SOLID WASTE MANAGEMENT
(A CASE STUDY OF MINNA AND ENVIRONS)

BY

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CERTIFICATION

This is to certify that this study was carried out by:

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ACKNOWLEGEMENT.

This study has been made possible by the full co-operation and guidance of my supervisor, Prof. J. M. Baba. I appreciate his criticisms and direction. I am also grateful to all my lecturers. The contribution of everyone involved in the success of this project is appreciated.

I remain very grateful to God for making me able to go through this programme successfully.

DEDICATION.

This work is dedicated to my brother Dr. C. U. S Onuigbo and all my sisters. And to everyone determined to ensure cleaner and healthier environment for all Nigerians.

ABSTRACT

Waste management has been in practice for long, starting with the initial crude methods to the now advanced and sophisticated methods.
Solid wastes in particular present problems in may countries when it comes to management.
The study has investigated solid waste management in Minna and Environs, with the main objective of determining if the management programme now is better than it was before.
The study has been mainly on comparative Investigation of the former agency responsible for waste management in the area of study known as Niger State Environmental Protection Agency and the present one, Niger State Urban Development Board.
The investigation was carried out theoretically, practically, statistically and with data sourced from NUDB, etc. all that were necessary and available used for the study. The investigation showed that there has been a remarkable improvement in waste management since the establishment of Niger State Urban development Board.

CHAPTER ONE

1.0   **INTRODUCTION**

1.1   **BACKGROUND**

Solid wastes are numerous and occur daily. It seems not much attention is given to their proper management and as such they generate a lot of environmental problems. With modernization, increasing amount of solid wastes are produced daily.

The world's attention is now focused on solving environmental problem. Solid wastes are major pollutants of the environment, therefore they require proper management.

This study is carefully chosen to examine the past and present management procedures for solid wastes in the Minna Metropolis and to proffer better management.

1.2   **STUDY AREA.**

The study area covers Minna and environs. Minna is a growing State Capital. The adjoining towns are also

growing in population and expanding in size. If attention is not given to proper disposal and management of solid wastes, they can cause very serious environmental problems in future as Minna and the environs develop further.
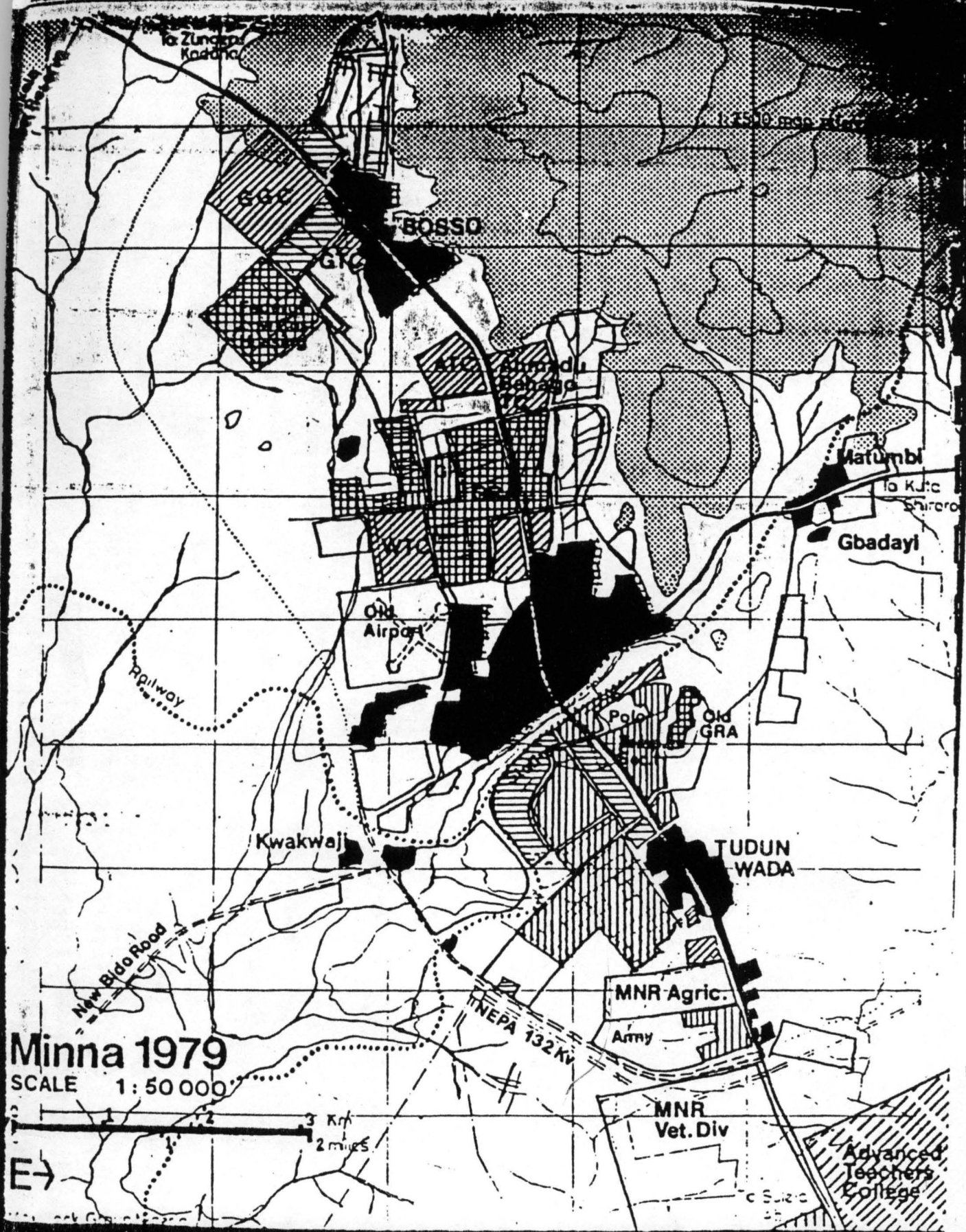
1.3   **NATURE OF THE PROBLEM**

Solid wastes are numerous and in various form. Managing solid wastes is not easy. The problem of several

Unplanned dump sites exists, and many are close to residential areas, blocking drainages, sometimes blocking roads partially or fully. Dumpsites are not restricted, refuse disposal is not well planned and not regular.

Disposal facilities like refuse removing machines, tippers, etc are inadequate. Evacuation from dump sites close to places of abode is not regular: refuse is left to pile up and in most cases to the stage that they begin to rot and smell, emitting offensive odour.

Because solid wastes are not well managed, they abound and cause numerous environmental problems, hence the need for proper management.

1.4   **MOTIVATION FOR THE STUDY**

One of the National problems facing us is the need for safe handling and proper management of solid wastes, both hazardous and non-hazardous ones. The need for a cleaner and healthier environment is the main motive for this study. Also relevant is the fact that Nigeria's urban centres often lack proper sanitation 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.

Existing Land Use

To Zungeru Kaduna

GGC

GTC

BOSSO

Matumbi

To K.J.C Shirero

Gbadayi

Old Airport

Railway

Polo

Old GRA

Kwakwaji

TUDUN WADA

New Bido Road

NEPA 132 Kv

MNR Agric.

Army

Minna 1979
SCALE 1 : 50 000

3 Km
2 miles

E→

MNR Vet. Div

Advanced Teachers College

■ Mainly Residential: High Density	▨ Institutions: Education	M Market
▦ Low Density & Existing Layouts	▥ Government	

Study Area Map

1.5 STATEMENT OF THE PROBLEM

Undoubtedly, numerous reasons can be adduced necessitation this study. Some of these include groundwater contamination, foul odours, visual impact, health and general well-being considerations.

Solid wastes in particular, and wastes in general cause a lot of environmental problems that directly or indirectly affect human beings. This study seeks to find answer to the question how can solid wastes be better managed to ensure cleaner and healthier environment? In the course of finding an answer to this, the study intends to find out how solid wastes have been managed in the past and how they being managed presently.

1.6 AIM AND OBJECTIVES OF STUDY

The aim of the study is to investigate the waste management programme in Minna and environs and to proffer solution to existing problems.

However, the following are the specific objectives:

i.) To identify and map the refuse dump sites

ii.) To determine frequency and efficiency of refuse clearance

iii.) To determine the effectiveness of final disposal methods

iv.) To make recommendations for better management.

1.7 JUSTIFICATION OF THE STUDY.

Effective waste management is very important for a cleaner and healthier environment. How efficiently the management is done is very important. It is necessary to determine the frequency and efficiency of waste clearance.

Comparing what was the practice before with what is being practiced now will help determine their efficiencies and thus to know whether the management is better now or not.

1.8 BASIC TERMS

Man's environment includes all the living non-living elements in his surroundings. It consists basically of three major components: physical, biological and social. To understand well the environment, one will need to study each of the global realms, namely: the atmosphere, the hydrosphere, the lithosphere and the biosphere.

Solid wasters are unwanted or undesirable products of life, and range from leaves, human and animal feaces to metallic, plastic and chemical by – products of manufacturing

industries. Normally, solid wastes are usually deposited in a safe, environmentally sound and aesthetically acceptable manner.

1.9   METHODOLOGY
1.91   LOCATIONS OF MAIN DUMP SITES

The study sought to identify the locations of the main or official dump sites, and to map them. Data was

sourced from Niger State Urban Development Board in form of sketch map showing locations of these. The locations were then fixed on a proper base map. This is to determine how appropriate the locations are.

1.92   FREQUENCY OF CHEARANCE AND EFFICIENCY.

Date for determination of this were got from several sources, including NUDB, personal interviews,

observation, etc. The intention was to find out the efficiency of management waste during the two periods of study.

1.93   METHODS OF DISPOSAL AND FINAL DISPOSAL LOCATIONS

Data was sourced from NUDB to ascertain methods of disposal and final disposal locations. Physical

inspections and observations were carried out. The essence is to determine how appropriate and efficient they are.

1.94   STATISTICAL DATA FROM PERSONAL INTERVIEW.

The study gathered statistical data for analysis through personal interview question administered randomly

but to people believed to be aware of what solid waste management entails.

After briefing each of them they were asked the question: Is waste management in Minna and environs better now than before? They were asked to score past and present management over ten.

River Basin

Tundun Fulani

N

Bosso

State

Lower

Hill Top

Govt House

Palda Hill

Maitunbi

To Gwada

ADP

Hill Top Model School

IBB Sport Complex

Dusen Kura

Kpakungu

Tudun Wada

To Bide

Residential Uses

MNR

Public Uses

Shiroro Hotel

To Baro

Utilities & Commerce

Location of housing Estates

Trade fair Complex

Allocated Land

0   1   2Km

SCALE

Army

College of Education

To Suleja
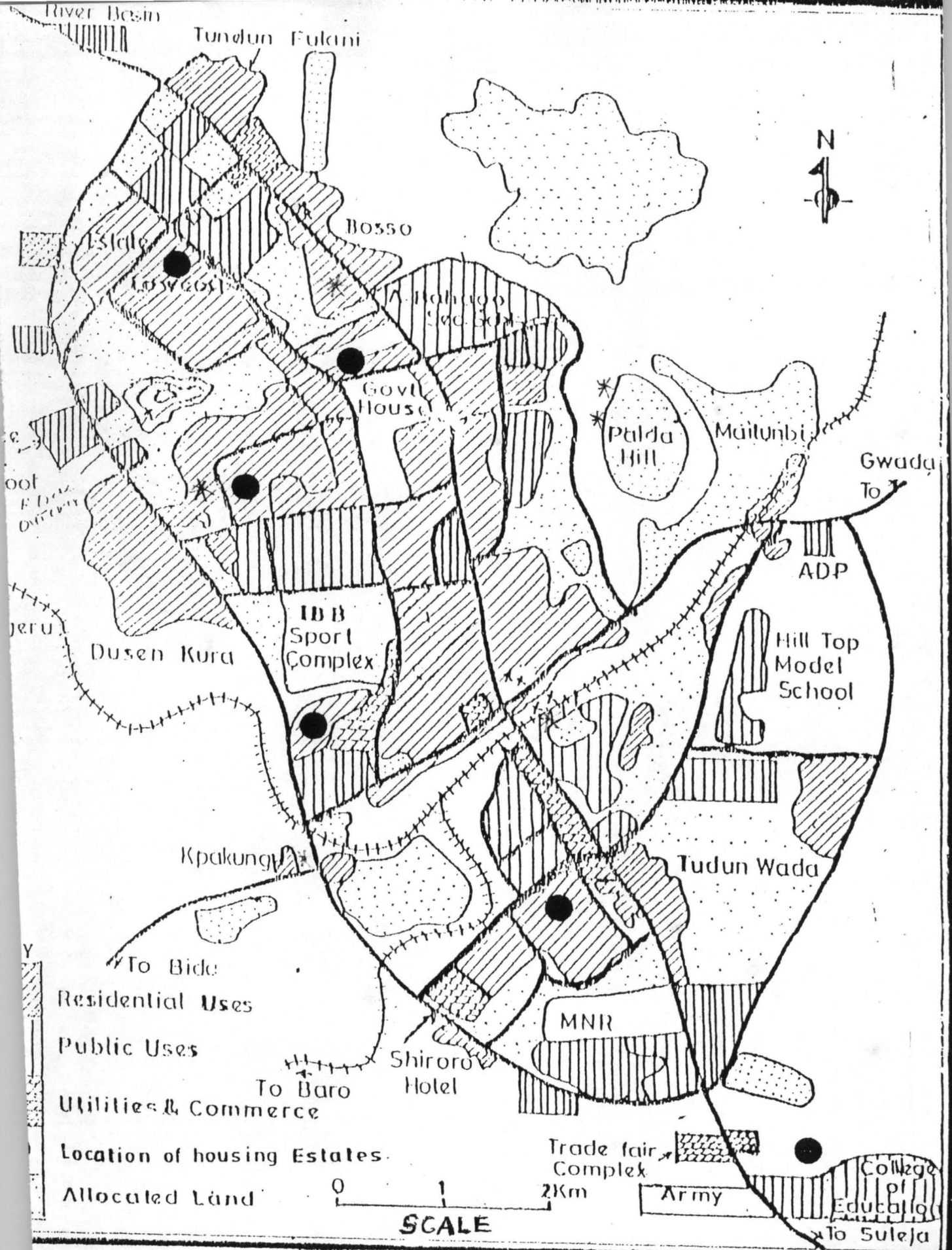
Source : Survey Department Minna With Modification

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 ENVIRONMENT AND ENVIRONMENTAL MANAGEMENT.

Man's environment includes all the living things and non-living elements 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 s wastes, 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 economical factors (Beale, 1980). The objective is to meet basic human needs within the potentials and constraints of environmental systems.

Man-made works make impact on the environment and there needs to be a workable and economical system which will ensure that those who contemplate potentially harmful actions assess the likely impact upon the environment. In order to protect the environment it is vitally important that environmental impact assessment be made prior to any action being taken and that it ranks equally with the technical and economic assessments which always precede development (Beale, 1980).

The need for better environmental management strategies in Nigeria grows with the increasing urgency of the perceived environmental problems, and the progressive nature of the threats to sustainable development that these problems pose (Olokesusi, 1994).

2.2 SOLID WASTES

Solid wastes are unwanted or undesirable products of life, and range from leaves, human and

animal feaces to metallic, plastic and chemical by – products of manufacturing industries (Olokesusi, F. 1994).The control of waste is at the heart of the sustainable development debate and is a key area to be addressed. Solid wastes are numerous and include: plastics, metallic materials, glass, tins, water proofs (or polythene), building debris, waste woods, etc.

Nowadays the refuse contains a lot more paper and plastic materials, solids exist in many forms large pieces, fine powders, sheets and son on. The mass of solid s may have difficult properties; it may be abraisive, sticky and may be exploisve (Henstoct, et al, 1975).

2.3 ENVIRONMENTAL PROBLEMS CAUSED BY SOLID WASTES.

The real cost of society of dumping industial or domestic wastes may be very much greater than

the costs usually assigned / charged (Henstock, M. E, 1975).See page and contamination of land and water may place an additional charge on the local authority ultimately responsible. Solid wastes can cause pollution to air, land and water; water through leaching. About 85% of all U. K. refuse is dumped with no prior treatment other than the almost random removal of large of desirable items, eg. Massive metal from it (Henstoct et. Al., 1975)

Paper, wood, cardboard and textiles will be converted to ash and to oxides of carbon. A more scientific study carried out by the then Federal Environmental Protection Agency (FEPA) in 1989, showed that toxic substances like polychlorinated biphenyl's (PCBS), gammalin 20, and heavy metals like lead, iron and copper are washed from dump sites into receiving surfaces and ground water, thereby constituting great health hazards to plant and animal lives (Olokesusi, F. 1994).

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 wastes. Since Nigerian's are sensitive to hazardous land fill sites as examplified by this study and this mode of waste disposal being the most prevalent in the country, there is indeed a need for policy recommendations. Perhaps, solid waste problem is the most pressing environmental problem being faced by urban dwellers, urban managers as well as urban planners. If the available internal municipal resources are inadequate, such municipal authorities may study the cost and benefits of contracting out waste collection and disposal operations to private sector operators. This might even turn out to be a profit making venture. Besides, there is need to have competent management team at the municipal level whether or not the job is contracted out (Olokesusi, F. 1994)

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

2.4 CONTROL OF SOLID WASTES DISPOSAL

The economist's see waste as that which it is cheaper to throw away than to make further use

of. This does not mean that waste is valueless; some of it certainly is not. (Henstoct et al., 1975). Current methods of refuse disposal vary from simple uncontrolled tipping in areas with no land shortage to highly sophisticated incinerators capable of 97% volume reduction. Unless recycling

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is possible, disposal is merely a question of relocation. Disposal never means total disappearance but only transfer from an inconvenient to a convenient site.

Traditionally, reclamation plants have separated solid wastes in the as-received condition. Hand picking has long been relied upon to extract from the flow of refuse certain classes of large saleable items, e.g. newspaper, cardboard, metals, and glass, and much interest has been shown in attempt to automate this process. Domestic waste, the type usually collected in bins or plastic bags, forms a substantial part (60- 70%) of municipal waste.

DISPOSAL METHODS INCLUDE:

a)   Sanitary landfill – whereby the waste is discharged and piled in thin layers at a suitable site, compacted and covered.

b)   Composting – a biological process whereby the Organic material is biologically decomposed. Coarse inorganic matter has to be separated and treated

Solid, in general, are much more difficult to handle in processing operations than liquids of gases. Large masses of insoluble solids, like sulphur and coal in pulverised form, are usually stored in enormous heaps out in the open. The solids are removed from the pile when required by tractor shovel and delivered to a conveyor (Henstoct et al; 1975)

Most important in the proper consolidation of the waste as it is put down, to prevent air getting in to the base of the tip and support combustion. It is not easy to put out a tip fire once it has got underground. On the other hand, if tipped material contains an amount of plasterboard containing gypsum, 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.

The most important factor in determining the proper handling methods for a solid waste is the actual charcter of the waste. Methods that define the chemical composition and physical characteristics of a waste are essential 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.   MANAGEMENT OF SOLID WASTES.

The waste prodcuts of society are, by definition, those that the generator finds more profitable to discard than to utilise; they include agricultural, house hold, human and industrial wastes. The diversity of substances contained in household waste, other wise, known as refuse, garbage or municipal solid waste (MSW) makes it less amenable than the more homogenous residues to most forms of utilisation (Henstock , 1983).

Incineration is the ideal alternative to land filling as the final disposition of municipal solid waste. Incineration has the advantages of 90% volume reduction to a completely odourless inert product; potential for recovery of valuable heat energy; and existing technology to remove dust

and pollutants from the flue gas to meet the most severe environmental requirements. There are four or five options for the final disposition of municipal waste, each with its own draw-back and limitations. Three of such options are: Land filling, which until recently was the most common method, is beginning to experience problems with a lack of space and environmental concerns, particularly ground water pollution. The cost of land filling will increase rapidly as more emphasis is placed on environmental controls and siting becomes a greater problem.

ii.   Ocean dumping, is being phased out by law in most cases because of possible damage to the environment and increasing costs plus energy loss.

iii.   Composting, is not appropriate for all types of municipal waste material and there are problems with a lack of market for the product, amount of space required and disposition of residues.

Waste disposal, is ostensibly the simplest form of waste management. However, reduced

land availability in may region s coupled with increasing costs of compliance with environmental regulations are making the disposal option less attractive to utilities.

2.6   RECYCLING.

Recycling is an excellent alternative, for about 30-35% of the waste. Every effort should be made to recover and recycle newsprint, aluminum, ferrous scrap and glass. The big problem is that 70% of municipal waste still remains to be disposed of.

Any waste or discarded material is technically worthless if it cannot, in its current form, be used. The value of a 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 circuit or open circuit methods. In either case one must know the composition of the waste in question (Henstock, 1983).

2.7   APPLICATIONS OF REMOTE SENSING IN (SOLID) WASTE MANAGEMENT.

The control of waste should be at the heart of the sustainable development debate and is a key area to be addressed. The SEPA State of Environment Report, 1996 notes that, greater legislative attention has and will continue to be applied to the good management of waste. This has led to the phasing out of sewage sludge dumping at sea by 1998, the introduction of a landfill tax, and producers being held responsible for their packaging and waste. The SEPA State that the pressure for more landfill sites will increase and that there may be a shortfall in suitable locations with these pressures being applied to waste management there will be a need for good compliance monitoring to ensure sustainable development (Smith, et al., 1997).

2.71   LANDFILL SITES.

A recent Department of Environment paper, waste Management paper No 266 (1997), sets down guidelines for the designing, development and monitoring of landfill sites. It is very important that baseline conditions are established before a landfill site is started.conventtionally, this is done by drilling monitoring boreholes. The boreholes are then monitored prior, during after the landfill site is operational. Some of the techniques to monitor parameters can be automated such as temperature and presuure. The testing for many contaminates, for example heavy metals, is done by dipped samples sent to a laboratory for testing. There are areas where remote sensing can be utilised, as described below.

Very High Resolution (VHR) satellites such as, cartena with a resolution of under 1 metre, will give monitoring organisations the ability to regularly check on the development of waste sites. In the absence of VHR satellite cover, the effect of the waste industry on the environment could still be monitored by using an airborne hyperspectral instrument, like CASI, to monitor plant stress as an indicator of laeakage.

Multispectral sensors can be used to help determine the location of a new site for waste storage. This can be done by identifying suitable geological conditions derived from digital imagery and field observations. On a regional scale landsat TM imagery can be helpful whilst on a local scale, airborne multispectral imagery would be required such as ATM date.

Thermal imagery can be used for the detection of heat build up in land fill sites or even the monitoring of underground fires. At present this is done via ground based sensors or airlborne thermal instruments, however landsat 7's thermal channel with a spatial resolution of 60metre will show sufficient detail for heat loss studies on large buildings and waste sites.

Ground Penetrating Radar (GPR) has been used to detect a number of underground features. GPR

has been used as a subsurface environmental sensing tool and for detection of buried tanks, landfill debris, water levels and contaminated fluids. Ground penetrating radar is a geophysical method that generates a

continuous profile of the subsurface.

The high precision of this technique can provide much information in a rapid and cost effective manner. It is applied mostly to materials quality, environmental assessments, detection of buried structures (storage

tanks, pipes) and to near-surface geology. These surveys can be done by vehicle, while airborne surveys can be done in difficult location.

2.72 MAGNETIC SURVEYS

Magnetic surveying measures the perturbations in the earth's magnetic field caused by changes in

concentrations of natural ferrous minerals or by femous metals such as wastes, drums or utilities (Smith, A. et al., 1997).

CHAPTER THREE

3.0

DATA ANALYSIS

3.1 GENERAL ANALYSIS.

From the data gathered in the course of the study, it is obvious that official and non-official dump sites exist. The official dump sites are the major dump sites, created and maintained by NUDB regularly. These are indicated on (fig 3.1). the unofficial dump sites are numerous and very close to residential areas.

The management programme does not include recycling. But it is known in waste management that improvement in environmental quality resulting from recycling rather than abandonment of materials, makes the case for recycling almost irresistible in many cases. If waste can recycled, pollution will disappear, since the latter is only material in wrong place at a particular time.

No land fill sites, due to cost; no incinerators. It follows that not all waste management methods are practised in the area of study. But it is not necessary that all must be practised before there can be efficient waste management.

3.2 LOCATIONS OF MAIN DUMP SITES.

The study sought to identify the locations of main or official dump sites, and to map them. Dump sites are collection centre for refuse from houses or house-holds, stores and other small establishments such as restaurants, bars, etc. They are usually in open, easily accessible locations. In the course of the study, the main dump sites were identified and indicated on the accompanying map (fig 3.1). The map shows clearly their locations. Data got from NUDB shows the frequency of clearance of these to be every six days.

The study identified some other large-size dump sites but which are not designated official dump sites. The official dump sites are clearly located away from residential areas; but most unofficial dump sites are within or very close to residential area. The unofficial dump sites are poorlytaken care of; people often put fire on them causing smoke and air pollution in the area.

3.3 METHODS OF DISPOSAL AND FINAL DISPOSAL LOCATIONS

The study examined disposal methods and final disposal locations. Data sourced from NUDB shows that public cleaning is a daily affair with two main groups of cleaners at works each day. See table 3.2 (a) and (b). One group cleans along the major roads, while the other cleans along the street corners or inner roads.

Public cleansing starts with simple and effective collection of refuse and street sweeping services backed up by good sanitary land fill. Leaving aside for the moment differences in composition and quantities of waste, the cardinal fact of life in Urban waste management is that only a part of the problem can be tackled by direct house – to – house collection. This system, using side and rear-end loading vehicles and tippers is possible only in city centres and in the middle and upper income suburbs where good access and western housing standards allow their efficient use.

For the rest, the only solution is the communal collection system, with centrally placed skips and bulk container vehicle. The communal points can be served by teams of collection labourer using wheeled trolleys to move refuse from households or illicit dumps to the communal or official dump points.

The sources of data for this aspect of the study is Niger State Urban Development Board. Through observations and personal interviews with the Assistant General Manager (AGM) waste Management, of NUDB, disposal of waster is by use of tricycles, dustbins, vehicles, etc. from small, scattered dump sites, streets and premises to the official or major dump sites. Then tippers and other disposal vehicles are used to transport wastes from the main sites to the final disposal indicated on map.

The final disposal sites are three large borrow pits located as follows: (1) Behind the School for the handicapped. (2) Along Bida road, after the toll gate. (3) Along Gwada road.

3.4 DETERMINATION OF FREQUENCY AND EFFICIENCY OF CLEARANCE.

This was carried out through personal interviews, observations and data obtained from Niger State Urban Development Board. The study covered the periods before the establishment of NUDS and since its establishment. Both primary and secondary data were used for the study. It was established that NUDB currently in charge of waste management in Minna and environs dispose of refuse more often than before. Prior to the establishment of NUDB, that is the period of Niger State Environmental Protection Agency (NISEPA), refuse dumps were cleared only on sanitation days. But now, with NUDB in place, the streets and small dump sites are cleared on daily basis, Monday to Saturday, by the Staff, using tricycles, baskets, etc. The staffs also collect refuse from refuse bins placed by NUDB on premises such as hotels, filling stations, restaurants, etc. The collection done daily and the people concerned pay five hundred Naira monthly per dustbin.

The wastes collected are carried to the major or official dump sites, which are located at safer and more convenient places. The official dump sites are cleared on the average of every six days. They are then taken to the final disposal sites.

3.5   EVALUATION OF MANAGEMENT EFFECTIVENESS

The study also examined the principal issues in proper management of solid wastes. The four main aspects of any solid waste management system are:

1.   Storage at or near the point of generation,

2.   Collection of waste

3.   Street cleaning

4.   Disposal of waste.

It is important to emphasize, again and again, that solid wastes management is much more than refuse collection and disposal. The most important factor in determining the proper handling methods for a solid waste is the actual character of the waste. Methods that define the chemical composition and physical characteristics of a waste are essential to ensuring that such materials are treated or disposed of in a manner that is protective of human health and the environment.

From the study, storage at or near the point of generation is prevalent. This accounts for the un official dump sites. Collection of waste has become more regular and betters. Street cleaning is now a daily affair with the exception of Sundays. Disposal of waste is now more frequent. It is no longer on sanitation days only.

Evaluation of present management programme shows remarkable improvement over the past. Solid wastes are now managed as properly as possible within the limits of NUDB financial capability. But incinerators and land fill sites are still not being made use of, and only the medical waste is treated before final disposal

3.6   STATISTICAL ANALYSIS

Scientific studies often demand use of statistical analysis. The study gathered such data through personal interview question administered randomly but to people believed to be aware of what waste management entails. After briefing each of them, they were asked the question: is waste management in Minna and environs better now than before? They were asked to score past and present management over ten.

From statistical data gathered; responses to interview question gave the following average mark: 4.1 over ten for past management programme and 6.7 over ten for present management programme.

Further analysis showed that twenty four people out of the thirty interviewed scored present management above six over ten, representing eighty percent (80%) while only four out of the thirty people scored past management over six, representing about thirteen percent (13.3%) unity block industry.

Table 3.3 Comparison of Facilities.

	FACILITY	BEFORE	NOW
1.	Incinerators	None	None
2.	Land fill sites	None	None
3.	Vehicles	4 tippers	11 Tippers
4.	Manpower	50 Cleaners	116 cleaners
5.	Dump sites	Less	More
6.	Clearance	Less often	More often
7.	Treatment of waste	Same	Same
8.	Final disposal method	Same	Same
9.	Organisation	Less	Better
10.	Wheel barrows	Less	More
11	Tricycles	None	Available

Table 3.4: Results of Personal Interview Question.

Weights (Scale 1-10)	No of Respondents (Frequency)	
	Before	Now
1.	0	0
2.	2	0
3.	9	0
4.	8	0
5.	7	6
6.	3	6
7.	1	9
8.	0	9
9.	0	0
10	0	0
	E = 30	E = 30

Table 3.2 ·   **Weekly Cleaning Time Tables**

a)   Cleaning along major roads

1)	Monday	-	from Mobil to Chanchaga
2)	Tuesday	-	from Mobil to Tudun fulani
3)	Wednesday	-	from Mobil to Maitumbi
4)	Thursday	-	from Mobil to Old post office/ Govt. House.
5)	Friday	-	Kpakungu down to Secretariat
6)	Saturday	-	Refuse dumping sites for clearance

Source: NUDB.

b)   Cleaning of Street Corner (inner roads)

1.   Monday   -   Moi filling station, Bay clinic road, New Tunga Primary School, Tunga secondary school, low cost, then opposite Elf dumping site.

2.   Tuesday   -   Kpakungu, Barikin Sale, Fly over, Broadcasting road, Opposite unity block industry.

3.   Wednesday   -   Ciromawa Estate, ERC road, to IDI praying ground and paida hill, back of hospital

4.   Thursday   -   Limawa Dumping site, Old airport road, behind Shiroro Cinema, 123 quarters.

5.   Friday   -   Moi – filling Station, Bay Clinic road, New Tunga primary school, Tunga secondary school, Tunga low cost, opposite Elf dumping site.

6.   Saturday   -   Kpakungu, Barikin Sale, Fly over, Board Casting road, opposite

3.7   DISCUSSION OF RESULTS

The number of official dump sites could be increased to make them closer to the people and discourage in discriminate dumping of wastes. They should be evenly spread and easily accessible.

The unofficial dump sites can be reduced in number by providing more refuse-bins at strategic places and closer to the people.

The Saturday market official dump site is not really well located. It is very close to the market; in fact the dump site is even part of the Saturday market site. Perhaps lack of

space, and the need to locate such in a place that will allow for easy evacuation prompted the allowing of that as official dump site.

Lack of land fill sites, incinerators, and non-treatment of wastes before final disposal make the management process short of ideal.

The statistical data and analysis show remarkable improvement in solid waste management. More people scored the present management higher marks over ten. Average mark for past management is 4.1 over ten while average mark for present management is 6.7 over ten. When further analysed, it was found that twenty-four people out of the thirty interviewed scored present management above five over ten, representing eighty percent. While only four out of the thirty people scored past management above five representing about thirteen percent (13.3%).

On the other hand, twenty-six people out of the thirty interviewed scored past management five and below representing twenty percent (20%). And all data source from NUDB compared with what was before showed that the present management is much more efficient and better than before.

CHAPTER FOUR

4.0   **FINDINGS, CONCLUSION AND RECOMMENDATIONS**

4.1   **SUMMARY OF FINDINGS.**

The Study has shown that most of the unofficial dump sites constitute eye sores and produce bad odours. There is no use of incinerators, but two are proposed for the year 2,000 budget. No land fill sites because of cost of establishment, which runs into millions of Naira. No treatment of wastes before final disposal except medical wastes (needles and syringes, treated with petrol, then burnt and buried in the ground)

Analysis of statistical data confirm improvement in management. Private sector participation has just recently been initiated. Penalties for general offence of unauthorized dumping and for specific offence of abandoning motor vehicles are not enforced.

4.2   **CONCLUSION.**

For decades, solid waste has been regarded more as a nuisance and private problem rather than as a major public problem requiring critical solution.

The most important factor in determining the proper handling methods for a solid waste is the actual character of the waste. Method that define the Chemical Composition and physical characteristics of a waste are essential to ensuring that such materials are treated or disposed of in a manner that is protective of human health and the environment.

With the establishment of NUDB, waste management programme in the area of study is now much better and more efficient, but there is still room for improvement.

4.3   **RECOMMENDATIONS.**

Perhaps, 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 costs on individuals and the local community.

My recommendations are as follows:

1.   There is the need for the concerned governments in Nigeria, to recognize solid waste management as a major problem and allocated appropriate and adequate resources to efficiently and effectively solve the problem.

2.   Participation of private sector in waste disposal should be encouraged. If well handled, it could 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.   House to house collection of refuse should be intensified, to avoid or reduce indiscriminate dump sites and uncleared heaps of wastes.
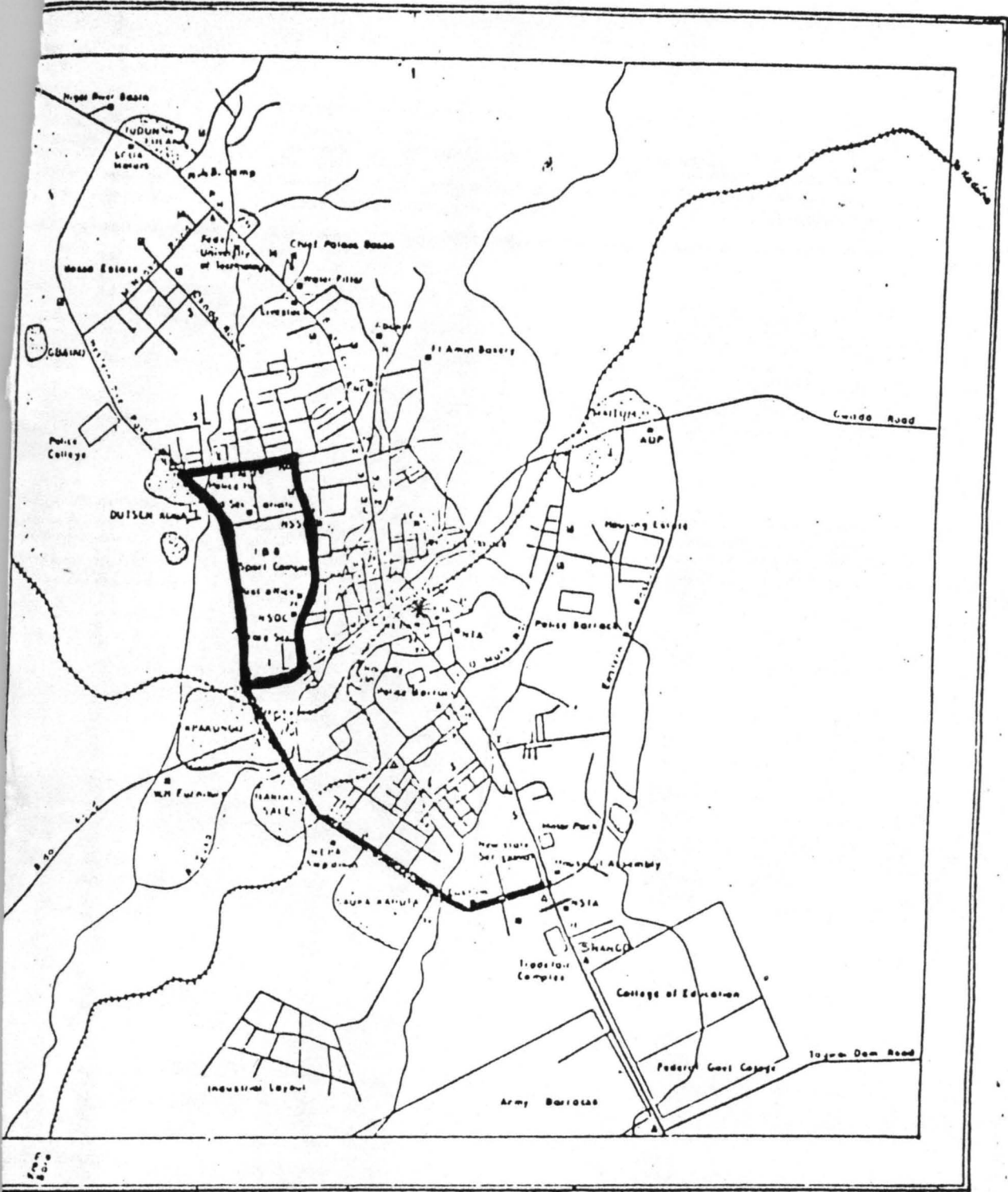
6. Wastes should be moved enmass on daily basis.

7. Government should build and maintain sanitary land fill sites, well located away from residential areas.

8. Incineration should be introduced as it reduces the mass and size of waste for final disposal.

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MINNA STREET GUIDE MAP

Scale -1:50000

Metres 1000   0   1   2 Kilometres

REFERENCE

Settlement	Mosque	Court
Road	Petrol Station	Police Station
Railway	Bank	Market
River	Secondary School	Clinic
Chapel	Primary School	Hotel