



## Assessment of Rural household's Vulnerability to flooding in Oyo State, Nigeria

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**Abstract** Flooding has been a seasonal challenge in Nigeria in recent times. Oyo state in particular has experienced devastating floods which affected several people resulting in grave consequences. This study examined the factors influencing the vulnerability of rural households to flooding in Oyo state. A multi-stage sampling procedure was used to select 90 respondents used for the study. Data were obtained with the aid of a structured interview schedule and analyzed using descriptive statistics and Chi-square. The study revealed that the mean age of the rural households was 52 years, with an average household size of six persons, but with low educational statuses. Oyo state witnessed fluvial and pluvial flooding. The factors that predispose the rural households to flooding includes poverty, building residents close to river banks, indiscriminate waste disposal, and weak drainage system, poor house planning and the lack of cooperation among the community members in maintaining the environment. The Chi square analysis established that flooding significantly affected the agricultural assets ( $X^2=72.461$ ,  $p< 0.05$ ), health ( $X^2=38.730$ ,  $p< 0.05$ ), economic ( $X^2=70.303$ ,  $p<0.05$ ), social lives ( $X^2= 62.416$ ,  $P<0.05$ ), and physical assets ( $X^2=73.640$ ,  $p< 0.05$ ) of the rural households. The study, recommended the enlightenment, awareness and sensitization of rural areas in Oyo state to flooding and attitudinal changes to avoid the consequences. Government should enforce rules and regulations on town and regional planning with all houses cited close to riverbanks being demolished. Farmers should be encouraged to insure their farms against risk and uncertainties. Both government and non-governmental organizations should assist the rural households to bounce back after flooding.

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### 1. Introduction

Flooding is the most wide-spread of all the natural hazards to which humans are exposed, and it accounts for most damages and losses of life across the globe. It damages to agriculture, household's livelihood systems, infrastructure, human settlements and public utilities which amount to billions of US dollars each year and creates vulnerable conditions which put human lives at stake (Musah and Akai, 2014; Kumar and Cheng, 2016). Historically, flooding in Nigeria, which dates back to the early 1950s have been a significant concern affecting rural areas and cities in the country (Bashir, Oludare, Johnson and Aloysius (2012). Nigeria has experienced devastating floods which affected millions of people and with grave financial consequences (NEMA, 2013).

Flooding may occur as an overflow of water from water bodies, such as a river or lake, or sea or large natural water basins, or it may occur from the accumulation of rainwater on saturated ground in an aerial flood (Saleh, 2014). There are three significant

types of flooding, which include Fluvial, coastal and pluvial floods. According to Ivan, (2014), Fluvial or riverine flooding, occurs when excessive rainfall over an extended period causes a river to exceed its capacity from either massive snowmelt or ice jams. The damage from a river flood can be widespread as the overflow affects smaller rivers downstream, often causing dams and dykes to break and swamp nearby areas. A pluvial, or surface water flood, is caused when heavy rainfall creates a flood event independent of an overflowing water body. One of the most common misconceptions about flood risk is that one must be located near a body of water to be at risk. Pluvial flooding debunks that myth, as it can happen in any urban area, even higher elevation areas that lie above coastal and river floodplains, Ivan (2014). Pluvial floods usually occur annually during rainy seasons (between July and October). Such floods which are arguably unprecedented in recent times are caused by more frequent and severe rainfall which overwhelms the efficiency of drainage systems and

soil infiltration capacity (Houston, Werritty, Bassett, Geddes, Hoolachan, Marion, 2011). A coastal flood, as the name suggests, occurs in areas that lie on the coast of a sea, ocean, or other large body of open water. It is typically the result of extreme tidal conditions caused by severe weather. Storm surge, produced when high winds from hurricanes and other storms push water onshore, is the leading cause of coastal flooding and often the most significant threat associated with a tropical storm. In this type of flood, water overwhelms low-lying land and often causes devastating loss of life and property Ivan (2014).

Several rural households are vulnerable to flood disaster. Vulnerability is the state of susceptibility to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt (Adger, 2006). According to Turner *et al.* (2003), vulnerability refers to the susceptibility of human society to damage, given a specific hazard event and can vary so widely between societies, or between social groups within a society.

(Sharma *et al.*, 2000; IPCC, 2001; Yohe *et al.*, 2006), classified vulnerability into three groups, which include: exposure; resistance; and adaptive capacity and resilience. Exposure refers to the “nature and degree to which a system is open to significant climate variations and it is a function of the geographic location of the elements (UNDP, 2004). Sharma *et al.* (2000) affirmed that the poor are more exposed than the rich to risky events because of their housing locations and thus, more vulnerable to flooding than the wealthy. Cutter *et al.* (2000) maintained that vulnerability can be highly differentiated spatially due to divergent scenarios of vulnerability from one location to the other. 'There are thus geographically distinct levels of vulnerability', and the risk to life tends to vary significantly over space, more than other forms of vulnerability (Cardona *et al.* 2012).

According to Cardona *et al.* (2012), lack of resistance leads to sensitivity (susceptibility/ fragility) and a community can either be resistant or susceptible to flooding. Social differences at a given place can make some people more vulnerable even than members of their immediate household. Yohe *et al.* (2006) maintained that specific human systems can resist damage from a hazard more quickly than others. For instance, Yohe *et al.* (2006) study on “Global distributions of vulnerability to climate change” on Southern Californian residents revealed that residents or households with tile roofs were more resistant to fire events than those with wooden shingles. Shifidi, (2014), found that residents of the Cuvelai with mud houses were more susceptible to flood damage than cement-walled houses.

Adaptive capacity is another component of social vulnerability. According to (IPCC, 2007), Adaptive

capacity is "the ability of a system to adjust successfully to climate change to moderate potential damage, to take advantage of opportunities, to cope with the consequences. It is the ability of a person or groups of persons to deal with and bounce back from adversity (Yohe *et al.* 2006). Income or savings could greatly influence adaptive capacity to any disaster, lack of which might enhance vulnerability (Danielson 2009).

## 2. Statement of the Problem

Flood is a major natural disaster that prevents Africans from escaping poverty and it is a bane to realizing the 2020 goals of improving the lives of urban slum dwellers by the United Nations (Action Aid, 2006). Floods caused the displacement of people from their usual dwelling places resulting in varying effects on infrastructure, crops, health, education, environment as well as damage to property (Zambia In-Depth Assessment of Floods Report, 2008). The hazards tend to hit communities in developing countries, increasing their vulnerability and setting back their economic and social growth sometimes by decades.

In the Oyo State of Nigeria, the occurrence of floods is quite alarming in recent times, leading to losses of lives and properties. The havoc caused by this natural disaster affects the physical, economic, social, geographical, psychological, and cultural spheres of human endeavour. Given the extent of damages caused by flooding, there is a danger of becoming myopic about the potentially hazardous situation of flooding if sustainable measures are not put in place to prevent or minimize the effects on the rural dwellers. More so, with the increasing occurrence of this natural event and the various effects in the society, it is imperative to know the various activities and factors exposing the rural dwellers to flooding in the study area. It is against this background that the study aims to assess the vulnerability of rural households to Seasonal flooding in Oyo State, Nigeria. Specifically, the study:

- i. describe the socio-economic characteristics of households in the area;
- ii. identify the types and frequency of flooding in the study area;
- iii. investigate the factors responsible for the vulnerability of the area to floods; and
- iv. determine the effects of flooding on the livelihoods of the respondents of rural households in Oyo state.

## 3. Research Material and Methods

The study was carried out in Oyo States, Nigeria. The State came into existence in 1976 and had its capital situated in Ibadan. Oyo State is bounded in the

north, east, south and west by Kwara Osun, and Ogun States as well as the Republic of Benin respectively. According to the National Population Commission (2016) and the National Bureau of Statistics (2017), the estimated population of Oyo state in 2016 was seven million, eight hundred and forty thousand, eight hundred and sixty four inhabitants (7,840,864). The state covers approximately an area of 28,454 square kilometres. The landscape consists of old hard rocks and dome-shaped hills, which rise gently from about 500 meters in the southern part and reaching a height of about 1,219 meters above sea level in the northern part. The State is 8° 19' 60" North, and 3° 2' 30" East. The State is dominated by Yoruba ethnic group, who have Agriculture as their primary occupation. The principal rivers in Oyo state include Ogun, Oba, Oyan, Otin, Ofiki, Sasa, Oni, Erinle and Osun rivers. The climate in the State favours the cultivation of crops like maize, yam, cassava, millet, rice, plantains, cocoa, palm produce, and cashew.

#### Sampling procedure and sample size

A multi-stage sampling procedure was employed to choose the respondents used in the study. It involved a purposive selection of three (3) Local Government Areas and three (3) flood-affected areas from each of the Local Government Areas. The final stage involved a purposive selection of ten (10) rural households from each flood-affected community. Thus, a total of 90 rural households were interviewed.

The information gathered was analyzed using descriptive statistics like frequency counts, percentages and mean.

Chi –square was used to determine the effect of flooding on the livelihoods of farmers in the study area.

$$X^2 = (O-E)^2/E$$

Where; O = the observed effect of flooding on the livelihoods of farmers in the study area.

E = the expected effect of flooding on the livelihoods of farmers in the study area.

#### 4. Results and Discussion

##### Socio-economic Characteristics of the Respondents

**Table 1: Socio-Economic Characteristic of Respondents**

Variables	Frequency	Percentage	Mean
<b>Sex</b>			
Male	87	96.7	
female	3	3.3	
<b>Age</b>			
≤ 40 years	8	9	
41 – 60 years	76	84.4	<b>52 years</b>
> 60 years	6	6.6	
<b>Religion</b>			
Christian	48	53.9	
Islam	42	46.1	
<b>Marital status</b>			
single	0	0	
married	89	98.9	
widow	1	1.1	
<b>Household size</b>			
≤ 5	37	41.1	
6 – 8	48	53.3	<b>6 persons</b>
> 9	5	5.6	
<b>Level of education</b>			
No formal education	33	36.6	
Primary education	14	15.6	
Secondary education	25	27.8	
Tertiary education	18	20.0	
<b>Pry source of livelihood</b>			
Farming activities	68	75.56	
Non-farming Activities	22	24.44	
<b>Farm size</b>			
≤ 1 ha	61	67.8	
1.1- 2 ha	25	27.8	
> 2 ha	4	4.4	
<b>Farming experience</b>			
≤ Ten years	77	85.6	
11- 20 years	11	12.2	
21- 30 years	1	1.1	
> 30 years	1	1.1	
<b>Annual income ( ₦ )</b>			
≤ 500,000	43	47.8	
501,000-700,000	24	26.7	<b>₦281,277.78</b>
>700,000	22	24.4	

Source: Field survey, 2018

Table 1 shows that 96.70percent of the respondents were male, while 3.30percent of them were female. The majority (84.40%) of the respondents were between the age ranges of 41-60 years, with a mean age of 52 years. The majority (98.10%) of the respondents were married with a mean household size of six persons. The household size was relatively large as it could contribute to the vulnerability of the household to flooding. The study shows that 20.00, 27.60, and 15.60percent of the respondents attained tertiary, secondary and primary education respectively while 36.60percent have no formal education. It shows that most of the respondents had a low educational level. Low level of education, according to Okeleye, Olorunfemi, Sogbedji and Aziadekey (2016) most rural farming populace had low literacy level, which might negatively influence their exposure, resistance and adaptive capacity to flooding. These findings agreed with the assertion of Adetunji and Oyeleye (2013), Isaac and Kofoworola (2015) that low level of formal education can impair sound decision when flood disaster strikes and also cause ignorance on houses or building planning, thereby increasing their vulnerability to flooding.

On the primary source of livelihood, 75.56percent of the respondents practised farming while 24.44percent engaged in non-farming activities such as artisan, civil servant, service providers, and trading. It shows occupation diversity among the respondents. Occupation diversity could be a risky averse strategy for the farmers. Although a huge proportion (85.60%) of the respondents have been practicing farming for ten (10) years they have a mean farm size of 0.8 hectares, an indication of relatively small farm holdings. Evidence from literature (Adebo 2014, Adebo and Ajiboye, 2014) shows that small scale farmers have less access to production resources (credit, improved varieties of crops and animal breeds, and technologies), hence, they are encumbered with the vicious cycle of poverty (low income, low savings and low productivity). The farming experiences have not actually translated to increased productivity. Consequently, the annual income from the farm was relatively low with an annual mean of two hundred and eighty one thousand, two hundred and seventy seven naira, seventy-eight kobo (₦281,277.78) an equivalent of 2.05 dollar per day (at May 6, 2020 exchange rate of 375 naira per dollar, which is just a little above \$1.90 per day 2011 PPP). The low income level might pre-dispose the respondents to flooding risk with little or no adaptive strategy.

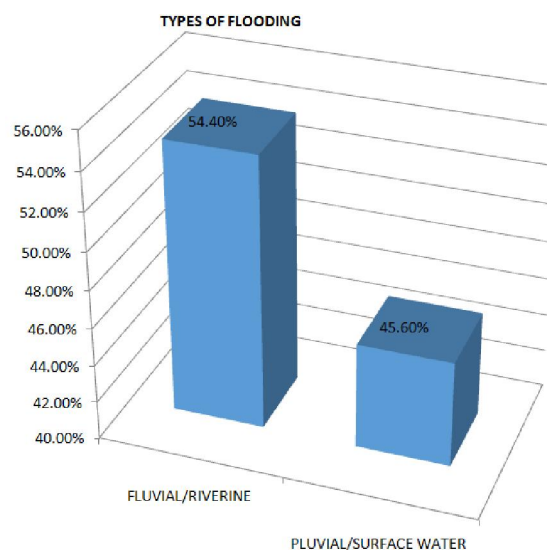
#### Types of Floods that Occurred in Oyo state

The result in Figure 1 shows that 54.46percent of the respondents indicated the occurrence of Fluvial or riverine flood, while 45.60percent indicated Pluvial

flood or surface water. This result established that flood from a flowing river is prevalent in the study area.

#### Frequency of flooding Occurrence in Oyo state

Table 2 revealed the frequency of occurrence of flooding in Oyo state, Nigeria. A majority (86.7%) of the respondents experienced flooding often while 3.3% experienced it always. It affirms that flooding is a significant challenge experienced often by the respondents. It aligns with the findings of Frederick, Yawson, Yengoh, Odoi and Afrifa (2010) that the frequency and severity of floods in Northern Ghana over the last decade has increased considerably.



Source: field survey, 2018

Figure 1: types of flooding

Table 2: Frequency of Flood Occurrence in the Study Area

How often / frequency of occurrence flood	Freq.	%
Never	02	2.2
Rarely	05	5.6
Sometimes	02	2.2
Often	78	86.7
Always	03	3.3

Source: Field Survey, 2018

#### Factors Responsible for the Vulnerability of Oyo state to Flooding

The results in Table 3 revealed the various factors responsible for the vulnerability of the area to flooding. The factors vary from building residents close to river banks (88.8%) to poverty, indiscriminate waste disposal and improper town planning (86.5% respectively), and weak drainage system (67.4%).

Likewise, 62.90percent emphasized the lack of cooperation among the community members in

maintaining the environment as a big challenge to vulnerability. According to Oladokun and Proverbs (2016) attributed the factors responsible for the vulnerability of the Nigerians to flooding to weak

infrastructure, inadequate drainage network, absence of integrated flood risk management systems, weak institutions and poverty.

**Table 3: Factors Responsible for the Vulnerability of the Study Area to Flood**

Factors responsible for vulnerability	Frequency	Percentage
Poor drainage system	60	67.40
The proximity of houses to river banks	79	88.80
Geographical setting	10	11.20
Lack of unity to dredge drainage	56	62.90
Poverty	77	86.50
Indiscriminate waste disposal	77	86.50
Improper town planning.	77	86.50

**Source: Field survey, 2018**

### Effects of Flooding on the Livelihoods of Farmers in the Study Area

The result of Chi square in Table 4 shows the effects of flooding on the livelihood of farmers in the study area. The results revealed that flooding significantly affected the agricultural assets ( $X^2=72.461$ ,  $p< 0.05$ ), health ( $X^2=38.730$ ,  $p< 0.05$ ), Economic assets ( $X^2=70.303$ ,  $p<0.05$ ), social lives ( $X^2 = 62.416$ ,  $P<0.05$ ), and physical assets ( $X^2 73.640$ ,  $p< 0.05$ ) of the farmers. It implies that flooding lead to several losses in Agricultural productivity in terms of loss of crop, livestock, and soil fertility. Flooding causes huge destruction to the rural and urban infrastructures (farmlands/crops, roads, buildings, damages, bridges, and power lines) and socioeconomic lives of the areas in central Nigeria. According to Nwigwe and Emberga (2014), Etuonovbe, (2011) affirmed that flooding do not only damage properties and endanger the lives of human and animals but also produce other secondary effects like outbreak of diseases such as cholera and malaria as well.

The health of rural households is usually affected by flood due to contamination of portable water from overflowing waste pits and the subsequent effects of such contaminants. Studies (Isidore, Aljunid Kamigaki, Hammad and Oshirani 2012; Brown and Murray, 2013; Cann et al., 2013; Olanrewaju, Chitakira,. Olanrewaju, and Louw, 2019) affirmed that flooding causes water borne diseases and that the most common waterborne pathogen isolated after flooding was the *Vibrio* spp., which causes cholera (watery diarrhoea).

The flood also led to emotional disturbance, physical injuries, and affects the livelihoods of the people. For instance the World Health Organization (WHO, 2012) affirmed that over 25% of the people in Ibadan lost their livelihoods to flooding in Ibadan in 2012. Most of these people do not have any resilience, hence could not bounce back after the shock and disaster. In fact evidence abounds that some people lost their families to flooding.

**Table 6: Showing the effects of flooding on the Livelihoods of rural households in Oyo state**

Livelihood Assets of The Farmers	$X^2$	DF	Exact. Sig.	Decision
Agriculture	72.461*	9	0.000	S
Health	38.730*	7	0.000	S
Economic Assets	70.303*	5	0.000	S
Social Assets	62.416*	3	0.000	S
Physical Assets	73.640*	4	0.000	S

**Source: Field survey, 2018**

\* Significant at 0.05 level of significance.

S = significant

### 5. Conclusion and recommendations

The findings of the study established that the common types of floods in the study area are fluvial flooding and pluvial flooding. The factors that predispose the rural households to flooding in Oyo

state, Nigeria includes poverty, building residents close to river banks, indiscriminate waste disposal, and weak drainage system, poor house planning and the lack of cooperation among the community members in maintaining the environment. The study established

that flooding affected the agricultural productivity, health, economic, social and physical assets of the rural households.

The study, therefore, recommended that more awareness and sensitization programs should be carried out to enlighten the rural household on how to avoid flooding. The government should enforce rules and regulations on town and regional planning. All houses cited close to riverbanks should be demolished. Farmers should be encouraged to insure their farms against risk and uncertainties. Both government and non-governmental organizations should assist the rural households to bounce back after flooding.

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