TOPIC: ASSESSMENT OF THE RISK AND EFFECT OF FLOOD IN SOME SELECTED COMMUNITIES IN MAKURDI LOCAL GOVERNMENT AREA OF BENUE STATE, NIGERIA

Submitted by

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Abstract: Flood disaster is seen as a recurrent event in Nigeria. When it occurs, it affects not only human lives and farmlands but also socio-cultural settings of communities. This thesis provides understanding of Risk and effect of Flood in some Selected Communities in Makurdi Local Government Area in Benue State, Nigeria. The objectives explored were the determination of the factors responsible for flooding in the study areas, mapping of the flood prone areas in the study area, development of the flood risk map of the study area and assessment of the socio-economic impact of flood in Benue State. The study employed both quantitative and qualitative methods. It further engaged key stakeholders within the communities as well as randomly sampled households. Quantitative Household questionnaire was used to collect data. It was observed that flood is recurrent within the study areas. When flood occurs, it affects their businesses seriously as they depend on farm produce and have no alternative businesses. It was also observed from the Digital Elevation Model that, the lowlands are located along the river course of river Benue and these low lands can be termed as flood plains. From this it was observed that many dwellers encroached on flood plains. The analysis revealed that high risk area occupies a total of 18,547,314 square metres, Moderate risk has a land area of 6,513,663 square metres while the Low risk area occupies the least land area with a total of 2,508,034 square metres. It was observed that tributaries of river Benue is one of the major sources for consumption and domestic use. The implication is that the communities will continue to be vulnerable to disease outbreak as a result of contamination that occurs during flooding. The study recommended amongst others that; Benue State Emergency Management Agency should endeavor, with the community heads and members to initiate mitigation measures by introducing community based flood early warning system in other to build community resilience. Budgetary allocation dedicated to effective pre-disaster should be implemented as against disaster relief that is common in the state. Lastly, introduction of disaster related management courses should be introduced in secondary school to catch the youth young on knowledge based preparedness.

Key Words: Risk, Flood Disaster, Disaster preparedness

1.0 INTRODUCTION:

Flood disaster is not a recent phenomenon in Nigeria and its destructive tendencies are sometimes enormous. According to the United Nations Environment Program (UNEP, 2006), flooding is one of the major environmental crises ravaging the universe within the century and the millennium. This is especially the case in most wetlands of the world. The reason is attributed to the general rise in sea level globally, due to the global warming as well as the saturated nature of the wetlands in Nigeria. Periodic floods occur on many rivers, forming a surrounding region known as flood plain. Within the cities, human activities such as rapid industrialization and urbanization, population growth, exploitation of natural resources and location of infrastructures (dams, piers and lands) exacerbates the occurrence of floods.

Extreme events like rain storm and flood has one way or the other affected the hydrologic balance of the community in Makurdi and the degree of it disaster is inversely related to the frequency of occurrence. In the past the villages surrounding the River Benue has encountered extreme flood event where their farm product, livestock and properties were loss. Shabu and Tyonum, (2013), studied the socio-economic implication of flooding in Benue state using ECLAC methodology. He observed that health, agriculture and business centers were hit by the flood. He further stated that the flood created enormous impact on the economic foundation of the state due to the cost of rehabilitation and reconstruction. The paper concluded that lack of early warning system contributed to the increased disaster socio economic impact in the state.

In the same-vein, Awopetu *et al*., (2013) reaffirmed also in his work "examination of the effect of flood on the socio-economic status of residents of Wadata and Gado -villa communities in the Makurdi metropolitan area of Benue State, Nigeria" and established that flood impacted negatively on the socio-economic well-being of residents in the two communities and as well use a digital elevation model to determine the level of vulnerability of the communities to the disaster.This study is aimed to assess the risk on some selected communities in Makurdi Local Government Area in Benue State to flood and the effects of flood on the people and their state bounded environment with the objectives to determine the factors that are responsible for flooding in the study areas; to map the flood prone areas and to assess the socio-economic impact of flood in Benue State.

2.0 METHODOLOGY

i. **GIS Mapping Techniques:** Minor ground truth was carried out through oral field observation. Areas identified as highly susceptible in Wurukum and Wadata were visited to verify if flooding actually occur and water-marks left on structures after flooding events were observed as proof. Areas where flooding events have been reported by recent media were also noted. The mapping depends on the use of computer-assisted interpretation of Quick Bird Satellite imagery. Field survey was carried out to compliment the imagery; GPS coordinates were captured in the field to enable the GIS techniques to develop the terrain model of the area.

Buffer width of 90m recommended by Vyas, (2012) was used to provide a buffer zone along the river channel. This was performed in order to obtain and document elements vulnerable to flood along the flood plain area. High Resolution Satellite imagery map was used for physical identification of communities. Captured coordinates were referenced on the imagery for boundary demarcation. Surfer 10 software was used to develop Digital Elevation Model of the study area. It makes it easy and direct to identify flood prone areas in the study area. ArcMap 10.1 was used to develop the flood prone area map of the study.

ii. **Questionnaire Administration**: Structured questionnaires were prepared and administered to the residents of the settlements around the River Benue for sampling socio-economic effects of flood in the study area.

iii. **Method of Data Analysis:** Socio economic characteristics of the respondents was analysed using descriptive method of statistics, raw data imputed into Statistical Package for Social Sciences data editor which produced frequency, the frequency data was then copied to Microsoft Excel 2010 version that reproduced the results in chats. The same procedure was used to determine the factors that are responsible for flooding in the study areas. To map the flood prone areas in the study area and to provide the flood risk map of the study area, the coordinate points of hazards features recorded on the field were transformed from latitude and longitude into universal transverse Mercator (UTM) in other to create a point map and was exported to the ArcGIS interface for composition.

Thereafter, the Quick bird (3.0 m resolution) image of Benue was also imported to ArcGIS environment. Shape files were later created on the ArcGIS interface for all the hazard features recorded. The shape files (polygons, lines and points) were used to represent features such as roads, rivers, buildings and other hazard features.

In order to determine the number of buildings vulnerable to flooding on the image, a buffer of 15meters, as standard development setback, was created along the rivers using the Arc toolbox window on the ArcGIS interface. Buildings within the buffer zones were considered as vulnerable to flooding and were digitized for map composition and subsequent enumeration

3.0 RESULT AND DISCUSSIONS

3.1 Major factor responsible for flooding in Benue State by ranking

Respondent's opinion confirmed that Torrential Rainfall is the major factor responsible for flooding in Markurdi. Aside this, many buildings are constructed on the flood plain in Makurdi in Benue State and this leads to flooding. It was also observed that many residential buildings lack drainage system, (See Table .1).

Table 1: Causes of flooding in Makurdi in Benue State according to ranking

Causes of Flooding	Wadata	Idye	Atsusa	Wurukumi	Nyiman	Gyado	Total	%	Ranking
Lack of Drainage System	21.1	23.9	15	13.3	23.3	25	121.6	20.3	3rd
Blocked Drains	15	13.9	19.4	18.3	21.7	16.1	104.4	17.4	4th
Building on the Flood Plain	25	38.3	25	22.2	17.2	31.7	159.4	26.6	2nd
Torrential Rainfall	38.9	23.9	40.6	46.2	37.8	27.2	214.6	35.8	1st
Total	100	100	100	100	100	100	600	100.0	

Sources: Authors work, 2016

3.2 Map of Flood prone areas of the study area

The digitized contour and the Digital Elevation Model of the study are shown in Figures 1 and Figure 2 respectively. The contour map for the study area (Wadata, Idye, Atsusa, Wurukum,

Akpehe, Logo1 and Logo 2, Ankpa Quarters extension, Nyiman and Gyado villa) ranges from 65 metres above sea level to 145 metres above sea level and a contour interval of 5 metres. The contour map (Figure 1) reveals that, the lowlands range from 65 to 95 metres above sea level while the high lands ranges from 125 to 145 metres above sea level. Digital Elevation Model created from the interpolation of the Contours and the flow accumulation analysis for the study area shows that, the lowlands are located along the river course of river Benue and these low lands can be termed as flood plains. The Digital Elevation Model and Flow accumulation analysis also reveal that the lands along the river course are on the natural drainage which makes them highly vulnerable. The slope characteristics and flow direction (Figure 3) from the DEM and flow accumulation was used to reclassify the study area into High Risk, Moderate risk, and Low risk. The elevations interpolated on the contour ranges from 65.0 to 141.7 metres above sea level (Figure 1).

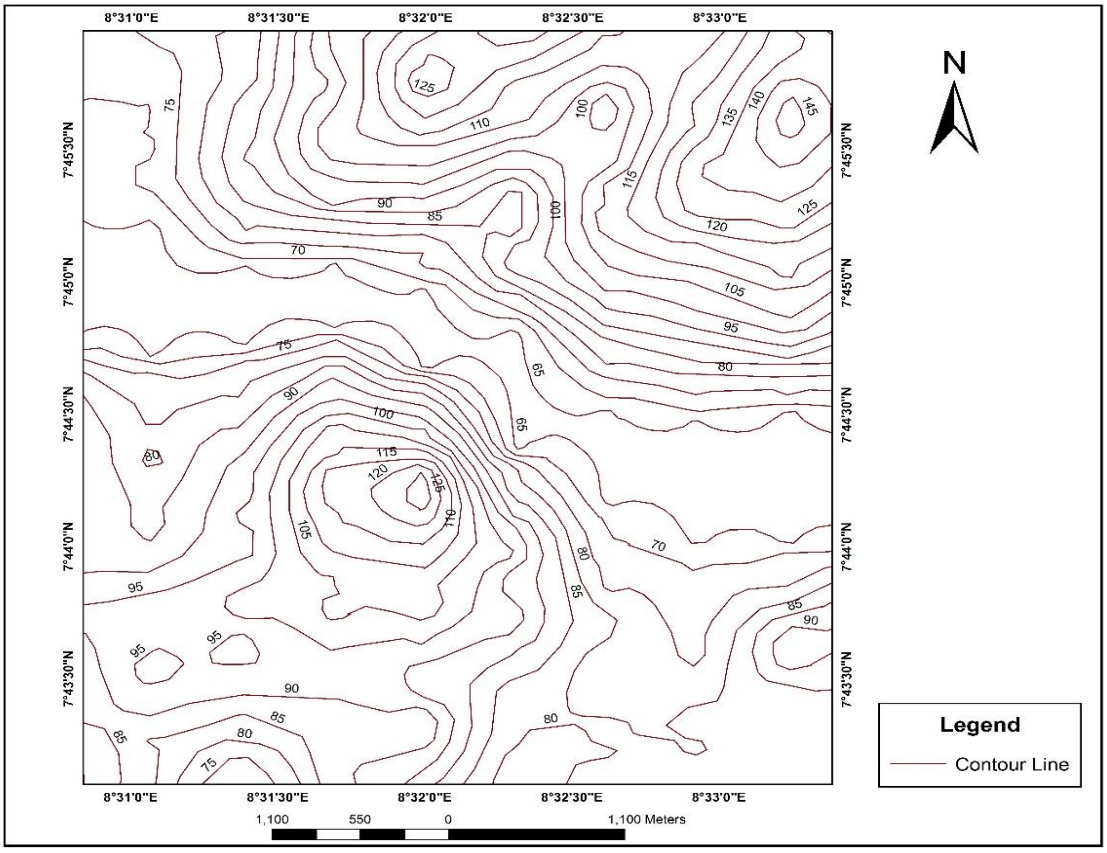

Figure 1: Contour Map of the study area
Source: Author's work, 2016

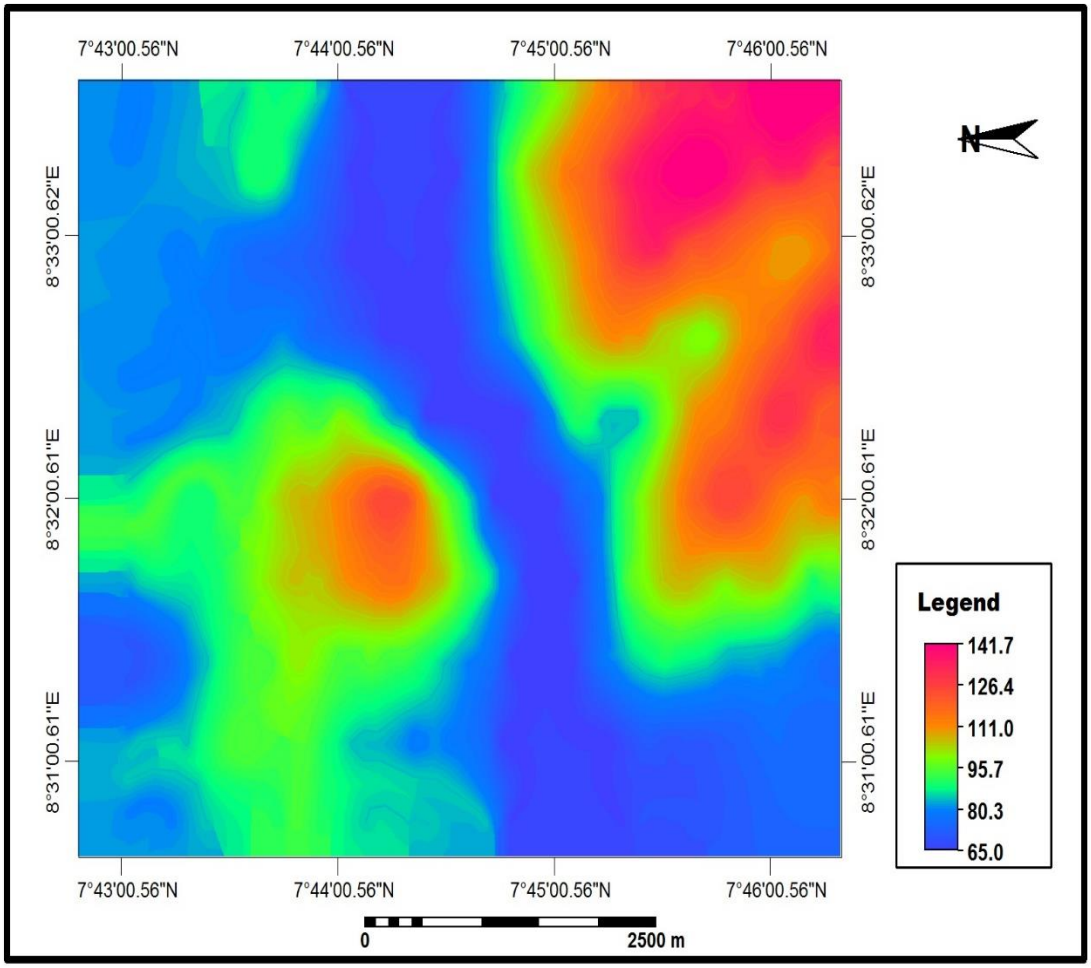

Figure 2: Digital Elevation Map of the study area
Source: Author's computation, 2016

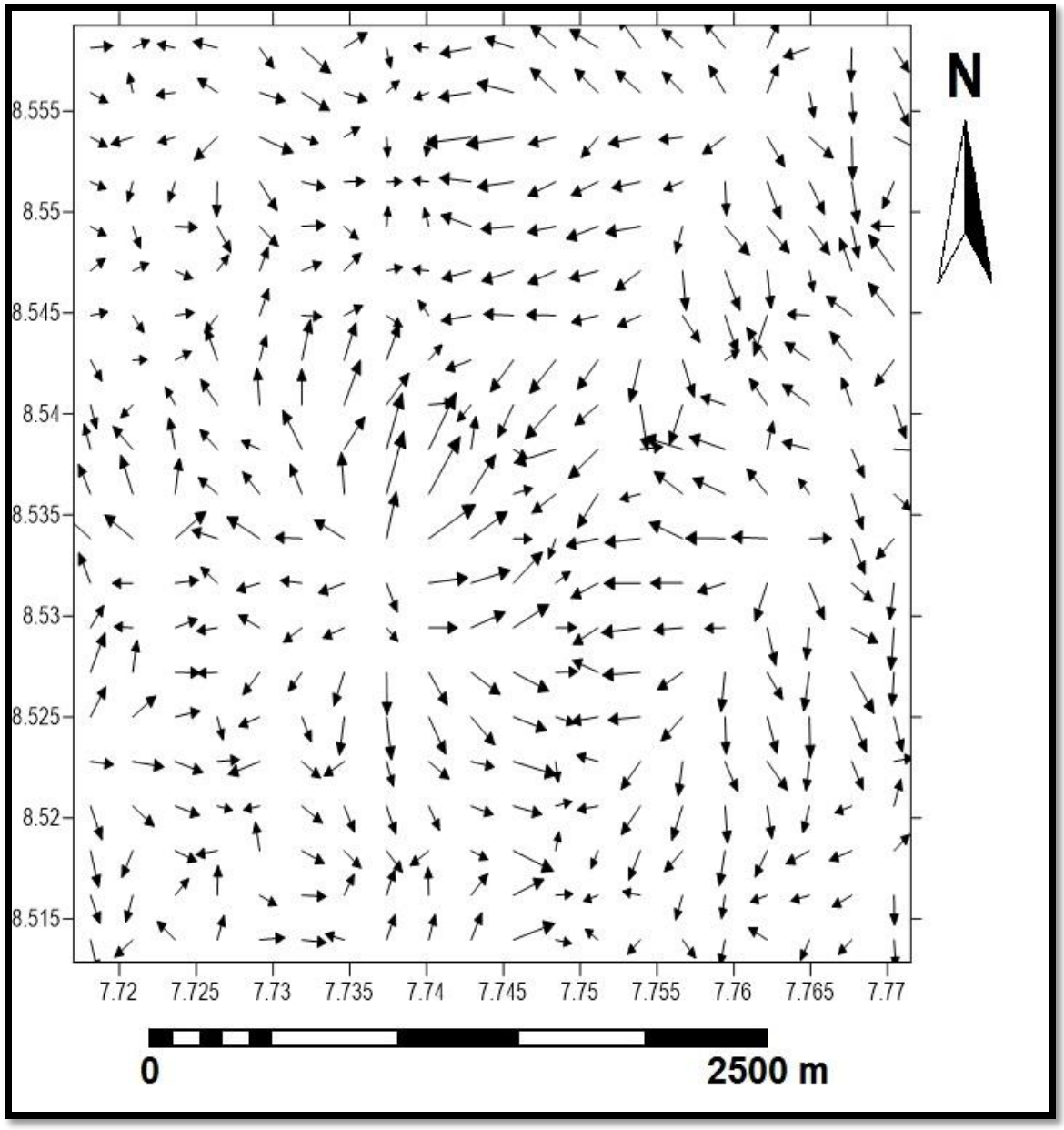

Figure 3: Map showing flow of direction of Flood in the study area
Source: Author's work, 2016

3.3 Flood Risk Map of the study area

Figure 4 shows the level of vulnerability to Flooding in the study area. The level of vulnerability were classified into three, that is High risk, Moderate Risk and Low risk. This was done in accordance with Vyas, 2012 of 90m Buffer width recommended. The analysis revealed that high risk area occupies a total of 18,547,314 square metres, Moderate risk has a land area of 6,513,663 square metres while the Low risk area occupies the least land area with a total of 2,508,034 square metres. The analysis further reveals that the high risk area occupies ample of space in the study area. This is an indication that the study area is at high risk. The 3D model of this analysis also depicts the vulnerable areas which are mostly low lands and the high lands that could be termed as safe haven, see Figure 5.

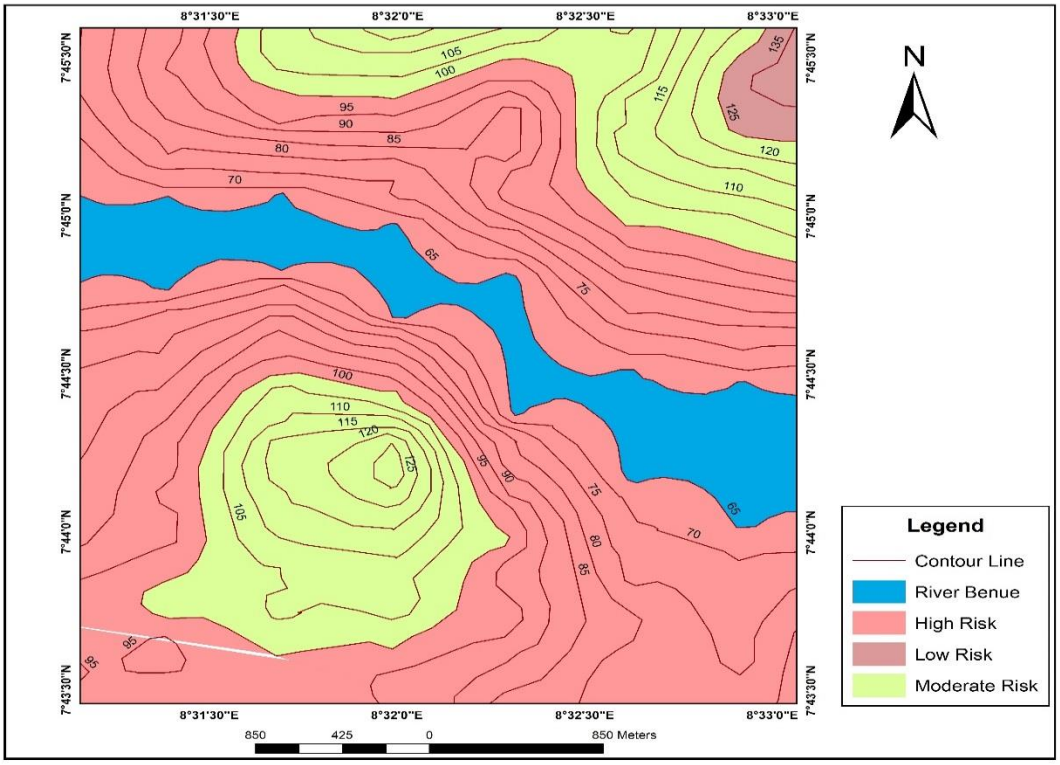

Figure 4. Flood Risk Map of the study area
Source: Author's work, 2016

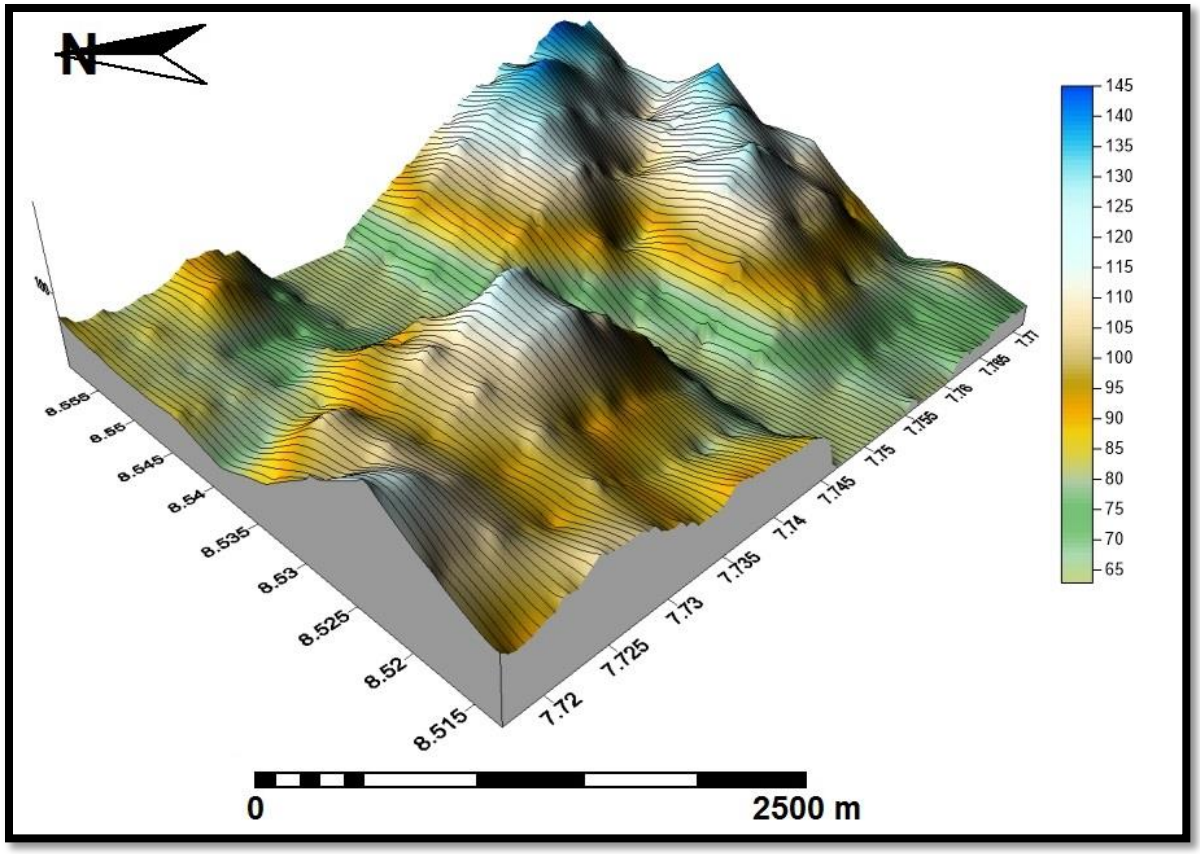

Figure 5: 3D of the Digital Elevation Map of the study area
Source: Author's work, 2016

3.4 Socio-economic impact of flood in Study area

3.4.1 Impact of Flood on Agriculture

Majority of the households sampled (83%) submitted that their farm lands were affected by floods. It was also observed that amongst the farms that were destroyed, Rice farm was in larger number (58%), followed by maize (22%) and Yam (20%).Also a reasonable number who were engaged in Fish farming had their farms destroyed by the flood. During the study, total area of land were not covered but it was evident that there was great flood impact on farmland.

The research further revealed that majority (83%) of the households within the study area over depended on farming and this makes them more vulnerable. It also revealed that majority (68%) of the households that experienced farm damages resides on flood prone areas, (Figure 6).

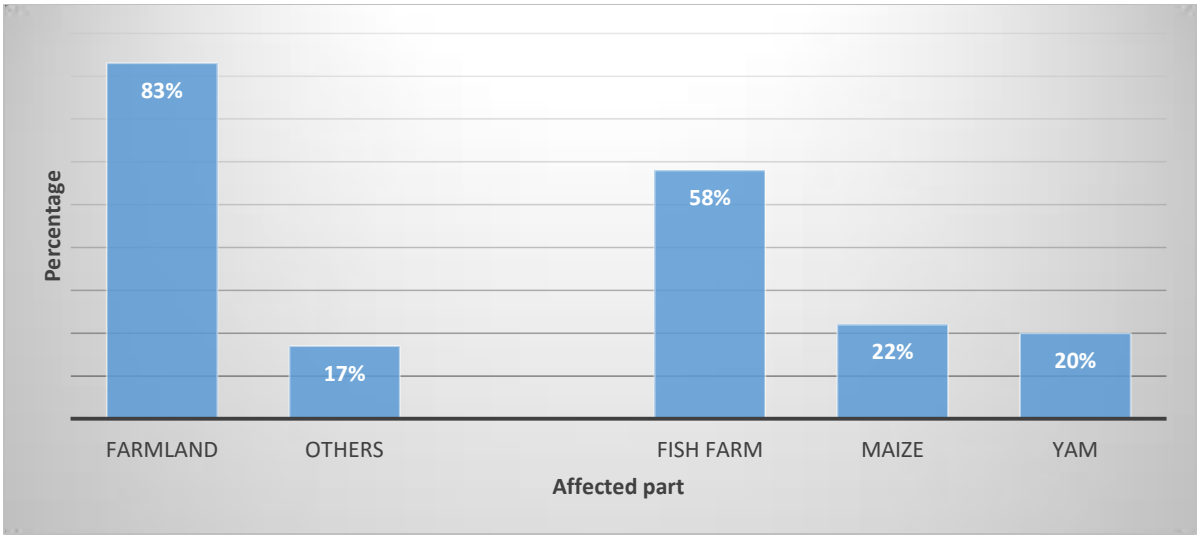

Figure 6: Part and products affected by the flood
Source: Author's computation, 2016

3.4.3 Impact of Flood on Health Facilities

The study shows that 47% of the total respondents across the study area confirmed that their toilet facilities were affected by flood. It was also revealed that majority of the respondents have their toilets detached from main building while some use nearby bush as toilet.

It was also revealed that 38% of the sampled households experienced problem in accessing health services due to road damage as a result of flooding.

3.4.5 Impact of Flood on Education

All the households sampled affirmed that education facilities are available in their communities.

In addition, 14% of the total household sampled submitted that their school buildings were damaged in one way or the other due to heavy flooding. Across the study area, 27% of the households sampled confirmed that children within the school age experienced education disruption as a result of damaged roads (19%) and destroyed school facilities (6%).

3.4.6 Impact of Flood on Water

Figure 7 reveals the types of water for consumption, available at the study areas. 37% of the respondents relied on unprotected well and 8% relied on river water for both consumption and other domestic uses.

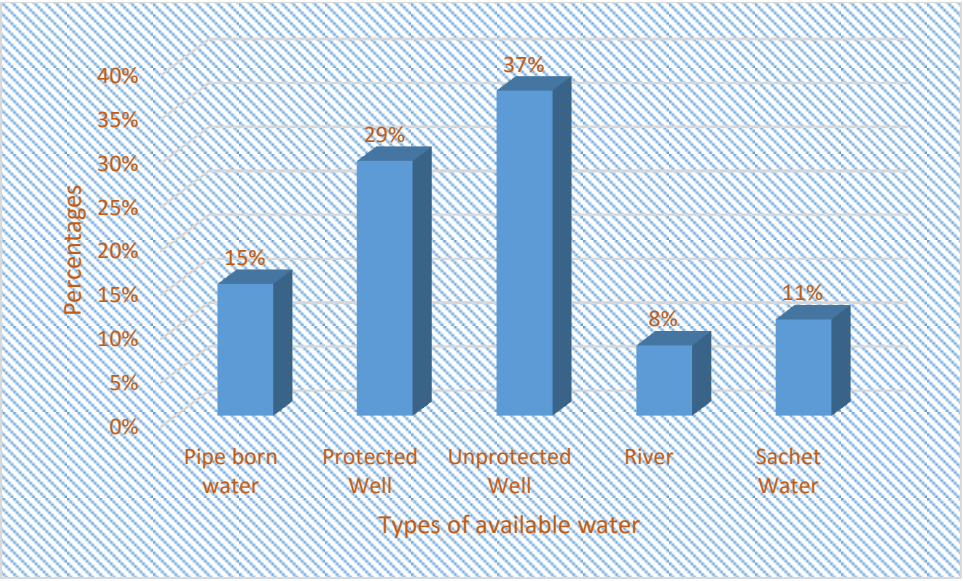

Figure 7: Types of available water within the study areas
Source: Author's computation, 2017

The research further established that 74% of the total number of the respondents relied on unprotected wells and river water for consumption and other domestic uses. The respondents in that category also claimed that their sources of water were polluted by flooding.

3.4.7 Impact of Flood on Housing

Out of the total sampled households within the study areas, 65% reported that their homes were affected in various degrees ranging from partial damage to total collapse. Within this figure, the total number of male headed households was 76% while the female headed households was 24%, (Figure 8).

Most of the households affected by flood moved to relatives' houses and temporary camps provided by government. Focus Group Discussion conducted also revealed that some of the households displaced sent their children to other villages where they had relatives. This arrangement have definitely caused break in social networks within communities.

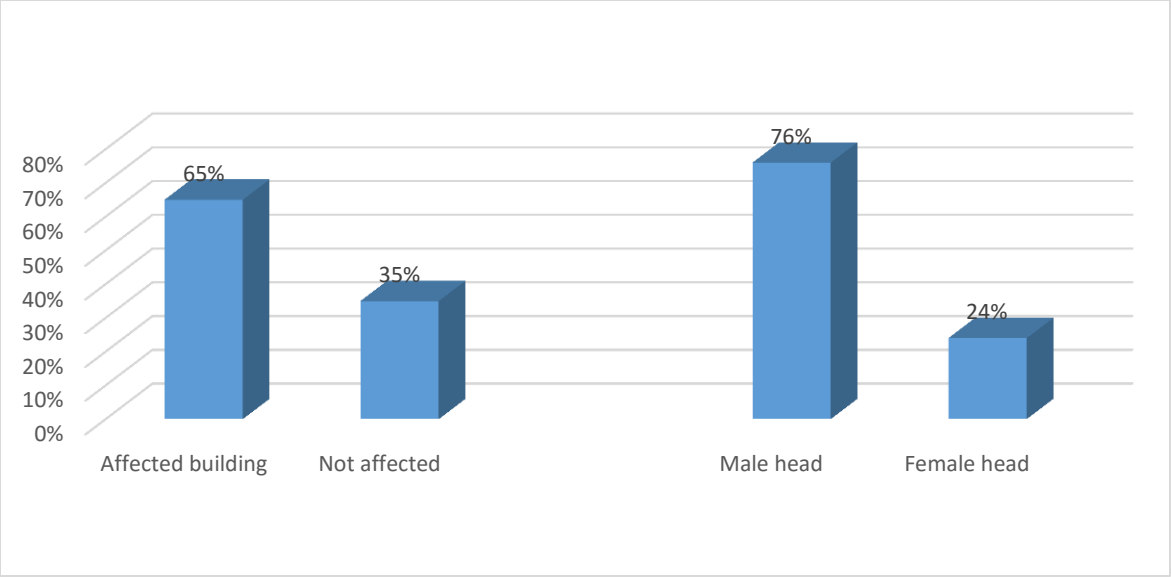

Figure 8: Flood Impact on Housing
Source: Author's computation, 2017

Plate I: Building on Flood Plane

4.0 Conclusion and Recommendations

The research shows that the flood have various degree of impact ons social economic activities of the people ranging from destruction of houses and farms product and as well contamination of domestic water uses that pose the communities under great health threat. The analysis revealed that high risk area occupies a total of 18,547,314 square metres, Moderate risk has a land area of 6,513,663 square metres while the Low risk area occupies the least land area with a total of

2,508,034 square metres. The analysis further reveals that the high risk area occupies ample of space in the study area.This is an indication that the study area is at high risk. The flood when it occurs, disrupts academic system of most of the communities as most of the schools are closed until water subsides and this prevents most of the children within school age from going to school for weeks or as long as the flood subsists.

The study recommended amongst others that; Benue State Emergency Management Agency should endeavor, with the community heads and members to initiate mitigation measures by introducing community based flood early warning system in other to build community resilience. Budgetary allocation dedicated to effective pre-disaster should be implemented as against disaster relief that is common in the state. Lastly, introduction of disaster related management courses should be introduced in secondary school to catch the youth young on knowledge based preparedness.

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