

PERCEIVED IMPACTS OF FLOOD AND ADAPTATION STRATEGIES IN SOME SELECTED LOCAL GOVERNMENT AREAS OF JIGAWA STATE, NIGERIA

¹Umar Nura Khalil, ²Zakaria Aliyu and ³Aji Yagana Muhammad

^{1 and 3} Department of Geography, University of Maiduguri, Borno State

²Centre for Disaster Risk and Development Studies, Ahmadu Bello University, Zaria

Corresponding Author's email: nukhaleel04@gmail.com



Abstract

This study is aimed at assessing socioeconomic impacts of flood and adaptation strategies in the vulnerable communities of Auyo and Miga LGAs, Jigawa State of Nigeria. A sample size of 666 respondents were drawn for self-administered questionnaires, 601 were fully completed. Data collected were analyzed descriptively for Relative importance, frequency, severity and preparedness indices. Findings revealed that, prior to flood, renovation of old-mud houses (RII of 4.602), and construction of new drainages and ditches or embankments (RII of 4.316) were the only adaptation strategies employed. However, most adapted strategies during and after floods were reliance on government and stakeholders for relief items (with RII of 5.000). Most effects posed by floods were 'always' the destruction of farmland (with FI of 90.807%) and damages to root crops (90.432% of FI). The 'great impact' was severe on economic (with SI of 95.9%), transport (SI of 95.4%) and housing (SI of 90.8%) sectors. From the findings, also, majority (77.7%) were aware of flood risks. There was also provision of neighborhood directory (97.8%), local shelter (75.9%) and emergency contacts (55.4%) during floods. The PI (92.6%, 98.6% 84.1% and 85.1%), were ranked above 65% threshold and hence considered 'prepared'; but, 'somewhat prepared' (PI of 61.7%) in terms of awareness of flood disaster risk management strategies; 'and unprepared' (PI of 55.5%, 50.5%, 50.5%, 50.8% and 54.3% respectively) in terms of community organization of public education and training of flood risk reduction (66.6%); engagement in rehearsals/emergency drills (51.6%); good community-based warning system (51.4%); and a standalone system for property protection measures during floods (52.4%); as well as an active recovery plan (62.9%). There is need for increase in awareness at all levels (community, local, state, and national) on the risk of flood and appropriate response technique in mitigating its multi-dimensional effects.

Keywords: Adaptation, Flood, Impacts, Preparedness, Socio-economy

Introduction

Flood occur because of the rapid accumulation and release of runoff water from upstream to downstream which is caused by very heavy rainfall, modulated by other environmental factors such as soil, elevation, slope, vegetation and land used among others (Borga *et al.*, 2011). Land use practices, in addition to environmental degradation and uncontrolled urban development on flood-line increases vulnerability of societies to flood. Thus runoff generation process is often changed, especially through decreasing soil percolation capacity and change of soil cover (Umar & Mu'azu, 2017; Umar, Abdullahi & Usman, 2019). There is also some evidence that climate

change will result in increased flood hazards. The work of Hirabayashi *et al.*, (2013) present regionally disaggregated flood risk estimates for the year 2100, based on the outputs of 11 climate models. A state-of-the-art global river routing model with an inundation scheme was employed to compute to model changes in river discharge and inundation areas, they show that a high-concentration climate change scenario could lead to large global increase in flood frequencies, with Southeast Asia, India, East and Central Africa, and large parts of Latin America being the most vulnerable. In the global environmental-change literature and specifically climate change “vulnerability” (assessed here in terms of loss) and adaptation (to extreme floods) is most often described as: the exposure or sensitivity of a particular population, place or system (exposure unit) to a threat, or suite of threats, associated with global environmental change; as well as the capacity to resist impacts, cope with losses, and/or regain functions when exposed to global environmental change (Eakin, 2008).

The occurrence of flood is of great concern due to the top ranking of such events among natural disasters (Jonkman and Dawson, 2012). Statistical data from 1980 to 2018 have registered almost 3500 global flood events which caused nearly 300,000 deaths, and economic loss of about 397 billion US\$ (Dihn, Balica, Popescu and Jonoski, 2019). This is not withstanding the fact that floods have positive impact in maintaining soil fertility by depositing layers of silt upon the surface layers (Ogboi, 2013). However, the negative impact of flood often outweighs the positive (Ezemonye and Chukwudi, 2014), since flood may impact on the general wellbeing and livelihood of many nations. At least 71 million people in Sub-Saharan Africa are estimated to live in both extreme poverty (using a \$1.9 a day definition) and significant flood risk thus making them particularly vulnerable to prolonged socioeconomic impacts (Rentschler & Melda, 2020). In Nigeria, 22 out of its 36 States and the FCT are affected by floods translating to about 33% of the populace being vulnerable. This had cumulatively accounted for more than 363 deaths; displacement of about 2.3 million; and affected about 7.7 million persons in the country between 2012 and 2018 (Obioji & Eze, 2019). The 2012 flood, wind storms and rainstorms that caused the most socioeconomic disruption has placed the country as one of the most globally worst hit by floods (Ojo, 2013; NEMA, 2020).

Extreme environmental events such as floods force humans to try to adjust to the changed environment in order to survive. Unfortunately, perception influences choice of strategies. Akuro, Gordon and Williams (2013) parroted that, humans are complex and at times culture, beliefs, political orientation, link to nature and environment, economic well-being, and even social networks, have a profound impact on how they perceive flood risks. Studies like that of Ezemonye and Chukwudi (2014) have shed light on flood adaptation and mitigation measures in Benin city of Nigeria, that there was no household preparedness in relation to flood and majority indicated religious believe system as a major governing factor to the lack of preparedness. In addition, flood control measures taken along Apete in Ibadan were: proper waste disposal, ensuring functional drainage, demolition of buildings along floodplain and re-channelization of water bodies. Whereas households’ level of preparedness were limited to: flood disaster campaign awareness, use of concrete embankment, vehicles’ tyres as walkway, relocation of residents during rain peak period, erection of plank for residents’ movement and use of sand bags (Odunola and Balogun, 2015). In another syudy, Umar and Mu’azu (2017) reported that, communities in Dutsinma of Katsina State were engage in building concentration on higher grounds, but using sand bags while construction of elevated footpaths and water embankments were found to be primitive and unsustainable. The level of community preparedness was low as there were no disaster management committees and local disaster management institutions to mind flood impacts.

Similarly, the study area had intense share of flood events following the location of large parts of the area lying on the northern bank of Hadejia River. The study of Zakaria, Umar, Mohammad and Yusuf (2021) had attempted to assess flood risk factors and their prevalence in the study area. From findings of the study, the current trend in the frequency of flood was on the increase, and the year 2012 (59%) and 2018 (61%) are marked the worst. Major cause of floods were heavy rains (RII of 4.890), overflow of river/stream (RII of 4.866), rainstorm, (RII of 4.890), long period of rainfall (RII of 4.805), steep side channels (4.785 of RII) and mystical beliefs (RII of 3.86). Man-made major factors were: deforestation (RII of 4.389) and lack of flood embankment, (RII of 4.316). It is apparent that, flood perception (risks factors and their prevalence) is extensively cited in Zakaria *et al.*, (2021). However, traditionally, people perception measurement and belief usually helps to develop a new measurement criterion for adaption using long term pragmatic experience. In addition, the negative impacts of flood hazards disseminate in a community as a sporadic calamity. Additional approach is suggested for including adaptive capacity and flexible governance structure owing to vulnerability assessment. It is against this background that this study attempts to build on Zakaria *et al.*, (2021). The aim is to assess the socioeconomic impacts of flood and adaptation strategies in the vulnerable communities of Auyo and Miga LGAs, Jigawa State of Nigeria.

Theoretical Framework

There are considerable variations in hazard risk perception between individuals and social groups. Researchers in a number of academic disciplines (particularly psychologists, anthropologists, economists, geographers and sociologists) have tried to explain these variations in different ways. As a basis for determining the objective risk, the UNISDR (2009) definitions of risk can be followed, this defined risk as a combination of hazard, vulnerability and exposure. However, the definitions fail to include risk perception component, thus including risk as a mental construction. A mental model is an individual's internal, personalized, intuitive and contextual understanding of how something works, acquired over time through social interactions and experiences. When an event repeats, the model is used as a lens through which the individual arrives at perceptions or evaluates new information (Kearney, 1997). This is related to the psychological side of risk and consequently to the perception of risk. However, from theoretical perspectives, Risk is seen as a perception, involving the subjective judgment that people make about the characteristics and severity of a risk. The phrase is most commonly used with reference to natural hazards and threats to the environment or health, such as floods. Several theories have been proposed to explain why different people make different estimates of how dangerous risks are or could be. This study follows the 'Cultural Theory of Risk' (CTR) propounded by Douglas and Wildavsk (1982) and the 'Protection Motivation Theory' propounded by Rogers (1975).

Cultural theory of risk

CTR often referred to simply as "Cultural Theory (CT)", consists of a conceptual framework and an associated body of empirical studies that seek to explain societal conflict over risk. Whereas other theories of risk perception stress economic and cognitive influences, CTR asserts that structures of social organization endow individuals with perceptions that reinforce those structures in competition against alternative ones. Two features of Douglas's work inform the basic structure of CTR: The first of these is a general account of the social function of individual perceptions of societal dangers as tends to associate societal harms-from sickness to famine to natural catastrophes-with conduct that transgresses societal norms. This tendency plays an indispensable role in promoting certain social structures, both by imbuing a society's members with aversions to subversive behavior and by focusing resentment and blame on those who defy such

institutions. The second important feature of CTR is a particular account of the forms that competing structures of social organization assumes. Douglas maintained that cultural ways of life and affiliated outlooks can be characterized (within and across all societies at all times) along two dimensions, called "group" and "grid" (Fig. 1). A "high group" way of life exhibits a high degree of collective control, whereas a "low group" one exhibits a much lower one and a resulting emphasis on individual self-sufficiency. A "high grid" way of life is characterized by conspicuous and durable forms of stratification in roles and authority, whereas a "low grid" one reflects a more egalitarian ordering (Fig. 1).

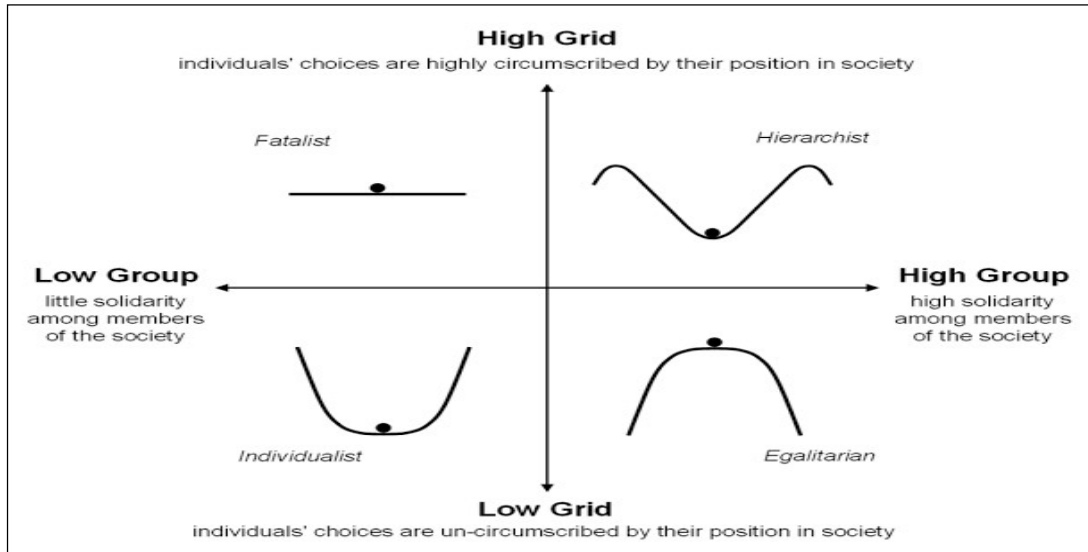


Fig. 1: Douglas' Grid - Group Model of Typology of 'ways of Life'

Source: Adapted from Renn and Rohrmann, (2000)

Generally, CTR deduced that, several factors determine how risk is seen by people and organizations. Individuals, institutions, communities or societies may perceive risks differently due to diverse cultures or beliefs. Risk can be seen as a collective and cultural construction. Perception of risk goes beyond the individual, and it is a social and cultural construct reflecting values, symbols, history, and ideology. This represents institutions in the sense of Ostrom (1990): For instance, in some cases in which the population is used to extreme flood events, they might have internalized them and might not consider the events as a risk. For these people, it is not risky to live with, it is a situation that they are living with for many years or centuries and which they have encapsulated in their daily lives. However, in cases in which community perception of risk is framed by historical and social events, risk awareness and perception are high, and people show enhanced preparedness in order to reduce potential harms. It is for this reason that the present study understands risk through the perception and meaning given to it by the people living in the study area. Such consideration may provide a useful perspective for developing risk management strategies that are tailored to the local needs of communities within Auyo and Miga LGAs.

Protection motivation theory

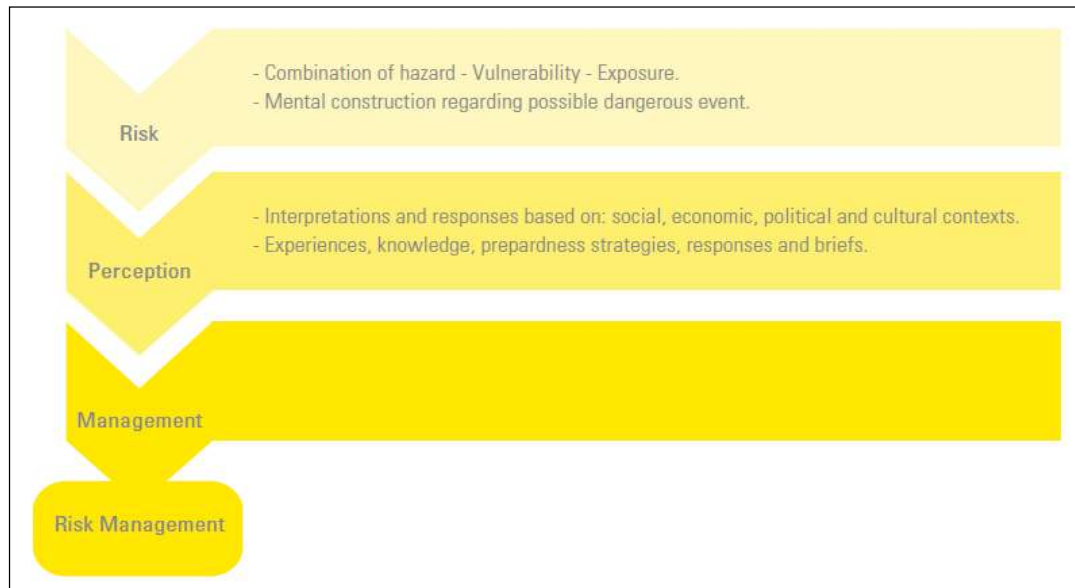


Fig. 2: Risk Perception and Management

Source: Adapted from Renn and Rohrmann, (2000)

Protection motivation theory (PMT) is a theory that was originally created to help clarify fear appeals. The PMT proposes that people protect themselves based on four factors: the perceived severity of a threatening event; the perceived probability of the occurrence or vulnerability; the efficacy of the recommended preventive behavior; and the perceived self-efficacy. Protection motivation stems from both the threat appraisal and the coping appraisal. The threat appraisal assesses the severity of the situation and examines how serious the situation is. The coping appraisal is how one responds to the situation and it consists of both efficacy and self-efficacy. Efficacy is the individual's expectancy that carrying out recommendations can remove the threat. Self-efficacy is the belief in one's ability to execute the recommended courses of action successfully. According to the PMT (Rogers, 1975), people or MSPs follow the appraisal of the threat and coping strategies, and might first decide whether a threat in the area is relevant or not (Fig. 2.). Moreover, Primary prevention: taking measures to combat the risk of developing a health or environment problem. An examples is controlling abuse of the environment through poor land use practice to prevent alluvial flood. Secondary prevention involves: taking steps to prevent a condition from becoming worse, by implementing strategies and actions to control and reduce risk. Example, of this training of is on flood risk prevention and reliable early warning system

In a nutshell, the present study attempts to relate the CTR and PMT as: risk perception largely influences risk management and therefore determines whether risk management is successful in reducing vulnerability. Since risk is perceived differently by people, risk management approaches are influenced by what people perceive as 'risky'. If within the study area flood hazard is perceived as a potential risk, the respective actors may take action to manage it. Often, preparedness in the face of a threat would influences the degree of risk perceived.

Study Area

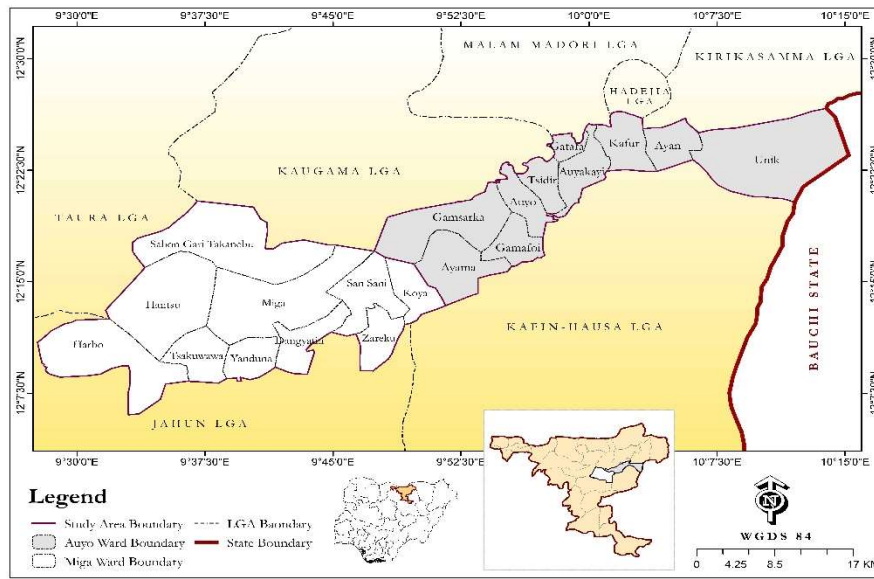


Fig. 3: The Study Area

Source: Adapted from Administrative and Topographic Maps of the Area

Auyo and Miga are two of the twenty-seven LGAs located in the north-east corner of Jigawa Senatorial Zone with their administrative headquarters in Auyo and Miga towns. The former has an area of 512 km², whereas the latter occupies 586 km² (Abubakar, Kutama and Sulaiman 2016). The area lies between Latitudes 12°21'6.457"N and 12°6'7.808"N to Longitudes 9°28'0.944"E and 10°15'28.924"E. It is bounded by Bauchi State to the east, Kafin-Hausa and Jahun LGAs to the south. To the north eastern part, the study area is bounded by Hadejia, Malam-Madori and Kirikasamma LGAs. It is bounded by Kaugama LGA to the north. Taura and some parts of Jahun LGAs to the north-western part respectively (Fig. 3). The climate of the area is semi-arid. However, the micro-climate is modified by -the local effect of the Hadejia River system, making the temperature slightly cooler in the northern parts. The mean annual temperature is about 25°C. The total annual rainfall ranges from 600mm to 762mm (Kaugama and Ahmed, 2014). The study area is part of an extensive downstream of floodplain created by the Hadejia River. It comprises of permanent lakes and seasonally flooded pools connected by a network of channels (Abubakar *et al.*, 2016). The population figure of 260,692 is the sum of the two LGAs under study based on the 2006 preliminary census figure. This figure is projected using equation 2 (NPC, 2009), to about 371,684 as at the year 2020

Materials and Method

Data used involved the use of questionnaire designed for the residents of Auyo and Miga LGAs due to their vulnerability to flood. Judgmental (non-probability) sampling technique was used to select the study wards. Thus, out of the 20 wards put together, six (6), with three (3) from each LGA were chosen, on the basis of the researcher's knowledge of those areas being predominantly within river basin and experiencing seasonal flood of greater magnitude. These wards were: Harbo, Miga and San-sani within Miga LGA as well as Ayama, Auyo and Kafur of Auyo LGA respectively. Ken (2004) formula was used (equation 1) to obtain a sample size of approximately 666. The selected wards were extracted from the 1991 estimated census figure of Jigawa, and their population projected to 2020 using equation 2. Equation 3 was used to determine the

proportion of respondents to be sampled, by adopting Yamene (1976). In collaboration with various ward heads within the study area, household were reached from various streets, where at least five (5) houses from each were selected at random and administered questionnaire with the aid of trained research assistants. Six hundred and one (601) completed copies of questionnaire were retrieved and analysed.

Sample size calculation

$$N = \frac{\left[\frac{z^2 \times p (1-p)}{e^2} \right]}{1 + \left[\frac{z^2 \times p (1-p)}{e^2 \times n} \right]} \dots\dots\dots \text{equation 1}$$

Where: N= sample size,

n= population size,

e= error margin (set at 5% = 0.05)

p= standard deviation (set at 50% = 0.5),

z= confidence level (set at 99% = 2.58)

$$Po = P1 (1+r)^n \dots\dots\dots \text{equation 2}$$

Where Po= projected population,

P1= Initial population,

r= Growth rate=3%=0.03

n= Number of years projected

$$Pp. = \frac{n \times 666}{N} \dots\dots\dots \text{equation 3}$$

Where: Pp. = proportion of respondents,

n=Population of each ward,

N=Total population figure

Technique of Data Analysis

The following descriptive statistics were used for analysis:

Relative important index (RII= $\Sigma W / [b \times N]$);

Severity index (SI= $\Sigma a [n/N] \times 100/3$);

Preparedness index (PI= $\Sigma a [n/N] \times 100/3$),

Where: W and a = weighting given to each factor by the respondents,

b = the highest weight

N = the total number of respondents,

n = the frequency of the responses

Following the recommended standard for assessing “extent of community preparedness” propounded by the Department of Interior and Local Disaster-DILD (2012) Manila, this study applied it to measure flood preparedness index of the study area:

PI range of: 60-65% = “somewhat prepared”

Greater than 65% = “prepared”

Less than 60% = unprepared

Results and Discussion

Socio-demographic Characteristics of Respondents

Table 1: Respondents’ Socio-demographic Characteristics

Gender	F	%	Marital Status	F	%
Male	425	70.72	Single	109	18.14
Female	176	29.28	Married	339	56.41
Total	601	100	Divorced	71	11.81
Age			Widowed	82	13.64
15-24	93	15.47	Total	601	100
25-34	110	18.30	Occupation		
35-44	194	32.28	Farming	230	38.27
45-54	116	19.30	Trading	190	31.61
55 and above	88	14.64	Civil Service	119	19.80
Total	601	100	Self Employed	62	10.32
Educational Qualification			Total	601	100
Primary	94	15.64	Period of Stay in Residence		
Secondary	193	32.11	0-5 years	201	33.44
Tertiary	140	23.29	6-10 years	310	51.58
Informal Education	93	15.47	11-15 years	57	9.48
No education	81	13.48	16-20 years	23	3.83
Total	601	100	21 years and above	10	1.66
			Total	601	100

Source: Field Survey, 2021

From Table 1, there were 70.72% males (which constitute the majority) and 29.28% females. The age range was 15-55 and above, with the majority (32.28%) within 35-44 and the least (14.64%) between 15 and 24 years. Majority (56.41%) of the respondents are married, whereas the least (11.81%) are divorced. Secondary education accounted for the highest (32.11%) and respondents with no education constituted the least (13.48%). Also, most of the respondents engage in farming (38.27%), and trading (31.61%), while the least were self-employed (10.32%). Fishing, and most importantly, rice cultivation are among other economic activities in the study area (Abubakar *et al.*, 2016). Additionally, respondents who had lived for six to ten (6-10) years accounted for the majority (51.58%) while those for 21 years and above accounted for the least (1.66%).

Impacts of Floods and Severity Level

Table 2 shows damages caused by floods and Table 3 denotes flood impacts on different socioeconomic sectors. Table 2 reveals that ranking the first and second, with the FI of 90.807% and 90.432% respectively, indicated that floods are ‘always’ associated with impacts on farmlands and crop production. Flood also causes submergence of roads (ranked third), and leads to injuries and diseases (ranked fourth). The range scores (FI of 88.270% and 76.414%) indicated that both are ‘often’ the case. Table 2 further shows that, the collapse of residential buildings was ranked fifth, whereas destruction of infrastructure was ranked sixth, with the FI of 62.188% and 54.368%

respectively. This indicated that flood ‘sometimes’ affect building structures. However, the least impact of floods in the area (ranked seventh and eighth), were disappearance of people and loss of lives which ‘rarely’ occurred (FI of 28.785% and 25.624% respectively). Generally, this finding is consistent with the findings of Odunola and Balogun (2015) whose study revealed that, effects of flood along Apete Community in Ibadan were disruption of agricultural land, public and personal property, outbreak of diseases and seldom tragic loss of lives.

Table 2: Ranking of the Perceived Impact of Floods in the Study Area

		Al	Of	Sm	Rr	TR	TS	FI %	R	RMK
SN	Score Range	4	3	2	1					
1	Damage to root crops	450	98	27	26	601	2174	90.432	2	Al
2	Destruction of farmlands	454	78	64	5	601	2183	90.807	1	Al
3	Loss of lives	0	0	15	586	601	616	25.624	8	Rr
4	Disappearance of people	0	2	87	512	601	692	28.785	7	Rr
5	Injuries and diseases	99	445	49	8	601	1837	76.414	4	Of
6	Submergence of roads	410	101	89	1	601	2122	88.270	3	Of
7	Destruction of infrastructure: commercial, healthcare and religious buildings	1	111	481	8	601	1307	54.368	6	Sm
8	Collapse of residential buildings	12	401	56	132	601	1495	62.188	5	Sm

Source: Field Survey, 2021

Key: Al=Always, Of=Often, Sm=Sometimes, Rr=Rarely, TR=Total Response, TS=Total Score, FI=Frequency Index, R=Rank, RMK=Remark

From Table 3, floods had ‘great impact’ on economic activities, transport and housing sectors (ranked first, second and third). The SI stood at 95.9%, 95.4% and 90.8% respectively. While health sector was ranked fourth, with the SI of 65.2%, the impact was ‘moderate’. Water and sanitation (ranked fifth) were the least sectors impacted by flood. With SI of 38.1%, the score indicated ‘little impact’ (Table 3). In a nutshell, socio-economic dynamics are recognized as factors that drive vulnerability (Peter, Emmanuel and Anthony, 2018). Findings from this study indicate a high degree of poverty, since apart of being civil servants, majority of the respondents are subsistence farmers and traders (see Table 1). Hence, might not afford to move far away from the watershed terrain site and also livelihood depends on harvests.

Table 3: Severity Level of the Impact of Floods on Socioeconomic Sectors

		EI	GI	MI	LI	TR	TS	SI (%)	R	RMK
S/N	Score Range	4	3	2	1					
1	Economic activities (agriculture, trading, civil service)	503	98	0	0	601	2306	95.9	1	GI
2	Housing	454	78	64	5	601	2183	90.8	3	GI
3	Health	109	152	334	6	601	1566	65.2	4	MI
4	Transport	502	88	11	0	601	2294	95.4	2	GI
5	Water and sanitation	1	1	310	289	601	916	38.1	5	LI

Source: Field Survey, 2021

Key: EI=Extreme Impact, GI=Great Impact, MI=Moderate Impact, LI=Little Impact, TS=Total Score, SI=Severity Index, R=Rank, RM=Remark, TR=Total Response

Community Adaptation Strategies to Flood Hazard

Table 4 discusses the adaptation strategies employed prior to, during and after-flood events. It can be seen that, renovation of old-mud houses (RII of 4.602), and construction of new drainages and embankments (RII of 4.316) were ranked the first and second most employed pre-flood adaptation strategies. The third (RII of 3.817) and fourth (RII of 3.057) ranked, which were 'disagreed' to be relatively among the strategies, were clearance of existing drainages prior to floods, and proper dumping of refuse. Also seasonal re-building of existing levees to link channels (RII of 2.780); routine afforestation by members of the community (RII of 2.681); available and reliable early warning systems (RII of 2.401); and abstinence from development and infrastructure in flood-prone areas (RII of 2.344), which were ranked fifth, sixth, seventh and eighth in that order, were 'strongly disagreed' to be adapted. Hence, there was perhaps negligence to replenish the existing farm parkland vegetation, alongside strong affinity to floodplains, which could be a pull factor for development and infrastructure along river banks and tributaries. This is common especially in northern Nigeria where the population is mostly agrarian (Anunobi, 2013).

From Table 4, the score ranges have shown that, after flood events, the victims usually rely upon government and stakeholders for relief items. They also exchange help among one another in order to attempt to bring the situation and livelihood to the original level. The RII stood at 5.000 and 4.992 respectively, and hence both are 'strongly agreed'. Ranked third and fourth were: attempts often made to move out valuable properties to places where flood has not yet reached (RII of 4.897), and evacuation from affected homes to governments' shelter (RII of 4.769), both were 'agreed' to be the case. The least strategy, which were ranked fifth and sixth (RII of 2.463 and 2.023) were 'strongly disagreed' to be adapted. These were identification of higher places to run to during floods, and consensus within the community to share housing with flood victims. This implies that, most common community adaptation strategies employed during and after floods in the study area were total reliance of support from government and other stakeholders as well as exchange of help. Umar and Mu'azu, (2017) also found out that, exchange of help within communities was the most common flood adaptation measure in Hayin-gada, Dutsin-Ma of Katsina State, Nigeria.

Table 4: Adaptation Strategies Prior to During and After Floods in the Study Area

	SA	A	D	SD	UD	Total	TS	RII	R	RMK
Prior to Floods	5	4	3	2	1					
Routine afforestation	48	87	91	375	0	601	1611	2.681	6	SD
Clearance of existing drainages prior to floods	78	404	50	69	0	601	2294	3.817	3	D
Construction of new drainages and ditches or embankments	402	55	78	64	2	601	2594	4.316	2	A
Existing Levees are re-built seasonally to link channels	0	45	379	177	0	601	1671	2.780	5	SD
Abstain from development and infrastructure in flood-line	6	7	181	401	6	601	1409	2.344	8	SD
Proper dumping of refuse	51	80	322	148	0	601	1837	3.057	4	D
Renovate old-mud houses	398	181	9	12	1	601	2766	4.602	1	A
Public early warning systems are available and reliable	14	22	158	404	3	601	1443	2.401	7	SD
During/After Floods										
Identify higher places to run to during floods	8	66	122	405	0	601	1480	2.463	5	SD
Victims usually relies upon government and other Stakeholders for relief items	601	0	0	0	0	601	3005	5.000	1	SA
Move out valuable properties to places where flood has not yet reached	543	55	2	1	0	601	2943	4.897	3	A
Exchange of help among one another	599	1	0	0	1	601	3000	4.992	2	SA
Evacuation from affected homes to governments' shelter is common after floods	498	81	9	12	1	601	2866	4.769	4	A
It is common to share housing with flood victims	0	1	15	582	3	601	1216	2.023	6	SD

Source: Field Survey, 2021

Key: SA=Strongly Agreed, A=Agreed, D=Disagreed, SD=Strongly Disagreed, UN=Undecided, TS=Total Score, RII=Relative Importance Index, R=Rank, RMK=Remark

Extent of Community Preparedness towards Flood

Table 5 presents extent of peoples' preparedness in the study area. From Table 5, majority (77.7%) of the respondents 'agreed' that, the community is aware of flood risks. There was also provision of neighborhood directory as attested by the majority (97.8). Many (75.9%) voted for availability of local shelter and emergency contacts (55.4%) during floods. The PI stood at 92.6%, 98.6% 84.1% and 85.1% respectively, which are above 65% threshold based on DILG (2012) standards. Therefore the community can be said to be 'prepared' in these regards. Whether the community is aware of flood disaster risk management strategies, majority (52.3%) of the respondents voted for 'undecided'. However, some (37.3%) 'Agreed' to be aware With the PI of 61.7%, which is slightly within the threshold 60-65%, the respondents were considered for this 'somewhat' prepared. Also majority 'disagreed' on: community organization of public education and training of flood risk reduction (66.6%); engagement in rehearsals/emergency drills (51.6%); good community-based warning system (51.4%); and a standalone system for property protection measures during floods (52.4%); as well as active recovery plan (62.9%). The preparedness indices

for these, scored below the threshold of 60-65% (55.5%, 50.5%, 50.5%, 50.8% and 54.3% respectively), and hence rendered 'unprepared' as per standard (Table 5). However, despite awareness on flood risk, neighborhood coalition and local shelter provision, occupants in the area have remained with no professional skills to ensure physical and personal security at a time of flood. Probably those who coordinated themselves to educate and learn about such measures might have in turn paid less attention due to low turnout and participation of local authorities, government and non-governmental organizations. Hence, the study area is doing little to prepare against floods.

Table 5: Level of Community Preparedness on Flood in the Study Area

	A		D		U		Total		PI	RMK
Score Range	3		2		1					
	F	%	F	%	F	%	F	%	%	
The community is aware of flood risks	467	77.7	134	22.3	0	0	601	100	92.6	PR
Aware of flood risk management strategies	224	37.3	63	10.5	314	52.3	601	100	61.7	SPR
The community organizes public education and training of flood risk reduction	0	0	400	66.6	201	33.4	601	100	55.5	UPR
Engages on rehearsals/emergency drills	0	0	310	51.6	291	48.4	601	100	50.5	UPR
There is good community-based warning system	0	0	309	51.4	292	48.6	601	100	50.5	UPR
There is provision of neighborhood directory	588	97.8	0	0	13	2.16	601	100	98.6	PR
There is community system for property protection measures during floods	0	0	315	52.4	286	47.6	601	100	50.8	UPR
There is availability of local shelter	456	75.9	4	0.7	141	23.5	601	100	84.1	PR
Individuals have emergency contacts	333	55.4	268	44.6	0	0	601	100	85.1	PR
The community has an active recovery plan	0	0	378	62.9	223	37.1	601	100	54.3	UPR

Source: Field Survey, 2021

Key: A=Agreed. D=Disagreed, Undecided, PI=Preparedness Index, PR=Prepared, UPR=unprepared, SPR=Somewhat Prepared, RMK=Remark

Conclusion and Recommendations

From the general perception it indicates that, the transport and housing sectors were greatly affected by flood. The effect on economic activities was high. While in the remaining sectors their severity impact is relative as compared to economic activities. This could be manifested by different land use activities to earn a living and enhance livelihood. Low quality of housing along stream channels and roads that are rather impermeable and compounded by poor drainage system and waste disposal practice, may collectively aggravate the severity of the damages caused by floods. In addition, the residents living very close to the stream possibly sourced their drinking water from the running stream and on such occurrences the water could be

contaminated and made unsafe for drinking. Generally, respondents interviewed showed high need for training in the entire preventive methods of flood risks. Often preparedness in the face of a threat would be influenced by the degree of risk perceived. For some people it is not risky to live with floods because they have lived with it for many years and have encapsulated it in their daily lives. This could have contributed to how the perceived risk of floods is framed and how the respective actors respond to it. There is need for increase in awareness creation at all levels (community, local, state, and national) on the risk of flood and appropriate response technique in mitigating its multi-dimensional effects.

References

- Abubakar, M.M., Kutama, A.S., Sulaiman, I.M. and Ringim, A.S. (2016): Impact of Climate Change on the Hadejia-Nguru Wetlands: A Review. *Dutse Journal of Pure and Applied Sciences* 2(1) 150 – 158
- Akuro, E.G., Gordon, T.A., Williams, W.P. (2013): Public Perception of Tidal Flooding Hazards on Bonny Island, Rivers State; Nigeria. *Journal of Marine Science*, 3(3): 91-99
- Anunobi, A.I. (2013): Housing Vulnerability, Resilience and Adaptation Strategies to Flood Hazard: A Study of Shiroro Town in Niger State, North Central Nigeria. *Developing Country Studies* 3 (12): 72-81
- Borga, M. Anagnostou, E.N., Blöschl, G. and Creutin, J.D. (2011): Flash flood forecasting, warning and risk management: The HYDRATE project. *Journal of Environmental Science Policy*, 14, 834–844.
- DILD; (2012): Seal of Disaster Preparedness Forms, Department of Interior and Local Disaster. Manila. Retrieved August 10, 2020 from: <http://ncr.dilg.gov.ph/h>
- Douglas, M. and Wildavsky, A. (1982): *Risk and Culture: An essay on the selection of technical and environmental dangers*. Berkeley and Los Angeles, California: University of California Press.
- Ezemonye N.M., and Chukwudi, N.E. (2014): Flooding and Household Preparedness in Benin City, Nigeria. *Mediterranean Journal of Social Sciences* 5(1) 532-547
- Anunobi, 2013
- Hirabayashi, Y., Mahendran, R., Koirala, S., Konoshima, I., Yamazaki, D., Watanabe, S., Kim H. & Kanae S. (2013): Global flood risk under climate change. *Nature Climate Change* 3, 816–821
- Jonkman, S.N. and Dawson R.J. (2012): Issues and Challenges in Flood Risk Management-Editorial for the Special Issue on Flood Risk Management. *Water*, 4, 785–792.
- Kaugama, H.H., and Ahmed, B.A. (2014): Prospect and Challenges of Farming along the Hadejia-Nguru Wetland in Jigawa State, Nigeria. *International Journal of Academic Research in Economics and Management Sciences* 3(6) 43
- Kearney, A.R. and Kaplan, S. (1997): Toward a methodology for the measurement of knowledge structures of ordinary people: the conceptual content cognitive map. *Environment and Behavior*, 29 (5): 579.
- Ken, B. (2004): *Business Statistics for Contemporary Decision Making*. (Fourth Eds) Wiley, India ISBN 9788126508099
- NEMA (2020): *National Disaster Framework: Response and Recovery Strategy*. Abuja: National Emergency Management Agency Press.
- NPC (2009): *Provincial Census Figure by States and Local Government in Nigeria*. National population Commission Abuja
- Obioji, J.N. and Eze, K.T. (2019): Disaster Management in Nigeria: A Study of Anambra State, 2011-2019 *International Journal of Innovative Development and Policy Studies*. 7(4):83-103
- Odunola, O.O. and Balogun, F.A. (2015): Analyzing Household Preparedness on Flood Management in Riverside: A Focus on Apete Community in Ibadan, Nigeria. *IOSR Journal of Humanities and Social Science (IOSR-JHSS)* 20(7) 07-32

Ogboi, K.C. (2013): “Disaster Risk Management and Adaptation strategies Challenges and Opportunities for Physical Planning Education and practice in Nigeria”. Presented at the 15th edition of MCPDP by NITP and TOPREC in Ta’al Conference hotel Lafia Nasarawa State Nigeria

Ojo, O.E. (2013): “Global Overview of Disaster: Nature; Concept; Impacts and Management Measures”. Course paper presented at the 15th edition of MCPDP by NITP and TOPREC.19th-20th June, 2012 in Ta’al Conference hotel Lafia Nassarawa state-Nigeria.

ome/index.php/2012-05-26-06-08-22/seal-of-disaster-preparedness-forms

Ostrom, E. (1990): Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge University Press, United kingdom.

Peter, N.M., Emmanuel, O.N. and Anthony, O. (2018): An Empirical Analysis of Vulnerability to Poverty in Nigeria: Do Household and Regional Characteristics Matter? *International Journal of Economics and Financial Issues*, 8(4), 271-276

Renn, O. and Rohrman, B. (2000): *Cross-Cultural Risk Perception Research: State and Challenges*. In: O. Renn and B. Rohrman (eds.): *Cross-Cultural Risk Perception. A Survey of Empirical Studies* Dordrecht and Boston .221-233

Rentschler, J. & Melda, S. (2020): *People in Harm’s Way Flood Exposure and Poverty in 189 Countries: Poverty and Shared Prosperity 2020*. Policy Research Working Paper, 9447: World Bank, Washington.

Rogers, R. W. (1975): A protection motivation theory of fear appeals and attitude change. *Journal of Psychology* 91 (1): 93-114.

Umar, N.K. and Mu’azu, A. (2017): Community perception and adaptation strategies toward flood hazard in hayin-gada, dutsin-ma local government area, Katsina State, Nigeria. *Dutse journal of pure and applied sciences (DUJOPAS)* 3(1) 444-457

Umar, N.K., Abdullahi, H.S. & Usman, A.K. (2019): A multi-criteria decision support system in the analysis of flood risk and vulnerability mapping in Suleja, Niger state, Nigeria. In: *Proceedings of the ICA. Copernicus GmbH*

UNISDR, (2009): Terminology on Disaster Risk Reduction: United Nations International Strategy for Disaster Reduction, Geneva. Retrieved November 10th, 2021 from: [www.inpe.br/.../UNISDR Terminology Disater Risk Reduction](http://www.inpe.br/.../UNISDR_Terminology_Disater_Risk_Reduction)

Yamane, T. (1976): *Statistics: An introductory analysis* (2nded.). New York, Harper and Row

Zakaria, A., Umar, N.K, Mohammad, L.A. and Yusuf, R.O. (2021): Flood risk factors and their prevalence in some selected local government areas of Jigawa State, Nigeria. *Dutse Journal of Pure and Applied Sciences (DUJOPAS)* 7(4b) 68-77