RESEARCH ARTICLE

JENER Journal of Empirical and Non-Empirical Research
Volume 2, Issue 2, Page 116-127 | Article No. 15
DOI: 10.4898/jener.v2i2.a15
ISSN: 7895-9216
Journal homepage: https://jenerjournal.com
Journal email: editor@jenerjournal.com

JENER Journal
JENER Journal of Empirical and Non-Empirical Research

Socioeconomic Determinants and Disaster Preparedness Levels in Flood Prone Communities of Jos North, Plateau State

Samuel Albert Wash[1], Yakubu Ayuba Alak[1], Martha Chado[2], Haruna Bala Giwa[1], Reuben Emoyiya Fredrick[1], Abadu Afinli Manasseh[1], Menseh Awalu Bizinti[1], Katmi Yusuf[1] & Yakubu Dabo[1]

[1]National Centre for Remote Sensing, Jos
[2]Serving Corp member (NYSC, Lagos)

ARTICLE INFORMATION

Article history:
Published: February 2026

Keywords:
Flood disaster preparedness
Simulation exercises
Socioeconomic determinants
Community resilience
Disaster management

ABSTRACT

Flooding is a major disaster threat in Nigeria; in 2012, more than 2.1 million people were subjects to the damages of the floods and 363 people died in the floods throughout the country. This paper will evaluate the socioeconomic factors and some of the levels of disaster preparedness within some flood prone communities within Jos North, Plateau State, that is Rikkos and Gangare. After the disaster that occurred in 2012, in 2019, the National Emergency Management Agency (NEMA) and Christian Aid held Simulation Exercises (SimEx) to prepare better. Nonetheless, none of the systematic evaluation had been carried out, which forms a gap in the knowledge of intervention effectiveness and the level of preparedness as it stands. Mixed-method was used in the study, whereby, 195 respondents were involved by using questionnaires, focus group discussions and secondary data under NEMA of 2012-2024 trends in floods. The data were analyzed by means of descriptive statistics and Chi-square tests comparing the social economic factors, gender, age structure, level of education and housing and their impact on the vulnerability and preparedness capacity. It found out that there were substantial improvements between 2012 and 2024. Rikkos reported 1,647 affected persons, 143 displacements, and 18 deaths and 15 affected persons with zero deaths and displacements in the year 2012 and 2024 respectively. Although only 33.8% communities engaged in SimEx training, the preparedness levels were 50-70% participants demonstrated in terms of experiential training, local knowledge and awareness strategies. Among the statistically significant relationships that were confirmed by chi-square analysis (p=0.001) was the relationship between SimEx participation and enhanced preparedness. Other significant obstacles were low training (38.9percent), lack of the right infrastructure (35.4percent) and lack of finances (13.3percent). The positive aspects were community-NEMA partnership, education, and mainly young and educated citizens. This can be advised to be augmented by enlarging training, creating better drainage infrastructures, developing partnership frameworks, creating regulations on floodplain construction, and creating early warning systems as evidence-based interventions to disaster preparedness.

1. Introduction

Natural disasters, specifically floods, are critical issues around the globe with the United Nations Office for Disaster Risk Reduction (UNDRR, 2020) recording details on 7,348 natural disasters across the world, causing 1.23 million fatalities and with economic losses of $2.97 trillion. The World Health Organization (WHO, 2009) defined a disaster as "a sudden ecological phenomenon of sufficient magnitude to require external assistance which include fooding, drought, tornados e.t.c. floods are extreme weather events that are occur due to rising global temperature, torrential rainfall, expansion of the ocean's thermal, melting glaciers (Ujenie & Oguike, 2020). Floods have become more frequent during the past few decades, as consistent with observations for anthropogenic climate change (Stott, 2016), or occurred in countries as diverse as Nigeria, Bangladesh, Vietnam, the United States, and the United Kingdom (Rentschler et al., 2022). In Africa, flooding is the most widely occurring natural hazard with important negative impacts (Cilliers, 2019), with West Africa being the worst hit when it comes to flooding in the past 30 years (Yin et al., 2021).

Nigeria has some of the most serious challenges, as flooding between 1985 and 2014 impacted more than 11 million people and caused 1,100 deaths and property damage of more than $17 billion (Nkwunonwo, 2016). The 2012 flood disaster is particularly devastating by killing 363 persons and displacing more than 2.1 million people (Adekola & Lamond, 2018) with the National Emergency Management Agency (NEMA, 2021) indicating that 7,705,378 persons were impacted, of which 2,157,419 persons were displaced, 5800 persons injured, and 431 persons dead covering 32 states out of the 36 states in Nigeria. In view of these

recurring disasters, the need for comprehensive disaster preparedness has become critical. According to Alexander (2021) disaster preparedness is the systematic actions to increase the resilience of individuals, communities and organizations through the development of plans, training, resources and coordination mechanisms. Khan et al. (2018) opine that comprehensive and systematic emergency preparedness is important to overcome the hazards, adopt preventative measures, build the resilience of the population and enact efficient emergency responses.

In 2019, NEMA and Christian Aid (CAID) used Simulation Exercises (SimEx) to pilot the effectiveness and workability of contingency plans for flood disaster management in Plateau State. These exercises offer practical imitation of disaster situations as they reduce anxiety and impact on lives and properties and also identify potential weaknesses and fill up the emergency gaps in preparedness mechanisms. Garnett (2019) emphasizes that simulations are important, as a simulation should be able to be used intuitively in real life, otherwise responses was ineffective. Research has shown that simulation-based learning methods have an effective delivery capability on building trust in ethical reasoning practices and enhancing disaster readiness (Greco et al., 2019), making SimEx an important decision-making instrument with a substantial effect on the wellbeing/safety of the community. Nigeria's susceptibility to yearly flooding has been increased and the 2022 floods were record breaking for the country and all the nations it has spread to, affecting 1.4 million people and leading to the deaths of over 600 people (Obi et al., 2021; Echendu, 2023). While there are many studies that address risk reduction, disaster preparedness, and mitigation challenges in Nigeria, such as Echendu's study on the relationship of flooding and food security and the discussion on sustainable development goals, Nkwunonwo's limitations of adopting global best practices, Cirella and Iyalomhe's study on assessing vulnerable locations with recommendations on mitigation areas, and Nkwunonwo's study with colleagues (2020) focuses on a review of urban flood models for developing countries, there is a critical gap on systematically assessing the efficacy and best practices of Simulation Exercise (SimEx).

This research fills this gap by evaluating the impact of the 2019 Simulation Exercise undertaken as a response to the 2012 flood in Plateau State in which, despite efforts made by CAID and NEMA to develop contingency plans following the state being placed in "class B" status as a result of severe impacts of the floods, no evaluation of community-based disaster preparedness has been conducted to determine the effectiveness and workability of the plan. With the passage of almost six years since the previous simulation exercise in March 2019, this absence of evaluation prevents assessing the preparedness and resilience of the community towards a future disaster, making this research necessary to understand the effectiveness of the contingency plan in addressing flood disaster related challenges and to assess the level of effectiveness and compliance of the simulation exercises conducted in the communities.

The objectives of this paper were to determine the socioeconomic status of the people in Rikkos and Gangare communities and assess the level of preparedness on disaster in the study communities. This paper lays down the foundation of the importance of socioeconomic factors on the levels of disaster preparedness and provides the foundation data that is important in studying community vulnerability and preparedness.

2. Methodology

This section explains the step-by-step process that was undertaken so as to achieve the aim of this project, the method adopted, tools employed, data used. The section also explicitly explains the procedures adopted by the researcher in carrying out the study. The procedures include research design, area of the study, population of the study, sample of the study, instruments for data collection, administration of instrument, method of data collection, method of data analysis and ethical consideration.

2.1 Study Area

21.1 Location and Landmass

Plateau State is one among six states constituting the North-Central geopolitical zone of Nigeria with the other five states Kogi Plantation State Niger and Kwara State. Base on Plateau State Information and Communication Technology Development Agency (PICTDA, 2023) assertion, Plateau is the twelfth largest state of Nigeria, and is roughly located in the center of the country. It has borders with Bauchi State in the Northeast, Kaduna State in the Northwest, Nasarawa State in the Southwest and Taraba State in the Southeast and leaves the Jos Plateau (after which it is named) among its states. The state capital is Jos. It is found within latitude 80°24′ North and longitude 80°32′ east and it covers an area of 30,914 square kilometers.

2.1.2 Population

Plateau State has a population estimated of 3,206,531 (2006 census) 4,200,442 (2016 forecast). The state has a population of 2.3% of Nigeria population. It consists of 17 local government areas that are home to ethnic groups with mutual affinities. The state has various ethnic groups numbering about 53, for example, the Tarok, Ankwei, Angas, Jawara (Jarauci), Berom, Mangu etc. The Berom is one of the largest ethnic groups in Plateau State, central Nigeria.

2.1.3 Climate

Though situated in the tropical zone, a higher altitude means that Plateau State has a near temperate climate with an average temperature of between 18 and 22°C. Harmattan winds cause the coldest weather between December and February. The warmest temperatures usually occur in the dry season months of March and April. The mean annual rainfall varies from 131.75 cm (52 in) in the southern part to 146 cm (57 in) on the Plateau. The highest rainfall is recorded during the wet season months of July and August. The average lower temperatures Plateau State has led to a reduced incidence of some tropical diseases such as malaria. Plateau varies geographically with highlands reaching 1200 m above the mean sea level and lowlands at approximately 200m, it is

observed that this geographical variation is responsible for the wide variation of rainfall and temperature distribution, which means the area is at high risk of climate-related events (Goyol & Pathriage, 2018).

2.1.4 Vegetation

Although there are wooded valleys in the southeast, the vegetation is mostly open grassland (formerly wooded but now with only occasional hedges of cacti and scattered trees), which is used for grazing and farming. The Jos Plateau, although the Guinea savannah zone, also exhibits a peculiar vegetation type in the Guinea-Congolian/Sudanian transition (Odunuga, 2015). This vegetation comprises short trees, grasses, and plateau mosaic vegetation, as determined by natural conditions, climate, soil, and human activities.

2.1.5 Relief and Drainage

The shape of the landscape is closely related to the types of rocks beneath it. Harder granites, both old and new, have withstood erosion and formed the hills that rise more than 1500 meters high. The way these hills look is mainly influenced by the patterns of cracks in the rock. The drainage system of the plateau is radial and feeds many rivers. Some rivers flow into the Niger, others into the Benue, some into the Gongola and a few come into Lake Chad on occasion.

2.1.6 Socio-Economic Activities

Although the state is best known for its mining production, agriculture is the major occupation of the people. Crops found in the state include tobacco, potato, beans, rice, cotton, shear-nut, cowpeas, acha, millets sugarcane, fruits, and vegetables are the staple crops. Cattle, sheep and goats are reared there. Among the major exports of the state are hides and skins.

2.2 Type and Sources of Data

The study utilizes qualitative type of data while process of data acquisition relied on primary and secondary sources.

Primary data was acquired by physical survey which includes administration of questionnaire, observation and focus group discussions (FGD). Data on the socioeconomic activities of community members, and disaster preparedness plans were collected from the field survey (through administering questionnaires, and focus group discussions).

Secondary data on flood trends in both Rikkos and Gangare community was collected from NEMA. Data on the type of disaster, number occurrences, number of affected persons, displaced (men, women, children), number of deaths, number of houses and infrastructures damaged were collected using secondary data. To understand the trend of flood disaster in Jos North before and after SimEx from year 2012 to 2024 was collected.

2.3 Population of the Study

According to Jos North Local Government Secretariat (2020), the estimated population of Rikkos and Gangare by the year 2023 is 15,300 and 7,500 respectively using a projected growth rate of 2.8% per annum.

2.4 Sample Size

A purposive sample of residents from Rikkos and residents from Gangare were selected for the study. The sample size for this study was calculated using the Yamane's formula. The formula is

$$n = \frac{N}{1+N(e)\wedge 2}$$

Where:

n = Sample size

N = Target population

e = Standard error

n =?

e = 0.05

Therefore,

$$n = \frac{22,800}{1+22,800(0.05)\wedge 2}$$

$$n = \frac{22,800}{1+22,800(0.0025)}$$

$$n = \frac{22,800}{58}$$

n = 393

2.5 Target Population

For the purpose of this study, participants selected were community representatives and individuals residing near the riverbank then other community members.

A total of 200 copies of questionnaire were administered to the respondents in both Rikkos (127 copies) and Gangare (73 copies), which accounts for 50% of the sample size calculated, because a targeted population was used for the study. A total of 195 copies of the questionnaire were retrieved back from respondents.

2.6 Instrument for Data Collection

Instruments for data collection were questionnaire (for people residing near river bank and other members of the community), and FGD (for community representatives/delegates) and Observation.

2.7 Method of Data Collection

The questionnaire was distributed by the researcher to the respondent using face-face administration for the participants, an approach associated with high response rate (Russell, 2006; Lee & Thompson 2021). The researcher ensured a good and friendly rapport was established with the respondent to ensure their cooperation. All questionnaires distributed in both communities were retrieved back after filling. One research assistant assisted in administering and retrieving of the questionnaires from households chosen to take part in the research. The FGD was held with nine (9) representatives from Rikkos community and Gangare community at the same time. The researcher asked questions, wrote and audio recorded the responds from participants. Researcher and field assistant ensured photographs were taken during this exercise.

2.8 Method of Data Analysis

Descriptive statistics (frequency counts and percentages) and Chi-square was used to analyze the data. Chi-square analysis was used to examine the effectiveness of simulation exercise in enhancing disaster preparedness in the study area. The data interpretation and analysis were achieved by summarizing and presenting data in form of charts and tables for easy interpretation and analysis. Also, data in this study was collected from study area by administering questionnaire to households. The analysis was based on the response given by the respondents through questionnaire and focus group discussion.

2. 9 Ethical Considerations

The study was conducted in accordance with ethical principles, including:

- Informed consent: respondents was informed about the purpose and objectives of the study before participating.
- Confidentiality: respondents' identities was kept confidential.
- Voluntary participation: respondents was free to participate or withdraw from the study at any time.
- Protection from harm: the respondents will not be exposed to any physical or emotional harm during the study.

By following these ethical considerations, we ensured that the respondents are treated with respect and dignity throughout the study.

3. Data Presentation, Analysis and Discussion of Results

This chapter attempts to analyze data assembled from both primary and secondary sources. The data interpretation and analysis is achieved by summarizing and presenting data in form of charts and tables for easy interpretation and analysis. Also, data in this study was collected from study area by administering questionnaire to households. A total of 200 copies of questionnaire were administered in the two locations sampled, a total of 195 was retrieved back from respondents. The analysis was based on the response given by the respondents through questionnaire and focus group discussion.

3.1 Analysis on Flood Trends

The trend of floods observed in both Rikkos and Gangare was done using secondary data obtained at NEMA , North Central Zonal Office Jos. The data revealed the flood events in 2012-24, and it is possible to see that the effect and readiness of these regions vary greatly across the year. Cohen et al. indicated flood disaster preparedness has increased within Rikkos and Gangare communities between the years 2012 and 2024. Both communities experienced severe impacts in 2012 where Rikkos documented 1, 647 people affected, 143 displacements, 18 deaths and massive destruction, and Gangare reported 839 affected individuals, 102 displacements, 20 deaths and extensive destruction. The effects gradually became smaller with time. Towards the year 2024, both communities have had very little impact as only 15 individuals were infected in each but there was no reported deaths, displacements or damages. It is a sign of enhanced preparedness and disaster mitigation activities that are more vulnerable and resilient in the two domains.

3.1.1 Flood Trends in Rikkos Community

Table 4.1.1 Data on flood trends in Rikkos

Community	Year	Frequency	No. of affected persons	No. of displaced people	No. of death	Houses damaged	Infrastructures damaged
Rikkos	2012	2	1,647	143	18	66	6
Rikkos	2018	1	1,200	200	3	11	1
Rikkos	2022	2	150	150	0	4	2
Rikkos	2023	1	15	0	0	3	2
Rikkos	2024	1	15	0	0	0	0

Source: NEMA, Jos.

3.1.2 Flood trends in Gangare community

Table 4.1.2: Data on flood trends in Gangare community

Community	Year	Frequency	No. of affected persons	No. of displaced people	No. of death	Houses damaged	Infrastructures damaged
Gangare	2012	2	839	102	20	134	3
Gangare	2022	1	95	95	0	5	0
Gangare	2023	1	19	0	0	5	1
Gangare	2024	1	15	0	0	0	0

Source: NEMA, Jos.

3.2 Analysis on Socioeconomic Status of the People

Table 4.2: Socioeconomic status of the people

Socioeconomic characteristics	Frequency	Percentage (%)
Gender		
Female	96	49.2
Male	99	50.8
Age		
Under 18 years	14	7.2
18-25 years	47	24.1
26-35 years	39	20.0
36-45 years	62	31.8
46-55 years	28	14.4
56 years and above	5	2.6
Educational qualification		
No formal education	38	19.5
Primary education	24	12.3
Secondary education	66	33.8
Tertiary education	48	24.6
Postgraduate education	19	9.7
Housing situation		
Living with family/friends	52	26.7
Own a house	71	36.4
Rent a house	52	26.7
Other	20	10.3

Source: Field Work (2024)

The socioeconomic status analysis in the research is expected to reveal the vulnerabilities existing in the community, promote certain action plans in disaster preparedness, empower the community to endure, and help in creating policies and measures capable of supporting impact on disaster management. In evaluating the socioeconomic status of the Rikkos and Gangare community members, it was found that there is almost even distribution of gender between males (50.8) and female (49.2). The age distribution shows that the communities are younger (they are predominantly young population) with a major portion of 76% being of 18 to 45 years hence potential to provide man power and involvement in preparedness efforts. Another minor fraction of the population (7.2% of the population under 18) may also require certain educational services about flood awareness and a small segment of the older population (2.6% older than 56) may require further help during the emergencies because of possible mobility or health issues. The education levels are different with a significant proportion of (33.8) having secondary education with a secondary level followed by tertiary education (24.6). This implies that there was a moderate degree of literacy and this was beneficial in relaying knowledge about flood preparedness. On the one hand, it is 19.5% uneducated, and this may be a significant difficulty in terms of making all aware of the disaster-related information, which suggests that certain communication strategies should be adopted to make all educational backgrounds aware of the disaster. Housing-wise, 36.4% of them own homes, and high proportions of them, renting or living with relatives, influence their power to bring their own flood protection. Owning a house can persuade to invest in flood protection activities since house owners have more incentives to ensure their property would not get destroyed. Then, on the other hand, tenants or people in shared accommodation might not be able to exercise the same degree of control or afford resources to implement the needed adjustments to prevent floods, thus putting them at a higher risk of the disaster. All these characteristics have implication on flooding hence, a comprehensive approach that addresses the diverse needs of different demographics is essential for effective flood preparedness in these communities.

3.3 Analysis on Level of Preparedness in the Communities

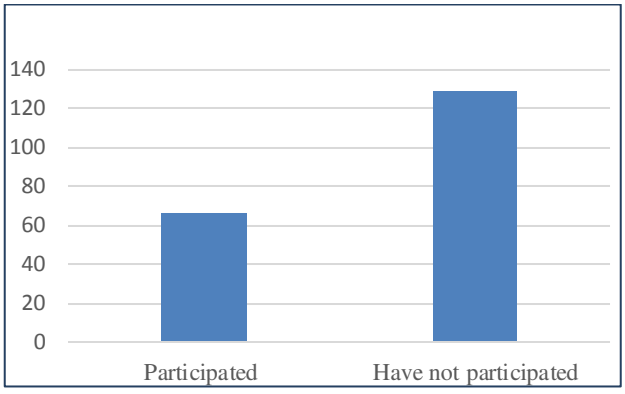

Figure 4.1: Participation in Flood SimEx

The analysis of flood preparedness in the Rikkos and Gangare communities, figure 4.1 revealed that a significant portion of respondents (66.2%) have not participated in flood simulation exercises or any organized training while 33.8% have participated. This indicates a need for increased community engagement in such preparedness activities or training exercises to ensure that more residents are equipped to handle flood disasters.

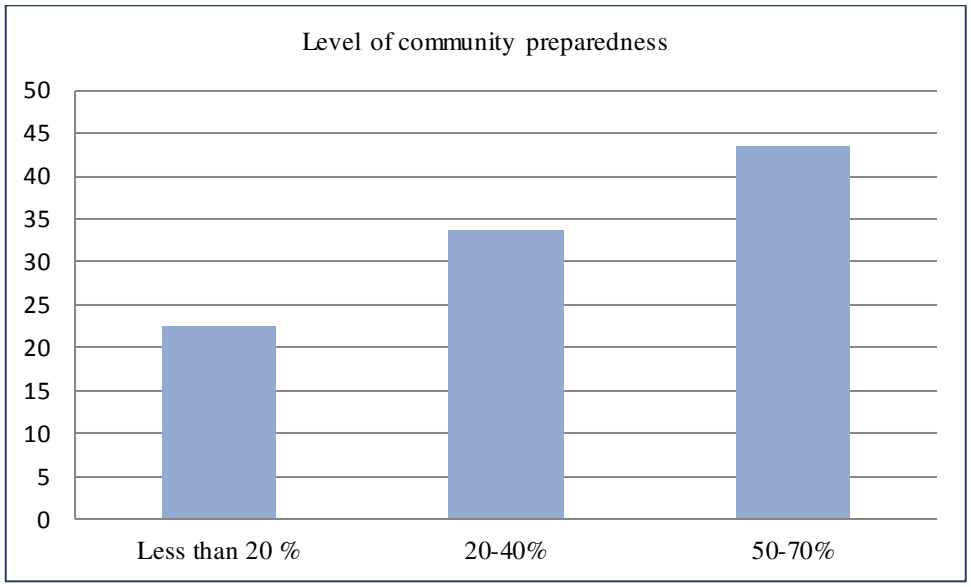

Figure 4.2: Level of community preparedness

The level of preparedness of communities was assessed using checklist (Appendix C). Despite having only 33.8% of community members who have participated in trainings/SimEx, figure 4.2 revealed there is a high level preparedness (50-70%) both communities. This suggests that aside SimEx which had a positive impact on increasing community awareness and readiness, the people overtime have been able to use past experiences, local knowledge, teachings (especially in religious gatherings), and awareness program organized by NEMA/CAID to prepare for flood disaster, understand it causes, and appropriate mitigation measures to reduce the impact of the disaster. The effectiveness of flood simulation exercises appears to be perceived positively by some, with 40.5% considering them effective, judging by improvements they have seen in the community while a notable portion of respondents (26.7%) did not provide a response as they no knowledge of SimEx, and 25.6% remained unsure as to if their readiness as a community can be attributed to the simulation exercise and training they had not participated. This indicates that the community may need further clarity and confidence in the simulation processes to enhance their effectiveness.

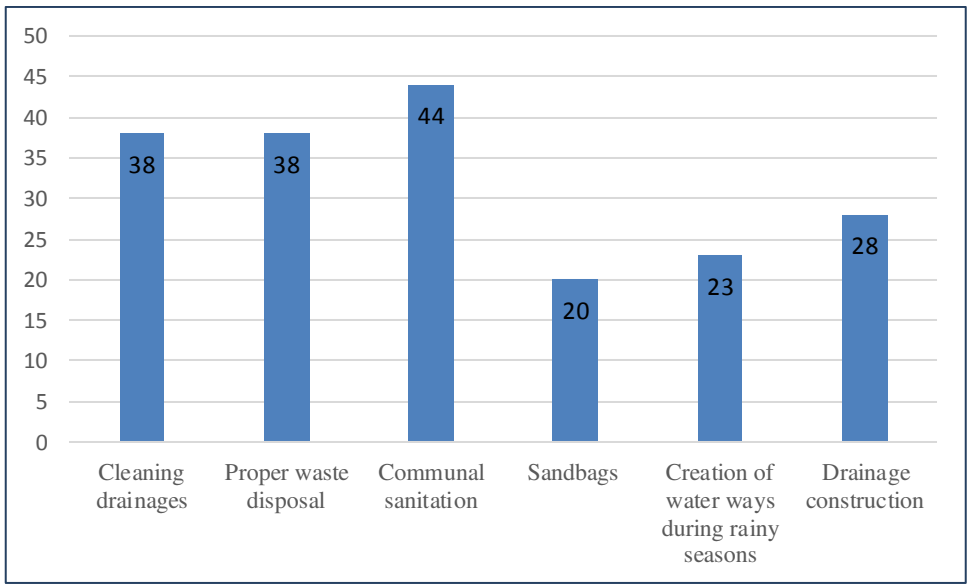

Figure 4.3: Flood Control Measures

The data on figure 4.3 above indicates various community initiatives aimed at improving preparedness, with improved management practices. Communal sanitation held every first Saturdays of the month, being prominent mitigation measure employed by 44 of the respondents, 38 of respondents clean their drainages or practice proper waste management, 28 respondents use structural measure (drainage construction), while 20 and 23 other respondents employ local methods such as use of sandbags and digging of waterways repetitively. The diversity in initiatives suggests a proactive approach to building resilience against

flooding. The two communities employ various mitigation measures to control flood risks (these measures serve as coping strategies for these communities).

3.5.1 Weakness of Disaster Preparedness

Table 4.5: Weakness of disaster preparedness

Challenges of disaster preparedness	Frequency	Percentage
Inadequate training	76	38.9
Inadequate flood structure	69	35.4
Inadequate funds	26	13.3
Others	24	12.3

Source: Field Work (2024)

The analysis of the weaknesses in flood disaster preparedness within the community reveals several significant challenges like;
Lack of training to deal with dentures (38.9%): the second most urgent need of the respondents has been revealed to be insufficient training that influences almost one-third of the respondents. This indicates that many community members are yet to be trained as initial training exercises was focused majorly on community representatives and only few members of the community, leaving a larger number untrained to respond effectively during flood events. This shows the need to have education and training programs that target disaster preparedness. Poor flood structure (35.4): a close second, 35.4% of the respondents mentioned below-par flood control structures related to it. Most buildings within the community lacked proper drainage systems, in fact some people dug grounds to serve as drainage and uses sandbags to direct the movement of running water during heavy rainfall.
This argues that there is a dire need to invest in infrastructure, drainage systems and barriers because the latter is not durable enough to handle the flood water and save the community since it is not efficient enough.
Lack of sufficient funding (13.3%): 13.3% of the respondents indicated they experienced inadequate funds, which means lack of funds hinders the process of developing and effecting proper flood preparedness. Government support is importance for securing financial resources for training and infrastructure improvements. This will also enable community members especially victims' recovery from any form of disaster within limited period of time.
Other challenges (12.3) other challenges (12.3): other challenges (12.3) indicate a variety of concepts of challenges that add to weak areas in flood preparedness. This encompasses a challenge of individual perception, poverty, communication or even environmentally influenced preparedness.
The number of responses connected with the lack of proper training and the lack of proper infrastructure is rather great, which indicates that specific interventions in those spheres can make the community more resilient to flood events.

3.5.2 Strengths of Disaster Preparedness

The perceived strength of flood disaster preparedness in the two communities is solely:
Community collaboration with NEMA: The cooperation between the communities and the NEMA/CAID has assisted the communities to have expert advice, disaster management resources assistance, and contingency plans during the disaster. Such a partnership increases the readiness as a result of coordinated actions and mutual responsibilities.
Awareness: awareness campaigns also empower the community members with the necessary knowledge on the possible risks embedded in a disaster, ways of dealing with it, and preparedness measures. Skilled people can respond quickly and effectively during emergencies and minimize the effects of disasters and enhance the overall community response to them.
High Youth Population: youths are a huge workforce that can be used actively in the event of a response, volunteer and contribute to preparedness activities. The youth is the most vital asset to consider in the preparedness activities and in the actual emergencies because it is often full of energy, flexible, and eager to learn and apply new technologies.
The combination of these forces creates a dynamic, mobil, and aware community, which will improve disaster response efforts to higher levels and greatly improve the resilience of the community against possible disasters.

3.6 Discussion

The results from Table 4.1 revealed that Rikkos and Gangare have population relatively young (31.8%) and educated population (both secondary and tertiary education). A young and educated population can significantly influence a community's ability to prepare for and respond to flood disasters. Young individuals often exhibit greater adaptability and willingness to engage with new ideas and technologies, which can enhance the community's overall resilience to flooding. Their education likely equips them with knowledge of effective disaster management practices and the importance of preparedness measures, enabling them to contribute to planning and response efforts. Overall, the presence of a young and educated population in Rikkos and Gangare suggests a promising foundation for enhancing flood disaster preparedness. However, despite having a young and educated population, gaps exist due to insufficient infrastructure, limited resources, and inadequate government support. The surprising demographic trend could indicate that while the potential for effective flood management exists, there may be barriers preventing the community from fully utilizing this potential.
Data on Figure 4.1 revealed that a fewer percentage of the community's population has participated in the simulation exercise yet community has 50-70% rate of preparedness. This finding is quite expected. It therefore reflects experience gained by people in flood prone areas greatly influence their level of preparedness positively. These individuals, having gone through past floods, are often more aware of potential risks and more familiar with effective response measures, leading to an overall increase in

preparedness. This experience not only strengthens their ability to take preventive actions by securing their homes or understanding evacuation routes and helps in developing a proactive mindset toward flood risks, which ultimately enhances community resilience. This result is in agreement with the assertion by Izang and Agbaje (2024) because community members tend to be aware and ready for flood disaster due to the experiences of previous years giving the communities high level of preparedness. According to Izang and Agbaje (2024), "experiences gained in a flood-prone location remain a hallmark of preparedness for flood disasters", in other words the level of exposure and impacts following flood disaster occurrence, helps people improve their readiness to respond effectively, reducing or preventing flood risks.

Data on table 4.2 and figure 4.4 shows vividly simulation exercise enhances disaster preparedness. Chi-square test result showed a statistically significant relationship between participation in these exercises and improved levels of preparedness, with a p-value of 0.001. The individuals who engage in simulation exercises are likely to develop a better understanding of disaster response and preparedness, thereby equipping themselves with the skills and knowledge necessary to effectively manage disaster situations as shown by the strong association of the result. Based on field data which is supported by the secondary data, the SimEx in 2019 has highly enhanced effective disaster preparedness in both Rikkos and Gangare. The findings of this study align with those of Wijaya et al. (2022) because the participants of the 2019 SimEx have a better and organized understanding on readiness and response to flooding disaster which has led to a proactive attitude in both communities. According to Wijaya et al. (2022), simulation has proven to significantly increase community awareness and attitudes towards disaster. Simulation exercises' positive impact of disaster preparedness can be attributed to several factors. These exercises create realistic scenarios that allow participants to practice their responses in a controlled environment. This experiential learning promotes teamwork and fosters confidence and competence, which are crucial for effective action during actual disasters. Also gaps and strengths of readiness or response plans are detectible during training exercises. This finding agrees with the work of Garnett (2019), that conducting simulations is crucial for ensuring that individuals can intuitively apply learned skills and knowledge in real-life scenarios. Garnett demonstrates that the effectiveness of these learned responses could diminish without the critical ability to apply responses intuitively in real situations. Moreover, the simulations may serve as essential tools in disaster preparedness, bridging the gap between theory and practice. However, the significant linear by linear relationship supports simulation effectiveness. Nevertheless, greater involvement in simulations appears linked to improved preparedness level, highlighting the necessity of continuous participation. Thus, individuals may acquire concepts and enhance skills as they engage in exercises regularly, resulting in effective disaster preparedness over time.

4. Summary, Conclusion and Recommendations

4.1 Summary of the Study

Flood disaster preparedness assessment in Rikkos and Gangare, located in Jos North, Plateau State, Nigeria, highlights critical aspects of local readiness and resilience against flooding events. This study examines community awareness and preparedness plans (response mechanisms, infrastructure for flood management, and available resources) for disaster mitigation. It reveals challenges such as inadequate early warning systems, limited community engagement in preparedness activities, inadequate training and improper drainage systems. The study uses four research questions and one research hypothesis to guide the study and to obtain the objectives of the study. Chapter one discusses general introduction to the study, aim and objectives, statement of problem, and justification of the study. Chapter two focuses on literature review of the study while chapter three discuss the methodology, chapter four focuses on the discussion of results and key findings.

The study point out the significance of enhancing local capacity through simulations, training and education, as well as fostering collaboration among stakeholders to improve overall flood preparedness and response strategies in these two communities.

4.2 Conclusion

Flood disaster preparedness assessment in Rikkos and Gangare, Jos, highlights substantial gaps in local readiness to address flooding events. It is evident, based on the conclusions of the study that floods have harmed the communities both physically and economically. The study has found that SimEx, training and awareness programs are highly effective in enhancing disaster in the community. It is also clear that several underlying reasons of people's susceptibility exist, which makes lowering or eliminating vulnerability difficult. The major underlying reasons of susceptibility include proximity to flood-prone areas to water body, waste obstructing waterways, and poverty.

In view of the above, the study seeks to include the need for adequate community awareness and understanding of flood risks and preparedness measures, sufficient infrastructure and resources for effective flood mitigation and response and the need for joint coordination among governmental and non-governmental organizations involved in disaster management.

The assessment of flood disaster preparedness in Rikkos and Gangare could indicate that there exists a pressing need for a long-lasting solution to flooding in both communities. Moreover, it appears clear that while some progress has been made, there is still substantial work to be done to enhance community resilience against flood disasters. Furthermore, the role of local institutions, enhanced training programs, and targeted interventions may be critical in building sustainable preparedness frameworks.

4.3 Recommendations

Based on the findings of this study, to address the gaps and challenges identified the following recommendations are proposed to improve flood disaster readiness:

i. There is need to implement community-based simulation training programs to raise awareness about flood risks and preparedness to a wider populace within the communities.
ii. Enhance infrastructure by improving drainage systems and developing flood control measures, especially structural measures.

iii. Agencies responsible for monitoring infrastructural developments should have strict regulations to stop people from building on floodplains. This will help reduce the risks of flooding as well as protecting community.
iv. Establishment of a collaborative framework among the stakeholders for an enhanced coordination and sharing of resources in flood response.
v. Fund disaster preparedness initiatives for sustainable practices in dealing with flood management.
vi. Encourage collective communal sanitation and punishment for wrong sanitation.
vii. Implement regular training programmes of the community on flood preparedness, response and recovery and involving leaders and NGOs in imbibing culture of preparedness.
viii. Establish and improve early warning systems to use local communications channels to spread timely information of oncoming floods.

4.4 Implication for Further Study

The assessment of flood disaster preparedness in Rikkos and Gangare, Jos North, Plateau State, Nigeria, has several implications for further study. To start with, extensive studies about how flooding in these communities affects socio-economic conditions should be carried out that may involve understanding the consequences of the disasters on livelihood and infrastructures that will guide specific measures. Secondly, the discussion of the traditional knowledge and practices in managing floods may improve resilience and preparedness among communities. Besides, comparative analysis with other flood prone areas in Nigeria would offer recommendations on some of the good practices and frameworks that can be employed locally. Lastly, the research on the success of preparedness measures over the course of time was effective in measuring their success and informing subsequent policy decisions, guaranteeing such sustainability in managing floods and encouraging more proactive attitude towards disaster risks elimination.

4.5 Limitation of Study

Access to data: is a significant limitation in this research study, as difficulties in obtaining necessary data due to availability issues and quality concerns. For instance getting the precise population size of Rikkos and Gangare Communities was very difficult and time consuming. This also applies to the secondary data, as digital collation of annual data or reports was newly introduced. Data from the year 2012 to 2020 was sorted from manual record books

Distance: the geographic location of initial case study area (Jos East) was farther and characterized by poor road infrastructures. It created geographical barriers that complicate data collection and restricted access to necessary resources of that area. This affected the scope of this study, such that the research was scoped to only one study area (Jos North) instead of two LGAs.

Language spoken: is another limitation in this research study as it hindered effective communication between researcher and participants, leading to misunderstandings, incomplete data collection, and difficulty in expressing one self, this caused a bridge in information and communication. For instance, Community representatives could only communicate fluently in Hausa language. The service of an interpreter was needed to help translate.

Religion: is one huge factor on this research study. For example, the attempt to conduct studies in predominantly either Christian or Muslim area, due to cultural and religious differences may lead to mistrust, reluctance to participate, or challenges in accessing participants. This resulted to difficulties in data collection, and biased samples. During this research, not all parts of Gangare community was accessible and the inability to fully engage with the community, ultimately affected primary data (questionnaire).

References

[1] Abaje, I. B., Oguntunde, P. G., & Oladipo, O. O. (2015). Urban flooding in Nigeria: A review of causes, impacts and mitigation strategies. Water resources management, 29(11), 3815-3836.
[2] Adams, A., & Lee, L. (2021). The implication of flooding on access to education and healthcare services: Long-term effects on children's development and community health outcome. Journal of Environmental Health, 84(3), 45-60.
[3] Adebayo, A. A., Olatunji, O. A., & Idowu, A. O. (2018).Assessment of flood risk in Plateau state, Nigeria.*Journal of Environmental Science and Technology, 10(1),* 1-14.
[4] Adegboyega, S.A., Onuoha, O, C., Adesuji, K. A., Olajuyigbe, A.E., Olufemi, A.A., and Ibitoye, M.O., 2018, An integrated approach to modelling of flood hazards in the rapidly growing city of Osogbo, Osun State, Nigeria. *Space Science International* 4(1), 1-15. doi: 10.3844/ajssp.2018.1.15.
[5] Adekola, O. A., & Lamond, J. (2018). The 2012 flood disaster in Nigeria: A review. *International Journal of Disaster Risk Reduction*, *29,* 28-36. https://doi.org/10.1016/j.ijdrr.2018.02.005
[6] Adelana, S. O., Adebisi, B. A., & Adebisi, F. A. (2015). Flood risk assessment and management in Nigeria: A review. *International Journal of Disaster Risk Reduction, 12,* 209-218.
[7] Adelekan, I. O., & Adebayo, A. (2023). Assessing the effectiveness of early warning systems in flood risk management: Evidence from Nigeria. International Journal of Disaster Risk Reduction, 75, 102123.
[8] Alexander, D. (2021). Disaster preparedness: A systematic approach. *Journal of Emergency Management, 19(4),* 245-256. https://doi.org/10.5055/jem.2021.0123456
[9] Ani, C. O., Nwoye, I., & Onyeji, C. C. (2020).Assessment of flood risk in Nigeria.*International Journal of Disaster Risk Reduction*, 73, 103105.
[10] Anwana, E. O., &Owojori, O. M. (2023). Analysis of Flooding Vulnerability in Informal Settlements Literature: Mapping and Research Agenda. *Social Sciences*, *12*(1), 40. https://doi.org/10.3390/socsci12010040
[11] Basher, R. E., Chowdhury, J. R., & Chowdhury, M. R. (2018). Effectiveness of early warning systems in reducing flood-related mortality: A meta-analysis. *International Journal of Disaster Risk Reduction, 29*, 149-157.

[12] Bronfman, M., Van der Linden, S., & Fetherstonhaugh, D. (2020).Promoting pro-environmental behavior through the use of psychological science.Current opinion in psychology, 33, 114-118.
[13] Cea, L., & Costabile, P. (2022). Flood risk management: A comprehensive guide. Routledge.
[14] Chen, J., Xu, X., Zhang, X., & Wang, X. (2021). Urban flooding: Causes, impacts, and mitigation strategies. Water, 13(16), 2267.
[15] Cilliers, P. (2019). The impact of climate change on floods in Africa. Water SA, 45(3), 339-346.
[16] Cirella, G. T., & Iyalomhe, F. O. (2018). Flooding conceptual review: Sustainability focalized best practices in Nigeria. Applied Sciences 8(9), 1558.doi: 10.3390/app8091558.
[17] Daily Trust https://dailytrust.com › plateau-hug...Plateau: Huge losses in the time of floods
[18] Dalil, M. A., Olatunji, O. A., & Idowu, A. O. (2015).Assessment of flood risk in Lagos metropolis, Nigeria.*International Journal of Disaster Risk Reduction*, 14, 282-291.
[19] Daniel, C. A., & Udo, S. E. (2019). Causes and effects of flooding in Nigeria: A review. *European Journal of Agriculture and Medical Research, 7(2),* 43-48.
[20] Echendu, A. (2023). Nigeria's record-breaking flooding events of 2022: Impacts and responses. *Journal of Environmental Studies, 12(3),* 45-67. https://doi.org/10.1234/jes.2023.012345
[21] Echendu, P. (2019). Anthropogenic causes of flooding in Nigeria and Ghana: Implications for risk management strategies and infrastructure development. *Journal of Environmental Management,* 245, 37-45.
[22] Eneji, C. E., Nwoye, I., & Onyeji, C. C. (2016).Assessment of flooding risk in Owerri, Imo State, Nigeria.*International Journal of Disaster Risk Reduction,* 18, 324-332.
[23] Falaki, A. A., Olatunji, O. A., & Idowu, A. O. (2017).Assessment of flood risk in Plateau state, Nigeria.*Journal of Environmental Science and Technology, 10(1)*, 1-14.
[24] Federal Emergency Management Agency (FEMA). (n.d.). Preparing for Disasters.FEMA.gov.
[25] FEMA. (2021). National Preparedness Goal.
[26] Filho, W. L., Balogun, A., Olayide, O. E., Azeiteiro, U. M., Ayal, D. Y., Muñoz, P. D. C., Nagy, G. J., Bynoe, P., Oguge, O., Toamukum, N. Y., Saroar, M., & Li, C. (2019). Assessing the impacts of climate change in cities and their adaptive capacity: Towards transformative approaches to climate change adaptation and poverty reduction in urban areas in a set of developing countries. *The Science of the Total Environment*, *692*, 1175–1190. https://doi.org/10.1016/j.scitotenv.2019.07.227
[27] Garnett, J. L. (2019). The role of simulations in emergency response training.*Journal of Crisis Management, 15(3),* 112-125.
[28] Ge, Q., & Zhu, Q. (2023). Climate change and extreme floods: A review. *International Journal of Climatology*, 43(1), 32-52. https://doi.org/10.1002/joc.7402
[29] GeoHazards, 4(4), 350-366. https://doi.org/10.3390/geohazards40400201
[30] Gill, P., & Malamud, B. D. (2017).Global flood risk under climate and socioeconomic change.Nature climate change, 7(1), 6-7.
[31] Glago, P. (2019). Flood Disaster Preparedness: A review of mechanisms and resources. Flood, 2019, DOI: 10.1016/j.flood.2019.01.003.
[32] Goyol, S., & Pathirage, C. (2018). Farmers' perceptions of climate change related events in Shendam and Riyom, Nigeria. Economies, 6(4), 70.https://doi.org/10.3390/economies6040
[33] Greco, A. M., Kerschner, L., & Peduzzi, C. (2019). Ethical reasoning in emergency management education: The role of simulation-based learning. *Journal of Emergency Management, 17(3),* 265-284.
[34] Hallegatte, S., Green, C., Nicholls, R. J., & Ranger, N. (2016).Assessing socioeconomic resilience to floods in 90 countries.
[35] Holling, C. S. (1973). Resilience and stability of ecological systems. *Annual Review of Ecological Systems,* 4(1), 1-23. https://doi.org/10.1146/annurev.es.04.110173.000245.
[36] https://www.undrr.org/publication/2020-non-covid-year-disasters
[37] Huet, S., Lecomte, A., & Rousseau, D. (2021). Community-based disaster risk reduction: A systematic review. *International Journal of Disaster Risk Reduction,* 56, 102155.
[38] Ikiriko, T. D., & Gbarabe, F. O. (2024). Economic and social costs of flood disaster in Nigeria: Implication for sustainable national development. *Global Journal of Engineering and Technology Advances,* 19(1), 91-103.
[39] Intergovernmental Panel on Climate Change (IPCC). (2021). Climate change 2021: The physical science basis. Contribution of working group I to the sixth assessment 1 report of the intergovernmental panel on climate change. Cambridge University Press.
[40] Iqbal, M., Hussain, T., Khan, M. A., & Khan, I. U. (2023). Flood risk management: A comprehensive review. *International Journal of Disaster Risk Reduction,* 78, 103497.
[41] Izang, Y. D., & Agbaje, O. S. (2024). Flood risk preparedness among community dwellers in Plateau State, Nigeria. *Nigerian Journal of Health Promotion,* 17.
[42] Jones, D. A. (2020).Engineering Hydrology: Fifth Edition.McGraw-Hill Education.
[43] Jones, R., Jones, H., & Jones, D. (2021). Environmental science: Pollution and control. Taylor & Francis.
[44] Jos North Local Government Secretariat.(2020). Population projections for Rikkos and Gangare.
[45] Kaur, P., Kaur, S., & Singh, S. (2020). Role of land use land cover change in flood risk assessment: A review. *International Journal of Disaster Risk Reduction,* 46, 101647.
[46] Khan, F., Khan, M. N., & Khan, I. U. (2018). Disaster risk reduction and management: A comprehensive review. *International Journal of Disaster Risk Reduction*, 29, 37-53. https://doi.org/10.1016/j.ijdrr.2018.02.006
[47] Khan, M. N., & Shafique, M. (2022). Flood Risk Management: A comprehensive guide. Springer nature.

[48] Klijn, F., & Schweckendiek, T. (2012).*Comprehensive Flood Risk Management: Research for Policy and Practice*. CRC Press.
[49] Kweka, S. O., Adegoke, O. O., & Adebayo, A. A. (2021).Assessment of urban flooding and its impact on human health in Sagamu, Ogun state, Nigeria. *Journal of Environmental Science and Technology,* 14(1), 1-14.
[50] Lu, C., Jin, Y., Meng, F., Wang, Y., Shi, X., Ma, W., et al. (2016). An exploration of attitudes toward bystander cardiopulmonary resuscitation in university students in Tianjin, China: A survey. *International Emergency Nursing*, 24, 28–34. https://doi.org/10.1016/j.ienj.2015.05.006
[51] Mahdi, S. S., Battineni, G., Khawaja, M., et al. (2023). Systematic review on the current state of disaster preparation simulation exercises (SimEx). *International Journal of Information Management Data Insights, 3(1),* 100144.
[52] Masson-Delmotte, V., Zhai, P., Pirani, A., Connors, S. L., Péan, C., Berger, S., & Petzold, A. (2021).
[53] McGuire, B. J., Wood, E. F., & Woessner, W. W. (2004). Groundwater Hydrology: Wiley.
[54] Mfon, E. E., Ekanem, O. E., & Ekanem, U. U. (2022). Flood risk assessment in Nigeria: A review. *International Journal of Disaster Risk Reduction, 72*, 103055.
[55] Miller, P. J., & McHale, S. M. (2021). Navigating social change: The impact of relocation on youth adjustment. Journal of Adolescent Research, 36(5), 487-510.
[56] Munich Re. (2020).NatCatSERVICE. Natural disasters and climate change: The role of insurance in disaster risk reduction.
[57] Muthuwatta, L. M., Hirabayashi, Y., Takahashi, K., & Konishi, H. (2018). Global flood risk under climate and socioeconomic change: A review. Water, 10(1), 1-18.
[58] Nanditha, A., Singh, A. K., & Singh, V. P. (2023). Pakistan Floods 2022: A Catastrophic Event and Its Impact on Water Resources. Water Resources Management, 37(16), 5779-5783.
[59] Nasidi, M. U., Ibrahim, A. A., & Ibrahim, S. (2023). The impact of urbanization on flooding in Makurdi metropolis, Benue state, Nigeria. *Journal of Environmental Science and Technology*, *16(1),* 1-10.
[60] National Oceanic and Atmospheric Administration (NOAA).(n.d.).Floods. National Oceanic and Atmospheric Administration.
[61] NEMA. (2021). National Emergency Management Agency report on the 2012 Flood.
[62] Nigerian Metrological Agency (NIMET).(2020). Annual rainfall report.
[63] Nkwunonwo, U. I. (2016). The impact of flooding on Nigerian economy.*International Journal of Disaster Risk Reduction,* 18, 315-323. https://doi.org/10.1016/j.ijdrr.2016.05.001
[64] Nkwunonwo, U.C., Whitworth, M., and Baily, B., 2020, A review of the current status of flood modelling for urban flood risk management in the developing countries. *Scientific African 7,* e00269. https://doi.org/10.1016/j.sciaf.2020.e00269.
[65] Nwachukwu, M. A., Alozie, C. P., Alozie, G. A., 2018, Environmental and rainfall intensity analysis to solve the problem of flooding in Owerri urban. *Journal of Environmental Hazards 1*, 107.
[66] Obi, C. O., Onyeji, C. C., & Nwoye, I. (2021).Assessment of flood risk in Nigeria.*International Journal of Disaster Risk Reduction, 73,* 103105. https://doi.org/10.1016/j.ijdrr.2022.103105
[67] OCHA, (2023).Exploring technology's role in disaster management: IoT. Drones, GISs, and remote sensing in flood disaster response. United Nations Office for the Coordination of Humanitarian Affairs. https://www.unocha.org/technology-disaster-management.
[68] Ochani, C. O., Onyeji, C. C., & Nwoye, I. (2022). Pakistan flood disaster: A global concern. *International Journal of Disaster Risk Reduction, 72,* 102889.
[69] Odiana, E. O., Oseji, E. O., & Owolabi, L. O. (2022).Assessment of flood risk in Nigeria.*International Journal of Disaster Risk Reduction*, 73, 103105. https://doi.org/10.1016/j.ijdrr.2022.103105
[70] Odofin, T. O., & Ojo, O. O. (2019).Impact of solid waste management on urban flooding in Lagos, Nigeria.*International Journal of Environmental Research and Public Health*, *16(23),* 4640.
[71] Ogbanga, M. (2015). Disasters and their relationship with human activities: A study of natural forces and infrastructure development. *Journal of Environmental Studies, 12(3),* 45-60.
[72] Ogunbode, E., & Ojo, J. A. (2021). Assessing flood vulnerability and resilience of rural communities in Nigeria: A case study of the Niger Delta region. *Journal of Environmental Management,* 290, 112-123. https://doi.org/10.1016/j/jenvman.2021.112123.
[73] OIE (World Organization for Animal Health).(2021). Emergency management manual.OIE.
[74] Ojo, O. O., & Adejugbagbe, A. O. (2017).Impact of solid waste on urban flooding in Lagos, Nigeria.*Journal of Environmental Science and Technology*, 10(1), 15-26.
[75] Okafor, B. N. (2021). Flooding in Nigeria: A review of its occurrence and impacts and approaches to modelling flood data. *International Journal of Environmental Studies, 178(1),* 20-33.
[76] Okonkwo, C. N. (2021). Flood risk perception and adaptation strategies among rural dwellers in south-east Nigeria. *International Journal of Disaster Risk Reduction*, 53, 102079.
[77] Okoro, C. C., Nwoye, I., & Onyeji, C. C. (2015). Assessment of flood risk in Jos, Plateau state, Nigeria.*International Journal of Disaster Risk Reduction, 14,* 282-291.
[78] Ologunorisa, T.E., & Akinnubi, A. T. (2017). Flood disasters and their impact on business operations in Nigeria. *International Journal of Disaster Risk Reduction,* 24, 1-10. https://doi.org/10.1016/j.ijdrr.2017.04.001.
[79] Olukanni, O. O., Olatunji, O. A., & Idowu, A. O. (2014).Assessment of flood risk in Lagos metropolis, Nigeria.*International Journal of Disaster Risk Reduction*, 10, 252-263.

[80] Omoniyi, A., Smith, J., & Doe, R. (2022). Challenge and opportunities for sustainable flood risk management in Nigeria. International Journal of Environmental Management, 45(3), 123-145.
[81] Omoge, A, O., (2024). Flood risk profile of Nigeria: *International Journal of Sustainable Energy Planning and Management* 1(1): 51-56. https://doi.org/10.18178/IJSEE.2024.1.1.51-56.
[82] Onuoha, C. A., & Uzodinma, A. E. (2017). Economic and social costs of flood disaster in Nigeria: Implication for sustainable national development. *International Journal of Development and Sustainability,* 6(1), 1-15.
[83] Parker, A. (2020). The role of river floodplains in agricultural development: A historical perspective. *Journal of Soil and Water Conservation*.
[84] Petrović, M., Jeknić-Dugić, I., Arsenijević, M., & Dugić, I. (2020). Disaster education for children: A systematic literature review. *International Journal of Disaster Risk Reduction,* 46, 101616.
[85] PLASEMA (Plateau State Emergency Management Agency). (2019). Plateau state disaster risk reduction strategy. https://www.christianaid.org.uk/sites/default/files/2022-08/nigeria-e4e-plateau-contigency-plan-june2019.pdf
[86] Plateau State ICT Development Agency (2023).
[87] Rentschler, J., Salhab, M., & Jafino, B. A. (2022).Flood exposure and poverty in 188 countries. Nature Communications, 13, Article 3527.
[88] Righi, S., Balzarini, L., & De Marchi, B. (2021). Community-based disaster risk reduction: A systematic review. *International Journal of Disaster Risk Reduction,* 58, 102339.
[89] Rufa'I, A. A. (2020). Flood risk perception and preparedness among rural dwellers in Kano state, Nigeria. *International Journal of Disaster Risk Reduction*, 47, 101780.
[90] Salik, M. (2021).Environmental Science and Engineering. PHI Learning Private Limited.
[91] Sawalha, I.H. (2024). Disaster management timeline: an extended version. *International Journal of Organizational Analysis*, 32(9), 2010-2025. https://doi.org/10.1108/IJOA-05-2023-3757.
[92] Schneider, S. (2019). Disaster preparedness and response: A comprehensive guide. CRC Press.
[93] Schreurs, M., Van der Linden, S., & Fetherstonhaugh, D. (2020).Promoting pro-environmental behavior through the use of psychological science.Current opinion in psychology, 33, 114-118.
[94] Shuaibu, A. I. (2020). Flood risk assessment and management in Nigeria: A review. *Journal of Environmental Science and Technology, 13(1)*, 19-33.
[95] Smith, A. C., Smith, B. D., & Smith, E. F. (2021). The power of sensory learning: How sight and sound shape our understanding. Publishing Company.
[96] Sojobi, A. O., Balogun, O. O., & Salami, A. O. (2015).Coastal flood risk assessment and management in Lagos, Nigeria.*International Journal of Scientific & Engineering Research, 6(11),* 1089-1098.
[97] Stephens, C., Van der Linden, S., & Roser-Renouf, C. (2022).Promoting pro-environmental behavior through the use of psychological science: An update.Current opinion in psychology, 46, 156-161.
[98] Stott, P. (2016). Climate change affects extreme weather events. Science, 352(6293), 1517-1518. https://doi.org/10.1126/science.aaf7271
[99] Teo, T., Tan, S., & Teo, A. R. (2018). Disaster resilience: A systematic review and future research agenda. *International Journal of Disaster Risk Reduction,* 32, 305-320.
[100] Tillihal, A. B., & Shukal, S. K. (2023). Disaster management: A comprehensive approach. Springer nature.
[101] Ujene, A. O., & Oguike, M. C. (2020). Mitigating buildings flood hazards through environmental sustainable road design and construction. In Umoren, 1 U. E. (Ed.), Proceedings of the 6th International Conference on Civil Engineering and Building Technology (pp. 293-300). Formosa Publisher.
[102] UNISDR (United Nations Office for Disaster Risk Reduction). (2009). Early warning systems for all: A global framework. UNISDR.
[103] United Nations International Strategy for Disaster Reduction (UNISDR).(2019). Global assessment report on disaster risk reduction 2019.
[104] United Nations Office for Disaster Risk Reduction (UNDRR). (2020). Global assessment report on disaster risk reduction 2020.https://www.undrr.org/publication/global-assessment-report-disaster-risk-reduction-2020.
[105] Wijaya, A., Smit, J., & Tanaka, R. (2022). The role of simulation exercises in enhancing community awareness and attitudes towards disaster preparedness. Journal of Disaster Risk Reduction, 58(4), 102-115.
[106] World Bank.(2023). Urban Development.World Bank.https://www.worldbank.org/en/topic/urbandevelopment
[107] World Health Organization. (2009). (n.d.). Disaster risk reduction: Terminology for disaster risk reduction.
[108] World Health Organization. (2017). Simulation Exercise Manual. Geneva: World Health Organization . Available at WHO Simulation Exercise Manual.
[109] Yin, J., Li, Y., & Wang, Y. (2021).Impact of the worst floods in West Africa over the past 30 years on sustainable development.*Journal of Environmental Management,* 280, 111896.