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THE PROBLEMS AND PROSPECTS OF SOLID WASTE MANAGEMENT IN THE PUBLIC SECTOR: A CASE STUDY OF KADUNA STATE ENVIRONMENTAL PROTECTION AUTHORITY {KEPA}

BEING

A PROJECT SUBMITTED TO THE DEPARTMENT OF GEOGRAPHY, SCHOOL OF SCIENCE AND SCIENCE EDUCATION, FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA.

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF A POST GRADUATE DIPLOMA IN ENVIRONMENTAL MANAGEMENT (PGDEM)

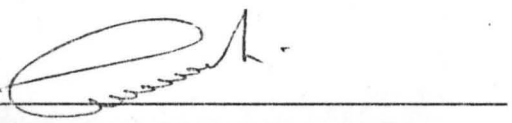
BY

SHEHU USMAN MUHAMMAD
PGD/GEO/98/99/002

APRIL, 2000.

DECLARATION

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



SHEHU USMAN MUHAMMAD
(PGD/GOE/98/99/002)

11-05-2002
DATE

CERTIFICATION

This project entitled The Problems and Prospects of Solid Waste Management in the Public Sector, A case study of Kaduna State Environmental Protection Authority (KEPA). By Shehu Usman Muhammad (PGD/GEO/98/99/002) meets the regulations governing the award of the Post Graduate Diploma in Environmental Management of the Federal University of Technology, Minna and is approved for its contribution to knowledge and literary presentation.

.....	.....
Shehu U. Muhammad **Student**	**Date**
.....	24/08/2000
Dr. M.T. Usman **Supervisor**	**Date**
.....	.....
External Examiner **Prof. S.O. Ojo**	**Date**
.....	24-08-2000
Head of Department **Dr. U.T. Umoh**	**Date**
.....	.....
Dean, Post Graduate School **Prof. K.R. Adiboye**	**Date**

DEDICATION

Dedicated to my late father Alhaji Muhammad Tukar (Mai- Rahama) may Allah have mercy upon him and all those that contributed in making me what I am today.

ACKNOWLEDGEMENTS

his project was carried out to determine the problems and prospects of waste anagement in Kaduna metropolis. Questionnaire administrators and the project writer nd all those deserve to be mentioned need to be praised for a job well done. I ecifically have to thank Dr M. T. Usman of FUT Minna for supervising the project and s patience in going through the manuscripts and making constructive suggestions that ushed to a quick completion of the write up. Mr. L. B. Achi, the former General anager of KEPA need to be specifically mentioned for his technical guidance and dvise. I need to thank all members of KEPA management for their understanding and operation.

am almost lost for words in trying to express my appreciation to my wives, children, lations and friends for their moral support and understanding. I thank you very much. I so wish to put on record the contribution of Mrs. Hassana Sanusi who assited in typing e manuscript and Mu'azu Idris Abdurr'uf for putting things in shape

nally thank Allah for sparing my life to this day and for making it possible to finish the oject. May He bless my effort.

TABLE OF CONTENT

CHAPTER ONE

CHAPTER TWO

WASTE MANAGEMENT FRAMEWORK IN KADUNA STATE

CHAPTER THREE

LITERATURE REVIEW

CHAPTER FOUR

METHODOLOGY

CHAPTER FIVE

CHAPTER SIX

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

ABSTRACT

Waste Management is a major Environmental (Health) problem, which has
red all solution especially in developing countries like Nigeria. Its generation is
mined by the dynamism of the population indices. The higher the growth rates the
r the waste generation in any growing society.

study examined waste generation, waste characteristic, storage facilities, dump
and waste conveyance facilities. Other areas considered in the study was the cost
use evacuation, efficiency of private sector and the public sector parties especially
cal government councils and the Kaduna State Environmental Protection Authority
A). The study also looked at the readiness of the citizenry to contribute their quota
ving waste management problem in the metropolis.

findings of this project should be of interest to planners of waste management in
etropolis and the state in particular because of its focus on the consequences of
propriate waste management of the total environment and the health of man in
ular. It indicated the level of awareness of the public on the dangers of the
nce of waste all over the surrounding. Absence of any sustainable waste
gement awareness programme in the state has made the public behave very
erently to all institutional changes in waste management in the state.

PA as the focal point of the project was studied for 5-year period and the outcome ealed very poor funding, poor staffing and inadequate equipment for waste agement. It also revealed that government itself is very much interested in adhoc or brigade approach to waste management because of lack of political will and rmination to return fire for fire in its fight against filth. It concluded by pointing out a that local government councils vested with the responsibility of waste management not have the funds, staff, equipment and commitment to face the challenges of ern refuse problems. KEPA isn't better either due to same problem. Finally, it is cated that the commercialization and full privatization of the exercise should be arked upon under an arrangement with State (KEPA) Local Government Councils the representatives of the interested private sector Operators. This should go with planned government incentives for investment in the field. Intensive awareness rams should also be put in place to promote home to landfill system under a guided te sector participation

DEFINITION OF TERMS

LID WASTE:- This refers to an over used, unused, misused and unwanted material ch is neither liquid nor gaseous, and is no longer needed for it's original purpose.

IDFILL:- Is the systematic deposition of waste, on land in an environmentally eptables manner, that protects soil and ground water, and reduce the nuisance ct of the waste.'

LOGICAL VECTOR:- Is an insect which transmits diseases among human/Animal ulations through blood sucking.

MP SITE:- This is a place weather open or enclosed which is air marked for porary storage of solid waste from various sources.

NERAL MANAGER :- This for the purpose of this research refers to the General ager and Chief Executive of the Kaduna State Environmental Protection hority(KEPA).

TROPOLIS :- Metropolis in this context means 15km radius of the Kaduna nship, which is the Kaduna State Capital.

ENVIRONMENT:- Means and include the complex, totality of man's surroundings which cover the biogeophisical components (e.g land, water, air, plant, animals e.t.c).

EALTH:- Is defined as the state of complete mental, physical, and social welbeing of individual, not merely the absence of disease or infirmity.

ZARD:- Is a condition or substance which when exposed to, predispose man tp ill-alth

CHAPTER ONE

INTRODUCTION

BACKGROUND TO THE RESEARCH

waste implies all over used, unused, misused and unwanted material which is
r liquid nor gaseous, and is no longer needed for its original purpose. This when
ited indiscriminately results or predispose to many disease conditions. Waste
e) comprise of four major components viz.:- Garbage, Rubbish, dead body and
. Perhaps it emanates from a variety of sources, all of which culminates from
activities. These include.

lustrial source- These result from the manufacturing processes of industries.
ually it comes as wastage, end products, and or process mistakes; to mention a
.

ricultural source:- A voluminous quantity of waste is generated from the
icultural region, in the form of animal waste and carcasses, rotten vegetable /
s etc.

rmore, a lot emanates from commercial hospital/healthcare centers, institutional
creational centers. Unfortunately, poor waste management cause numerous
and nuisances to the public and the environment. Typical among them are:-

ers the surrounding and defaces its natural beauty.

t refuse could be blown by wind to a near by water course or drain and cause
kage and or, flood.

Accumulation of Solid Waste provides a favorable breeding place for insect vector and several disease causing organisms.

The traces of fecal matter in refuse enhance faster spread of intestinal diseases among human beings.

Sharp objects (e.g. nails, glasses, knives etc) commonly found in solid wastes are sources of domestic accidents.

There were reported cases of configuration on refuse dumps, which results to fire disaster in many communities.

efore, the need for a concretely planned and sustainable waste management em can not be over emphasized. In essence, there should be an organized ction system, good method of storage, adequate transport arrangement and tive treatment/disposal of refuse irrespective of the source.

ertinent also to note that the effective management of refuse requires the blessing stakeholders. Emphatically, the already demarcated roles among stakeholders like ate government, local government, the private sector, NGOs and Individuals must rformed at the right time, by the right person at the right place. Moreover, the legal institutional frame works, funding arrangement, resources management and tenment campaign are the determinant of the success of the exercise or wise. Unfortunately, careful study of the history of waste management in Kaduna led that government has been handling the exercise single handedly. Like any government projects, political instability and other factors militated against the ss of the exercise seriously. This is evident by the series of changes and morphosis waste management has under gone within a span of just 20 years. Viz.

m KCDB the exercise was transferred to local government after the Dasuki Local ernment Council reform which conferred the responsibility on them. Later, a task e was formed and saddled with the responsibility of handling the exercise. Then e the issue of KASUPEPA which took over from the later. When the performance of UPEPA was not satisfactory, a private firm RESLARC was commissioned to handle collection and disposal of refuse from Kaduna metropolis on condition that individual ehold would pay for the service. This did not last long before KEPA was brought in ke over and barely after a little above one year the local governments requested to nue with what they claimed to be their constitutional responsibility and the request granted. Hence the local Government Councils now are in control of the exercise in iple.

ever, unanswered questions remain; has the government succeeded in ensuring a ree environment? Is their hope for a sustainable waste management system in e? Answers to these questions were the motivations for this research.

1.2 STATEMENT OF PROBLEMS

The ever -growing refuse heaps in our society especially in Urban centers should a serious cause of concern to any well -meaning environmentalist and any environmental authority. The refuse heaps serve as breeding ground for some biological vectors, vermin and rodents. These constitute serious sources of public health problems in the society.

The absence of a clear government arrangement and poor private participation in the business of solid Waste Management in Kaduna metropolis and the State in general constitutes a great obstacle to a sustainable waste management. The military governments that existed for over a decade were characterized by a task-force-approach in their dealings with the assignment of waste management in the state. This situation continued until the Kaduna Environmental Protection Authority (KEPA) was created and given the responsibility for Solid Waste Management in the metropolis, after five years in existence, one cannot conclude that the waste management's. scenario has changed. There is thus the need to examine the structure parties and issues involved with a view to establishment measures to charge the situation for the better.

JUSTIFICATION

e is the general expectation of our community that refuse management is the sole onsibility of the various levels of government in the state. This belief might not be nnected to the fact that governments in the past, have been taking the onsibility for waste management right from the collection, storage, transportation disposal. The government on the other hand, nowadays, expects the community to full responsibility for waste management since the polluter-pays-principle dictates every individual or organization should be responsible for any waste generated by activity. Private sector operators are showing keen interest in participating in the e management sector. However, due to lack of fund and legislative framework, participation is at a very low level.

e is the need to study the situation viz-a-viz the constitutional provisions and assign able roles to each sector/stakeholder with a view to implement a sustainable solid e management system in the state.

AIM & OBJECTIVES OF THE STUDY

aim of the study is to examine the establishment of Kaduna Environment Protection hority (KEPA) and its various functions as well as ascertain the roles of all keholders as they relate to waste management in Kaduna State.

specific objectives are to:-

Examine the institutional structure and legal framework establishing KEPA

Determine the role of KEPA in Solid Waste Management in the State.

dentify problem militating against sustainable Waste Management in the State

Assess the finances available to KEPA for Solid Waste Management

Examine the prospect of sustainable Solid Waste Management in the State.

dentify appropriate roles for all stakeholders in Solid Waste Management in the State.

SCOPE AND LIMITATION OF THE STUDY

study covered the function of Solid Waste Management in Kaduna metropolis n the jurisdiction of the Kaduna State Environmental Protection Authority (KEPA). study is limited to a period of 5 years only i.e. from the time KEPA was excised the former KASUPEPA in 1994 to 1999.

e is the limitation of organized system of keeping record on refuse management in uthority. Since the function of Solid Waste Management in the Country was vested onstitution. Responsibility for its management therefore has never been consistent, e stewardship of the state and that of KEPA has kept on changing.

equate resources also limited the study to an examination of problems and ects and recommendation of roles to various stakeholders, which will ensure inability.

CHAPTER TWO

STE MANAGEMENT FRAME WORK IN KADUNA STATE

0 GENERAL BACKGROUND OF THE STATE

duna State, is one of the 36 states in Nigeria, derived its name from the name of duna town, the seat of the former Northern region 1962-1966, and the capital of the th Central State (which comprised of the present Katsina and Kaduna States) 1967 - 6, while Kaduna town derived the name from the word **Kada** which is the Hausa d for Crocodile which nature had blessed the then Kaduna River with. The word duna was directly the Hausa plural of Kada which is "**Kadduna**" i.e. crocodiles.

urally since Kaduna was the seat of power by the colonialist even before ependence, it retained that status after independence till date. Hence with the easing socio-economic activities and as the seat of power, the increasing rate of se generation was directly proportional to the increasing population and economic ivities in the town. The refuse generation rate increased as its characteristic and mposition increased in complexity due to the different new activities in town.

e present Kaduna State was created in 1987 form the then Kaduna State which now clude the Katsina province, now Katsina State. The state presently comprises 23 al government areas (fig 2.1) namely Kaduna North, Kaduna south, Chukun, Igabi ria, Sabon Gari, Kudan, Makarfi, Ikara, Lere, Kauru, Kubau, Soba, Zangon Kataf, chia, Jema'a, Jaba, Sanga, Kaura, Kagarko and Birnin Gwari.

first four Local Governments mentioned above make up the Kaduna metropolis, e the metropolitan town of Zaria comprises, Zaria and Sabon-Gari Local ernment Councils. Kaduna town (the state capital) roughly lies on longitude 7'25' of the Greenwich meridian and latitude 10'30 North of the equator, while the state a population of 3,169,252 (Male 2,059,352, female 1. 909,570), (1992 National sus report). It has a population density in urban/metropolitan centers of 112 sqkm rural/village settings of 75/sqkm.

luna state is endowed with mineral deposits, reutile, clay, quarry, amethyst, Tin ore, phite, gemstone, antony, rubbies, sapphires, zircon with 5 main soil types namely dy loamy, sandy clay, gravel-sandy, clay loam, sandy surface and loamy sandy face all grouped under Alfisols and luvoisols. The state is 80% agrarian. Its main icultural products are guinea corn, millet, maize, Rice ,Yam, Ginger etc while cattle l sheep can be found largely in the state. It has over 130 industrial convcerns notable ong which are Peugeot Automobile (PAN) KRPC, DIC, UNT Plc., e.t.c (PA/MASTER AN STUDY 1997.).

ver Kaduna where the state drived its name is the most important source of both nking and industrial water. The river takes its sources from kujama hills in the Jos ateau and flows for 210 Km before reaching Kaduna town. It crosses the city, dividing e city into North and South. Beyond Kaduna the river flows for about 100km into the iroro dam. After shiroro it continue to flow for 200km and finally discharges into the ver Niger on the Northern shores of Pategi (KEPA, 1998).

2 ESTABLISHMENT OF KCDB

stablishment of Kaduna Capital Development Board (KCDB) became necessary in 72 when the expanding rate of the city became very rapid. There was the need for ntrol of development and provide urban infrastructures such as road, drainage, street nts, urban aesthetics, refuse evacuation, and plans approval etc.

ny collection points were constructed and sanitary laborers were employed to be in-arge of the points. Unguwar Mu'azu dumpsite was the only major site receiving refuse m the city. At least at that time relative success was recorded to keep the refuse out sight.

WASTE MANAGEMENT IN THE LOCAL GOVERNMENT

wever, with the increasing pressure from then Kaduna Local Government, the ction of waste disposal was transferred to it and all the plants and equipment were omatically transferred to the Local Government Council. This pressure was due to recognition of the constitutional provision, which vested the responsibility of refuse cuation to Local Government councils as enshrined in the Dasuki Local Government rm of 1986. The then Local Government continued the task of refuse evacuation in metropolis. However, since "Waste generation is directly proportional to population wth" Prof. Falade (1999), Aina E. A. O. (1996). The waste generation became too ch for the Local Government to handle, with degeneration of the Waste Collection ipment, poor skills, poor management and therefore garbage waged a serious war inst the city. In summary by the end of 1987, all vehicle were grounded.

Local Government introduced a scheme for the collection and disposal of refuse gh refuse contractors in 1988. The contractors were charging not more than N30 ouse/drum. In spite of all these efforts, the scheme failed due to the refusal of the c to pay for the services, the poor enforcement of the sanitation edicts of 1984 and igh cost of hiring tippers by contractors. Later in 1990, the Local Government led to assist (for political reasons) the public by paying 50% of the cost charged by efuse contractors to enable the refuse evacuation exercise progress. Not long after the arrangement failed in 1992 due to; the fact that the Local Government Council not pay its counterpart fees as at when due, dissatisfaction with the service on the of the general public, ignorance of the public on the dangers of squatting with s of refuse, poor supervision and logistical support.

WASTE MANAGEMENT USING TASK FORCES

se became a problem child no good Samaritan was willing to accommodate use of its associated high growth rate and little resource to manage, neither the e contractor nor the local Government or State Government.

forces on refuse evacuation was the only willing alternative between 1986 –1990. task forces were set up at different times to wage war on the invading refuse ntains, but twice the refuse army was sent parking. The task force of 1990 could not a daily generation rate of 450, 000m3 in the metropolis out of which only 35% of it being collected and disposed by Local government arrangement (task force report)), between 1972 and 1992 refuse collection and disposal was just changing hand veen KCDB, Kaduna Local Government Task Forces and Local Government health rtments

WASTE MANAGEMENT WITH KASUPEPA

h though one cannot relate the creation of a department in Kaduna State Urban ing and Development Authority (KASUPDA) responsible for environmental matters e ever increasing refuse generation in Kaduna metropolis, but one can confidently al that refuse management crisis facing the Kaduna metropolis was one of the us environmental problems which necessitated the creation of that unit to take ge, hence KASUPDA was upgraded to KASUPEPA i.e. Kaduna State Urban ning and Environmental Protection Authority in 1990.

gh the new unit was not solely responsible for refuse evacuation in the metropolis, ecause "it was charged with the responsibility to monitor, regulate evaluate, vise, advise coordinate and undertake project where possible in all matters g to the environment " KASUPEPA Technical Committee on Solid Waste, 1992. fically, as regards to waste management, the function of KASUPEPA largely ns coordination, advise and supervision.

ver, because of the magnitude of the garbage crises that drew everybody's on, the then Ministry of Work and Transport, established a sub-committee under PEPA on Solid Waste Management in September 1992 and the terms of nce of the technical sub-committee were as follows (MENR/ENV/164)

Waste Management Sub-Committee:

To prepare periodic masterplan for Solid Waste Management in the State.

To advise and recommend to the State Government the necessary institutional framework for effective execution of all solid Waste Management projects;

To design criteria for the establishment of waste disposal sites that guarantee the safety of surface and ground-water systems:

To recommend standards for adequate sanitary facilities for the collection and disposal of human and other solid wastes in dwellings and public facilities in both urban and rural areas of the State;

To recommend criteria for the registration, regulation and licensing of all major land based waste disposal sites or system;

To recommend criteria for the registration, regulation and licensing of all major land based waste disposal sites or systems;

To prepare State of the Environment annual report in the filed of solid waste management;

To make submissions on the legal and constitutional aspects of the relationships between the Local, State and Federal Governments in solving the enormous problems encountered in Solid Waste Management in the State.

s committee made all effort to see that it operates and discharge the duties reposed it but due to obvious reasons, it could not operate and it winded up officially six nth after its inauguration. However, the department of environment that was then onsible for it, continued the task with relevant institutions to ensure that a practical roach was developed for solid waste services. That included meeting with MAMSER PAEHON Kaduna State Chapter, until finally KEPA was established.

department of Environment and its staff were initially deployed to KEPA and later itional posting was effected to KEPA after the asset sharing, for effective take off.

ESTABLISHMENT OF KEPA

Kaduna State Environmental Protection Authority (KEPA) came into being legally through enactment of Edict Nos.1 of 1994 by the Military Administration of Col. Ja'afaru Isa. It metamophosized from a department in the then (KASUPEPA) and the KASUPEPA Edict was amended to remove the EPA. It regained its previous name i.e.KASUPDA. Immediately the Edict was signed into law, the Authority moved to the former NRC State Secretariat located in Nos. L.10 Link Road, Unguwar Tolovision, Kaduna South, Kaduna. It has a governing Council headed by a Chairman and representatives of the various ministries and interest groups.

FUNCTIONS OF THE AUTHORITY

The Authority was vested with a lot of power and functions with a view of conserving and protecting the State Environment, KEPA Edict Nos. 1 of 1998 (as amended) provided in Section 5 a to f , the functions are as follows:-

The Authority shall subject to this Edict have the general responsibility for all ers relating to environment and relating thereto and with prejudice to the generality foregoing it shall be the duty of the Authority to ;act and enforce State regulations ol criteria, procedures, guideline and environmental standards for effective ention, remediation, control and prevention of point and non-point sources of ion and degradation;

formulate, implement, and review environmental policy in the State and in particular to demand and review Environmental Impact Assessment and Statement for new development projects and to also demand and review environmental audit reports for existing developments and such other operations which are deemed to have significant impact on the environment;

prepare in accordance with the State Policy and Edict on the environment periodic master plans for the development and the financial requirements for implementation of such plans;

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

They shall in particular:

i. Monitor the whole parts of the State for any of such discharge;

ii. Cause the responsible Parties to stop or remove such discharge;

iii. Remove or cause to be removed such discharges at the expense and account of the defaulting party;

iv. Cause penalty to be paid in accordance with the appropriate regulations;

v. Reinstate, rehabilitate or cause the effected environment to be restored to its original State at the expense of the responsible party or parties.

vi. Approve landscaping and drainage plans on new developments.

vii. Grant final approval for all manner of mining activities in the State;

Monitor environmental quality, conduct programme of continuing, surveillance and of regular periodic inspection of actual or potential contaminants of point and non-point sources in the environment in accordance with the laid down regulation as the authority may deem fit.

To liaise with Federal, State, Local Government and other public and private authorities, agencies, and institutions engaged in environmental planning and functions.

Research, collect and collate information and research findings in various environmental disciplines;

Develop libraries and archives and to establish and maintain a data base on environment;

Stimulate public interest on environment by dissemination of information, organizing lectures, seminars, and workshops for public awareness campaigns, generally encourage environmental education programs in Schools, Mass media and other formal and informal sectors;

Where feasible, conduct training programs for industrial, commercial and public institutions, and or recruit and train environmental extension workers and staff of the Authority for the purpose of effective mobilization of the public towards environmental education and awareness;

Issue permits, licenses, approvals and to administer certification systems and operation procedures as may be provided under any regulation, Edict or federal enactment and to charge fees, levies for the issuance of such permits, licenses, approvals and certifications as the authority may from time to time prescribe;

Establish and maintain close liaison and linkages with major research and scientific institutions, professional association, experts and consultants as well as government and non-government Organizations in the field of environment;

Investigate and ascertain all violations of this Edict and or relevant rules and regulations under this Edict and prosecute or cause to be prosecuted such violations.

Demand to have access to any public or private property of premises, at all reasonable times enter upon for the purpose of inspecting and investigating for ascertaining any violations or potential violations.

Establish zonal offices in the State and constitute joint consultative committee with the Federal and Local governments, for the purpose of operating, administering and enforcing the provisions of the law and regulations and/or any enactment relating to the environment generally.

Without prejudice to the provisions of any existing law relating to refuse disposal the Authority shall establish operational mechanisms for refuse collection, transportation and disposal in cooperation with Local Governments of the State;

Subjects to approval of the Governing Council the Authority may borrow money, whether by way of mortgage or otherwise, such sum of money for executions and discharge of its functions may be determine by under this Edict as the governing council deem necessary;

The authority may accept gifts of land, money, books or other property upon such terms and conditions, as may be specified by the person making the gift, provided it shall not be lawful for authority to accept any gift if the conditions attached thereto by the person making the gift are inconsistent with the function of the authority under the Edict or contrary to law or regulations for the time being in force;Subject to

existing regulations and legislation's honor, adopt and execute all existing bilateral and multilateral agreements, memoranda of understanding, cultural obligations, including entering into mutually beneficial joint venture relationship and executing projects and programs with foreign countries non-governmental organizations, and individuals;

The authority shall have the power to delegate some of or any of its functions to any body or organization on such terms and condition as it may determine;

2.8 STRUCTURE OF THE AUTHORITY

The Authority was established with six directorates, four technical and two non technical, namely Directorate of Planning, Research and statistics, inspectorate (later amended to read Conservation and Natural Resources), Environmental Technology, Finance and Supply and Directorate of Personnel. A General Manager/Chief Executive leads the Authority.

2.9 STRUCTURE AND FUNCTIONS OF DIRECTORATE OF ENVIRONMENTAL TECHNOLOGY.

The Directorate of Environment Technology was one of the four technical department and is headed by an Acting Director, the Structure shows it has 4 units i.e. Health and sanitation, Engineering, Mechanical Workshop and Sewage and Drainage.

The functions of the department especially as it relates to the legal backing on the function, is section 5(1) (P) and it reads".

"Without prejudices to the provisions of any existing law relating to refuse disposal the authority shall establish operational mechanisms for refuse collection, transportation and disposal in cooperation with local government of the state".

ne above quoted sections gave the authority the power to be fully involved in eveloping masterplan for solid waste management and at one point and then be volved in the direct evacuation and disposal of refuse within the period under xamination i.e. 1994/1995 - 1998/1999.

.10 SERVICE OPERATION

he Authority, under the provision of the Edict establishing it coordinates the activities of ıe Local governments, Private sector, and non-governmental organizations (NGOs) in reas of waste management in the state especially in the Kaduna Metropolis.

o enable the authority discharge its services efficiently, the directorate of nvironmental Technology, under its health and sanitation unit, among others, onsiders the following as its major activities:-

Organize and coordinate the National Sanitation of every end of the month when it was the practice.

Develop framework/masterplan for solid waste management.

Organize and conduct direct refuse evacuation as at when directed by the State Government.

Divide and group the Kaduna metropolis into manageable zones for refuse evacuations by refuse contractors.

Accredit refuse contractors in the metropolis.

Employ on temporary workers that were charges with the responsibly of house to house inspection control of stray animals in the metropolis in conjunction with local government sanitary inspectors in the metropolis.

Identify, locate and control the use and management of official dumpsite/landfill sites in the metropolis.

On behalf of the government, enter into discussions, agreements and arrangement with NGOs and organized private sector in areas of Waste Management. e.t.c.

he day to day activities involved in Waste Management within the period of report was haracterized by marked changes as follows:-

. From June 1994 – Dec 1994 was a period that witnessed the consideration of a proposal from waste management consultants in Kaduna State. The proposal was approved in December 1994.

. Jan-June 1995- trial of launching of the home to landfill system introduced by Reslarc via solid waste contractors but failed due to many problems.

. June 1995 - Dec., 1995. The State Government pulled out of the arrangement and allowed the metropolitan Local Government Councils to re-examine the proposal with Reslarc. It finally failed completely by the end of Dec. 1995.

. June 1995 - March 1996 KEPA launched intensive house to house inspections exercise, and introduced home to landfill system via the officially designated dumpsites. The metropolis was zoned into 114 zones (See appendix 11) that are accessible for refuse evacuation. The zone are grouped thus;-

ABLE1 SHOWING THE ZONING OF KADUNA METROPOLIS FOR WASTE ANAGEMENT

S/N	LOCAL GOVERNMENT AREAS	NO OF ZONES	PERCENTAGE
1.	Kaduna North	35	30.70%
2.	Kaduna South	48	42.11%
3.	Chukun	22	19.30%
4.	Igabi	9	7.89%
	Total	114	99%

100 casual workers were employed and were given two weeks intensive training on identification and abatement procedures of nuisance in the metropolis, excluding the heavy commercial and industrial areas. Instruments of abatement were also given to them and were mandated to apply them as at when necessary. The instruments were:-

Abatement notice booklets,

Defaulter/fine booklets

KEPA receipt books

Notice and signboards

A lot of success was recorded in the exercise. A number of communities wrote in to commend the Authority for initiating the exercise. Many houses that had no toilets provided it, cleanliness of environment was improved, many stray animals arrested and owners were fined and or prosecuted in the state constituted environmental courts. Drainage constructions and maintenance, provision of waste bins in the vehicles were initiated and enforced

However, the exercise was halted mainly because of lack of fund to sustain it, especially for the payment of the workers and the logistics involved in the exercise.

11 SOURCES OF FUNDING/REVENUE

he Authority was expected to be funded by the state government as at when ecessary. Throughout its operation, (except for the period between January 1998 – ec 1998 when the then Government felt that the Authority could survive without overnment grant), the State Government was responsible for its staff salary and some onthly grant to cover the overheads.

he edict establishing KEPA gave the authority the necessary provision on matters elated to finances as stated in part Vi, section 19-20 as follows:-

1) The authority shall establish and maintain a fund from which there shall be defrayed all expenditure incurred by the Authority.

2) There shall be paid or credit to the funds:

a. Such money as may be appropriated, from times to time to the Authority by the Government of Kaduna State.
b. All money that may accrue to the authority by way of loans, endowment, grants or gifts;
c. Money raised in any appropriate manner for the purposes of he authority;
d. Interest accrued on money invested by the authority;

e. Such other funds or sums of money or property which in any manner become payable to or be invested in respect of any matter primary or incidental to the functions of the authority.

(1) The authority may from time to time apply the funds at it's disposal for:-

a. The pursuance of all or any of its functions under the provisions of this Edict;
b. The cost of it's administration;
c. The remuneration honoraria of the Governing Council of the Authority or any class or members in respect of their duties under the provision of the Edict;
d. The payments of salaries allowances gratuities or pensions of staff of the Authority.
e. The payment of any taxes duties, or other charges payable by it under any enactment;
f. Any other purpose necessary or incidental to the carrying out of its functions.

(2) The Authority may with the approval of the Governing Council from time to time make grants from funds at it's disposal if in the opinion of the Authority, it is likely to enhance it's objectives.

With the above provision the Authority raised revenue in the areas of sanitation rent, levy and fees for stressing the environment by industries, stray animal arrest, approval of Environmental Impact Assessment (EIA) and Environment Audit Reports, registration of consultants and contractors, fines by environmental Courts, grants from international donor Agencies such as UNDP and world Bank.

Below is table2 showing the amount raised as revenue through waste management including sanitation exercise and grant by KEPA from 1994 – 1999.

TABLE 2

Year	Sanitation Revenue	mobile court	other sources	Total
1994	171787	37040	-	208827
1995	310840	126797	8770	446407
1996	293870	336845	8090	639485
1997	201721	388991	12820	603532
1998	341333	188795	44880	574988
TOTAL	**1319551**	**1078468**	**74560**	**247259**

Other sources include fines from stray animals arrest and use of KEPA landfills.

12 STAFFING

om June 1994 - 1998 the Authority had the following staff;

ABLE 3 SHOWING THE LIST OF PROFESSIONALS IN THE AUTHORITY

N	CADRES	NOS	%	REMARKS
	Town Planner	4	6.25	
	Chemists	1	1.56	
	Environmental Health Officers	3	4.68	Relevant to waste
	Engineers(building)	1	1.50	management
	Cartographer	1	1.50	"
	Mechanical Engineer	-	-	
	Chemical Engineer	-	-	"
	Geologists	-	-	
	Hydrologist	-	-	
0.	Civil Engineer	-	-	
1.	Administrators	4	-	
2	Work superintendents	3-1	6.25	"
3	Driver/Mechanics	2	1.56	"
4	Drivers	6	3.12	
5	Other (non Professional)	41	9.37	
			64.06	
		64	**100.00**	

nformation taken as at December 1998.

13 LOGISTICS

hen the authority was created in June 1994, 2 Saloon cars were released to the uthority. After the asset sharing with the KASUPEPA later, the following plants and quipment were transferred to KEPA.

Tipper 911 – Reg. No 21 KDSG		28
Tipper 911 – Reg. No. 21 KDSG		10
Tipper 911 – Erg No. 21 KDSG		30
Tipper 911 – Reg. No 21 KDSG		34
Grader – Austin – Reg. No 21 KDSG		34
Tractor –International Reg. No 21 KDSG		15
Tractor – International Reg. No 21 KDSG		21
Payloader – International Reg. No 21KDSG75		1
Voxwagen – combi – Bub – Reg Nos 21 KDSG	32	1
0.Sweep Leyland -Reg. 21 KDSG42		1
1.Sweep Leyland -Reg. KD 7195		1
2. Septic Tank emptier Reg No. 21 KDS 9		1
3. Septic Tank emptier Reg No. 7364A.		1

tems 1-8 are all relevant to waste management unit, but none functions for a day i.e. hroughout the period of this study. This makes it necessary for the authority to go to the rivate sector and hire all the needed plants and equipment for its operations.

CHAPTER THREE

LITERATURE REVIEW

1 GENERATION

lid Waste, especially in the developing World, comes from different sources. The urces are classified into domestic, institutional, commercial, Agricultural and industrial nianwa, 1998) each of which can further be examined based on the socio-economy d culture of the society, that determines the composition of the refuse.

MHE (1982) survey revealed that the study of 6 Nigerian cities that refuse generation, m Abuja had 65.2% as ash/dust/stone while Warri had the least of 5.9%. In the antity of food remnant, Port-Harcourt had the highest of 30.3% and Ibadan recorded e least with 6.5%. Paper component of the refuse was highest for Lagos 23.5% Warri corded 5.0% only. For bottle and glass, Lagos recorded 15.4% against Kano's 4.6%, ns/metals constituted 20.6% of wastes in Warri against 6.0% for Abuja .Other onstituents include/ rags for which Ibadan recorded 4.5%.

ne major indicator and determinant of Waste Generation is the level of economic ctivity of a particular Country. (UDBN 1998) . It has been noted that the per capita rate f Solid Waste generation increases as the standard of living improves (UNCHS abitat, 1984). The generation rate is influenced by factors such as climate, cultural abits, and economic status and to some extent population size and level of economic evelopment.

wever, personal income has been on waste generation due to its impact on individual nsumption pattern.(UNCHS Habitat, 1984). Data by the World Bank on the ationship between income and waste generation rate for 30 countries shows a range 0.4 – 0.6 cap/day for low income Countries and 0.7-1.8 kg/cap/day for industrialized ntries. Same impression was created by a survey by the Urban development Bank Nigeria(UNBN) 1997 on waste generation by weight per capita. The maximum was 7kg/cap/day recorded in Asaba while the lowest was 0.25kg/cap/day in Jos.

e rate of generation "also varies by ecological zones with the highest value of 9kg/day in the tropical rain forest and lowest value of 0.37kg/day in the mangrove est. The corresponding rates for Guinea and Sudan Savannah are 0.41kg/day and 3kg/day respectively" Oyinlola (1998) in a study in Kaduna, which is our area of cern, have shown to generate 257,837 in 1982, 280, 925 in 1985, 324,084 in 1990 is projected to generate 4,031, 314 in the year 2000 (FMHE, NEST 1991). It is efore established that waste generation is daily on the increase, as population and capital income of individuals increase.

COLLECTION AND STORAGE

d Waste collection by household and its storage either by individual household or mmunity is a very important determinant of a successful waste management system. e storage system of refuse in any society is determined largely by the available nnology, the social and economic status of the society, by and large the role ernment plays in waste management are related. The efficiency and effectiveness of ection is intimately related to the method of house hold or communal storage

baseline socio-economic conditions of the area change, not only may the collection
d transfer equipment considered appropriate change but the associated storage
thod may correspondingly change"

ere are basically two categories of storage systems considered i.e. the household
parate unit) and communal storage. The former constitute the most common and are
ermined by individuals themselves such as cardboard cartons, plastic bags, crates
ch are mostly temporary, while plastics or metal bins mostly are permanent in
ure. The standardized containers are usually plastic or metal bins and with "lids
tic bag are generally considered inappropriate for standardized application in less
eloping Counties they are subject to being torn by scavenging animals and they
fere with some resource recovery system" LDGS, 1995.

communal storage are usually determined by government or the community itself.
population the point serves are determined by the population of the community,
e availability and its distance to the beneficiaries. Observations in china and Africa
shown that most beneficiaries seem prepared to carry the waste 50-100m to a
munal storage point but not more than 250m (SANDEC,1996). In some Countries
le refuse collection points have shown to record a great success in solid waste
agement. In Shanghai (China) there the households carry the refuse 50m to a
ile" collection point consisting of a tricycle or handcart ...mobile collection points
fore offer a type of collection facility within reach of the households" SANDEC'96.

Nigeria, any container that can be forfeited to collect a sizeable waste are used for mestic waste storage. In households, Cartons, Plastics, metal drums, plastic drums, lophane bags and baskets mostly unstandadized are used.

DBN (1997) survey documented that "on the average, 57.8% of households adopted stic containers of varying sizes, 27.4% use metal drums while 14.6% use cartons" e differences and lack of established standard may not be unconnected to the fact t there is policy or legislation that states clearly the type and nature of such ntainers for waste storage in less developing nations.

INDISCRIMINATE DUMPING

aniran (1995) stated that " one of the major environmental health problems facing geria especially in the major cities, is poor solid Waste Solid Management at the nicipal, (Local Government) state and national levels. "Apart form the huge tons of id waste generated, a much more serious and intractable problem is the attitude of me Nigerians with regards to solid waste disposal. Indiscriminate dumping of solid ste (Refuse) is the order of the day in most urban areas. Refuse is dumped on the d sides, in the streets, gutters (drainage system), markets any open space and und residential areas". This attitude makes it difficult for any management authority have an organized system of collection and disposal since the dumping is iscriminate. Therefore the cost of its evacuation increases, exhausting the scarce ources available for solid Waste Management

e presence of waste indiscriminately in urban areas has not only posed a threat to blic Health " but it is also a source of pests and vermin breeding ground and

ource of fire out-break. It also constitutes problems to traffic flow near the market most specially where management is very poor

Waste Management authorities are faced with the task of choosing the best options for anaging Solid Waste, (Sridhar and Adeoye, 1999) Suggest three principal methods of isposal. "They are sanitary landfill or land reclamation, incineration and composting". he three methods definitely have advantages and disadvantages, especially for an gency that may initially concern itself with collection (out - of- sight) and disposal to chieve a political goal. Infact in cities, land available to transform to landfill site is a erious obstacle to safe and sanitary disposal of refuse.

he global view on waste was summed up by the population report (May 1992) which eported that " millions of people throughout wastes from industrial plants, power enerating stations, refineries, tanneries and hospitals, once these chemicals have een dispersed into waterways, landfills and air, it is difficult and very expensive to emove them". Therefore, any authority charged with the responsibility of waste anagement must be having it difficult to discharge the duties especially landfill siting nd maintenance.

CHAPTER FOUR

0 METHODOLOGY

variety of methods have been employed in data collection for this study. These are e methods that are most appropriate for a study of this nature and which no doubt ade the collection of useful and relevant information possible during the field studies. ne methods adopted were as follows.

1 STUDY OF EXISTING DATA

eing the primary source of data, already compiled and stored relevant facts to the bject of study were carefully reviewed and excerpts taken were carefully reviewed. is source is principally the literature studied from various text books and magazies thored and published by different intellectuals and organizations. Other auxiliary urces fully utilized were the report of similar studies conducted or sponsored by vernmental and non-governmental agencies.(e.g. world bank, KEPA etc)

1.1 THE OBSERVATION METHOD

view of the cosmopolitan nature and devastating effect of the problem under study, e researcher deemed it necessary in the quest for relevant data about it to embrace ner means of gathering information like the observation method. This entailed visit to blic dump sites to assess the manner of use and maintenance of such facilities in me part of Kaduna metropolis. Similarly, individual houses visited, where the volume d characteristics of refuse as well as the type waste bin in use were studies.

Since the government commits huge resources in waste management, the facilities used, production adopted and final disposal sites/methods for the exercise here examined, with a view to determine their safety, adequacy and efficiency through non participant observation.

Several still pictures were taken (see appendix 1) and video coverage made of relevant portions. Record of governmental agencies and their department context as a bit of data was taped and used accordingly.

A lot of vital information was gathered in the process, on the subject of study and a wide gap on silent issues identified which was bridged at the end of the research.

1.12. INTERVIEW METHOD

Some facts which could not be gathered through other methods were obtained during interview of stake holders. Many people were contacted on individual, group and organizational bases and interviewed on various aspects of waste management.

Principally, much information was gathered from retired and serving officials of KEPA, KASUPDA, FEPA, MIN. OF HEALTH and LGAs on their opinions and experiences regarding the institutional and legal frame work of solid waste management, the implementations strategies, achievements recorded obstacles and constraints faced as well as the suggested methods of ensuring a sustainable system. The data elicited by the interview method contributed immensely to the text articulated/success of the research work.

.13 USE OF QUESTIONAIRES

nother method employed was the use of questionnaires, where series of related uestion related to the subject of study were structured on paper and administered on rious stake holders which elicited most of the information used for this research work. his entails extensive trips to the Urban Local Government Areas under the jurisdiction KEPA with more emphasis on the LGAs in the sampling frame.

he questionnaires were first distributed to officials of Governmental, non-overnmental and private sectors involved in waste management as well as few from e general public. Later, the researcher went round and retrieved them. A total of 120 uestionnaires were distributed, to various respondents, out of which only 100 were ly completed and returned, while 20 were not returned for reasons unknown to the searcher. The questionnaires were distributed to one hundred and twenty head of ousehold from one hundred and fourteen refuse management zones using random ampling method. The remaining six questionnaires were redistributed to the four etropolitan Local Government Areas using systematic random sampling.

ABLE 4 SHOWING THE DISTRIBUTION AND RETRIEVAL QUESTIONNAIRES

UESTIONAIRIES	NUMBER	PERCENTAGE
DMINSTERED	120	100
ETRIEVED	100	83.33
OT RETRIEVED	20	16.66

ne data elicited by the responses in the 100 questionnaires which represented 83.33 of the total target population was analyzed and presented as in chapter five. This enotes that 100 respondents became the sampling unit, and were used as enominator in the computation of various indices of the data presented.

.2 ANALYSIS OF DATA

ll the relevant information gathered throughout the various methods mentioned above ere properly presented and analyzed using the descriptive method. The data collected as always presented first either in tabular or diagrammatic form and later discussed xhaustively using the responses of the majority to judge in each case.

CHAPTER FIVE

.0 ANALYSIS AND DISCUSSION OF RESULTS

)emographic structure (Heads of household)

\ge – sex structure – table 5

LOCAL GOVERNMENT AREAS	MALE	FEMALE	TOTAL
Kaduna North	09	16	25
Kaduna South	13	12	25
gabi	11	14	25
Chukun	7	18	25
Total	**40**	**60**	**100**

Table 6; Occupation in the selected groups

Local Government Areas	Civil Servants	Farmers	Traders	Applicants	Others	Total
Kaduna North	10	4	7	3	1	25
Kaduna South	9	5	8	2	2	25
Igabi	6	12	3	3	1	25
Chukun	4	10	8	1	2	25
Total	**29**	**31**	**22**	**9**	**6**	**100**

Analysis:

The sex structure of the metropolis Table 5 shows out of the 100 respondents are in the metropolis 60% are females while 40% are males. Table6 indicates higher population engaged as farmers and civil servants. 9% are unemployed. Table 7 shows less than 10 years constitutes 70% while 15-49years constitute 64%, the aged i.e. 50 years and above constitute 10% 10-14years population are 29% finding Table 5, 7, 6 15-49years constitute 64%, the aged i.e. 50 years and above constitute 10% 10-14years population are 29%.

TABLE 7

AGE GROUP	MALE	FEMALE	TOTAL	PERCENTAGE
Below 10years	3	44	7	7%
11-14years	14	15	29	29%
15 –49years	30	34	64	64%
50years +	3	7	10	10%
	40	**60**	**100**	**100%**

Finding Table 5, 7, 6

There are more females in the metropolis, because out of the 100 population sampled out, 60(60%) are females while 40(40%) are males with the age distribution, the school age children constitute more than 29%, but it is worth noting that 10% of the sample is aged i.e. unproductive, when put together with the school age population and infants that constitute 46% compared to the workforce of 64% which are economically productive. The dependency ratio is 1:7 which can slightly be accommodated.

With more women in the population and for their culture of remaining indoor throughout the day, the rate of waste generation cannot be below the standard of 0.46kg/head/day in the developing society.

TABLE 5: POPULATION DENSITY

	KADUNA NORTH	KADUNA SOUTH	IGABI	CHUKUN	TOTAL	PERCEN TAGE
High Density	3	4	3	5	15	15
Medium "	17	15	19	14	65	65
Low "	4	6	2	5	17	17
Others	1	-	1	1	3	3
Total	**25**	**25**	**25**	**25**	**100**	**100**

Analysis

Out of the 100 population examined 65 (65%) of the population lives within a medium populated area, 15 (15%) lives in high density area, 17% in low density area, while 3(3%) lives in unclassified area.

Findings

Kaduna metropolis comprises more of civil servants, farmers especially in Chukun and Igabi Local Government Areas 65 (65%) lives in a medium density area, while only 17 (17%) lives in GRA. This is an indication that the major source of waste generation is from the medium density area which naturally will reflect their socio-economic background. Hence the refuse will have characteristics of food reminant, decomposable materials, few landed and other commercial waste.

Table 9: HOUSEHOLD STRUCTURE

Local Government Areas	LESS THAN 3 YEARS	3-5 YEARS	6-8 YEARS	9-11 YEARS	12 AND ABOVE	TOTAL
Kaduna North	6	8	6	2	3	25
Kaduna South	5	9	4	3	4	25
Igabi	3	2	5	5	10	25
Chukun	3	3	4	6	9	25
Total	**17**	**22**	**19**	**16**	**26**	**100**
Percentage	**17%**	**22%**	**19%**	**16%**	**26%**	**100%**

Analysis:

The number of people in a house hold seems to vary from semi metropolitan town to actual metropolitan towns. 26 (26%) of the households have more than 12 heads, 16 (16%) have 9-11 people, 22 (22%) have between 3-5 people, while 6-8 people have 19 (19%). Household of less than 3 people constitute 17 (17%).

Findings:

From the analysis above, households with more population will generate more waste than the rest. However, where the house holds having more than 12 people in the population of less than 3 with good economic status might generate more waste than household with more population but with very low Socio-economic status.

TABLE 10 WASTE CHARACTRISTICS IN A HOUSEHOLD WASTEBIN

S/N	WASTE	PERCENTAGE
I	Vegetable matter	26.47
ii	Food remnant	6.21
iii	Metal and metal related	14.08
iv	Paper &paper related	5.62
v	Plastics/Rubber/Leather	9.96
vi	Textiles related	3.96
vii	Glass/bottle related	4.06
viii	Ashes, dust, stones	24.40
	Others	**5.92**

Analysis

The constituents of the household refuse generated in the sampled population reveals that vegetable matter was 26.47%. Ashes, Dust, Stones 24. 40%, paper and paper related materials 14.08%, food reminant 6.21%, others that are unclassified such as cans, etc 5.92%, plastics/rubber/leather were 4.28%, Glass/bottle related, were 4.06%, Textile related products were 3.96%.

Findings

Vegetable matter constitute the highest with 26.47%, while the least is textile and its related waste which constituted 3.96%. The degradable matter constituted more than 50% but not up to 60%. These indicate a high presence of nondegradeable matter in the household refuse.

composition also shows that many small scale businesses can come up witj equate study to determine the recyclable and useful materials in the waste item i. – iii viii are degradable and/or recyclable. While items vi-vii can be recycled and/or used.

ABLE 11 WASTE SEPARATION

ASTE SEPARATION	NOS	PERCENGATE
es	2	20%
o	98	98%

nalysis

nly two (2%) separate waste, while 98 (98%) do not separate waste in their private ustbins.

indings

Since the majority 98% do not consider it necessary to separate their household waste, t is very difficult to ensure proper sorting out and proper disposal. Inevitably, the disposal site will be badly managed. Underground water pollution due to leachate generation can be suspected because of the mixture of toxic and non toxic materials in same waste bin.

BLE 12 TYPES REFUSE CONTAINERS

ME	NOS	PERCENTAGE
en space	18	12
ch	10	6.67
tal Container	26	17.33
astic/Bucket/Basket	41	27.33
andard dustbin	25	16.67
one	30	20
otal	150	100

nalysis

ne table revealed that 41 (27.3%) store their waste in a plastics/bucket/basket those hat do not have a dustbin at their own entire are 30 (20%). Those with metal (drums) containers are 26 (17.33%) those with standard dustbin 25 (16.67%) dumped in open space are 18 (12%) while those storing in an dug ditch are 10 (6.67%).

Findings

It is a cause of concern to see that not up to 20% posses a standard dustbin in a metropolitant town like Kaduna and up 20% do not seem 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. It is easier to convince those with plastic dustbins (27.33%) to acquire a standard dustbin than those without any to acquire one.

LE 10 WASTE STORAGE OTHER THAN IN A HOUSEHOLD DUSTBIN

ERNATIVE STORAGE	NOS	PERCENTAGE
own indiscriminately	4	13.33
own in the gutter	5	16.67
own at the backyard	4	13.33
ectly to public dustbin	12	40
rown in the neighbours dustbin	4	13.33
t specified	1	3.33
otal	30	100%

nalysis

2 (40%) of those remaining 30 respondents in Table 12 directly dump their waste in ublic dustbin while our gutter receives from 5 (16.67%). Waste is thrown ndiscriminately by 4 (13.33%). 4 (13.33%) goes to neighbors dustbin, 4 (13.33%) goes to the backyard or sanitary lane, still 1 (1%) respondents could not know where his waste goes to.

Findings

It is interesting to see that 40% of the sampled population rely on the public dustbin rather than their individual ones, all those waste thrown indiscriminately, in the gutter, sanitary lane which constitute 13% are later considered government responsibility. When one add to those accumulated at the dustbin one will realize the high community expectation on various government on refuse management. One of the 30 dwellers in the metropolis do not know how he/she disposes his/her generated refuse. This poses a

waste management planners in the state.

alysis for tables 12 and 13 are good indicators that any organized waste nagement system in the town will only take care of about 80% population while the st of the 20% may continue to dispose their waste indiscriminately.

ABLE 14 QUANTITY OF EASTE GENERATON DAILY PER HOUSEHOLD.

UANTITY	NOS	PERCENTAGE
ess than 1KG	48	48
– 5kg	15	15
– 9kg	16	15
0 – 13kg	17	17
14 – 17kg	4	4%
18kg and above	-	-
Total	100	100%

Analysis

48 (48%) other household in Kaduna generate less than 1 kg of waste on a daily basis, 15 (15%) generates 2 – 5kg, 16 (16%) generates 6-9kg of waste, 17 (17%) generates 10-13kg, while only 4 (4%) generate as much as 14 – 17kg of domestic waste.

Findings

The highest waste generation of less than one kg are by households that may not have more than 3-5 people in the household. While the least of 14-17kg are as few as 4(4%) and might have come from large extended families. No house generates more than 18kg per day in the sample population.

BLE 15 PAYMENT OF REFUSE EVACUATION

YMENT FOR REFUSE	NOS.	PERCENTAGE
s	28	28&
	72	72%
tal	***100***	***100%***

ABLE 16 RESPONSIBILITY OF WASTE DISPOSAL

BODY RESPONISIBLE	NOS.	PERCENTAGE
KEPA	22	30.55
LGA	39	54.16
NGOS/CBOS	6	8.33
TASK FORCE	2	2.77
OTHERS	3	4.16
Total	***72***	***100%***

TABLE 17 BODIES COMMERCIALISING REFUSE MANAGEMENT

BODY RESPONISIBLE	NOS.	PERCENTAGE
KEPA	2	7.14
LGA	-	-
Refuse contractors	10	35.71
Wheel barrow/trunk users	15	53.57
Others	1	3.57
Total	***28***	***100%***

Analysis of Tables 15-17

In table 15, 72 (72%) of the respondent do not pay for refuse evacuation, while only 28 (28%) do pay for it. Table 16 shows that out of the 72 (72%) that do not pay for the refuse evacuation, 39 (54.16%) considers it the responsibility of the LGAs to evacuate refuse, 22 (30.55%) considers it the responsibility of KEPA, 6 (8.33%) sees NGOs /CBOs as responsible, 2 (2.77%) to Task –force and 3 (4.16%) felt whoever is interested especially who wishes to make use of the refuse or the plot. Table 17 gives a simple breakdown of those paying for the services. 15 (53.57) make use of wheelbarrow/truck users, 10 (35.71%) uses (registered) refuse contractors, 2 (7.14) make use of KEPA, 1 (3.57%) uses other means such as community based efforts and none to LGAs.

Findings

Majority (72%) of people in Kaduna metropolis do to consider it necessary to pay for their refuse evacuation, because they consider it a social responsibility for government via KEPA and LGAs to evacuate refuse from the town. Few see it necessary for them to pay for the service prefer the unorganized group i.e. the wheelbarrow/Trunk users (10) 35.71%. It is surprising to note that the LGAs that are vested with the responsibility of refuse evacuation constitutionally do not have the public sympathy to charge for the service. People consider utilizing the unorganized group rather than KEPA or LGAs may be because of fear of using force to effect payment and may likely to be very expensive.

TABLE 18 COST OF REFUSE EVACUATION

RANGE	NOS.	PERCENTAGE
Less than N50	2	7.14
N51 – N100	8	28.57
N101 – N200	10	35.71
N201 – N300	5	17.85
N301 and above	3	10.71
Total	***28***	***100%***

Analysis

Out of the 28 that have to pay for the refuse evacuation 10 (35.71%) could afford N101 – N200, 8 (29.57%) could pay the range of N51 – N100, 5 (17.85%) pays the range of N201 – N300, 3 (10.71%) could pay N301 and above while 2 (7.14%) could consider paying N50 and below for the refuse collection.

Findings

Majority 10 (35.71%) could pay a range of N101 – N200 for their refuse service. This is not too far from what an average household pays for water and electricity bills in the metropolis without profitable services on such payment and there is no indication of public confidence on the government agencies. Only 3 (10.71%) could afford N301 and above which might be a point that make private investors break even.

TABLE 19 DESIGNATED (PUBLIC) WASTE BINS

DISTANCE	NOS.	PERCENTAGE
Less than 50m	2	2
51 – 100m	6	6
101 – 150m	12	12
151 –N200	24	24
201 and above	56	56
Total	***100***	***100%***

TABLE 20 SUGGESTED DISTANCE FROM HOUSE TO DISPOSAL POINT

SUGGESTED DISTANCE	**NOS.**	**PERCENTAGE**
1 25	3	3
26-50M	61	61
51 – 100m	30	30
101 – 150	3	3
151 and above	3	3
Total	***100***	***100%***

Analysis of 19 & 20

Table 19 shows that 56 (56%) of the respondents have designated waste collection points as far as more than 200m away from their houses, 24 (24%) have it located between 151 – 200m away, 12 (12%) 101 –150metres 6 (6%) have it designated at 51 –150m away while 2 (2%) as close as less than 50m while table 15 had 61 (61%) suggesting a distance of between 26 –50m, 30 (30%) of the residence suggest a distance of 51-100m away from their houses, 3 (3%) each for 1 – 25m, 101 – 150m 151m and above respectively.

Findings

The two tables clearly show that, the public finds it difficult it to travel far away from their houses (sources of the waste generated) to where they will empty their dustbins. It seems most of the dustbins are located more than 200m away. That gives room for pupils to be sent to dispose the waste along the road and in drainage or behind sanitary lanes. From table 20, it shows clearly that generally people (66%) would not want to travel more than 50m to dispose off their waste. Only 3 (3%) could afford more than 20m.

TABLE 21 FREQUENCY OF REFUSE EVALUATION

FREQUENCY	NOS.	PERCENTAGE
Daily	2	2
Once Weekly	18	18
Bi – Monthly	62	62
monthly	11	11
No specific Time	7	7
Total	***100***	***100%***

TABLE 22 KNOWLEDGE ON DANGERS OF REFUSE

IS REFUSE IN NUISANCE	NUMBER	PERCENTAGE
Yes	96	96
No	4	4
Total	***100***	***100%***

TABLE 23 WHAT DANGERS DOES THE PRESENCE OF REFUSE POSES

DANGER OF ACCUMULATED REFUSE	NOS.	PERCENTAGE
Breeding place for vectors	2	2
Sources of fire hazard	8	8
Source of injury to children	12	12
Source of odour	32	32
Depicate the aesthetic condition	26	26
All the above	10	10
Total	***100***	***100%***

Table 21 FREQUENCY OF REFUSE EVACUATION

The table shows that 62 (62%) of the respondents attest to the fact that refuse collection is done two times in a month, 18 (18%) said theirs is once weekly, 11 (11%) reported monthly. Respondents with no specified time constitute 7 (7%) while 2 (2%) have theirs on daily basis.

indings

able 21 give an indication that the frequency of refuse evacuation is too poor, 62 62%) of evacuation is done two time a month. While only 2% are evacuated daily. This nakes people to live in pools of their refuse which is dangerous to not only the health of he generator but to the total quality of the environment.

NALYSIS TABLE 22 & 23

96 (96%) of respondent are quite aware that refuse accumulation within the society constitute a danger to their health. Only 4 (4%) didn't share that knowledge while table 23 clearly recorded 32 (32%) consider the odour coming out of it as dangerous, 26 (26%) considered the damage to aesthetic condition as most serious, 12 (12%) Consider it a source of injury to children especially 10 (10%) consider all the above mentioned hazards as very dangerous and serious. 8 (8%) and 2 (2%) consider accumulated refuse as source of fire hazard and a breeding place for vectors respectively.

FINDINGS ANALYSIS 22 & 23

Since up to 96% of the respondents believed that there are dangers associated with refuse and infact all the 100 respondent (Table 23) believe in one form of associated hazard, it seems it is easier to plan an awareness programme to them to improve their sanitation with a view of reducing the dangers posed by the refuse accumulated. That can also be used to make them pay a token for its quick and frequent evacuation.

ABLE 24 MEAN OF TRANSPORTING WASTE TO DISPOSAL SITE

EANS OF CONVEYANCE	NOS.	PERCENTAGE
en tipper/pick up	69	69
heel barrow	11	11
e of donkey	12	12
the head	6	6
hers	2	2
tal	***100***	***100%***

BLE 25 ESTIMATED MONTHLY QUANTITY OF WASTE EVACUATION.

TIMATED QUANTITY	NOS.	PERCENTAGE
s than 20%	46	46
40%	32	32
- 60%	18	18
- 80%	4	4
- 100%	-	-
al	***100***	***100%***

ALYSIS OF TABLE 24

table shows 69 (69%) of respondents siting open tippers/pick up vans as a means onveying refuse out of the metropolis. 11 (11%) spotted wheel barrow, 12 (12%)

Findings

Table 25 indicated that majority of the respondents i.e. 78% observed and believed that less than 40% of the refuse collected in various refuse collection points are evacuated for final disposal. This means that the remaining 60% are left to constitute all sort of public health hazards, block the roads and become landmarks in the metropolis. It is more often than not cleared by taskforces when there are important events that attract very important personalities such as visit of head of state (May 1998), FIFA games 1999 e.t.c. In the absence of any festivity, the accumulated refuse mountains became more of a serious environmental and public health problem.

TABLE 26 OPINION ON WEATHER GOVERNEMNT SHOULD CONTINUE TO EVACUATE REFUSE

SHOULD GOVERNEMNT CONTINUE TO EVACUATE REFUSE	NOS.	PERCENTAGE
Yes	76	97
No	24	24
Total	***100***	***100%***

ABLE 27 HOW REFUSE SHOULD BE FINANCED

OW REFUSE EVACUATION SHOULD BE INANCED	NOS.	PERCENTAGE
y individual generators	2	2
y Government	8	8
y commercializing its services	12	12
otal	***100***	***100%***

ABLE 28 EQUIPING KEPA TO HANDLE REFUSE

IOULD KEPA BE EQUIPED TO HANDLE EFUSE	**NOS.**	**PERCENTAGE**
s	60	60
	40	40
tal	***100***	***100%***

ABLE 29 SHOULD LOCAL GOVERNMENTS BE EQUIPED TO HANDLE REFUSE

IOULD LOCAL GOVERNMENTS BE EQUIPED TO NDLE REFUSE	**NOS.**	**PERCENTAGE**
s	40	40
	60	60
tal	***100***	***100%***

alysis of Table 26,27 ,28 & 29

% of the respondents are of the opinion that government should continue to evacuate use while 24 (24%) believed otherwise. Table 26 that 73 (73%) are of the opinion t governments at various level should finance waste management, 25 (25%) suggest mmercialization and only 2 (2%) accepts polluter – pays-principles i.e. the refuse nerator should pay for its management.

able 28 has it that 60 (60%) suggest KEPA to be equipped to handle refuse vacuation, 40 (40%) suggests otherwise. Table 29 Recorded that 40 (40%) are of the ew that Local Government councils should be equipped to handle refuse, while 60 0%) believed the contrary.

INDINGS ON TABLES 26 -29

6 (76%) suggest government to continue to do refuse disposal service (table 26) spite of the fact that the service has been very poorly done (table 25). People (73%) ill believe that government should completely finance refuse services, a view nsidered too bad for a society like Kaduna. Only 25% are ready for commercialization obably, due to poor government (free) service. For the majority (Table 28) to suggest EPA to be equipped (60%) for future refuse management might be due to its pressive performance during the recently concluded FIFA 1999 sanitation exercise. 0% suggest the funding and equipping of Local Government councils (Table 28) within e metropolis to handle refuse. The knowledge of the constitutional provision on refuse anagement for the Local Government area might be their reasons for that view. The ajority (60%) that didn't see why Local Government councils be equipped to face our fuse heaps might be of an opinion that state government, private refuse contractors, individuals could do it better and sustainably.

CHAPTER SIX

6.0 FINDINGS, CONCLUSION AND RECOMMENDATIONS

6.1 WASTE GENERATION, CHARACTERSTIC AND SEPARATION

A metropolitan city like Kaduna does not have a record of a very comprehensive study of its generation rate and the waste characteristics. This poses problem for refuse management planners in both the public and the private sector. However from the present statistics (table 10). There is up to 40% non-degradable waste from house holds (domestic sources) A comprehensive record/report on its quantity, quality, sources could attract investors, however, its absence constitute one of the problem of refuse management.

The concept of waste separation is completely absent in the city, 98% do not see the need to separate their waste due to reasons such as poor socio-economic status, ignorance of the need, space or enabling law and regulation to ensure the separation. In fact, since government has not deemed it necessary to initiate and sustain a campaign on waste separation, it may be concluded that it may be due to poor sensitization and awareness. Therefore, Government can reduce the problem to the barest minimum by initiating a comprehensive and sustainable awareness campaign on the need for each household to possess a standard dustbin. Backed by a law and adequate enforcement mechanism, Local Government health units can be mobilized to ensure compliance.

6.2 WASTE BINS AND WASTE STORAGE FACILITIES

The study showed only 16. 67% had a standard dustbin in Kaduna metropolis. The cost of a standard plastic wastebin is not less than N15, 000 (WASCO'99) and metal type made locally is not less than N1,500 while the local plastic drum that can be converted for refuse storage is not less than N2,000.00 The poor Solid economic background made the cost unaffordable to users .There is a sizeable population (20%) that do not seems to see the need for dustbins. Therefore this attitude leads to extreme dirty environment due the load of refuse that are deposited in the drainage, Sanitary lanes and open streets and spaces.

This behavioral attitude can be addressed through an enlightenment programme, adequate laws and regulations, enough manpower to ensure house – to – house inspection , developing locally (cheaper) durable dustbins that are affordable and accessible for the general public Adequate provision must also be made to punish defaulters and reward conformist law abiding citizens

6.3 PUBLIC COLLECTION POINTS

Waste transfer stations or public refuse collection points or refuse houses are all expected to receive the individual waste from house holds in a system where government evacuates the refuse free of charge to the landfill sites. Due to distances of this public collection points to individual households, many resort to throwing the refuse indiscriminately (Table 13) 40% of the population depends on the nearby (legal and illegal) public refuse collection points but because

relative distance to individual houses which the majority could not afford to travel to (56%) are more than 200m away, people tend to dispose it any where (non – designated sites). People can only afford to walk not more than 50m to reach public dustbins (Table 20).

The continued existence of refuse houses will negate the home to landfill system which was derived from the Polluter-Pays-Principle. The public will continue to depend on the Government to dispose their refuse inspite of the fact that they are not satisfied with the rate of disposal. Government must encourage home to landfill by demolishing all refuse houses, and enforcing commercialization/privatization of refuse management in most parts of the urban center. The outskirts of the metropolis can gradually be introduced to the concept meanwhile they could be sensitized against the dangers of filthy environment and the need to keep it clean and tidy.

6.4 FREQUENCY OF EVACUATION

Many factors determine the rate of waste evacuation by government from the legal and illegal dumps. These range from availability of plants/machinery, usability, funds, quantity/rate of generation, the concern of the surrounding community, the strategic location of the dump and existence or otherwise of an event that may attract very important personalities to the town as identified from the study.

In most cases, the rate at which government evacuate refuse might depend on the above mentioned factors but in all cases it is assumed it is the responsibility of the local government to do the evacuation because it is their constitutional responsibility. Even when there is an important event, the state government directs the local governments to make a contribution to a central pool for the exercise. This practice has made the local governments to neglect any waste disposal exercise until forced to do so by the state government.

However, individual households where the private sector is involved in waste collection and disposal at a fee, the number or frequency of evacuation are jointly determined by the two parties, which inevitably determines the cost of the evacuation.

From the study, less refuse (less than 2%) are evacuated monthly from the dump sites. The mountains of refuse left are allowed to solidify and be a landmark. It is only attended to when it becomes an eyesore especially to very important personality visitors. It is then government will pool a lot of its resources and hand it over to a taskforce for urgent evacuation (Government spent 8.7 million on sanitation during the FIFA 1999 exercise). This clearly buttress the quantity of refuse quantified and listed for evacuation because of its presence in the highways expected to be patronized by visitor during the FIFA 1999 games (6,705m^3) of accumulated refuse was earmarked and noted to have accumulated over the year during the period see appendix iii).

These quantity of refuse were computed from 48 dump sites in the 4 metropolitan local governments, while officially there are 114 official dump sites. Thus when compared, conservatively over 14,000ms of refuse could be computed in the 114 official dumpsites. This is observed and noted to be the greatest problem of solid waste management in the metropolis. These heaps of refuse continue to accumulate for a long period and it becomes a source of road degradation, blockage of drainage, bad odour, emission of various sources of pathogenic and non-pathogenic organisms, hence the spread of disease which threaten the public status of the community.

6.5 KNOWLEDGE OF THE PUBLIC ON DANGERS OF REFUSE

It is obvious that the public is quite aware (96%) of the dangers of refuse especially as sources of breeding place for vectors, fire hazards, injury especially to children and scavengers, odour, poor aesthetic condition etc. Absence of any organized and sustained further awareness programme from government at any level and any organized method of evacuating refuse makes the public to live with the heaps of the refuse because of lack of better alternative. It is clearly shown that any little sensitization to make them pay for0 refuse evacuation, as long as it is backed by a well planned programme and clear implementation schedule, will highly be appreciated and supported by the public. This can be government or privately motivated.

6.6 MEANS OF TRANSPORTING WASTE

Since open tippers constitute 69% of all the means of conveyance of refuse from the dump sites to landfill, it is necessary to note that the cost of one new tipper 5kg capacity is beyond 10million Naira which no local Government can afford to buy at a sitting. In fact 95% of the tippers currently used for waste evacuation belongs to the private sector which are specifically meant for sand/gravel collection and for road construction business. The cost of hiring is exorbitant for local and state governments to afford. The cost profile is as follows :-

5Ft Tipper (Single)	-	N5,000 daily
12Ft " (double)	-	N8,000 daily
24Ft : (trailer size)	-	N25,000 daily

The service (refuse evacuation) is suffering from lack of means of conveying the refuse. From the survey the state owned agency (KEPA), responsible for refuse evacuation does not have a single tipper, payloader or bulldozer for the services. It rely on private sector for hiring. This constitutes a serious problem not only to the authority (KEPA) but to the service, the metropolis and the state in general. This might explain why the cost of refuse evacuation by the private sector is too high to afford due to high cost of hire or/and maintenance. Therefore, the accumulated refuse continues to be littering the streets and polluting th environment.

6.7 FUNDING OF KEPA TO EVACUATE REFUSE

Since the public (73%) are still interested in the state Government to continue taking responsibility of refuse evacuation, but the responsibility is vested on the local governments councils, there will still be problem of intersectoral collaboration between the various Local Government Areas and the state agencies, especially KEPA.

Currently very many arrangements of refuse evacuation between KEPA, on behalf of the State Government and Local Government Areas and between KEPA and the private sector have received serious set back. Each of the arrangements failed due to one reason or the other. The consequences on the state of the metropolitan sanitation were enormous with serious implication to the health of man and his total environment.

8 RECOMMENDATIONS

ne various stakeholders in waste management in Kaduna State need to be sponsible for the waste management exercise. The responsibilities are multi nensional it is therefore necessary for each stakeholder to perform his role equately. Therefore the following roles are recommended for each of the mentioned keholders:-

1 THE ROLE OF KADUNA STATE GOVERNMENT

Prepare in accordance to National policy, periodic master plan on Solid Waste Management in the State.

Assist develop capacity for Waste Management in the State

Subject to (FEPA) guidelines establish regulation and permit programme for discharges and disposal of waste.

Establish criteria, guideline for accreditation and registration of Solid Waste handlers and consultants.

Coordinate National Sanitation Days and propose update on sanitation laws and regulations including bylaws in Local Government Councils.

Select and manage approved sanitary landfill sites.

Initiate and co-ordinate waste to Wealth Programmes

Liase with State, Federal and International Bodies on behalf of Local Government Councils in all matters relating to Solid Waste Management.

To sponsor and coordinate research, continue education and surveys in all matters relating to Waste Management.

Accredit NGOs, CBO and the private sector interested in any aspect of Solid Waste Management.

6.8.2 ROLES OF LOCAL GOVERNMENT COUNCILS

These roles are drawn based on home to landfill and polluter pays principles

1. To ensure the strict implementation of this policies designed by the State Government on Solid Waste Management

2. To make bye-laws where necessary on safe Solid Waste Management in its areas of jurisdiction

3. To determine and enforce fees and modality of Waste Collection and Disposal.

4. To revitalize and sustain sanitary house- to - house inspection through health officers

5. To mount health education campaign at community/house hold levels on safe methods of refuse collection/disposal and other positive health habits

6. To register NGOs/Private firms interested in participating in Solid Waste Management, commercially or through self-help projects.

7. Responsible for arrangement for evacuation of Waste from public places. E.g. motor parks, market places, schools etc.

8. Attend to all complaints and issues on solid Waste discharge delegated to them by SEPA/Ministry of Environment.

9. Adopt procedures, modalities and design of refuse collection, transportation and storage of Solid Waste in their Local Government Areas.

10. To prepare and submit monthly progress reports to the State Government through the Ministry of Environment.

6.8.3 ROLES OF NON GOVERNMENTAL ORGANIZATIONS [NGOS]

NGOs include registered organizations, voluntary, or Business oriented interested in issues relating to Waste Management and Waste minimization, recycling, re-use with a view of making wealth from waste and/or improving the Waste Management System.

Must register with the State Local Government Areas before they are eligible to operate.

To operate under the stipulated Local Government Councils guidelines.

To initiate and execute community based self help sanitary schemes and activities.

To complement Government efforts in Solid Waste Management within their areas of operation

To assist in protecting the Government facilities provided in their areas.

To encourage Waste –to- wealth campaigns based on the guidelines, through awareness Programmes aimed at advocating waste minimization, re-use and recycling.

To identify and report emergency Solid Waste associated problems to their Local Government Areas.

May request for technical guide, assistance or training on sanitary matters from the Local Government Areas

Participate in networking for NGOs in promoting waste management information and education.

6.8.4 ROLES OF THE PRIVATE SECTOR, TRAINING AND RESERCH INSTITUTIONS

"Waste to Wealth Principle"

NOTE; Waste to wealth principle can be achieved through sensitizing the private sector in areas of investment in waste business by providing the enabling environment such as soft loan to buy waste

Equipment's, machinaries for recycling etc.

. All members of the private sector must register with State Local Government Area before they are eligible to operate in the scheme

To operate under the State/Local Government councils guidelines on Waste Management.

To collect and safely dispose of domestic refuse, or any other type as may be specified and permitted by the ministry of environment and Natural resources or its agent, according the governmental guidelines.

To participate in research and promotion of viable options of achieving waste to wealth projects.

To liase with interested and relevant firms, institutions on waste handling in the state.

evant bodies that need to be contacted may include Urban Development Bank ja, National Directorate of Employment, Federal Ministry of Works and Housing, eral Environmental Protection Authority/Federal Ministry Of Environment & Natural ources to have access to World Bank Environmental Management Project Fund, ed Nations Environmental Programme and United Nations Development ramme.

CONCLUSIONS

e state of Kaduna has suffered an untold hardship and various environmental oblems due to inconsistency in the manner of refuse management in the State. For e last 5 years the role of waste evacuation and disposal have been changing hands m various organization and authorities. The instability of the exercise is not healthy the health of man and his environment. Therefore there is the need for each ntioned stakeholders to be allowed to perform his role and also allow for legislative vision to ensure performance. Adequate funding and continue manpower velopment in the waste management sector will also ensure success of the exercise. ss Education through public awareness activities is of great importance to waste nagement. The awareness programme could be formal (Environmental Education in hools) and could be informal through mass media and traditional methods.

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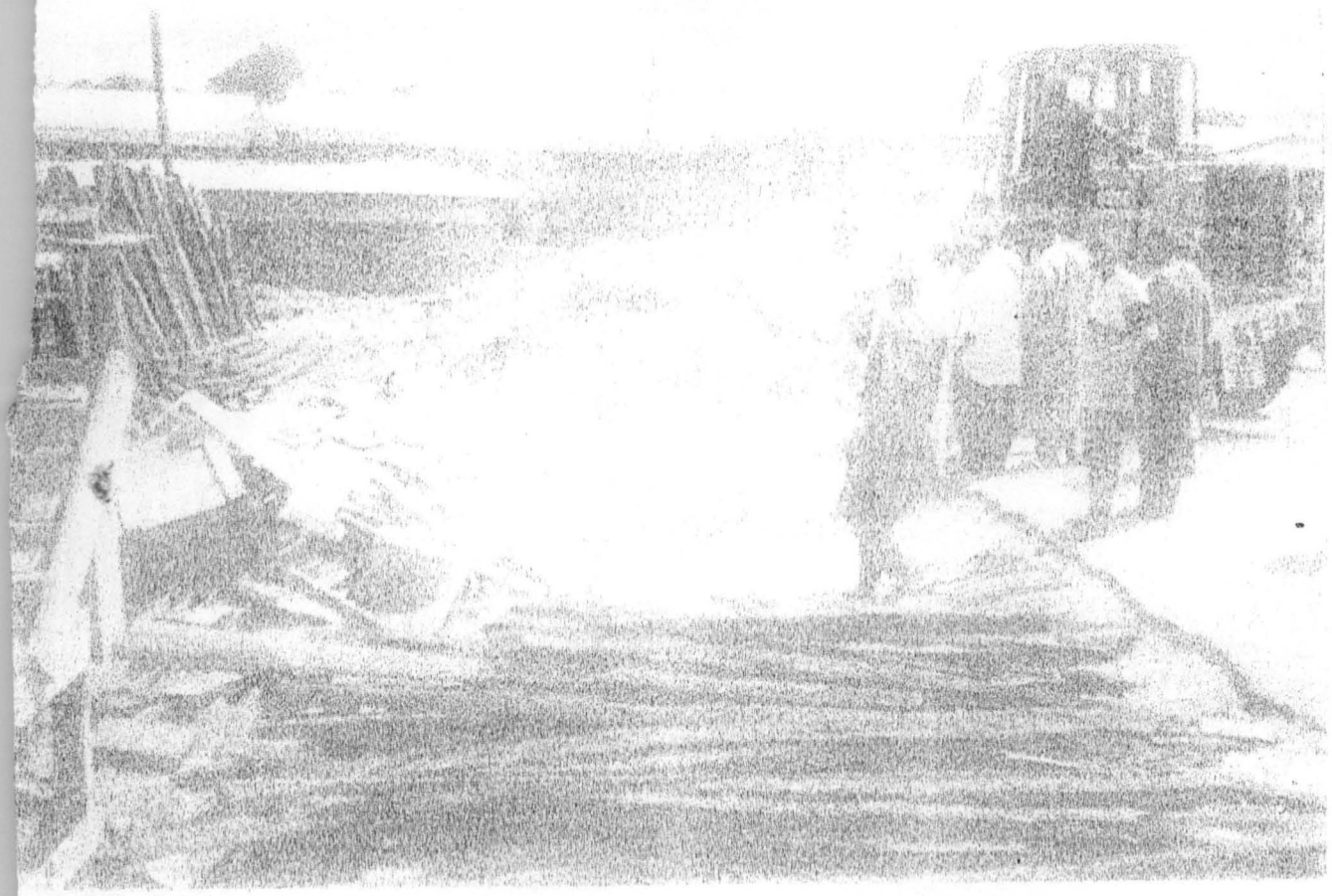
APPENDICES

APPENDIX I

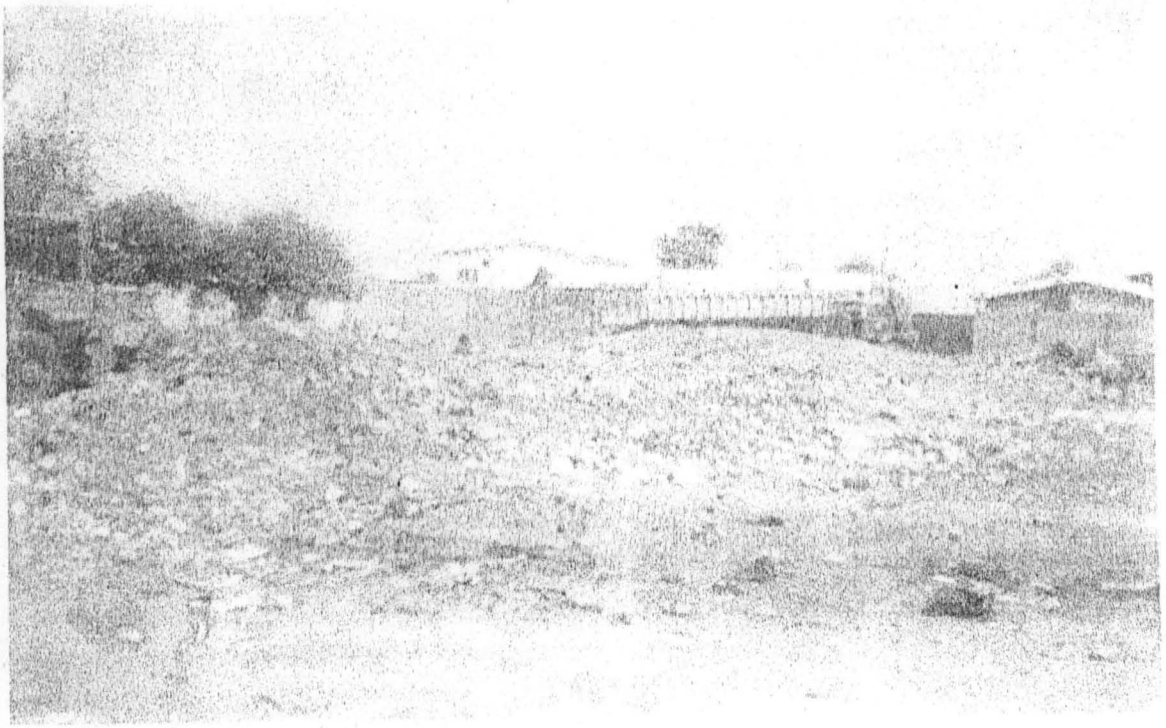
otographs showing KEPA solid waste management activities.

Drainage cleaning is part of sanitation exercise periodically conducted by KEPA. Above shows casual workers exployed to do the exercise in active work.

ABOVE SHOWS KEPA IN ACTIVE REFUSE EVACUATION

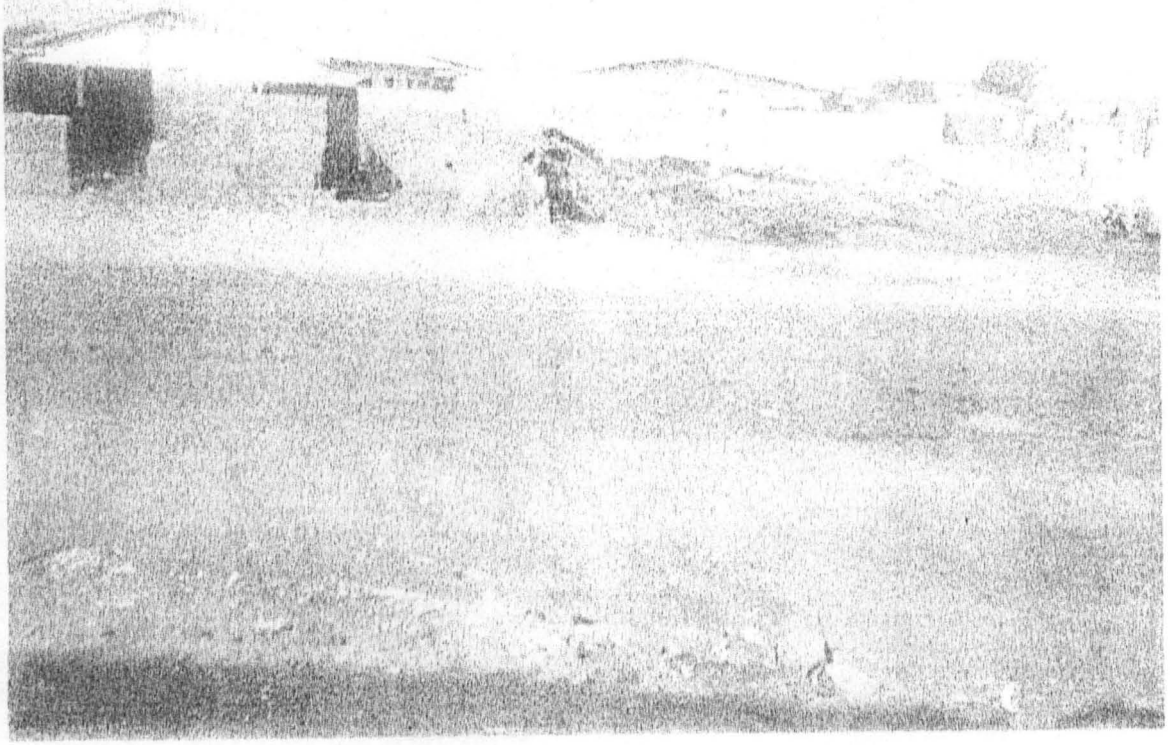


Another refuse heap that nearly taken over the main enterance to Nasarawa through the Express Road by Flourmill Kaduna.



3 YEARS OLD REFUGE HEAP BY KURMI MASHI PRIMARY SCHOOL

This refuse mountain have taken over underverloped plots, and it also extend to the main road Kurmin Mashi dump site.



Initially this site was overtaken by refuse, after

INITIALLY THIS SITE WAS OVERTAKEN BY REFUSE, AFTER EVACUATION, IT IS CLEARLY SEEN THAT THE STRUCTURE IS WEAKEN BY THE OLD AGE REFUSE AND SOME PARTS OF THE STRUCTURE ARE DESTROYED.

KEPA in active refuse evacuation exercise at Kawo refuse dump site.

Refuse have taken over streat covered the drainage and extend to uncompleted structure along Hayin Banki Road Kaduna

APPENDIX II

REFUSE DUMP SITES ALONG MAJOR ROUTES/STRATEGIC PLACES WITHIN KADUNA METROPOLIS

S/NO	LOCAL GOVERNMENT AREA	LOCATION OF DUMP SITE	ESTIMATED VOLUME
	ChikunL. G. A	Sabon-Tasha Market	$120m^3$
	"	Narayi Road Narayi	$115m^3$
	"	College Road,S/Tasha	$90m^3$
	"	Ung. Sunday by Market	$170m^3$
	"	Makaranta Road U/Yelwa	$60m^3$
	"	Makaranta Road U/Yelwa by Express	$60m^3$
	"	Ung. Bero Along main Road	$120m^3$
	"	Wakili Road/Express Nassarawa	$90m^3$
	"	Ung. Television by Express	$200m^3$
	"	Sabon Tasha By the Bridge	$190m^3$
	"	Nassarawa by Express	$170m^3$
	"	Shagari Road Narayi	$160m^3$
			$1545m^3$
	Kaduna North LGA	Kaduna Bridge by stadium	$150m^3$
	"	Fed. Govt. College Malali	$90m^3$
	"	Ung. Sarki Opp. Sultan Bello Mosque	$120m^3$
	"	Malali Ghana Road	$160m^3$

	"	Ibrahim Taiwo Road by Royal Cinema	85m^3
	"	Ori-Apkata by Rail	100m^3
	"	Ung. Kanawa by rail	90m^3
	"	Kawo/Mando Junction	110m^3
	"	Hayin Banki by Railway Property company	70m^3
	"	Limited, Ung. Dosa by GGSS Kawo	150m^3
	"	S. M. C. Quarter	120m^3
	"	Kabala Costain Club	80m^3
	"	Hayin Banki by WAEC	85m^3
	"	Kabala Costain by primary School	160m^3
	"	Ung.Shanu/Ung Kanawa Bridge	200m^3
		TOTAL	**1,670m^3**
	Igabi L. G. A	Mando by Haji Camp	120m^3
	"	Mando by primary School	100m^3
	"	Rigasa by Daura Road	220m^3
	"	Rigachikun along KD-KN road	160m^3
	"	Mando by sterling Eng. Company	110m^3
	"	Dan-mani village by express-sites	220m^3
	"	Naira Road Rigasa	230m^3
	"	Hayin Zaurawa Rigasa	170m^3
	"	Hayin makera Rigasa	110m^3
	"	ECWA Road Rigasa	90m^3
	"	Sarkin Afaka Road Mando	120m^3

			1,670m^3
	Kaduna South L. G.A	Behind polytechnic main campus – 3 dump site	300m^3
	"	Ung. Sanusi by GGSS/market	90m^3
	"	Monday market to Kakuri General Hospital	150m^3
	"	Ung. Mau'azu by Express	100m^3
	"	Kurmin Mashi by express – 3 point	220m^3
	"	Express road behind KFCC	300m^3
	"	Tudun-wada Kagoro Road Kaduna	170m^3
	"	Barnawa Aliyu Makama Road 3 point	150m^3
	"	Mando by motor park	100m^3
		Ung. Gwani Trade fair Complex (4point)	230m^3
		TOTAL	**1,820m^3**
	SUMMARY	S/Total =1,075,600	
	Chukun L. G. A	" 1,241,600	
	Kaduna North LGA	" 1,170,000	
	Igabi L G. A	" 1,181,600	
	Kaduna South	" 4,668,800	
	L.G.A		6705m^3

APPENDIX III

OFFICIAL & ILLEGAL REFUSE DUMP SITE IN KADUNA METROPOLIS.

KADUNA NORTH LOCAL GOVERNMENT AREA

1. Ung. Gwari Kawo
2. Hayin Banki
3. Kawo Village I
4. Kawo Village II
5. Kawo New Extension I
6. Kawo New Extension II
7. Rafin Gusa
8. Ung. Dosa Village
9. Ung Dosa New Extension
10. S. M. C. Quarters
11. Badarawa Village
12. Badarawa New Extension
13. NDA/New Barracks
14. Ung. Kanawa
15. Ung. Shanu
16. Abakpa
17. Ung. Sarki
18. G. R. A I
19. G. R. A II
20. G. R. A III

21. G. R. A IV
22. Malali Low Cost
23. Malai Village
24. Ung Rimi Village
25. Ung. Kudu Village
26. Ung Rimi Low cost
27. Doka I
28. Doka II
29. Doka III
30. Doka IV
31. Kabala East I
32. Kabala East II
33. Kabala East III
34. Kabala East IV
35. Kabala East V

KADUNA SOUTH LOCAL GOVERNMENT AREA

1. Kurmin Mashi
2. Badikko
3. Mechanics Village
4. Badikko New Extension
5. Ung Sanusi I
6. Ung Sanusi II
7. Ung Sanusi III
8. Ung Sanusi IV

Ung Sanusi V

0. Kaduna Polytechnic C.S. T

1. 44 Armed forces

2. Old panteka

3. Tudun Nupawa I

4. Tudun Nupawa II

5. Kasuwan Barchi

6. Tudun Wada I

7. Tudun Wada II

8. Tudun Wada III

9. Tudun Wada IV

0. Tudun Wada V

1. Tudun Wada VI

2. Tudun Wada VII

3. Kabala West I

4. Kabala West II

5. Kabala West III

6. Ung Muazu I

7. Ung Muazu II

8. Railway station/Down quarters

9. Ung Mission

0. Kaduna Polytechnic C. E S

1. Keffi Road

2. Chinese Quarters I

3. Chinese Quarters II

34. Barnawa I
35. Barnawa II
36. Barnawa III
37. Barnawa VI
38. Barnawa V
39. Barnawa VI
40. Narayi High cost
41. Makera I
42. Makera II
43. Kakuri I
44. Kakuri II
45. Kakuri III
46. Arty Barracks
47. Televisions Village I
48. Televisions Village II

CHUKUN LOCAL GOVERNMENT AREA

1. Nassarawa I
2. Nassarawa II
3. Nassarawa III
4. Nassarawa New Extension I
5. Nassarawa New Extension II
6. Nassarawa New Extension III
7. Kudenda
8. Naravi I

Narayi II

Narayi III

Narayi High Cost

Ung Romi I

Ung Romi II

Soni Gora Village

abon Yelwa Village

ng. Sunday

abon Tasha

ng Boro

saunin Kura I

saunin Kura II

tel Quarters

ahuta/NNPC Quarters.

I LOCAL GOVERNMENT AREA

gasa I

gasa II

gasa III

gasa IV

g Rana

denda Village

g Kaji

ndo Village (Afaka) I

ndo village (Afaka)II

APPENDIX 1V

OBLEMS AND PROSPECTS OF SOLID WASTE MANAGEMENT IN THE PUBLIC SECTOR CASE OF KADUNA STATE ENVIRONMENTAL PROTECTION AUTHORITY (KEPA).

GENERAL QUESTIONNAIRE

E: ----------

question was designed for the purpose of above named project and will strictly be for that purpose, therefore you are requested to carefully fill the question and n please.

ame:---------- Sex:---------- Age:----------

ddress:----------

llage/ward:----------District:---------- LGAs:----------

ccupation:----------

(a) Civil Servant

(b) Farmer

(c) Trader

(d) Applicant

(e) Other

ace of accommodation/residence in the metropolis----------

High density area

Medium density area

:) Low density area

l) Others

ouse hold structure

umber of people in the household

Less than 3

3– 5

. 6–8

. 9 – 11

12 and above

ge distribution per house hold

Below 10 years

11 – 14 years

15 – 29 years

50 and above

hat is the characteiste of your waste generation?

) Vegetable matter

) Food reminant

Paper and paper related

Metals and metal related

Plastics/rubber and related

Ash/dust related

Textiles related

Glass /bottle related

Others (specify)

you separate the waste you generate from the source i.e. your private dustbin

es/No?

ype of refuse containers

a) None open space

) Ditch

) Metal container

) Plastics buckets/baskets

) None of the above

(a) none is the response for above than how do you get rid of your waste.

) Thrown indiscriminately

) Thrown in the gutters

) Thrown at the backyard

) Directly to public dustbin

) Thrown in the neighbors dustbin.

timate the quantity you generate daily

Less than 1kg

2 – 5kg

– 9kg

10 – 13kg

14 – 17kg

18kg and above

respect of your response in Nos. 8 do you pay for the refuse evacuation and

posal? Yes/No.

lo who does the disposal services

KEPA

Local government Council

c) NGOs/CBOs

d) Taskforce

e) Others(specify)

yes, to whom?

a) KEPA

b) LGA

c) Private refuse contractor

d) Wheel barrow/trunk users

e) Others

ow much do you pay for the waste disposal service monthly?

) Less than N50

) N50 – N100

) N101 – N150

) N150 – N200

) N201 – N250

N251 – and above

there any designated waste collection point near your house yes/No

yes how far is it from your house?

Less than 50metres

51 – 100metres

101 –150metres

151 –200metres

201metres and above

ts distance to your house is not convenient to you, suggest the maximum you can

avel to dispose your refuse

1 – 25m

26 – 50m

51 – 100m

101 – 150m

151m and above

respect of response Nos. 12 & 13 how often is the waste collected and disposed

a) Daily

b) Once a week

c) Bi-monthly

d) Monthly

e) No specific time

o you consider accumulated refuse as a nuisance yes/No

yes, what sort of hazard does it posed

a) Breeding place vectors of public health importance and other insects

b) Source of fire hazard

c) Source of injury to children and scavengers

d) Sources of odour

e) Depicate the aesthetic condition of the environment

) Others

ow is the waste transported to final disposal site?

a) By use of open tippers/pick-up

b) Wheel barrow

c) Use of donkey

d) Carried on the head

e) Others

In respect of 16 above, what estimated quantity of waste are evacuated by the refuse collection body monthly

(a) Less than 20%

(b) 21 – 40%

(c) 41 – 60%

(d) 61 – 80%

(e) 81 – 100%

Do you agree that government should continue to evacuate refuse free of charge yes/no?

. If no how can refuse evacuation going to be financed.

a) By individually paying for the service completely

b) By government complementing the payment made by individuals

c) By total commercialization of refuse evacuation

a) Are you of the opinion that KEPA should be well equipped for the service of waste management yes/No?

) If No why?

(a) Because government cannot sustain it

(b) I want the public to be responsible for the payment of the service

(c) The private sector can do it better

(d) I want the Local Government Areas to do it free for the public

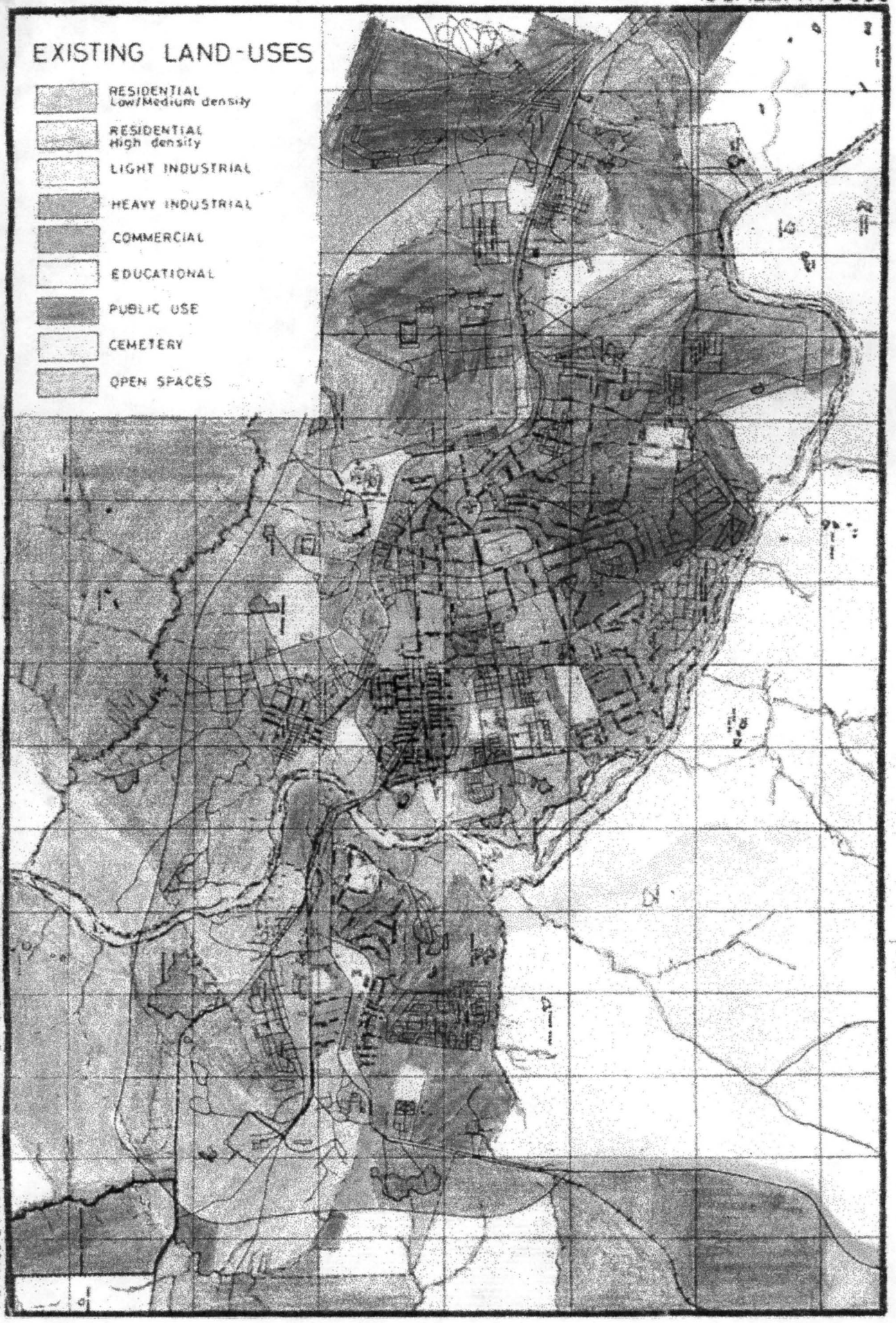
(e) I want the Local Government Areas do it and charge a token for the service.

(f) Others.

hould Local Government Areas be equipped to handle refuse? Yes/No

KADUNA METROPOLIS & ENVIRONS

FIG. 1. 4
SCALE: 1:70 000



PREPARED & PRODUCED BY KADUNA STATE ENVIRONMENTAL PROTECTION AUTHORITY

ADUNA STATE - ADMINISTRATION
IOWING THE 23 LOCAL GOVERNMENT AREAS

IG. 1. 2