

SEWAGE MANAGEMENT IN THE NEW
FEDERAL CAPITAL TERRITORY ABUJA

By

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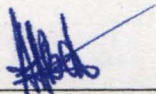
DEDICATION

This piece of work is dedicated to my late father Alhaji Inuwa Ashafa who answered the call of Allah on 28th June, 2001 whose prayers and tenderness I swim in.

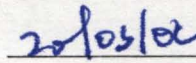
To my mother Hajiya Fatima Mansir, my uncle Alhaji Saleh Ashafa, my wives Ramatu and Zuwaira, my children, Abdulkadir and Lukman whose untiring patience, courage, moral and mutual understanding made it possible for me to successfully complete my post graduate (Diploma) programme.

CERTIFICATION

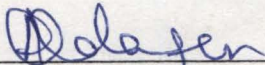
This is to certify that this project work being submitted by Inuwa Mohammed Ashafa (PGD/GEO/2000/2001/142) is my original work and has not been submitted before by anybody for any purpose and meet the requirement governing the award of PGD in Environmental Management, Geography Department, Federal University of Technology, Minna.



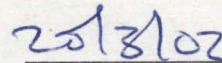
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Alhaji Usman Sokodabo
Mohammed Abdul
ASHAFI

ABSTRACT

This study attempt to examined the entire sewage management in the nations new Federal Capital Territory, Abuja.

Infact, this study enveloped variables as related to sewage treatment, disposal techniques in relation to the daily influx of population as well as facilities available and its efficiency. The entire system was examined which obviously revealed what is actually operational as regard sewage collection, disposal and treatment by means of a well-designed questionnaire. In addition, physical inspection and practical participation alongside with the staff of AEPB, FCDA Engineering departments were conducted to some of the major centres and the treatment plants respectively.

It was discovered that sewage collection and its disposal is far from being satisfactory as a result of increase in the numbers of occupants of both residential and office accommodation in Abuja without corresponding increase in the number of facilities and equipments necessary for appropriate sewage collection and its disposal. Thereby exposing part of Garki I and Wuse I of the city to an ugly situation liable to culminate into related diseases due to poor sanitary conduction e.g. Malarial, Typhoid, Fever etc.

Finally, some recommendation were made to avert or improve on the existing situation which among others include the review of frequency of services to household soakaway from half yearly i.e. 6 months to quarterly basis i.e. three months interval, establishment additional sewage treatment plants and the completion of wupa treatment Lagoon.

Finally, the Abuja Environment protection board should strengthen its effort through procurement of additional trucks to replace the broken ones for regular and prompt evacuation of sewage.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 SEWAGE MANAGEMENT AND ENVIRONMENTAL HEALTH

Water is the most basic resource, which is essential to man, animals, and plants without which life on earth would have been impossible and in addition industrial activities may never have existed.

Water may be said to be the single most dominant factor in settlement civilization and growth of ancient empires and kingdoms.

The impairment of water resources by the unrestricted disposal of domestic and industrial water is especially evident today in heavily urbanized and industrial areas like Abuja, Lagos, Kano, etc. Uneven and unplanned industrial growth in these areas has resulted in the severe violation of environmental laws thereby causing pollution on the nearest water course.

“Sewage” is the wastewater of a community. It may be purely domestic or industrial in origin. It may also contain some agricultural water as well. (Metcalf et al 1991). Domestic sewage is composed of human body waste (faeces and urine) and “sullage” which is the water resulting from personal washing, Cooking, flushing toilets or from factories, offices and

even the rain water which runs from built up areas. (Romalho, 1983). Fresh sewage is a gray turbid liquid, which has earthy but offensive odour. It contains large floating and suspended solid (i.e. rags, paper, plastic containers, etc), smaller suspended solids and very small solid in colloidal suspension (flocs) as well as pollutants in true solution. It is quite objectionable in appearance and hazardous in content depending on its constituents. Sewage is composed of a number of diseases causing organisms. The composition of industrial sewage is determined by the nature of industrial operation being carried out.

Sewage treatment plant is a process plant established for the sole aim of treating wastewater from residence, institution and industrial establishments. If wastewater from these sources is allowed to accumulate, the deposition of organic materials contained in it, can lead to large production of pollutant gases. On the other hand, untreated wastewater and industrial wastes usually contain numerous pathogenic or disease – causing micro-organism that dwell in the human intestinal tract. However, wastewater also contains some nutrients, which can stimulate the growth of aquatic life and may contain some toxic substances detrimental to their growth (Thomann, 1987). For some of the reasons given above, free removal of wastewater from its sources of generation, followed by treatment and disposal is not only desirable but also necessary in this modern world to prevent the spread of diseases.

As a result of the above-mentioned predicament associated with the untreated wastewater, there is need for the establishment of sewage treatment plant in our urban areas. Such treatment plants however, require monitoring to ensure their effectiveness in preventing pollution of the environment. It is worthy to note that very efficient plant will reduce ill-smelling odour to the lowest possible level, the surface of the river will be prevented from being blocked by large growth which tends to prevent free transfer of oxygen to aquatic animals and the removal of disease causing organisms in the wastewater will make it safe for consumption by both human and aquatic in life.

The Abuja wastewater treatment plant, which was established in 1993, was designed to treat waste from 50,000-population equivalent. However, the effectiveness of the plant in treating the wastewater before discharge into Wuye River has not been subjected to a rigorous analysis.

1.2 AIMS AND OBJECTIVES

The aim of this study is to investigate the conduct of sewage management and disposal in the New nations administrative headquarter to determine its effectiveness or otherwise and to see whether or not it will curb those environmental problems associated with poor sewage management techniques. The following objectives had been formulated for this research work.

- i. To find out the methods and procedure of sewage collection and disposal techniques vis-à-vis the environmental health.
- ii. To investigate the effectiveness or otherwise of sewage management/disposal techniques in relation to the new Federal Capital City of Nigeria.
- iii. To identify problems and prospects of sewage management and suggest probable solution to the identified problems.]

1.3 STATEMENT OF PROBLEM

The master plan for the new Federal Capital Territory entails proper and careful planning in order to avoid all forms of congestion as well as environmental pollution which are detrimental to human health.

Today, environmental health has become a great concern to all citizens in both rural and urban sittings. Most especially the continuous influx of people from all parts of the county into Abuja City left nothing to be desired.

1.4 SIGNIFICANCE OF THE STUDY

Environmental Sanitation has been a nation wide programme that has gained an acceptance by all and sundry. The study aimed at contributing to the already existing body of knowledge about good sanitary environment and aesthetic values.

This study will go a long way to expose the effectiveness and or inadequacies of the Abuja Environmental Protection Authority, FCDA Engineering Department and make the agencies informed of their responsibilities.

It is in the good aspiration of the Author that the data collected for this study was interpreted and used to improve the health standard of the people through good sanitary environment.

The study would equally serve as a guide to the staff of AEPA, the FCDA Engineering Department, Health personnel's of Department of Health FCDA as well as non-governmental organizations (NGOS) as a tool of further enlightenment to the public in order to enhance good health habit and its enforcement.

1.5 SCOPE AND LIMITATION

Investigation and research were conducted with the department of waste management of Abuja Environmental Protection Authority (AEPA) and FCDA Engineering Dept. which covers the Federal Capital City (FCC) with those places like Garki 1, Asokoro, maitama, Wuse 1 and the central Area, the activities at the treatment plants and the sewage lagoon constructed in Wuye districts.

Some questionnaire forms were rejected due to non-correct completion while some were not returned. Some were returned but very late.

Others limitation like respondents false or dishonest responses that cropped up were however averted as the respondents were assured of their confidentiality of responses. And that their responses would just be used for the purpose of this research, which would have no reflection on their persons.

There was equally the problem of government bureaucratic redtapism which tags a lot of documents and records as secret and therefore not releasable to my kind of enquiries.

Also the time factor was a major constraints to the detailed of information and data that could be collected for the study, in addition the enormous class work that had to be done at the same time. However every effort was made to bring into focus all aspect that was considered relevant.

1.6 BACKGROUND OF THE STUDY AREA, ABUJA FCT.

The historical background of the study area will cover the physical, socio-economic and political setting of Abuja. But before then it will be pertinent to examine the "legal instrument establishing the capital Territory".

The Federal Capital Territory Decree No. 6 of 1976, was promulgated on the 14th February 1976. The Decree is the legal instrument establishing the Federal Capital Territory (FCT). The object of the Decree was to give legal status to the area which has been delineated as the FCT. The schedules to the decree clearly demarcated the Territory, which consists of portions of land exercised from Kwara (now Kogi), Niger and plateau states (now Nasarawa state).

The Decree established the Federal Capital Development Authority (FCDA), as the Federal Government Agency responsible for the design, construction and the administration of the Territory. The Decree also vested ownership and control of land in the Territory in the Federal Government of Nigeria (1)

1.6.1 THE PHYSICAL SETTING OF THE FCT

Abuja, the Federal Capital Territory is situated starting from the village called Izom on 7° longitude and 9° latitude project a straight line westwards to a point just north of lehu on the kemi river, then project a line along 6° southwards passing close to the village called semasu Zui and Bassa down to a place a little west of Ebagi in Kwara state then, then project a line along a parallel 8° 27" N. Latitude to Ahinza village 7° 6" (on the kunama river), thence project a straight line to buga village on 8° 30" N latitude and 7° 20", E longitude, then drew a line northwards joining the

villages of Odu Karshi and Karu from the line proceed along the boundary between the northwest of Benue plateau states now(kogi-Nasarawa states) as far as karu, thence the line proceeds along the boundary between the north-central and north-western states up to a point just north of Bwari village, thence the line goes straight to Zuba village and thence straight to Izom (2)

The territory is therefore located at the center of the country, it covers land areas of 8,000 square kilometers. It is thus more than twice the land area of the former FCT of Lagos (3,538sqkm). Because of its central location, the Territory is easily accessible from all parts of Nigeria and indeed from major cities of Africa.

The Federal Capital City (FCC) itself, which is located in the eastern fringes of the Territory is design to cover land area of 256sqkm or 3% of the total land area of the Territory. This means that 7744sqkm i.e. (97%) of the land area of the Territory constitutes the city's regional components to be utilized for other service such as agriculture and the development of satellite towns to absorb the future excess influx of population into the city.

The FCC is shaped like a crescent with aso hill as a central focus and located at the north-eastern quadrant of the Territory. The choice of this location was based on such consideration as tarrain, soil characteristics, vegetation, climate, environmental easthetic etc.

1.6.2 ADMINISTRATIVE SET UP

As earlier stated, the Federal Capital Territory was carved out from three neighbouring states, Niger, Old Kwara and old plateau states. The area which constitutes the Federal Capital Territory, groups together people of different culture and traditions from all Nigeria. This therefore made the need for a unified administration inevitable.

In order to meet this need and to ensure adequate provision of social services, the Federal Government considered it essential to set up an effective administration in the Federal Capital Territory that permeated to the grassroots.

The Territory was to that extent divided into seven Development Areas namely, Abaji, Bwari, Karshi, Kuje, Rubochi, Yaba and Gwagwalada Development Areas. Administrative machinery was also put in place under the supervision of the Federal Capital Territory Administration (FCTA). FCTA to administer the Territory except for the Federal Capital City (FCC). It provided Institutional mechanism usually associated with state governments such as the Police, High Court and Lower Courts, Hospitals, and schools for the Territory. For an effective administration therefore, the Ministry was structure to cater for both physical, social and political development of the Territory. It has 13 professional and service departments, - personnel management, Finance/economic development, Land & Surveys, Engineering services, Public works, Education etc.

In addition, there are boards and Agencies responsible for the provision of social services such as water management, mass education, environmental protection etc. These are all headed by Directors. The erstwhile Development Areas have since evolved into six Area Councils. These Councils which are under the supervision of the MFCT are the tier of government closest to the grassroots. They are responsible for local administration and provision of basic social services. Each of them is headed by an elected Chairman and Councillors.

1.6.3 ABUJA MASTER PLAN AND SEWAGE SCHEME

The Abuja master plan provides for Central sewage schemes for the city and the satellite towns. This is to ensure that wastewater resulting from the usage of potable water is properly disposed off without polluting the environment. To facilitate this therefore, the sewage network is planned to follow the natural drainage basins.

The sewage is however, designed to collect sewage from the neighbourhoods through tertiary sewer lines via secondary lines to interceptor lines and to the trunk lines for conveyance by gravity to the central sewage treatment plants.

The study on sewage management and disposal in FCT confirmed that FCDA Engineering Dept. in collaboration with Abuja Environmental

Protection Board mainly concentrates in the City through the development of central service scheme.

The scheme presently encompasses the interceptor sewer, which collect sewage from the districts in phase I and transport to the main treatment plant. The interceptor sewer lines in this basin are categorized into three schedules I, II, and III.

- a. Schedule I collects from Garki I and Garki II districts
- b. Schedule III collects sewage from Asokoro, Maitama, Wuse I, Wuse II districts and Central area.
- c. Schedule II interceptor sewer lines collect the earlier sewage conveyed by both schedules I and III and discharged into Wuye basin treatment plant.

1.6.4 DEFINITIONS OF TERMS

- i. **Sewer:** A sewer is a pipe for the drainage of buildings (in more than one household or ownership).
- ii. **Sewerage:** A system of sewers and auxiliary works to convey sewage from its points of origin to a treatment works or other place of disposal.

- iii. **Storm Sewer Network:** This is equally called the storm drains, they are basically serving as collectors of runoff from open space including the roads network into the opened natural valleys.
- iv. **Foul Sewer Network:** This is the sanitary sewers. These are the collectors of wastewater generated by human activities from toilets (black water), Kitchen, bath and washings (grey water).
- v. **Principle Of Management:** Management is a cyclical goal oriented process. It involves setting goals and objectives, establishing long term plans, programming, budgeting, implementation, operation, maintenance, monitoring and evaluation, cost control, revision of objectives and plans.
- vi. **Sewage Management System:** This includes all phases of waste water collection, transfer, recycling, resource recovery and disposal in urban areas.
- vii. **Sewage Lagoon:** This is a pond where sewage is discharged to and a natural purification process occurs. The organic matter in the sewage is broken down by microorganisms into CO_2 and other substances, some of which act as nutrients to green algae.
- viii. **Sewage Treatment Plant:** This is the treatment of collected sewage by Aeration. Aeration reduces odour and decreases organic pollution over a period of time. The treatment plant must therefore consist of the followings: Pumping station, screening station, Grit chamber and Activated sludge pond.

CHAPTER TWO

2.1 LITERATURE REVIEW

The need for water sanitation in large towns became evident during the Industrial Revolution.

Urban mass were developed without adequate provision for water supply or for removal of waste was taken from shallow wells, from polluted streams, or at best from leaky water mains which were under pressure for only a few hours each day. Accumulation of wastewater resulted in the contamination of water supplies. High mortality from water borne diseases, typhoid, cholera and forms of dysentery was widespread in the densely populated areas.

However, the proper management of wastewater in modern societies is a necessity not an option. Historically, the practice of collecting and treating wastewater prior to disposal is a relatively recent undertaking. Although the remains of sewers have been found in ancient cities, the extent of their use for wastewater carriage is not known (Romalho, 1983). The elaborate drainage system of ancient Rome was not used for waste disposal and waste were excluded specifically from the sewage systems of London, Paris and Boston until well after the turn of the nineteenth century (Pickford 1977).

Earlier before this time, city residents place "night soil" in buckets along the street and workers emptied the waste into "honey-wagon" tanks. For the main purpose of disposal of the wastes over agricultural lands, it (waste) was transported to rural areas. These systems of waste disposal practice were drastically changed by the invention of flush toilet in the nineteenth century. The transportation of urban wastes for disposal on agricultural lands by the existing systems were not adequate to handle the large volume of liquid generated by the flush toilets. Faced with this transportation problem, cities began to use natural drainage systems and storm sewers for wastewater carriage against the device of such as Edwin Chadwick,(1842) British Secretary to the Poor Law Commission, who in 1842 recommended rain to the river and sewage to the soil (Eckenfelder, 1979).

Edwin Chadwick also realized that much poverty was the result of disease and early death, though it was not known then that bacteria were responsible for the spread of disease such as cholera. He became convinced that the failure to remove waste-water promptly and lack of clean water supplies is the basis of most prevalent diseases. Chadwick and supporters campaigned energetically for improvement (Porteous 1976).

During the later half of nineteenth century, of combined sewers were common place in large cities since drainage system naturally ended at water

courses, water borne wastes were discharged directly to streams, later without treatment pollution of them resulted, and health problems were transferred from the sewerred community to downstream users of the water (Porteous 1976).

An innovative English Engineer named Lindsey built the first "modern" sewage system for wastewater carriage in Hamburg Germany (Haandel et al 1994). Many of the systems that are used today are included and the inclusion of manholes, pumping stations and others were most of the improvement in wastewater collection systems over the last 100 years .

Wastewater treatment lagged considerable behind its collection. Treatment was considered necessary only after the self-purification capacity of the receiving waters was exceeded and nuisance conditions became intolerable. Various treatment processes were tried in the late 1800, in common the 1920s wastewater treatment had evolved to those processes in common used today(Metcalf et al, 1991).

Until mid- century, however, design of wastewater management and its treatment facilities remained empirical. In the last thirty to forty years, great advances have been made in understanding wastewater management and its treatment. And the original processes have been formulated and quantified. The science of wastewater treatment is far from static however, advance wastewater treatment processes are currently being developed that

will produce portable water from domestic wastewater. Methods used for treating municipal wastewater are often referred to as either unit operation or unit process.(Schroeder1985). Generally, a unit operation involves contaminant removal by physical forces which unit processes involve biological and or chemical reactions.

2.2 WATER AND SEWAGE CHARACTERISTICS

Every community produces both liquid and solid waste. The liquid portion is called wastewater and the solid portion is the refuse. Hulshoft define waste water as a combination of liquid or water carrying waste removed from residents, institutions, commercial and industrial establishment, together with such ground water, surface water, and storm water as may be present.

As understanding of the nature of sewage is essential in the design and operation of collection, treatment, and disposal facilities and in engineering management of environmental quality, Metcalf observed that sewage characterization studies are conducted to determine:

- i. The physical, chemical and biological parameters.
- ii. The concentration of constituents in the wastewater.
- iii. The best means of reducing the pollutants concentration.

The characteristics of sewage are broadly classified into physical, chemical and biological according to the type of measurement test that has to be performed.(Stirlon R. 1971).

2.3 ENVIRONMENTAL POLLUTION AND PROTECTION

In the dictionary, pollution is defined as something that makes the water physically impure, foul or filthy, dirty, stained, tailed or defiled. Bridguster, R. defined environmental pollution as the presence of toxic substances naturally or due to man's activities, in the environment at a level where acute toxic effect can be recognized. These toxic substances do not only stony in the environment but are transferred directly or indirectly into the body of man.

Environmental pollution is on the increase due to the increase in population, urbanization and industrialization. (Metcalf et al. 1991). The degree with Sawaragi et al 1997 who said that the degree of environmental pollution which a society has to accept is still primarily dependent of the prevailing economic climate, and lack of scientific and engineering ability to solve the problem.

Regardless of its sources pollution, arises as a result of wastage and inefficiency and much of today's pollution is caused by economic constraints. (Metcalf and Eddy 1991). The degree with sewaragi Y and

Akashi 1997) who said that the degree of environmental pollution which a society has to accept is still primarily dependent of the prevailing economic climate, and lack of scientific and engineering ability to solve the problem.

Environmental pollution is classified according to the source from which the pollutants are present. Hence, based on the phase of existence, pollution can be classified into three:

- i. Water pollution
- ii. Air pollution
- iii. Land pollution

2.3.1 WATER POLLUTION

Numerous sources of pollution may adversely affect water quality. In modern industrial society much refuse is run into lakes, an action, which produces a syndrome of effect that we call pollution. (Sawaragi et al 1997).

The importance of sewage as a vehicle for the spread of diseases has long been recognised and there have been numerous publication and article describing human health in relation to water and sanitation.

Pickford determined the various concentrations of trace elements in four different fish species turning in five different wastewater. Results obtained showed that the concentration of the metal on the fish were high enough to warrant further detailed study as far as human health is concerned.

Under the topic "drinking water quality" of reference written by Batstone, he confirmed that bacterial and viral diarrheas and epidemics of cholera typhoid are frequently transmitted primarily via drinking water, thus making the quality of drinking water a conical factor.

Mara, suggested that the control of microbial and biological contamination inevitably take the dominant role in any rural water supply programme. Chemical contaminant are not normally associated with acute effect and thus of lower priority than microbial contaminant, the effect of which can be immediate and drastic. He also said that there are three main types of intervention employed to safeguard drinking water quality:

- i. the protection of water resources from direct fecal contamination and from secondary pollution caused by leaching from pit latrines, septic tanks, cesspool, etc.
- ii. the treatment of source of water prior to supply is an obvious fail back position where protection measures have failed.
- iii. Health education is a mandatory companion to any technology-based intervention, if only to guarantee proper use and maintenance of the facilities.

Beecroft, G.A. in his lecture suggested some preventive control-measure against water pollution in developing countries as follows:

- a. **Simultaneous planning:** water supply and wastewater disposal projects in development programmes should be designed, constructed and maintained simultaneously.
- b. **Waste water disposal:** disposal of wastewater's should be carried out, as far as possible, by means of agricultural irrigation.
- c. **Legislation in preparation** for drafting and implementing water pollution control legislation should start as soon as possible.
- d. **River Basin authorities:** preparation for establishing river basin authorities should start as soon as possible.
- e. **Professional training:** training facilities for educating Environmental Health Engineers should be provided in existing and newly planned universities or selected national should be sent abroad for training.
- f. **Sub-professional Training:** Medical officers and senior health inspectors serving in town planning communities as representative of the health authorities should be trained in diagnosing the assessing possible effect caused by water pollution, and in applying the existing public health laws as a means of control.
- g. **Information:** owners and promoters of newly proposed industries should be informed at the time of proposing new industrial projects of the possible industrial waste water hazards and the additional financial costs involved in solving the expects waste water disposal problems. This information should be recorded in writing.

2.4 WASTE WATER TREATMENT

Worldwide, there is no shortage of water, but too often it is in the wrong place at the wrong time; and often of the wrong quality.

Bridguster and Mumford define waste as a material that is considered by the producer to have no value. The term scrap, residues, by-products, effluents, is terms used synonymously with waste but they have deferent meaning according to the originating industry.

The main objective of all terms of wastewater treatment is the production of an effluent suitable either for disposal into the environment, or for some form of re-use (Metcalf and Eddy 1991). If treated, waste water is allowed to accumulate the decomposition of the organic materials it contains can lead to the production of large quantities of malodorous gases.

In addition, untreated water supply contain numerous pathogenic or diseases causing micro-organism that dwell in the human intestines or toxic chemicals that may be present in industrial waste. All these are contaminant that will adversely affect the public health (Sawaragi, et al 1997).

Therefore, the treatment of wastewater is an essential service if the best use is to be made of water. Mara, observed that the extent to which the wastewater should be treated and the methods to be used can be determined only after many factors such as political, social, natural and economic are taken into consideration.

2.5 TREATMENT METHODS

The contaminants in wastewater are removed by physical, chemical and biological means. The individual methods usually are classified as physical unit operations, chemical unit operation and biological unit operations or processes.

Conventionally, wastewater treatment processes are classified as primary, secondary and tertiary treatment.

- i. Pre and primary treatment involve physical unit operations.
- ii. Secondary treatment involves physical and chemical unit operations.
- iii. Tertiary treatment include physical, chemical and biological unit operations.

2.5.1 PHYSICAL UNIT OPERATION

Treatment methods in which the application of physical forces predominates are known as physical unit operation or unit processes. Because most of these methods evolve directly from man's first observation of nature (Metcalf et al 1991), they were the first to be used for treatment. Some typical unit operations include the following:

Screening: This is the method used to remove solid found in wastewater with the aid of devices have a uniform opening usually called screen.

Mixing: Mixing is an important unit operation in many phases of wastewater treatment where one substance must be completely intermingle with another.

Flocculation: An essential part of any chemically acidic precipitation system is stirring or agitation to increase the chance or opportunity for particles contact after chemical have been added.

Sedimentation: Gambo, (1992) reported that the objective of primary sedimentation is to take load off biological treatment unit by removing most of the settle-able and floating solids, but the degree of treatment must be considered in relation to the subsequent treatment stage for an overall least-cost result.

Floatation: This is the unit operation used to separate solid or liquid particles from a liquid phase. Introducing fine gas(usually air) bubbles into the liquid phase brings about the separation.(Holshoft et al 1986).

Filtration: Is the process of removing suspended and collided particles from water by passage through porous media.

The main objective of filtration and super-filtration methods such as reverse osmosis is to stop pollution and to find a remedy for the lack of water in many countries throughout the world.

2.5.2 CHEMICAL UNIT PROCESSES

Treatment methods in which the removal or conversion of contaminants is brought about by the addition of chemical or by other chemical reactions are known as chemical unit processes. Some of the operations involved are briefly described below.

Precipitation And Coagulation

In chemical precipitation treatment is accompanied by producing a chemical precipitation that will settle. This is achieved by coagulation.

Gas Transfer

It is a process by which gas is transferred from one phase to another usually from the gaseous to the liquid phase. It is applied in the transfer of oxygen in the biological treatment of wastewater and also in one of the processes of removing nitrogen compounds from wastewater.

Adsorption

Adsorption is the removal of specific compounds (which are accumulated between two places) from the wastewater in the solid surfaces using the forces of attraction between bodies.

Disaffection

This refers to the selective destruction of disease causing organisms. The mechanism for detection depends on the nature of the disinfectant used and the micro-organism. The common disinfectants used are chlorine and its compounds and ozone.

2.5.3 BIOLOGICAL UNIT PROCESSES

Treatment methods in which the removal of contaminant is brought about by biological activities are known as biological unit processes. Biological treatment is used primarily to remove the biodegradable organic substance (colloidal or dissolved) in wastewater. Among the biological processes are the mass transfer and aeration operations.

Mass Treatment

In order to carry out biological reactions, it is necessary to transfer substances into or out of the wastewater as well to move them adequately within the water to control concentration differences. The rate at which these substances are transferred is the important consideration and is the primary concern of the field of mass transfer (Metcalf et al 1991).

Aeration

This is similar to the gas transfer already described. It involved the use of mechanical aerators to supply abundant oxygen to the wastewater for effective aerobic operations.

2.6 SEWAGE EFFLUENT DISPOSAL AND RE-USE

The fundamental thesis governing the disposal of effluents and the regulation of pollution is to make the treatment plants do part of the work and to let nature complete it.

There are broadly for methods of disposing of sewage. It can be dumped at sea liquid, dumped in landfill tips as solids or liquid recycled to land for beneficial use as a solid or liquid or it can be incinerated.

Dilution in receiving waters

This is, by far, the most common method and it involve discharging of the wastewater into body of water e.g. lakes, streams and rivers. Type of receiving water and effluent standards are used as a regulatory to quantity and quality of river water must be considered with seven Pont's in mind.

- a. A sufficient level of dissolved oxygen to avoid the development of anaerobic conditions.
- b. Freedom from organic matter, which encourage the production of sewage fungus.
- c. Lack of turbidity to form substantial sludge deposits.
- d. Freedom from oils, grease, etc.
- e. Toxic substances not to be sufficient to affect the fish life or the self-purification of the river.

- f. Freedom from unwanted and unnatural discoloration.
- g. Temperature increase should best be excessive.

Once the criteria necessary for the protection of the various beneficial uses have been established, it is possible to set standard for surface water with the stipulation that no discharge shall create conditions that violate them.

Land Application

Land application of wastes provides relatively low cost but very high treatment thus allowing a fixed amount of resources to achieve a greater level of public health and environmental protection (Metcalf et al 1991).

Land application is agriculturally based, hence is more amenable to a broader variety of sites. There is limitation, however, to the use of wastewater for agricultural purposes.

The type of crops to be irrigated with reclaimed sewage depends on the quality of the effluent, the amount of effluent used, and the health regulation concerning the use of treated and untreated wastewater on crops.

The use of untreated water is generally discouraged. Furthermore, field crop like carrot, garden eggs, tomatoes, etc that are normally consumed in a raw state cannot be irrigated with wastewater of any kind(treated or untreated) (Batstone et al 1989).

The effluent could also be dewatered, dry and compact and buried into the ground as landfills.

Recycling and Recovery

The water coming from a biological plant, however, efficient this may be, cannot be re-used as it is, because it contains a high organic load and pathogenic organisms which makes it dangerous even for irrigation as crops and fruits would be contaminated.

Some form of treatment is always required to reduce the health risks due to pathogens to an acceptable economic minimum. The only exception to this is biogas production, but if the digested sludge from the biogas generator is to be re-used on the land, additional treatment is necessary, (Bridgustol et al 1979). The renovated water can be used directly for municipal, industrial, agricultural, recreational and ground water recharge. The sludge, after de-watering and drying can be used as manure for landfill or incinerated.

2.7 THE ABUJA ENVIRONMENTAL PROTECTION BOARD

This is the Agency responsible in keeping Abuja Clean, among the various functions of the Boards we are however concerned with the Waste Management Department of (AEPB) which has relevance to this work.

The Department of Waste Management of AEPB is made up of two Departments namely:

1. The Solid Waste
 2. The Liquid Waste
- a. **Solid Waste:** It is obvious that for long immemorial burial of solid wastes has always been easy particularly in the moral areas. In larger cities as Abuja is gradually turning more difficult and advanced. This is because disposal has become more Problematic as Population density is increasing. Simultaneously, there is a greater Production of Waste per Unit area and a decreased Proportion of Land available for its disposal.

TYPES OF SOLID WASTE

The types of Solid wastes as is presently collected in the city of Abuja Are categorized as follows:

a. **Residential or Domestic Waste**

These are wastes generated as a result of human activities within residential Districts in the city. The composition of residential waste may vary considerably in different communities and climates. The quantity of residential solid waste in a city varies with the season of the year, wastes generated such as flower trimmings, clean up campaigns as presently been experienced due to activities of open space management of the board are all seasonal in their generation, and are expected to be more during the raining seasons than during the dry seasons.

Commercial Wastes

The aggregate composition of commercial Solid Waste is similar to that of residential Waste but individual generation point tend to produce a more homogenous waste stream. That is Restaurants obviously generate more food and related packaging waste and markets produce some food and mostly paper or cartons wastes. The amount of solid waste generated per collection unit is much higher for a commercial solid waste source than for a Residential Solid waste source, as a result collection vehicles in commercial area full up more rapidly than in Residential areas.

Construction Wastes

These are Solid wastes resulting from Demolition and construction activities. These include stones, broken concrete, asphalt, pipes, and steel materials. On the average, Abuja Environmental Protection Board has to contend with Abuja City, as it is the place where a major construction activity is presently going on.

Bulky Wastes

Bulky Wastes includes trees, bushes, abandoned automobiles and auto parts, tyres, refrigerators or other large appliances, furniture, crates, mattresses, usually, conventional collection vehicles are not able to pick up such materials open trucks or tow trucks are usually used.

Disposal Of Solid Wastes

Disposal of solid wastes collected as is presently been practiced in FCT is disposed of at the land fill sites located somewhere behind Karimu village and around the outer northern express way both in FCT.

Liquid Waste (Sewage)

This is one of the functions of the liquid wastes Department of AEPB, which relates much to this study. It is the management and maintenance of sewer network in the city. Abuja the new Federal Capital City of Nigeria is designed to compare to every other modern city in the world. The sewage network is made up of two components:

1. The storm sewer Network
2. The foul sewer Network.

The Storm Sewer Network

The functions of the storm sewers in the city is basically to serve as collector of run off from open space including the roads network in the valleys which Abuja is abundantly blessed with. These collector networks are presently of two types in the city (1.) We have the open drainage otherwise known as gutters in Garki I and Wuse I Districts and (2.) The other type consists of network of buried conducts. These are found in the

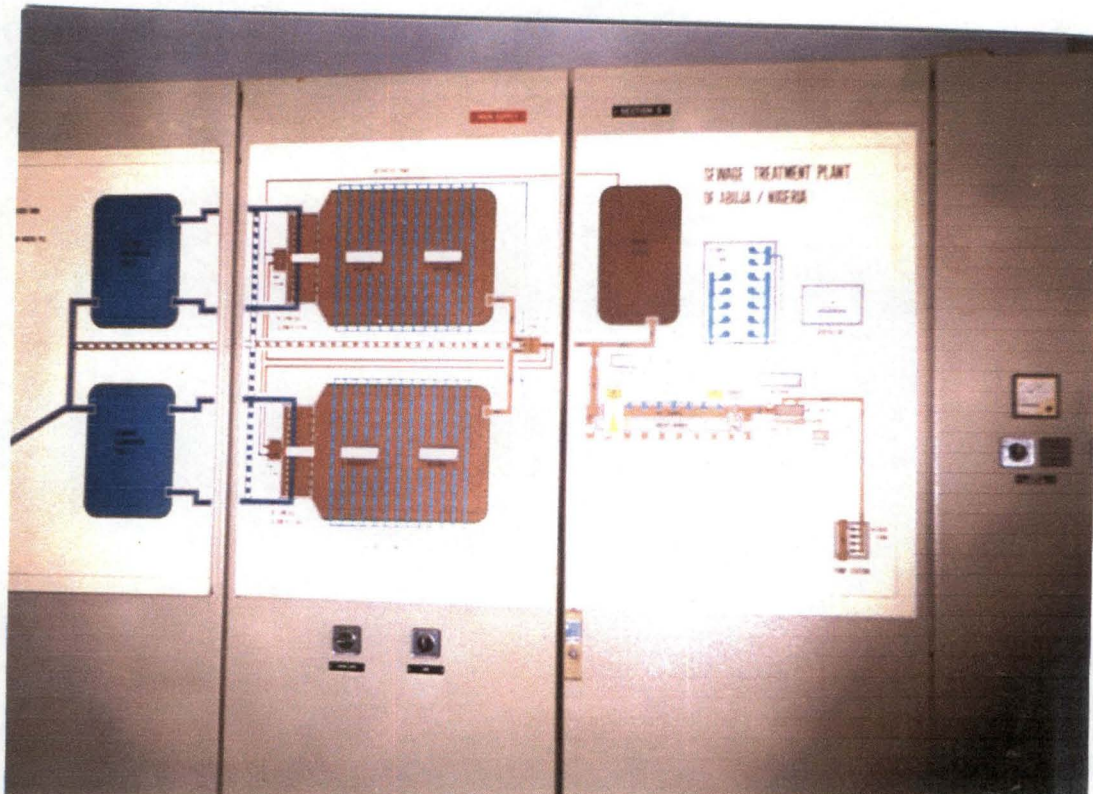
other district of Maitama, Asokoro, Wuse II and Garki II. They 60th serve the same purpose of collecting storm water. The only difference is that one is open drainage and the other is buried conduct. The open drainage as far as maintenance is concerned is more problematic to maintain. This is because by their nature they are subject to abuses by residents and numerous traders in most streets in Abuja. Refuse are often dumped at will hence the regular maintenance work are often carryout.

Foul Sewer Network

Wastewater is used water generated by human activities from toilets (black water), kitchen, bath and washing (gray water). Wastewater was preciously disposed on site as still observed in most cities today as in pit latrines or septic tank/soakaway. In the pit latrine of septic tank system, solid accumulates and biodegrades in the pit while the liquid infiltrate into the soil. This solution to waste management is considered not appropriate due to (a) lack of space (b) pollution of underground water which serves as source of water for some people.

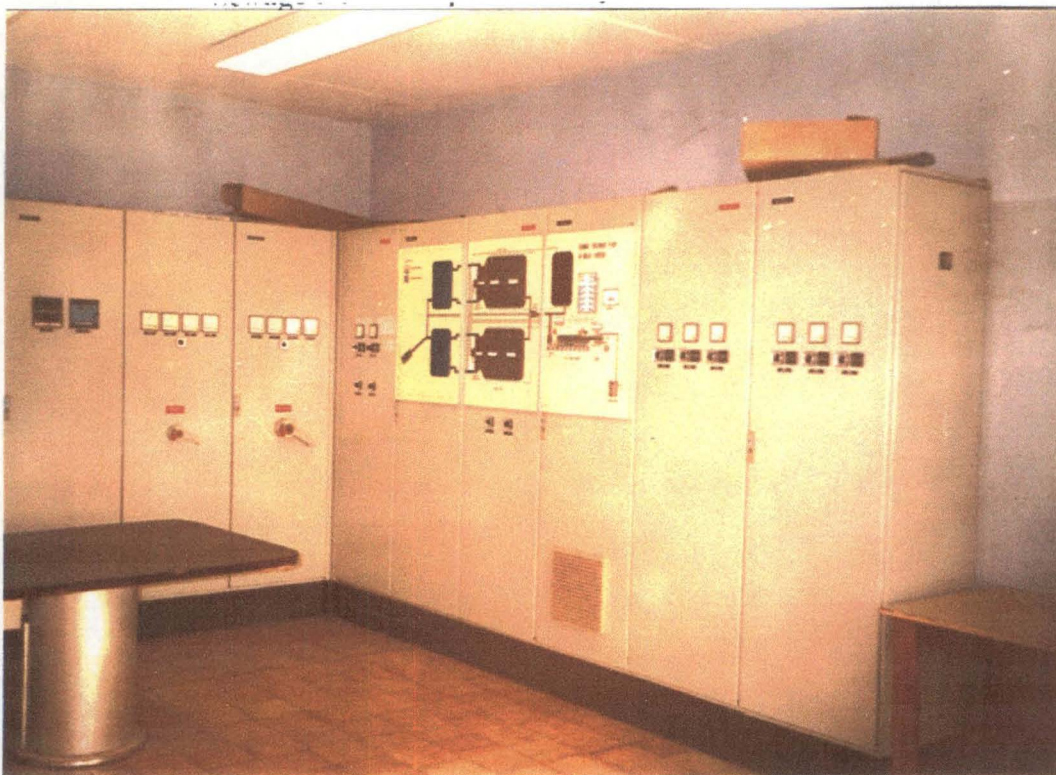
(c) Increasing specific water consumption, which exceed infiltration capacity of soil etc.

Here in Abuja, wastewater is transferred via tertiary, secondary sewerlines to collectors lines or interceptor sewerlines and finally to the Aerator e.g the one in Abacha Barrack or the treatment plant presently at wuya lagoon close to Julius Berger Yard.



PHOTOGRAPH I

Sewage treatment plant at Wuye, Abuja



PHOTOGRAPH II

Sewage treatment plant



PHOTOGRAPH III

Blower, the premises of treatment plant where Oxygen is used for Oxidation



PHOTOGRAPH IV

The Aerator and the out-let of treatment sewage to various ponds



PHOTOGRAPH V
Sewage from the Aerator to the various ponds



PHOTOGRAPH VI
Pond I



PHOTOGRAPH VII

Collected Sewage from Various Neighborhood of the Study Areas.
(Pond II)



PHOTOGRAPH VIII
(Pond III)



PHOTOGRAPH 1X
Outlet of Treated Sewage into Wuye River



PHOTOGRAPH X
The Flowing Wuye River



PHOTOGRAPH X1.
Sludge of Sewage After Disposal in Wuye River
(Pond IV)

CHAPTER THREE

3.0 METHODOLOGY OF STUDY

In this chapter, we are going to deal with the following:

1. Research Method
2. Population
3. Research Instrument
4. Procedures for data collection
5. Method of data Analysis

3.1 RESEARCH METHOD

Here descriptive survey of research method was used. Best and Jacobs 1981 said to obtain information concerning the current status or phenomena descriptive survey should be used. This is because they are directed towards determining the nature of a situation as it exists at the time of the study. It was asserted that descriptive design method is often used in this type of research as it described, interprets and is concerned with condition or relationship that exist, opinions and samples that are held, processes that are going on, effect that are evident or trend that are developing.

Therefore the descriptive design method selected for this study allowed for indept study of the situation prevailing in the management of sewage and those inadequacies at AEPB and the wuye Sewage Treatment Plant, Abuja

3.2 PROCEDURE FOR DATA COLLECTION

The aim was to provide further details or sources of information used in this study. Both the primary and secondary sources were used in the collection of data for his study.

3.2.1 SECONDARY DATA

Before the collection of primary data, available sources of information about the study was collected mainly from thesis, dissertations, books, reports, journals, seminar papers and other published and unpublished materials on environmental and problems of sewage management and disposal.

3.2.2 PRIMARY DATA

Volunteered research assistants distributed the structure questionnaires to various respondents in their locations. The administration of the questionnaires forms was carried out by these research assistants

especially those for stakeholders sewage treatment [plants and the sanitary inspectors of public health department (AEPB) wait and collect on the spot was not practicable but most respondents tried to meet up the scheduled arrangement for the collection.

A total of 130 questionnaires forms were distributed with 31 copies to agencies responsible for sewage management and 99 copies for stakeholders.

This was achieved through the research assistants and the researcher himself.

Only 20 usable questionnaires was successfully returned from the agencies, while 82 copies were returned from the stakeholders and these were used for the analysis.

3.3 RESEARCH INSTRUMENT

The research instrument used for his study was self developed structured questionnaires. Likert attitudinal rating scale of "Yes" and "No" format was used. The respondents reacted to each item on the questionnaires by ticking (✓) from the alternatives given to each question item. This format was employed because it does not give room for wider scope and against the essay structured type, given the maximum amount of freedom in responding which makes the scoring a choice.

3.3.1 POPULATION

The target population for this study was made up of two parts. The staff of the Agencies/Departments responsible for sewage collection, treatment and disposal and the end beneficiaries (i.e. stakeholders).

The agencies comprise of AEPB with staff strength of 403, FCDA engineering department (102), FCDA Health Department (87) and Abuja Municipal Area Council (AMAC) (45). 5% of the total staff strength of each body was considered for the questionnaire. Only 20 staff responded and returned their questionnaire out of 31 questionnaire allocated. In addition, a population of 120 blocks each at Garki 1 and Wuse 1 and 50 blocks each at Maitama, Asokoro and Central area were equally sampled and examined. This cover 68% for residential purposes, 32% for other uses such as offices, Hotels, Restaurants, Banks, Shopping Complexes etc. The 120 premises which was viewed for Garki 1 and Wuse 1 became necessary in view of their multiple congestion problems and drainage system.

The total population of each area from which sample were selected are sub-divide into three parts. Garki 1 and Wuse 1 has 33 premises each while Maitama, Asokoro and Central area consists pf 11 premises each, totaling 99 premises sampled.

3.4 DATA ANALYSIS

The completed questionnaire forms the respondents were collected, coded and analyzed. The descriptive statistics of percentages were used to analysis the data.

Table 3.1 Agencies Responsible For Sewage Management, Treatment And Disposal

The table below present information of the respondents according to staff strength of the respective Departments/Agency within the MFCT administration. 5% of the total staff from each department or Agency were consider for the questionnaire distributed

Agency/Dept	Staff Strength	% Considered	No. Allocated	No. Returned	Percentage
AEBP	403	5%	20	14	70%
FCDA Engr. Dept.	102	"	5	3	15%
FCDA HEALTH Dept	87	"	4	2	10%
AMAC	45	"	2	1	5%
TOTAL			31	20	100%

Source, Field Survey, December 2001

**Table 3.2 The Total Number Of Questionnaire Administered
Throughout The Exercise**

S/N	Questionnaire Forms	Agencies	Garki 1	Wuse1	Maitama	Asokoro	Central Area	Total	Percentage
1	Total No. Adm.	31	33	33	11	11	11	130	100%
2	Total No. Returned	20	30	30	8	9	5	102	78.4%
3	Total No. Not Returned	11	3	3	3	2	6	28	21.5%

Source: Field survey, December 2001.

CHAPTER FOUR

RESULT AND DISCUSSION OF FINDINGS

4.0 DATA PRESENTATION AND ANALYSIS

The general result obtained from the analyzed data collected on sewage management, treatment and disposal in some parts of the federal capital city namely Garki I, Wuse I, Maitama, Asokoro and Central Area are carefully presented in statistical manner.

This enable the researcher evaluates logically for better understanding and for ease of interpretation and comparism to other area. This descriptive method of data presentation allows the researcher reached a conclusion concerning sewage management and its related activities based on sampled premises in the project area.

Table 4.1 Administration Of Questionnaire

Questionnaire	Number	Percentage
Total Number Administration	130	100%
Total Number Returned	102	78.4%
Total Number Not Returned	28	21.5%

Source: Field survey, December 2001

Table 4.2 This table is in response to the question on what sewage really mean?

S/N	Definitions	Agencies	Garki I	Wuse I	Maitama	Asokoro	Central Area	Total	%
1.	Sewage is the liquid waste or waste water	20	25	23	7	8	4	87	85.2%
2.	Sewage to the combination of both solid and liquid waste	-	3	4	1	1	1	10	9.8%
3.	Sewage is the solid waste only	-	2	3	-	-	-	5	4.9%
	TOTAL	20	30	30	8	9	5	102	100%

Source: Field Survey December, 2001

The above table shows that the inhabitant of all the study area except the central area that returned only five (5) questionnaire have about 72% knowledge of what sewage entails. This is evident from the fact that 87 respondents aware of what sewage is all about. 10 respondents representing 9.8% believes that sewage is a combination of both solid and liquid wastes, while 5 respondents representing 4.9% held the opinion that sewage is a solid waste. Garki and Wuse Area which has 83.3% and 76.6% respectively shows that the residents have adequate knowledge on sewage generally.

Table 4.3 Sewage Collection Method

This table analyzed the various method adopted by the Agencies for the sewage collection in response question 2 of the questionnaire.

S/N	Method of Sewage collection.	Agencies	Garki I	Wuse I	Maitama	Asokoro	Central Area	Total	Percentage
1.	Sewage collection through sewerlines	8	-	-	6	7	4	25	24.5%
2.	Direct Emptying by truck	12	30	30	2	2	1	77	75.4%
3.	Direct Human Emptying	-	-	-	-	-	-	-	-%
4	Others	-	-	-	-	-	-	102	100%
	TOTAL	20	30	30	8	9	5	102	100%

Source: Field survey December, 2001

This table shows that collection of sewage in Garki I and Wuse I is 100% done by using truck as against the use of sewerlines as applicable in Maitama, Asokoro and the Central Area. This goes to say that sewerlines which is being adopted is both Maitama, Asokoro and Central Area contributed for the hygenic condition of the areas thereby exposing other parts to offensive odours during evacuation and few days after in addition the soakaways serves as homes for mosquitoes and flies which consequently aided in spread of diseases as malaria, typhoid, and diarrhea.

Table 4.4 Machineries Responsible For The Collection Of Sewage

This table explains the various agencies that does the sewage collection.

S/N	Definitions	Agencies	Garki I	Wuse I	Maitama	Asokoro	Central Area	Total	Percentage
1.	AEPB	15	28	26	7	7	4	87	85%
2.	FCDA Engineering Dept	2	1	2	-	1	1	7	6.8%
3.	Health Dept FCDA	1	-	-	1	1	-	3	2.9%
4.	AMAC	2	1	2	-	-	-	5	4.9%
	TOTAL	20	30	30	8	9	5	102	100%

Source: Field survey December, 2001

The above tale shows that "Abuja" Environment protection Board is the single largest Agency responsible in sewage collection, and disposal. 85% representing 87 respondents indicate clearly that AEPB has upper hand in keeping Abuja Clean; 7 respondents has 6.8% while 3 respondents has 2.9% and 5 respondents 4.9%.

Table 4.5 Available Sewage Treatment Plants In Fcc Of Abuja

S/N	Treatment Plant	Agencies	Garki I	Wuse I	Maitama	Asokoro	Central Area	Total	Percentage
1.	Wuye sewage Treatment plant	20	26	18	4	-	2	70	68.6%
2	Others	-	4	12	4	9	3	32	31.3%
	TOTAL	20	30	30	8	9	5	102	100%

Source: Field survey December, 2001

This table confirmed that there is only one treatment plant in Abuja “wuye Sewage treatment plant”. The whole of the Agencies which represents 100% indicate that wuye treatment plant is the only sewage treatment plant. 70 respondents representing 68.6% are aware of wuye sewage treatment plants as the only plant available 31.% of the respondents don’t even know what is all about sewage treatment plant. It was further confirmed that FCDA Engineering department is the only one responsible for management of the treatment plant.

**Table 4.6 Diseases Related To Improper Sewage Disposal Experience
In Fcc**

S/N	Diseases	Agencies	Garki I	Wuse I	Maitama	Asokoro	Central Area	Total	Percentage
1.	Typhoid	8	20	18	6	7	3	62	60.7%
2.	Para typhoid	5	5	10	1	1	-	22	21.5%
3.	Cholera	3	-	-	-	-	-	3	2.9%
4.	Others	4	5	2	4	1	2	15	14.7%
	TOTAL	20	30	30	8	9	5	102	100%

Source: Field survey December, 2001

From the table it is obvious therefore that Almost all the study areas are expose to Typhoid Fever, Particularly Garki I and Wuse I. This is to show that sewage management and disposal techniques is not effective and hence require advance technology to curb with the challenges of increase in population in the years ahead. 62 responsible representing 60.7% attested that improper. Sewage disposal is responsible for increasing number of victims affected with typhoid fever in the city of Abuja particularly in Garki I and Wuse I.

Table 4.7 This Table High Lights On The Period Of Services Which Sewage Are Collected From The House Hold Soakaways.

S/N		Agencies	Garki I	Wuse I	Maitama	Asokoro	Central Area	Total	Percentage
1	Monthly	-	-	-	-	-	-	-	
2	Quarterly (3 monthly)	-	-	-	5	7	5	17	16.6%
3	Half Yearly	15	-	3	3	1	-	27	21.5%
4	Annually	3	27	23	-	1	-	54	52.9
5	Others	2	3	4	-	-	-	9	8.8%
		20	30	30	8	9	5	102	100%

Source: Field Survey December, 2001

The above tables present a detail on in efficient management system on Sewage disposal. 54 Respondents representing 52.9% confirmed that most of Soakaways are often emptied annually. While 22 respondents representing 21.50% indicated that sewage collection is done on every six months interval. While 17 respondents representing 16.6% attested that the collection is on Quarterly basis. This explains how ineffective are the AEPB and the need to Reinforce the agency to review their service interval to at least every 3-months.

**Table 4.8 Problems Associated With Improper Sewage Management
And Disposal**

S/N	Needs	Agencies	Garki I	Wuse I	Maitama	Asokoro	Central Area	Total	Percentage
1	Lack of facilities	13	23	21	4	4	3	68	66.6%
2	Poor Funding	6	3	8	2	3	2	24	23.5%
3	Lack of qualified Personnel	1	2	1	1	2	-	7	6.8%
4	Others	-	2	-	1	-	-	3	2.9%
		20	30	30	8	9	5	102	100%

Source: Field survey December, 2001

The above table reveals that 68 out of 102 respondents that is representing 66.6% indicate that the problem associated with improper sewage management and disposal is lack of facilities and Equipment at their disposal while poor funding takes 23.5% representing 24 respondents. Those stands for lack of qualified staff are 7 (6.8%) while others that do not know what answer to give represent 2.9%.

4.9 DISCUSSION AND IMPLICATION OF RESULT

From the tables presented and the data analyzed and its subsequent disposal in the FCC of the New Federal Capital Territory is far from being satisfactory despite all initial plan by Government as incorporated in the master plan. Most of the facilities presently is almost grid to a halt as a result of excessive influx of people from within and outside the country.

This inadequacies of personnel and equipment prone the city into hazardous condition in addition limited number of conveniences e.g. toilets, bathrooms available to the users, open drains of waste water became obvious and the disposal interval grossly inadequate. Thee entire Area of study was divided into Two main parts. Part I comprise of Garki I and Wuse I while part II consists of Maitama, Asokoro and the Central Area. Which makes comparison easier concerning the sanitary condition of the respective area and how overcrowded population over stressed the existing toilet facilities in places like Garki I and Wuse I. Thereby exposing the vicinity to the risk of environmental diseases. The prime cause of this is associated with scarcity of residential accommodation to take care of the daily influx migrant into the New Federal Capital City.

The implication of this ineffective and inefficient management of sewage, treatment and disposal is that some areas where physical inspection were conducted revealed that soakaway slabs are broken while some had

major leakages thereby exposes the feaces to the environment. This was discovered in Garki, Area 1 section one. The situation was an eye-saw requiring an urgent intervention. The irregular disposal intervals of sewage left nothing to be desired and the method of using truck for collection exposes the environments.

CHAPTER FIVE

5.1 SUMMARY OF FINDING; CONCLUSION AND RECOMMENDATION

Throughout this work effort was geared towards achieving an indept studies on the existing practice in relation to the sewage management and disposal. It was however observed that the result of what is operational as regards sewage management, treatment and disposal in addition to environmental awareness is far from being satisfactory. Garki I and Wuse I which make up 60% of the city is over congested, Poor/open drainage system, dilapidated soakaway pits thereby exposing the vicinity to unpleasant and polluted environment which has negative effect on the occupants health condition.

5.1 CONCLUSION

Considering the high rate of urbanization as Abuja has gradually turn to be, it was emphasized that government should imply appropriate measures through re-enforcement of the existing Agencies and departments to guarantee a hitch free sanitary environment and to enact appropriate legislation towards protecting the entire city from the menace of health problems.

Additional trucks and sewage treatment plants be procure and established for effective management, treatment and disposal of environmental sewage.

5.2 RECOMMENDATIONS

Based on the general conclusion arrived at, the following recommendations are made which if properly implemented, would go a long way in minimizing the effect on sewage discharges on the environment.

- i. there is need to construct more sewage treatment plants and provide for the utilization and disposal facilities.
- ii. There is need to employ capable hands and introduce efficient method of treatment because of growing in complexity of sewage, which require advance technology.
- iii. Government should as a matter of fact provide for proper funding of sewage policy and sewage management programme's as well as to ensure regular and un-interrupted supply of electricity and oxygen to the treatment plant.
- iv. For any industry to be cited in industrial area of FCT, the public needs to know the danger associated with the industrial wastewater and the necessity to prevent the pollution of our environment.

- v. There is need for more research work to be carryout. This is necessary in order to arrive at a coincide and ^{for the} failure conclusion regarding the effects of these wastes on the health and environment.

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APPENDIX I

DEPARTMENT OF GEOGRAPHY
SCHOOL OF SCIENCE AND SCIENCE EDUCATION
FEDERAL UNIVERSITY OF TECHNOLOGY
MINNA, NIGER STATE

QUESTIONNAIRE FORMS

This questionnaire is designed to assist in obtaining information for research work on "SEWAGE MANAGEMENT IN THE NEW FEDERAL CAPITAL TERRITORY ABUJA",

The only option available is to appropriately please

1. Location /Residential Address _____

PART A: FOR GOVERNMENT OFFICES

DATE: _____

1. What is Sewage?

- (i) Sewage is liquid water or wastewater
- (ii) It is the combination of both liquid and solid
- (iii) It is the solid waste only

2. How is sewage collected?

- (i) Through Sewer lines
- (ii) Direct emptying with trucks
- (iii) Direct human emptying
- (iv) Others Specify _____

3. What are the Various Agency responsible for the collection of Sewage?

- (i) Abuja Environmental Protection Board
- (ii) FCDA Engineering Department
- (iii) FCDA Health Department
- (iv) Municipal Area Council
- (v) All of the Above
- (vi) Others Specify _____

4. How many Sewage treatment plant available within FCT?

- (I) One
- (ii) Two
- (iii) Three and above

5. Please give me the names and location of the treatment Plants _____

6. What is the nature of sewage collection from the FCC?

- (i) Only liquid waste (Wastewater)

- (ii) Combined (Solid and liquid)
- (iii) Others Specify _____
7. From the available treatment Plants enumerated what is the capacity of each?
- (i) From one 50,000 population capacity
- (ii) From 50,000 to 100,000 population
- (iii) From one million and above
- (iv) Others Specify _____
8. Since the creation of the FCT and when the physical development commenced what are the noticeable environmental hazards associated with improper Sewage disposal if any.
- (i) Typhoid
- (ii) Para-typhoid
- (iii) Cholera
- (iv) Others Specify _____
9. Please what are the problems associated with Sewage management, disposal and treatment?
- (i) Lack of facility
- (ii) Poor finding
- (iii) Lack of qualified personnel
- (iv) Others specify _____
10. Suggest any possible ways that could assist in preventing the identified problems.
- (i) Employment of capable hand /Adequate funding
- (ii) Establishment of more treatment plants
- (iii) Households responsibilities
- (iv) Enactment of laws and ensure its enforcement
- (v) Others Specify _____

PART B: TO PRIVATE INDIVIDUALS (STAKEHOLDERS)

1 TYPE OF HOUSE/BUILDING

- (i) Flat
- (ii) High Rise
- (iii) Duplex
- (iv) Others Specify _____

2. How many rooms available/flat

- (i) One room
- (ii) Two Rooms

- (iii) Three Rooms
- (iv) Other specify _____
3. How many toilets facilities provided?
- (i) One
- (ii) Two
- (iii) Three to five
- (iv) Other Specify _____
4. How many people per flat/Room
- (i) One
- (ii) Two
- (iii) Three to Five
- (iv) Other Specify _____
5. Types of toilet facilities?
- (i) Pit
- (ii) N.C
- (iii) Other Specify _____
6. Types of Anal cleaning materials?
- (i) Water
- (ii) Tissue
- (iii) Hand paper
- (iv) Other specify _____
7. Type of Bath Room
- (i) In built
- (ii) Isolated
- (iii) Others specify _____
8. How Many Bath Rooms?
- (i) One
- (ii) Two
- (iii) Others Specify _____
9. Is Kitchen facilities Provided?
- (i) Yes
- (ii) No
10. If Yes, How many _____
11. Nature of kitchen facility
- (i) Sink facility

(ii) Without Sink

(iii) Others Specify _____

12. Source of water available?

(I) Pipe Borne water

(ii) Well

(iii) Motorised Borchole

(iv) Others Specify _____

13. How Regular is your water supply?

(I) Constant daily supply

(ii) Occasional with an Interval of one or Two day

(iii) Weekly supply

(iv) Others Specify _____

14. Do you agree with the existing practice of Sewage management, disposal and treatment in FCT?

(i) Yes

(ii) No

15. If Yes, is the system

(i) Effective

(ii) Not effective

(iii) Needs Improvement

(iv) Others Specify _____

16. How often dose your Sewage disposed off?

(i) Monthly

(ii) Quarterly of (3) or (4) months

(iii) Half yearly

(iv) Annually

(v) Other Specify _____

17. Dose such disposal suit your comfort and convenience?

(i) Yes

(ii) No

18. Who does the Service of your Sewage Collection and disposal

(I) AEFPB

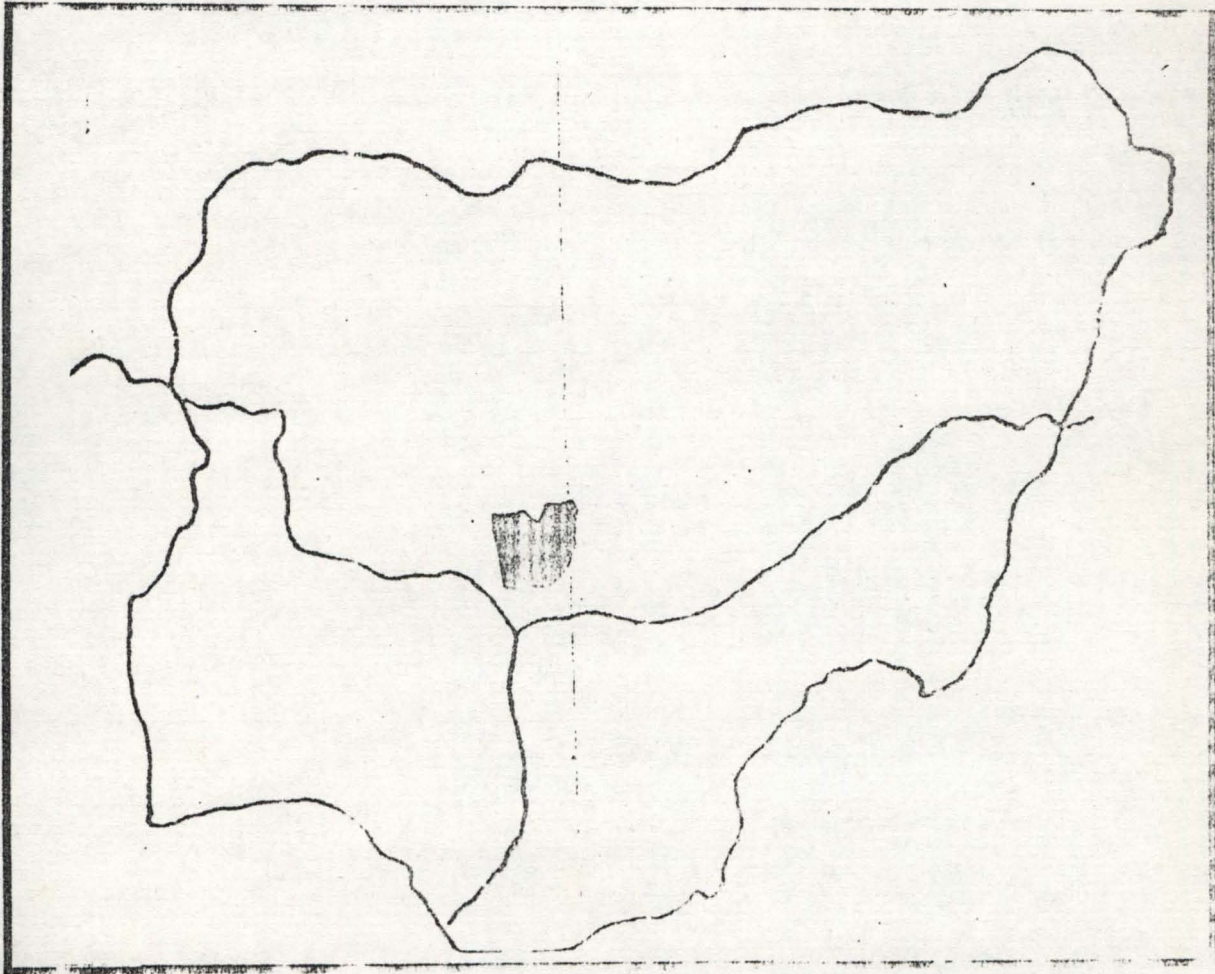
(ii) FCDA Engineering Dept

(ii) Health Organisation

(iv) Others Specify _____

THANK YOU VERY MUCH

APPENDIX II



MAP OF NIGERIA SHOWING ABUJA