POOR DRAINAGE SYSTEM IN BWARI AREA COUNCIL (FCT)

(A Case Study of Bwari and Its Environment)

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Research Project Submitted to Federal University of Technology, Minna, Niger State, In Partial Fulfillment for Award of Post- Graduate Diploma (PGD) in Environmental Management.

2001/2002

DEDICATION

This is research is dedicated to God, the Alpha and Omega who in His infinite mercies has given me the wisdom, knowledge to successfully complete this PGD programme. I also want to dedicate this project to my lovely parents Mr & Mrs. S D Melaiye, my sweetheart Bolanle ,and to the entire family as a whole.

ACKNOWLEDGEMENT

The successful completion of this project is a product of contribution of very many people. I wish to register my profound gratitude to all of them for their usefull suggestion, words of advice and inspiration which no doubt has culminated in these sauces of project.

I wish to thank my supervisor, Dr Abubakar for finding time out of his usual tight schedule to read my draft and for his kind and advice on the research project.

My special gratitude also goes with warm regards to my dear parents, brothers and sisters for their moral and spiritual supports. I am also very grateful to my sweetheart Miss Bolanle for her lovely support, cooperation and advice during the odds times of this course.

I must also remember my friends and brothers here in Bwari and my course mates' .A friend in need is a friend indeed. You are my favorites; I will never forget you all.

Finally, I give honour, glory, adoration and power to God almighty, the most merciful for given me the strength and for his protection in all my journey to and fro to Minna, God bless you all.

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CHAPTER ONE.

1.0 INTRODUCTION

1.1 OVERVIEW

Most of the developing countries particularly African countries have made great effort in recent years to improve the qualities of their environment .in most cases however, pavement drainage performance still leaves a lot to be desired .it has not been sufficient enough to presence the quality of the environment in a desired condition .History has shown that delay in the provision of drainage where necessary entails not only expensive reconstruction and rehabilitation but can adversely caused erosion and retard development.pronding urban drainage channel is an important aspect of urban planning because of its attendant consequences. In Nigeria, flooding and erosion are two drainage problems that are rampart .After heavy rainfall, many roads residential and non –residential compounds open spaces are usually flooded as a result of poor facilities.

Furthermore, it does not only block road but also damage house hold properties and severe cases loss of lives. Huge quantities of sand are normally deposited on road causing damages to the asphalt used in road construction, which usually weakens and disintegrates when subjected to prolonged period of flood water.

It is these destructives elements of rain water and storm water caused by inadequate and sometimes lack of drainage that triggered of the study.

1.1.1 EROSION

While flooding is a seasonal problem, erosion produces a rather permanent problem in some locations of Abuja especially Bwari (.FCT)

Erosion is so severe that the roadways have been warn away and reduced making movement of vehicles difficult. Another aspect of urban erosion problem is the erosion pavement of houses and the foundations, this has led to the collapse of fences, some measurement to control erosion by urban residents includes dumping of huge sacks of sand and erosion areas and gully roads.

1.2 THEORETICAL PERSPECTIVES

To effectively treat the issue of drainage problems and effects in many parts of the world , there is need to know what it entail , its fundamental basis as well as the principles guiding its planning, provisions , and maintenance.

Arnoid in 1974 define drainage 'as the removal of excess water from the land into a natural channel or into other land ". It can be an artificial conduit ore channel for carrying off excess water or removal of water by graying impaling either a flow down a slope or percolations.

In large areas of land, the drainage channels often form a network of ditches into which the surplus water seeps from the surrounding soil. The channel must be made progressively deeper to provide a gradient otherwise the water will not flow and it will not be very effective. In low- lying region ,the channel may drain into a stagnant lake or a artificial swamp from which the water can periodically be pumped to allow drainage to continue. These channels may be-open ditches to an adequate depth with sloping sides and sufficient gradient to permit the water to flow or they may be covered pipes that is closed conduit usually concrete but sometimes plastics into which the excess water can seep and be craned off. This therefore emphasizes the significant of width and gradient in the provision of drainage channels for the achievement of efficiency.Draniage can be divided into surface and sub-surface drainage.

1.3 SURFACE DRAINAGE

This involves the re mover of water from the topsoil. It could be said that it is the removal of water from whether rain or melting snow that falls directly on the roadbed and interception and the removal of water coming to the road from houses and adjacent terrains. This is usually done on soil where sub soil water movement is very slow, while –sub-surface drainage involves the removal of water from beneath the soil surface. If involves the removal of water from the sub-surface and with the interception of underground water coming to the sub-surface .This is accomplished by the use of pipe drains through which the water is removed to a safe distance from the area.

1. It permits aeration of the soil which is essential for root growth.
2. It favors the growth and development of beneficial soil micro-organisms, by enabling enough oxygen to circulate in the soil.
3. It helps in preventing an area from flooding, which always destroy .lives and properties
4. It also helps in controlling the salinity of the soil especially area soil water is common

The process of drainage channel implies the ways of draining water in an urban area .This is mostly concerned with the techniques of draining water in an urban area and the type of drainage channels to suit the type of soil in urban area especially the study area .The common types are:-

1.3.1 PIPE DRAINAGE-this involves the use of clay plastic prefixed in very permeable soils following a relatively wide drain surface.

1.3.2 MOLE DRAINAGE –This may be used in fairly uniform clay sub-soil, which has stable water .Typical mole drainage has permanent drains so as to pass through the gravel. Thus, the grave or permanent black fills (as it is called), will serve to connect the mole to the permanent drains

1.3.3 DRAINAGE IN DEVELOPED AND DEVELOPING COUNTRIES

As kale (1962) states that industrialization and urbanization in urban design to convey surface run off through the basin to the nearby natural steam channels. Flow augmentation of urban stream has resulted to over bank flow causing server flood hazards in the flood plains .Excess street storm run off drains freely into either nearby stream or adjoining on the streets, causing flooding of the roads. These types of problems have been shown to be acute.

1.3.4 URBAN DRAINAGE

Man has shown his creative and innovative mind through his design and construction of cities which stand as monuments to his imagination, similarly his powerful intellect has enable him evolve solution to the problems facing cities today. One of the problems commonly found in the cities is the flow of storm water through channels /drainage's to receiving water causes. Considerate amount of budgets and time are devoted to the safe conveyance of this water either through sewage systems or in channels and these led to the construction of drainage's of various capacity and discharge.

1.3.5 DRAINAGE IN NIGERIA URBAN CENTERS

The third (3^{rd}) national development plan [1975- 80] noted that storm water drainage system has not changed for decades , inspire of the called to include drain channels in road construction .If also noted that many of the urban centers lack integrated drainage systems consist mainly of open earth in roads . This trenches are often generally too narrow and too sallow to drain the water from the cities efficiently during heavy rain . Consequently, many streets become flooded and un-motor able. Physical structures such as building are also affected in one way or the other. This is the situation in Bwari Town where only few drainage channels have been provided inspire of the high population of people.

1.4 STATEMENT OF PROBLEM

The presence of stagnant water in some part of the FCT is due to inadequate number of drainage channels. Poor maintenance of the existing number of the drainage channels in the study area has led to the presence of stagnant water, places in the satellite towns are usually water logged. Poor construction method of the drainage channels due to lack of adherence to engineering specification by contractor usually disintegrates when subjected to prolong period of floodwater.

1.5 AIMS AND OBJECTIVES;

The aims is to examine the impact of poor drainage system in Bwari town/FCT with a view to suggesting solutions that will remedy the problems within this broad aim, the specific objectives are:

a. To examine the concept of drainage system in the study area.
b. To examine the existing drainage channels in Bwari town.
c. To identify the problems; effects, and causes of poor drainage system on the study area.
d. To suggest physical planning solutions to problem identified.

1.6 JUSTIFICATION

There is a lot of impervious surfaces with very few drainage channels available in Bwari Town .These drainage channels are used for refuse disposal, as a result of high population density, thereby blocking the channels. Therefore whenever, there is rainfall, the water from the impervious surfaces cannot drain into the Natural drainage.

The result in flash flooding which covers the roads and causes damage to stagnant water every where in Bwari Town even during the dry season , water from sewers does not have free passage and the result is water stagnation , which often affects the general wellbeing of the people .Therefore this study

As it is now , Bwari appears to be a low regional service center , and it certainly need to be more equipped in order to be able to concretely perform its assigned role of spatially spreading development in its north – eastern region.

1.9 GENERAL RELIEF

The FCT is an aréa of hills and dissected terrains and undulating plains. Much of the northern part of the fct is undulating and characterized by varying degrees of ruggedness. On the other hand, the eastern, central and south-eastern parts are the most rugged, while the sand stone belt in the south west , is moderately so.

The highest part of the fct is the nort –eastern" pan- handle" where there are many peaks that are 760meters above sea level. In general, the western half of the fct lies below 305 meters above sea level, except in the extreme north-west, where massive rock hill rise to higher levels. The lowest elevations are found in the extreme south- west, in the flood plain of river gurara with an elevation of a mere 70 meters above sea level. Thus it is from this flood plain that the land raises irregularly in the eastern northern as well as north- western directions.

Hiil in the fct occur either as clusters or they found long ranges, wuna and the wasa –sukuru ranges.

The last one is in the fact of a complex of ridges that run across the centre of the FCT from kwali in the west, to wasa in the east. These ridges are composed of the pre-canbrian basement complex rock. To the south of the wasa –sukuru ranges are the east-west frending sandstone – ridges. They are strongly characterized by sleep- sided and flat topped hills. Elsewhere in the FCT, holls occur as individual inselbergs and rock out crops in the basement complex

areas. In the sedimentary region, they occur as conical- shaped outliers of the iron stone-capped ridges.

1.10 DRAINAGE

The Gurara River dominates the drainage scene of the FCT. Tributaries to the gurara river having their origin in the hill around the fct drain the whole territory with the exception of the Bada plains and the eastern slopes of the Agwai – karu hills , which form the headquarters of the koto river , lying outside the FCT.

Generally, seven drainage water sheds are within the FCT. They include the usuma, bobo, Afari- bokwoi, its, mangoe, yaru, and topa rivers. The drainage pattern of the rivers and their tributaries is primarily dendrites although located rectangular parallel and trellis could be formed due to joint systems and other structural features of these rivers, the bobo and Afari- Bokwoi and their tributaries drain the bobo plains.

As far as ground water resources is concerned, only limited and generalized data are available in the FCT. However , two areas the gwagwa plains and the Agwai- karu hills have been identified the northern most part of Agwai- karu hills is considered a potential groundwater source because of the extent of faulting within the underlying metamorphic geologic structures.

1.11 CLIMATE

The FCT climate is the hot, humid tropical type. Its is such that its major elements have regimes that are transitional from those of the southern and northern parts of the country.

As a result of the climate being the tropical type, the sunshine duration ranges between eight to ten hours a day in the northern parts during the dry season.

The climate of the F C T is largely governed by the inter – tropical convergence zone (I T C Z). This zone of convergence is normally defined by both the moisture –laden south –west winds and the north – east dry, continental winds. Rain normally occurs south of I T C Z when the ITCZ passes northwards through the FCT between the middle of march and June, it heraids the beginning of the rainy season.

On its return southwards about the middle of October, it heraids the onset of the dry season.

The fct records its highest temperature and greatest diurnal ranges during the dry season months, when the maximum temperature ranges between 30.40oc and 35/oc. During the rainy season on the other hand, the maximum temperatures ranges between 25.8oc and 30.2oc. Also the diurnal range is much reduced.

Two main factors strongly influence temperature patterns in the FCT. These are cloud cover and elevation. The cloud cover is much less during the dry season, hence the high temperatures at this time of the year. As a result of difference in elevation between the north and the south the latter has higher temperatures throughout the year than the former.

Human sensibility to these temperature patterns is very greatly affected by the relative humidity. During the dry season, relative humidity falls considerably in the afternoons The desiccating effects of the dry season are accounted for both the relative humidity and the high afternoon temperatures at this period, which is also characterized by the harmattan haze.

The onset of the rains is from about the middle of march, The end of the rainy season, on the other hand, is around the middle of October in the north, whereas it is about early November in the south.

Consequently, the duration of the rainy season varies from about 240days, in the south, to about 190days, in the north. The mean annual rainfall total ranges from 1,145mm to 1,631.7mm. This reflects a situation that results from the FCT,s location on the windward side of the jos plateau. This gives rise to frequent rainfalls and a noticeable increase in the mean annual total from the south to the north.

The beginning and the end of rainy season is characterized by frequent occurrences of squall lines. This is a weather condition that is heraided by the occurrence of cumulo-nimbus clouds. It is accompanied by thunder and lighting, followed by strong winds and rainfall of very high intensity. This rainfall types mainly last for up to thirty minutes, and it is then followed by drizzle that may last for several hours. Rainfall patterns exemplify the transitional character of the FCT. For example, it is located between the zone of double rainfall maximum of the southern parts of the country, and that of single rainfall maximum of northern parts.

Another features of the rainfall is its mean monthly distribution. There is a very high concentration of rainfall in the month of July, August and September, during which about fifty –seven percent of the annual total is received.

Relief rainfall is another important feature of the fct. This type of rainfall is associated with the presence of inselbergs, that exert a very strong influence on the local weather

1.12 SOIL.

The majority of the soil in the FCT have developed from the crystalline rocks of the general form to the physical and chemical constituents of the weathered rocks.

However local factors such as topography, vegetation types and microclimate conditions determine the site specific morphology of the soil. The soils are generally welled drained except in valley bottoms.

The soils of the plains and hill consist of alluvial complex soil. Generally, the soils of the territory especially those conciding largely with hilly and fugged landscapes are more sandy than the surrounding soils and are as noted by Ethotiyon Associates (1996) better earmarked for nature protection and outdoor recreation

1.13 VEGETATION.

Even though the fct is located within northern boundary of the guinea savanna, the two major types of vegetation that are found in the country. (I.e forest and savanna) are also recognizable within it. Rain forest Riparian Vegetation complex are the two type of forest found in the FCT and they both have an area extent of twenty- one percent of its land area. On the other hand, three types of savanna, namely woodlands, part savanna and shrub savanna cover seventy- nine percent of the FCT land mass.

1.14 LAND USE

One of the major factors, which contributes to the overall quality of the physical environment of any locality of land to various land use types. The land use pattern in Bwari indicates that residential and shopping complex constituted over 80% of the total developed.

This reflects that virtually all- available spaces in Bwari are devoted to residential land use. The density of residential dwelling is higher as no space is left between individual building for sewers and drainage channels. This shows that the proportion of land devoted to residential area is excessive when it is realized that ideally only about 50% to 60% of the developed land in high

density residential area of Nigeria cities should be devoted to residential dwellings.

Another serious deflect of the land use structure in the area is the small amount of land devoted to transport that is road and streets. Ideally, high density residential area to which Bwari belongs should devote between 15 to 20 percent of land area to streets and roads or for circulation. Mobility within Bwari is highly restricted.

CHAPTER TWO

2.0 LITERATURE REVIEW

The sustainable urban drainage Scottish working party published a sustainable urban drainage systems design manual in march 2000.According to them Drainage of land is required to make it suitable for development, to protect existing and proposed development from the effects of flooding, and to deal with pollution arising from the interaction of rainwater and the development. Development reduces surface permeability by replacing vegetated ground with roofs, roads and paved areas and through compaction of ground by vehicular movements. This reduces the amount of water infiltrating into the ground and increases surface run-off. The alteration of natural flow patterns (in both total quantity and in peak flow) can lead to problems elsewhere within the river catchments, particularly flooding downstream. Increased flow rates from hard surfaces can also cause erosion, decrease percolation into the soil, lead to low ambient flows in watercourses and damage stream and streamside habitats. Flood risk and other environmental damage can be managed by minimizing changes in the volume and rate of surface run-off from development sites through the use of sustainable systems.

The conventional method of draining excess surface water from built-up areas has been via underground pipe systems. Historically, this surface water would have been combined with foul water from toilets, wash hand basins and so on and drained through one combined sewer. However, surface water from rain storms can place a significant and variable burden on waste water treatment works. Recent practice has separated drainage systems to provide separate sewers for the foul and the surface water.

Sustainable urban drainage not only reduces the amount of diffuse pollution but also improves the environmental quality of development to the benefit of the local community. The SUDS Design Manual requires SUDS to be

considered for development at an early stage in project design in order to determine its applicability. It is SEPA policy to promote SUDS as the preferred solution for drainage of surface water run-off, including roof water, for all proposed development, Greenfield and Brownfield.

Also Richard Foster- march 2002 explain that ,a pipe that only takes drainage from a building or buildings within the same property boundary is called a drain. The water that drains into it may be surface water (for example rainwater from the roof) and/or foul water (for example, bathroom or toilet waste). The responsibility for unblocking a drain or repairing any defects on it lies with the owner or occupier of the building.

This is the case, even if the problem on the drain is beyond the boundary of the building, or under a road or pavement. From the point at which a pipe takes drainage water from two or more buildings that are not within the same property boundary, it is called a sewer. A sewer that was constructed after 1 October, 1937 is called a **private sewer** unless it has been adopted by Yorkshire Water. The law generally requires that the owners or occupiers of the properties that use and connect into the sewer above the point of blockage, to remove the obstruction and/or repair it. They all must keep it in good condition, regardless of whose land the problem is located on.

Within the overall objectives of the UNESCO Project on Environment and Development in Coastal Areas and Small Islands and specifically its component related to sustainable development of continental coastal regions, and as a contribution to the Disasters Reduction Programme, the Coast and Small Islands (CSI) Division of the United Nations Educational, Scientific and Cultural Organization (UNESCO) funded a project to study the drainage channels in Victoria and Ikoyi Islands, Lagos, Nigeria. The study also includes

examining the impacts of flooding and conduct public awareness campaign on the reduction of flooding in Lagos (Victoria and Ikoyi Islands), Nigeria.

Many huge drainage channels built about three decades ago, serve as receptacles for surface runoff and smaller channels which discharge into the Lagos lagoon or the Kuramo waters. Recent observations have shown that many of these drainage channels lack enough drainage heads to discharge runoffs into the lagoon. This is because these drainage channels were built without proper information on tidal parameters and sea level rise. Rising sea level, increased rainstorm and ocean storm surges associated with astronomical high tides are now making these drainage channels ineffective. This often results in the backup of runoffs in the drainage channels and eventual flooding of the Islands. Such occurrences are most apparent and disastrous during the rainy seasons or when storm surges coincide with high tides resulting in astronomical high tides.

The dumping of domesticated refuse directly into the drainage channels also exacerbates the problem of seasonal flooding of the islands. This human activity results in the blockage of the channels resulting in eventual flooding of the residential and commercial areas of the island, here the major causes of flooding were discussed, Flooding could be linked to both natural and anthropogenic activities. Some of the natural causes include: low lying coastal topography, intense wave and tidal climate, vulnerable soil characteristics and storm surge. Sea level rise as well as localized subsidence also exacerbates the rates of coastal erosion and subsequently flooding

Also Rapid population growth as a result of urbanization and accompanying poor land use may lead to blockage of drainage channels. Alterations of the channel (canalization, dikes, dams, and bridges) change the overall conveyance system of a catchments area. These activities have a noticeable effect on flow volume, peak magnitude, and timing of the peak. Increased population also

lead to increased generation of solid waste. Ineffective waste disposal facilities cause residents to dispose their waste in the channels, with the believe that the channels will transport the refuse to the ocean or lagoon. Blocked drainage channels hence result in flooding of adjacent areas.

The Nigerian Background information(Standard 15)on physical systems effect on human systems which examines the ways in which physical systems impact Nigerian society, stated that many tropical diseases in Africa are related to the presence of water. Many diseases that affect Africans are spread by mosquitoes, which breed near water. "Malaria, for example, is transmitted by various species of mosquitoes which breed close to stagnant or slow-moving water." Malaria is one of the most widespread of all African diseases. Binns estimates that roughly 200 million Africans had malaria in the early 1990s. Dengue fever and yellow fever are two other diseases transmitted by mosquitoes. While attempts have been made to eradicate these diseases, these attempts have only met with limited success. Mosquitoes sometimes become resistant to insecticides. Malaria strains have also become resistant to vaccinations and medicines. In many ways, the surest way to reduce the occurrence of these debilitating diseases is to destroy the habitat of mosquitoes. This requires the draining of wetlands and swamps, which serve as breeding grounds for the mosquitoes. In a country of abundant seasonal rainfall, however, such a task is a daunting one.

CHAPTER THREE

3.0 DATA AND COMPUTATIONAL TECHNIQUE.

The questionnaire was self administered together with the help of my brother and my friends around in Bwari. The assistant who is my brother is a student of the Nigeria polytechnic. The assistant from the polytechnic was briefed on the procedure and the reason for collecting the administered questionnaire on the spot to ensure maximum return rate.

House to house canvass was adopted in accordance with the method of sampling procedure that is, only defined units and houses that fall within the sampling technique were contacted accordingly. The data collected were analysed through the use of percentages and tables. The data from the questionnaires were tabulated. These data were then use for various discussion of the result. Apart from the questionnaire, the ground truth assessment of the study area will add to the information require by the project work.

3.1 DESCRIPTION OF DATA SET

The main research instrument of this study was a structured questionnaire. The questionnaire was designed in such a way that, the information needed for the study was all included.

A total of 96 questionnaires were sent out to cover the whole of Bwari during the course of the exercise, but due to invalid returns and respondents who could not return the questionnaire, 74 were return valid and treated.

Data are collected from the responses received from people who filled and return their questionnaire forms and the ground truth assessment made of various places within the study area.

The questionnaire was divided in to two board sub division with each section containing different item relevant to the study. Section A; contains personal

information such as socio- economic characteristic of the respondents. It sought information such as age, occupation, religion just to mention few.

Section B: Sought information on attitude towards maintaining good drainage system in their community.

3.2 METHODOLOGY

The method of investigation in this project work will be through the use of prepared questionnaires, which will be distributed among the population of Bwari the study area . All the responses received for the questionnaires will form the basis of the data. Apart from the questionnaire, the ground truth assessment of the study area will add to to the information required by the project work.

CHAPTER FOUR

4.0 DISCUSSION OF RESULT:

A total of 150 questionnaires were sent out to respondent and 74 completed questionnaire were returned , representing 77% of the total number of questionnaires sent out. The responses are as follows.

Table 1: Closeness of drainage to residential houses

RESPONSE	FREQUENCY	PERCENTAGE
Pipe Drainage	**19**	**25.6%**
Mole Drainage	**20**	**27.0%**
Local Drainage	**20**	**47.2%**

Sources: Field survey, 2003.

Of all the drainage system in the study area, Local channel constituted the largest. This channel contains mostly waste from pure water, sobo drinks and other commodities sold in polythene bags.

The local channel constitutes about 47% of the total drainage system. . This is followed by mole drainage system which is more refined and can only be found in restricted areas. These are the areas that are averagely planned.

Table 2: Handling of household waste

RESPONSE	FREQUENCY	PERCENTAGE
By throwing them anywhere	**64**	**86.4%**
By storing them in dustbins	**10**	**13.5%**

Source: field survey, 2003.

Wastes generated from the study area are largely thrown away in to near by drainage system instead of being stored before before removal.

About 86.4% of the total wastes generated are simply thrown away into drainage\channel. This also indicates that the use of dustbins is not in practice. Only 13.5% of the respondents stored their waste before they are collected for disposal. These are flats with modern system of waste disposal.

Table 3: Regularity of wastes removal from dumping sites

RESPONSE	FREQUENCY	PERCENTAGE
Immediately waste are dumped	**08**	**9.30%**
Not removed at all	**15**	**17.44%**
Removed after several weeks	**63**	**73.23%**

Source: field survey, 2003

Table 3: above indicates that the bulk of the wastes dumped at the various dumping sites or local channel within the study area are abandoned for several weeks (fig 1) without removal. 73.26% respondent indicated that wastes are abandoned at the dumping sites/ local channel for a long time before removal. This indicates that the wastes sometimes block the effective passage of water.

Table 4: Time of wastes increase in Bwari and its Environments.

RESPONSE	FREQUENCY	PERCENTAGE
Rainy season	**57**	**85.08%**
Dry season	**10**	**14.96%**

Source: field survey, 2003.

Of the whole waste generated within the study area 85.1% is in the rainy season. This may be due to the additional agricultural wastes that are abundant during the period. There is only 14.96% increase in wastes generation during the dry season.

Table 5: Preference of the people to the use of local drainage rather than the use of dustbins.

RESPONSE	FREQUENCY	ERCENTAGE
Poverty	**25**	**36.23%**
Ignorance	**12**	**17.39%**
Not provided by the Government	**32**	**46.38%**

Source; field survey, 2003.

46.38% of the people in the study area do not use dustbin but prefer to dump their wastes into local drainage because they are not provided by the government. This is followed by 36.23% of the respondents who attitude the lack of usage of dustbin to be due to poverty. The remaining 17.39% of the respondent attribute the reason to ignorance. It implies that they are not through the blockage of these drainage systems.

Table 6: Assistance of the people to proper drainage system management can be through.

RESPONSE	FREQUENCY	PERCENTAGE
Community effort	**20**	**30.77%**
Government to employ cleaning waste from the channel/drainage	**45**	**69.23%**

Source. Field survey, 2003.

About 69.2% of the respondents have shown that government should employ labour (direct involvement of government) as the best to help channel/ drainage management. About 30.8% of the respondents however indicate that community effort is the best way to deal with the local drainage /channel

management. This indicates that majority of the people will prefer intervention provided by the government.

Table 7: Government can improve wastes and local drainage channels through.

RESPONSE	FREQUENCY	PERCENTAGE
Early removal of wastes from channel/ drainage system	**54**	**72.97%**
Increasing public awareness	**20**	**27.03%.**

Source: field survey, 2003.

Table 7 above indicated that about 72.9% of the respondents in the study area have indicated that government can improve the waste and local channel / drainage management by quick removal of wastes from the channel and its environment.

This has also shown the level of disturbance heaps of refuse in and around the drainage system to the people of the study areas.

The 27.03% response means that people do not see public awareness as an important as immediate removal of wastes from within and around the drainage system.

Table 8: Which of the following hazards is more disturbing, if drainage channels are blocked with solid wastes?

RESPONSE	FREQUENCY	PERCENTAGE
Offensive smell	**20**	**27.03%**
Damage of property	**18**	**24.32%**

Flooding of the environment	**36**	**48.65%**

Source: field survey, 2003.

In table 4.04, 48.6% of the respondents believed that flooding of the environment is more injurious. This could lead to inaccessible road and make movement very difficult. This is because every house hold near flooded channel is uncomfortable due to the muddy and wet ground. 27.03% of the respondents are of the view that offensive smell from dumping sites is more disturbing when wastes are mixed with flooded water .while only 24.32% of the respondents have pointed to damage of properties to be the most disturbing hazard of channel blockage.

Table 9: Which of the following acts causes the blockage of drainage?

RESPONSE	FREQUENCY	PERCENTAGE
Solid wastes falling into drainage dumping sites	**10**	**13.51%**
Wind blowing wastes into drainage	**22**	**29.73%**
People directly dumping wastes into drainage	**42**	**56.76%**

Source: field survey, 2003.

56.7% of the respondents in table 4.09 believed that drainage in Bwari are blocked by refuse directly thrown in to them by the people whole 29.7% believed that the wastes in drainage are blown in by the agent of wind.

Only 13.51% of the respondents see the blockage to be due to direct falling of wastes into the drainage from dumping sites thereby resulting in blockage.

Table 10: The consequences of a blocked drainage

RESPONSE	FREQUENCY	PERCENTAGE
Offensive smell	**30**	**41.09%**
Flooding of surrounding	**43**	**58.90%**

Source .field survey, 2003.

Out of 73 respondents in table 4.10, 43 people representing 58.9% consider the effect of the blockage to drainage to be flooding of the surrounding areas.

While the remaining 30 people representing 41.0% see offensive smell to be what is likely to happen due to drainage blockage.

4.1 GROUND ASSESSMENT

On the ground assessment the study indicate that the whole environment had scattered presences of one type of solid waste or the other. The solid wastes dumping sites are located in some strategic location in Bwari and its environment.

Most of the dumping site have grown in to heaps of solid wastes (fig.2) .The height of the wastes kept on growing because of non- collection of wastes as soon as they are dumped. It is possible to have some parts of the wastes that have been dumped for several weeks without collection.

The composition of the wastes is largely polythene bags. Some have been dumped for several months while some are freshly dumped. Apart from the polythene bags, raw and cooked food wastes were also noticed in large quantities. There was little scattered presence of metals and rubber wastes around the channels drainage system.

Most of the channels /drainage systems visited were in a terrible state of offensive smell emanating from the rotten garbage and other rotten materials.

This is as a result of the mixture between waste water and rotten garbage. Some wastes are also set on fire because of irregular collection. The fire produces huge smoke nuisance that spread over a wide area surrounding the dumping site.

Animals, like goats, chicken, dogs etc are seen mouth-probing in to the wastes looking for some food. These animals contribute in scattering the wastes all over the dumping sites.

4.2 HEALTH RELATED HAZARD.

It is a known fact that many area that are not well drained serves as suitable grounds for breeding of diseases carrying pathogens. Some of the present drainage channels are menace to public health and welfare (Jackson M .H. etal 1966). The act apart from polluting the air , contribute in the spread of various water born diseases such as typhoid, gastroenteritis, arsenic poisoning such fouled water can gain passage to public tap through broken water pipes in drains. Where cleaning of drainage channels are attempted no provision is made for the disposal of the solid wastes removed from the cleared area. The wastes removed from the drainage channel are pitted up by road sides, which eventually end up again in the same channel.

The stagnation of water and the decomposition of debris, result in the production of highly undesirable and offensive odour, which can be hazardous to the health of the populace.

Planning of urban drainage channels is an important aspect of planning of an urban area like Bwari, because of its attendant consequences. in Nigeria, flooding and erosion are the major drainage problems that are rampant after heavy rainfall. Many roads, residential and non residential compounds or open spaces are usually flooded. It does not block roads, but also damage houses and

properties worth million of naira. Drainage has been one of the pressing problems in urban areas.

In urbanized environments, the infiltration capacity of the ground is further reduced by the replacement of vegetal ground cover with a lot of impervious surfaces. According to Leopold (1986) of all the land use changes affecting the hydrology of an area, urbanization is by far the most hazardous.

Urban drainage problem is a phenomenon, which has got the attention of many environmentalist and government. As Lazarus (1978) said it is generally accepted that the United States and in nearly, all other nations will continue through the remaining parts of the countries. The hydrology of urban areas is suite complex. This is evident in our urban centers where problems are on the increases with increasing urbanization. The demand for better study of the growing magnitude of urban drainage problems and the in ability of traditional method of dealing with the problems need to increase.

Fig.1 showing dumping site near Bwari Area Council Secretariat Bwari

A blocked drainage

dumped wastes are left in the bed of the channel and eventually the wastes will block the channel, which result into flood.

A part from the unsightly nature of these dumping sites there is also the problem of offensive smell from the rotten materials concerted in the heaps of wastes. The smell even increased dump intensive heat when decomposition rate heightens. The smell makes life seriously uncomfortable for the inhabitants of the areas near dumping sites. Furthermore, domestic wastes water and rainwater causes offensive smell when they mix with solid wastes.

Most pedestrian paths close to the dumping sites are completely blocked. People who normally should pass through the blocked road path are forced to take alternative route.

The closeness of some of the dumping sites to the drainage system may result in some wastes falling inside the drainage system but people also throw wastes directly into the drainage system. See {table 4.09}.

A very disturbing phenomenon in connection to the dumping sites is the smoke nuisance. Most of the dumping sites are always on fire producing clouds of smoke nuisance into the atmosphere. A part from the effect of this smoke in climate change, it makes the whole environment uncomfortable for living. The smoke causes eye disturbances which may led to more serious eye problems if exposure continues.

Ground-Truthing reveals that domestic animals are always found around the dumping sites and drainage channel. Since the life of these animals are related in one way or the other to the other to the life of human beings there is the fear of disease Transmission from one type of animal to man.

This will go a long way in supplementing the cost of wastes management. This will also avoid the local channel or drainage system from being used as dumping sites for solid wastes.

A strong public awareness campaign regarding the dangers of deposition wastes everywhere and the advantages of using dustbins should be established and every measure taken to keep it alive for as long as necessary.

Finally, a set of legislation should be promulgated to check the activities and conducts of the people towards maintaining a clean environment. The legislation should be strong enough to deal with any one, no matter his social position, who contravenes any of the environmental protection law.

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