Nature and Extent of flooding: Evidence from the 2012 Devastating floods in Southeastern Nigeria

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ABSTRACT

Floods are among the most disastrous natural hazards in the world. The study investigated the nature and extent of the 2012 devastating floodsin South eastern Nigeria. The study focused on two States in Southeastern Nigeria; Anambra and Imo States as they were the only two mostly affected States in the study area during the 2012 floods. Multi-stage, stratified and random sampling were employed in selecting the target population and administering the copies of questionnaire. Data were collected 400 households from 8 communities in 4 Local Government Areas (LGAs) were sampled. The nature of flooding was analysed using descriptive while the flood extent was analysed using Moderate-resolution imaging Spectroradiometer (MODIS) and Shuttle Radar Topography Mission Digital Elevation Model (SRTM DEM) images. The flood extent, depth and inundated area maps of the study area were generated using ArcGIS 10.2.The results show all the households were affected by the 2012 floods. Majority (69%) experienced severe degree of flood damage while 27.7% and 3.3% households experiences were classified as moderate and mild respectively. The findings also revealed that 91.2% experienced floods of high frequency most times in the rainy season while the remaining 8.2% households experienced flooding whenever it rains, occasionally or rarely. The results also revealed that flood extent isprimarily a function of the elevation of the communitiesand LGAs as areas below 35m (the threshold) were inundated. The flood extent and depth were found to be linked to the availability and sizes of rivers that drained the study area asriver (fluvial) flooding is predominant in the study area.In terms of percentage of inundated area, Ogbaru LGA was the most affected followed by Oguta, Anambra East and Ohaji/Egbema LGAs where 98.5%, 50.6%, 41.7% and 26.6% respectively of their entire land were submerged. The negative implications associated with severe inundation are mainly economic losses, food insecurity and deaths. To cushion these negative implications, flood emergency response and preparedness have been recommended.

Keywords: DevastatingFloods, Flood extent, Flood depth, Inundation, Digital Elevation Model

1. Introduction

Flooding is generally a condition of complete or partial inundation of normally dry areas due to overflow of tidal or inland or waters or from abnormal and rapid accumulation of runoff (Jeb and Aggarwal, 2008; Djimesah, Okine and Mireku, 2018). Floods have been described as the most recurring, disastrous and widespread natural hazards of the world (Odufuwa, Adedeji, Oladesu and Bongwa, 2012; Djimesah et al., 2018). Globally, floods have caused about half of all observed disasters and 84% disaster deaths are attributed to flooding, with an average of 20,000 deaths per year (UN-Water, 2011). In addition, an estimated number of about 500 weather-associated disasters occur annually compared to about 120 weather-related disasters that occurred in the 1980s with floods occurring a six fold, affecting a substantial number of people (Oxfam, 2007; WHO 2008).However, it has not been established whether the increased adverse effects of floods in the last decades were caused by more intense and recurrent flooding, or by the increased vulnerability of flood plains, which are the preferred areas for economic development and settling (Klijn, 2009).

The incidence of flooding has increased due to rise in sea level mostly in the coastal cities as well as changes in annual and seasonal rainfall as a result of climate change, building in floodplains, blocked/inadequate drainage facilities and unplanned urbanisation (IPCC, 2007; Akinsanola and Ogunjobi, 2014; Douglas et al., 2008; Etuonovbe, 2011; Syaukat, 2011; Oladokun and Proverbs, 2016; Ojo and Adejugbagbe, 2017; Dan-Jumbo, Metzgerand Clark, 2018; Olanrewaju et al., 2019). These frequent floods have resulted to loss of human lives and property, displacement of people, increased pest/disease outbreaks, reduced crop yields,soil erosion and general damage to the environment (Adewuyi and Olofin, 2014; Emaziye, et al., 2013; FAO, 2008; Jeb and Aggarwal, 2008; Nzeadibe et al., 2011; Olanrewaju et al., 2019).

Nigeria has recorded frequent scenarios of destructive floods such as in Akure (1996, 2000, 2002, 2004, 2006), Ibadan (1985, 1987, 1990, 2011), Osogbo (1992, 1996, 2002), Yobe in 2000, Makurdi (2008, 2012), Sokoto in 2010, Ogbaru,Oguta and Egbema in 2012. Similarly, coastal cities such as Lagos, Port Harcourt,Yenegoa, Uyo, Calabar,and Warri experience floods frequently in Nigeria (Folorunsho and Awosika 2001; Ologunorisa, 2004; Mordi 2011; Amaize, 2011; Olajuyigbe et al., 2012; Olanrewaju et al., 2019).

In 2012, Nigeria experienced a devastating flood event between August and October where rivers overflowed their banks and submerged hundreds of kilometres of urban and rural lands (Ojigi, Abdulkadir and Aderoju, 2013), affecting 33 of the 36 States in the country. The flood was the worst ever experienced in Nigeria in the past 40 years according toThe United Nations Office for the Coordination of Humanitarian Affairs (UN-OCHA, 2012).Estimatedly, over 7,705,378 Nigerians were affected with 363 deaths, 2,157,419 internally displaced persons (IDPs), and more than 618,000 damaged houses (UN-OCHA, 2012). The reports of FEWS NET (2012; 2013) showed that farmlands were extensively destroyed which led to food insecurity in parts of the country since communities that produce yam, cassava and sweet potatoes (3 main tuber food crops in Nigeria) were affected by the floods.

However, two States (Imo and Anambra) selected for this study in Southeastern Nigeria are vulnerable to flooding due to their proximity to River Niger and are agrarian; they have comparative advantage in the production of staples (cassava, maize and potatoes).

According to Adewuyi and Olofin (2014), the southern axis (South South and South East regions) of Nigeria were the most affected by the 2012 devastating floods compared to other parts, since 13 of the extreme flooding incidences lasting for more than 14 days were recorded in the southern axis.

Since the 2012 has been termed “the worst” in Nigeria by UN-OCHA (2012), affected mostly the southern axis according to Adewuyi and Olofin (2014) and caused food insecurity in parts of the country (FEWS NET, 2012; 2013), there is need to study the nature and extent of this devastating 2012 floods in Southeastern Nigeria. This study is pertinent because of paucity of literature on mapping the 2012 flood extent in Southeastern Nigeria to ascertain the degree of inundation/damage as well as determining flood vulnerability hotspots in the study area, despite its comparative advantage in producing the main tuber crops (staples) of Nigeria. The flood extent map would help policy makers in formulating sustainable flood emergency programmes and coping strategies for the region.

2. MATERIALS AND METHODS

2.1 The Study Area

2.1.1 Location

The study area, Southeastern Nigeria is made up of five States namely; Abia, Anambra, Ebonyi, Enugu and Imo. It is located between latitudes 4° 20′ to 7° 10′ north of the equator and longitudes 6° 35′ to 8° 25′ east of the Greenwich Meridian with a land size of about 28,983km^2. The region is bounded to the north by Benue and Kogi States, to the south by Rivers State, to the east by Cross River State and to the west by Delta State (Figure 1). Two States (Anambra and Imo) have been selected for this study due to they were the two most affected States among the five States that make up the Southeastern region of Nigeria. Anambra State is located between latitudes 5°40′ and 6°46′ north of the equator and longitudes 6°35′ and 7°21′ east of the Greenwich meridian. To the north, the State is bounded by Enugu and Kogi States, to the south it is bounded by Imo State, to the east it is bounded by Abia and Enugu States, and to the west it is bounded by River Niger and Delta State. Anambra State has a spatial extent of about 4,816km^2. Imo State is located between latitude 5°10′N to 5°25′N and longitude 6°35′E to 7°23′E of the Greenwich meridian with a total land area of about 5,183sqkm. It is bounded on the east and west by Abia State and Rivers State respectively, and on the north by Anambra State and on the south by Abia and Rivers States (Fig. 1).

2.1.2 Climate

Southeastern Nigerialies within tropical wet-and-dry climate or Aw climate based on Koppen’s climate classification (Anyadike, 2002). It usually experiences an average of eight months of rainfall and four months of dry season. The two major seasons experienced in this region are; the rainy season (March to October) and the dry season (November to February). Heaviest rainfall usually occurs in July and September, and December records the driest month while the month of March records the hottest weather. Mean annual rainfall ranges from 1800mm to 2000mm. It experiences high temperatures all year round with an average value of 27°C while the average relative humidity ranges between 60-70% and 80-90% in January and July respectively (Monanu, 1975a; Monanu, 1975b; Anyadike, 2002). Floods in the south east are usually experienced between July and October, and greatly are influenced by the rainfall pattern.

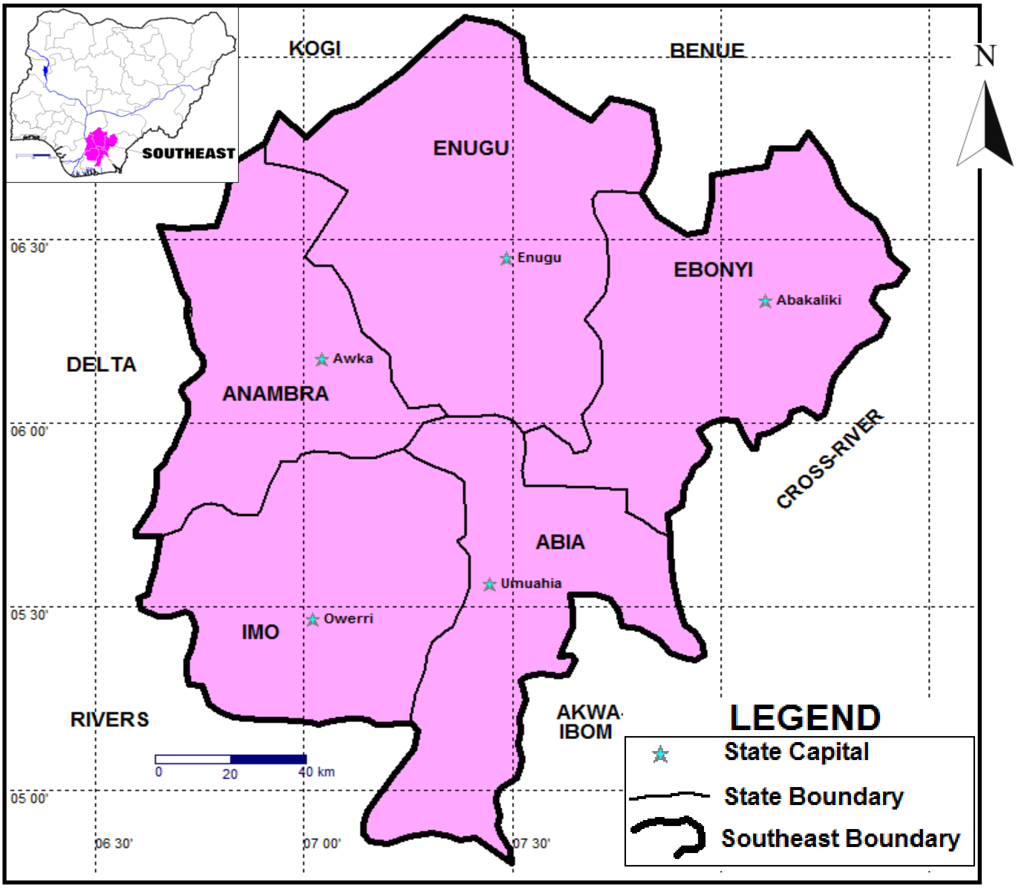

Figure 1: Map of the Study Area.
Source: GIS Lab., Department of Geography, University of Nigeria, Nsukka, 2015

2.1.3 Relief and Drainage

The Southeastern region of Nigeria are classified into two broad relief regions namely; lowlands and cuesta landscapes. The lowlands have heights of less than 400 meters and are made up of the Niger-Anambra lowlands in Anambra State and the undulating lowlands and coastal plains located along the Bende-Ameke-Umuahia axis of Imo and Abia States. The cuesta landscapes of above 350 meters high comprise the Nsukka-Okigwe cuesta and Awka-Orlu uplands (Ofomata, 2002). The Nsukka-Okigwe cuesta is made up of the Enugu escarpments formed by the resistant sandstone in the lower coal measures and in the lower parts of the false bedded sandstone.The Awka-Orlu uplands are found around the Agulu, Nanka, Oko, Ekwulobia and Onitsha areas in Anambra State and Orlu area in Imo State.

In terms of drainage, Anambra State is surrounded by rivers such as the River Niger, Omabala River, the Nkisi River, the Idemili River, Duo River, Mamu River, Ezu River and the Nwangele/Utumonye creek. Imo State has few rivers with enormous interfluves that carry run-off in periods of heavy rains(Udo, 1981). The main streams draining Imo State are Njaba, Imo, Otamiri and Ulasi rivers with all having few tributaries. With the exception of Imo River (which runs through the area underlain by the Imo Shales), other rivers in Imo State rise within the coastal plain sands. All these rivers in the Southeastern region of Nigeria, are tributaries of River Niger (Figure 2), and they sometimes overflow their banks to inundate adjacent communities especially due to excessive water supply from River Niger as experienced in 2012.

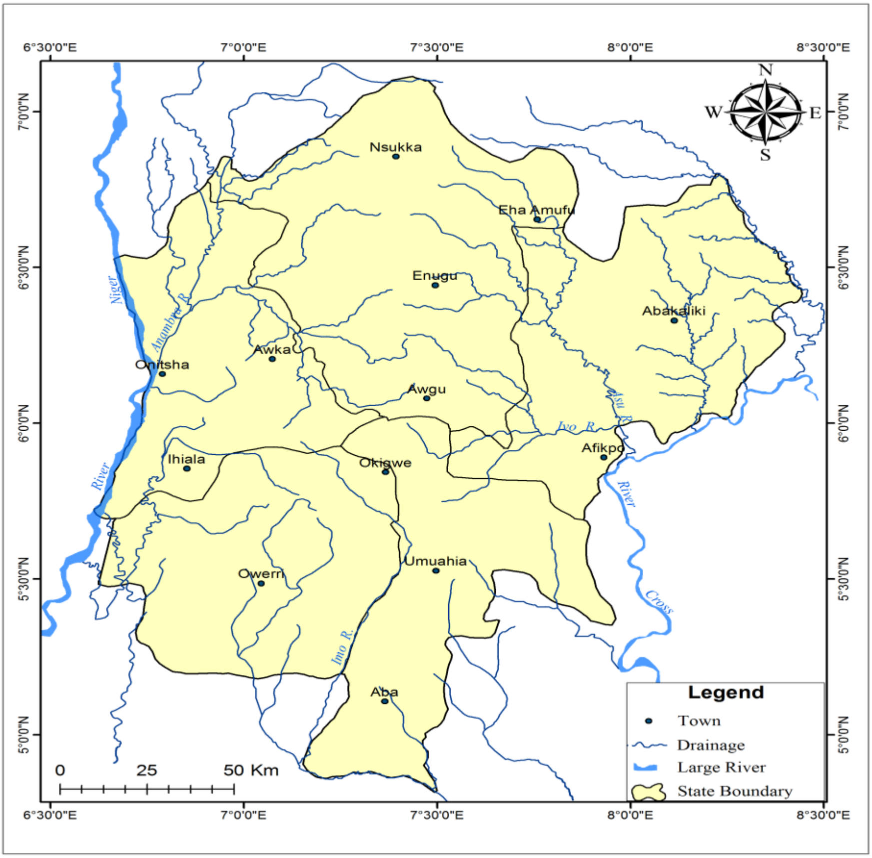

Figure 2: Drainage Map of the Study Area.
Source: GIS Lab., Department of Geography, University of Nigeria, Nsukka,2015

2.1.4Field Sampling Techniques

Anambra and Imo States have been selected for the study becausethey were the most vulnerable States to flooding as they were the only two States affected in the region by the 2012 floods termed the most devastating floods in Nigeria (UN-OCHA, 2012). Only two Local Government Areas(LGAs) namely; Ohaji/Egbema and Oguta LGAs were affected in Imo State by the 2012 floods (Fig. 3). Thus, for equal and unbiased representation of the two States, two (flood vulnerable and easily accessible) LGAs namely; Ogbaru and Anambra east LGAs were purposively selected in Anambra State. These four LGAs viz; Ohaji/Egbema and Oguta LGAs (in Imo State); Ogbaru and Anambra east LGAs (in Anambra State) were sampled because they consist of agrarian communities that are very vulnerable to floods; that are situated not too far from the River Niger (the largest River in Nigeria) and were among the most affected by the devastating 2012 floods in Nigeria as well as being accessible. The sampled communities, LGAs of Anambra and Imo States are shown in Figure 3.

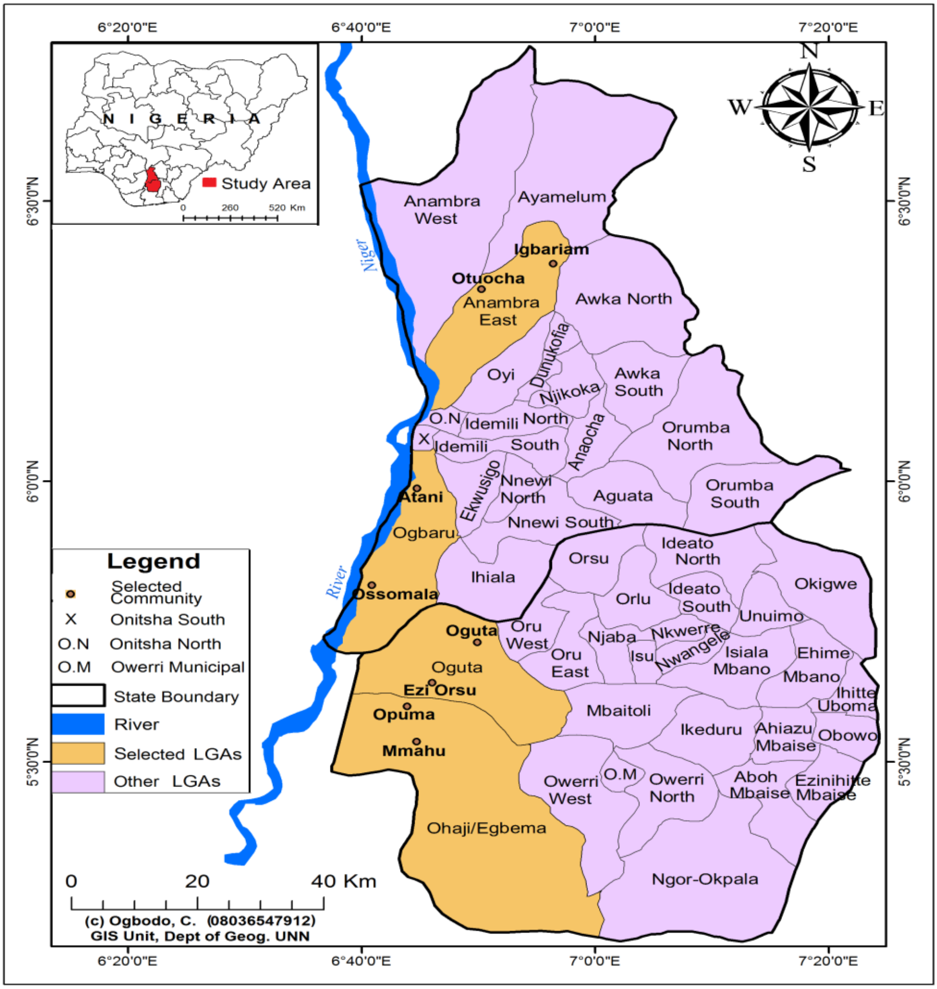

Figure 3: Map of the study area showing the sampled LGAs/Communities.

Source: GIS Lab., Department of Geography, University of Nigeria, Nsukka, 2016

2.1.5 Data collection and Sampling

Moderate-resolution imaging Spectroradiometer (MODIS) (October, 2012) and Shuttle Radar Topography Mission Digital Elevation Model (SRTM DEM) imageries collected from the United States Geological Survey (USGS) were used to identify flooded locations and estimate areas affected in the study area with ArcGIS 10.2 and QGIS 2.0.1. However, the population of Anambra East, Ogbaru, Oguta andOhaji/Egbema LGAs were 152,149, 223,317, 142,340 and 182,891respectively in the last official census conducted in 2006 (National Population Commission, 2010) with a total of 700,697 persons. The population was updated in 2016 (year of data collection) using equation 1 at the LGA level, where the population of Anambra East, Ogbaru, Oguta andOhaji/Egbema LGAs used for the analysis became 205,401, 301,478, 192,159 and 246,903 persons respectively, making it a total of 945,941 persons. The sampled communities, LGAs and States are already shown in Figure 3.

$P_2 = P_1 (1+r)^n$ ...(1)

Where; P_2 is the projected population

P_1 is the known population (2006 in this case)

R is the rate of natural increase, 2.8% as noted by the United Nations, 2013.

n is the number of years between P_1 and P_2 (interval),that is, 11 years.

The sample size was determined using Yamane (1967) equation where the sampling size of any study is with a population between 100,000 and more persons, is 400 at +/-5% level of precision. Thus, 400 respondents were sampled.The equation is given as;

$n = N/[1+N(e^2)]$...(2)

where;

n – is the sample size

N- is the population of Anambra East, Ogbaru, Oguta and Ohaji/Egbema LGAs

e – is the level of precision/sampling error i.e. 0.05.

N=205,401+301,478+192,159+246,903=945,941

$n = 945{,}941/(1+(945{,}941*0.05^2))$

n = 400 respondents

2.2 Data Analysis

2.2.1 The Flood Extent Mapping Procedure

Digital image processing of earth remote sensing data and GIS geoprocessing techniques were employed to determine the 2012 flood extent in the study area, and the processes executed using ArcGIS ArcMap software. The 2012 flood extent was analysed because 100% of the participants agreed to have experienced extreme floods in 2012 (Table 1), and 2012 has been termed the worst flood year in Nigeria for over 40 years where 33 out of the 36 States that make up the country were affected (UN-OCHA, 2012).

The Moderate-resolution imaging Spectroradiometer (MODIS) Aqua 8-day composite satellite image (MYD09Q1.A2012281.h18v08.006) captured in October, 2012 spanning the flood period, was acquired for the study area, via the USGS EarthExplorer portal. Similarly, the Shuttle Radar Topographical Mission (SRTM) v3 3-arcsec Digital Elevation Model (DEM) dataset for the area was acquired.

For easy identification of inundated surface from the MODIS image, the 534 band combination (a false colour composite) at default 500m spatial resolution was used, because the true colour composite would not allow for ease of identification or visual contrast between bare surface and flood water.

The MODIS image, the SRTM DEM, and the ArcMap pixel inspector, were used to identify the maximum elevation inundated by the 2012 flood water in the study area as 35m.

Whereas, the satellite image provided a visual of the extent of the flood event, and visual clarity was impaired slightly by cloud cover. The study area largely being a plain, the DEM intuitively helped to obtain a more complete picture of the event, when subjected

alongside the MODIS image, to a conditional reclass algorithm implemented in ArcMap, effectively dealing with the cloud cover, and thus producing a visual of the flood extent.
The algorithm follows that: If LC is [X]pixel and DEM is LT.EQ [Y]pixel, then Output [X]pixel as [F]pixel else, [X]pixel is [N]pixel.
Where: LC is the MODIS image derived Land Cover Raster, categorized into Flood, Cloud, and Others.

[X] pixel is cloud pixel
[Y] pixel is maximum elevation under inundation
[F] pixel is Flood pixel
[N] pixel is Not Flooded
LT.EQ means Less Than or Equal To

From the output of the conditional reclass, the corresponding pixels of the DEM were extracted, and classified into flood depths below 10metres and those above.
The area of land inundated in each LGA was also computed via the spatial analyst toolbox.
Structured questionnaire were used to collect data on severity of flood,flood depth (the height of flood water recorded on their building), flood frequency among others used for analysing the nature of flood (see Table 1). A total of 400 copies of questionnaire were distributed using random sampling.

3. RESULTS AND DISCUSSION

3.1 The Nature of flood

Flooding has been avowed to be one of the devastating environmental problems faced by some communities. Flood characteristics in terms of extent, frequency, severity and depth were examined to ascertain the area of inundation, the magnitude of damage as linked to how frequently floods occurred in the study area. Table 1 shows the flood characteristics and it reveals that all the households (100%) in the study area were affected by the 2012 floods. In terms of severity, majority (69%) of the household suffered severe degree of flood damage which has been linked to the frequency of flooding since floods occurredmost times in the rainy season. In addition, a greater proportion (91.2%) of households experienced flood events most times in the rainy season in the study area while 8.8% either experienced flooding whenever it rains, occasionally or rarely.
An analysis of the year(s) households were most affected by flooding, shows that all sampled households (100%) were affected in 2012, 9.8% in 2013, 34% in 2014, 22.5% in 2015 and 48.5% in 2016.It could be inferred from the percentage of households affected that devastating flooding occur on a two-year basis with that of 2012 being the worst in the last five years within the period under study. However, 2012 had been noted to be the most extreme flood year in the last five as evident in Table 2 and which is in line with the findings of UN-OCHA (2012) and FEWS NET (2012; 2013).
Fluvial (River) flooding resulting from rivers overflowing their banksis the major type of flooding experienced in the study. This type of flood isaggravated by increased rainfall, farming on floodplains among others. The flood water that affected houses were indicated by majority (51.7%) to be2-4m deep while 5.8% indicated that it was >4m deep. Moreover, 19% households reported that the flood water within houses was between 1-2m deep while 23.5% indicated that it was was <1m deep (Table 1). The depth of flood water within these housing units shows how vulnerable the households are

to flooding. Consequently, flooding in the sampled States is caused mostly by excess discharge from rivers.

Table 1: Nature of flood in South eastern, Nigeria

Nature of flood	Component	Frequency	Percent (%)
Severity of flood	Mild	13	3.3
	Moderate	111	27.7
	Severe	276	69.0
Flood frequency	Rarely	4	1.0
	Occasionally	10	2.5
	Whenever it rains	21	5.3
	Most times in the rainy season	365	91.2
Flood depth (house)	<1m	94	23.5
	1-2m	76	19.0
	>2m	107	26.7
	>3m	100	25.0
	>4m	18	4.5
	>5m	5	1.3
Flood type	Flash flood Yes	277	69.2
	No	123	30.8
	River flood Yes	400	100
	No	0	0.0
Affected by flood	Yes	400	100
	No	0	0.0
Year affected by flood	2012	400	100
	2013	39	9.8
	2014	136	34.0
	2015	90	22.5
	2016	194	48.5
Extreme flood year	2012	400	100
	2013	0	0.0
	2014	5	1.3
	2015	9	2.3
	2016	18	4.5

Source: Researcher's computation, 2017

3.2 Flood Extent Mapping

3.2.1 Elevation

Figure 4 shows that the elevation of the study area falls within 1-150m high with the selected communities (Atani, Ossomala, Otuocha, Igbariam, Oguta, Ezi-Orsu, Mmahu and Opuoma) falling within 1-50m high, hence the reason for their high vulnerability to flooding.

3.2.2 Flood Extent

Flood extent was analysed to illustrate the area inundated during extreme flood event, and the risk related to flood-induced losses emanated from the flood extent map. Flood analysis from the MODIS and SRTM DEM images show that the maximum elevation inundated in the study area was 35m above sea level, thus any area with an elevation below the 35m threshold was inundated.

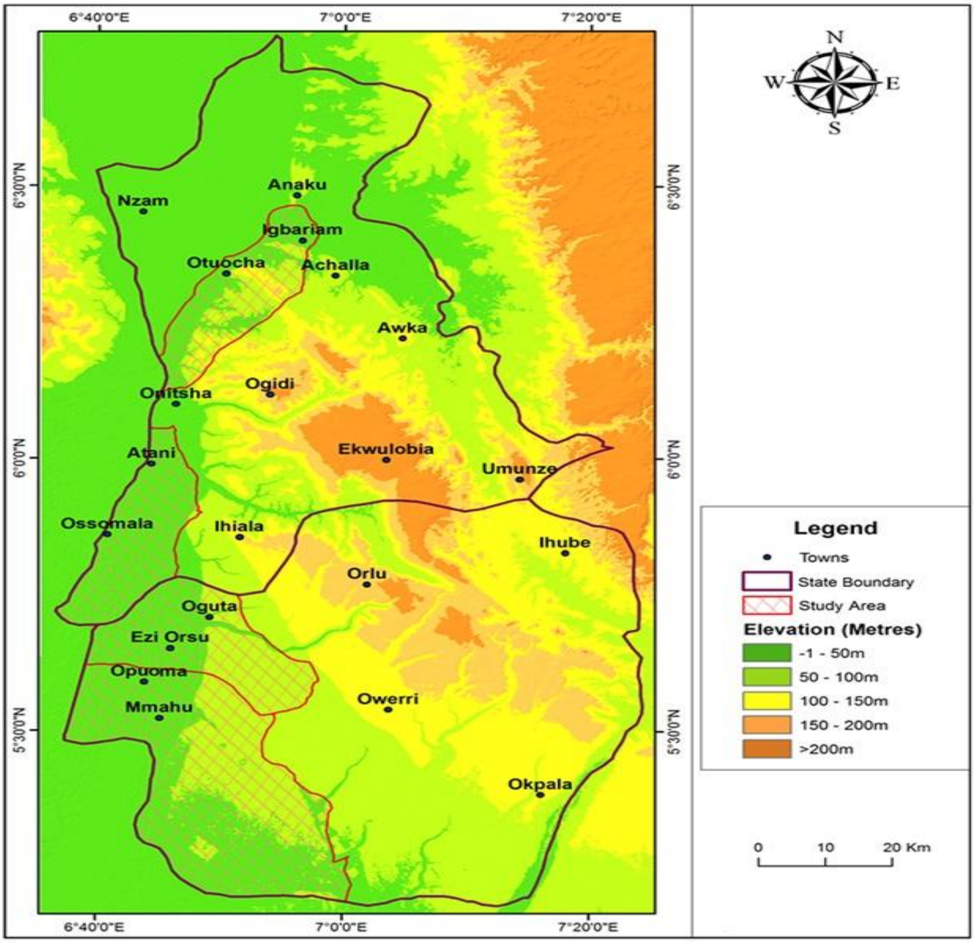

Figure 4: Elevation map of the study area

Source: Cartography Lab., Department of Geography, University of Nigeria, Nsukka

Figure 5 shows that areas lower in elevation (1-50m) are more flood-prone and they experienced floods as deep as 10m and above extending to more parts e.g. Atani and Ossomala. Fluvial (River) flooding was the major flooding experienced and this was caused mostly by the overflowing of the banks of Duo River, Mamu River, Ezu River, Nkisi River, Anambra River and River Niger that drain the study area. This agrees with the findings of Okwu-Delunzu et al. (2017) who noted areas lower in elevation in Anambra East LGA were prone to flooding as a result of concentration of run-off in these areas from areas of higher elevations. Figure 5 illustrates that most parts of the study area recorded floods as deep as 10m. Atani, Ossomala, Mmahu and Opuoma communities were highly submerged with a recorded flood depth of above 10m. A large proportion of Ezi-Orsu and Oguta communities were partly submerged with a recorded flood depth of1-10m while a small proportion of Otuocha and Igbariam communities were submerged with flood water as deep as above 10m. Majority of the farmlands in the study area was submerged (Plates 1 and 2) which resulted in household food insecurity and economic losses as concurred by the findings of FEWS NET (2012; 2013) and deaths by suicide (Ujumadu, 2012).

Plates 1 and 2 were taken during the 2016 and 2017 floods that were not as severe as those of 2012.

Plate 1: Submerged yam farms in Atani, Ogbaru LGA (31/08/2016)

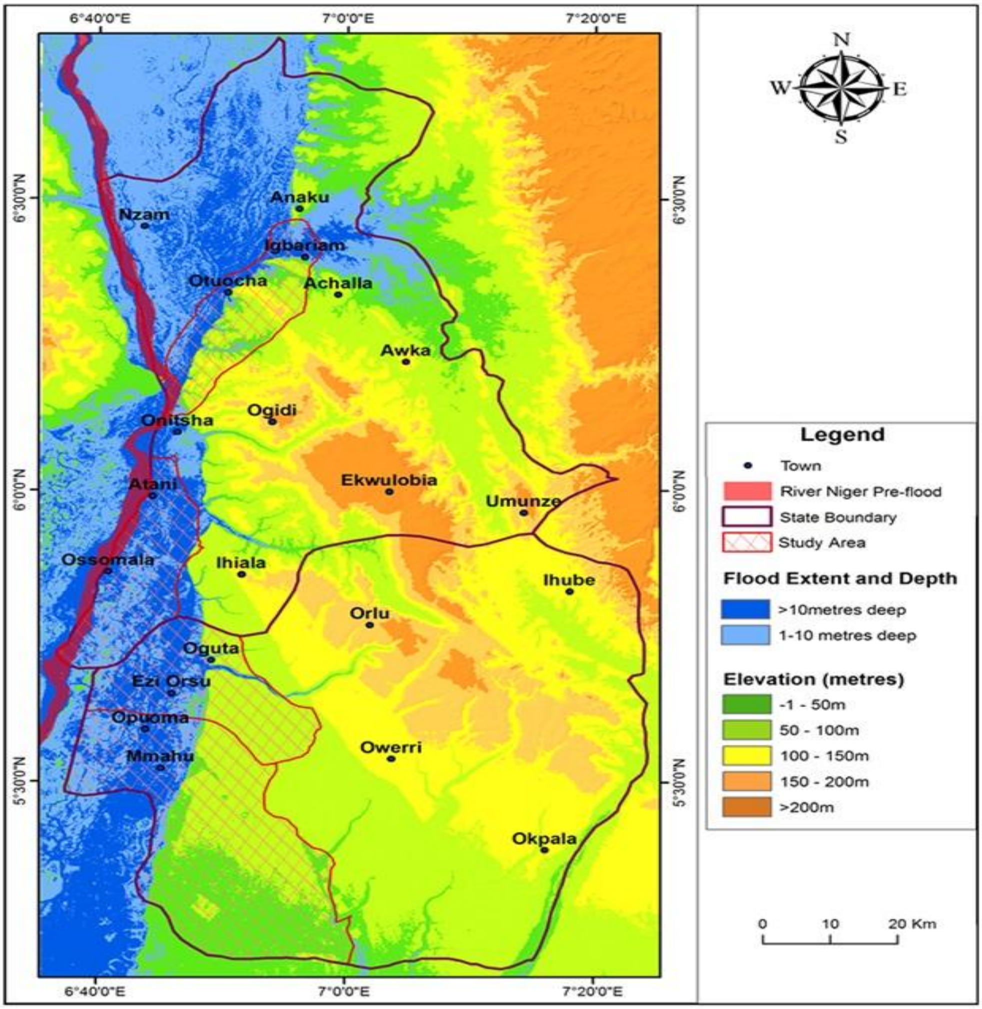

Figure 5: Flood Extent and Depth map

Source: Authors' analysis (2017)

With respect to the area affected by flood, Anambra East LGA recorded the smallest proportion of 158.004 km^2 followed by Oguta, Ohaji/Egbema and Ogbaru LGAs with an inundated area of 241.982 km^2, 305.706 km^2 and 391.789 km^2 respectively (Figure 6). The implication is not only on the area affected but also on the proportion of the entire LGA affected. Table 2 shows that the Ogbaru LGA would have suffered severe effects of flooding, followed by Oguta, Anambra East and Ohaji/Egbema LGAs in a decreasing order with percentage inundated area of 98.5%, 50.6%, 41.7% and 26.6% respectively. The flood extent was primarily a function of the elevation of the communities and LGAs e.g. the 1.5% areas not flooded in Ogbaru LGA were between 100-150m above sea level and the entire inundated area in all the LGAs were mainly plains between 1-50m above sea level. The flood extent and depth are linked to the availability and sizes of rivers that drained these areas because the major cause of flooding in the study has been adduced to rivers overflowing their banks.

Plate 2: A partly submerged house in Oguta (29/09/2017)

Table 2: Percentage Inundated Area

Local Government Area (LGA)	LGA size (km^2)	LGA Inundated Area (km^2)	Percentage Inundated Area (%)
Anambra East	378.95	158.004	41.7
Ogbaru	397.61	391.789	98.5
Oguta	478.24	241.982	50.6
Ohaji/Egbema	1147.51	305.706	26.6

Source: Researcher's computation, 2017

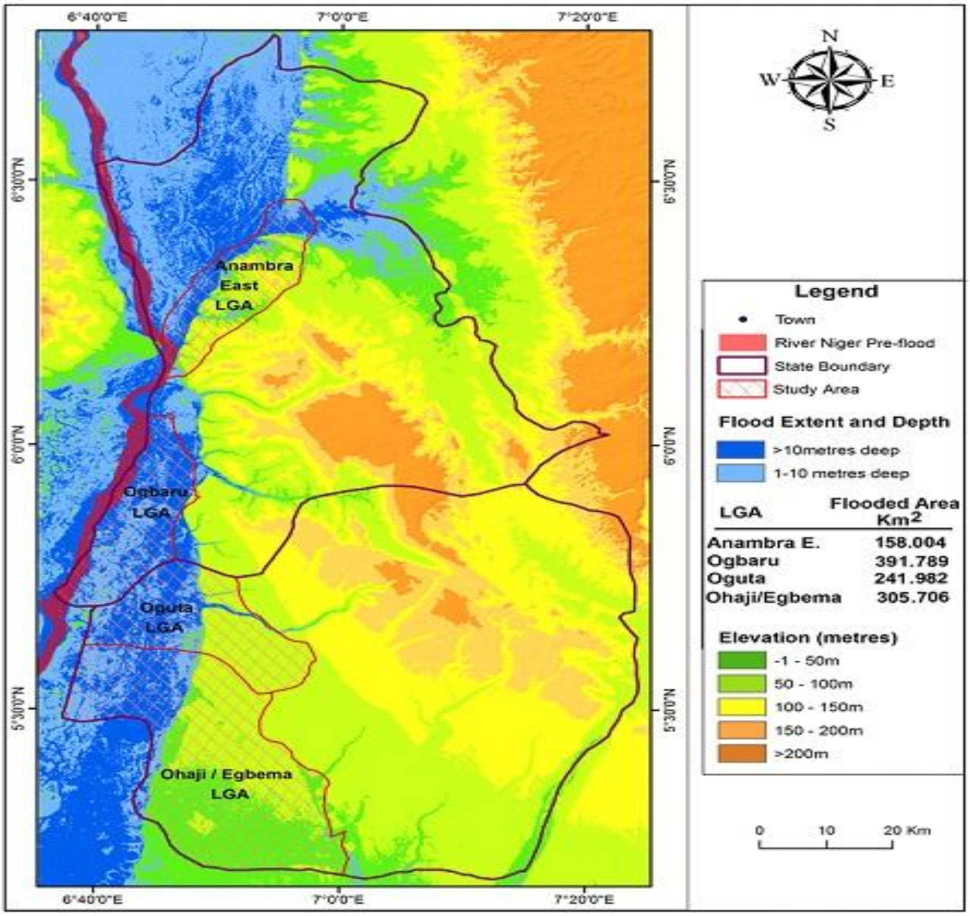

Figure 6: Inundated Area at LGA level
Authors' analysis (2017)

4. CONCLUSION

The nature and extent of the 2012 most devastating floods in the last 40 years in Nigeria was assessed using evidence from Anambra and Imo States in Southeastern Nigeria. The study comprised 400 respondents from 8 communities in 4 Local Government Areas (LGAs) of two States (Anambra and Imo) selected because they were the only two mostly affected by the 2012 floods. On the one hand, the nature of the floods was analysed using descriptive statistics. On the other hand, Moderate-resolution imaging Spectroradiometer (MODIS) and Shuttle Radar Topography Mission Digital Elevation Model (SRTM DEM) images were used to determine flood depth and extent, and the maps generated using ArcGIS.

The results revealed that all the respondents have been affected by flooding, and majority of the households experienced severe flood damage as a result of frequent flood occurrence during rainy seasons. River flood is the most experienced type of flooding as rivers overflow their banks due to excessive runoff aggravated by increased rainfall, inadequate drainage facilities and farming on floodplains in the study area. Additionally, the flood extent is mainly a function of the elevation as areas with lower elevation (1-50m) were more susceptible to flooding and they experienced floods as deep as 10m and above e.g. Atani and Ossomala. It was also revealed that the floods submerged a substantial proportion of farmlands resulting to economic losses, household food insecurity and deaths by suicide.

However, the map showing the inundated area revealed that Ogbaru LGA was the most affected while Anambra East LGA was the least affected with 158.004 km^2 and 391.789 km^2 inundated area respectively. Consequently, Ogbaru LGA suffered severe effects of flooding, followed by Oguta, Anambra East and Ohaji/Egbema LGAs with percentage inundated area of 98.5%, 50.6%, 41.7% and 26.6% respectively of each LGA's total land size.

Thus, flooding is a major environmental problem that has caused untold hardship in the study area due to its frequent occurrence. Finally, formulation of flood emergency response and preparedness; flood response awareness creation and formulation of policies such as sustainable flood managementby policy makers have been recommended. These would increase peoples' resilience, and promote the Sustainable Development Goal 11 by making the communities habitable, safer and inclusive.

5. RECOMMENDATION

Based on the findings, the following recommendations are made;

a. Formulation of flood emergency response and preparedness. The survey revealed that majority of households were aware of their communities' vulnerability to flooding due to the perennial flooding they experienced. The lack of flood preparedness and emergency response system worsened the situation in 2012 as some went to bed and woke up in submerged houses with no rescue team in sight. Irrespective of the early warning, the government should constitute evacuation and flood emergency response teams that would be based within the flood-prone communities to salvage the situation in times of devastating floods.

b. Awareness creation on what to do before, during and after floods events to cushion the effects of flooding.

c. Formulation of sustainable flood management policies or implementation of the existing National Disaster Management Framework. This will increase peoples' resilience and make the communities habitable, safer and inclusive in line with the Sustainable Development Goal 11 which emphasizes safety and inclusiveness in settlements.

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