

An Analysis on the Causes and Effects of Flood in Adamawa State North-East Nigeria

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Abstract- *Flooding is an environmental hazard that needs appropriate measures to be instituted to stem the tide of occurrence. Floods are one of the most cataclysmic events in the face of the Earth, which are exceptionally unpredictable to demonstrate and difficult to predict at an earlier point of time. The examination of improvement of flood-forecast designs has added to diminish hazard, policy suggestion, minimization of the loss of lives and damage caused to properties due floods. This project was conducted in three selected local government areas of Adamawa North-East Nigeria. These Local Government Areas include Numna LGA, Demsa LGA and Yola North LGA of Adamawa State in North-East Nigeria. To determine the effect and factors contributing to flooding in the study area, a sampled of 3900 households participated in the study. A questionnaire consisting of four sections was used to collect data. Descriptive statistics was used to analyze the data. The study revealed that excess rainfall, poor drainage, poor road design construction and opening of dams are the major causes of floods. The study also indicated that there are seasonal floods which cause negative effects on the respondents such as environment pollution, soil infertility, damages to farm crops, destruction of human lives, animals lives, farmland and properties.*

Indexed Terms- *Floods, Descriptive statistics, Effect, Cause, Adamwa State*

I. INTRODUCTION

Flood can be defined as is an overflowing or eruption of a great body of water over land not usually submerged (Daniel and Udo, 2019). It is an extreme weather event naturally caused by rising global temperature which results in heavy down pour,

thermal expansion of the ocean and glacier melt, which in turn result in rise in sea level, thereby causing water to inundate coastal lands. Flooding causes inundation and harm to plants and animals, including man, buildings and infrastructure (Ujene and Oguike, 2020). However, flooding is a global natural hazard that has affected lives, led to the loss of properties and extinction of species in the environment. In fact, flooding is a threat that affects the quality of the environment. Given the issues relating to flooding, it is regarded as a factor that is used in defining environmental quality of residential neighborhoods. Other environment hazards include drought, desert encroachment, soil erosion and tsunamis.

Flood hazard is a primary weather-related disaster worldwide. Escalation in flooding events is indeed a dilemma through recent years, as innumerable causalities are caused by them every year (El-magd et al., 2021) Moreover, climatic change has many consequences as surge in frequency of rainfalls potentially enhance the rate of flooding. Urbanization, associated with intensified hydrological, ecological, environmental and climate changes, gives rise to reduction in groundwater recharge, evapotranspiration (ET) and infiltration, consequently resulting in an increase in quantity of runoff volume during most of the floods (Pirnia et al., 2019).

n Nigeria, flooding has remained a prevalent environmental problem. Available studies have shown that there is frequent occurrence of flooding (Ejenma et al., 2014; Komolafe et al., 2015; Nkwunonwo, 2016; Yesufu, 2016; Sule et al., 2016; Adetuj and Oleyele, 2018 and Onwuemele, 2018; Bamidele and Badiora, 2019)

Nigerian has experienced heavy flood as a results unusual heavy rains and climate change as well as the

released of water from the Lagdo Damo in neighboring Cameroon which began on 13 September, 2022(Wahab, 2022). The 2022 Nigeria floods have affected most of the country, displacing over 1.4 million people, killing over 600 and injuring more than 2,400, over 200,000 homes completely or partially destroyed, 110, 000 hectares of farmland destroyed, while Nigeria typically experiences seasonal flooding, the flood were the worst in the country since (Maclean, 2022). This paper is aimed at analyzing the causes and effects of flooding to Adamawa State communities to curb devastating effect through the results of the study

II. LITERATURE REVIEW

Yaode et al., (2020) conducted a study on the vulnerability analysis of flood disaster in Ibadan, Nigeria. The study makes use of personal observations and questionnaire for data collection. The sampled respondents for the study include victims that were affected with flood previously in Ibadan Nigeria. Descriptive and inferential statistics were used as data analysis for the study. Their results revealed that excess rainfall is the highest cause of flooding in the study area. The findings also show out that terrain of the area is the least cause of flooding. This implies that the terrain is a less significant factor in causing flood. Since rainfall account for most flood occurrences, they called for adequate channelization. This will help in reducing the hazards of flooding and its negative consequences on the residents of Ibadan.

Rufa'i (2020) carried out a research to assess household preparedness to flood risk hazard in Nigeria. The results of his study revealed that climate change which triggers severe rainfall in Nigeria which results to flooding. The increase rate of flooding calls for adequate measures to be taken so as to curtail the effect of flood on Nigerians. While flooding is increasing in terms of occurrences in Nigeria, the preparedness of households has not been given attention. He based his study on review of existing literature which point to the fact that households are losing properties, lives and other valuables to flooding. Odubo and Raimi (2019) conducted a study on Settlement and Readjustment Patterns of Rural Dwellers during and after flood disasters in Bayelsa State, Nigeria indicates that flood victims are more in shock and confusion during and immediately after

flood disasters as well as worsened situation in terms of resettlement and re-adjustment patterns. Out of the eight (8) local government areas in Bayelsa state, seven (7) were adversely affected. Public and private properties worth billions of naira were submerged and destroyed and thus the living conditions of some of the victims remain deplorable.

Emeribeole (2015) carried out a study that focused on managing flood disasters in Nigerian Cities: with emphasis on deducing issues and strategies towards meeting the challenges in the modern world. He observed that flooding in Owerri metropolis has claimed lives and has led to property damage. His study specifically showed that at least 20 per cent of the population of Owerri metropolis is at risk of flooding. His study showed that sovereign states and national governments mostly adopt remedial reaction that come in the form of post-disaster reaction where relief materials are supplied to the affected victims. Therefore, flood management options that supposed to be focused on addressing issues of inadequate channelization and poor distribution of drainage channels are only addressed through the supply of relief materials. He called for adequate and appropriate measures to be put on ground to ensure flood management. He opined that the discouragement of developments and housing units on flood plains will go a long way in handling the issues of flooding together with the development of drainage channels for stormwater distribution will also help in managing flooding. The study recommended that technology will also help in curtailing flood challenges in Nigeria. Another study conducted by Olanrewaju (2016) on flood and flood management in Uyo Urban, Akwa Ibom State revealed that a larger part of Uyo Urban has been ravaged by incidence of flood. In his study, he noted that urban flood is mostly caused by anthropogenic activities in addition to climate variability which is more alarming over the years. Systematic random sampling was used for the study of which four (4) flood zones were used. His findings revealed that flood exists every year and causes untold destruction, but the challenges involved in restoring the emotional, social, economic status of the victim in the study area are clearly identified.

Okoye (2019) assessed perennial flooding and integrated flood risk management strategy in Nigeria.

He observed that the need to manage flood hazards stem from the observation that flooding in Nigeria has resulted in loss of lives, sources of livelihoods, property and socio-economic infrastructure. In other to manage flood hazard, he engaged in a discourse with the aim of identifying strategies and prospective solutions for controlling flooding. He observed that there is need for development of appropriate channelization to facilitate run-offs. He also suggested that water be used for productive purposes such as farmland irrigation, transportation, hydro-electric power generation, mineral mining, recreation and tourism.

Ani et al., (2020) showed that flood affect the economic lives of people, the environment as well as animals and people. Nnodim and Ezekiel (2020) examined the perceived impact of perennial flooding on livelihood activities of rural dwellers of Orashi Region of Rivers State. They adopted the descriptive survey design and collected data from rural dwellers in Orashi region. They used simple random sampling in selecting 150 rural dwellers in flood affected communities. Their findings revealed that the causes of flooding in rural areas of Orashi region were prolonged rainfall, overflow of rivers, continued release of excess water from artificial reservoirs, climate change amongst others. They also revealed that flooding submerge farmlands, destroy crops, destroy irrigation facilities, destroy harvested produce while also affecting fish farming through the spread of infection that causes diseases in fishes. Flooding also causes pollution of rivers and streams and destroy fishes and other aquatic animals.

Echendu (2020) investigated how flooding affected Nigeria's efforts to achieve its SDGs. Those most impacted were the eradication of poverty, ending hunger, ensuring healthy lives and wellbeing for all, ensuring equitable and inclusive quality education for all, ensuring access to adequate and clean water and sanitation, providing decent work and economic growth, and finally 'making cities and human settlements inclusive, safe, resilient, and sustainable by the year 2030'. Controlling flood disasters is crucial to sustainable development.

III. METHOD AND MATERIALS

- Study Area

The study was conducted in Adamawa State north eastern part of Nigerian. With emphasis on Numan LGA, Demsa LGA, and Yola Noth LGA of Adamawa State Adamawa state is located in the north-east sub-region of Nigeria, at latitude 9.330N and longitude 12.50E with its capital in Yola. The state was created in 1991 from the defunct Gongola State and has since been one of the 36 states that presently constitute the Federal Republic of Nigeria. Adamawa State is one of the largest states in terms of land mass, occupying about 36,917km². The state shares boundaries with Borno to the north, Gombe to the west, Taraba to the south, and Cameroun republic to the east. The State has a population of 3,106,585 (2005 estimate).

Adamawa lies within the Sub-Sudan Savannah and the Guinea Savannah belts. Topographically, it is a mountainous land crossed by the larger river valleys of Benue, Gongola and Yedsarem. The valleys of Cameroun, Mandara and Adamawa Mountains form part of this undulating landscape. Adamawa is an agrarian state, therefore the major occupation of the people is farming and few others engaged in business and formal employment with the public and private sectors. Cash crops grown in the state are cotton and groundnuts while food crops include maize, yam, cassava, guinea corn, millet and rice. The village communities living on the banks of the rivers engage in fishing while the Fulanis rear cattle. A study like this therefore, is timely to address the problems faced by the vast majority of its inhabitants who rely on farming as a source of livelihood.

- Population of the study

The population of this study comprise of some selected local government areas within the study area in Adamawa State North-east Nigeria. A total of 3900 households were used as total population of the study. Sample and Sampling Techniques

The study made use of a multi-stage sampling procedure. The first stage was to select three (3) wards in each of the selected LGA. This was due to their geographical location and continues record in flood disaster. The second stage was to select three (3) Villages from each LGA wards that are mostly hit by

flood. The third stage was selecting households using random sampling. Random sampling was used to select as a list was obtained. The sample size was 3,900 respondents selected for the study. 1300 respondents were sampled from each of the selected LGA. The sample was obtained via Simple Random sampling.

• Research Instruments

The study makes use of questionnaire as a means of data collection.

• Procedure for Data Collection

The researchers alongside with the help of local government aid administered questionnaires in the selected LGAs. The questionnaires were administered to households selected, filled and returned to the researchers/

• Method of Data Analysis

The study makes use of tables and simple percentage to analyze section A while simple percentage as well as the simple mean score with tables for data analysis.

Using the mean score of $\frac{\Sigma F}{N}$

ΣFX = frequency multiplied (X) score

N = Total Number of population (3900)

The cut-off point was fixed at 3.0. A mean score above 3.0 was accepted while a mean score below 3.0 was rejected.

IV. PRESENTATION OF RESULTS

Table 1 display the demographic information in terms of sex, marital status, age, religion, education and occupation of the respondents.

Table 1: Demographic distribution of the respondents

Variables	Frequency	Percentages (%)
SEX		
Male	2,007	51.5
Female	1,893	48.5
Total	3,900	100
MARITAL STATUS		
Married	2,340	60.0

Married	243	6.2
Widow	1,119	28.6
Single	198	5.2
Separated	3,900	100
AGE		
29 below	1,326	34.0
30-39	1,153	29.6
40-49	536	13.7
50 -59	400	10.3
60 and above	3,900	100
RELIGION		
Christianity	1,571	40.2
Islam	336	8.7
Traditional	3,900	100
EDUCATION		
Primary	1,568	40.2
Secondary	1,345	34.5
Tertiary	598	15.3
None	3,900	100
OCCUPATION		
Farming	569	14.6
Trading	1,267	32.5
Fishing	231	5.9
Civil Servant	292	7.5
Other occupation	3,900	100
Total		

A total of 5000 copies of the questionnaires were distributed across the selected local government area in Adamawa State North-East Nigeria and only 3900 questionnaires were correctly filled and returned giving a response rate of 89.2%. Table 1, shows the results of the demographic distribution of respondents. The results on sex of the respondents indicated that majority of the respondents were male with 2,007(51.5%) followed by female with 1893(48.5%). The results on the marital status of the respondents revealed that also majority of the respondent were married with 2340(60.0%), followed by 1119(28.6%) were single, 243(6.2%) were widowed while 198(5.1%) were separated. This means that these that are married dominated the area while these that are single stay on their own, perhaps because they have grown up to be independent The dominant age of

respondents was 30-39 years with 1326(34.0%) followed by those aged between 40-49years 1153(29.6%), 485(12.4%) were below 29 years of age, 536(13.7%) were aged between 50-59 and 400(10.3%) were between 60 years and above. The results of the study also indicated that Majority of the respondents were Christians with 1993(51.1%), followed by Islam with 1571(40.2%) and traditional religion has 336(8.7%). The results on educational qualification of the respondents indicated that Most of the respondents, 1568(40.2%) had attended Secondary School, 1345(34.5%) had tertiary education, 389(10.0%) had primary education and 598(15.3%) had no formal education. A greater proportion of the

respondents, 1541(39.5) were farmers, 1267(32.5.6%) were fisher men and women, 569(14.6%) were traders, 231(5.9%) were civil servants, while 292(7.5%) were students/other occupation not mentioned (Table 1).

4.2 Answering of Research Questions

three research questions were formulated and answered in this study. The results on research questions one to three are illustrated in Table 2-4

Research Question one: I. What are the effects of flood on the people in Adamawa State Nigeria?

Table 2: Respondent’s response on effect of flood

Variables	Yes	No	Total
Seasoning Rate of Flood in the community	(86.2.0%)	(13.8%)	(100%)
Flooding causes Pollution	(79.8%)	(20.2)	(100%)
Flooding Causes damage to farm Crops	(92.1%)	(7.9%)	(100%)
Floods causes soil infertility	(76.8%)	(23.2%)	(100%)
Flood bring contamination and diseases	(61.9%)	(38.1%)	(100%)
Flood causes collapse of houses	(70.3%)	(29.7%)	(100%)
Flood destroy human life, animals and properties	(92.8%)	(7.2%)	(100%)

Table 2, indicated that majority of the respondents, 3360(86.2%) agreed on the seasoning rate of flooding in their community, 540(13.8%) disagreed. This affirmed that most of the respondents experienced seasoning rate of flooding in their area. Most respondents on opinion whether flooding causes pollution as shown indicated that 3112(79.0%) agreed while 788 (20.2%) disagreed. This is a clear indication that majority of the respondents agreed that flood indeed causes pollution of soil and water. A greater proportion of respondents, 3591(92.1%) agreed on flooding in Adamawa course damage to farm crops and 309(7.9%) disagreed. Majority of the respondents 2994(76.8%) agreed that flooding causes soil infertility through erosion, while 906 (23.2%) disagreed. The results of the study also revealed that majority of the respondents 2416(61.9%) agreed that flooding causes diseases which are dangerous to

human health while 1484(38.1) disagreed to the assertion that flood cause diseases that are dangerous to human health. A greater number of respondents were of the view that houses collapse during flooding, 2743(70.3%), while 1157(29.7%) disagreed. 3621(92.8%) respondents agreed that flooding destroy human life, animal life and properties while only 279(7.2%) disagreed (Table 2). From the respondent’s point of view, it is obvious that the effects of flood on the respondents cannot be over emphasize. The results indicated there is need to tackle flood issues in the study area to improve the livelihoods of the people living in a flood prone area in Adamawa State Nigeria,

Research Question Two: What are the possible risk factors causing flood in Adamawa State Nigeria?

Table 3: Respondents response on the factors responsible for floods

S/N	Variables	SA	A	SD	D	UD	Mean Score	Remark
1	Poor road design is a contributing factor to flooding	1457	1682	230	432	0	4.3	Accepted
2	Poor drainage contributes to flood	1721	1438	227	514	0	4.4	Accepted
3	Opening of dams causes flood	1274	1563	421	642	0	4.2	
4	Presence of stagnate water causes flood	1274	1563	421	642	0	4.2	Accepted
5	Excess rainfall causes flood	514	887	1151	1348	0	2.6	Rejected
6	Raise in water level course flood	1759	1479	250	412	0	4.2	Accepted
6		1676	1710	1	387	0	4.1	Accepted

Table 3 shows the results of respondents on the factors affecting flood in Adamawa State Nigeria. Majority of the respondents with a mean score of 4.3 agreed to the assertion that poor road design construction contribute to flooding. In response to question 2 in table 3 the mean score of 4.4 affirmed that majority of the respondents accepted that poor drainage in their communities contributes to high rate of flood. Question 3 in table 3 with a mean score of 4.2 indicates that majority of the respondents agreed that opening of dams contributes to flood in the study area. The results in table 3 indicated that respondents did not agree with the accession that presence of stagnant water also contribute in flooding with a mean score of 2.6. The study also revealed that excess rainfall is also a factor affecting flood in the study area with a mean score of 4.1 as shown in table 3. The respondents accepted that rise in water level contribute to flood with a mean scores of 4.1 in table 3.

Research Question three. What is the strategy adopted for flood mitigation?

Mitigation Strategy	Frequency	Percentage
Relocation during flood	1804	46.3%
Sand Bags	1318	33.8%

Creation of drainage	421	10.8%
Improving of quality of road and Landscape	270	6.9%
Early action due to flood prediction technology (EWS)	87	2.2%
TOTAL	3900	100%

Table 4 represents the respondents view on their preparedness for flood. The study revealed that majority of the respondents relocates their homes before and during flood with 1804(46.3%). This means that anytime there was flood, the only preparation they have is to relocate to relatives, family or friends during flood and still relocate back to their respective houses after flood. 1318 (33.8%) of the respondents uses sand bags to prepare for flood which in most cases not effective because the sand bag may not withstand strong flood. The results in Table 4 also indicated that 421 (10.8%) of the respondents create drainage to curb flood. The creation of drainages is very expensive hence only few of the respondents have money to do that in order to curb flooding in the study area. 270(6.9%) of the respondents improve the quality of road and landscape. This means that if the

government does not come to their aid, majority of the respondents had to source money to embark on such project to mitigate flood. The results in Table 4 also indicted that only 87(2.2%) of the respondents prepared properly as a results to early warning from a flood predictive system. This means that early warning systems or flood predictive model has not been adopted or used to curb flooding. This also means that there is need to design such system so as to help people in flood prone areas with early warning so that they will be able to adopt an effective method to avoid flood.

CONCLUSION

This paper analyzed the causes and effect of flood on the people of Adamawa State as a results of frequent flooding in the study area. The results from the study indicated that floods have a negative effect on the respondents. These effects as indicated by the study includes: environmental pollution, damages to farm crops, soil infertility, destruction of human life, animals and properties. The study also attributes poor road design construction, poor drainages. Opening of Dams, excess rain falls and rise in water level are the major causes of flood.

The study in further revealed that majority of the respondents relocate their homes before and during floods. The study shows that some of the respondents uses sand bags a means to curb floods which is not a very effective means of curbing floods. The study also shows that majority of the respondents do not heed to early warning action due to flood predictive technology.

This paper concludes that there is need for the government to provide good drainages on water ways, good road construction and proper majors should be put in place before opening of Dams. The government should also educate citizens on the need to give full attention to Flood early warnings and adopt a good strategy to curb floorings.

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