SOLID WASTE MANAGEMENT IN LAFIA NASARAWA STATE CAPITAL

BY

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PGD/GEO/2000/2001/178

BEING

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DECLARATION

I hereby declare that myself composed this project and that it is the out come of my personal research effort. It has not been presented in any previous application for a higher degree or diploma. All source of information hare been acknowledged by means of reference.

…… ……

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CERTIFICATION

This project entitled solid waste management in Lafia Nasarawa State Capital by Jibrin Usman Bawa (PDG/GEO/2000/2001/178) meets the regulations governing the Award of the Post Graduate Diploma in EnvironmentalManagement of the Federal University of Technology, Minna and its approved for its contribution to knowledge and illitracy presentation.

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DEDICATION

This project is dedicated to my late GrandMother Hajiya Adamu Yahaya and my daughter Sa'adatu Usman Jibrin.

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My *thanks goes to all those who have contributeed to initiation,* direction and compilation of this project. The work has come true as a result of assistance from all those who have aided me in one way or the other. However, the supreme being must be thanked first for whom I felt oblique to acknowledge.

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ABSTRACT

Waste management has been in practice for long, starting with the initial crude methods to the now advance and sophisticated methods.

Solid waste in particular present problems in many countries when it comes to management. The study has investigated solid waste management in Lafia with the main objective of determining if the management programme now is better than it was before. The project was carried out theoretically, practically, statistically and with data sourced from Nasarawa Urban Development Board, Lafia Local Government and the State Environmental Protection Agency and all that were necessary and available used for the study. In carrying out the study, both oral interview, questionnaire and observation method were used on mode of collecting data, while the sampling technique used for the study was the statistical technique. The result of the study affirmed that there is no proper solid waste management in Lafia town, this was associated with the existing management technique.

It was also observed that as a result of ineffective solid waste management, people have converted any available space into dumping ground. This situation has not only cause air pollution, but also lead to sanitary problem around the city. Therefore, necessary recommendation was given at the end of the study which include allocation of adequate resources to efficiently and effectively solve the problem.

Private sectors should be encouraged to participate in waste disposal with a view to solving solid waste management problem in Lafia and Nigeria at large.

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CHAPTER ONE

1.0 INTRODUCTION

Towns/Cities generally absorb a great deal of materials but also transform and reject many. As a result of rapid urbanization combined with industrialization in most of these towns, there are greater concentration of waste than these towns systems can absord (Barry, et al. 1974).

Nigeria like most other developing nations is experiencing a rapid increase in population with the attendant environmental changes which create many more centres of daily activities and the intensity of these centres are of increasing environmental liabilities.

The poor situation of the urban environment in most of our towns has attracted the attention of many in recent years. Despite all these efforts, it is observed that the state capitals are degrading fast in environmental quality due to land pollution resulting from solid waste.

Lafia the capital of Nasarawa State is growing rapidly as a result of its transformation from Local Government Headquarters to a State Capital. These is no doubt that the rapid change that occurred in the structure of the town produced more waste than planned for. This is the case in Lafia as there is much of management problems.

1.2 STATEMENT OF PROBLEMS

undoubtedly, numerous reasons can be adduced necessitation this study. Some of these include poor management of solid waste in Lafia town leading to;

- Indiscriminate dumping of solid waste
- Ineffective collection and disposal
- Inadequate facilities
- Inadequate awareness of the community on health hazard of indiscriminate solid waste disposal.
- Inaccessibility of the compounds for refuse collection and disposal.

1.3 AIMS AND OBJECTIVES

The aim of this project is to examine solid waste management system in Lafia town with a view to evolving easier and more effective system of waste management.

The major objectives are:-

1. To examine the source and type of solid waste in Lafia town
2. To examine the state holders in solid waste management in Lafia town.
3. To evolve an easier and more effective method of solid waste management in Lafia town.
4. To identify problems associated with the existing managemnent techniques.
5. To make recommendation(s) to appropriate authority(s) for improvement.

1.4 JUSTIFICATION OF THE STUDY

The relevance of this research work is to enhance the environmental quality of the area and also its sanitary condition.

One of the National problem facing us is the need for safe handling and proper management of solid waste, both harzardous and non-harzardous ones. The need for a cleaner and healthier environment is the main motive for this study . Also relevant is the fact that Nigerians urban centres often lack proper sanitary and solid waste management. Another motivating factor is the desire to propose better and more effective methods of management in order to ensure healthier environment.

1.5 SCOPE AND LIMITATION

The study covers waste management, techniques and the administrative machinery within Lafia town.

The study is limited to the management of solid waste by the Nasarawa Urban Development Board (NUDB).

1.6 DESCRIPTION OF STUDY AREA

1.6.1 Location

Lafia is both capital of Nasarawa State and headquarters of Lafia Local Government. It is located at the south – west part of the state on Latitude 8. 30N and Longitute 731 E. Its location at the junction of regional roads confers on it, good linkage with Makurdi (Capital of Benue State) to its south, Akwanga – Keffi and Abuja (the Federal

Capital City) to its north – west and Jos (Capital of Plateau State) to its north – east.

1.6.2 Topographical Characteristics

Lafia is located on the northern bank of River Amba that feeds mada River. Lafia town site is on the edge of a Plateau extending eastward and northward. The steepest slopes of about 8 – 15 are found in the south western part dipping northward and in the northern part. The slopes on the Lafia Plateau are gentle.

The slope pattern around the town shows that there are two slope regions. First is the highland sector stretching from the western and southern sectors. This is the source region of the tributaries of River Mada, which flows south – westward, emptying into the Benue River. Rising gently from river Amba is the second slope region which is established as low Plateau on which Lafia town is situated.

1.6.3 Geology

At Lafia town site, the geology consist of Basement Complex covered by three (3) lithological units in the Lafia geological form. The main town is located on the sandstones lithological unit. Other settlement in the Lafia area located on this lithological type include Akurba, Adogi, Bakin Rijiya, Unguwar Rere and Akoko. South and South – east of the sandstones boundary the geology consists of Grey Shales. The shales type also form a northern belt with the southern bundary stretching from Ambi/Anzaku and Kwandare across to Shabu and extending eastward on that line.

1.6.4 Climate and Vegetation

The mean monthly temperature in the Lafia area ranges between 30C in March and 25C in December. This is a very close range and of such high level, the hot whether is a regular feature of the Lafia area. The discomfort is greater with the rising humidity in March – April before the cooling effect of the rains. The mean annual rainfall is about 1270 – 1530mm mainly received over seven to eight months (April to October) of the rainy season, that is the area has just about 4 months of dry season.

Lafia area is within the southern Guinea Vegetation belt. The rainfall and other environmental factors support the natural vegetation consisting of open forest dominated by trees and tall grasses with some undergrowth. The generous establishment of orange and cashew orchards and forest reserves supports the natural vegetation. Cultivated areas have become altered into sub sudan vegetation with more scattered trees and shrubs as well as grasses.

1.6.5 Growth Characteristics of Lafia

Lafia town has had a stable growth in population and built – up area. The town expansion has become more rapid since 1996. When it was designated a state capital owing to the influx of formal and service workers as well as business enterprenuers.

The built – area of Lafia has grown from its initial location near river Amba towards the railway line to the north. By 1963 the town had grown across the railway line occupying an area of about 80 Ha. This

northward and eastward growth has continued. Accordingly, by 1977, the town has grown to about two times its size of the Nigerian Independence in 1960. The town has grown by lateral expansion and also in – filling to abort four time (i.e. 640Ha) of its 1960 size. By 1998, it has grown by about three times.

Growth in the old parts of the town was organic being associated with narrow winding streets in a largely residential environment of houses of mud walls and thatch roofs. This has changed significantly as some main streets have been tarred and widened while most traditional houses have zinc roofs and walls platered with cements. The nem part has groown with some physical planning input. Sabon Pegi, milloniares quarters, for example are planned sectors set out in grid – iron pattern with houses built of modern building materials.

1.6.6 Landuse and Settlement Pattern

The regional landuse is dominated by small – scale rain – fed agriculture. This largely involves the cultivation of cereals (maize, rice and sorghum); legumes (beans, soya beans and groundnut) tubers (yam, cassava); fruit trees (mangoes, locustbean, oranges, cashiew); and others (beniseed, melon).

The former Lafia Agricultural Development Project (LADP) and the Mada-Dep River Basin Development project has promoted improved agricultural system in the areas. These activities which are now sustained by the Nasarawa State Agricultural Development Project (NADP) Are promoting good utilisation of agricultural land resources

thereby supplying food and cash crops including agro-base industrial produce.

Nasarawa State as the home, of solid minerals is endowed with economic minerals. Within the Lafia area, there are minerals like glass sand, coal, clay and barytes. These are currently been exploited in places thereby making this a significant land use in terms of strengthening the regional economic base.

The city region of Lafia is heavily settled by several farming communities prominent of which are the Eggon, Kanuri (Kambari), Koro, Alago, Migili, etc. The settlement system consist of numerous villagers and farmsteds as well as a few small town such as Agyragu, Kwandare, shabu, and Akurba.

1.70 DEFINITION OF TERMS AND CONCEPTS

1.71 Solid Waste:

This is defined according to (United States Enviromental Protection Agency 1975). As useless, unwanted, discarded materials with insufficient liquid content to be free flowing wastes. The constituents of solid waste are determined by social and living standards. The constituents include industrial, commercial, Household and Agricultural waste.

1.72 Refuse:

This is the collective name for all component parts of solid wastes both domestic and industrial which may be in human environment.

1.73 Management:

Management means directing business, government agencies and many other organisation and activities.

1.74 Disposal:

This is the act of getting rid of waste from various land uses or areas.

1.75 Sanitation:

This refers to the application of measures to make environmental conditions favourable to health.

1.7.6 Solid Waste Management

Refers to the way solid waste generated is treated and disposed off in order to achieve the desired environmental standards. It involves the whole process of collection, transport, storage, treatment, disposal and the after case of disposal sites.

CHAPTER TWO

2.0 LITERATURE REVIEW

This chapter is intended to examine literature related to solid waste. Therefore, to achieve this, certain issues have been identified among which are collection and storage, indiscriminate dumping, environmental problem caused by solid waste, control of solid waste disposal and management of solid waste.

It's worth mentioning here that, these issues are arbitrary, they are identified here as a matter of convenience. However, we hold the belief that they will give enough direction to the points of forcus and work in this study.

2.1 COLLECTION AND STORAGE

Man's environment include all the living and non living things in his surroundings. The major components are physical, biological and social. A better understanding of the environment will be obtained by studying each of the global realms, namely the atmosphere, the hydrosphere, the lithosphere and the biosphere. The lithosphere which is the solid earth where waste are dumped.

Environmental management is not "management of the environment", it is management of the activities within tolerable constraints imposed by the environment itself and with full consideration of chemical factors (Beale, 1980). Waste collection by household and its storage either by individual household or community is a very important determinant by a successful waste management system. storage

system of refuse in any society is determined largely by the available technology, the social and economic statu of the society, by and large the role government plays in waste management are related. Sandara, 1994 opined that "the efficiency and effectiveness of waste collection is intimately related to the method of household or communal storage selected.

Basically, there are two categories of storage system considered, these include the household which is the commonest and is been determined by the individuals themselves such as cardboard, cartons, plastic bags and which are mostly temporary. While plastics or metal bins are more or less permanent in nature. The standardized containers are usually plastic or metal bins and with hids. However, plastic bags are generally considered in appropriate for standardized application in less developed countries because they are subject to being term up by scavenging animals and they are with some resource recovery system (LDGS, 1995).

2.02 INDISCRIMINATE DUMPING

The way and manner in which solid waste are been being dumped in most Nigerians cities constituted a threat to public health. Olaniran (1995) stated that one of the major environmental health problem facing Nigeria especially in the major cities, is poor solid waste management at the local, state and national level. He further argued that apart from the large tons of solid waste generated, a much more serious and infrastable problems is the attitude of some Nigerians with rergard to solid waste disposals. It is quite clear that in Nigeria today

most people have turned road sides, gutters, backyard, and open space in the market as refuse dumping ground. This behaviour has make it very difficult for any management authority to have an organised system of collection and disposal of waste since dumping is indiscriminate. The presence of indiscriminate waste according to Olaniran (1995) has posed a threat to public health and it is also a source of pest and verim breading ground and source of fire out break. It also constitudes problem to traffic flow near the market most especially where management is very poor;

2.3 ENVIRONMENTAL PROBLEMS CAUSED BY SOLID WASTE

Pollution resulting from burning of refuse, poor aesthetics, well and ground water pollution as well as health hazards are some of the environmental problems posed by solid waste. Henstoct et. al 1975 argued that "solid waste can cause pollution to air, water and land through leaching, About 85% of all U.K. refuse is dumped with no prior treatment other than the almost randon removal of large desirable items e.g massive metal from it."

Solid waste problems is the most pressing environmental problem being faced by urban dwellers, urban managers as well as urban planners. Dumped waste produced in most cases, bad uncomfortable odour, they also block drainages. The dumped sites, especially when uncontrolled, take up street spaces. Some waste decompose and leach into streams and under ground water. Some that leach into water are poisonous and so poison both water and aquatic life. They generate air borne disease and other health hazards. (Olokesusi,F 1994)

2.4 CONTROL OF SOLID WASTE

Current methods of refuse disposal vary from simple uncontrolled tipping in areas with no land shortage to higly sophisticated incinerators capable of 97% volume reduction. Unless recycling is possible, disposal is merely a question of relocation. Recycling is an excellent alteration for about 30 – 35% of the waste. Every effort should be made to recover and recycle newsprint, alluminium ferrors scrap, and glass. The big problem is that 70% of municipal waste still remains to be disposed of (Hensteck, 1983).

Any waste or disposal material is technically worthless if it cannot, in its current form, be used. The value of waste is therefore potential rather than real and depends entirely on its ability to be re-utilised. The value of recycling may be economic or social, usually the former. Recycling can occur by closed methods. In either case one most know the composition of the waste in question (Henstock, 1983).

Principally, disposal methods include:-

a. ***Sanitary landfill*** :– where by the waste is discharged and filled in this layers at a suitable site, compacted and covered.
b. ***Composing***:- A biological process whereby the organic materials is biologically decomposed. Caused in organic matters has to be seperated and treated. Solid in general, are much more difficult to handle in processing than liquid or grasses. Large masses of insoluble solids, like sulphur and coal in pulvarised form are usually stored in enormous heaps out in the open. The solid are removed from the pile

when required by tractor shovel and delivered to a conveyor (Henstock et al 1975).

Most important is the paper consolidation of the waste as it is put down, to prevent air getting into the base of the tip and support combustion. It is not easy to put out a tip fire once it has got undergorund. On the other hand, if tipped materials contains an amount of plasterboard containing gypsun, anerobic conditions can develop and bacterial reduction of the sulphate can then produce hydrogen sulphide. Such a problem arose in Loughborough a few years ago. (Henstock et al; 1975)

The most important factor in determining the paper handling methods of a solid waste is the actual character of the waste. Methods that define the chemical composition and physical characteristics of the waste are essentials to ensuring that such materials are treated or disposed of in a manner that is protective of human health and the environment (Leorenzen, et al, 1986).

2.5 SOLID WASTE MANAGEMENT IN DEVELOPED COUNTRY U.S. EXPEREINCE

In most parts of the world today, there are various ways solid waste are being generated, collected, and disposed. For example, a survey conducted in the United State revealed that 94% of the land disposal sites were inadequate and many states and municipality sanitary landfill or other improved processing and disposal practices. Richard (1985).

About 80% of all community waste in the United State is disposal in open dumps and about 10% in incinerated. Richard, (1985), other disposal methods, such as composting, salvage and reclamation takes only small portions of the total. (table 2.1)

Table 2.1 **TYPE OF SOLID WASTE IN U.S.A.**

S/NO	COMPONENTS	PERCENTAGE
1	Papers	50.6
2	Food Waste	19.6
3	Metal	9.9
4	Glass	10.1
6	Wood	3.5
7	Textiles	3.0
8	Leather and Rubber	1.7
9	Plastics	1.4
10	Miscellaneous	0.2
Total		**100%**

Source:- Encyclopedia Americana Vol. 28 1985.

There are also other types of waste that because of their large size or origin, are usually segregated for separate handling. These items include automobiles, household appliances, furniture, industrial metal scrap, demolition wastes, manure from cattle feed lots, radioactive materials, and power plant fly ash.

In the United States, the percentage capital production of solid waste has increased steadily to a daily rate of over 10 pounds (4.5Kg) per person, including both industrial and residential wastes. This is equivalent to a national total of about 360 million tons per year. This total includes 55 billion cans, 26 billion glass bottles, 30 million tons of waste paper, 7 million automobiles, and 100 million fires.

In addition, 2,000 million tons of waste is provided by agricultural sector and over 1,100 million tones are mining and mineral waste, Richard, (1985).

2.6 SOLID WASTE MANAGEMENT IN DEVELOPING COUNTRY (NIGERIA EXPERIENCE)

The first systematic environmental planning in Nigeria Township ordinance was launched in 1917 titled "The Nigerian Township Ordinance No. 29 of 1917." This was aimed at sanitising the evnironmental condition. Although, its impact was not felt all over the country.

There was a bubonic plaque that spread in Lagos and killed many people, which to the establishment of the Lagos Executive Development Board (LEDB) to control all forms of development and also to sanitised the enviroment. This development took effect in 1929.However, not until 1946 that an ordinance tltled "The Nigerian Town Planning Ordinance of 1946 was introduced to cover the whole nation.

Generally speaking, proper refuse collection, disposal, and treatment has for long been an illusion in the country until 1975 when an act tagged "Solid Waste Act 1975" was passed by the federal government on disposal and management of solid waste. The act clearly spelt out the responsibility of each tier of government –Federal, State, and Local government.

In addition, Irabo (1991) said that there were other subsequent acts, programmes and policies on how sanity could be attained in Nigeria.

For example, in 1984 an enviromental sanitation edict was postulated and became effective in 1985. This was to boost the morals of the citizens in the "war Against Filts and Dirts." To this effect, the government emarked one million naira to the cleanest state as a prize. Also in 1988 the federal government set up the Federal Environmental Protection Agency (FEPA) in major cities of the federation to combat the filty nature of the environment.

Further more Environmental Sanitation Boards were established in all the states of the federation charged with the responsibility of keeping the environmental tidy and clean in order to ensure proper sanitary condition of the country and also to note the states of the solid waste generated, Adeniyi (1986) , discussed the research work of Filani and Abumere in which they forcasted for some cities in Niegeria, Faniran (1982), and Filani and Abumere 1982 have to study the solid waste problems of urban areas with the hope of finding solution to the same. The Maclaren report of 1970, was also a report of commisioned

study of the waste situation in Ibadan to find solution to the Environmental Sanitation Problems. (table 2.2 below for solid waste generation in some major towns of the country.)

TABLE II SOLID WASTE GENERATION RATE IN LOGRAMMES PER HOUSE HOLD PER CAPITAL PER DAY

CITY	WHOLE TOWN	PER CAPITAL
Ibadan	3.3	0.39
Lagos	2.9	0.34
Oshogbo	2.6	0.43
Kaduna	4.0	0.56
Suleja	3.7	0.63
Kano	2.7	0.33
Jos	3.0	0.53
Potiskum	4.4	0.56
Portharcourt	3.6	0.54
Aba	3.2	0.38
Onitsha	3.1	0.39
Oyo	2.9	0.19
Warri	3.3	0.21
New Bussa	1.3	0.21
Gusau	2.3	0.43

Source : ADENIYI (1986)

The above table has clearly indicated that no cities produces same volume of waste per household or per capital because the activities differ greatly from one city to another city. But the table shows that generally the volume of solid waste generated in the Southern part of the country is greater than that of Northern part of the country. The reason could be that they are more industrial waste in the south than the north due to the concentration of industries there.

2.7 SOLID WASTE MANAGEMENT TECHNIQUES

Nigeria like most other developing nations is experiencing a ripid increase in population with the attendant environmental changes which create many more centres of daily activities and the intensity of those centres are of increasing environmental liabilities. The hirachy of insanitation in Nigeria from observation can be felt from the village to the city when most of the villages remain relatively clean, the cities are gradually becoming slums. Lagos, Ilorin, Kano, Abuja and other large cities in Nigeria fall in the category. It is observed that most of the cities are degrading fast environmental quality due to land pollution resulting from solid waste.

However, at present in Nigeria, there is no adequate and definite techniques of solid waste management. Some techniques presently in practice are open dumping, composting, sanitary, land fill and inceneration.

CHAPTER THREE

3.01 METHODOLOGY

Several methods were employed in the collection of data for this study. These are the methods the researcher felt are relevant and can obtain relevant imformations that could be useful for the success of this study. Among the method used for the study include the following:

3.02 USE OF QUESTIONNAIRES

Questionnaire methods was used where question related to the subject matter of study were structured on paper and administer on various stake holders which elicited most of the information use for this study. Several tips were made to Lafia and some other relevants areas for the purpose of administering and retriving the questionnaires.

The questionnaires were distributed to officials of Govermental, non Govermental and private sectors who are in one way or the other involved in waste management as well as few from general public. A total of 150 questionnaire were distributed out of which only 120 were filled and returned, while 30 were not returned for reason not known to the researcher.

The informatiom obtained from the returned questionnaire was analysed and presented as in chapter four. Therefore, 150 respondants were the sampling unit and were used as monitors in the computation of various indices.

3.2 INTERVIEW METHOD:

Some informations that were not obtained through other methods the interview method of data collection was used to obtain such informations. People were contacted on individual, group and organisational basis and interviewed of various aspects of waste management such as the institutional and legal frame work of solid waste management, the implementation of strategies, achievement, obstacle and constrains faced as well as suggested ways of ensuring a sustainable system of waste management. The information gathered through the interview have contributed greatly to the success of this study.

3.3 OBSERVATION METHOD

Considering the need for an articulated study, the researcher finds it absolutely necessary to carryout personal observation in order to have a first hand information and knowledge about waste management. Therefore, visits to public dump site to asses the manner of use and maintenance of such facilities in some part of Lafia town was carried out. Some individual houses were visited where the volume and characteristics of refuse as well as the type of waste bin in use were studied. Relevant site photographs were snaped for articulated study.

3.4 USE OF EXISTING DATA

Relevant informations gathered from past studies on the subject matter were carefully studied and excerpts taken were reviewed.

This source is principally, the literature studied from various textbooks, journals, and magazines published by different authorities and organisations.

3.5 STATISTICAL TECHNIQUES:

The statistical techniques used were total average and percentage range. These were adopted in order to link the hypothesis drawn in chapter one. As a result, there were provisions for a number of tables which were discussed and interpreted.

CHAPTER FOUR

ANALYSIS AND DISCUSSIONS OF RESULTS

4.0 CHARACTERISTICS OF THE RESPONDENTS

TABLE 1: SEX DISTRIBUTION

Wards	Male	Female	Total
Angwan Maina	20	8	28
Angwan pada	6	15	21
G.R.A/Millionaires Quarters	10	25	35
Bukan Sidi	5	10	15
Angwan Gwandara	2	11	13
Sabon Pegi	3	5	8
Total	**46**	**74**	**120**

Source : Field survey December 2001

TABLE 2. OCCUPATIONAL GROUP OF THE RESPONDENTS

Wards	Civil Servant	Farmers	Traders	Applicants	Others	Total
Angwan Maina	5	12	3	3	2	25
Angwan Pada	3	8	2	1	1	15
G.R.A/ Millionaire Qtrs	4	9	4	2	3	22

Bukan Sidi	3	10	3	2	2	20
Anwan Gwandara	2	5	4	4	3	18
Sabon Pegi	4	8	3	3	2	20
Total	**21**	**52**	**19**	**15**	**13**	**120**

Source : Field survey December 2001

Analysis:

Sex distribution of the respondents shows that out of the 120 respondents 61.7% are females while 38.3% are males. Table 2 shows higher population engaged as former and civil servants. 10.8% are unemployed.

TABLE 3. AGE GROUP OF THE RESPONDENTS:

Age group	Male	Female	Total	Percentage
Below 10 Yrs	2	5	7	5.8%
10-14 yrs	8	5	23	19.2%
15-49 yrs	35	45	80	66.7%
50 yrs and above	2	8	10	8.3%

Source: Field survey December 2001

The above table shows that the less than 10 years constitute 5.8% while 15-49 years constitute 66.7% while the ages 50 years and above constitute 8.3%.

***FINDINGS*:- TABLE1,2and 3.**

There are more females in Lafia town because out of 120 sampled population about 61.7% are females while the remaining 38.3% are males.

With the age distribution the school children constitute more than 17%, but it is worth nothing that 8.3% of the sample are aged that is unproductive, when put together with the school age population and infants, it constitute 27.5% compare to the work force of 72.5% which are economically productive. The dependency ratio is 1:7 which are slightly be accomodated.

With more women in the population and for their of remaining indoor throughout the day, the rate of waste generation can rist be below the standard of 0.46 kg / head / day in the developing society.

TABLE 4. **WASTE CHARACTERISTICS IN A HOUSEHOLD WASTE BIN**

	WASTE	PERCENTAGE
i.	Vegetable matter	26.47%
ii.	Food reminant	6.21%
iii.	Metal and metal related	14.08%
iv.	Paper & paper related	5.62%
v.	Plastics/Rubber/Leather	9.96%
vi.	Textiles related	3.28%
vii.	Glass/Bottles related	4.06%
viii.	Ashes/Dust& Stones	24.40%
ix.	Others	5.92%

Source: Field survey 2001

Analysis:

The constitute of the household refuse generated in the sampled population reveals that, the vegetable matter was 26.47%, Ashes, Dust and stones 24.40%, paper and paper related materials 14.08%, food reminant 6.21% others that are unspecified such as cams e.t.c 5.92%, plastic/rubber/leather were 4.06% while textiles related products were 3.28%.

FINDINGS:-

Vegetable matter constitute the highest with 26.47% while the list is textiles and its related waste which constitute 3.96%. The degradable matter constitute more than 50% but not up to 60%. This indicated a

high pressence of non degradable matter in the base hold refuse. Composition also shows that many small scale business can come up with adequate study to determine the recyclable and useful materials in the waste items VI-VII can be recycled / or used.

TABLE 5. **WASTE SEPERATION**

SEPERATION	NOS	PERCENTAGE
YES	3	2.5%
NO	117	97.5%

Source: Field survey 2001 ,

Analysis:

Only 3 (2.5%) separate waste, while 117 (97.5%) do not separate waste in their private bins.

FINDINGS:

Since the majority (97.5%) donot consider it necessary to separate waste, it is very difficult to ensure proper sorting out and proper disposal.

Therefore, the disposal site will be badly managed.Underground water pollution due to leachate generating can be suspected of the mixture of toxic and non toxic materials in the waste bin.

TABLE 6: **TYPE OF REFUSE CONTAINERS**

Name	Nos	Percentage
Open Space	10	8.3%
Dug Ditch	2	1.7%
Metal Container	20	16.7%
Plastic/Bucket/Basket	43	35.8%
Standard Dustbin	10	8.3%
None	35	29.2%
Total	**120**	**100%**

Source:- Field Survey December, 2001.

The above table reveals that 35.8% store their waste in a plastic/bucket/basket. Those that have no dustbin are 35 (29.2%). Those with metal containers are 20 (16.7%), those with standard dust bin 10 (8.3%), another 8.3% dumped their waste in an open space while 1.7% use dug ditch as means of waste disposal.

FINDINGS:-

It is a point of concern to see that not even up to 10% have standard dustbin in a town like Lafia, a state capital. Besides, about 29.2% do not seems to understand the need to have a personal dustbin. However, it is worthy to note that majority have one form of storage system or the other.

TABLE 7 **WASTE STORAGE OTHER THAN HOUSE HOLD DUSTBIN**

Alternative Storage	Nos	Percentage
Thrown Indiscriminatly	6	17.1%
Thrown in the gutter	4	11.4%
Thrown at the backyard	4	11.4%
Public dustbin	12	34.3%
Use neigbourhood dustbin	3	8.6%
Un specified	1	2.8%
Total	**30**	**100%**

Source: Field Survey December 2001

ANALYSIS

34.3% of those remaining 30 respondents in table 7 dumped their waste in public dustbin while 11.4% use gutters, an means of their waste storage. About 17.1% throw their waste indiscriminately whereas 8.6% use their neigbourhood waste storage and abort 2.8% could not kow where their waste goes to.

FINDINGS

It is interest to see that 34.3% of the sampled population rely on public dustbin other than their individual ones. All those waste thrown indiscriminately, in the gutter are considered as government responsibility. When added to those accumulated at the dustbin, one will realise the high expectation on various government on refuse

management. However, about 2.8% of the respondent do not know how he/she generated refuse.

This poses a serious problem to waste management system in the town will only take care of about 80% population while the remaining of the 20% may continue to dispose their waste indiscriminately.

TABLE 8 RESPONSIBILITY OF WASTE DISPOSAL

Body Responsible	**Nos**	**Percentage**
Local Gov't Areas	60	50%
Nasarawa Urban Dev. Board	35	29.2%
Task Force	20	16.7%
Others	5	4.4%
Total	120	100%

Source:- Field Survey December, 2001.

ANALYSIS

60 (50%) of the respondents, considered it the responsibility of the local Government Area to evaluate refuse, 29.2% consider to be the responsibility of the Urban Development Board, 16.7% consider it to be the responsibility of Task Force while 4.1% felt whowever is interested or wishes to make use of the refuse or the plot.

FINDINDS:

Many people according to about 50% of the respondents were surprised to have seen that the LGA's who were vested with the responsibility of evaluating waste do not have the public sympathy to charge for the services.

TABLE 9: KNOWLEDGE ON DANGERS OF REFUSE

Is Refuse a Nuisance	**Nos**	**Percentage**
Yes	115	95.8%
No	5	4.2%
Total	**120**	**100%**

Source:- Field Survey December, 2001.

TABLE 10: WHAT DANGERS DOES THE PRESENCE OF REFUSE POSES

Dangers of Accumulated Refuse	**Nos**	**Percentage**
Breeding place rectors	4	3.3%
Source of fire hazard	16	13.3%
Source of injury to children	15	12.5%
Source of Odour	40	33.3%
Depicate the Aesthetic condition	30	25.0%
All of the above	15	12.5%
Total	**120**	**100%**

Source:- Field Survey December, 2001.

ANALYSIS :- Table 9 and 10

95.8% of the respondents are aware of the dangers of refuse dumped within their environment to their health. Only 4.2% are not aware. Besides, 33.3% consider the odour coming out of it as dangerous, 25% consider it to aesthetic condition as most serious, 12.5% consider it to be injurious to children while 12.5% consider all of the above mention harzards as very dangerous and serious.

FINDINGS

Since up to 95.8% of the respondents believed that there are dangers associated with refuse and in fact all the 120 respondents believe in one form of associated harzard, it seems it is easier to plan an awareness programme to them to improve their sanitation with a view to reducing the dangers posed by the refuse accumulated. That can also be used to make them pay a token amount for its quick and frequent evacuation.

TABLE 11: **OPINION ON WHETHER GOVERNMENT SHOULD CONTINUE TO EVACUATE REFUSE**

Should Government continue to Evacuate Refuse	**Nos**	**Percentage**
Yes	110	91.7%
No	10	8.3%
Total	**120**	**100%**

Source:- Field Survey December, 2001.

TABLE 12: **SHOULD LGAS BE EQUIPED TO HANDLE REFUSE**

Should LGA's be equiped to Handle Refuse	**Nos**	**Percentage**
Yes	70	58.3%
No	50	41.7%
Total	**120**	**100%**

Source:- Field Survey December, 2001.

ANALYSIS:- Table 11 and 12

Table ii viewed it that 110(91.7%) suggest Local Government be responsible to handle refuse evacuation while 8.3% suggest otherwise. On table 12, it was recorded, 58.3% suggest that Local Government be equiped to handle refuse evacuation while 41.7% thought otherwise.

FINDINGS:- ON Table 11 and 12

Majority on table 12 suggest that LGA's be equiped to handle refuse management. However, 41.3% holds an objective view.

CHAPTER FIVE

5.0 SUMMARY, RECOMMENDATION AND CONCLUSION

5.1 SUMMARY

The aim of this research is to carryout study on waste management in Lafia town the capital of Nasarawa State and to test the assumption made in the opening chapter to see whether the assumption were uphald or rejected.

The result of the study shows that there is poor waste management in Lafia town leading to indiscrimiate dumping of solid waste , inffective collection and disposal of waste and also inadequate facilities of waste disposal.

The findings of the study further validate the ealier assumption made at the beginning of the chapter that there is no adequate awareness of the community on health hazards as a result of indiscriminate solid waste disposal. Equally too was the inaccessibility of the compounds for refuse collection and disposal.

Through observation, the researcher was able to understand that many people around the town converted their backyard, open spaces and drainages as their refuse dumping ground.

Based on this result, it has becoming necessary for us to make some recommendations using our experience from the field work in other to allievate the problem of waste management in Lafia town.

5.2 RECOMMENDATIONS

Perharps, solid waste problem is the most pressing environmental problems being faced by urban dwellers, urban managers as well as urban planners. The removal and disposal of solid waste generally impose cost on individual and the local community.

The following however were my recommendations:

1. There is the need for the concerned governments in Nigeria to recognize solid waste management as a major problem and allocated appropraite and adequate resources to efficeintly and effectively solve the problems.
2. Participation of private sector in waste disposal should be encourage. If well handled it will become, a source of revenue for the government.
3. There should be more education of the people on environmental issues to create more awareness.
4. There should be more refuse bins and regular collection of them.
5. Houes to house collection of refuse should be intensified, to avoid or reduce indiscriminate dumped site and uncleared heaps of wastes.
6. Government should build and maintain sanitary land fill sites, well located away from residencial areas.
7. Inceneration should be introduced as it reduces the mass and size of waste from final disposal.
8. Waste should be moved enmass on daily basis.
9. There is the need to provide adequate facilities or equipment for effective operation of the system.

5.3 CONCLUSIONS

Lafia has suffered an untold hardship and various envirionmental problems due to the inconsistency in the in the manner of refuse management in the town.

For the last five years the role of watse evacuation and disposal have been changing hands from various organisation and authorities. The instability of the exercise is not healthy to the health of man ans the environment. Therefore there is the need for each mentioned stakeholders to be allowed to perform his role and also allow for legislative provision to ensure performance.

Adequate finding and continue manpower development in the waste management sector will also ensure success of the exercise. Mass education through public awareness activities is of great importance to waste management. The awareness programm could be formal (Environmental Education in Schools) and could be informal through mass media and traditional methods.

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SCHOOL OF SCIENCE AND SCIENCE EDUCATION
DEPARTMENT OF GEOGRAPHY
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QUESTIONAIRE DESIGN ON:-

Topic:- SOLID WASTE MANAGEMENT IN LAFIA TOWN NASARAWA STATE.

HOUSE HOLD/ORGANISATION:- Questionaire to be directed to the head of household/management agency.

Dear Sir/Madam,

The question below are in respect of the above topic. Please tick or fill in the appropraite answers.

The answers will be treated in strict confidence.

1. Name of household head.....
2. Sex (a) Male ( ) (b) Female ( )
3. Occupation: (a) Civil Servant (b) Traders ( ) (c) Farmer ( ) (d) Others ( ).

4. Name of management agency.....

5. Year of establishment.....

6. Name of type of solid waste generated in the house or organisation.

(a) Domestic refuse ( ) (b) industrial refuse ( ) (c) Office refuse ( )

(d) Commercial refuse ( ) (e) Agricultural refuse ( ) (f) Others ( ).

7. Type of collection point

(a) General collection point ( ) (b) Illegal collection point ( )

8. How are refuse collected: (a) House to House collection ( )

(b) Commercial depot ( ) (c) No collection ( )

9.Implement use for refuse collection (a) Dust bin ( ) (b) Refuse van ( )

(c) Wheel barrow ( ) (d) Basket ( ) (e) Drums ( ) (f) Others ( ).

10. How often is refuse collected (a) Daily ( ) (b) Weekly ( )

(c) Every two weeks ( ) (d) Once a month ( ) (e) Not regular ( ).

11. Where do you dispose your waste?.

(a) Tipping in the stream ( ) (b) Tipping in the farm ( ) (c) Collection point ( ) (d) Ttipping at open space ( )

12. Waste management technique used.

(a) Incenerator ( ) (b) Open dumping ( ) (c) Composity ( ) (d) Land filling ( )

13. How many dumping site are their in the town.....

14. What is your opinion about the open dumping technique practice....

15. Is the refuse dumping site legally used?

(a) Yes ( ) (b) No ( )

16. Do you consider accumulative refuse a nuisance? Yes/No.

If yes what sort of hazard does it pose

(a) Breeding place for vectors and other insects.

(b) Source of fire hazard.

(c) Source of injury to children and scavangers.

(d) Source of odour.

(e) Deplicate the aesthetic condition of the enviroment.

(f) Others.

17. What collection system do you use in getting solid waste to the site?

(a) Family dust bin ( ) (b) Family refuse van ( ) (c) Having central collection point of a walking distance ( ) (d) Government refuse van ( ) (e) Private refuse van ( )

18. What possible suggestion do you have to improve on the collection and disposal of waste in your area.....

.....

19. Are you satisfy with the refuse collection sysytem in your area?

If Yes reasons.....

If No reasons.....