

**FLOOD HAZARD ANALYSIS AND DAMAGE ASSESSMENT
OF 2012 FLOOD IN ANAMBRA STATE USING GIS AND
REMOTE SENSING APPROACH**

BY

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1.0 Introduction

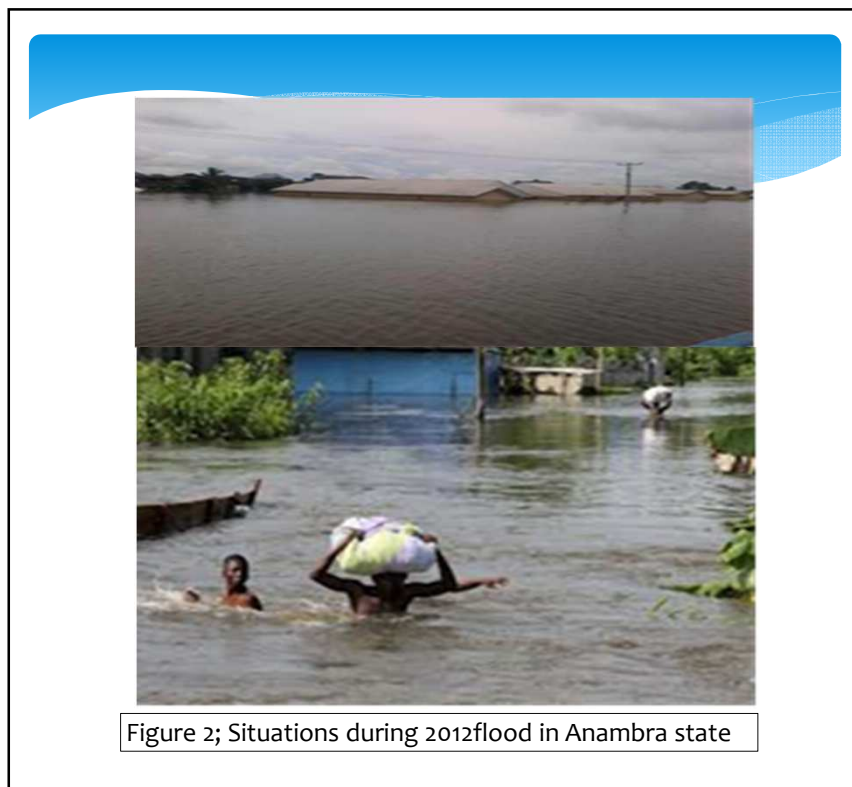
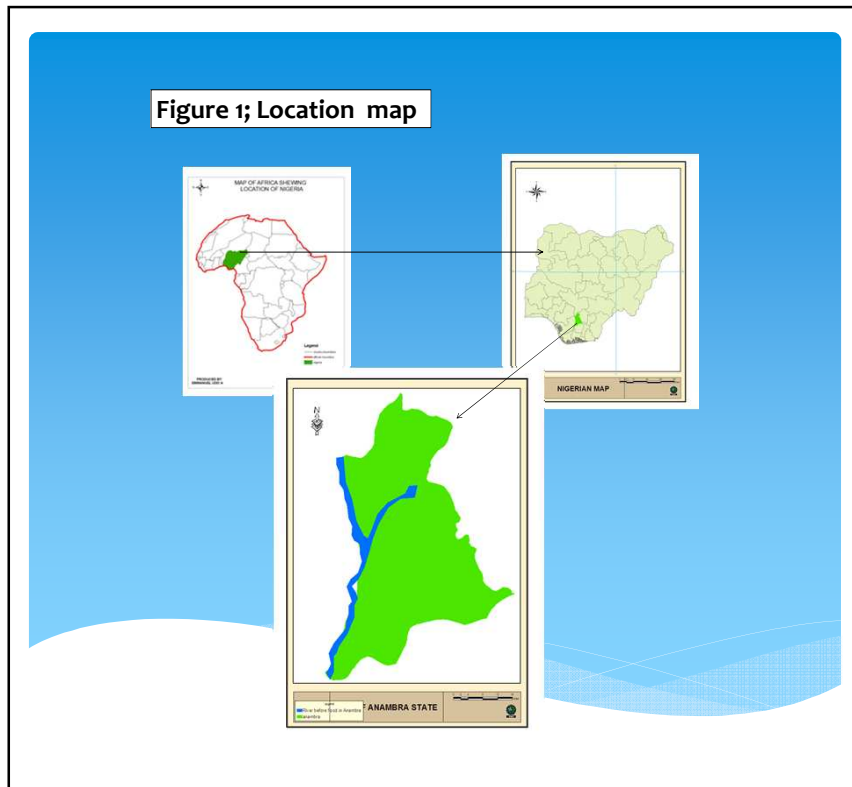
- The 2012 unprecedented flood disaster in Nigeria, has been described as the worst in over 40 years.
- Based on level damage Anambra state was among the states categorized in group “A” in the impact assessment rating.
- In Anambra state it was estimated that properties worth of twenty three billion naira was damaged.
- In order to lessen the negative consequences of floods, hazard areas must be identified and proper counter measures should be adopted.

1.2 Significance Of Study

- Whenever disasters with great magnitudes occur in a country, efforts are usually made to prevent future occurrences where possible, or at least minimize the impacts through various preventive programs and mechanisms
- In Anambra state, Lack of comprehensive flood hazard map was one of the major problem in combacting 2012 flood disaster
- Hazard maps can be the most valuable tools for avoiding social and economic loses from floods.
- There is the need for a comprehensive flood hazard mapping and analysis for emergency management and contingency planning within the state .

1.3 Study area

- Anambra State is a state in the south eastern part of Nigeria.
- It is located between latitudes $5^{\circ} 40'N$ and $6^{\circ} 50'N$, then longitudes $6^{\circ} 35'E$ and $7^{\circ} 25'E$.
- 2006 population census recorded the state to have a total population of 4,182,032 with male constituting 2,174,641 and female 2007391 fractions of the population.
- The state has a land mass of approximately 4855.Skm.



MATERIAL AND METHODS

Table 1; Data used

DATA	DATA SOURCE
SRTM	USGS's website
MODIS	NASA's website
Google Earth satellite image	Internet
Population data	National bureau of statistics
Topographical map	Federal surveys
GPS coordinate of flooded areas	Field work

3.2 DATA PROCESSING AND ANALYSIS

3.2.1 Extraction Of The Spatial Extent Of The Flooded Areas

- Image Enhancement
- Image Classification
- Change detection
- Geo-referencing
- Formation Of Shape Files
- Digitizing
- Data overlay
- Spatial erase
- Determination of flood extent at various location
- Groudtruthing

3.2.2 Terrain Modelling

- Mosaicking
- Data masking
- Generation of elevation model and overlay analysis with flood layer

3.2.3 Hazard Analysis

- Hazard classification based on elevation
- Hazard classification based proximity to river
- Hazard classification based on land use
- Hazard classification based on slope and flow accumulation

$$FHM = \sum \{ \text{Reclassified (Elevation, Distance to Drainage, land use, flow accumulation, and slope map)} \}$$

3.2.4 population vulnerability

Pop.Vuln. = Area of risk category * pop. density

HAZARD ZONE	AREA(Km) ²	POPULATION. DENSITY	POP VULNERABILITY	% POP VULN
VERY HIGH	2106.78	861.38	1814733	43.40
HIGH	955.39	861.38	822953	19.68
MODERATE	835.054	861.38	719298	17.20
LOW	555.48	861.38	478486	11.44
NO	402.334	861.38	346561	8.29

Table 2

4.0 RESULT

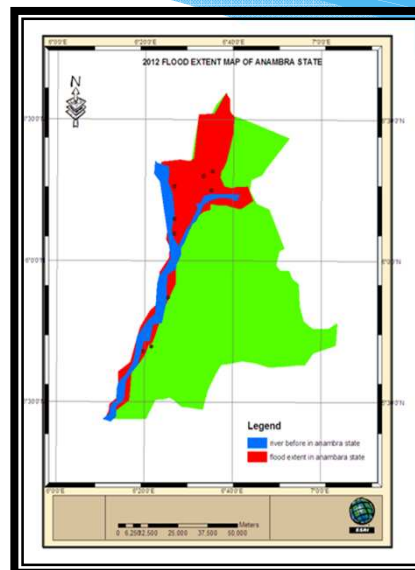
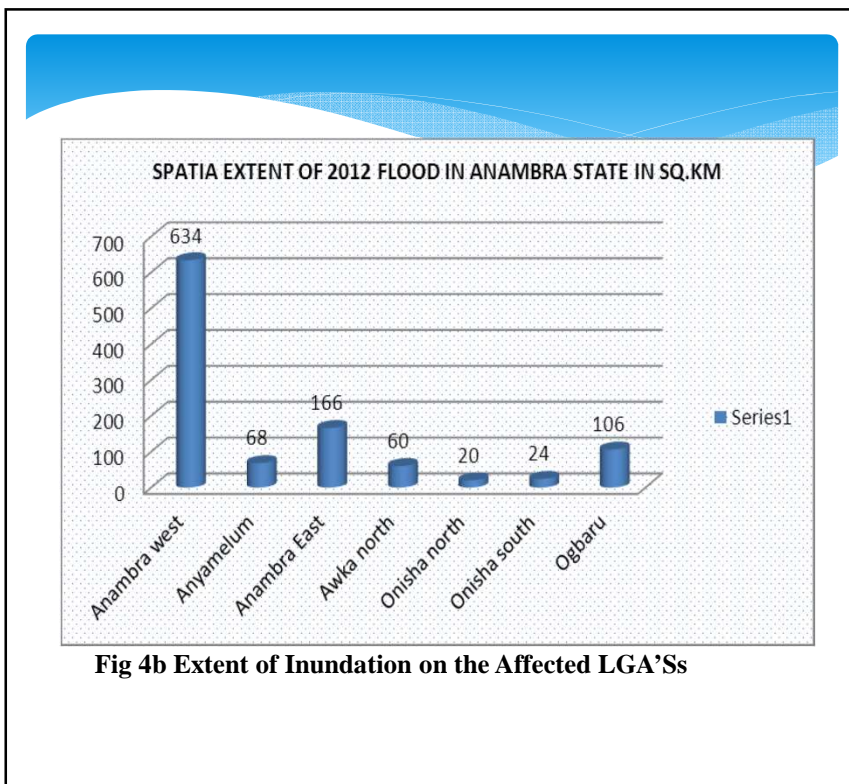
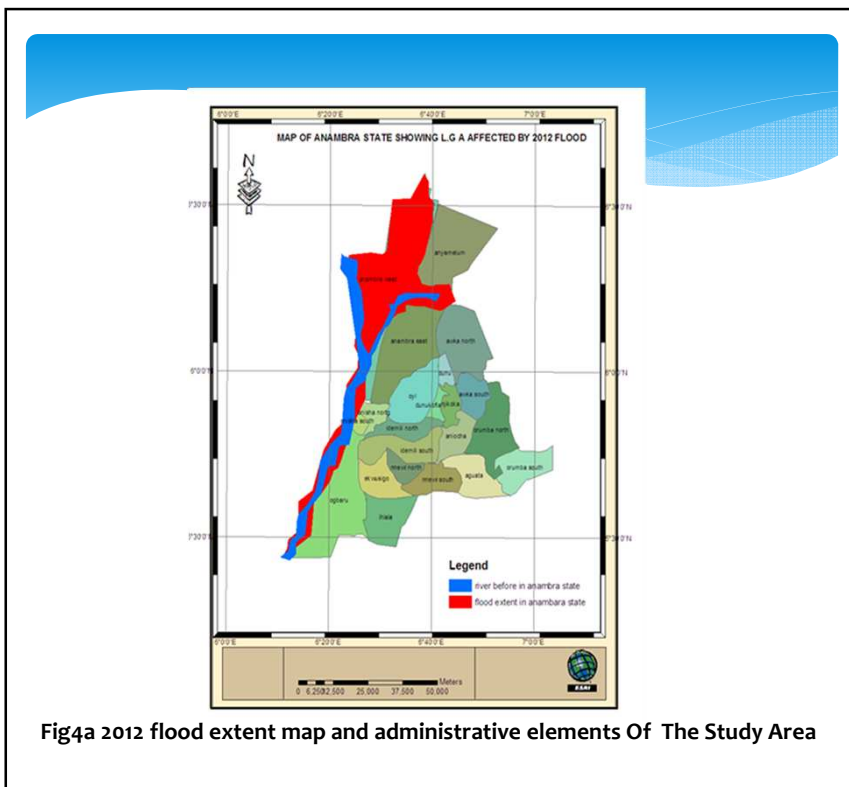
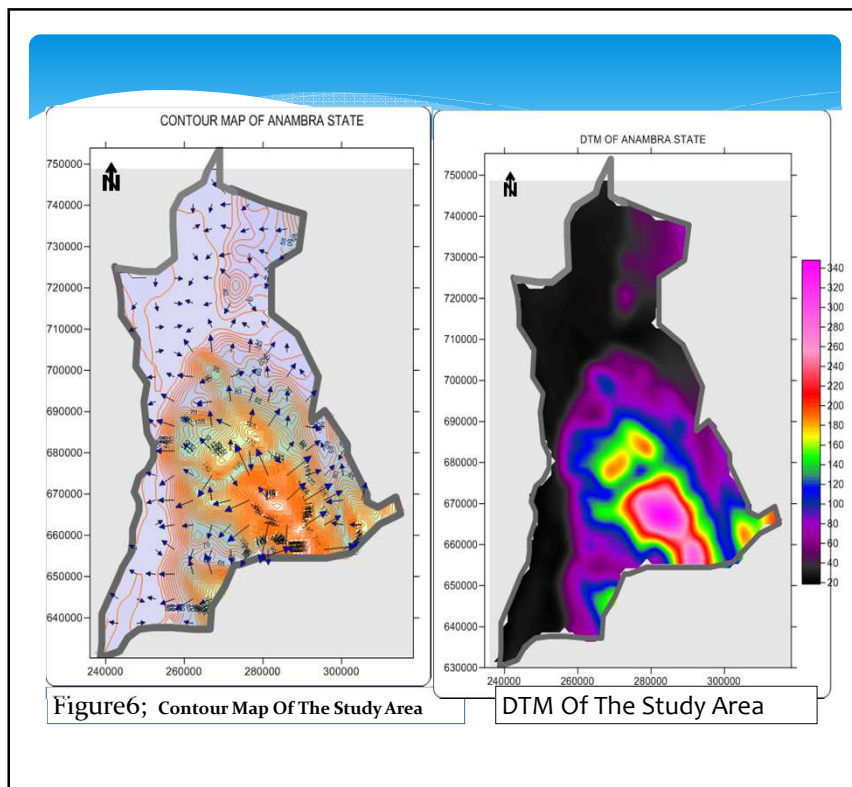
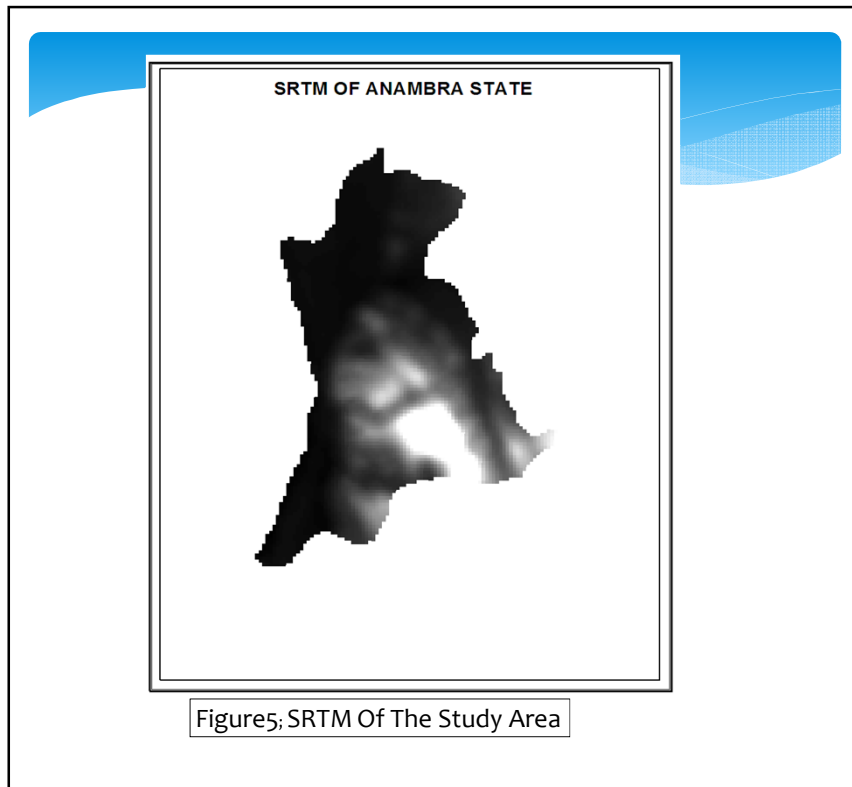
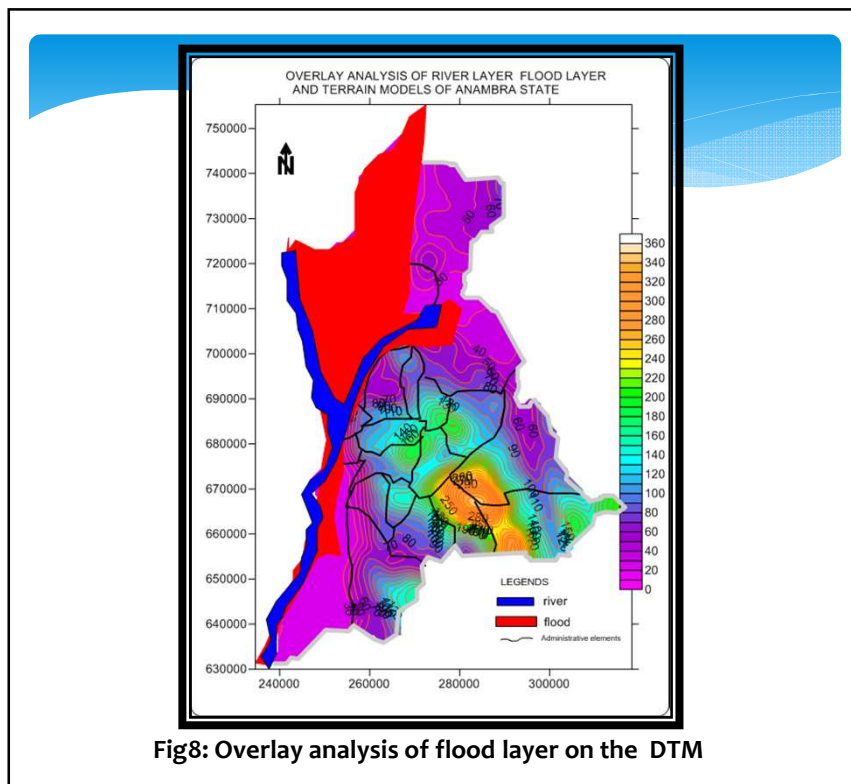
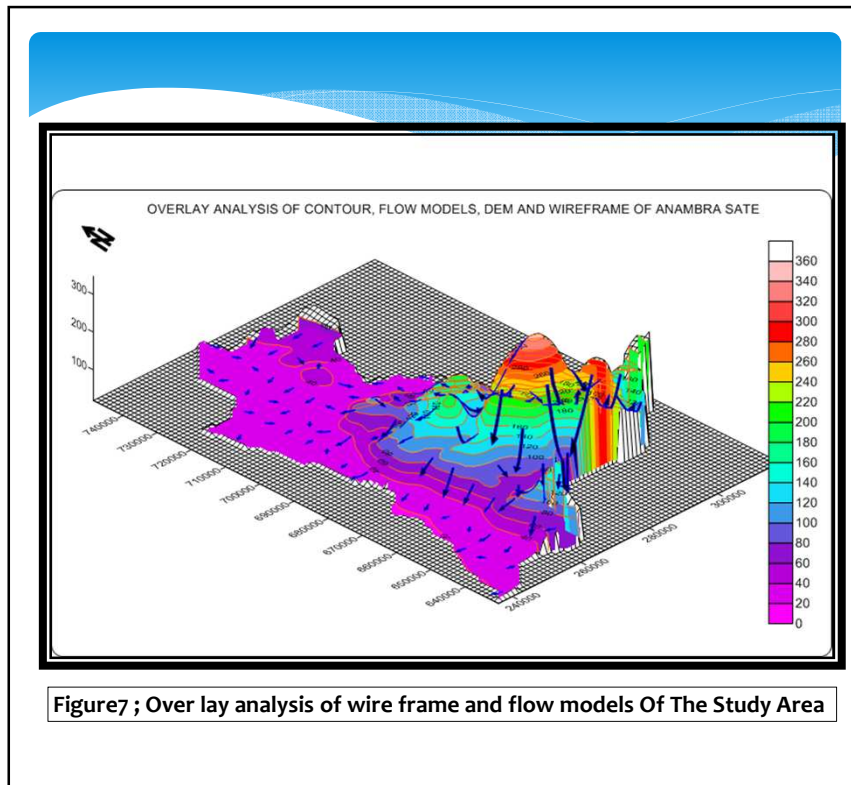
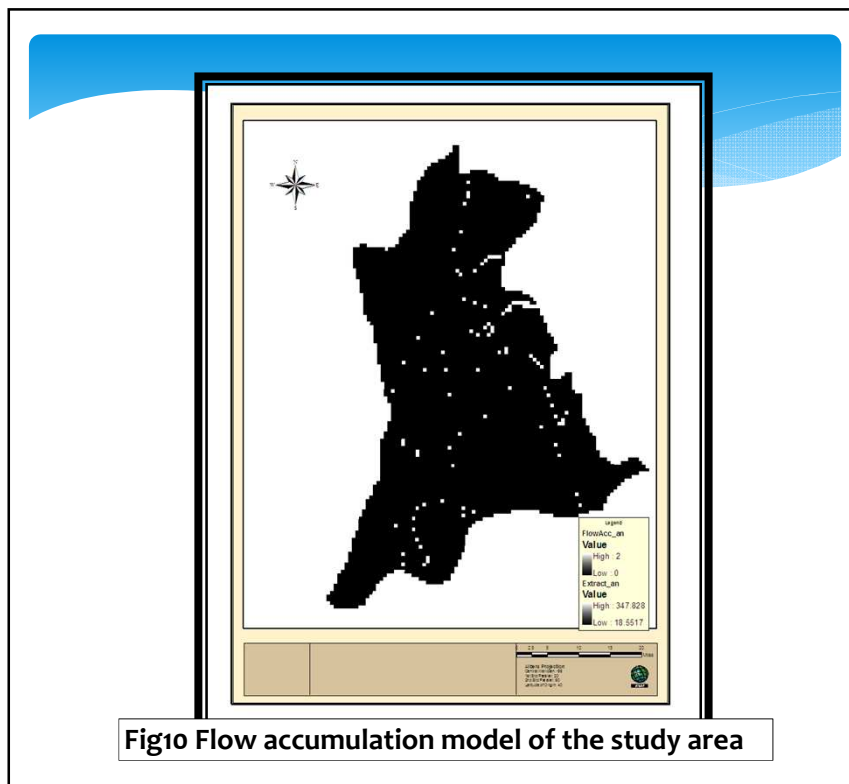
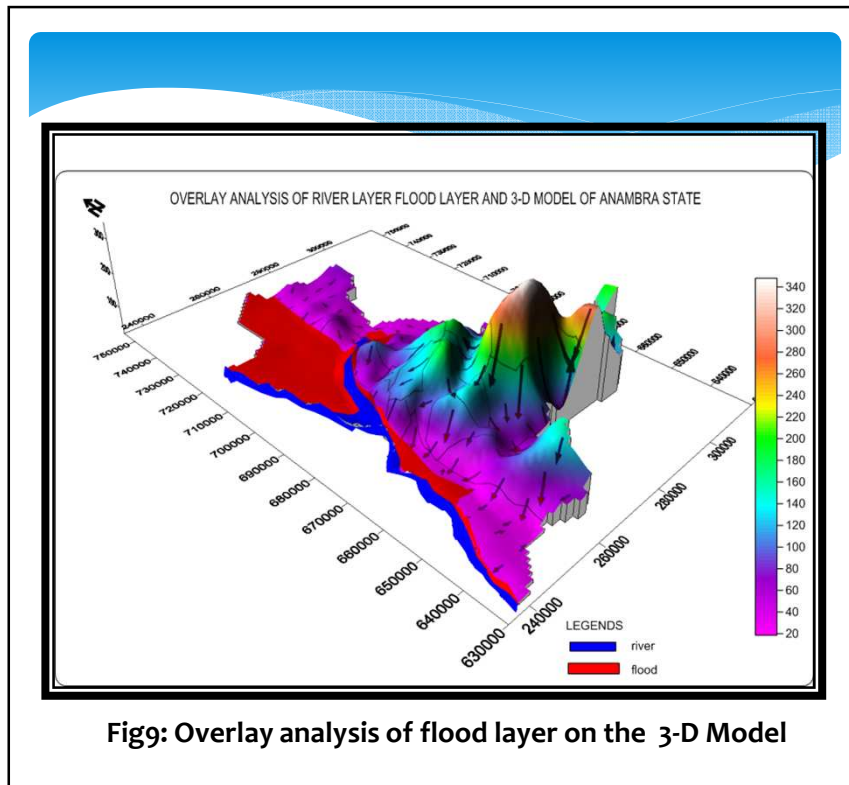


Fig 3: 2012 flood extent map Of The Study Area









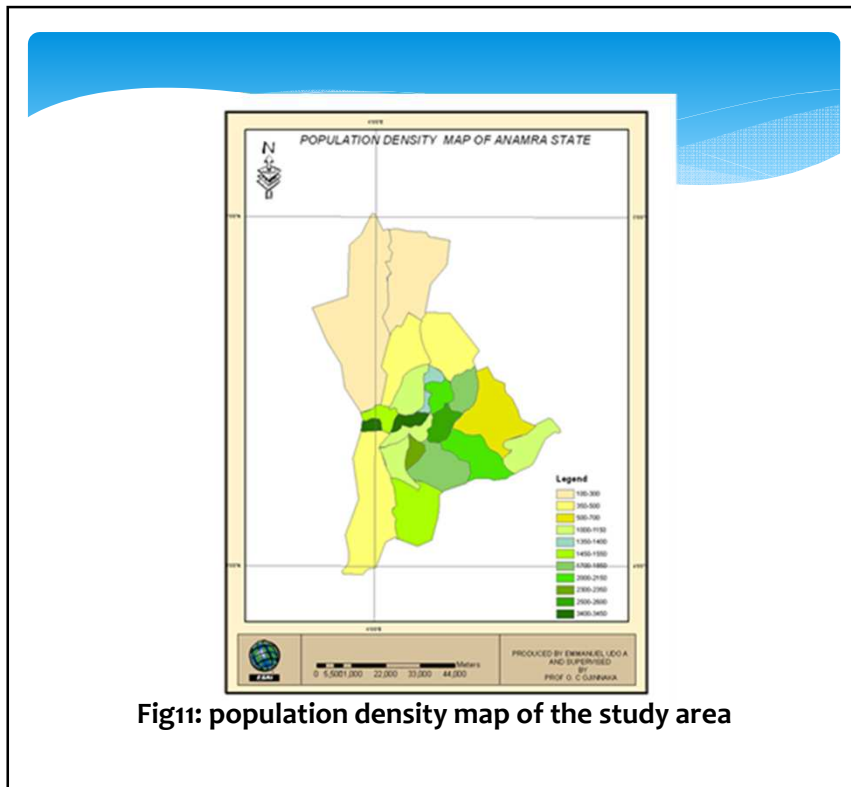


Fig11: population density map of the study area

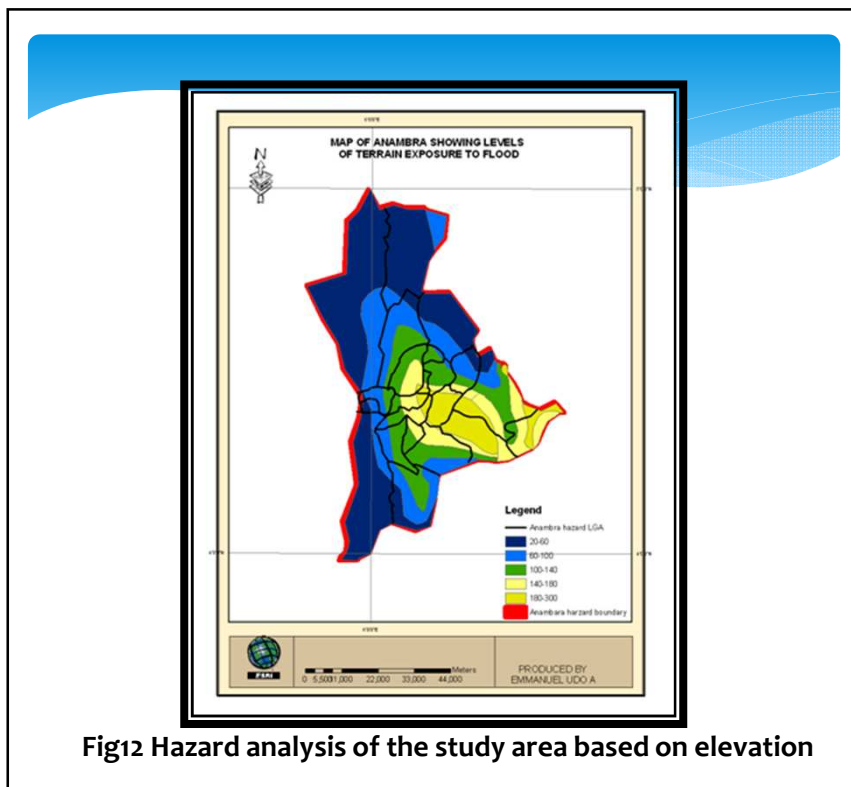


Fig12 Hazard analysis of the study area based on elevation

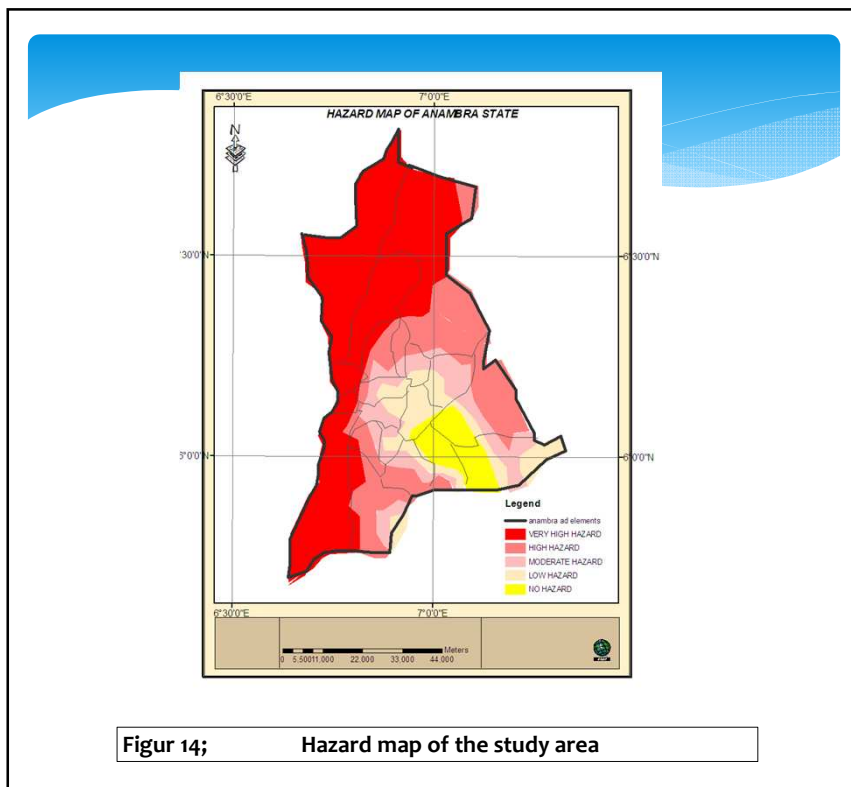
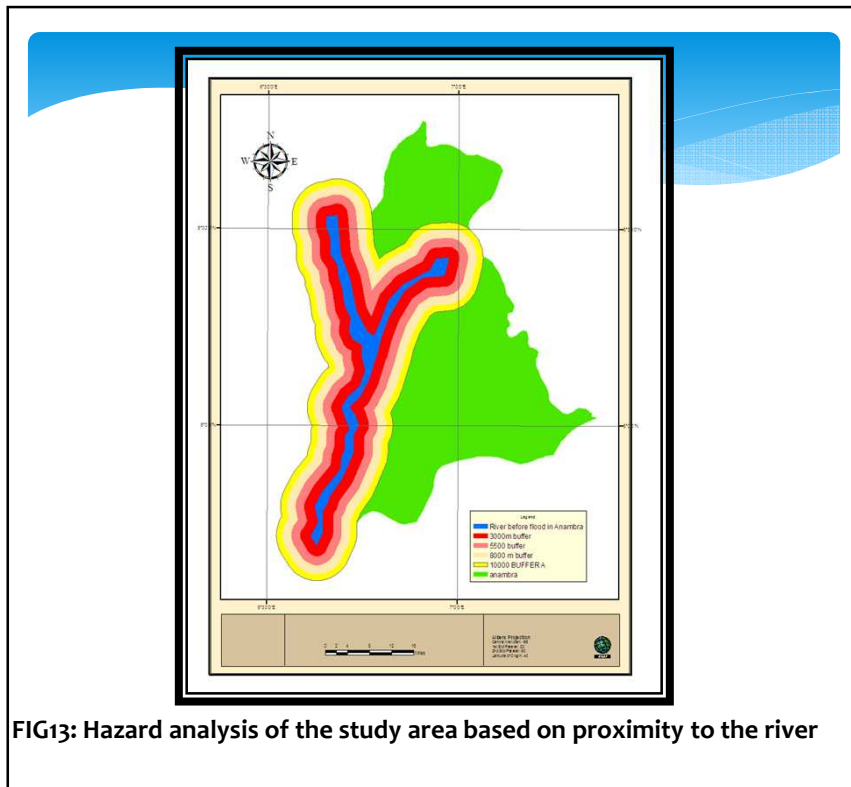
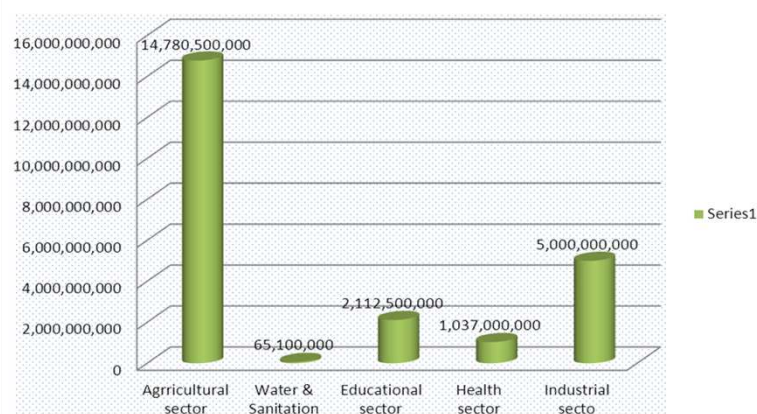
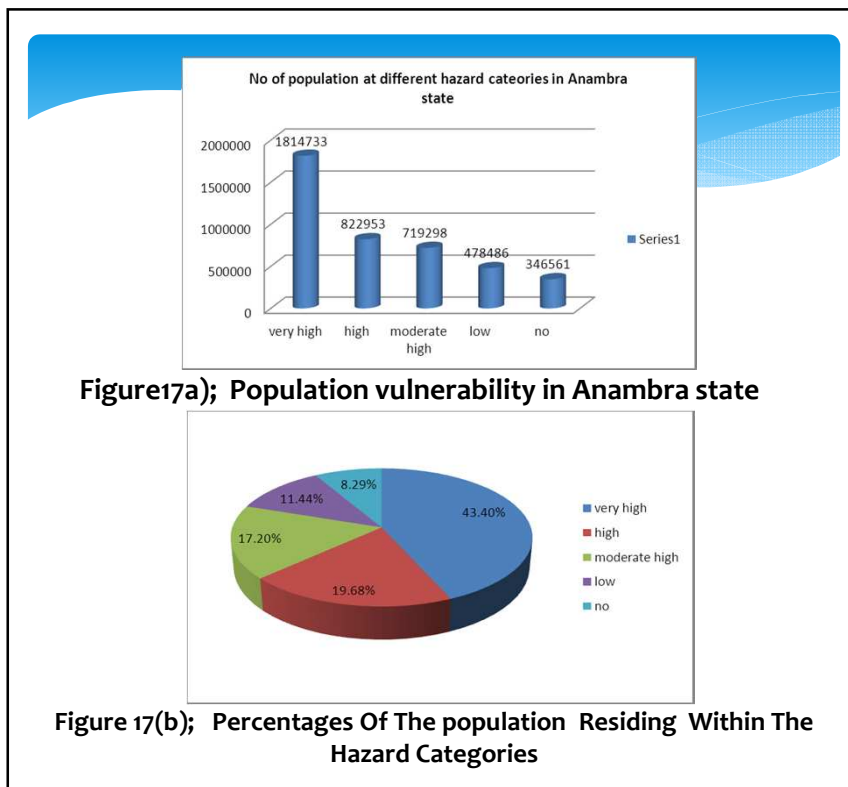
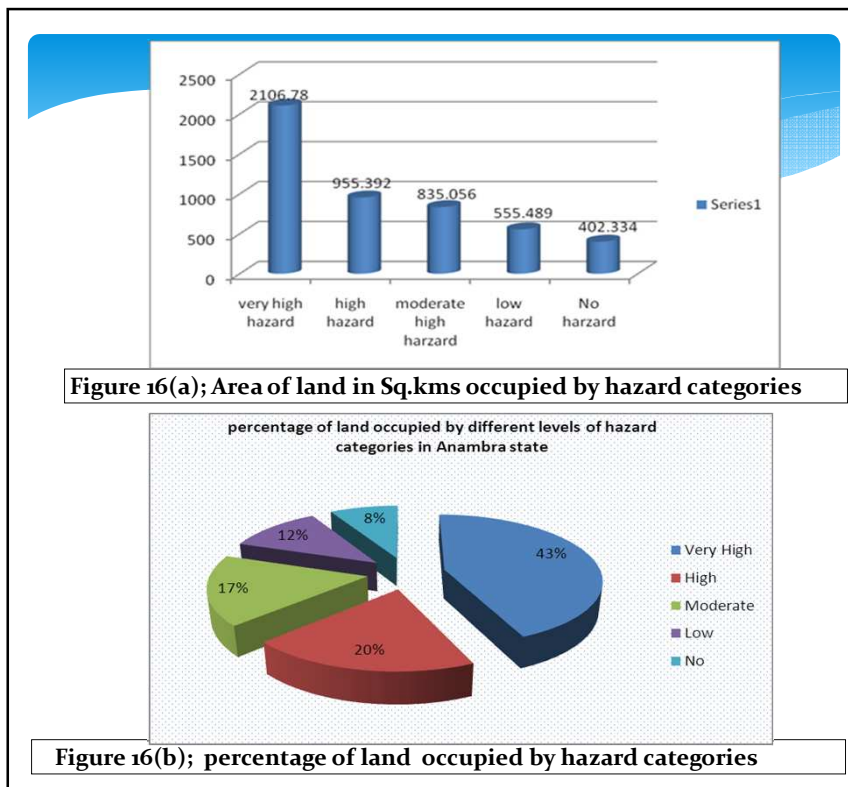


Table 3: Economic damages in the study area

SECTOR	FACILITY AFFECTED	MONETARY VALUE OF LOSS
Agricultural	117148 farmers and agro based business people affected)	N14,780,500,000
Water& sanitation	79 facilities submerge	N65,100,000
Education	325 School Affected	N2112 500,000
Health	122 facilities	N1,037000,000
Industrial	35 privately owned manufacturing industries	N5000,000,000

Source: ASFCC (2012)

SUMMARY OF MONETARY VALUE OF FACILITY DAMAGES IN ANAMBRA STATE BY 2012 FLOOD**Fig15: Economic damages in the study area**



4.0 SUMMARY OF RESULT

4.1.0 Spatial And Physical Impacts

- This study revealed that 57 communities in seven local governments were adversely affected.
- All areas inundated are within the elevation range of 10m to 90m above mean sea level
- All communities affected are located within very high hazard region.
- A total of 1078km² of land was flooded.
- 150,000 number of persons were affected while property worth of twenty three billion naira (₦23,000000000) was damaged.

4.1.2 Hazard and vulnerability analysis

➤ Hazard Analysis

Very high : 2106.78km²(43.40%), high: 955.39km²(19.68%), moderate: 835.054km²(17.20%), low: 555.48km² (11.44%), and no hazard 402.334km² (8.29%)

➤ Pop vulnerability

A total number of 1814733 (43.40%), 822953 (19.68%), 719298 (17.20%), 478486 (11.44%), and 346561 (8.29%) are residing at very high, high, moderately , low, and no hazard zones

Conclusion

- Flood hazard mapping is a vital component for appropriate land use planning in flood-prone areas.
- It creates easily-read, rapidly-accessible charts and maps that can facilitate administrators and planners to identify areas at risk and prioritize their mitigation and response efforts.

Recommendations

In response to the re-occurring flood events in Nigerian cities, there is the need for;

- Continual hazard Mapping of cities in Nigeria including Anambra State.
- There is the need for improved land Use Planning.
- flood monitoring and management should be encouraged and funded by government and non-governmental agencies



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