CAUSES OF FLOODING IN EGOR LOCAL GOVERNMENT, EDO STATE

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BEING A RESEARCH WORK SUBMITTED TO THE DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING, FACULTY OF SOCIAL SCIENCES UNIVERSITY OF BENIN, BENIN CITY, NIGERIA.

IN PARTIAL FULFILMENT OF THE REQUIRREMENTS FOR THE AWARD OF BACHELOR OF SCIENCE (B.SC) DEGREE IN GEOGRAPHY AND REGIONAL PLANNING

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CERTIFICATION

This is to certify that this project work was written by Toweh David with matriculation number SSC1608163 of the Department of Geography and Regional Planning, University of Benin, Benin City.

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DEDICATION

I want dedicate my project work to God almighty for his mercy and grace upon me and strength to see through to the end.

ACKNOWLEDGEMENTS

Primarily I want to thank God for being able to complete my project with great success.

I will like to also thank my supervisor Mr. Asarobo whose valuable guidance, has been of help to me to patched this project and make it a full proof success through his suggestion and instruction as the major contributor towards the complexion of the project.

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Lastly but not the least I will like to thank all my wonderful course mate in the person Paul, and many I can't mention, also to my course lecturers of our great department public administration and to my fellow comrades thank you all for your support and love also for making the journey a smooth one for me.

TABLE OF CONTENTS

CHAPTER FOUR: DATA PRESENTATION AND ANALYSIS

CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSION AND SUGGESTIONS FOR FURTHER STUDIES

ABSTRACT

This study investigated the causes of flooding in Egor Local Government Area. In carrying out this study questionnaire were sorted using SPSS version 21. The result from this research work revealed that there are both physical and anthropogenic causes of flood in Egor Local Government Area from respondents perception. The physical causes in their order of importance include: heavy rainfall, lack of vegetal cover, topography (low-lying areas etc). amongst others. While the anthropogenic or human-induced causes in their order of severity include: increase in built-up areas (urbanization), poor drainage system, blockage of drainage system with debris and so on. This research approach which is purely descriptive or exploratory in nature has indeed create robust awareness on the human-base activities and the physical factors responsible for the flood problem in the study area Thus, this study saw the need to adopt some measures such as adequate drainage system provision, proper refuse disposal system, creating environmental awareness, raising building foundation in low lying areas, and so on to prevent, control and mitigate the causes of flood in the study area . Undoubtedly, this study is an eye opener to residents, leaders, planners within the study area and may also provide vital information and guide to researchers and government on the causes of flood in Egor Local Government Area of Edo State, Nigeria.

CHAPTER ONE

1.0 Introduction

A flood is a natural occurrence that can have far-reaching consequences for both people and the environment. Simply put, a flood is an accumulation of water in the 'wrong' place (Obeta,2014). Flooding is most commonly caused by heavy rain fall when natural water courses are unable to convey excess water. Floods, and also are always triggered by heavy rainfall (Edward, 2007). Floods have posed a significant risk to people's lives and property all over the world. Floods account for roughly one-third of all fatalities, one-third of all injuries, and one-third of all natural disaster damage (Askew, 2007).

It has been shown that the removal of natural vegetal cover from a forested area during construction work can lower the level of infiltration to a point where rainfall intensity becomes higher (Dunne and Leopold, 1978). In an urbanizing environment, the infiltration capacity is furtherly reduced by the replacement of the natural bare surfaces with impervious urban surface. This in turn increase the volume or level of overland flow which if not adequately accommodated by the existing storm drains, it can result to flooding condition, especially in areas of depression or low lying terrain. In the rural settings, the infiltration capacity seems to be higher intrinsically because of the relative availability of more natural bare surface for precipitation or rain water to infiltrate into the Sub-surface.

Flood is triggered by a combination of heavy rainfall and river/ocean overflow, and it can occur at any time of year, not just during the rainy season. Floods usually occur over a period of days when there is insufficient rain water to fit in the rivers and the water spreads over the surrounding land (the flood plain). They can, however, occur extremely fast (Adeaga, 2008).

When a large amount of heavy rain falls in a short period of time, these "flash floods" occur with little or no warning and result in the greatest loss of human life of any type (Egunjobi, 2007).

Coastal areas are also vulnerable to sea flooding, which occurs when storms and large waves bring seawater onto land. The worst flooding may occur when storms,'spring tides,' and low atmospheric pressure all combine. The situation is similar in Nigeria, where a number of floods have been recorded in major towns and cities. The cause of urban flooding is indiscriminate dumping of refuse, encroachment on, and poor channelization of drainages, combined with excessive rainfall. It has also been observed that unscrupulous human activities along flood plains contribute to flooding (Fadairo and Olarewaju, 2009). According to Adebayo (2006), the danger of flooding to lives and property is now an annual event in many countries' urban centers.

Flooding is extremely dangerous; only 15cm of fast-flowing water is required to knock you off your feet! Floodwater can severely disrupt public and private transportation by cutting off roads and railway lines, as well as communication links when phone lines are damaged. Floods disrupt normal drainage systems in cities, and sewage spills, along with standing water and wet materials in the home, pose a serious health risk. Bacteria, mold, and viruses spread disease, cause allergic reactions, and damage raw material long after a flood (Onokerhoraye, 2008; Nwaubani, 2010).

Again, large amounts of fast flowing water can erode soil, destroying crops, destroying agricultural land/buildings, and drowning farm animals. Severe floods not only destroy homes and businesses and personal property, but the debris left behind causes additional damage to

property (Adeaga, 2008). When a business is damaged, toxic materials such as paints, pesticides, and gasoline are accidentally released into the environment and wildlife.

1.1 Statement of Research Problem

Flood control and prevention have received a lot of attention since the dawn of civilization in the developed world. Flooding, on the other hand, has continued unabated in developing countries such as Nigeria (UNESCO, 2009). Floods cause damage due to the immense power of moving water and the deposition of dirt and debris when floodwaters recede (Akinyemi, 2009).

People who have never experienced a flood may have a naive understanding of the dangers of moving water. The energy associated with moving water grows as the square of its speed; when the speed doubles, the energy associated with it grows by a factor of four (Kabiru, 2009). Flooding is typically defined as too much water moving too quickly, due in part to the weight of an increased amount of water upstream, which causes an increase in the pressure gradient that drives the flow (Olaniran, 2003).

Most flood damage is magnified by the debris carried by the waters: trees, vehicles, boulders, buildings, and so on. When the waters move quickly enough, they can sweep away everything in their path, leaving behind scenes of terrible destruction (Aderogba, 2012).

The effect of water on structures and the objects within them can be devastating: books, furniture, photographs, electronic equipment, and so on can be damaged simply by being immersed in water, even if they are not directly damaged by the water movement. Furthermore, floodwaters frequently contain suspended silt as well as potentially toxic microorganisms and dissolved chemicals (Okereke, 2007). This means that floods typically disrupt drinking water supplies, resulting in short-term shortages of potable water and additional long-term costs in

restoring drinking water service to flooded residents (Aderogba, 2012). When floodwaters recede, the mud and debris left behind can be costly to clean up and pose a health risk, especially if there are decomposing bodies of drowned wild and domestic animals in the debris (Adeaga, 2008).

Floods occur frequently in Egor local government area, both in urban and rural settings, making it an excellent case study for determining what causes them. Such a study will aid in the provision of critical information as well as strategic planning recommendations in order to prevent, control, and mitigate flood problems in Egor local government in particular and Nigeria in general.

The following questions are posed in light of the research problem statement:

i. What is the general public's opinion of flooding in the study area?
ii. What are the causes of flooding in the research area?
iii. Are there any flood mitigation measures in the study area?

1.2 Aim And Objectives Of The Study

The overarching goal of this research was to identify the causes of flooding in the Egor local government. The following are the study's objectives:

i. To investigate people's perceptions of flooding in the study area.
ii. Investigate the sources of flooding in the study area.
iii. To identify flood mitigation measures in the study area.

Even though hypothesis enables a researcher to better streamline the findings of a research process this study, this study is fundamentally exploratory in approach because there is no relationship factor in terms of dependent and independent variables. As a result, the findings of

this study will undoubtedly provide the foundation or substance for hypothesis testing in future research expedition in this area.

1.3 Scope Of The Study

The study's spatial scope is concentrated on identifying the causes of flood events in Egor local government area, Benin City, Edo state. Iguikpe and Iguediaye are rural communities, while Uwelu, Ugbowo, and Uselu are urban communities. The community selection is based on a random selection of communities in the Egor local government area.

1.4 Significance Of The Study

The research is significant because it evaluates the causes of flooding in the study area. The study also aims to determine people's underlying perceptions of flooding in Egor local government. More importantly, the study's findings are expected to be critical inputs in the development of short term and long-term mitigation strategies to reduce the impact of floods and the associated risks.

1.5 Study Area

1.5.1: Location

Egor local government is in Benin City, Nigeria, with its headquarters in Uselu. It is located between latitudes 60 44'N and 60 21'N, and longitude 50 44'E. The area is approximately 1125km2. The population of Egor Local Government Area was 340,287 in 2006, and it was projected to be 445,800 in 2016 during the most recent census (National Population Census, 2016). Egor is both urban and rural, and the study includes ten (10) geopolitical wards and registered streets (INEC, 2015), which include the following:

(1) Evbuotubu, (Evbuotubu road, Igbinedion and Ogbahon streets).

(2) Oliha, (Erhumwunse, Upper Erhumwunse, Omosede and Ediado streets).

(3) Ogida/Useh, (Igbinaduwa, Useh road, Okungbowa, and Ogunbor streets).

(4) Egor, (Siluko road, Osazuwa and Otokiti streets).

(5) Evbareke, (Textile Mill road, Alimele and Aghedo streets).

(6) Uwelu, (Uwelu road, Ojo, Ajayi and Okao street)

(7) Uselu1, (Mela road, Benin Technical Road, S and T, Edaiken primary school road and Odia streets).

(8) Uselu 2 (Good Samaritan, Medical Store Road, Ebo, Okiri and Iyase streets).

(9) Okhoro (Okhoro Road, Imade, Enoma and Eweka streets).

(10) Ugbowo, (Irowa, Obaze, Adolor, Nova road, Federal Girls Road and Lucky streets) (See Fig.1.1 below).

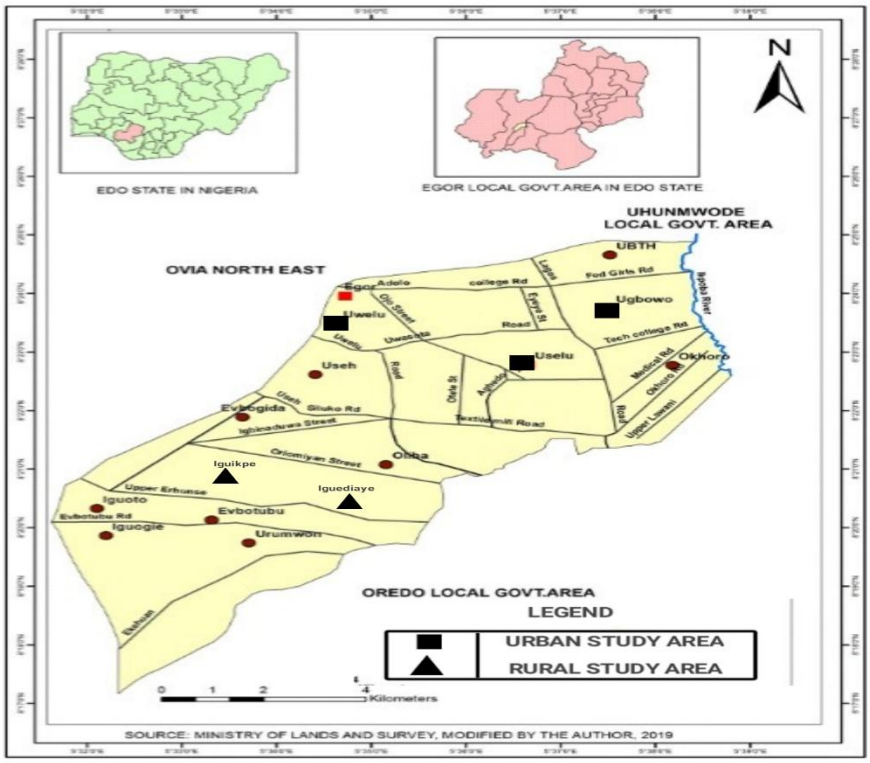


Figure 1: Egor local government Showing Study Locations Source: Compiled by the author using Google Earth Imagery (2022)

1.5.2 Economic Activities

The city hosts primary, secondary, and tertiary education. Primary activities include farming, mining, and so on, while secondary activities include manufacturing and processing, and tertiary activities include, among other things, health care, banking, educational services, and commercial activities. The city is well-known for bronze casting, wood carving, and other aspects of its rich cultural heritage. In the study area, there are several markets with different market days. Among the most important are Evbuotubu, Ugbiyioko, Oliha, EkiUwa, Ogida, Useh, Uselu, and Uwelu. The study area is made up of people from various religious and cultural backgrounds, but the majority of them are Christians.

1.5.3 Urban Economy And The Socio-Demographic Characteristics

Egor local government has been a draw for its administrative and commercial functions since its inception. The former Benin Empire, for example, was significant and was regarded as the center of the ivory, pepper, and slave trades. The artisan of the kingdom was well-known for his sculptures, ivory carvings, and bronze castings. These socio-demographic role and responsibilities still exist (though they are beginning to fade) in the modern era. After the 1960s, the city thrived on rubber, palm oil, yams, cassava, corn, and timber production. Rubber processing, sawmills, and breweries are the most important manufacturing industries. Since then, rubber processing and sawmills have declined, possibly due to the rapid decrease in rubber plantations and the decline of forestry equipment.

Benin's metropolis has evolved from agricultural-based socioeconomic activities to a diverse set of business and administrative functions supported by numerous financial institutions, education, health, and other business institutions. Financial institutions and transportation are critical components of the region's economic foundation. The region's demonstrated success in

the transportation sector (particularly interurban mobility) is attributed to its role as a hub. In short, the state dominates the economy in the formal sector and trade in the informal sector. The administrative role of the region as the administrative capital of Edo state encourages the establishment of government offices, ministries, and related agencies, making the government the primary employer of wage-earning jobs.

As a result, such temporary economic prosperity quickly engulfed population growth and composition. The current metropolis has a diverse population made up of residents and migrants from other parts of the country. It was originally the birthplace of the Binis or the Edos. Between 1952 and 2006, the region experienced massive population growth (Onokerhoraye, 1977). Benin's population was 53,753 in 1952 and doubled to 100,694 in 1963, with an annual growth rate of 5.5%. It was estimated at 200,000 in 1972 (Doxiadis Associated, 1972), and 314.219 in 1976 according to a household survey (Sada, 1976). This estimate indicates an 8.5% growth rate between 1963 and 1976. The city's population was 801,622 in 1991. (NPC, 1991). The region's population increased to 1,085,676 in 2006. (NPC 2006). It has approximately 542,545 men and 544,337 women, with a higher proportion of the population aged 0 to 29. (NPC, 2006).

1.7.4 Climate And Vegetation

The Inter-tropical Conversion Zone (ITCZ) influences the climate of Egor local government, making the sea winds and Sahara winds dustier and warmer (MFA 2018). These two opposing wind directions cause the annual West African monsoons, which lead to rainy season in northern Benin during the months of November and two rainy seasons in the southern regions from March to July and September to November. The majority of the country, in general, experiences temporary tropical conditions with less rainfall than other regions at the same

latitude, a climate known as the Benin variant (MFA 2018). The average temperature annually in Benin is 27° C, and the total annual rainfall is 1150 mm. The average temperature in Benin has risen by 1.1 degrees Celsius since 1960, and the average number of "hot" days per year has increased by 39 between 1960 and 2003, as have hot nights by 73. The annual frequency of "cold" days and nights, on the other hand, has decreased dramatically since the 1960s. Climate problems in the Egor lacal government have worsened since the late 1960s, resulting in a 180mm reduction in annual rainfall amplitude. Droughts also increased during the same time period, particularly in the 1970s (MFA 2018).

The majority of the vegetation in Egor local government is mangrove. Rubber plantations are gradually replacing the humid tropical forest of the Egor lowlands. In the southeast, the soil is low-productive sand, while in the northwest, the soil is fertile clay. The northern outskirts of the Esan Plateau are dominated by savanna vegetation, whereas the southern part is dominated by tropical forest with supplementary vegetation and elephant grass, owing to deforestation. Clayey or porous red sands are the soil types. Rubber and oil palm thrive in this climate. The northern plateau is covered in savanna vegetation, and oil palm grows wild. The soil is harsh in the higher elevations, but sandy near the Orle Valley.

CHAPTER TWO

CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

2.1 Introduction

This chapter discussed flooding concepts as well as the theoretical framework that guided this study. It also synthesizes the researcher's review of literature on the causes of flooding and mitigation measures in the Egor Local Government Area.

2.2 Conceptual Framework

2.2.1 The Concept Of Flooding

Flooding, according to Geoscience Australia (2013), is simply "water where it is not wanted." A flood is defined as water overflowing onto normally dry land. Flooding is frequently associated with heavy rainfall, but floods can occur in a variety of forms that are not specifically linked to ongoing weather events. As a result, a comprehensive description of flooding must include mechanisms that may have little or no relationship to meteorological events. Nonetheless, it is clear that the water involved in flooding fell as precipitation at some point, possibly a long time ago. No matter what particular event causes the flooding, the origins of flooding ultimately lie in atmospheric processes that produce precipitation.

It can also be defined as a situation that occurs when a normally dry part of the earth's surface is overwhelmed and surrounded with water as a result of heavy rainfall or the overflow of a water body. Among all natural hazards to which individuals are exposed, floods are the most common and widespread.

2.2.2: Storm Hydrograph

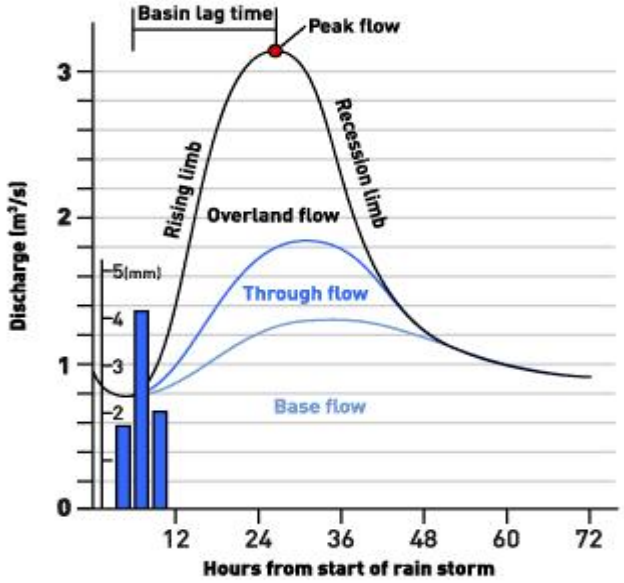


Figure 2: Showing storm hydrograph

The hydrograph is an urban hydrological diagram showing a water flow in a typical flood plain.

2.2.2: Hydrograph of Urban and Rural Run-Off

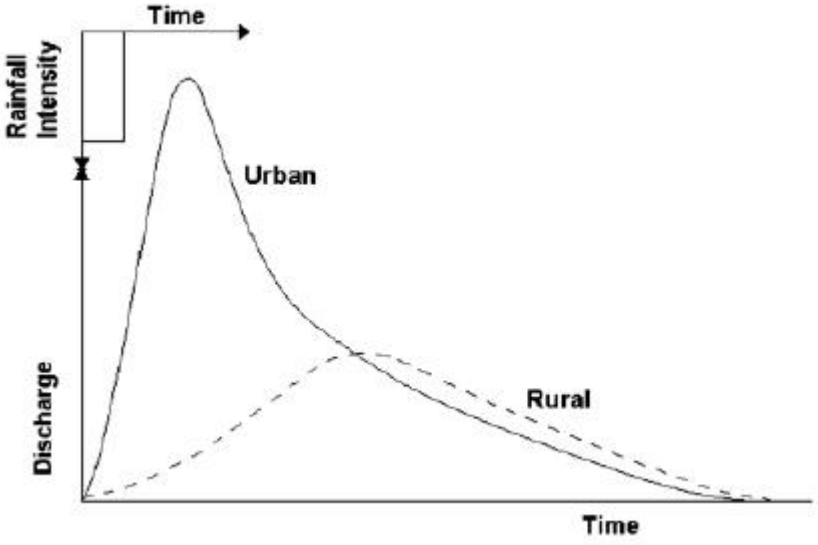


Figure 3: Showing the disparity in the degree of urban and rural run-off (which invariably determine the intensity of flooding in these two physical environment).

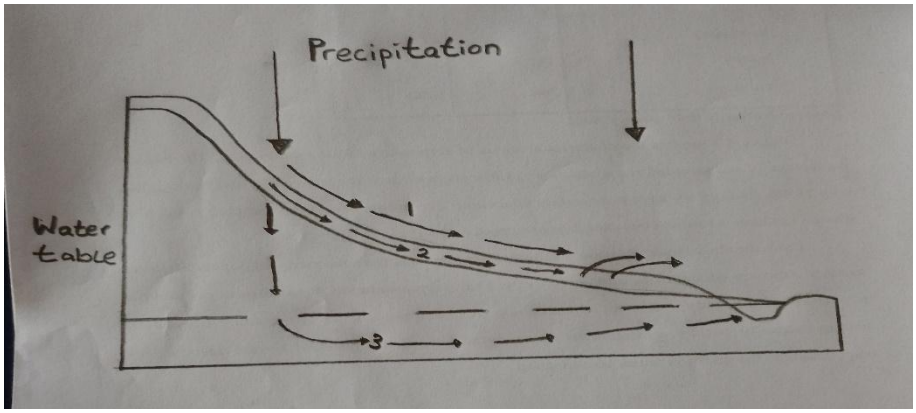
Plate 1.0 Urban Flooding Condition In The Study Area

Plate 2.0 Rural Flooding Condition In The Study Area

According to Agbonkhese et al. [2014], the main cause of flooding is excessive or heavy precipitation; other factors include climate change and anthropogenic activities. According to Komolafe et al. [2015], two natural causes are heavy downpours and river storms. Anthropogenic causes include burst water pipes, insufficient culverts, and dam overflow.

There is complete agreement that anthropogenic causes and climate change will increase the occurrence, extent, and severity of extreme weather-related events such as extreme rainfall or temperature and storms, among others that cause natural disasters such as floods. Echendu [2021] identified anthropogenic causes as the primary drivers of flooding in Nigeria and Ghana, exacerbated by heavy rainfall, but the effects of which can be mitigated through risk-management strategies and infrastructure planning.

According to Dilley et al. (2005), more than one-third of the world's land area is flood prone, affecting approximately 82 percent of the world's population. The reason for this is that most areas are located in the widespread geographical distribution of river flood plains and low-lying coasts, which have long attracted human settlement.



Source: Dunne and Ledpolo (1978)

Figure 4: Rain Water Paths

Path 1: Hortonian Overland Flow Model
Path 2: Subsurface Flow Model
Path 3: Saturation Overland Flow Model

A: Hortonian Overland Flow Model (Path 1)

Horton created the overland flow model (1945). The Horton overland flow is defined as overland flow that occurs when the intensity of rainfall is so high that not all of the water can infiltrate. This is determined by two critical variables: rainfall intensity and infiltration capacity. Rainwater will accumulate and fill all depressions on the soil surface. When rainfall intensity exceeds the maximum defining rate at which a soil in a specific condition can absorb rainfall. Increased rainwater will lead to the water in depression storage to spill over and run down slope as an irregular sheet of overland flow when the depression is full. In a small drainage basin with homogeneous soil properties. Horton overland flow will occur all over the basin at the same time.

$q = (i - f) a$

where q = overland flow discharge pre unit contour

i = the rainfall intensity after interception

f = the soil infiltration rate

a = the area drained per unit contour (length or distance of overland flow)

The equation implies that the amount of overland flow is proportional to the distance traveled, especially when rainfall intensity exceeds infiltration capacity. For various reasons, the Hortonian overland flow model has been criticized.

The absence of empirical evidence of widespread sheet flow over large areas of hillslopes is the first. Betson (1964) observed that, because soil infiltration capacity varies even in small basins, the area making a contribution Horton overland flow may be only a tiny fraction of the drainage basin.

Second, high rates of infiltration have been observed in humid regions with dense vegetal cover and deep soil cover. Horton overland flow does not occur on large areas of the landscape in most humid regions where infiltration capacity exceeds rainfall intensity. Percolating water instead flows downward to recharge the table, with some flowing downslope within the soil as through flow or subsurface flow to overwhelm the storm runoff hydrograph.

B: The Subsurface Flow Model (Path 2)

Subsurface storm flow was defined by Whipkey (1965) as underground storm period flow that attains the storm channel without accessing the general underground zone. To describe subsurface flow, Hewlett and Hbbert (1965) prefer the term translatory flow. They attributed this movement to the thickening of water films surrounding soil particles, as well as the development of a pulse in water flux as the saturated zone approached. Although Hewlett and Hibbert (1965) found that subsurface stormflow from hillsides is a major contributor to storm hydrographs at the Coweeta Forest Experiment Station in the Appalachian Mountains and other areas with deep very permeable soils, dune and Black (1970) questioned the role in other humid regions because the reaction of subsurface flow to rainfall was extensively attenuated by storage and transmission within the soil.

C: Saturation Overland Flow Model (Path 3)

When the water table is really close to the soil surface, rainstorms cause it to rise, causing water to emerge at the surface. Water will flow overland to the stream channel from this saturated surface. Musgrave and Horton refer to this type of runoff process as return flow (1964).

The velocity of saturation overland flow to the channel is one hundred times that of subsurface storm flow. As a result, stormflow hydrographs have higher peaks and much shorter lag times

than subsurface stormflow hydrographs. During a rainstorm, the areas that are first saturated, which are usually near the valley bottom, expand along valley flows and the lower portions of hillsides upslope, so that a larger area contributes saturation overland flow.

2.3 Literature Review

2.3.1 Causes Of Flooding

Many factors have been identified in the literature as contributing to floods.

In general, Oyeleye (2013) believes that unintentional urbanization leads to urban flooding. According to (Emeribeole, 2015), flood events in many Nigerian capital cities are primarily caused by residents' lack of awareness of environmental information, inadequate (or, in some cases, complete lack) of spatial information on flood prone areas, waste dump, and construction of buildings (both commercial and residential, including public offices) on river channels without adequate water flow measures.

According to Agbonkhese et al. (2014), heavy rainfall combined with poor human behavior in relation to the environment and a lack of drainage infrastructure in most Nigerian cities has resulted in hundreds of people being distressed and homeless as a result of floods. Similarly, Agbonkhese et al. (2013) observed that indiscriminate dumping of refuse on drainage channels leads to channel adjustment and poor drainage conditions, resulting in floods.

Floods in Nigeria are also caused by heavy rainfall, drainage blockages, and dam failures (Jeb and Aggarwal, 2008). Flooding is a common feature in Nigeria during urban flooding, which occurs in towns, on flat or low-lying terrain, particularly where little or no drainage provision has been made, or where existing drainage is blocked by municipal waste, refuse, and eroded soil sediments (Folorunsho and Awosika, 2001).

Excessive rainfalls caused by climate change have resulted in flooding in almost every part of the world over the years, claiming lives and property (Komolafe, et al., 2015). Climate change has been blamed for floods in some studies. According to Karley (2009), the main causes of Flooding in Ghana is caused by heavy rains, which cause massive run-off, resulting in floods. According to Criss (2009), the increasing frequency of flood events cannot be unrelated to climate change. While some scholars argue that the increasing flood is caused not only by extreme climate change, but also by the continued encroachment of people and properties in flood-prone areas, resulting in increased potential damage (Hooijer, et al.,2004). The ravaging floods of 2012, which devastated many Nigerian states, were also blamed on the release of water from the Lagos dam into the Benue River, as well as the Shiroro and Kanji dams, which released water into the Niger River, as well as climate change, which caused excessive precipitation (NEMA, 2012).

Furthermore, Komolafe et al. (2015) believe that floods are caused by both natural and anthropogenic factors; natural causes include heavy rainstorms and ocean storms along the coast, while human causes include burst water main pipes, a lack of effective drainage systems, dam failure, and spills. As there is little we can do to make nature obey "No to Ravaging Floods," and without a doubt, man is a major cause of flooding. As a result, man should exercise caution in his use of the environment, as human interaction with the environment will never be exonerated from the ravaging floods. Komolafe, et l., (2015). Floods can be concerned with or seen as a direct result of precipitation; therefore, when flood waters emerges directly from rainfall, atmospheric processes can be identified as being directly responsible for the event. That is, rainfall amounts far exceed the average for the affected area. Only when those rainfalls exceed the average can land that is normally dry be affected,

resulting in a flood. As a result, the rainfall amounts required for floods cannot be specified in absolute terms (Schanze, 2006).

A rainfall event that creates flood in one location may be completely within the bounds of what is normal in another. In general, the threshold for flood-producing rainfalls rises as a region's annual average rainfall rises (Akintola,1994).

2.3.2 Effects Of Flooding

Flooding is an environmental hazard that occurs on a yearly basis in various parts of the country and is frequently featured in local and national news. While many floods cause little damage and are quickly forgotten except by those who are directly affected, others can cause major disasters involving structural adjustments, erosional damage, disruption of socioeconomic activities, transportation, communication, and loss of life and property. People being displaced, agricultural land being destroyed, and food, water, and the environment in general being contaminated Burton and Kates (1972) observed that in the United States of America, man loses a lot of property to flooding every year. Lake (1976) also noted that the flood on August 12 in south-eastern Scotland damaged railways and roads. He stated once more that the flood destroyed seven mainlines, railway bridges, and several road bridges.

In addition, Odemerho (1985) observed that people living in flood-prone areas of Benin City reacted to the problems posed by flooding activities in his research work on urban floods and challenges in Benin City. Among the issues they face are traffic congestion, drain clogging, flooded homes, and so on.

2.3.3 Measures For The Control Flooding

According to Bariweni et al. (2012), flood control refers to all methods used to reduce or prevent the negative effects of flood waters. According to Kolawole et al. (2011), the basic consequences of flooding include loss of human lives, submerging of residences and streets, inflow to sewage, municipal pollution, property damage, health hazards, cleanup cost, disruption of services, traffic obstruction, aesthetic discoloring, economic loss, and infrastructural damage. As a result, taking any and all flood-prevention measures is more than needed in any society. Planting vegetation to retain extra water, establishing flood forecasting systems, drainage and dam construction, ensuring population preparedness and awareness assertive town planning and discouragement of development in flood zones, and development of other institutional capacities charged with environmental consciousness and management are some flood control methods that have been used in the past.

According to Jeb and Aggarwal (2008), the amount of flood information available and knowledge of the areas that are most likely to be impacted during a flooding event will have a large impact on reducing flood risk. Agbonkhese et al. (2014) propose "Early Warning" as a proactive measure to reduce the flood threat in Nigeria. Early warning is a proactive mechanism in which certain recognized bodies or agencies study climate and human interactions with the environment in order to predict the occurrence of floods and thus issue warnings to both individuals and government structures in order to effectively be prepared and curb the occurrence of floods, averting loss of life and property, and preventing the spread of epidemics (Agbonkhese, et al., 2014).

Furthermore, Aderoju et al. (2012) believe that it is necessary to use modern techniques in developing measures that will assist governments and relief agencies in identifying flood prone areas and planning for future flooding events. Remote sensing and geographical information

system (GIS) knowledge is a tool that can be used to investigate and map areas that are less or more vulnerable to flooding, in conjunction with forecasting techniques to predict the intensity and duration of precipitation in the near future (Aderoju, et al., 2012).

Providing a master plan for flood prevention and relief measures for victims; mitigating floods through relevant land use laws and edicts; proactive planning in controlling development, particularly along flood prone areas; improving institutional capacity for flood prediction and public awareness programs; and minimizing the impact of floods through the provision and maintenance of appropriate infrastructure were the objectives in 2003 agenda.

Agbonkhese et al., 2014) provide a vivid depiction of how structural and non-structural measures could reduce the threat of floods. Structures such as check dams, levees, flood walls, and adequate drainage systems will help control periodic inundation in flood-prone areas in the following ways: Construction of irrigation structures and use of excess run-off water for inter-basin transfer as an alternative to absorbing excess water from Cameroons; Peak flows will be reduced by check dams. Levees and flood walls keep water in predetermined channels. Adequate drainage systems will reduce flood peak flow stages and divert excess flow. Storm water embankments should be built in communities where the rate of flow of storm water is high (Agbonkhese, et al., 2014). Non-structural measures, on the other hand, are behavioral changes that reduce the likelihood of flooding and mitigate its effects. According to Smith and Tobins (1979), there are six types of non-structural measures (behavioral adjustments), which include loss bearing, public relief funds, flood insurance, floodplain zoning, flood forecasting and warning schemes, and weather modification.

It is widely accepted in flood research that absolute flood protection cannot be achieved (Schanze, 2006). Instead, increasing emphasis has been placed on a new flood management

paradigm based on the effective implementation of both risk mitigation (structural, technical flood defense measures such as dams, dikes, or polders) and adaptation (nonstructural, soft measures such as community preparation, flood insurance, information management, and social networks) measures (Kubal et al., 2009).

To conclude on this literature review, I will like to posit strongly that this study hope to fill a gap or lacuna in literature concerning the causes of flood in Egor Local Government Area of Edo State. The study is novel in the sense that it is not only out to study the causes of flood in the study area but to reflect on the differential perspectives in terms of severity of the flood disaster or problem in the urban and rural setting of Egor Local Government Area in Edo State, Nigeria (Figure 3; plate 1 and plate 2).

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter describes the various data collection and analysis methods used in this study. It will be discussed in the following sections: Data Sources; Research Design; Population and Sample; Research Instrument; Data Collection Method; and Data Analysis Method.

3.1 Sources Of Data

In this study, two different data sources were used. They came from both primary and secondary sources. The primary data sources involved the use of a carefully designed questionnaire to elicit information from study area respondents. The secondary data source involved the use of available literature such as textbooks, journals, internet materials, and so on that capture issues related to this topic.

3.2 Research Design

The cross-sectional survey research design was used for this project. It is a type of descriptive survey design in which a group of people is sampled and investigated over a specific time period. The investigation usually begins and ends at a specific point in time, as well as some characteristics of interest are measured during that time period.

3.3 Population Of The Study and Sampling Technique.

This study's population included men, women, and youths aged 18 and up in Egor Local Government Area. As a result, a sample of these men and women would be drawn to represent the entire group, and the results would be generalized.

The sample size for this study was obtained using the Cochran (1977) formula:

$$n_0 = \frac{z^2 pq}{e^2}$$

Where, n is the sample size, z is the selected critical value of desired confidence level, p is the estimated proportion of an attribute that is present in the population, q =p −1 and e is the desired level of precision.

Thus, p is the assumed maximum variability (i.e. 50% or 0.5) and the confidence level selected is 95% precision (i.e. 5/100 or 0.05)

$$\frac{(1.96)^2 x\ (0.5)\ x(0.5)}{(0.05)^2}$$

n =384.16=384

Therefore, the required sample size calculated to 384 was rounded up to 390.

3.4 Research Instrument

A thoughtfully constructed questionnaire titled Causes of flooding in Egor Local Government Area of Edo State was used to collect data for this study. The questionnaire was divided into two sections: the first contained questions about the respondents' socio-demographic information, and the second contained questions about the causes of flooding in the study area.

3.5 Sampling Technique

In the administration of the survey to respondents in the study area, the simple random sampling technique was used. This was done to ensure easy coverage of the entire study area and representation in all chosen communities.

3.6 Method Of Data Collection

The researcher and field assistants distributed the questionnaires. The researcher or assistants interviewed the respondents and solicited questionnaire responses from them. In total, 390 questionnaires were distributed to men, women, and youths aged 18 and up in both the rural and urban parts of the study area, with Ugbowo, Uselu, and Uwelu chosen as urban areas and Iguikpe and Iguediaye chosen as rural areas. The 390 questionnaires were distributed among the communities using a proportional factor (urban, 60%, and rural, 40%). Thus, 234 will be administered in urban areas, while the remaining 156 will be administered in rural areas.

3.7 Method Of Presentation And Analysis

The goal of data collection is to create something useful from it. The researcher must treat and analyze the data collected in order for it to be useful. The major packages for analyzing the data collected using SPSS version 21 were Microsoft Excel and the questionnaire. In addition, the descriptive simple percentage table was used.

The sample statistical technique or frequencies and percentage used were shown below:

$$\text{Thus } \%\frac{F}{N} \quad \frac{100}{1}$$

Where F = frequency of a particular response

N = Total Response

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.0 Introduction

This chapter is concerned with the presentation of data gathered from a field survey. Statistical techniques for validating research questions are also discussed. The interpretation of the data presented and analyzed is based on responses from the field questionnaire. The responses of respondents derived from 390 copies of the administered questionnaire were analyzed using SPSS version 21 statistical software. The questionnaires were distributed in five communities within the Egor local government, from which generalizations will be made across the study area. Ugbowo, Uselu, Uwelu, Iguikpe, and Iguediaye are all names. As shown in table 1, questionnaires were distributed equally to all five communities. Figures, tables, and statistical measures are used to present the findings. To present descriptive statistical data, a simple percentage was used.

Table 4.1: Name Of Community

Name of communities	**Frequency**	**Percentage (%)**
Ugbowo	78	20.0
Uselu	78	20.0
Uwelu	78	20.0
Iguikpe	78	20.0
Iguediaye	78	20.0
Total	**390**	**100.0**

Source: Field Survey (2022)

A total of 390 questionnaires were distributed, and 390 were returned with a 100% response rate. A response rate of 100% is considered adequate for the study, while a response rate of 50% or higher is considered acceptable.

4.1.1 Socio Economic And Demographic Characteristics Of Respondents As Regard The Causes Of Flood

This section presents cross-tabulation of socio-economic profile of the respondents in Egor local government. These include the age, educational background, and duration of stay in Egor local government. The age distribution of the respondents is presented in table 4.2 below. The age between 31- 40 consisting 47.1%, has the highest number of respondents. This figure verifies that more were 30years and above. It is evident that the population of Egor local government is a youthful one with high growth potential because more than 50% of the respondents are less than 45years in age. This is as a result of the immigration of able bodied youths from the surrounding towns and villages to Egor local government in search for greener pastures.

SECTION A: Personal Data

The demographic information includes Gender, age, marital status and educational level of the respondents.

Table 4.2: Sex of the respondent

Response	Frequency	Percentage (%)
Male	187	47.9
Female	204	52.3
Total	**390**	**100.0**

Source: Field Survey (2022)

Table 2 indicates that 47.9% of the respondents are male while 52.3% are female. This justifies the claim of Makinwa (2008) that female population is higher than male population. Which could be one of the proofs to support the findings of (Beleke, 2011) that death and external migration is higher among the male gender.

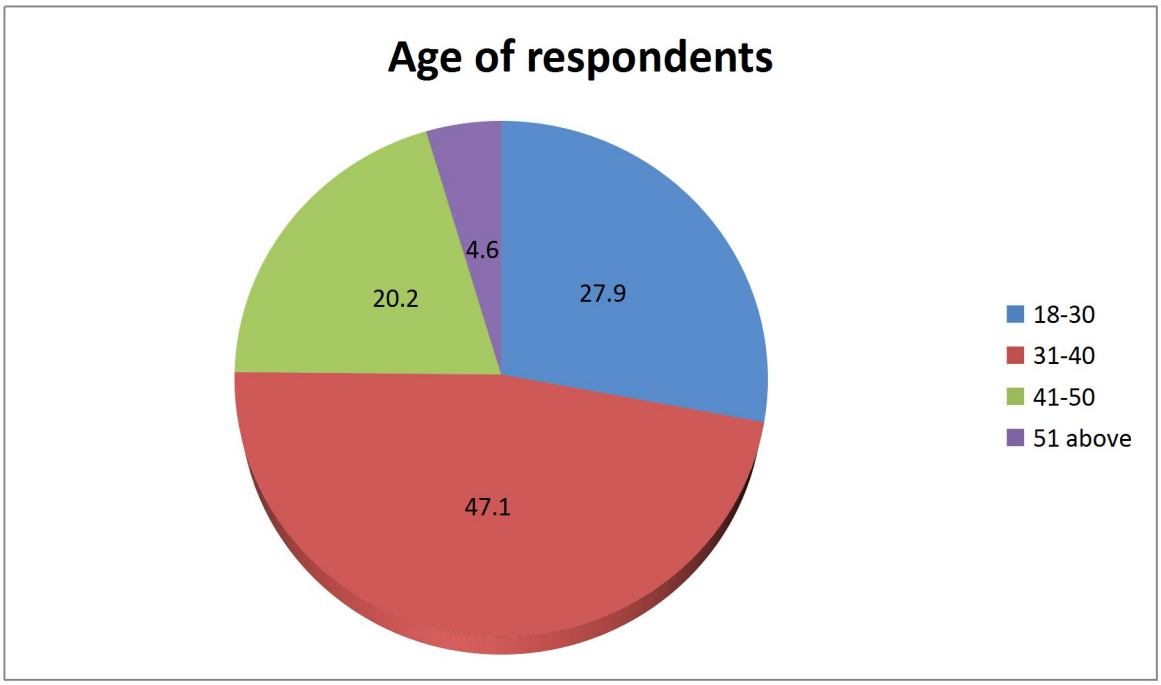


Figure 5: Showing the Age Of The Respondent

Figure 5 depicts the age of the respondents. The proportion of selected respondents within the age bracket 18-30 years are having a representation of 27.9% while 47.1% of respondents affirmed they are within the age bracket of 31-40 years. On the other hands 20.2% and 4.6% represent the age bracket 41-50 and 50 above respectively. The majority of the respondents (47.1%) are within the age bracket of 31-40 years. This implies that the population is young and growing. It can be concluded thus that the majority of respondents are youths.

Table 4.4: Showing The Marital Status Of Respondents

	Frequency	Percentage (%)
Single	94	24.1
Married	167	42.8
Separated	60	15.5
Divorce	39	10.0
Widow/Widower	30	7.6
Total	**390**	**100.0**

Source: Author's field survey 2022

Table 4.4 shows the marital status of respondents in the study area. From the table, the proportion of respondents who are single is represented as 24.1%, the proportion who are married is represented as 42.8% while the proportion who are divorced or separated is given as 15.5% and 10.0% respectively, with the proportion of the sampled population who are widowed having a representation of 7.6%.

From the above, the marital status with the highest representation is the married population having a proportion of 42.8%. This implies that the majority of the sampled population in the study area is married. The marital status with the least representation is the widow/widower population with a proportion of 7.6%. The reason for this low representation can be attributed to traditional and religious beliefs.

Table 4.5: Showing The Level of educational qualification

	Frequency	Percentage (%)
Non formal education	55	14.1
Primary	91	23.3
Secondary	111	28.4
Tertiary	132	33.8
Total	**390**	**100.0**

Source: Author's field survey 2022

Figure 4.5 depicts the educational status of respondents in the study area. The highest percentage of the sampled respondents at 33.8% affirmed that they have a tertiary education, with 28.4% stating they have a secondary education. The proportion of the sampled population who do not have a formal education is represented as 14.1%.

From the above interpretation, the highest respondents from the sampled population have attained a tertiary education as buttressed by the 33.8% representation. It can also imply that the population of the study area is an educated one. A higher percentage of the study population having access to tertiary education in the study which can be justified by the response of respondents to the questionnaires administered.

Figure 6

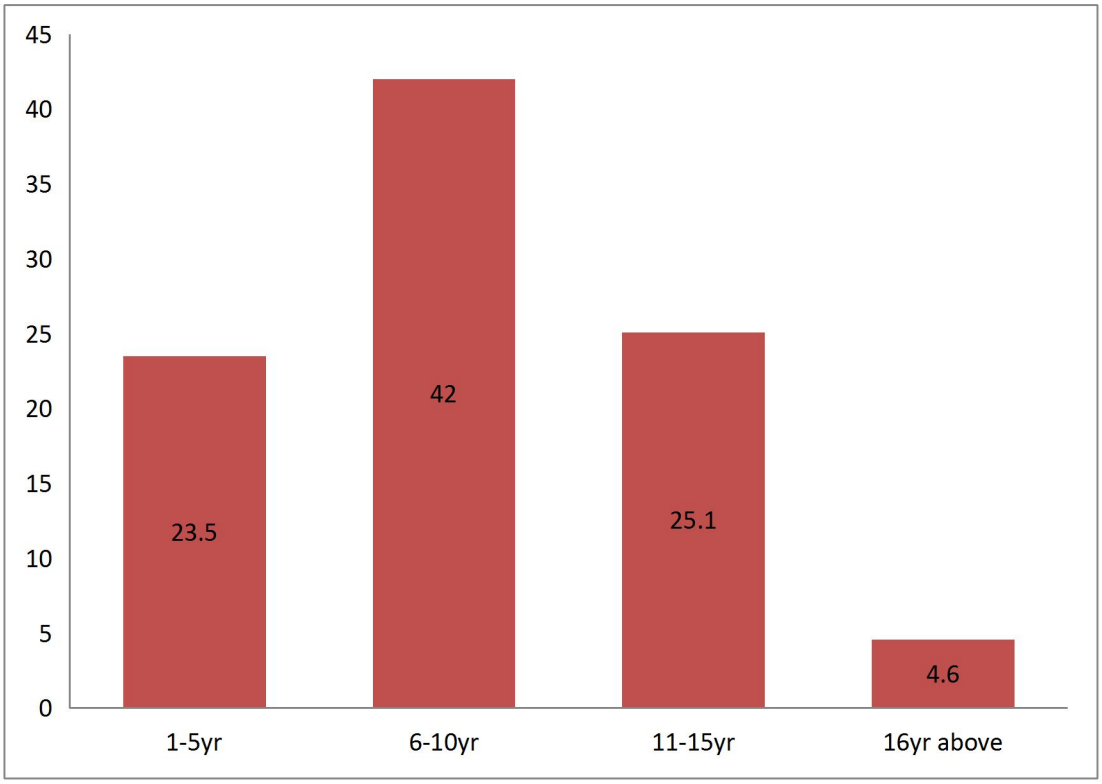


Figure 6: Showing The Duration Of Stay Within Egor Local Government Area (Author's Field Survey 2022)

Residents in Egor local government in relation to causes of flood are cross-tabulated as shown in figure 4.2. The result shows that respondents whom have stayed in Egor local government for more than 10 years are more acquainted with the causes of flood within the area than those who have stayed less than 10years. This is because this respondent have lived in the environment for long to have firsthand information and observation as regards that which causes flood within their neighborhood and their environment.

4.1.2 What is Flooding

This aspect is very important to any respondent because the respondent have to know what flooding is before explaining how it has affected the society and the livelihood of people. In the table below, 97.0% of the respondents are knows what flooding is and its impacts, while 3.0% of the respondents have not heard about it. These set of respondents are mostly the illiterates who are not conscious of the happenings in their surrounding or what the term flooding real means.

Table 4.7: Showing Respondent Conception On What is Flooding

WHAT IS FLOODING	**Responses**			
	Yes	%	No	%
Flowing water	369	94.6	21	5.4
Excess water in an area	356	91.2	34	8.7
Covering of dry land with a large amount of water	378	96.9	12	3.0
Erosion	14	3.6	376	96.4
Rain fall	51	13.1	339	86.9

Source: Author's field survey 2022

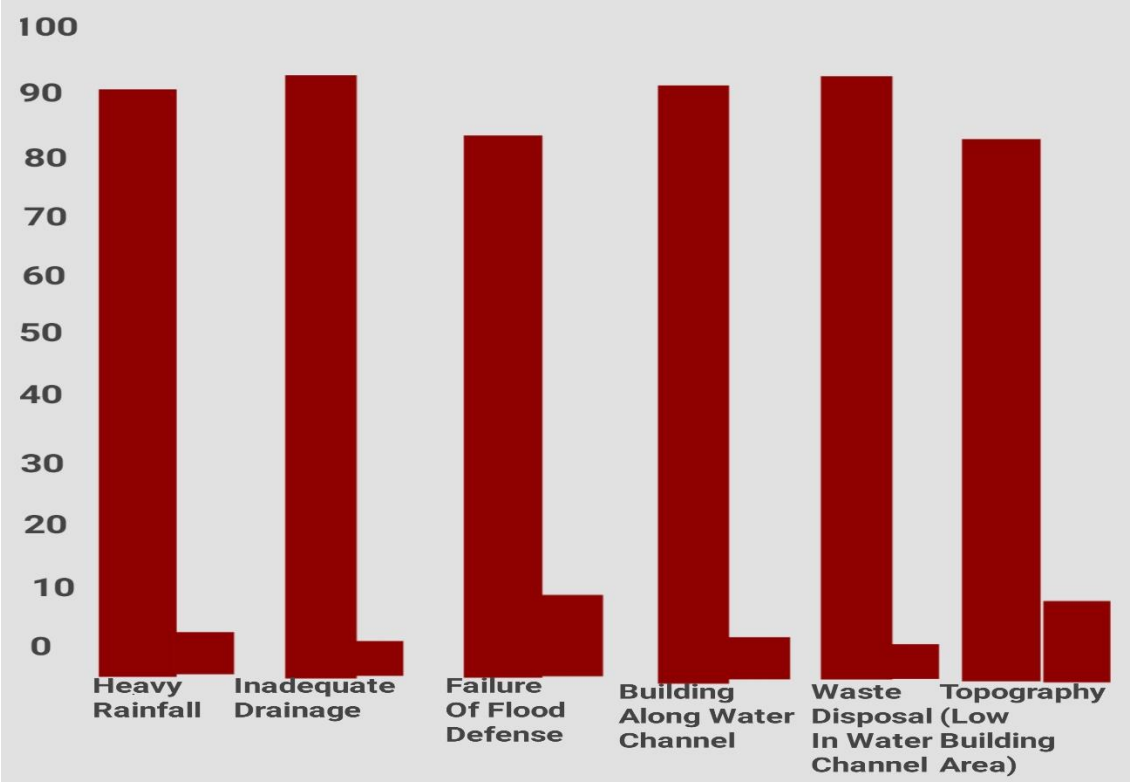
The result from table 4.7 indicates that, 94.6% , 91.2% and 96.9% of the respondents regards flooding as flowing water, excess water in an area and the covering of dry land with large amount of water respectively, this justify the definition of Kates in (1985) when she defines flood as an overflow of an expanse of water that submerges land. European Union (2007) sees flood as a temporal covering of land by water, not covered by water before the

incidence. Therefore there is a need to know what causes flooding in order to have a proper understanding on how to address its effects.

On the other hand majority of the respondents do not see erosion and rainfall as flooding as shown in the table.

4.1.3: Causes Of Flooding

Flooding is caused by a number of factors, which I the researcher believe can be control, though they are outline in the table below, which was responded to by the respondent from the study area.



Showing The Perceive Causes Of Flood In The Study Area

Source: Author's field survey 2022

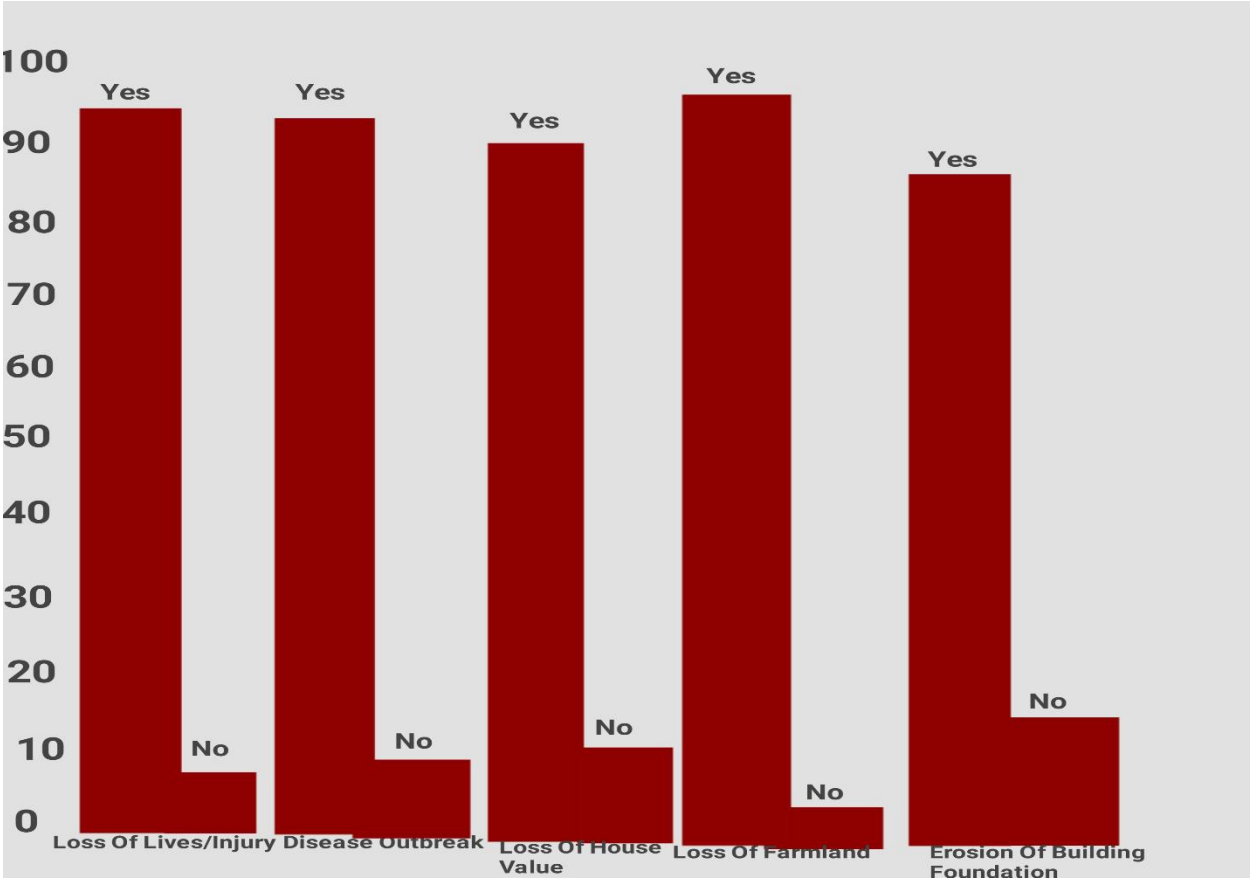
Table 4.8: Showing The Perceive Cause Of Flood In The Study Area

Perceive Causes Of Flood	Respondent			
	Yes	%	No	%
Heavy Rainfall	369	94.6	21	5.4
Inadequate Drainage System	376	96.4	14	3.6
Failure of Flood Defenses	339	86.9	41	10.5
Building Along Water Channel	391	95.1	19	4.9
Waste Disposal in Water Channels	378	96.9	12	3.1
Topography (Low Building Area)	339	86.9	41	10.5

Source: Author Field Survey, 2022

From the response of the respondents, as shown in table 8, it indicate that waste disposal in water channels, inadequate drainage channel, building along water channel, heavy rainfall are the major causes of flooding among others with a percentage ranging from 94.6 and above, although indices such as Waste disposal in water channels, Farming along flood plains, Flooding from river, Poor condition of drainage, Climate change, also strike a chord as some of the major reasons or cause of flooding as shown in the high percentage of yes from respondent. This therefore justify the claims of Etuonovbe (2011) that there is no one cause of flooding

4.9 Effects Of Flood Disaster



Source: Author's field survey 2022

Table 4.9: Showing The Effect Of Flood Disaster

EFFECTS OF FLOOD DISASTER	RESPONDENTS			
	Yes	%	No	%
Loss of Lives/Injury	369	94.6	21	5.4
Disease Outbreak	356	91.3	34	8.7
Loss of House Value	348	89.2	42	10.8
Loss of Farm Land	376	96.4	14	3.5
Erosion of Building Foundation	339	86.9	51	13.0

Source: Author's field survey 2022

According to Nangia, 1987 countless numbers of farmland are lost to the incidence of flood, which confirm the findings indicted in Sanon's study (1998) were he observed that 83.6 Percent of abandoned farmland are flood prone areas. This can also to be proven by the response of respondents from the table above with loss of farm land appearing to be the major

effects of flood disaster having the percentage 96.4. Moreover, the effects of flood disaster are numerous, (Mathur, 1984).

4.1.5, MEASURES FOR FLOOD CONTROL

The output from Table 4.10 shows the perception of respondents regarding the measures of flood control. Most respondents identify construction of drainage where there is none (96.6%) as the most infective measure to flood control.

Table 4.10: Shows The Measures Of Flood Control

MEASURES FOR FLOOD CONTROL	Responses			
	Yes	%	No	%
Adequate drainage system provision	369	94.6	21	5.4
Constant opening of drainage	356	91.3	34	8.7
Proper refuse disposal system	348	89.2	42	10.8
Construction of drainage where there is none	376	96.4	14	3.5
Proper land use planning	339	86.9	51	13.0
Creating environmental awareness on the danger of flood	347	88.9	43	11.1
Sorting of waste before disposal	234	60.0	156	40.0
Using of sand bags	278	71.3	112	28.7
Raising of building foundation	319	81.8	71	18.2
Construction of bridge	338	86.7	52	13.3
River channelization	329	84.4	61	15.6

Source: Authors field survey 2022

Other measures of flood controls identified include proper use of drainage system (94.6%), constant opening of drainage (91.3%), proper refuse disposal (89.2%), Creating environmental awareness on the danger of flood (88.9%) proper land use planning (86.9%), construction of

bridge (86.7%) and others as shown in table 4.16 above. However, construction of drainage where there is none and proper use of drainage system are the most prominent measures to flood control as identified by respondent in Egor local government area. This finding collaborates with the views express by Odjugo and Ikhuoria (2003) that the construction of more drainage system and the usage of these systems will help in reducing the impacts of flood in our society.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND SUGGESTIONS FOR FURTHER STUDIES

5.0 Introduction

This section discusses the major findings of this study which are based on the specific objectives of the study.

5.1 Summary Of Findings

The result of the study showed that flooding is a well known epidemic problem in the study area, as a good percentage of respondents could identify with the flooding conditions (Table 4.7). From the study, it was discovered that both human base activities (anthropogenic) which include: increase in built-up areas (urbanisation), poor drainage system, blockage of drainage system with debris etc, and physical causes such as heavy rainfall, lack of vegetal cover, topography (low lying areas etc) were also indicated. The study also reveals that the more urbanized areas in the study area (figure 2) experienced greater amount of flood problems compared to the more rural areas, particularly due to the variation in the infiltration rate, which in turn result in the variation in the degree of the amount of surface run-off (plate 1 and 2).

Furthermore, the study also reveals some impact of flood disaster such as loss of lives / injury, disease outbreak; loss of house value , loss of farmland and erosion of building foundation. The respondents in the urbanized areas perceived loss of lives/ injury as the greatest effect of flood disaster, while those in the rural area of the study area perceived loss of farmland as the worse effect of flood disaster. (Table 4.1.4)

Although, flooding has a number of negative impact on our society as stated above, this sly indicates some measures for flood control which include adequate drainage system provision, proper refuse disposal system, surting of waste before disposal, raising of building foundation in low-lying areas in the study area, creating environmental awareness on the danger of flood and so on (table 4.0). And this study therefore posits some recommendations such as the policy framework to manage flood in the study area must have both a short-term programme to handle the immediate flood problems like removing of debris in the drainage system regularly and a long-term programme like provision of more drainage system to reduce flood problems in the study area .And secondly, appropriate actions should be taken by the individuals, private establishments, non-governmental organizations and government to prevent, control and mitigate flood problems in the study area in particular and Nigeria at large.

5.2 Conclusion

This study investigated the causes of flooding in Egor local government. In carrying out this study, questionnaires were sorted using SPSS version 21. The result from this research work revealed that there are many causes of flood in Egor local government, the highest value of response to all outlined causes of flood in the areas where questionnaires were administered in Egor local government, which is heavy rainfall, is in consonance with Leopold (1968) citing of provision of storm sewers (to accommodate the rainwater) as control measure for flooding. For instance, Ugbowo-Uselu road storm drain is a case in point, which receives surface run-off from the numerous side roads joining it.

Thus, amongst others, to ameliorate the damaging effects of flood in Egor local government area, the spread of urban structures such as building construction, road network in the

underdeveloped parts must be accompanied by a simultaneous development of storm sewers (to accommodate the growing or increasing surface run-off).

5.3 Suggestions For Further Research

The above discussion provides some clues about the causes of flood in Egor local government, Edo State. Without pretending that the following is exhaustive in scope, these represent useful areas to consider for future research.

1: It is believed that flooding have an adverse effect on human lively and economic growth of society respectively. Therefore, further work should be carried out to explore those effect in details.

2: Studies has also shown that there is a connection between poor drainage system and flooding. A further study should therefore be carried out to explain the connection between both parameters.

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