

**A SURVEY OF ENVIRONMENTAL SANITATION FACILITIES
AND ISSUES ARISING IN KPAKUNGU AREA OF MINNA,
NIGER STATE, NIGERIA**

BY

**TSADO, FAITH MAMA
M. TECH/SSSE/2006/1520**

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

APRIL, 2010

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ARISING IN KPAKUNGU AREA OF MINNA, NIGER STATE, NIGERIAN**

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M.TECH/SSSE/2006/1520**

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

APRIL, 2010.

DECLARATION

This is to affirm that I, Tsado Faith M. with registration number Tech/SSSE/2006/1520 carried out this project titled "A survey of environmental sanitation facilities and issues arising in Kpakungu area of Minna, Niger State, Nigeria". This thesis is a part of the requirement for the award of the degree of Master of Technology (M.TECH) in environmental development planning of the department of Geography, School of Science and Science Education, Federal University of Technology, Minna. Within current knowledge, this same thesis has never been produced elsewhere by other researchers.



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Tsado, Faith M.

05-04-10
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Date

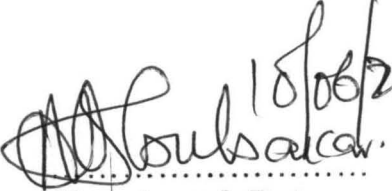
CERTIFICATION

This thesis titled: A survey of environmental sanitation facilities and issues arising in Kpakungu Area of Minna, Niger State, Nigeria by: Tsado, Faith Mama (M.Tech/SSSE/2006/1520) meets the regulations governing the award of the degree of M.Tech of Federal University of Technology, Minna, and is approved for its contribution to scientific knowledge and literary presentation.

Dr. P.S Akinyeye
Name of Supervisor


Signature & Date 15/08/2010

Dr. A.S Abubakar
Name of Head of Department


Signature & Date 18/08/2010

Prof. M. Galadima
Name of Dean, School of Science
and Science Education


Signature & Date 14/8/2010

Prof. S. L. Lamai
Name of Dean Postgraduate School


Signature & Date 11/8/2010

ACKNOWLEDGEMENTS

My gratitude first is to Almighty God, the father of both living and the dead for grace, wisdom, provisions, guidance and innumerable blessings I have enjoyed in the course of the study, to Him be glory. I want to appreciate my dearly beloved husband, Mr. Danielle German who supported me in all ramifications to make this venture a reality, a big thank you DD!. My appreciation goes to my parents, Mr. & Mrs. Isaiah Z. Tsado, Mr. & Mrs. Godwin German, relatives, friends and all well wishers, may my good Lord enrich you abundantly Amen. An unreserved gratitude to my project supervisor, Dr. P.S. Akinyeye for his tireless effort to guide, instruct, correct, read and proof read my research work, God bless you. My head of department, Dr A.S Abubakar, a big thank you. My course lecturers: Prof J.M Saba, Dr M.T Usman, Dr. Halilu, Prof Nsofor, Dr Jinadu not forgetting our able postgraduate coordinator, Mall. Salihu for their understanding during my course of study, may God reward you. To everyone who contributed in one way or the other knowingly or unknowingly, you are blessed.

ABSTRACT

Environmental sanitation has been one of the major health concerns of developing countries especially in Nigeria due to poor or non-existence of environmental management system of refuse and sewage disposal. Lack of basic sanitation facilities has implication on health, socio-economic live and so value of properties. The aim of this research was to take a survey of environmental sanitation facilities in Kpakungu area of Minna in Niger State Nigeria. This was achieved by identifying the sources of waste and sewage decay; assess the available sanitation facilities and their main sources of portable drinking water through an organized questionnaire and personal observation of the facilities by the researcher. The findings indicate that there is no existing drainage facilities, and sewage disposal system, the existing method of waste disposal is also inadequate. commendations were made to the government to direct more effort to construct good drainage systems within the metropolis, frequent and efficient methods of waste evacuation from dump sites, and provision of public toilets especially at the Kpakungu motor park and renovation of the existing toilets.

TABLE OF CONTENTS

	Page
Cover page	i
Title page	ii
Declaration	iii
Certification	iv
Acknowledgements	v
Abstract	vi
Table of Contents	vii
List of Tables	x
List of Figures	xi
List of Plates	xii
1.0 CHAPTER ONE: INTRODUCTION	1
1.1 Waste and Health: An appraisal	2
1.2 Statement of the problem	5
1.3 Aims and objectives	6
1.4 Scope and limitation of the study	7
1.5 Justification of the study	7
1.6 The study area	9

	Page
2.0 CHAPTER TWO: REVIEW OF RELATED LITERATURE	15
2.1 Environmental Sanitation factors and consequences	15
2.2 waste disposal	21
2.3 waste water collection	24
2.4 Impact of poor sanitation on health	28
2.5 tackling poor sanitation	32
2.6 Environmental impacts and health hazards	34
3.0 CHAPTER THREE: MATERIALS AND METHODS	37
3.1 Data collection	37
3.2 Selecting the sample	39
3.3 Statistical analysis	39
3.4 Water analysis	39
4.0 CHAPTER FOUR: RESULTS	42
4.1 Analysis of basic Infrastructures	42
4.2 Conditions of basic Infrastructures	56
5.0 CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS	60
5.1 Introduction	60
5.2 Discussion of the Findings	60

Page

5.3 Summary of Findings

64

5.4 Conclusion

66

5.5 Recommendations

66

REFERENCES

68

APPENDICES

70

LIST OF TABLES

Table	Page
4.1.1 Employment sector of house hold head	42
4.1.2 Toilet types	43
4.1.3 Number of people to one toilet	44
4.1.4 Source of water supply	45
4.1.5 Run off / gutter	46
4.1.6 Different method of refuse disposal	47
4.1.7 Frequency of refuse collection & disposal system	48
4.1.8 Waste water collection & disposal system	49
4.1.9 Drainage facilities available	50
4.1.10 Frequency of waste water network blockage	51
4.1.11 Responses on presence of waste water on street	52
4.1.12 Type of ailment complained in hospitals	53
4.1.13 Frequency of ailment complained of in hospitals	54
4.1.14 Presumptive test	55
4.1.15 Confirmed test	55

LIST OF FIGURES

Figure	Page
1.1 Niger State, Nigeria	12
1.2 Minna, Niger State-Nigeria	13
1.3 Minna showing the study area	14

LIST OF PLATES

Plate	Page
I. Showing drainage system in a residential	57
II. Showing method of waste disposal	57
III. Showing sewage disposal from a toilet	58
IV. Showing waste water on the street	58
V. Showing an open drain from a residential	59

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

There has been a phenomenal increase in the volume and range of waste produced in many developed and developing countries. This is due to increasing rate of population growth, urbanization, industrialization and general economic growth. Environmental hazards is a generic term for any situation or state of events which poses a threat to the surrounding environment, examples include: hazardous wastes, toxic substances, radon gas and materials containing asbestos. These types of hazards can adversely affect the value and marketability of the property. Human health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

Environmental sanitation has been one of the major health concerns of developing countries especially in Nigeria due to poor or non existence of environmental management system of refuse and sewage disposal.

Young children are particularly vulnerable to environmental pollution hazards. Their physical characteristics, childhood activities and natural curiosity put them at greater risk from environmental hazards. In fact, the quality of a child's environment is a key determinant of whether a child survives the first year of life and of her or his further physical and mental development.

In recent years, threats to the environment are clearly on the increase, as illustrated, for example, by increasing contamination and over pumping of aquifers and the degradation of freshwater catchments areas. But the most serious, far-reaching threat is global warming, with its complex and comprehensive impact on water resources and its predicted multiplier effect on diarrhea, malaria and other diseases. The impact of global warming is and will continue to be felt most by developing countries and by children.

It is not uncommon to find wastes blocking streets and roads and sewages from poorly built systems flowing into nearby water bodies close to the surroundings. The WHO paper on 'sanitation challenge' (Water, Sanitation and Hygiene Annual Report 2007) emphasizes that human well-being requires a healthy environment. Inadequate sanitation practices negatively impact the environment. For poor

families living in congested urban slums and villages, the lack of any sanitation facility means that waste lies on the streets; clog the drains and creates an immediate local hazard as well as creating optimum conditions for the growth of vectors carrying disease. Sewage water resources may contaminate surface waters when it is discharged into the environment without adequate treatment thus endangering downstream users and aquatic resources.

More than 2.6 billion people – forty per cent of the world's population – lack basic sanitation facilities, and over one billion people still use unsafe drinking water sources. Inadequate access to safe water and sanitation services, coupled with poor hygiene practices, kills and sickens thousands of children every day, and leads to impoverishment and diminished opportunities for thousands more. (Water Sanitation and Hygiene Annual Report 2007).

Poor sanitation, water and hygiene have many other serious repercussions. Children – and particularly girls are denied their right to education because their schools lack private and decent sanitation facilities. Women are forced to spend large parts of their day fetching water. Poor farmers and wage earners are less productive due to illness, health systems are overstretched and national economies

suffer. Without Water Sanitation and Hygiene (WASH) sustainable development is impossible. Water Sanitation and Hygiene Annual Report 2007.

UNICEF works in more than 90 countries around the world to improve water supplies and sanitation facilities in schools and communities, and to promote safe hygiene practices. UNICEF sponsors a wide range of activities and work with many partners, including families, communities, governments and like-minded organizations. ALL UNICEF WASH programmes are designed to contribute to the Millennium Development Goal for water and sanitation: to reduce by 50% in 2015, the proportion of people without sustainable access to safe water and basic sanitation.

In September 2002, the UN General Assembly adopted a number of millennium development goals that challenged the global communities to increase the health and well-being of all people. By including sanitation and hygiene in the millennium development goals, the global community has acknowledged the importance of promoting sanitation and hygiene as development interventions and has set a series of goals and targets to amongst other things:

- Promote safe hygiene practices.
- Integrate sanitation into water resources strategies.
- Implement plans, national policies and incentives for waste minimization and improved recycling and use of waste water.
- Removing the stigma around sanitation, so that the importance of sanitation can be more easily and publicly discussed.
- Highlighting the poverty reduction, health and other benefits that flow from better hygiene, household sanitation arrangements and wastewater treatment.

1.2 STATEMENT OF THE PROBLEM

The problem of environmental sanitation is universal even though the degree may vary from town to town and within areas of cities.

Almost 2.6 billion people worldwide, lack access to even the most basic sanitation facilities – a situation that affects all aspects of their lives, from education to national development.

It is a common phenomenon to find wastes all over the surrounding of Kpakungu which is the study area and the seemingly overflow of sewage and waste water on the streets

It is in view of this, that this research work attempts to take a survey of the environmental sanitation facilities within the area to ascertain their availability or not and the adequacy of the available ones.

No work can claim to be completely authoritative on any subject matter and this does not attempt to be that. However, it is my hope that it will provide background information on the topic and at least provide a workable recommendation to the government.

1.3 AIM AND OBJECTIVES

The aim of this research is to assess the environmental sanitation facilities of Kpakungu area and the effects the lack of it or inadequacy of such facilities could have on the residents and environment as a whole. This will be achieved through the following objectives.

- ❖ To identify the sources of waste and sewage decay;
- ❖ To assess the available sanitation facilities and their main;
Sources of potable drinking water;
- ❖ To analyze the adequacy of the existing sanitation and waste disposal facilities and systems;
- ❖ To recommend appropriate measures for providing an efficient and effective facilities aimed at improving the sanitary condition of the study area.

1.4 SCOPE AND LIMITATION OF THE STUDY

The study is basically an assessment of existing sanitary facilities and waste disposal system and the attendant effects on lives and properties in the study area. It is not an attempt to originate new theories or hypothesis, but an attempt to guide towards the choice of a most relevant management technique firmly built on the framework of existing knowledge. It focuses on the following

- The methods of refuse and sewage disposal
- The hygienic conditions of toilets of some household in the area.
- Environmental conditions.

The research was conducted between June 2008 to February 2009.

Out of 150 questionnaires that were administered, only 114 were retrieved, even out of these, some questions were left unanswered.

1.5 JUSTIFICATION OF THE STUDY

Adequate sanitation is a basic necessity of Hygiene. Lack of access to proper sanitation is linked to the deaths of 1.5 million children each year.

“Children are the most vulnerable, and they are the ones who continue to pay the highest price in terms of lives and futures lost”. Children are at the heart of the MDGs, from reducing poverty to improving education to maternal and child health and establishing gender equality and environmental sustainability,” “Addressing sanitation will have positive impact on all of these goals.” Veneman A. (March ,2008)

There is no doubt that a clean environment will have a positive effect on the various aspects of urban life including economy, environment, health and social life.

Kpakungu – Minna, which is the study area of this work, is located at the southern part of Minna and is bound to experience influx of people with movement of the Federal University to her Main Campus along Minna-Bida road. This is likely to move the student population from Bosso closer to their permanent site and also the siting of the NECO headquarter office complex and other structures along that same route will make staff want to move closer to their place of work.

Economic activities to provide services for the increasing population will have a one to one correspondence with waste production which could worsen the sanitary condition of the suburb.

Poor environmental sanitation is a challenge to sustainable development and the study seeks to open up new ideas on better environmental strategies aimed at ensuring a minimum level of environmental hazards.

1.6 THE STUDY AREA

Niger State was created in 1976 with Minna as the state capital. The state comprises of 25 local government areas and is characterized by three (3) major tribes namely Gwari, Nupe and Hausa.

It lies between latitude $9^{\circ} 37^1$ North and longitude $6^{\circ} 33^1$ East. Its total land is estimated at 73,555,478 square meters.

For over 30 years, Minna has grown most remarkably in terms of population and even physical development, which has also been the bane of the city. The combination of a rapidly swelling population and physical development had aggravated pressure for increased supply of water and electricity as well as such services as health facilities and

schools. Fortunately, the demand had far outstripped supply. Again the city had also been under the burden of inadequate sanitation as a result of which refuse dumps were common sights at almost every available space in Minna. Notoriously poor drainage system that had caused disastrous flooding a number of times and indiscriminate erection of illegal structures made the whole city look not much better than a slum.

“The government had no choice than to embark on the beautification of the ancient city of Minna because when your city is beautiful, people will definitely like to come and do business with you. That will surely stimulate your economy. Musa S. (2007)

Kpakungu which is the area of this work is located at the southern part of Minna metropolis along Minna-Bida road, this settlement is bound to the south, east, west and north by Gidan mangoro, Dusten-kura, Sauka-Kahuta and Keterin - Gwari respectively.

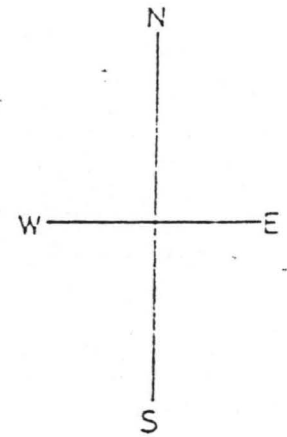
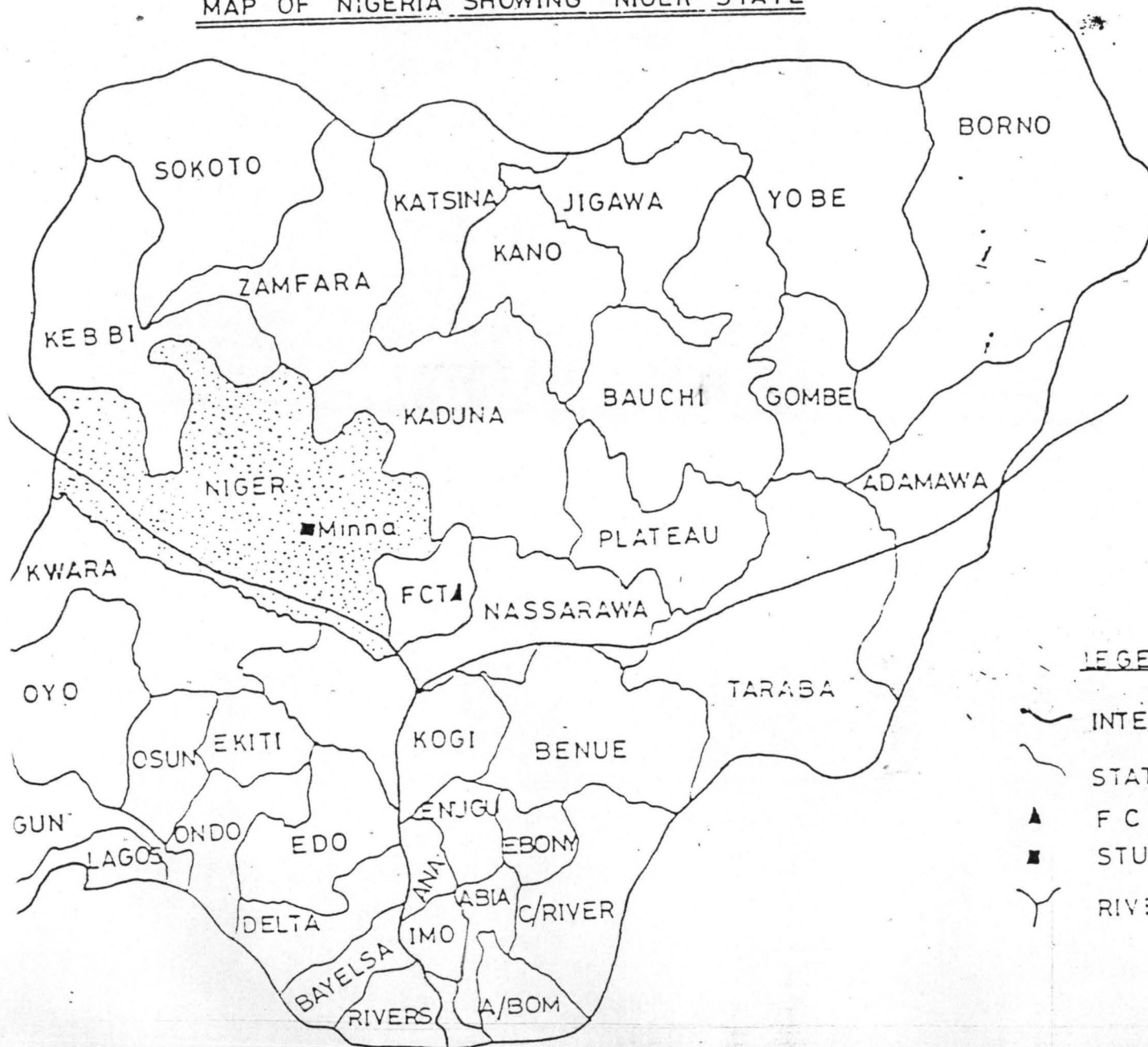
The area is highly commercialized due to the fact that it is the major link into Minna metropolis via the Bida-Minna route and these commercial activities generate waste which contributes to the unsanitary condition of the area.

The drainage system existing in the area is very poor. They are either inadequate or non-functional. It is therefore necessary to manage solid waste to prevent blockage of the existing ones which serves as breeding habitat for mosquitoes and other disease carrying vectors.






Recently the government of Niger State has embarked on increasing the housing project of five hundred (500) housing unit which is located in the study area (Kpakungu). Also the federal government housing unit is situated in the same route so as to help in the development of the area and the State as a whole. This present development is championed by the Chief Servant and Executive Governor, Dr. Muazu Babangida Aliyu to break the record of non-existing estate or low cost.

There is a fast increase in the population of the area and likewise increase in the building of houses both by individuals and the government. The issue of abandoned buildings is gradually becoming a forgotten issue in the area due to population increase which leads many to own a house of their own.

MAP OF NIGERIA SHOWING NIGER STATE

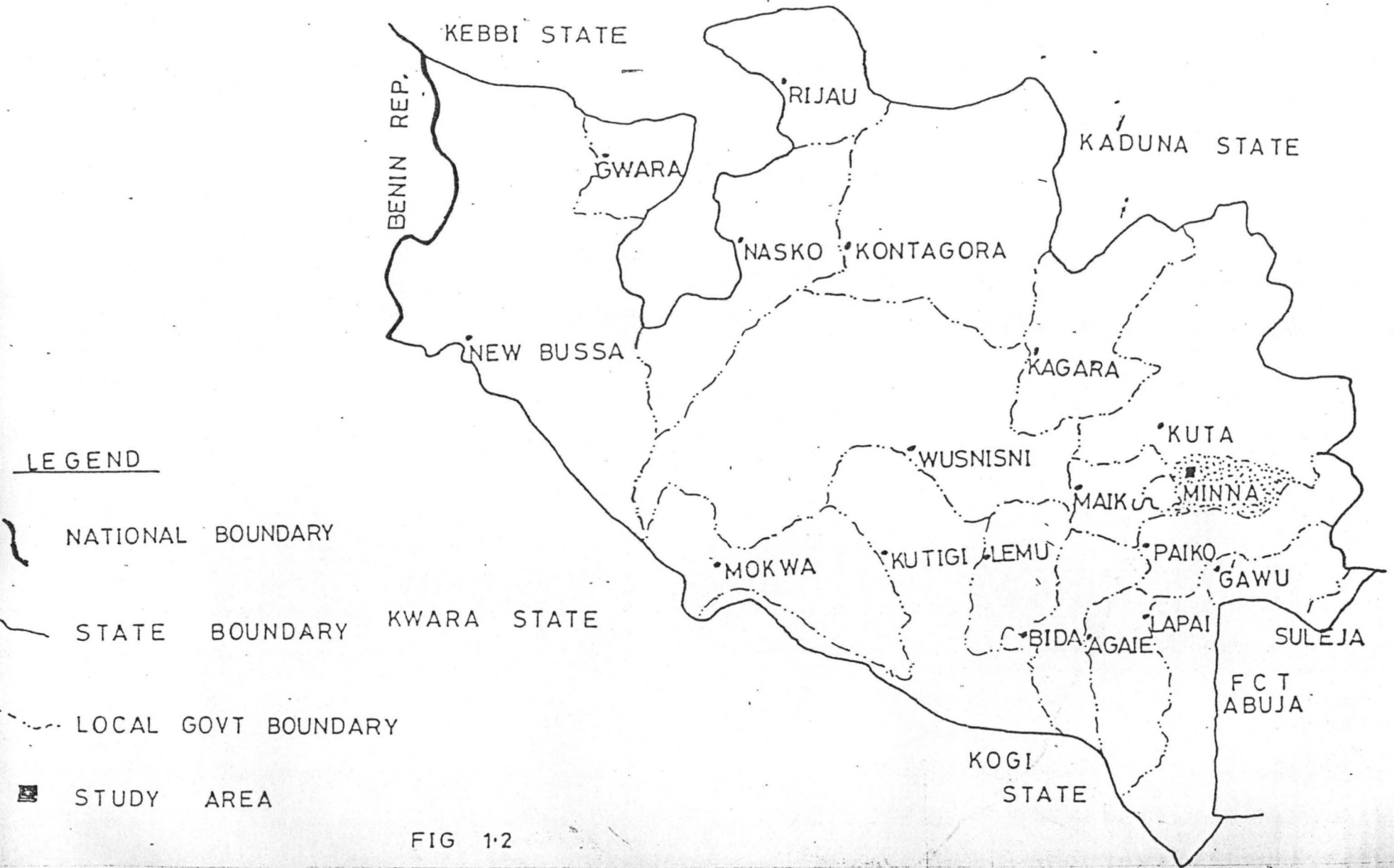


LEGEND

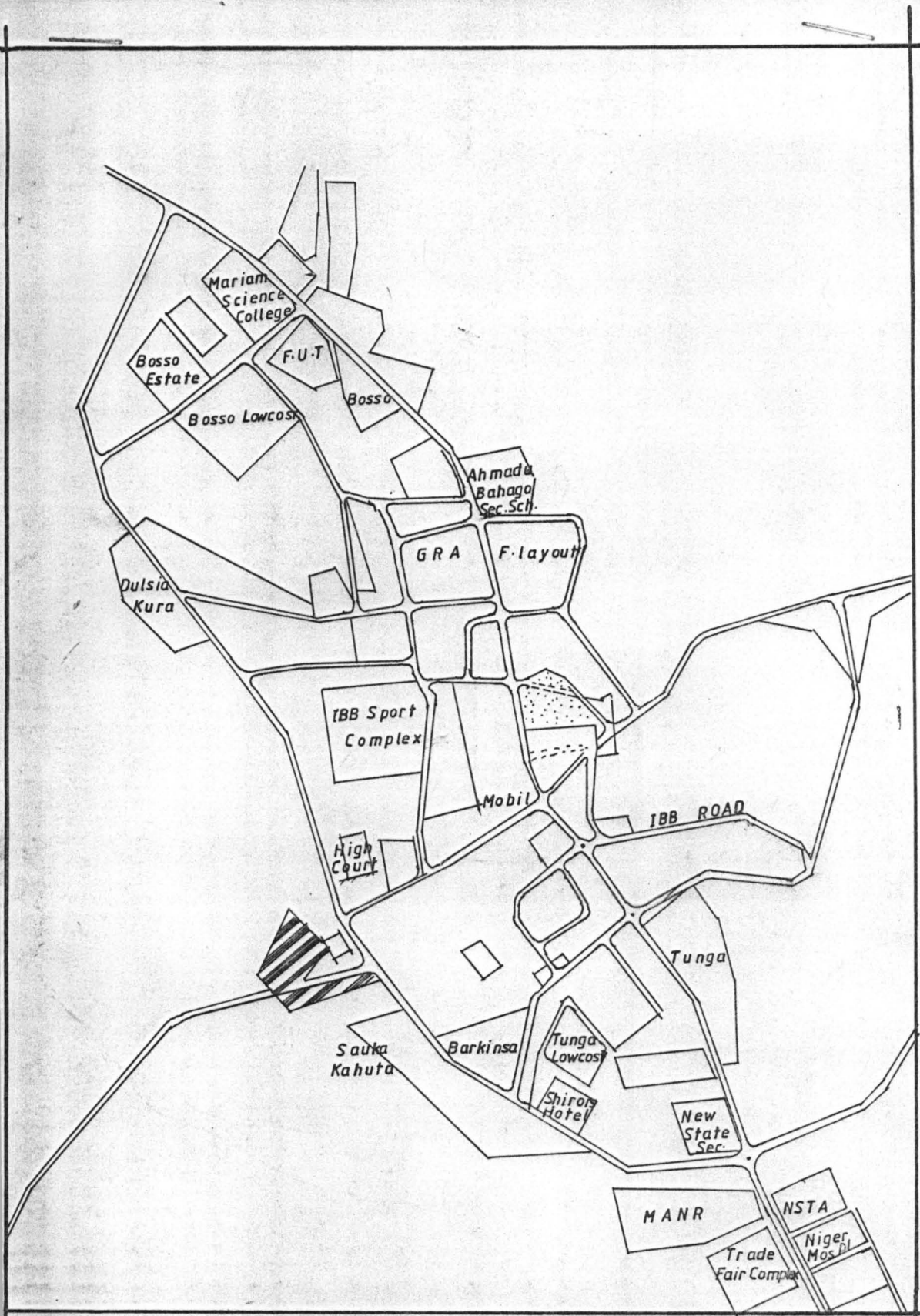
-  INTER BOUNDARY
-  STATE BOUNDARY
-  F C T
-  STUDY AREA
-  RIVERS

SCALE : 9000000

MAP OF NIGER STATE SHOWING MINNA

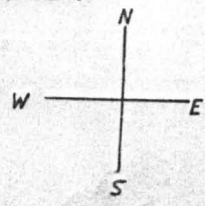


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MAP OF MINNA SHOWING THE STUDY AREA

- LEGEND**
- ROAD
 - ▨ STUDY AREA



SCALE: 1:50,000

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Environmental sanitation, factors, Indicators and Consequences

Environment is a combination of all the living and non-living elements in our surrounding. Elements made by human beings, their inter-relationships between these and various circumstances which surround people on earth.

Sanitation: is the hygienic means of preventing human contact from the hazards of wastes to promote health. Hazards can be either physical, microbiological, biological or chemical agents of disease. Wastes that can cause health problems are human and animal feces, solid wastes, domestic wastewater (sewage, sullage, greywater), industrial wastes, and agricultural wastes. Hygienic means of prevention can be by using engineering solutions (e.g. sewerage and wastewater treatment), simple technologies (e.g. latrines, septic tanks), or even by personal hygiene practices (e.g. simple hand-washing with soap).

The problem of environmental sanitation is universal especially in highly industrialized nations. Nigeria has its fair share though, due to

high population densities and lack of failure to implement polices aimed at achieving a sanitary environment.

Children need a clean environment

Deteriorating environmental conditions have their most profound effect on children who are exposed to a barrage of environmental threats – from lead in air pollution to faecal bacteria in drinking water. Children in developing countries are the least protected and the most affected by unsafe environments, both through direct threats to their health and from the poverty caused by environmental pollution and resource degradation.

Empowered children are a dynamic and ultimately powerful force for protecting and improving the environment.

What children learn today will shape the world tomorrow. Instilling environmental awareness at a young age is the best way to protect the environment. But increasing children's environmental awareness is not enough. For children to become affective agents of change, avenues must exist for their knowledge to be translated into advocacy and action.

“UNICEF uses its WASH programmes around the world to educate and empower children on environmental issues related to water, sanitation and hygiene. Activities include the development of sanitation and environmental education programmes in schools, participatory processes to involve children in the reduction of open defecation in their communities, and initiatives that promote the participation of children in local, national and global environmental initiatives.”

Veneman A. (2008)

Sixty-two per cent of Africans do not have access to an improved sanitation facility – a proper toilet – which separates human waste from human contact, according to the WHO/UNICEF Joint Monitoring Programme for Water Supply and sanitation.

Chan, (2008) “Sanitation is a cornerstone of public health. Improved sanitation contributes enormously to human health and well-being, especially for girls and women. We know that simple, achievable interventions can reduce the risk of contraction diarrhea disease by a third.”

Although WHO and UNICEF estimate that 1.2 billion people worldwide gained access to improved sanitation between 1990 and 2004, an estimated 2.6 billion people – including 980 million children –

had no toilets at home. If current trends continue, there will still be 2.6 billion people without basic sanitation in 2015, and the children among them will continue to pay the price in lost lives, missed schooling, in disease, malnutrition and poverty. (Water sanitation and Hygiene Annual Report, 2007)

“Nearly 40% of the world’s population lacks access to toilets, and the dignity and safety that they provide,” Veneman, A.M. (2008) “The absence of adequate sanitation has a serious impact on health and social development, especially for children. Investments in improving sanitation will accelerate progress towards the Millennium Development Goals and save lives.”

Using proper toilets and hand washing – preferably with soap – prevents the transfer of bacteria, viruses and parasites found in human excreta which otherwise contaminate water resources, soil and food. This contamination is a major cause of diarrhea, the second biggest killer of children in developing countries, and leads to other major diseases such as cholera, schistosomiasis, and trachoma.

Improving access to sanitation is a critical step towards reducing the impact of these diseases. It also helps create physical environments that enhance safety, dignity and self-esteem. Safety issues are particularly important for women and children, who otherwise risk

sexual harassment and assault when defecating at night and in secluded areas.

Also, improving sanitation facilities and promoting healthy hygiene strategies in school benefits both learning and the health of children. Child-friendly schools that offer private and separate toilets for boys and girls, as well as facilities for hand washing with soap, are better equipped to attract and retain students, especially girls. In health-care facilities, safe disposal of human waste of patients, staff and visitors is an essential environmental health measure. This intervention can contribute to the reduction of the transmission of health-care associated infections which affect 5% to 30% of patients. (Chan, 2008)

“The focus on sanitation is fundamental to human beings,” says Pasquale Steduto, UN-Water chairman. “The MDG target on sanitation is seriously lagging behind schedule. The entire UN System has a shared responsibility in mobilizing concrete actions towards its achievement; investments must increase immediately.” UN-Water is the coordinating mechanism of the UN agencies, programmes and funds that play a significant role in tackling global water and sanitation concerns.

World Water Day provides an opportunity to draw attention to the International Year of Sanitation 2008, a year in which the UN General Assembly in December 2006 has called for a focus on addressing sanitation and hygiene problems. The International Year of Sanitation 2008 aims to raise the profile of sanitation issues on the international agenda and to accelerate progress towards meeting the Millennium Development Goal target of reducing by half the proportion of people living without access to improved sanitation by 2015. Within the UN system, the focal point for the International Year of Sanitation is the United Nations Department of Economic and Social Affairs, in collaboration with the UN-Water Task Force on Sanitation.

Waste generation and environmental degradation have been associated with human settlements since the dawn of history. This is profoundly influenced by the level of urbanization and the intensity of socio-economic development of the settlement.

The problems of refuse disposal, collection and environmental sanitation in our cities and urban areas throughout the country have occupied the attention of government authorities at all levels.

Water and sanitation is one of the primary drivers of public health. Which can be refer to as "Health 101," which means that once we can secure access to clean water and to adequate sanitation facilities for all people, irrespective of the difference in their living conditions a huge battle against all kinds of diseases will be won.

2.2 Waste Disposal

The World Book Vol. 21 pp. 112. defines waste disposal as the process of permanently removing waste material which includes, paper, plastics products, bottles, cans, food scraps etc.

The encyclopedia Americana refers to waste disposal as the collection, storage and processing of waste materials. Although the Romans had some elements of sanitation system especially related to waste water collection and transport way from populated areas, there is little record of sanitation in Europe until the late middle ages. Unsanitary conditions were widespread throughout Europe and Asia through the middle ages. But there were no cataclysmic result until the 1300s when overpopulation of some regions created overcrowding and magnified the impacts of lack of sanitation.

Stawell (2002) enumerated ways in which the discharge of untreated waste water and excreta into the environment affects human health.

1. By polluting drinking water.
2. Entry of bacterial into the food chain, e.g. via fruits, vegetable, fish, shellfish e.t.c.
3. Providing breeding sites for flies and insects that spread disease.
4. Poor nutrition from loss of important fish protein sources due to environmental pollution.

WHO (2004) in its publication 'water sanitation and hygiene links to health' came out with facts and figures of diseases caused by inadequate sanitation and hygiene. Some of which are highlighted below.

Diarrhea

- 1.8 Million People die every year from diarrhea diseases (including cholera) 90% are children under 5, mostly in developing countries.
- 88% of diarrhea is attributed to unsafe water supply, inadequate sanitation and hygienic
- Improved sanitation reduces diarrhea morbidity by 32%

Schistosomiasis

An estimated 160 million people are infected with Schistosomiasis

- It is strongly related to unsanitary excreta disposal and absence of nearby source of safe water.
- Basic sanitation reduces the disease by up to 77% intestinal helminthes (ascariasis, hookworm)
- 133 million people suffer from high intensity intestinal helminthes infections, which often leads to severe consequence such as cognitive impairment, massive dysentery or anaemia.
- Access to safe water and sanitation facilities can reduce morbidity from ascariasis by 29% and hookworm by 4%

Carr and Strauss, (2001) emphasized that it is important to understand that sanitation can act at different levels, protecting the household, the community and 'society'. They stressed that in case of latrines it is easy to see that this sanitation acts at a household level. However, poor design or inappropriate location may lead to migration of waste matter and contamination of local water supplies putting the community at risk. In terms of water born sewage the containment may be effective for the individual and possibly also the community, but health effects and environmental damage may be seen far down stream of the original source, hence affecting 'society'.

Kofi Anan (2006) stated that the world shall not finally defeat tuberculosis, malaria or any other infectious disease that plague the developing world until the battle for safe drinking water, sanitation and basic health care is won.

2.3 Waste water collection

The standard sanitation technology in urban areas is the collection of wastewater in sewers, its treatment in wastewater treatment plants for reuse or disposal in rivers, lakes or the sea. Sewers are either combined with storm drains or separated from them as sanitary sewers. Combined sewers are usually found in the central, olden parts or urban areas. Heavy rainfall and inadequate maintenance can lead to combined sewer overflows or sanitary sewer overflows, i.e. more or less diluted raw sewage being discharged into the environment. Industries often discharge wastewater into municipal sewers, which can complicate wastewater treatment unless industries pre-treat their discharges.

The high investment cost of conventional wastewater collection systems are difficult to afford for many developing countries. Some countries have therefore promoted alternative wastewater collection

systems such as condominal sewerage, which uses smaller diameter pipes at lower depth with different network layouts from conventional sewerage. In developed countries treatment of municipal wastewater is now widespread, but not yet universal. In developing countries most wastewater is still discharge untreated into the environment. For example, in Latin America only about 15% of collected sewerage is being treated.

Ecological sanitation

Sanitation is sometimes presented as a radical alternative to conventional sanitation systems. Ecological sanitation is based on composting/vermicoposting where an extra separation of urine and feces at the source for sanitization and recycling has been done. It thus eliminates the creation of black water and eliminates faecal pathogens from any still present wastewater (urine). If ecological sanitation is practiced municipal wastewater consists only of greywater, which can be recycled for gardening.

Sanitation in public health

The importance of waste water isolation lies in an effort to prevent water and sanitation- related diseases, which afflicts both developed countries as well as developing countries to differing degrees. It is

estimated that up to 5million people die each year from prevented water borne disease as a result of inadequate sanitation and hygiene practices

The Joint Monitoring Program for water and Sanitation of WHO and UNICEF have defined improved sanitation as

- connection to public sewer,
- connection to a septic system,
- pour-flush latrine,
- simple pit latrine and
- Ventilated improved pit latrine.

According to that definition, 62% of the world's population has access to improved sanitation in 2008, up 8% since 1990. Only slightly more than half of them or 31% of the world population lived in houses connected to a sewer. Overall, 2.5 billion people lack access to improved sanitation and thus must resort to open defecation or to the unsanitary forms of defecation, such as public latrines or open pit latrines. Additionally 1.2 billion people have access to no facilities at all. This outcome presents substantial public health risks as the wastes contaminate drinking water and cause life threatening forms of diarrhea to infants. Improved sanitation, including hand washing and water purification could save the lives of 1.5 million children who suffer

from diarrheal each year. In developed countries where less than 20% of the world population lives, 99% of the population has access to improved sanitation and 81% were connected to sewers.

Sanitation in the food industry

Sanitation within the food industry means to the adequate treatment of food-contact surfaces by a process that is effective in destroying vegetative cells of microorganisms of public health significance, and in substantially reducing numbers of other undesirable microorganisms, but without adversely affecting the product or its safety for the consumer (FDA, Code of Federal Regulations, 21CFR110, USA). Sanitation Standard Operating procedures are indispensable for food industries in US, which are regulated by 9 CFR part 416 in conjunction with 21 CFR part 178. 1010. Similarly in Japan, food hygiene has to be reached through the compliance of Food Sanitation Law.

Additionally, in the food and Biopharmaceutical industries, the term sanitary equipment means equipment that is fully cleanable using Clean-In-Place (CIP), and Sterilization In- Place (SIP) procedures: that is fully drainable from cleaning solutions and other liquids. The design should have a minimum amount of deadleg or areas where the turbulence during cleaning is not enough to remove product deposits. In general, to improve cleanability, this equipment is made from

Stainless Steel 316L, (an alloy containing small amounts of molybdenum). The surface is usually electro polished to an effective surface roughness of less than 0.5 micrometre, to reduce the possibility of bacterial adhesion to the surface.

2.4 Impact of Poor Sanitation on the Health of People

A report entitled “The Human Waste”, issued by the British charity Water Aid and Tearfund, a British relief and development agency, (2002) details the horrific consequences of poor sanitation and lack of clean drinking water. Lack of sanitation now affects about 40 percent (2.4 billion) of the world’s population and is expected to rise to 50 percent by 2025.

Diarrhea caused by bad sanitation kills nearly 6,000 children a day – an annual toll of two million deaths. People suffering from waterborne diseases occupy half the world’s hospital beds.

Already half of Asia’s population lacks adequate sanitation and in China, India and Indonesia twice as many people die from diarrhea diseases as from HIV/Aids. In Africa in 1998, 308,000 died as a result of war, yet nearly two million died of the effects of diarrhea disease.

In developing countries 80 percent of all disease results from a combination of poor hygiene, contaminated water and poor sanitation. Parasitic infections are exacerbated by poor sanitation – the report estimates that 1.5 billion people have parasitic worm infections. Such worms, whilst they may not cause death, lead to stunted growth and general debilitation. Among the disease resulting from poor sanitation, unclean water and poor waste disposal are dysentery, cholera, typhus fever, typhoid, schistosomiasis and trachoma.

The increasing urbanization of population throughout the world is exacerbating poor sanitation. The Report estimates that 160,000 people move from the country to live in cities every single day. It states that in Africa, Asia and Latin America there are 600 million people living in squatter settlements around conurbations that lack any sanitation infrastructure. These settlements are expanding faster than any attempt to provide such infrastructure. Dhaka, the capital of Bangladesh, is growing at an exponential rate. Its population at the beginning of the 1970s was a quarter of a million, whereas it is now 10 million.

A recent United Nations (UN) Habitat Report (2002) similarly warns of the impact of rapid urbanization. It details the rate of urbanization of

African countries, forecasting that the numbers living in cities will rise from the 1990 figure of 138 million to 500 million by 2020, with 200 million people living in cities with populations of more than a million. The report explained that a 1990 survey showed eight out of 29 sub-Saharan countries "were suffering from water stress or water scarcity." This is expected to increase to 20 countries by the year 2025.

The "Human Waste" Report by the (British Charity water Aid and tearfund,)2002 explains that the answer to the vast numbers of preventable deaths and illness is a simple one. For a very small amount of money, a person in the developing world could be provided with safe water and adequate sanitation - £11 (US\$16) billion a year would reduce by 50% the number of people living with no sanitation and save millions of lives.

The report calls for increased aid from Western countries, and for the British Labour government to give a lead in this by increasing its spending on overseas aid to 0.7 percent of GNP. However, this offers no solution for this rapidly expanding human catastrophe.

Following the pledges made by Western governments to increase aid flows to governments carrying out "sound" policies at the Monterrey conference on poverty held in March, the World Bank issued the report

"African Development Indicators 2002". It suggests that it was time Western governments "deliver on their promises of more generous aid." It explains that despite African governments adopting the policies demanded of them by the West, aid flows are still declining. Mozambique, for example, a country that has carried out the pro-market economic reforms demanded, saw aid fall from \$ billion in 1990 to \$804 million in 1999.

Even if aid donations were increased by tiny amounts, there can be no reasonable expectation that it will be spent on issues such as poor sanitation. The true meaning behind the Western commitment to "halving poverty by 2015" as the United Nations declaration of 2000 put it, was made clear in a recent speech by British development minister Clare Short in Johannesburg. She said, "in these globalised times, a surplus of capital is constantly looking for investment opportunities. The precondition for this investment was "good governance", explained Short, citing the example of China where there has been "considerable progress" over the last ten years. Despite Short's rhetoric about "political rights", the reference to China leads to the obvious conclusion that only countries that discipline their population to accept the demands for ruthless levels of exploitation by multinational companies can expect increased aid and investment.

Aid in the past “has too often been used for political reasons,” said Short. Although she made perfunctory references to promoting trade interests of donor countries and propping up “corrupt rulers”, it is clear that “politically” motivated projects include direct public spending on areas such as sanitation and health. Stressing the importance of the “private sector” several times and “public and private partnerships”, Short made clear that aid would now only be used to “back reformers” who opened up their economies, including the former state sectors, to the market.

2.5 Tackling Poor Sanitation

Improvements in sanitation and sewerage systems can have a dramatic effect on reducing cholera and other diarrhea diseases, research has shown. The study, co-funded by the Wellcome Trust (2007), has led scientists to call for action to improve urban sanitation as an effective way of improving health in developing countries.

According to the WHO (2007), the number of cholera cases during 2006 was 236,896, with 6,311 deaths in 52 countries, a rise of 79% on the previous year. The importance of sanitation in preventing cholera and other diarrhea diseases was recognized in the Millennium Development Goals, which set a target of halving the number of people without access to basic sanitation by 2015. However, this

target is unlikely to be achieved because the resources allocated to it are small. Part of the reason for this neglect of sanitation is the absence of rigorous evidence for its effectiveness in prevention of disease.

In 1997, the city of Salvador in Brazil implemented a city-wide sanitation project, known as Bahia Azul, or Blue Bay. Its objective was to increase the number of households with an adequate sewer system from 26% to 80%, including extending the sewerage network, improving water supply and capacity-building in ten smaller towns in the state.

Professor Barreto and colleagues studied the health impact of the sanitation programme in reducing cases of diarrhea in children under the age of three years old, working with two cohorts of around 1,000 children. Previous studies had evaluated sanitation only in small scale interventions, i.e latrines in village. The researchers found that overall prevalence of diarrhea fell by 22%. However, in high-risk areas, where sanitation –and hence, disease – is worst. Sanitation can be seen as being an equitable approach to tackling a major health problem.”

2.6 ENVIRONMENTAL IMPACTS AND HEALTH HAZARDS OF SOLID WASTE

Waste pollution

Waste pollution is defined as the degradation of the quality of the environment by introduction of pollutants resulting from different types of waste and waste management practices. Typical materials that are found in households waste which have specific environmental impacts with them include biodegradable wastes, batteries, aerosols oils, acids and fluorescent tubes.

Biodegradable waste such as food waste or sewage is broken down naturally by microorganisms either aerobically or anaerobically. If the disposal of biodegradable waste is not controlled it can cause a number of wider problems including contributing to the release of methane a potent green house gas leading to climate change and can impact upon human health via encouragement of pathogens. Fires periodically break out in open dumps, generating smoke and contributing to air pollution. In the Mexican city of Tampico, on the Gulf of Mexico coast, for instance, a fire burned for over six months at the local open dump fires at open dumps often start spontaneously by the methane and heat generated by biological decomposition.

Other forms of pollution associated with waste materials include illegal dumping and leaching. illegal dumping or fly-tipping often involves unregulated disposal of materials on private or public land. Remote sites with road access coupled with limited surveillance often provides the perfect opportunity for this form of dumping which often goes unpunished and leaves others (such as the community or developer) to properly dispose of the waste. Leaching is the process by which contaminants from solid waste enter soil and often ground water systems contaminating them.

Potential health hazards

Some of the health problems associated with poor water quality arising from inadequate waste disposal and waste management practices include typhoid fever, diarrhea, cholera, hepatitis, hook worm infestation, skin diseases, malaria etc. (Chukwuekezie C.I 1998, Ekugo E.I 1998)

Waste dumps are unsanitary and destroy the aesthetic appeal of the environment, they harbor flies, fleas, mosquitoes, rats and other disease vectors. Some diseases carried by rodents and insect vectors include Lassa fever, malaria, filariasis, yellow fever etc. These areas

provide food, water and habitat and breeding for these disease-carrying agent.

Pollution of rivers and lakes results in extensive fish kills and destruction of other forms of aquatic life due to an increased organic load and the concomitant depletion of dissolved oxygen in the water. When fish or other aquatic organisms are not immediately killed they accumulate pollutants, which are eventually transferred to man via the food chain (Ajiwe V.I.E et al 2000). Airborne pollutants and noxious gases produced from refuse dumps contribute to the increased pulmonary diseases among the populations near dump sites, as well as degradation of the physical environment.

CHAPTER THREE

MATERIALS AND METHODS

3.1 DATA COLLECTION

Two methods of data collection were employed for the purpose of this study. They are the primary and secondary data.

A. Primary Data

This is also called the firsthand data. The source of information under the primary data was obtained from the following:

1. Direct interviews: This was handled by the researcher and used to supplement information that may not be properly answered in the questionnaire.
2. Photographs of features significant to the research will be taken.
3. Direct personal observations of the sanitation facilities by the researcher.

QUESTIONNAIRE DESIGN AND ADMINISTRATION

A standardized questionnaire was designed to ensure uniformity in data analysis. The questionnaire was based on information derived from other public investigations. In addition, a large spectrum of variables related to environmental sanitation was included which has about 27 closed questions organized through the following sections: 1) identification of residents in the selected houses 2) socio-economic status of selected families 3) water supply and individual hygiene habits 4) waste water disposal and existence of nearby streams 5) domestic refuse storage and disposal 6) drainage facilities and 7) related environmental based ailments.

B. Secondary data

The primary data was supplemented by collection of accessible information data from relevant ministries and parastatals like the NUDB and NISEPA.

All this was combined with the first hand information obtained through the fieldwork to prepare this work.

3.2 SELECTING THE SAMPLE

Stratified random sampling was used since the study area is divided by major roads in three (3) zones. 50 households were selected from each of the three zones regarded as stratum which means, a total of 150 household were being studied.

3.3 STATISTICAL ANALYSIS

Data from the questionnaire was collated and analyzed using the Statistical Package for Social Sciences (SPSS) package. The results gotten from the analysis form the basis for assessing the quality of existing environmental sanitation facilities in the area.

3.4 WATER ANALYSIS

Water samples were collected from the various sources of drinking water identified in the area. This was taken to the laboratory to detect the presence of coli form bacteria in water through the three (3) basic tests which include: Presumptive, Confirmed and completed.

This is universally accepted for monitoring the microbial pollution of water supplies.

Presumptive test: This process determines the presence of coliform bacteria in a water sample and gives some index as to the possible number of organisms present in the sample under analysis,

Procedure: Three separate series consisting of three groups making a total of nine tubes per series in a test tube rack. The test tubes are labeled as to the sample source and volume of sample invoked as illustrated and identify with initials. The samples were shake thoroughly and using a 10ml pipette, 10ml aliquots were invoked into three test tube labeled LB2X-10ml. using a 1ml pipette, 1ml of water was invoked into three test tubes labeled LB1X-1ml with subsequent flaming of container using a 0.1ml. the procedure was repeated for five samples analysed. The tubes were incubated for 24-hours at a temperature of 37 degree centigrade.

Confirmed test: This process confirms the presence of coliform bacteria in a water sample showing a positive presumptive tests may be the result of organisms of non-coli form origin that are not recognized as indicators of faecal pollution. The confirmed test required the selective and differential media such as Eosin Methylene blue agar (EMB) or macconkay agar be streaked from positive lactose both tube obtained from the presumptive test. The nature of this differential and selective media may be reviewed E.M.B forms a

complex that precipitates out onto the coli form colonies. This reaction is characteristic of indicator micro-organism.

Procedure: The EMB plates and Macconkey agar plates were labeled using a positive 24 hours lactose broth culture from presumptive test. One EMB plate, one Macconkey agar plate were streaked to obtain discrete colonies. The above mentioned procure was repeated for the remaining samples. All plates were incubated at an inverted position for 24 hours at 37 degree centigrades.

Completed test: The complete test confirms the presence of coliform bacteria in a water sample or if necessary to confirm a suspicious but doubtful result of the previous test. The completed test is the final analysis of the water sample. It examined the coli form colonies that appeared on EMB and Macconkey agar plates used in the confirmed test.

Procedure: The tubes were labeled as before. One lactose broth and one nutrient agar slant from the isolated colony obtained from an EMB and Macconkey agar plate from the confirmes test. All tubes were incubated for 24 hours at 37 degree centigrade.

All the tubes of lactose broth single strength and both double strength were examined after 24 and 48 hours of incubation and results are recorded in Table 4.23 and Table 4.24 of the next chapter.

CHAPTER FOUR

RESULTS

The data collected for this study are presented in this chapter based on the research questions. Frequency and percentage tables were used in the presentation.

4.1 ANALYSIS OF BASIC INFRASTRUCTURES

4.1.1: Employment sector of House-hold head

Table 4.1.1 shows that many household head are engaged in public employment which has the larger percentage of 51(44.7%)

Table 4.1.1: Employment Sector of House-hold head

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Public	51	44.7	44.7	44.7
	Private	28	24.6	24.6	69.3
	Self Employed	29	25.4	25.4	94.7
	Unemployed	6	5.3	5.3	100.0
	Total	114	100.0	100.0	

Source: Authors Field work

4.1.2: Toilet types

The results of Table 4.1.2 shows that majority of the people use pit toilets with larger percentage of 53(46.5%)

Table 4.1.2: Toilet types

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Self Flushing	43	37.7	37.7	37.7
	Pit Toilet	53	46.5	46.5	84.2
	Bucket	16	14.0	14.0	98.2
	others	2	1.8	1.8	100.0
	Total	114	100.0	100.0	

Source: Authors Field work

4.1.3: Number of people to one toilet

Table 4.1.3 indicates that the option between 2-3 people to one toilet has the highest frequency because it has the larger frequency of 56 which is 49.1%

Table 4.1.3: Number of people to one toilet

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2-3	56	49.1	49.6	49.6
	3-5	30	26.3	26.5	76.1
	Above 5	27	23.7	23.9	100.0
	Total	113	99.1	100.0	
Missing	System	1	.9		
Total		114	100.0		

Source: Authors Field work

4.1.4: Source of water supply

From Table 4.1.4 it is evident that tap water is the major source of drinking water in the area with a frequency of 55 representing (48.2%)

Table 4.1.4: Source of water supply

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Well	33	28.9	28.9	28.9
	Borehole	26	22.8	22.8	51.8
	Tap water	55	48.2	48.2	100.0
	Total	114	100.0	100.0	

Source: Authors Field work

4.1.5: Availability of Run-offs/Gutters

Table 4.1.5 indicates that 73.7% have existing runoffs/gutters at their residences to take care of their waste water. Because these are poorly constructed, the waste water finds their way to the streets at the end of the day.

Table 4.1.5: Availability of Run-offs/Gutters

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	84	73.7	74.3	74.3
	No	29	25.4	25.7	100.0
	Total	113	99.1	100.0	
Missing	System	1	.9		
Total		114	100.0		

Source: Authors Field work

4.1.6: Different methods of refuse disposal

The results from Table 4.1.6 shows that larger percentage of the people disposes their refuse through Local Government provision which is 47(41.2%)

Table 4.1.6 Different methods of refuse disposal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Local Gov't	47	41.2	42.3	42.3
	Private Firm	20	17.5	18.0	60.4
	Burnt Outside	25	21.9	22.5	82.9
	Disposal by Self	19	16.7	17.1	100.0
	Total	111	97.4	100.0	
Missing	System	3	2.6		
Total		114	100.0		

Source: Authors Field work

4.1.7: Frequency of refuse collection and disposal

Table 4.1.7 shows the frequency of refuse collection and disposal. It reveals that collection and disposal of refuse at the dumps is mostly done 2 times a week with the percentage of 39.5% which is 45.

Table 4.1.7: Frequency of refuse collection and disposal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2 Times a Week	45	39.5	51.1	51.1
	3 Times a Week	25	21.9	28.4	79.5
	Not Applicable	18	14.9	19.3	98.9
	Total	88	77.2	100.0	100.0
Missing	System	26	22.8		
Total		114	100.0		

Source: Authors Field work

4.1.8: Waste water collection and disposal system

Table 4.1.8 reveals that a larger percentage of the people representing 43.9% have no waste water collection and disposal system.

Table 4.1.8: Waste water collection and disposal system

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Available	47	37.7	40.2	45.8
	Not Available	60	43.9	46.7	94.4
	Total	107	93.9	100.0	
Missing	System	7	6.1		100.00
Total		114	100.0		

Source: Authors Field work

4.1.9: Types of drainage facilities available

The drainage system existing in the area is very poor as indicated in Table 4.1.9. The prevailing drainage system in the area is of free flow which has the highest percentage of 38.6% and open drains has a 29.8%.

Table 4.1.9: Types of Drainage facilities available

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Free Flow	44	38.6	40.3	40.3
	Open Drains	34	29.8	31.2	65.1
	None	31	27.2	28.4	88.1
	Total	109	95.6	100.0	100.00
Missing	System	5	4.4		
Total		114	100.0		

Source: Authors Field work

4.1.10: Frequency of waste water network blockage

From Table 4.1.10, the responses for wastewater network blockage stands at 62 this could be because of the open drain drainage system existing in the area

Table 4.1.10: Frequency of waste water network blockage

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	62	54.4	56.4	56.4
	No	48	42.1	43.6	100.0
	Total	110	96.5	100.0	
Missing	System	4	3.5		
Total		114	100.0		

Source: Authors Field work

4.1.11: Responses on presence of Wastewater on Street

From the responses shown in Table 4.1.11, 69.3% of the people have waste water flowing on the streets. This shows that there is no proper method of sewage disposal.

Table 4.1.11: Responses on presence of waste water on street

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	79	69.3	73.1	73.1
	No	29	25.5	26.8	99.1
	Total	108	94.7	100.0	100.00
Missing	System	6	5.3		
Total		114	100.0		

Source: Authors Field work

4.1.12: Type of ailment complained of in hospitals

Table 4.1.12 below shows that the major ailment being complained of in the hospitals is malaria with the larger percentage of 70.2%. Followed by diarrhoea which has 8.8%.

Table 4.1.12: Type of ailment complained of in hospitals

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Malaria	80	70.2	80.0	80.0
	Diarrhea	10	8.8	10.0	90.0
	Typhoid	5	4.4	5.0	95.0
	Dysentery	1	.9	1.0	96.0
	Cholera	4	3.5	4.0	100.0
	Total		100	87.7	100.0
Missing	System	14	12.3		
Total		114	100.0		

Source: Authors Field work

4.1.13 Frequency of ailment complained in hospital

Table 4.1.13 reveals that the frequency of ailment complained of weekly is more than others with the highest frequency of 48 respondents; this represents a total of 41.2%.

Table 4.1.13: Frequency of ailment complained in hospital

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Weekly	48	41.2	48.5	49.5
	Forthnightly	24	21.1	24.7	74.2
	Monthly	25	21.9	25.8	100.0
	Total	97	85.1	100.0	
Missing	System	17	14.9		
Total		114	100.0		

Source: Authors Field work

OBSERVATION AND RESULT OF WATER ANALYSIS

4.1.14 Presumptive Test

Table 4.1.14 reveals the analysis of the various water samples and their reaction in acid and gas. All the samples test positive with similar range/probability.

Table 4.1.14: Presumptive test.

Water Sample Code	Acid and Gas									Reading	MPN	Range/Probability
	LB2x-10ml			LB1x-1ml			LB1x-0.1ml					
Tube	1	2	3	4	5	6	7	8	9			
Borehole	+ve	+ve	+ve	+ve	+ve	+ve	+ve	+ve	+ve	3-3-3	1100	150-4800
Well	+ve	+ve	+ve	+ve	+ve	+ve	+ve	+ve	+ve	3-3-3	1100	150-4800
water vendor	+ve	+ve	+ve	+ve	+ve	+ve	+ve	+ve	+ve	3-3-3	1100	150-4800

Keynote:-

Lactose broth double strength = LB2x.
 Lactose broth single strength = LB1x.
 Acid formation = yellow
 Acid and Gas formation = YG
 Organisms in 100ml of water sample.
 No change or alkaline reaction = NG

+ = Positive for given reaction
 - = Negative
 - = Negative
 MPN = Most probable number of micro-

4.1.15 Confirmed Test

Table 4.1.15 reveals confirmed test results on water sample. The outcome showing the three sources non-portable.

Table 4.1.15: Confirmed test.

Water Sample Code	Coliforms		Potable	Non-potable
	Maconkey Plate	EMB Plate		
Borehole Water	Pinkish colonies, pink colonies, green brown	Pinkish colonies, green brown		✓
Well	Pink colonies, pink mucoid colonies	Pink colonies, pink mucoid colonies		✓
water vendor	Red minute colonies, green-brown colonies	Metallic speen colonies, brown		✓

Keynote:-

M.C.A = Macokey Agar.

E.M.B = Eosin Methylene Blue Agar

4.2 CONDITION OF BASIC INFRASTRUCTURES



Plate I: showing drainage system in a residential



Plate II: showing method of waste disposal

one toilet. While between 3-5 persons to one toilet has a percentage of 26.3% and above 5 people is represented by 23.7%.

Table 4.4 shows the source of water supply of the residents. Majority of the respondents source their water from the tap and is represented by 48.2% those that rely on well water have a percentage of 28.9% and borehole is represented by 22.8%.

Table 4.5 indicates that runoffs/gutters are existing in the area and is represented by 73.7%. these runoffs are personal efforts of the individuals and are not well constructed thereby waste water are still found lying on the streets because they are not properly channelled. 25.4% said they do not have these runoffs/gutters.

Table 4.6 shows the different methods of refuse disposal. 41.2% dispose their waste through the local municipal provision. 17.5% make arrangements with private firms to dispose their waste and about 21.9% resort to burning the waste outside. A fewer percentage said they dispose off their waste by themselves.

Table 4.7 shows the frequency of refuse collection and disposal. 39.5% of the people responded that their waste are being evacuated

from the dump sites at least twice a week while about 21.9% responded for thrice a week. About 14.9% confirmed that neither option is applicable to them, these are those that probably dispose their waste by themselves or burn them outside.

Table 4.8 shows responses for the availability of waste water collection and disposal systems in which 37.7% accounts for availability and 43.9% which forms the larger percentage for non-availability. The implication of this is that, waste water is found lying in the surrounding and constitutes health hazards to the residents.

Table 4.9 shows the type of drainage facilities available. 38.6% fall within those with the free flow while 29.8% accounts for those with the open drain systems. 27.2% have no drainage facilities at all. With these results, it is evident that there is no existing drainage system Kpakungu area at all.

Table 4.10 shows the frequency of waste water network blockage. Majority of the respondents representing 54.4% of the sample population affirmed that their existing systems of waste water disposal is blocked. 42.1% answered 'No' and the percentage of non-respondents stands at 3.5%.

Table 4.11 shows the responses on presence of waste water on street in which 69.3% said 'Yes' and 25.5% said 'No'.the presence of waste water on the streets could be attributed to the lack of drainage facilities in the area and the blockage of the existing ones which are poorly constructed.

Table 4.12 shows the type of ailment complained of in hospitals.those that complain of malaria are represented by the larger percentage of 70.2%. Diarrhoea 8.8%, typhoid fever 4.4%, dysentery 0.9%, cholera 3.5% and the percentage of non-respondents is 12.3%. from this result, it can be deduced that malaria is the major ailment suffered by the people in that area.

Table 4.13 shows the frequency of complain in hospitals. 42.1% complain weekly and 21.9% complain forth nightly. A percentage of 21.9% were non-respondents to this question.

Table 4.14 & 4.15 Interpretation Of Water Analysis

The presumptive evidence so obtained confirmed the presence coliform bacteria in the entire water sample under analysis sample 1-3, immediately suggests that the water sample is non portable. Confirmed of these result is necessary, since positive presumptive test may be the result of micro organism of non coliform origin that are not recognised as indicators of faecal pollution, since gas appeared in all three tubes labelled LB2X-10mls, three of the tubes labelled LB1X-1 and in three labelled LB1X-0.1ml, the series was read as 3-3-3. From MPN table, such a reading indicates there is approximately 1,100 micro organisms per 100ml of water with a 95% probability that there be between 15 and 4,800 micro organisms present. The most probable number (MPN) of coliform present in 100ml of water tested can be estimated by the number of positive tubes that shows up after incubation.

5.3 SUMMARY OF FINDINGS

The following points summarise the findings of this research work.

- There are no existing drainage facilities in the area, thus waste water is found lying on the streets and front of residential. This could serve as breeding ground for disease carrying vectors such as mosquitoes.

- The major ailment being complained of by the people is malaria which is majorly caused by mosquito bites.
- Majority of the people rely on the municipal authorities for their waste disposal which are not even properly kept at the dumpsites as evidenced in 'plate III' of Chapter 4 of this work. The evacuation of this waste is done btw 2-3 times a week which is not sufficient.
- Coliform bacteria was found to be present in the well and borehole water samples. This bacteria is known to be responsible for typhoid, dysentery and cholera. However, the percentage of respondents for this cases were very few, this could be due to the fact that a larger percentage of the populace have access to tap water.

5.4 CONCLUSION

The conclusion drawn from this study are as follows:

- Lack of adequate drainage facilities and septic tank in the area is causing pollution of the environment because all waste water and sewage decay eventually find their way to the streets.
- Besides becoming breeding ground for disease carrying vectors, the sewage may find their way to nearby wells and boreholes used for drinking. This is evidenced in the result of water samples where coliform bacteria was found to be present.
- The ----- at the dump sites are not put into proper use causing wastes to fly from one point to the other and even clogging the existing drains.

5.5 RECCOMENDATIONS

The following recommendations are offered as guidelines towards improving the sanitary condition of Kpakungu metropolis:

- It is recommended that government should direct more effort to good drainage systems in the environment as the only available

ones are private individual efforts mostly in residential which are disposed off on the streets at the long-run.

- The sanitation agency in the state should ensure that proper procedures are followed in construction of sewage tanks and soak-aways to take care of the excess waste water flowing on the streets.
- Additional toilets should be introduced in the environment to cater for the passengers coming to the motor park and also the workers and traders who defaecate in the surroundings for lack adequate facilities.
- The local authorities responsible for waste disposal should increase the frequency with which they do so as to reduce the overflow at the dumpsites.

REFERENCES

- Aloysius, E. (1998) A practical guide to writing research projects reports in tertiary institutions. John Jacob's classic publishers Ltd. Enugu
- Barry, M. (2002) Report on impact of poor sanitation on world's health. World Socialist Web site. wsws.org
- Code of Federal Regulations "1910.141 Sanitation" retrieved on 1 march 2008
- Ebong, R. D (1994) Environment health Knowledge and practice survey among secondary school children in Zaria.vol102 No 3, pp 310-312 http://www.ehponline.org/realfiles/members/1994/1_02-3/ebong-full.html [2nd June 2008]
- Encyclopedia Americana Vol 28 pp 424
- George, T. and Frank, K. (2002) Handbook of Solid Waste Management, 2nd edition, Mcgraw Hill. ISBN:9780071356237
- Israel Ministry of Environment. (2003) Solid waste management policy updated 10109/2003
- John, O: A new face for old Minna. 2003-2007 @ Guardian Newspaper Limited by dnetsystems.net
- Sanitation and drinking water: is the world on track? Circle of blue, July 31, 2008

- Ujang, Z. (2003) Environmental Biotechnology: Advancement in water and waste water application, iwa Proceedings, Malaysia
- Veneman, A. (2008) A plea for dignity and health for all. Speech delivered at the International Year of Sanitation,
- Water Sanitation and Health (WSH) (2007): Sanitation challenge, Turning commitment into realities <http://www.who.int/water-sanitation-health/hygiene/envsan/sanitchallenge/en> [20th July, 2008]
- Welcome Trust (2007, November 10) Tackling Poor Sanitation in Developing Countries, Researches Urge. Science Daily
- Wikipedia, the free encyclopedia. <http://en.wikipedia.org/wiki/sanitation> [27 July 2008]
- William D. R (1986). The solid waste management: a practical Guide, John Wiley and Sons.
- World Health organization Expert Committee (1973) Problems of the human environment WHO Chronicle 27 (7-8):325-327
- World Health organization: (1979) Promoting environmental health in the years 1978-1983. WHO Chronicle 33:169 -173
- World Health Organization and UNICEF Progress on Drinking Water and Sanitation: Special Focus on Sanitation [2000].
- World Book 2001 Vol 21 pp 112, Vol 18 pp 71,2001

APPENDIX A

DEFINITION OF TERMS

Environment: This refers to the external influences that affect the individual's physical needs for good health such as fresh air, water, shelter food, protection against disease etc.

Sanitation: Sanitation refers to the tendency to react towards the promotion and maintenance of good health. The "world book" defines it as the various effort to control the environment so as to control and prevent disease. According to Burnett white "sanitation is the hygienic means of preventing human contact from the hazards of waste to promote health". Hazards can be physical, biological, or chemical agents of disease.

The term "sanitation" can be applied to a specific aspect, concept, location or strategy such as.

Basic Sanitation: This refers to the management of human faeces at the household level. This terminology is the indicator used to describe the target of the millennium development goal on sanitation.

On-Site-Sanitation: The collection and treatment of waste is done where it is deposited. Examples are the use of pit latrines, septic tanks and Imhoff tanks.

Food Sanitation: This refers to the hygienic measures for ensuring food safety.

Environmental Sanitation: The control of environmental factors that form links in disease transmission. Subsets of this category are solid waste management, water and waste water treatment, industrial waste treatment and noise and pollution control.

The 'world book encyclopedia' defined it as the science controlling man's surrounding to promote health and comfort in the process of taming the environment so that it no longer constitutes health hazard to man and in order to change and enhance his physical, mental and social being

APPENDIX B

QUESTIONNAIRE

TOPIC: *Effects of poor environmental sanitation on human health
in kpakungu metropolis, Nigeria*

1. Sex Male Female
2. Age; 20-30 31-40 51-60
 above 60
3. Employment Sector of Household head Public
 Private Self-employed Unemployed
4. Occupation of Household head
5. Since when have you been living here? 0-8yrs
 8-10yrs 10-16yrs over 20 yrs
6. Number of Household: 0-5 6-10 11-15
 15-20 over 20
7. Number of children: 1-2 3-4 5-6
 7-8 8-10 over 10
8. What kind of toilet facility do you have? Self flushing
 Pit toilet Bucket
9. Do you wash your hand before and after defecation?

Yes No

10. Do you wash your hand regularly before and after eating?

Yes No

11. How many toilets do you have? 2 3 4

12. How many people to one toilet? 2-3 3-5 above

5

13. Source of water supply. Well Borehole

Tap water Stream

14. How regular is your tap water per day? 2hrs 2-5hrs

5-10hrs 24hrs

15. Do you purify your drinking water? Yes No

16. How? Filter By allum Boil & filter

Boil and Allum

17. Do you have run-offs/Gutters? Yes No

18. If yes, is it paved? Yes No

19. Method of refuse Disposal Local Gov't Private firm

Burnt outside Disposal by self

20. Frequency of refuse collection by municipal 2 Times a week

3 Times a week Not applicable

21. Do you have an existing bathroom facility? Yes

No

22. Waste water collection and disposal system Available
 Not available
23. Drainage facility Free Flow Open Drains
 None
24. Waste water network blockage. Yes No
25. Superficial presence of wastewater on street Yes No
26. Aliment complained of in Hospitals Malaria
 Diarrhea Typhoid Dysentery
Cholera
27. Frequency Weekly Fortnightly
Monthly