IMPACT OF POOR DRAINAGE SYSTEM AND FLOOD CONTROL IN NIGERIA (ANAMBRA EAST LOCAL GOVERNMENT ANAM COMMUNITY AS CASE STUDY).

BY

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2016224053

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD

BACHELOR OF ENGINEERING (B.ENG.) DEGREE IN CIVIL ENGINEERING

SUBMITTED TO THE

DEPARTMENT OF CIVIL ENGINEERING

FACULTY OF ENGINEERING

NNAMDI AZIKIWE UNIVERSITY, AWKA.

MAY, 2023

CERTIFICATION

This is to certify that I, Ogbonna Williams ifeanyi with registration number 20167224053 personally carried out this project till completion for the award of Bachelor's degree in Engineering (B.Eng.), department of Civil Engineering, Nnamdi Azikiwe University Awka. This work to the best of my knowledge has not been to any form submitted for same purpose in the field of Civil Engineering.

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APPROVAL

This research work "determination of the effect of egg shell powder and lime stabilization on engineering properties of clay soil." is an authentic academic work undertaken by Nwali Jeremiah ugonna has been assessed and approved by the department of civil engineering, Nnamdi Azikiwe University, Awka Anambra state.

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DEDICATION

This project is dedicated to God Almighty whom his infinite grace and mercy has accompanied me to the successful completion of this project. I equally dedicate this work to my beloved family, friends, and everyone who served as a real source of inspiration towards my academic pursuit.

ACKNOWLEGDEMENT

ABSTRACT

The study will examine the effects of poor drainage systems and flood control on the community's infrastructure, including roads, bridges, and buildings. It will also analyze the impact on the local economy, including agricultural activities, business operations, and employment opportunities. The study will further investigate the social consequences of poor drainage systems and flood control, such as health hazards, displacement of residents, and social dislocation. The study will utilize both primary and secondary data sources to obtain relevant information on the subject matter. Primary data will be collected through the use of questionnaires, interviews, and observations. Secondary data, on the other hand, will be obtained from various sources, including government reports, academic articles, and online databases. The findings of this study will be significant in highlighting the importance of proper drainage systems and flood control measures in Nigeria. It will provide useful insights into the challenges faced by local communities in addressing flooding and its impact on their livelihoods. The study will also recommend possible solutions to mitigate the effects of poor drainage systems and flood control, such as the construction of drainage channels, the implementation of flood warning systems, and the establishment of early warning systems. In conclusion, this study will contribute to the existing body of knowledge on the impact of poor drainage systems and flood control in Nigeria. It will serve as a valuable resource for policymakers, local authorities, and other stakeholders in addressing the challenges faced by communities in dealing with flooding and its consequences.

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CHAPTER ONE: INTRODUCTION

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Introduction

1.1 Background of study

Environmental disasters have become common phenomenon in the world, Oyegbile (2008). According to him, from China to Mexico, Indonesia, United States of America, United Kingdom and Nigeria, there is no doubt that the world is under serious threat from the environment. But analysts have argued that the environment was only responding to the abuses heaped on it by man's activities Christopherson, (2007). This has created a great burden for world leaders which is why the issue of environment ran neck and neck with matters of economy and poverty at the last meeting of the eight world's most developed economies otherwise known as the G8 submit in Japan. The concern is that the world may be getting close to extinction through natural disasters unless immediate actions are taken; and the signs are just too apparent to be ignored Christopherson, (2007) and Oyegbile (2008). Specifically, in May 2008, floods triggered by torrential rains killed dozens of people across China, while thousands of others were victims of landslides caused by the downpours. China is not alone. In the United States of America, the Mississippi River caused lots of damages put at several millions of dollars when it over flew its banks.

Floods are the most recurring, widespread, disastrous and frequent natural hazards of the world. It is worthy to note that all floods are not alike, while some floods develop slowly and last for a period of days; flash floods can develop quickly, sometimes in just a few minutes and without any visible signs of rain flooding some cities, towns, farmlands and major industrial installations over a distance of about 250km and ravaging Iowa before it heaped downstream. The occurrence of flood represents a major risk to riversides populations and floodplains, in addition to causing substantial impacts on the environment, including aquatic fauna and flora, and bank erosion. Flooding is becoming an increasingly severe and more frequent problem in Nigeria. Unfortunately, the impact is more felt by the urban poor in such a way that recovery is unlikely to be achieved without external aid Blaikie (2004).

Presently, about 2.6 billion people are living without proper sanitation, of which Africa is not exempted Olukanni, (2013). The need to provide proper drainage and sanitation facilities is essential to match up with the ever increasing population growth (Banerjee and Morella, 2011). The increase in the population of a settlement and the attendant growth of the needs of the residents in both quantity and variety, bring about intensive exploitation of the resources of the environment. Such exploitation might increase to a level that the resources would not be able to sustain the population, and in some cases the environment would collapse resulting in serious environmental problems Asoegwu (2009). This is further buttressed by Belete (2011) who expressed that high urban population growth rate also results in drainage system challenges because an increase in population requires a proportionate increase in infrastructure (roads and drainage systems) of which when not properly catered for, the facilities will be imperfect. Also, inadequate integration between road and urban storm water drainage can be attributed to natural causes such as intense rainfall, flat topography and poor soil infiltration or man-made causes such as improperly laid and graded street, poor and inefficient drainage facilities that aggravate the flooding problem Jimoh (2008).

Urban environments in Nigeria are faced with myriad of issues regarding poor drainage systems Offiong et al. (2009) and water tight structures which are the major causes of flooding Belete (2011). Urban flooding which is the inundation of land or property in a built environment, particularly in more crowded areas are caused by rainfall overwhelming the capacity of drainage systems. Although this is sometimes caused by events such as flash flooding Tucci (2001).Urban flooding is a condition characterized by its repetitive and systemic impacts on communities whether or not the affected communities are located within floodplains or near any body of water (CNT, 2013). Sule (2001) described Lagos, Abuja, Calabar and Ibadan as cities where houses are constructed directly on drain channels and that this practice has resulted to blockage of storm drains and consequently leading to overflow and flooding of streets.

Drainage systems are constructed to ensure that waste water and sewage is transported neatly to disposal points, thereby keeping the environment well drained and free of waste. Examples of components that make up a good drainage system includes; closed ditches having pipe drains, drainage pipes, channels and conduits. Sustainable Drainage Systems are approaches put in place

to manage the water quantity (flooding), water quality (pollution) and amenity issues in the environment. Sustainable drainage is a concept that includes long term environmental and social factors in decisions about drainage. Flooding have caused massive erosion landslides and loss of soil nutrient in places in Anambra state especially Awka east local government, resulting to other environmental problems. Poorly maintained drainage systems and poor waste management habits can adversely affect our environment in the following ways;

i. **Flooding**: The immediate effects of flooding include loss of human life, damage to property, destruction of crops and other plants, loss of livestock

ii. **Erosion**: The absence of good drainage systems can cause erosion problems. This has been experienced in many areas of Nigeria, where roads have been washed away and gullies created as a result of flooding.

iii. **Diseases**: Deterioration of health is another effect of flooding, due to the increase in waterborne diseases and unsanitary conditions. Stagnation of water occurs when water passages are blocked. This makes the people around such environments susceptible to infections from mosquitoes and other insects. We are exposed to numerous air and water borne diseases if we have our environments polluted with stagnant water.

In the past year communities in the Anambra east local government faced extensive water logging during the rainy season (July to September) as result of a serious problem of poor drainage. Inadequate drainage problems become one of the most common sources of compliant from the residents in Anam, Anambra east local government and this problem is becoming worse every year. Poor existing drains and their improper operation and management mainly cause severe flooding which creates a lot of damages.

In addition, diseases are spread and give problems to the population such as malaria and diarrhea. This critical situation was severely aggravated because the natural drainage system, which conveys storm runoff from the areas to the river were not fully operated and the existing drains blocked with huge amount of garbage, solid waste, silt sand accumulation and vegetation.

1.2 Statement of the problem

Recently, in Northern Nigeria, flood displaced more than two million people as the flood gates on Lagdo dam in Cameroon were opened to release rising waters along the Benue River. Flooding has also affected at least 300,000 people, submerging hundreds of Communities in Niger State. Flooding has wreaked havoc across many other parts of Nigeria in recent years, including the following states: Anambra in the east, Sokoto in the northwest, Borno in the northeast, Plateau in the centre and Yobe in the north. Over the years in Anambra State, flood has remained a worrisome natural problem which successive governments in the State could not effectively solve. Flood therefore is still a problem in areas like Awka, Oko, Onitsha, Agamelu, Aguleri, Umuleri, and Adani. In most areas of the state, such as Awka, Oko and Onitsha, flooding has posed a major concern to the occupants of properties. Flooding is inimical to human activities especially when it occurs on a large scale Ogunyemi (2002).

Flooding has been a threat in the study area. Anambra east local government of Anambra State which includes (Aguleri, Umuoba anam , Enugwu aguleri, Ikem ivite, Umueri etc) which has been experiencing flood disasters as a result of so many factors like lack of spaces for drainage system, blockage of the drainage system, unplanned building and businesses, poor environmental awareness, inadequate management of wastes, poor construction of drainage system, attitude of the residence towards wastes disposal etc. all these help to aggravate flooding during rainy seasons in Anambra east local government.

Globally, flooding has displaced more people than any other hazard or disaster. About 20% of the Nigerian population is at the risk of flooding as concluded by Etuonovbe (2011) who also acknowledged flooding as a perennial problem in Nigeria which consistently causes death and displacement of communities. In 2010, lives were lost as about 1,555 people were killed and 258,000 more displaced while properties worth billions of naira were destroyed. Flooding is a recurring phenomenon in most cities of Nigeria. On the 26th of August 2011, the flooding disaster which occurred in Ibadan metropolis caused monumental destructions in the city. The continuous construction of structures on flood plains, indiscriminate dumping of refuse, water release from dams, lack or improper construction of drainages, excessive rainfall and deforestation were identified as the causative factors which helped render the

town vulnerable Khandihela and May (2006). The National Emergency Management Agency (2012) reported that the 2012 flood in Nigeria was declared a national disaster as it affected over 2.3 million people and killed over 363 people. Some Nigerian cities were swept off by the flood and affected 34 out of 36 states of the federation including Anambra state which was ranked as the worst hit. According NEMA (2012), at least 68 people were killed in Plateau State in central Nigeria and also 25 bodies found in Benue River after the flood while properties were also lost. These occurrences show that flooding is ailing to the affected the national populace and economy; yet mitigation measures are still poor as affirmed by Anambra State Ministry of Environment (2012), ANSEMA (2012). Anambra state was declared in 2012 as the most affected state in the flooding of 2012. This paper set out to find out Efforts that will be made to find out how the effect of flooding can be curbed.

1.3 Aims and objectives

The aim of this research is to evaluate the effects of impact of poor drainage system and floods control in Anam Community in Anambra east local government, Anambra State. Other specific objectives include:

1. To examine the impact of poor drainage system and floods control in Anam Community in Anambra east local government
2. To determine the relationship between poor drainage system and floods control in the study community in Anambra east local government.
3. To identify the causes of flood in the study community.
4. To proffer solution to the causes of flood in in Anam Community in Anambra east local government.

1.4 research question
1. What is the impact of poor drainage system and floods control in 5 communities in the Anambra east local government?
2. What is the relationship between poor drainage system and floods control in 5 communities in the Anambra east local government?
3. What is the geometry of selected drainage channels in communities in the Anambra east local government?

4. What are the causes of flood in communities in the Anambra east local government?

5. What is the solution to the causes of flood communities in the Anambra east local government.

1.5 Statement of research hypothesis

1. H0: Poor drainage system has no significant impact on floods control in Nigeria.

2. H1: Poor drainage system has significant impact on floods control in Nigeria.

1.6 Significance of study

This study is directly beneficial to 5 communities in the Anambra east local government for future road drainage system construction to avoid problems by assessing the performances of the current drainage systems and proposing mitigation measures to avoid improper functioning. The study will propose appropriate solutions to the drainage systems whose implementation would contribute to floods control in Nigeria especially in Anam community in the Anambra east local government.

The findings of this study will also expose the effect and discomfort flood can have on an individual and the community as well. It will also educate them on the dangers of flood and its destructive nature to lives and properties. The study will be beneficial for academicians and researchers, who conduct similar researches on the impact of poor drainage system and floods control in the eastern part of Nigeria.

1.7 Scope of study

The scope of study will cover the impact of poor drainage system and floods control in Nigeria. (A case study of Anam community in the Anambra east local government).

1.8 Limitation of study

1. Financial constraint- soil test to determine the properties of the soil in those area susceptible to flood was carried out and insufficient fund tends to impede the efficiency of the researcher in sourcing for the relevant materials, literature or information and in the process of data collection (internet, questionnaire and interview).

2. Time constraint- The researcher will simultaneously engage in this study with other academic work. This consequently will cut down on the time devoted for the research work.

1.9   Definition of terms

Impact: the action of one object coming forcibly into contact with another

Poor: of a low or inferior standard or quality.

Drainage system: Drainage systems are constructed to ensure that waste water and sewage is transported neatly to disposal points, thereby keeping the environment well drained and free of waste.

Floods control: Flood control refers to all methods used to reduce or prevent the detrimental effects of flood waters.

CHAPTER TWO

LITERATURE REVIEW

This chapter gives an insight into various studies conducted by outstanding researchers, as well as explained terminologies with regards to the investigation into the impact of poor drainage system and floods control in Nigeria.

2.1 Conceptual framework

2.1.1 Flooding

Flood is a large amount of water covering an area that is usually dry. It is an overflowing of a great body of water over land not usually submerged. Nwafor (2006) defined flood as a natural hazard like drought and desertification which occurs as an extreme hydrological event. On the other hand, Abam (2006), defined flood as large volume of water which arrives at and occupy the stream channel and its flood plain in a time too short to prevent damage to economic activities including homes.

Floods occur in Nigeria in three main forms: coastal flooding, river flooding and urban flooding Folorunsho and Awosika (2001). They noted that coastal flooding occurs in the low-lying belt of mangrove and fresh water swamps along the coast. River flooding occurs in the flood plains of the larger rivers, while sudden, short-lived flash floods are associated with rivers in the inland areas where sudden heavy rains can change them into destructive torrents within a short period. Urban flooding on the other hand occurs in towns, on flat or low-lying terrain especially where little or no provision has been made for surface drainage, or where existing drainage has been blocked with municipal waste, refuses and eroded soil sediments Olagunorisa, (2004). Floods are the most common and widespread of all the natural hazards.

In many parts of the world according to Ocheri and Okeke (2012) floods seem to be occurring more often and they seem to be increasing in size. Floods are generally regarded as extreme

hydrological events, where there is excess of water which may have devastating effects. According to Ayoade (2008), floods in tropics are partly or wholly climatological in nature, that is, they result from torrential rainfall. Floods by nature are complex events caused by a range of human vulnerabilities, inappropriate development planning and climate variability. Normal floods are expected and generally welcomed in many parts of the world as they provide rich soil, water and a means of transport, but flooding at an unexpected scale and with excessive frequency particularly flash floods causes damage to life, livelihoods and the environment. Many factors have been linked to the incidence of floods in many cities of Nigeria.

2.1.2 Types of drainage system

This work shall consist of constructing surface or sub-surface drains in accordance with the requirements of these Specifications and to the lines, grades, dimensions and other particulars shown on the drawings or as directed by the Engineer.

Surface Drainage

The surface water is collected and disposed. The water is first collected in the longitudinal drains, generally in the side drains and then it is disposed of at the nearest stream, valley or water course. Cross drainage structure like culverts and small bridges may be necessary for the disposal of the surface water from the road side drains.

Sub Surface Drainage

Changes in the moisture content of sub grade are caused by fluctuations in ground water table, seepage flow, percolation of rain water, movement of capillary water and even water vapour. In sub surface drainage of highways, it is attempted to keep the variation of moisture in sub grade soil to a minimum. However only gravitational water is drained by usual drainage system.

2.1.3 Causes of flood

The usual universal cause of floods is heavy or excessively prolonged rainfall or even both. Flood can manifest along marine coasts from wind-driven storm surges and rain-swollen streams

associated with tropical typhoons and hurricanes. Besides, flooding can also occur on the shorelines of large inland lakes. Climate change is also a major cause of flooding and it is an issue that is related to economic, social, cultural and physical environment of any nation. It is a vital environmental factor that shape and re-shape various activities of human beings in a society. The United Nations Framework Convention on Climate Change, UNFCCC defines climate change as a change of climate which is attributable directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. Human activities such as industrialization, technology development, urbanization, deforestation, burning fossil and agricultural activities, etc. and natural factors such as solar radiation quality and quantity, astronomical position of the earth are notable causes of climate change. Climate change is making weather less predictable, especially in developing countries like Nigeria where facilities to predict and manage weather conditions are not adequate. The unpredictability of rainfall in recent times has caused untold hardship during the raining season.

Climate change works in an indirect way to aggravate flooding by altering the pattern of flooding in the flood prone areas. It however go beyond doubt that climate change and its impacts such as increase in sea level have direct impacts on urban and coastal floods, and it has continuously disrupt the social fabric of cities and exacerbates poverty particularly in most developing countries, including Nigeria. People are indeed becoming increasingly vulnerable as the urban population increases and the poor ones are pushed into the fragile areas which are prone to flooding. As already mentioned above, another major cause of flooding is human interaction with his environment in the form of industrialization, technology development, urbanization, deforestation, burning fossil and agricultural activities. Activities of man are undoubtedly assuming greater importance as cause of flooding. As urbanization intensifies, natural surfaces are replaced, which do not allow water to percolate readily into the ground. The effect is that a large proportion of the rainfall which should normally infiltrate into the soil or be intercepted by the vegetation and thus be delayed for some time before running off, is immediately available for surface run-off into streams and rivers, making them flood. Bad planning also brings about floods and as humans try to harness available water resources which have resulted in the construction of dams and other water control structures, the failures of these structures have

resulted in floods. Good examples include the collapse of the Bagauda Dam near Kano in 2008 and the release of water from Lagdo dam 2022 in Cameroon which resulted in disastrous environmental consequences; the mass failures of drainage systems across Nigeria; the encroachment of buildings on the flood plains of streams and rivers flowing through towns and cities and the deposition of waste materials in their courses. Natural flooding through streams which is caused primarily by excessive down pour is the most regular or common form of flooding in Nigeria. This invariably causes water in the stream or river to flow beyond its boundary to nearby settlements. However, several causes are responsible for flood to occur but the most important are the climatologically causes.

In an area that is already saturated with water, smaller amount of rainfall may also produce flooding. Furthermore, in Nigeria, other causes of which climatologically factors are only parts or indirectly responsible include:

(a). Flooding of low lying coasts by excessively high tides associated with storm-surge effect;

(b). Rivers and tributaries carrying water floors very much in excess of their transporting capacities due to concentration of run off;

(c). Heavy rainfall synchronizing with spills of rivers;

(d). Main rivers backing up the water in their tributaries;

(e). Inadequate and inefficient drainage of low lying and flat areas to the overflow;

(f). Ponding back of stream flow by rising tides, particularly during spring tide conditions;

(g). Peak floods occurring at the same time in a main river and its tributaries.

Flooding is, however, not totally a natural phenomenon but an environmental hazard. Flood becomes a hazard when it impinges unfavorably on human activities as it frequently does because of the affinity which man tends to have for flood plains and coastal locations.

Poor drainage network remains a contributing factor to flood occurrence in Nigeria. It is estimated that the required drainage channel is short by about 61.78%; and the existing ones are only about 30% maintained, Amaize, (2011). There is nowhere the estimated shortfall in the drainage channels is less than 50% except at Abuja (27%) and Calabar (48%). It is as high as 78% and 76% at Onitsha and Jalingo respectively Aderogba (2012). Flood disasters result from human-created vulnerability which is an outcome of our interacting with the environment by some human activities such as designing and locating our infrastructure, exploiting natural resources, concentrating our population and so on Hualou, (2011).

2.1.4 Effects of poor drainage on floods control

According to Askew (2009), natural disasters, such as the occurrence of floods, cause much misery, especially in developing countries where low-income earners undergo great stress. Losses due to floods reduce the asset base of households, communities and societies through the destruction of standing crops, dwellings, infrastructure, machinery and buildings, in addition to tragic loss of life. From Lagos, Ibadan, Abeokuta, Calabar, Port-Harcourt and Warri in the southern region through Ilorin, Abuja, Lokoja and Minna in the Middle belt to Kano, Kaduna Jalingo, Maiduguri and Gombe in the North, the rains came down and floods came-up, washing away streets, battering dams, collapsing bridges, submerging buildings, killing people, trapping some in their homes and separating thousands of others from theirs. Nothing is spared by the marauding floods Adedeji, Adeola, Adeyemi and Kuyoro, (2011).

Adedeji et al (2012) similarly argued that flooding is a phenomenon that sometimes has devastating effects on human livelihoods. Impact of floods is more pronounced in low-lying areas due to rapid growth in population, poor governance, decaying infrastructure and lack of proper environmental planning and management. Flooding is also exacerbated by climate change and inadequate preparedness. Damage and lose from floods are mostly the consequences of urbanization without corresponding infrastructural restructuring Brooks (2003). Flooding, as one of the most frequent and widespread of all environmental hazards and of various types and magnitudes, occur in most terrestrial portions of the globe, causing huge annual losses in terms of damage and disruption to economic livelihoods, businesses, infrastructure, services and public

health. Long term data on natural disasters suggest that floods and wind storms (which frequently lead to flooding) have been by far the most common causes of natural disaster worldwide over the past 100 years Ahern, Few, Matthias and Kovats (2004).

Worldwide, there has been rapid growth in number of people killed or seriously impacted by flood disasters (UN-Water, 2011). Indeed, the amount of economic damages affects a large proportion of people in low-lying coastal zones or other areas at risk of flooding and extreme weather condition. According to UN-Water (2011)floods, including urban flood is seen to have caused about half of disasters worldwide, and 84% disaster deaths in the world was attributed to flooding. Askew (2009) reiterated that floods cause about one third of all deaths, one third of all injuries and one third of all damage from natural disasters. According to the International Federation of Red Cross and Red Crescent Societies, in 10 years from 2003 to 2002 flood disasters affected more people across the globe (140 million per year on average) than all the other natural or technological disasters put together (IFRC, 2003);with an increasingly urbanizing world, flood disasters are reportedly increasing in urban areas and particularly negatively impacting on poor people and urban development in general Alam, Herson, and O"Donnel, (2008).

Hendersons (2004) study of vulnerability to the impact of flood in developing countries revealed that the level of risk and vulnerability in urban areas of developing countries is attributable to socio-economic stress, aging and inadequate physical infrastructure. Indeed, according to Satterthwaite et al (2007), hundreds of millions of urban dwellers have no all-weather roads, no piped water supplies, no drains and no electricity supplies; they live in poor-quality homes on illegally occupied or sub-divided land, which inhibits any investment in more resilient buildings and often prevents infrastructure and service provision.

However, according to Mantua and Lebel (2005), climate change and poor drainage system compounds the existing challenges of managing floods review of climate change impacts on urbanization by the international institute of environment and development Huq, Kovat, Reid and Satterthwaitte, (2007) found that the floods are already having severe impacts on cities, smaller urban centers and rural areas in many African Nations. Examples cited include floods in

Mozambique in 2000, which displaced around 4000 people in Maputo alone and crippled transport networks, breaking market links Christie and Hanlon (2001); heavy rains in East Africa in 2002 that brought floods and mudslides and forced tens of thousands to leave their homes in Rwanda, Kenya, Burundi, Tanzania and Uganda Huq et al. (2007). More common, but less often reported, such as the many small floods that affect neighborhoods in cities and small towns such as the 2nd June, 2003 storm that led to flooding in the western region of the Gambia destroying houses in Darsilameh village and affecting 300 people (IFRC, 2003).

2.1.5 Solutions to the problems of flooding

It has been argued that to date, the challenge of addressing urban floods and reducing urban flood vulnerability has received little attention (Zevenbergen (2007). This is partly because in the traditional flood management approach, responses to mitigate urban fluvial and coastal flood risks have often been set outside the realm of the urban system (i.e. where confined to the catchment level), but also because responses at the city level were predominantly passive, using robust solutions such as urban defenses and increasing the capacity of major culverts. Adedeji et al., (2012) argued that the prevailing effects of climate change, particularly flooding affecting almost everything in cities demands urgent attention in form of environmental and infrastructure planning, effective policy, improved and effective management of ecological fund, enhanced environmental disaster insurance, effective professional practice, enhanced public enlightenment programmed, integration of environmental planning and education to curriculum of schools at all levels, capacity building towards adaptation and mitigation of climate change impact. It also argued for the need to reinvent Nigerian cities through good governance towards creating sustainable cities in the country. The following major bottlenecks have been identified, which hamper the adoption and effective implementation of flood-risk management in urban planning practices according to Sz¨Oll¨Osi-Nagy and Zevenbergen (2005); lack of understanding of current and future risks and implications at the city scale, lack of long-term planning, poorly integrated and comprehensive planning, and inadequate controlling roles of local and regional authorities, and the conservative nature of the building sector.

Urban environments are complex - socially, economically and physically. This complexity multiplies the risk which comes from increasing poverty and inequality and failures in governance, high population density, crowded living conditions and the sitting of residential areas close to hazardous industry or in places exposed to natural hazard (including the modification of environments which generates new hazard, e.g. through the loss of protective mangroves to urban development, or subsidence following ground water extraction) Pelling (2008). This combined with the cumulative nature of many environmental problems, makes it difficult to identify causal relationships when considering risk and vulnerability Oelofse (2002). Urban risk and vulnerability need to be understood in terms of the nature of risk, the causal mechanisms that shape people's response to them and the contingent conditions that provide the context within which they occur. Many risk problems sit at the interface of the natural and social environment, such as flooding, which occurs as the result of the inadequate provision and maintenance of drainage systems, the location of people on marginal sites, and the physical characteristics of an area Oelofse, (2002) and Olufemi (2008). Infrastructure is one of the indispensable elements in the process of urbanization and emergence and continuity of an urban growth. It is considered as motor/engine for economic development Olufemi (2008). In situations where urbanization is not matched with corresponding urban infrastructure, hazards such as flood disaster are often inevitable. This is largely responsible for flood incidences in Nigeria. It is even made worst as by nature it is complex events caused by a range of human vulnerabilities, inappropriate development planning and climate variability Olufemi (2008).

One major aspect of urban problem with respect to housing is the poor state of the infrastructures Sule (2007). Urban infrastructure and housing provision are interwoven. Without infrastructures, housing cannot be sustainable and hence should be treated integrally Sule (2004). An ideal urban neighborhood should be provided with good roads, drainage networks, electricity and portable water supply, good waste management system and security. The condition of these services in Nigeria urban neighborhoods contradicts the principle of sustainability in urban housing Aderamo (2008).

However, flooding in most Nigerian cities is a major environmental challenge that has continued to defy solution as more people are rendered vulnerable to hazards involved. The implications of

recent flooding in Nigerian cities include among others; loss of life and properties, spread of diseases, deformed livelihoods, assets and infrastructure.

Community has different perceptions on disaster and develops different efforts to overcome the floods. The capacities to cope with the disaster impact is however different depending on social groups; poor and rich, men and women, young and old, indigenous or nonindigenous, etc. Many have struggled to relocate out of their flood-prone neighbourhoods to better areas without success mostly due huge cost of rent. Being located in the flood-prone area, majority of the people are aware of the danger involved and they have tried to protect and cope with flood effects. There are many ways or of coping mechanism employed by the local people to deal with the negative impact of flood.

The provision of drainages in most parts of 6 communities under study is inadequate both in number and in sizes. This is evident in the incessant reports of flood events in the city. In addition, where drainages are provided, unapproved structures are erected in the storm water right-of-way Sule (2009). These unsustainable growths remain a major factor of flood occurrence in most parts of Calabar. From the literature reviewed, it is generally observed that most of the studies looked at the qualitative aspect of drainage network inadequacies and flood events; Aderogba (2012) described such an approach as journalistic and non-quantitative, being superficial and lack directions for professionals and policy makers.

2.1.6 Drainage designs problems

Urban drainage system issues are also generated by improper design of these systems. This is attributed to the variance created in rainfall distribution patterns faced by the developing countries as a result of global warming Silveira (2001). Most of these drainages were designed with basic hydraulic formula without considering this variance thereby ending up not solving flood cases in these areas. More emphasis has to be made to producing homegrown methods that are related to these areas rather than depending on this formula or assumptions already in use in the developing countries because we have different catchment characteristics. Also, roof catchment methods of rain water collection should be encouraged to reduce peak flows of runoff that should have entered this drainage. There is so much reliance on hydrological data in

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2.2. Theoretical framework

2.2.1 The General System Theory

The General System Theory Conceptually, the Von Ludwig Bettalanffy"s (2001) General System Theory provides an appropriate framework for comparing the mutual interdependence of land policies, sustainable development and integrated land use management systems. The centripetal nature of the growth of cities creates intense pressure on the economic and spatial structure of urban system which includes service facilities comprising hospitals, educational institutions, housing, transport, telecommunication systems, drainage network systems and energy supply Ratclif (2003).

Since the provision of these facilities tend to be at rate slower than that of the growth of the urban population in developing countries, a wide margin between the demand and supply of urban infrastructural facilities and services is created Olayiwola (2006) Appropriate management of drainage systems requires knowledge relating to the system boundary, system resources, interactions between adjacent systems and allowable limits, or thresholds, for each resource. Each of these elements will be unique to the particular system under consideration, and each system must be assessed on its own merits. However, this often is not the case in our urban centers. What obtains is the haphazard and mono-directional treatment of urban development. This non-conformity to the systems approach in urban planning and development is major factor accounting for recurrent flood disasters in towns and cities of Nigeria.

In many developing countries, effective and efficient land use planning and management is not well established. The most patent manifestation of this is the chaotic state of land use systems in the cities. Rapid rates of urbanization have resulted in unplanned and unregulated growth on land. Significantly, the acquisition and development of land is the basis of physical growth Agboola (2002).

The development control process is subject to plans, regulations and laws. The manifestation of ineffectiveness of the control processes in cities derives to a large extent from the planning, the regulatory and administrative frameworks within which physical development takes place Sule (2010). Nigerian cities are reputed to be the dirtiest, most unsanitary, least aesthetically pleasing and dangerously unsafe for living (Agboola, 2002). They are characterized by non-functioning infrastructure facilities, most poorly governed, intensively dotted with illegal structures while physical growth and development of the cities had not been properly managed or controlled (Askew 2009). In brevity, Nigerian cities are developed without recourse to order especially the observed disconnect between population growth and infrastructural provision. Urban infrastructure can be generally defined as the set of interconnected structural elements that provide framework supporting an entire structure of development, it consist of basic physical and organizational structures needed for the operation of a society or enterprise that provides services essential to enable, sustain, or enhance societal living conditions (Brooks, 2003; IPCC, 2007). Consequently, local policies on development should no longer be viewed in their isolationist

context, but within the broader framework of constraints and opportunities afforded by the 21st century information technology. As a common factor and denominator in the framing and execution of urban social and economic policies of nations, Ratclif (2003), was of the view that the allocation, use and management of land should be done to guarantee access and equity, which the Land Use Act (2008), aimed to achieve in Nigeria. Irrespective of the varying attributes of land, it is imperative that policies be directed towards urban land development to provide the cross-cutting for streamlining and aligning all the countervailing forces affecting its disbursement and management Raticlif, (2003).

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter is designed to describe the procedures adopted in this research. The procedures involve the following: research design, population of the study, experiments, sample and sampling techniques for questionnaire, instrumentation, validation of the instrument, administration of the instrument and data analysis techniques.

3.1   Research Design

This study will be employ survey research design to evaluate impact of poor drainage system and floods control in Nigeria. According to Nworgu (2006), survey research design insurance that a group of people or items is studied by collecting analyzing data from only a few people or items considered to be representative of the entire group. It uses a questionnaire to determine the opinions, preferences, attitudes and perceptions of people about issues that concern them. A survey design is suitable for this research because it is going to make use of a questionnaire to elicit information from the respondents.

3.2   Population of the Study

The population of the study consists of   about 134 respondents were selected based on their knowledge on impact of poor drainage system and floods control in Nigeria.

3.3 Sample and Sampling Techniques

A sample of 100 was selected out of the population of 134 as stated above for the purpose of the study.

3.4 Instrumentation

The instrument for this study is questionnaire constructed by the researcher which was drawn from the research questions. The questionnaire was coded.

3.5 Validation of the Instrument

The validation was determined by the expert judgment of the supervisor. The judgment were sought to guarantee that each of the items in the instrument measured what it was supposed to measure. The final draft was adjudged valid by project supervisor.

3.6 Administration of the Instrument

A total of 134 copies of the questionnaire will be administered to the respondents by hand and 134 were returned after the exercise.

3.7   Data Analysis Techniques

Data collected will be analyzed using frequency table, percentage and mean score analysis while the Pearson correlation method was used to test the formulated hypothesis using SPSS (statistical package for social sciences)

CHAPTER FOUR
DATA ANALYSIS AND INTERPRETATION
4.1. Introduction

This chapter deals with the presentation and analysis of the result obtained from questionnaires. The data gathered were presented according to the order in which they were arranged in the research questions, sample percentage and pie charts were used to analyze the demographic information of the respondents while the Pearson correlation method was adopted to test the research hypothesis.

4.2. Data analysis

Bio- data of respondents

Table 1 gender of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	65	65.0	65.0	65.0
	female	35	35.0	35.0	100.0
	Total	100	100.0	100.0	

Source: field survey, April, 2023.

Table1 above shows the gender distribution of the respondents used for this study.

Out of the total number of 100 respondents, 65respondents which represent 65.0percent of the population are male while the remaining 35 which represent 35.0 percent of the population are female.

Table 2 age range of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	15-19 years	15	15.0	15.0	15.0
	20-24years	10	10.0	10.0	25.0
	25-29years	25	25.0	25.0	50.0
	30-34 years	20	20.0	20.0	70.0
	above 34 years	30	30.0	30.0	100.0
	Total	100	100.0	100.0	

Source: field survey, February, 2023.

Table 2 above shows the age grade of the respondents used for this study.

Out of the total number of 100 respondents, 15 respondents which represent 15.0percent of the population are between 15-19 years.10 respondents which represent 10.0 percent of the population are between 20-24 years. 25 respondents which represent 25.0 percent of the population are between 25-29 years.20 respondents which represent 20.0 percent of the population are between 30-34 years while the remaining 30 respondents which represent 30.0 percent of the population are above 34 years

TABLES BASED ON RESEARCH QUESTIONS: IMPACT OF POOR DRAINAGE SYSTEM AND FLOODS CONTROL IN NIGERIA (A CASE STUDY OF ANAM COMMUNUNITY IN ANAMBRA EAST LOCAL GOVERNMENT AREA ANAMBRA STATE.)

Table 6 Poor drainage system has significant impact on floods control in Anam Anambra state, Nigeria.

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
strongly agree	30	30.0	30.0	30.0
agree	42	42.0	42.0	72.0
undecided	10	10.0	10.0	82.0
disagree	10	10.0	10.0	92.0
strongly disagree	8	8.0	8.0	100.0
Total	100	100.0	100.0	

Table 6 Poor drainage system has signif-icant impact on floods control in Anam Anambra state, Nigeria.
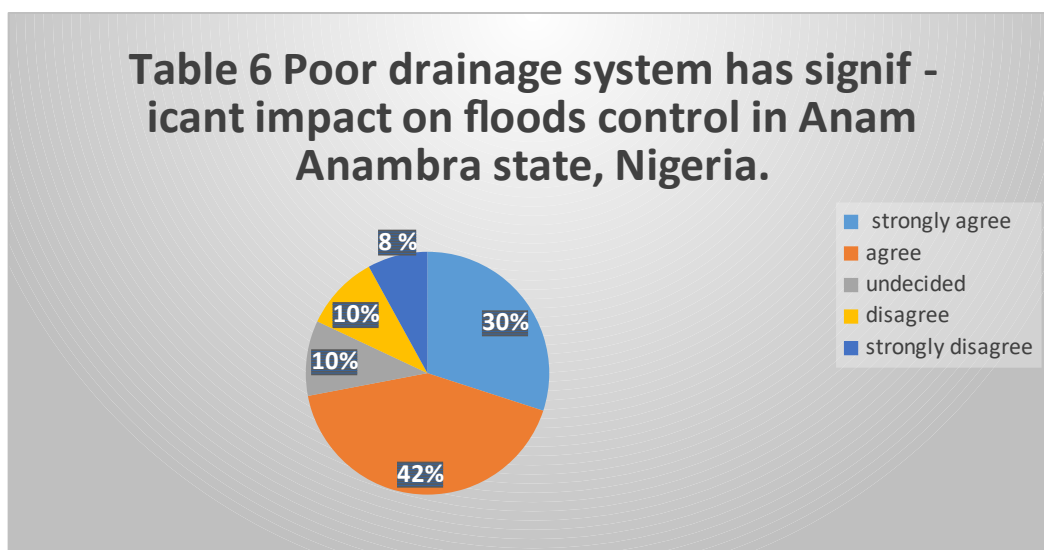
Source: field survey, February, 2023.

Table 6 shows the responses of respondents that poor drainage system has significant impact on floods control in Nigeria 30 respondents representing 30.0percent strongly agreed that poor drainage system has significant impact on floods control in Nigeria. 42 respondents representing 42.0percent agreed that poor drainage system has significant impact on floods control in Nigeria.10 respondents representing 10.0 percent were undecided.10 respondents representing 10.0percent disagreed that poor drainage system has significant impact on floods control in
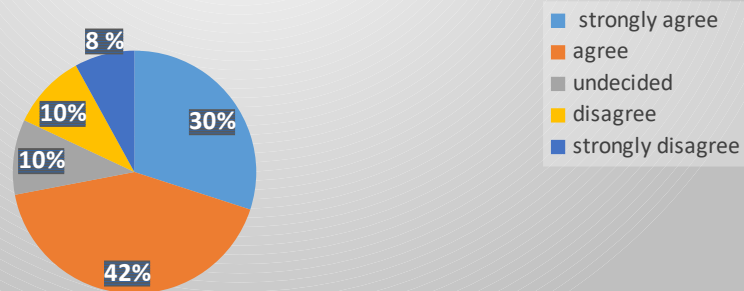
Anam community Anambra state, Nigeria. While the remaining 8 respondents representing 8.0 percent strongly disagreed that poor drainage system has significant impact on floods control in Anam community Anambra state, Nigeria.

NOTE: from table 6 above, we found out that most of the respondents were affirmative with the question being asked; we therefore conclude that poor drainage system has significant impact on floods control Anam community Anambra state, Nigeria.

Table 7 There is a significant relationship between drainage system and floods control in Anam Anambra state, Nigeria.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	10	10.0	10.0	10.0
	agree	15	15.0	15.0	25.0
	undecided	5	5.0	5.0	30.0
	disagree	40	40.0	40.0	70.0
	strongly disagree	30	30.0	30.0	100.0
	Total	100	100.0	100.0	

Table 7 There is a significant relationship between drainage system and floods control in Anam Anambra state, Nigeria.
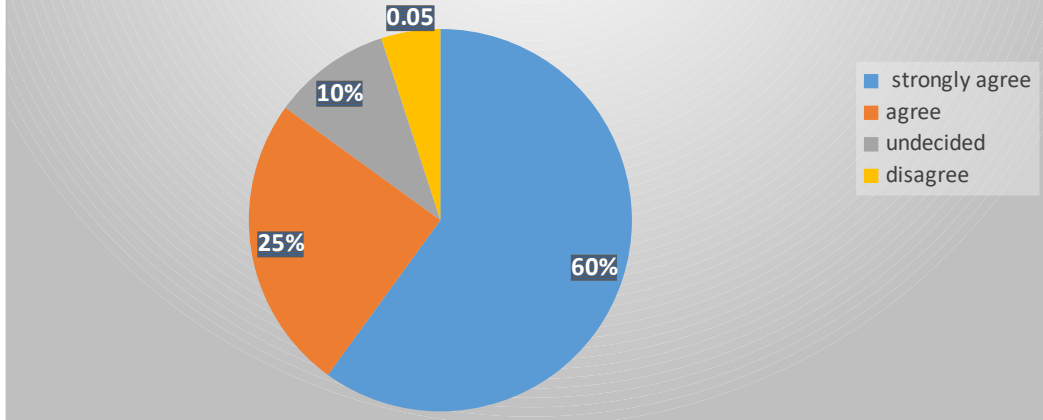
34

Source: field survey, February, 2023.

Table 7 show the responses of respondents that there is a significant relationship between drainage system and floods control in Nigeria. 10 of the respondents representing 10.0percent strongly agree that there is a significant relationship between drainage system and floods control in Nigeria. 15 of the respondents representing 15.0percent agree that there is a significant relationship between drainage system and floods control in Nigeria 5 of them representing 5.0percent were undecided.40 of the respondents representing 40.0 percent disagree that there is a significant relationship between drainage system and floods control in Nigeria. While the 30 of the respondents representing 30.0percent strongly disagree that there is a significant relationship between drainage system and floods control in Nigeria.

NOTE: from table 7 above, we found out that most of the respondents were affirmative with the question being asked; we therefore conclude that there is a significant relationship between drainage system and floods control in Nigeria.

Table 8 Lack of materials is one of the major factors affecting the nature of the drainage system in Anam Anambra state, Nigeria.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	60	60.0	60.0	60.0
	agree	25	25.0	25.0	85.0
	undecided	10	10.0	10.0	95.0
	disagree	5	5.0	5.0	100.0
	Total	100	100.0	100.0	

Table 8 Lack of materials is one of the major factors affecting the nature of the drainage system in Anam Anambra state, Nigeria.
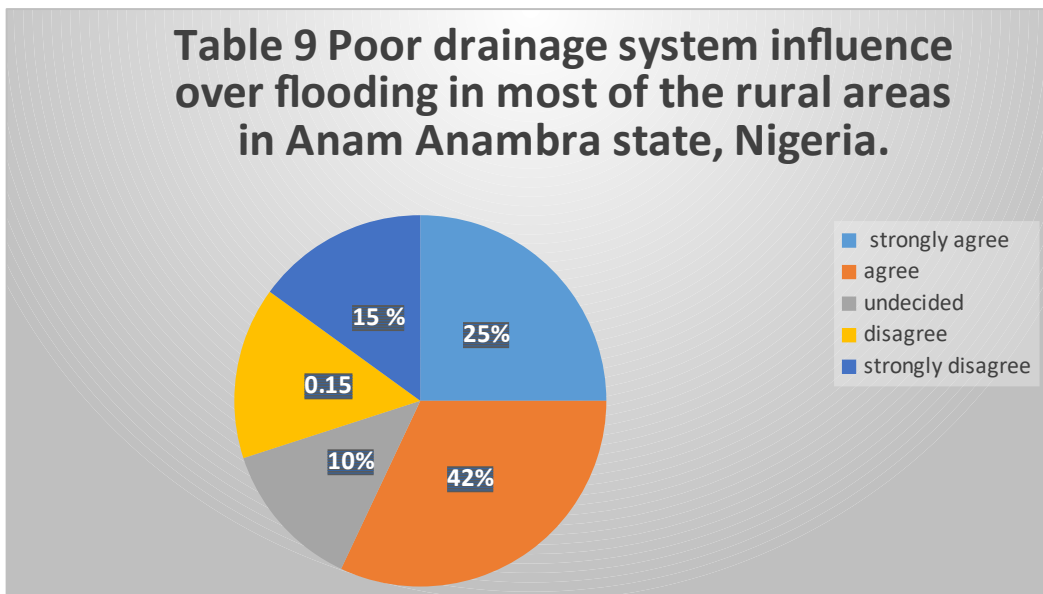

Source: field survey, February, 2023.

Table 8 show the responses of respondents that lack of materials is one of the major factors affecting the nature of the drainage system in Nigeria 60 of the respondents representing 60.0 percent strongly agree that lack of materials is one of the major factors affecting the nature of the drainage system in Nigeria. 25 of the respondents representing 25.0percent agree that lack of materials is one of the major factors affecting the nature of the drainage system Anam community Anambra state, Nigeria.10 of them representing 10.0percent were undecided While the remaining 5 of the respondents representing 5.0percent disagree that lack of materials is one of the major factors affecting the nature of the drainage system in Nigeria.

NOTE: from table 8 above, we found out that most of the respondents were affirmative with the question being asked; we therefore conclude that lack of materials is one of the major factors affecting the nature of the drainage system in Nigeria.

Table 9 Poor drainage system influence over flooding in most of the rural areas in Anam Anambra state, Nigeria.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	25	25.0	25.0	25.0
	agree	32	32.0	32.0	57.0
	undecided	13	13.0	13.0	70.0
	disagree	15	15.0	15.0	85.0
	strongly disagree	15	15.0	15.0	100.0
	Total	100	100.0	100.0	

Table 9 Poor drainage system influence over flooding in most of the rural areas in Anam Anambra state, Nigeria.

Source: field survey, February, 2023.

Table 9 shows the responses of respondents if poor drainage system influence over flooding in most of the rural areas in Nigeria

25 of the respondents representing 25.0percent strongly agree that poor drainage system influence over flooding in most of the rural areas in Nigeria. 32 of the respondents representing

32.0 percent agree that poor drainage system influence over flooding in most of the rural areas in Nigeria.13 of the respondents representing 13.0percent were undecided. 15 of the respondents representing 15.0percent disagree that poor drainage system influence over flooding in most of the rural areas in Nigeria.

While the remaining 15 of the respondents representing 15.0percent strongly disagree that poor drainage system influence over flooding in most of the rural areas in Nigeria.

NOTE: from table 8 above, we found out that most of the respondents were affirmative with the question being asked; we therefore conclude that poor drainage system influence over flooding in most of the rural areas in Nigeria.

Table 10: The rate of flooding in Nigeria is seasonal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	65	65.0	65.0	65.0
	agree	30	30.0	30.0	95.0
	disagree	3	3.0	3.0	98.0
	strongly disagree	2	2.0	2.0	100.0
	Total	100	100.0	100.0	

Table 10: The rate of flooding in Nigeria is seasonal
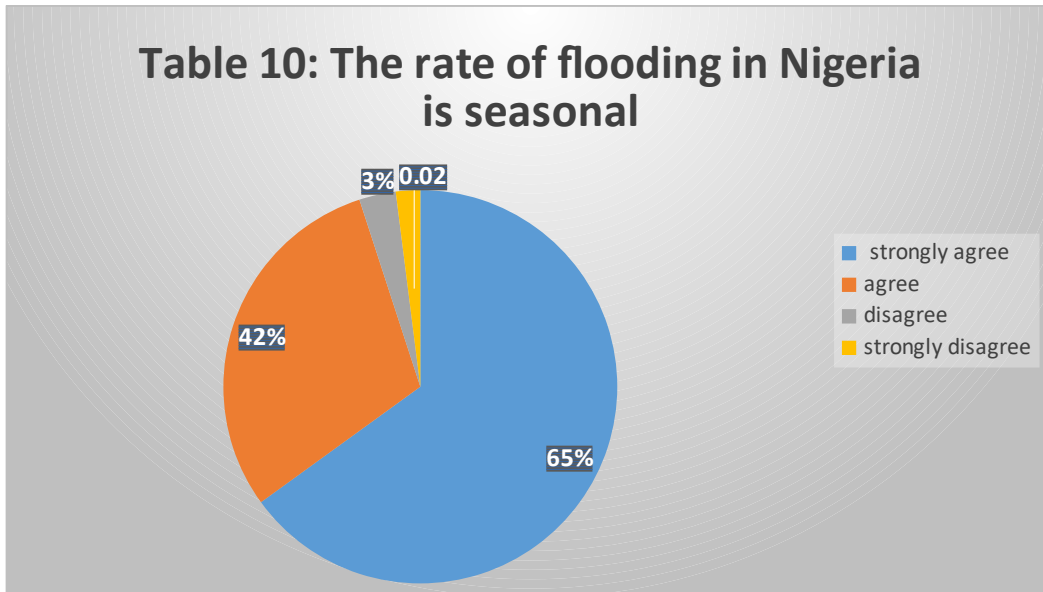
Source: field survey, February, 2023.

Table 10 show the responses of respondents if the rate of flooding in Nigeria is seasonal, 65 of the respondents representing 65.0percent strongly agree that the rate of flooding in Nigeria is seasonal. 30 of the respondents representing 30.0percent agree that the rate of flooding in Nigeria is seasonal.3 respondents representing 3.0percent were undecided. 3 of the respondents representing 3.0percent disagree that the rate of flooding in Nigeria is seasonal.2 of the respondents representing 2.0 percent strongly disagree that the rate of flooding in Nigeria is seasonal.

NOTE: from table 8 above, we found out that most of the respondents were affirmative with the question being asked; we therefore conclude that the rate of flooding in Nigeria is seasonal.

4.3 Research hypothesis

Hypothesis

H_{O1}: Poor drainage system has no significant impact on floods control in Nigeria.

Hi: Poor drainage system has significant impact on floods control in Nigeria.

Level of significance (α=0.05)

Decision Rule

In taking decision for "r", the following rules shall be observed;

i)   If the value of "r" tabulated is greater than "r" calculated, accept the alternative hypothesis (H_1) and .reject the null hypothesis (H_0).

ii)   If the "r" calculated is greater than the "r" tabulated, accept the null hypothesis (H_0) while the alternative hypothesis is rejected

Table 14

Correlations

		Poor drainage system has significant impact on floods control in Nigeria	There is a significant relationship between drainage system and floods control in Nigeria
Poor drainage system has significant impact on floods control in Nigeria	Pearson Correlation	1	.819**
	Sig. (2-tailed)		.000
	N	100	100

There is a significant relationship between drainage system and floods control in Nigeria	Pearson Correlation	.819**	1
	Sig. (2-tailed)	.000	
	N	100	100

**. Correlation is significant at the 0.01 level (2-tailed).

4.4 Conclusion based on decision rule

From table 14 above, since the value of "r" tabulated is greater than "r" calculated, accept the alternative hypothesis (H_1) and reject the null hypothesis (H_0) and conclude that poor drainage system has significant impact on floods control in Nigeria

NOTE: There is a statistically significantly (0.00) strong relationship (0.819) between the responses of the respondents that said that poor drainage system has significant impact on floods control in Nigeria and those that said that there is a significant relationship between drainage system and floods control in Nigeria

CHAPTER FIVE
SUMMARY CONCLUSION AND RECOMMENDATION

The main aim of the research is to examine the impact of poor drainage system and floods control in Nigeria. The study found out that poor drainage system has significant impact on floods control in Nigeria, there is a significant relationship between drainage system and floods control in Nigeria, lack of materials is one of the major factors affecting the nature of the drainage system in Nigeria, poor drainage system influence over flooding in most of the rural areas in Nigeria and the rate of flooding in Nigeria is seasonal.

5.1 conclusion

In conclusion poor drainage system and soil properties has significant impact on floods control in Nigeria. The result of the data analysis shows that there is a statistically significantly strong relationship between the responses of the respondents that said that poor drainage system has significant impact on floods control in Nigeria and those that said that there is a significant relationship between drainage system and floods control in Nigeria.

5.2 recommendation

The study recommends that:

1. The federal government in collaboration with state government should improve on the construction of drainage.

2. The federal government of Nigeria should assist the state government in the construction of drainage and good road in order to minimize the rate of flood.

3. The state government should encourage most of the manufacturing companies to assist in building roads that leads to their various companies.

4. The construction of the road should be monitored and should ensure that soil tests are carried to accurately understand the soil properties at those area susceptible to flooding.

5. The state government in collaboration with the Nigeria hydrological service agency (NIHSA) should collect data that will help in the construction of adequate drainage system.

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APPENDIX

QUESTIONNAIRE ADMINISTRATED

INSTRUCTION: Please endeavor to complete the questionnaire by ticking the correct answer (s) from the options or supply the information where necessary.

1. Gender
   a. Male ☐
   b. Female ☐
2. Age range
   a. 20-30
   b. 31-40 ☐
   c. 41-50 ☐
   d. 51-60 ☐
   e. Above 60 ☐
3. Educational qualification
   a. PSLC
   b. WASSCE/GCE/NECO ☐
   c. OND/HND/BSC ☐
   d. MSC/PGD/MBA/PHD ☐
   e. Others
4. Years of experience ☐
   a. 0-2ys ☐
   b. 3-5yrs ☐
   c. 6-8yrs ☐

d. 9-11yrs ☐

e. 11-13yrs ☐

f. Above 13yrs ☐

SECTION B: QUESTIONS ON IMPACT OF POOR DRAINAGE SYSTEM AND FLOODS CONTROL IN NIGERIA (A CASE STUDY OF ANAM COMMUNUNITY IN ANAMBRA EAST LOCAL GOVERNMENT AREA ANAMBRA STATE.)

1. Poor drainage system has significant impact on floods control in Anam Anambra state, Nigeria.

a. Strongly agreed ☐

b. Agreed ☐

c. Undecided ☐

d. Disagreed ☐

e. Strongly disagreed ☐

2. There is a significant relationship between drainage system and floods control in Anam Anambra state, Nigeria.

a. Strongly agreed ☐

b. Agreed ☐

c. Undecided ☐

d. Disagreed ☐

e. Strongly disagreed ☐

☐

3. Lack of materials is one of the major factors affecting the nature of the drainage system in Nigeria

a. Strongly agreed ☐

b. Agreed ☐

c. Undecided ▭

d. Disagreed ▭

e. Strongly disagreed ▭

4. Poor drainage system influence over flooding in most of the rural areas in Anam Anambra state, Nigeria.

a. Strongly agreed

b. Agreed ▭

c. Undecided ▭

d. Disagreed ▭

e. Strongly disagreed ▭

5. The rate of flooding in this Anam community is seasonal

a. Strongly agreed ▭

b. Agreed ▭

c. Undecided ▭
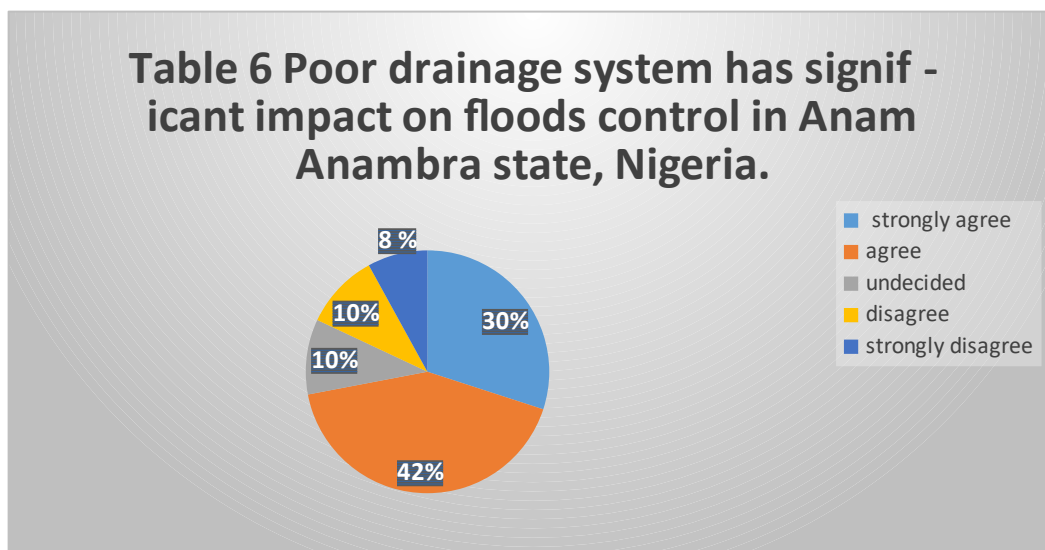
d. Disagreed ▭

e. Strongly disagreed ▭

Table 6 Poor drainage system has significant impact on floods control in Anam Anambra state, Nigeria.

Valid				Cumulative
	Frequency	Percent	Valid Percent	Percent
strongly agree	30	30.0	30.0	30.0
agree	42	42.0	42.0	72.0
undecided	10	10.0	10.0	82.0
disagree	10	10.0	10.0	92.0
strongly disagree	8	8.0	8.0	100.0
Total	100	100.0	100.0	

Table 6 Poor drainage system has signif - icant impact on floods control in Anam Anambra state, Nigeria.
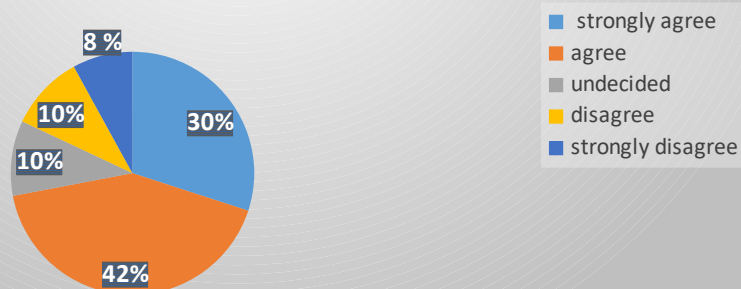
Source: field survey, February, 2023.

Table 7 There is a significant relationship between drainage system and floods control in Anam Anambra state, Nigeria.

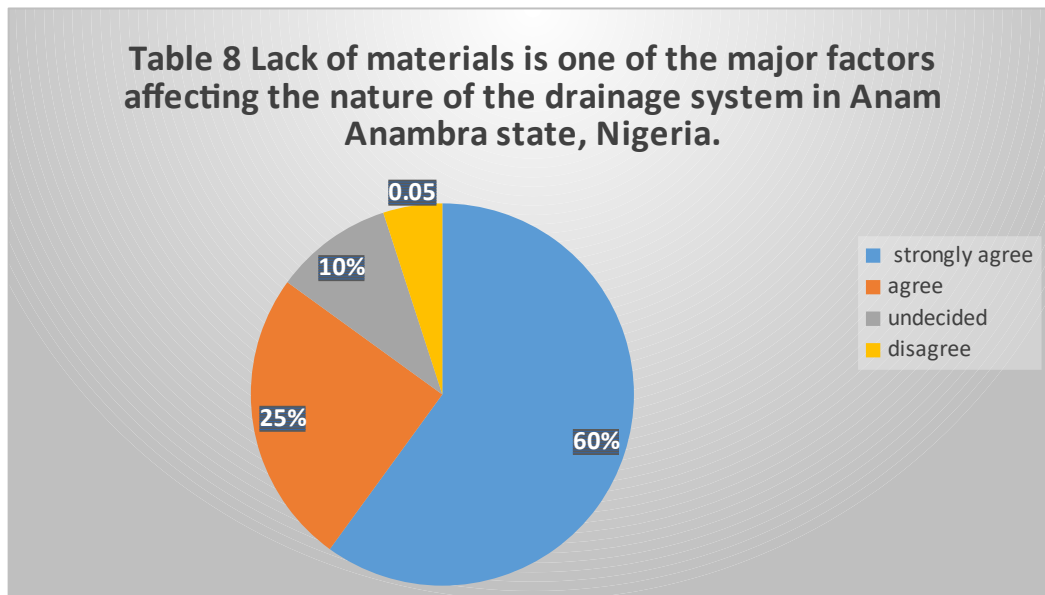|		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	10	10.0	10.0	10.0
	agree	15	15.0	15.0	25.0
	undecided	5	5.0	5.0	30.0
	disagree	40	40.0	40.0	70.0
	strongly disagree	30	30.0	30.0	100.0
	Total	100	100.0	100.0	

Table 7 There is a significant relationship between drainage system and floods control in Anam Anambra state, Nigeria.

8 % 10% 10% 30% 42%

strongly agree
agree
undecided
disagree
strongly disagree

Source: field survey, February, 2023.

Table 8 Lack of materials is one of the major factors affecting the nature of the drainage system in Anam Anambra state, Nigeria.
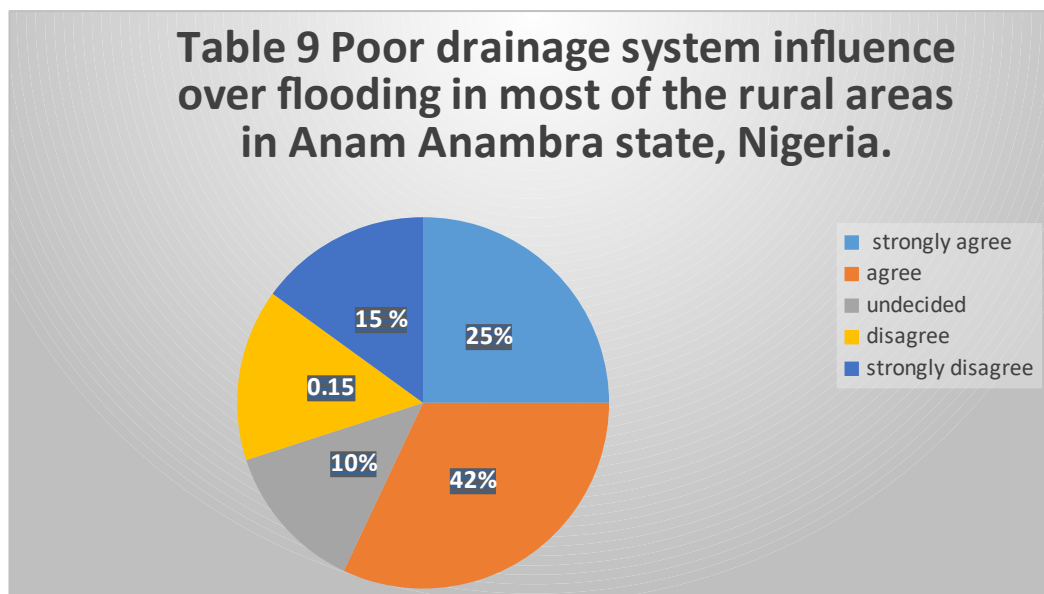
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	60	60.0	60.0	60.0
	agree	25	25.0	25.0	85.0
	undecided	10	10.0	10.0	95.0
	disagree	5	5.0	5.0	100.0
	Total	100	100.0	100.0	

Source: field survey, February, 2023.

Table 9 Poor drainage system influence over flooding in most of the rural areas in Anam Anambra state, Nigeria.
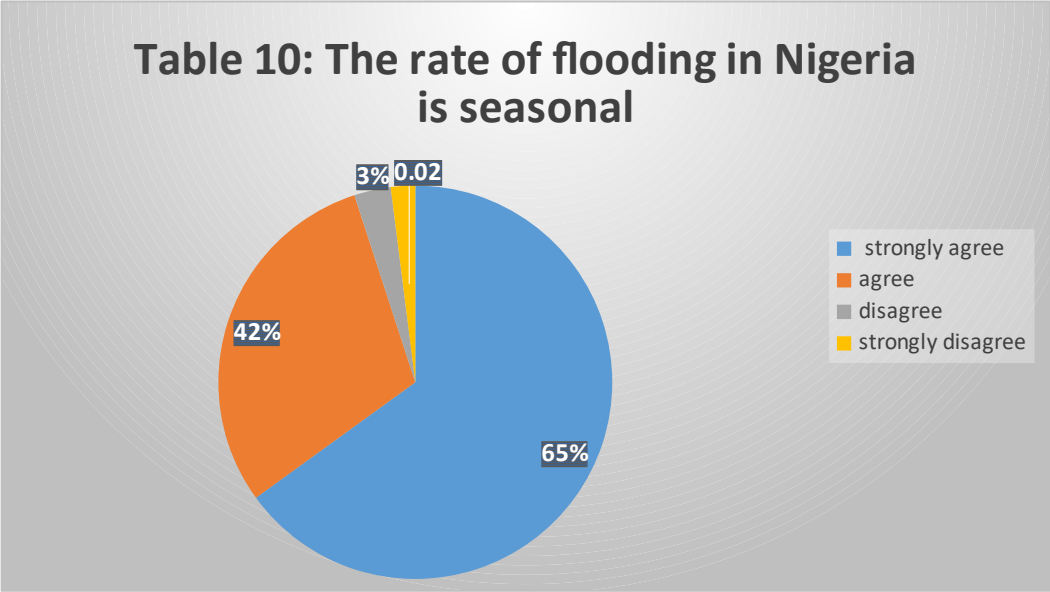
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	25	25.0	25.0	25.0
	agree	32	32.0	32.0	57.0
	undecided	13	13.0	13.0	70.0
	disagree	15	15.0	15.0	85.0
	strongly disagree	15	15.0	15.0	100.0
	Total	100	100.0	100.0	

Source: field survey, February, 2023.

Table 10: The rate of flooding in Nigeria is seasonal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	65	65.0	65.0	65.0
	agree	30	30.0	30.0	95.0
	disagree	3	3.0	3.0	98.0
	strongly disagree	2	2.0	2.0	100.0
	Total	100	100.0	100.0	

Table 10: The rate of flooding in Nigeria is seasonal

Source: field survey, February, 2023.