open ground awaiting collection. On the other hand, there are few paper products and non-food items.

Within any of the 3 sectors the quantity and to certain extent, the quality of refuse vary with days of the week, with weeks of months, months of the seasons and with seasons of the year. For efficient refuse collection and disposal, it is important to be familiar with these variations.

5.1.3 Method of Waste Disposal

From Table 4.3, it will be seen that 150 respondents, (representing 46.2%) stated that they dump their refuse on public dump sites, 95 respondent (representing 4.2%) asserted that they dump it inside the dustbin; 55 respondent (representing 16.9%) stated that they dump their refuse into ponds and gutters while 25 respondents, (representing 7.7%) burned their refuse. Observation from the field survey indicates that there exist four dumping sites from different angles. These dumping sites are not accessible to more than half of the population of the residents, due to the distance of these dumping sites.

5.1.4 Sources of Solid Waste Generated

Table 4.4 shows that the quantity of refuse produced at weekends in Kpakungu is often more than that of other days of the week. This is because more people go for shopping at weekends than at ordinary days. In Kpakungu salaries and wages are paid in certain weeks of the months and the quality of refuse produced on such salary and wages weeks have been found to be more than other weeks.

5.1.5 Percent of Households Enjoying Regular Solid Waste Collection in Kpakungu

The waste management in Kpakungu is highly dependent on an active informal network (See Table 4.5). This sector consists of waste pickers itinerant, waste dealers and wholesalers, and small recycling enterprises. Generally, there is poor performance of the formal sector which is basically restricted to:

- (a) Sweeping and kerbside collection;
- (b) Transportation by hand-carts to large or road collection points, which often than not are open dumps; and
- (c) Transportation by vehicles to the disposal sites. As an example, waste collected by the formal and informal sectors in Kpakungu is delivered to one

major destination along a major highway. This dumping in an open field is extremely hazardous to both the environment and health of the people.

Like in many other parts of Nigeria, waste management in Minna has focused primarily on minimizing the costs of collection. Government has thus contracted a consulting firm to manage waste disposal in the State. The approach has not given much attention to key economic goals of waste management such as waste reduction, source segregation, and local recycling. In a similar vein social goals such as sustainable employment generation and environmental goals such as Jitter avoidance, and the care for a healthy and sustainable environment are not properly reflected in the current approach. Yet these constitute economic, social and environmental externalities that affect waste generation and management. It is now accepted that to achieve socially and environmentally sound solid waste management, an integrated approach is not only necessary, but also imperative. Such an integrated approach will take into account the nature of waste generated, the number of stakeholders that are essential and substantial, the environmental, economic and social impacts, as well as the involvement and participation of the private sector operators and community members.

5.1.6 Number and Average Size of Households

Table 4.6 depicts the number and average size of households for the different sectors A, B and C of Kpakungu area. From the table, Section A has total number of households of 33,105; Sector B has 20,3004 while Sector C has 50,450. The average size of households for sectors A, B and C are respectively, 6.7, 5.2 and 8.4 respectively. From these results, it could be deduced that Kpakungu area has high per capita solid waste generation, which is physically manifested in the numerous dump sites that abound in the entire area.

5.1.7 Households Income Distribution

The household income distribution for the different sectors of Kpakungu is depicted in Table 4.7. sector A has the highest monthly household income obtainable, with up to ₦2,300,000 and a low of ₦16,000. This sector presumably is a sector with people mostly of who can afford collective refuse evacuation, as well as higher affordability to health services. Sector B is having the least monthly income, with a record of about ₦3,600, indicating a sector where the majority of the people are poor, therefore can hardly afford collective refuse collection, high incidences of diseases, and

low affordability to healthcare. This is the sector where most of open dump sites and drainage blockages are prevalent.

5.1.8 Communicable Diseases Associated with Solid Waste Disposal in Kpakungu

Table. 4.8 shows that 80 respondents (representing 24.6%) stated that the most common ill - health is Malaria; 120 respondents (representing 36.9%) stated that diarrhoea is more common; 60 respondents, (representing 18.5%) sited typhoid fever while 40 respondents (representing 12.3% said is dysentery. This indicates that the common ill health suffered by the residents of Kpakungu is diarrhoea, Malaria fever, typhoid etc. Diarrhoea has higher incidence in the study area, followed by malaria and typhoid fever. The disease vectors (especially mosquitoes and houseflies) are mostly found in open refuse dump sites and in blocked drainages, which were seen at different locations in the study area (see plates I, II, III and IV).

5.1.9 Availability of Healthcare Centres in Kpakungu

From Table 4.9, 283 respondents, (representing 87.7%) said there is primary healthcare while 40 respondents (representing 12.3%) stated No. This indicates that, there is a health facility in the area. This is very important

because many minor ailments can be referred to the primary health care centre.

5.1.10 Affordability of the Healthcare Delivery

From Table 4.10, it will be seen that 206 respondents (representing 63.4% agreed that the health facility is affordable; 104 respondents (representing 32%) stated that it is fairly affordable while 15 respondents, representing 4.6% stated that, the health facility is not affordable This indicate that, the health facility is affordable, since 206 respondents; represent the highest numbers who attest that the health facility is affordable.

5.2 Summary

The result from the waste characteristics in Kpakungu shows that for all the sectors, residential (land use) is higher than business, agric, transport and Green private land tenure is also higher than public. Some communicable diseases associated with solid waste in Kpakungu were identified, prominent of which include malaria, dysentery and other forms of fever. Waste management in Kpakungu is of low efficiency, resulting in leftover accumulation that are either removed on irregular basis or burnt on site.

Many factors determine the waste evacuation by Government from the legal and illegal dump sites. These range from availability of plants/machinery, funds, quantity and rate of waste generation, the concern of the surrounding community, the strategic location of the dump site, etc. In most cases, the rate at which government evacuate refuse might depend on the above listed factors, but in all cases, it is the responsibility of the local government to carry out the evacuation because it is within its constitutional responsibility.

Dump sites are expected to be accessible to the community which is not the case with Kpakungu resulting in many of the residents throwing the refuse indiscriminately. Since open van constitute 54% of all means of conveyance of refuse from the dump site to landfill areas, it is necessary to note that this constitute a serious problem as the refuse is thrown and b all the place especially on road.

5.3 Conclusion

In order for the state to achieve the goal of sustainable economic development, it is pertinent that environmental protection must be taken seriously. People tend to believe that cleanliness of the environment is the responsibility of the government, therefore, refuse (solid waste) can be

dumped carelessly for government to evacuate and dispose off. Attitude of the public environmental sanitation authorities has also made people to dump their wastes indiscriminately in open gutters and drains. The non-challant attitude shown by the public towards solid waste management can be minimized. The public should embrace the habit of environmental friendliness by joining hands with the government to ensure that solid waste management is given a priority.

5.4 Recommendations

With the quantity of waste generated daily at Kpakungu area, coupled with the existing heaps of refuse left over, the local government should take immediate action on waste management by clearing all the refuse dump in the area. The evacuation of the refuse should be twice a month or at least once a month in order to maintain a healthy environment and improve the health condition of the residents in the area. The following are some of the useful recommendations:

1. More access roads should be provided for efficient collection and disposal of waste and the number of refuse dump sites should be increased in order to prevent illegal dumping of waste.

2. Making available enough financial resources to carry out the duties of waste management effectively can solve most of these problems.
3. People within and around Kpakungu should be enlightened on the health implication associated with indiscriminate disposal of solid waste.
4. The local government should mount health education campaign at community household levels on safe method of refuse collection/disposal and other positive health habits.
5. They should always make arrangement for the evacuation of waste from public, places dumping sites, motor parks, market place etc.
6. Legislation: Having created enough awareness, the law-making arm of the state government should put forward legislative instrument that would serve to regulate all human activities as regards environmental pollution by ensuring strict compliance of the regulation. This can be achieved through strict enforcement of the environmental sanitation edict by the Niger State government, to control the indiscriminate dumping of refuse and other toxic waste in the environment.

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- c. Other
9. Who supervise the collection?
- a. Government health department
 - b. Local government health department.
 - c. Voluntary organization
 - d. Other.
10. What type have you had among the disease listed below?
- a. Malaria Fever
 - b. Diarrhoea
 - c. Tuberculosis
 - d. Cholera.
 - e. Typhoid
 - f. Dysentery.
11. Do you have a primary healthcare centre in your area?
- a. Yes
 - b. No
12. How affordable is the health care delivery?
- a. Affordable
 - b. Fairly Affordable
 - c. Not Affordable