

## **Human Adjustments to Flood Hazards in Ndokwa East Local Government Area of Delta State.**

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### **Abstract**

*This research gives an overview of the human adjustment strategies to flooding in Ndokwa East Local Government Area. This study examined the causes, effects and human adjustment techniques with a view to address effective floodplain management that can reduce vulnerability to damages and create a balance among natural and human uses of floodplains and their related watersheds to meet both social and environmental goals. Meteorological data (rainfall 1971-2012) collected from Nigeria Metrological Station (NIMET), Asaba, and complemented with participatory observation methods such as direct field observation and interview schedule through the use of questionnaire survey. The result of the findings shows that flooding was a serious seasonal environmental problem caused by abnormally high rainfall in 2012 which was 5% - 60% higher than the previous year's monthly rainfalls. This led to overflow of the River Niger. Other anthropogenetic factors were also contributory to the extent of the flooding. The effects of the hazard range from loss of property, farmland pollution, health hazards, suspension of business activities, and displacement of the occupants. The study also revealed that the residents were ignorant of adjustments strategies resulting from overflow of a river. The result of the study implies that the problem is enormous and the occupants lack the technical capability to resolve it due to paucity of climatic data and the technical expertise.*

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### **I. Introduction.**

There have been several researches in various kinds of natural hazards which is not entirely new and has attracted the likes of Burton and Kates (1964), Burton, Kates and White (1968), Mitchell (1989) in explicating the trend as well as the characteristics of natural hazards. Studies of this kind originated from the United States in the 1930s through careful observation of urbanizing river catchment characteristics which has posed problem to flood management control techniques.

Flood hazards cause significant property damage, total degradation and loss of vast area of land, devaluing and despoiling of land, and traffic obstructions. It constitutes nuisance, health hazards, damage infrastructure and even loss of lives. This form of water is alien to Ndokwa East Local Government Area (refer to afterwards as Ndokwa East LGA for brevity) but its nature and impact has made it a source of concern to all and sundry.

Amongst the natural catastrophes that besets humanity today flooding in some way is the most distressing (Legal and Hatheway, 1998) more so that can adjust or adopt protective measures when other natural phenomena occur but that to see a great river burst its bank and flood waters creeping higher and higher with nothing to be done until peak is passed tries the endurance of the most calm among men.

P.A. Bariweni, et al (2012) have looked at the problems of flood, its perception, frequency as well as its adjustment in some of Nigerian towns. From their findings, it was evident that concentrated attentions were given to individual perception and adjustment to flood hazards which were a function of the type of land use pattern on flood plains together with its frequency and magnitude.

Leigh and Kwaisim (1983) undertook an analytic study of the attitudinal trend of flood hazard victims in Malaysia. Erickson (1970) did the same for New Zealand, while Oya (1970) undertook some analytical studies for Japan. It was evidently clear from their studies that individual perception and adjustment techniques vary in space.

### **Statement of Problem**

The cultural orientation in the study area of Ndokwa East LGA varies widely in space. People still live and work in flood prone areas in the study area which include parts of Ashaka town, Aboh, Onu-Aboh, Okpai, Benekuku, Inyi, Uchi, Ase, Umu-Ochi and Abala communities which houses both commercial, and mainly residential in terms of land use pattern.

Although previous adjustment studies have employed a higher degree of generalization and abstraction in explicating the attitudes of people in flood zones, it is explicit therefore to determine the dwellers' adjustment strategies to flood hazards in a majorly rural community like that of the Ndokwa East LGA. This study is a further contribution to flood studies, and it has the overall objective of accessing the adjustment strategies of people living in flood prone areas of Ndokwa East LGA.

The aim of this study is to examine the human adjustments to flood hazards perception and response in Ndokwa East LGA. This aim will be achieved through the following specific objectives:

- I. To identify the primary and remote cause(s) of the flood hazard;
- II. To examine the effects of the flood hazards in 2012 and to review the adjustment strategies employed by people of Ndokwa East LGA;
- III. To provide recommendations of policies and measures on the human adjustment strategies for consideration and adoption by the government

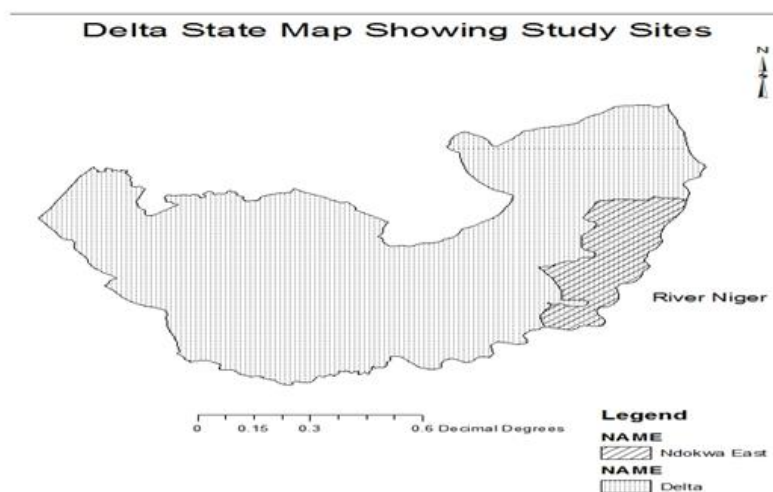
### **Research Questions**

The following research questions are set out to serve as a guide to this study. They are:

- I. What are the people's perceptions of flood hazards in the study area?
- II. What is the nature of behavioral responses of the occupants of the flood prone areas to the risk of flooding in the study area?

### **Study Area**

Delta state lies roughly between longitudes  $5^{\circ}00'$  and  $6^{\circ}45'$  E and latitudes  $5^{\circ}00'$  and  $6^{\circ}30'$  N. The total land area of the State is  $16,842\text{km}^2$ . The study area is bounded by River Niger that shares boundary with Anambra and Rivers States respectively which accounts for why it was flooded in 2012 by the overflow of the River Niger.



The study area has a mean annual rainfall of about 2,093mm and annual mean temperature of about  $28.04^{\circ}\text{C}$ . Relative Humidity ranges between 75% – 88% during the wet season to about 70% – 79% in the dry season. The study area is located in the freshwater swamp close to the River Niger, where annual flooding and deposition occurs up to 45 km from the river's course.

Ndokwa East LGA is on the area where River Niger drains and discharges into the sea which makes it liable to flood hazards especially when the river overflow its bank as in the case of the 2012 flood event.

## **III. Literature Review / Conceptual Framework**

### **Global Climate Change and Recent Climatic Extremes in Nigeria**

The solar energy from the sun is refracted by dusts and particles in the atmosphere, some absorbed into the earth crust and part is reflected from the surface of the earth. These has impacts on the temperature of the earth surface. Change in temperature causes a change in the weather and climate which is manifested in abnormal high rainfall, flooding, melting of the glacier in the North and South poles and rise in ocean level. The earth's temperature has risen by a little less than  $1^{\circ}\text{C}$  which has altered the earth's climate for visible increase in storms, floods and raging forest fires in the last decade (FAO, 2006). When we observe global weather, extreme in

precipitation, flooding, droughts storms and note its development, we can rightly say that these extremes have quadrupled over the last 50 years (Peter Werner, 1962)

Meteorological data has revealed that an increase of 1<sup>0</sup>C makes the earth warmer now than it has been for at least 1000 years of which the 20 warmest years on record, 19 years have occurred in the last 8 years (Naqui and Sejian 2011). The rise in temperature is likely to cause a change in precipitation and patterns of rainfall (Abiodun, 2012).

Nigeria has in recent times been experiencing extreme climatic conditions characterized by multi-year anomalous weather conditions. These have resulted in flooding in many parts of the country. Studies on rainfall variability in Nigeria have shown strong latitudinal variation and altitudinal control (Ojo et al 2004). Studies have revealed that the mean value of the annual distribution of rainfall in Nigeria decreases from the coast to the hinterland.

He categorized the intensities of rainfall of climate extremes in Nigeria. The mean annual rainfall anomaly of rainfall/coastal zone was standardized (1961-2011). Extreme climatic events of rainfall anomaly which range from normal to wetter than normal and maximum temperature departure (warmer than normal condition) in the Niger Delta from 2007-2011 (Olokoye et al, 2012)

During this period most places in Nigeria experienced wetter than normal conditions with pockets of regions with drier than normal rainfall (NMET, 2011). From 2011-2012 many parts of Nigeria experienced a series of weather related hazards like incessant flooding resulting from heavy and sustained rainfalls and thunderstorms.

The implication of the 5-year analyses of the extreme climate events (2007-2011) implies that there have been steady and consistent departures from the long terms conditions and trends in maximum temperatures, rainfall amount and distribution in time and space.

### **Effects and Response to Flooding**

Over 363 lives were lost during the flood disaster that ravaged many parts of the country in 2012. Statistics on the flood situation made available by the National Emergency Management Agency (NEMA 2012) reveal that more than seven million people were displaced by the flooding between July 1 and October 31, and a total of 7,750,398 million persons were affected by the flood. Out of this number, 2,157,419 Internally Displaced Persons (IDPs) were registered in the affected states.

The states affected by flooding in 2012 in Nigeria are Abia, Anambra, Bayelsa, Benue, Borno, Delta, Ebonyi, Edo, Jigawa, and Rivers States.

No fewer than 70 coastal communities, spreading across seven local government areas of Delta State, have been submerged by flood as the River Niger overflowed its banks.

The people had resorted to self-help initially, but their efforts were soon overwhelmed as the river continued to surge into upland. Victims, who were lucky to have relocated earlier, abandoned their property at the mercy of flood.

Communities worst hit include Aballa-Oshimili, Utchi, Okwumedo, Umuochi, Owelle, Obalu, Obeche, Okpai, Abalagada, Aboh, Abuato, Ugbene, Agwe-Iyom, Ise-Onokpo, Onuobiuku, Umu-Ugbome, Umu-Uti, Afiankwo, Umuolu, Adiai, Utuoku, Oworubia, Wari-Irri, and Onyah.

Other communities affected are Aballa-Obodo, Aballa-Uno, Inyi, Umu-Inyagbo, Obeche, Umu-Agwuyam, Isiolu, Umuoga, Ezinyi, Utuke, Ude, Ogigogwe, Ezeagba, Umu-Eche, Ogwasi, Umigwo, Umuazu, Ozala and Onuaboh.

The flood also ravaged Akarai, Azagba, Ekpe, Ibedeni, Osafu, Ase, Asaba-Ase, Onogbokor, Iyede-Ame, Anyama, Oko-Odifulu, Oko-Ogbele, Oko-Anala, Oko-Amakom, Omeligboma Camp, Elenchere Camp, Ogbe-Ofu, Abuta an Akwuebulu, Anwai, Illah, Okwagbe, Uzere, Aviara, Abari, Burutu, Bomadi and Abala-Uno.

The affected communities are spread across the seven local government areas of Oshimili South, Oshimili North and Ndokwa East in Delta North, Ughelli South in Delta central as well as Isoko South, Bomadi and Burutu in Delta South. *Saturday Sun: Voice of the Nation 29/09/12 Vol. 9 No.509*

### **Adjustments to Flooding**

The individuals of a community may adjust to flood hazard differently, because they do not have the same information about the probability of flood hazard events in their region, about flood mitigation measures and their effectiveness. Perhaps also, they may have different background regarding the experience of living in a floodplain and of being flooded (Messner and Meyer, 2004).

The inhabitants in the flood ravaged Ndokwa East LGA has either at one time or the other adopted some adjustment strategies or not. This is one of the things this study is intended to investigate.

#### IV. Materials and Methods

Meteorological data was collected Nigeria Metrological Station (NIMET), Asaba. The climatic parameter relevant to this study was mean monthly rainfall (1971-2012) of the study site. Also, participatory observation methods such as direct field observation and interview schedule through the use of structured questionnaire survey. The questionnaire had four major sections: the respondents' characteristics (section A); the nature of problems and causes of flooding in Ndokwa East LGA (section B); the effects of flooding on nature and socio-economic activities in Ndokwa LGA (section C); and the possible adjustment techniques by the respondents in Ndokwa East LGA (section D). The survey was administered in Abala, Aboh, Ase, Ashaka town, Benekuku, Inyi, Okpai, Onu-Aboh, Uchi and Umu-Ochi communities in April, 2013. A total of 240 completed questionnaires were administered in the 10 aforementioned communities. Percentages were used for comparisons of the rainfall in 2012 as against 1971-2011. Literatures related to the study were searched with emphases to climate change, environmental degradation and human adjustment to flooding events using electronic and non-electronic databases.

#### V. Discussion of Results and Findings

##### Causes of Flooding

The general rise in sea level globally, due to global warming as well as the saturated nature of the wetlands in the Niger Delta is the major cause of flooding. Rivers overflow for reasons like excess rainfall. (Abowei and Sikoki, 2005).

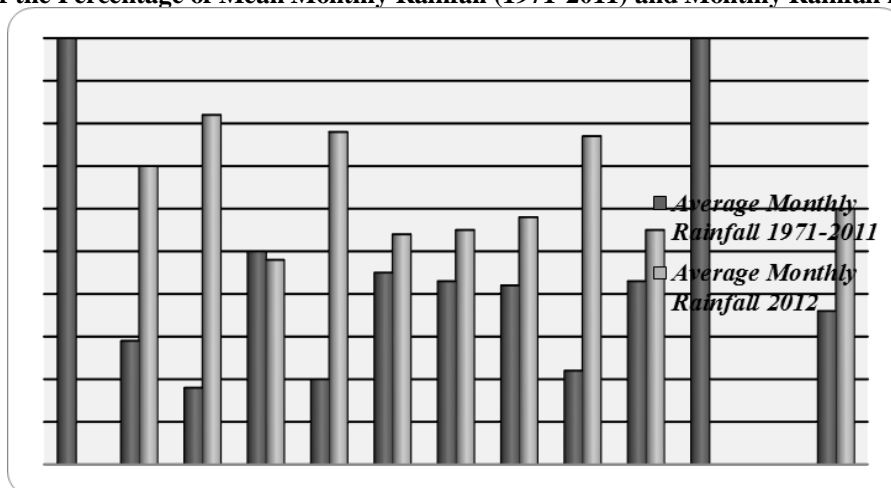
The two primary causes are climate change, resulting in increased severity and intensity of rainfall and new developments on floodplains and which increase the risk of flooding downstream.

Floods are caused by many factors like heavy rainfall, unusual high tide, tsunamis, or failure of dams, levees, retention ponds, or other structures that retained the water. Flooding can be exacerbated by increased amounts of impervious surfaces or by other natural hazards such as wildfires, which reduce the supply of vegetation that can absorb rainfall (Welch *et al.*, 1977).

In Ndokwa East LGA the causes of flooding were those resulting from natural causes and or human induced through the various interferences with the natural environment in a bid to restore and enhance the environmental quality to suit its environmental needs. The respondents believed that the overflow of the River Niger, dumping of refuse on drainage path and the deity of the land must have been desecrated which has angered the gods. Field observation revealed that the river actually overflowed its banks breaking levees. It was also observed that there was indiscriminate dumping of refuse. Other causes of the flooding in Ndokwa East LGA as perceived by the respondents include building across water channels, the nature of the topography and abnormally high rainfall. Field observation shows that there some structures built across water channels and houses, roads, houses and farmlands were also built on the flood plain. Field observation also shows that the topography is such that it slopes in the direction of the river and that many residents have settled on the river valley either in terms of residence or farmland.

This implies that all the factors perceived by the respondents to have been the cause of flooding in the study area have been constant with the exception of rainfall. The researchers took an average of three years (1971-2011) mean monthly rainfall as against that of 2012; the essence was to determine the rate at which the rainfall frequency has over the last 41 years.

##### Comparism of the Percentage of Mean Monthly Rainfall (1971-2011) and Monthly Rainfall for 2012



Source: Nimet and authors' computation

The findings revealed that rainfall for 2012 was more and far higher than the average of 1971-2011 as shown in the chart above. The range is between 9%-60% higher from the month of February to October. It only higher than that of 2012 in December and January (100%) where the rainfall amount is negligible. Climate Change is an attributed cause of flooding because when the climate is warmer it results to:

- Heavy rains
- Relative sea level will continue to rise around most shoreline
- Extreme sea levels will be experienced more frequently

Climate change is therefore likely to increase flood risk significantly and progressively over time. At particularly increased risk will be low-lying coastal areas, as sea levels rise and areas not currently prone to fluvial or tidal flooding as more intense rainfall leads to significantly higher risk of flooding from surface runoff and overwhelmed drainage systems.

### **The Effects of Flooding on Man, Nature and Socio-Economic Activities**

During flooding water supplies that result in contamination of water (water pollution) is obviously increased. Clean drinking water becomes scarce. Unhygienic conditions and spread of water-borne diseases result. People, buildings, infrastructure, agriculture, open recreational space and the natural world. In extreme cases flooding may cause a loss of life. Torrential rains pushed rivers over their banks, collapsed mud houses and washed away livestock (Adelye and Rustum, 2011). Damage bridges and caused a dam to overflow, submerging buildings, displacement from homes, the loss of personal valuables and the ongoing fear and insecurity caused by the experience. Potable water supplies may be lost or contaminated in a flood and this can have immediate health effects upon people and animals. (see plate 1 below)



Plate 1 showing the impact of flooding in the study area

The built environment may be damaged or destroyed as a result of flooding with high repair costs and long periods required for reinstatement. The public realm is often badly affected through damage and the deposit of potentially large quantities of debris. Land contamination may also be transported and spread during flooding.

In Ndokwa East LGA field observation reveals that the effects of flooding in 2012 can better be imagined. Eye witness account affirmed the fact that this was one of a kind for over 50 years. Everything was submerged under water, everything lost to flood. Another account told us that mere description of the flood event will not be sufficient to give a true picture of what actually happened and the best thing would have been seeing it for ourselves.

The respondents perceived that flooding destroyed tangible property (partially or totally destroyed) which includes completely inundated or partially submerged building, highways and other road paths covered by water, landed property represent 15% of the land area, farmland- mature crops, prospective crops and livestock were killed by the destructive waters.

In the study area, business activities were either slowed down or completely suspended which incapacitates the farmers, traders, self employed, craft workers etc and even the civil servants. The moveable property affected by the flood was items like vehicles, furniture and fixtures, clothes etc. Household property that was destroyed includes furniture, rugs, carpets, electronics, clothes, food stuffs, to completely sacking them from their residence. Other effects suffered by the people of Ndokwa East LGA were health related problems resulting from the flood events. There was mass pollution of usable water thereby creating problem of inadequate or shortage of drinking water. And the increment of mosquitoes infestations in the study area. Transportation is also adversely affected in so many ways ranging from the increase in cost of commuting, the long hours of wait for very scarce vehicles, no vehicles in some cases to human portorage to convene goods, themselves and freight from one place to another. During and immediately after flooding, power outages, electrocution in some cases and

telecommunication breakdown are common phenomenon for days until the relevant agencies correct them in the LGA. Another major concern is that the aesthetic value of the environment is greatly reduced by the removal, transportation and deposition of debris by the running water. Cases of deaths of individual were recorded by some families directly from the flood events or an aftermath of the hazard in the Ndokwa East LGA.

Some of the effects of flooding in the Niger-Delta in different communities are itemized below.

**Table 1 Effects of Flooding in the Niger Delta**

S/n	Location	Effects of Flooding in the Niger Delta	Source
1	Ewulu community	Affected several buildings; internally displaced many people; inaccessibility of roads; agricultural produce and infrastructure affected	The Pointer: Vol.11, No 3364 ISSN14444-5975 26/11/2012
2	Irri, Ivrogbo, Okpe, Aviara, Ada-Irri, Iyede-London, Iyeda-ame in Ndokwa East LGA	Hurriedly harvesting crops; internally displaced hundreds of persons; flooding for over 3 weeks; school underwater; over 1,000 refugees; inaccessible roads; over 10 fish ponds destroyed; crops destroyed	The Pointer: Vol.11, 3375 No ISSN 14444-5975 8/10/ 2012
3	Igbide, Ofagbe, Uzere, Emede, Ikpide Irri	Areas affected are predominantly farmlands; communities submerged under water; mud houses collapsed; sources of drinking water, including wells, lakes, streams and boreholes are polluted by the flood waters,	The Pointer: Vol.12 No 3401 ISSN 14444-5975 6/11/ 2012
4	Communities affected seven local government areas of Oshimili South, Oshimili North and Ndokwa East in Delta North, Ughelli South in Delta central as well as Isoko South, Bomadi and Burutu in Delta South	Waters of the rains have sacked people from their homesteads, farmlands; Roads submerged, bridges collapsed; People have died and animals missing; majority are now living as refugees in makeshift shelters; Two human casualties recorded; Scores of persons were trapped in the flooded areas; Farmlands, crops, domestic animals and fishponds were destroyed; Houses have caving in while property swallowed in the intense flood. The head office of Nigeria Immigration Service and the council secretariat of Ndokwa East LGA in Aboh, were submerged by the water. (see Plate 1 and 2)	Saturday Sun: Voice of the Nation Vol. 9 No.509 29/09/2012
5	Isoko area of Delta State	3 persons drowned, communities submerged by the flood which has also cut off Ughelli Asaba. Comprising Isoko North and South as well as Ndokwa East LGA; increased transportation cost of road of water by 500%;	Daily Sun; Vol 7; No 2467 5/10/2012
6	Neighbouring Isumpe, Utagba-Uno community in Ndokwa West LGA	displaced persons die of hunger and waterborne diseases; over 1,000 houses destroyed, displaced thousands and taken over their farmlands; petrol stations, private and public schools, mortuaries, other public buildings and government agencies all submerged; council secretariat relocated; price of foodstuff increased by 400%	The Pointer Vol 11, No 3378 ISSN 14444-5975 11/10/ 2012
7	Communities in Delta State	buildings, farms and schools were totally submerged in the flood waters; sewages washed away; people can even fish in their compounds while children swim in the flooding compound, thinking it is the same as the river; flood waters are polluted.	The Pointer Vol 11 No 3375 ISSN 14444-5975 8/10/ 2012

**The Adjustment Techniques by the People of Ndokwa East LGA**

Flood control refers to all methods used to reduce or prevent the detrimental effects of flood waters. Some methods of flood control have been practiced since ancient times. These methods include:

- Planting vegetation to retain extra water;
- Terracing hillsides to slow flow down hills;
- Construction of flood ways (man-made channels to divert floodwater);
- Other techniques include the construction of levees, dikes, dams, reservoirs or retention ponds to hold extra water during times of flooding

The investigation revealed that the residents were oblivious of the techniques to combat flooding. We proffered eleven adjustment techniques, that is, build flood walls around stead/houses, raise building foundation above flood site, building houses in stilts/poles and platforms, reclaim land by earth filling low lying areas, control land use in flood prone areas, construct more drains and culverts, clean city drains and culverts, provide more access roads to ease traffic congestion, repairs of already broken down roads, control of traffic on roads and provide good roads network and linkages to ease traffic congestion. The respondents were only conversant with a few techniques to resolve the problems of flooding in the area. They looked among other things the techniques of earth nourishment in other to reclaim lands lost to flood before now. Channelization of the flood was also mentioned, they were of the opinion that constructing more drains and culverts was the way out. At this juncture it was evident to the researchers that the people were not too sure of the causes of flooding. Surprisingly, those that said the flooding was as a result of the overflow of the river Niger stated some of the techniques employed which were no way close to resolving the problems. Some suggested the control of land use in flood prone area as a good adjustment technique. This suggestion is apt as it was observed that the building patterns were haphazard and poor channelization of water. Farmlands were also on flood prone areas.

Flood warning is the provision of advance warning of conditions that are likely to cause flooding to property and a potential risk to life. The main purpose of flood warning is to save life by allowing people, support and emergency services time to prepare for flooding. The secondary purpose is to reduce the effects and damage of flooding. Flood warning systems can provide a reduction in direct losses through:

- The timely operation of flood control structures (e.g., gates)
- Temporary flood defenses preventing inundation of property and land
- Prevent maintenance operations to ensure free channel conveyance
- The installation of flood resilience measures (e.g., sandbags, property flood barriers)
- The removal of property to somewhere above the flood level or out of the flood plain

The people interviewed (40%) were pre-informed of the flood hazard through various sources which include government agencies, village head and neighbours. Field survey shows that the essence of the flood warning was defeated because there were no preventive measures to reduce the hazard suffered. Apparently the inhabitants did not take the warning serious because such catastrophe caused by flooding was alien to everyone in Ndokwa East LGA. Agreed there are annual flood events but one of these magnitudes has never been seen or heard of in the study area. One can be correct to align with the 60% of the respondent who claimed that they had no knowledge of the danger to come.

## **VI. Summary of Findings, Recommendations and Conclusion**

### **Summary of Findings**

The nature and spatial forms of flood problems are very serious. Majority of the respondents have lived their entire life in the study area and so had experience of flood hazards over the years. The investigation revealed that the flooding problem was seasonal although it is believed that it started in the last 20 years.

Respondents perceived the major causes of the flood event to overflow of the river and anthropogenic factors. Little consideration was given to abnormally high rainfall, nature of topography and the land use patterns. Field observations show the contributory effect of increased severity and intensity of rainfall and the susceptibility to the risk of flooding downstream. It was obvious that the river overflowed its bank, it was primarily caused by runoffs from sustained rainfall which breaks the refuse dump used as levees by the local indigenes. The rainfall for 2012 was observed to be far higher than the previous years by 5%-60% of mean monthly rainfall, the researcher could not state whether it because of climate change or climate variability because of paucity of climatic data as at time of investigation.

Field observation shows that the topography is such that it slopes in the direction of the river and that many residents have settled on the river valley either in terms of residence or farmland.

The study shows that there was a colossal effect of the flooding in 2012. Tangible property that were partially or totally destroyed includes completely inundated or partially submerged building, highways and other road paths covered by water, landed property, and farmlands and livestock were killed by the ravaging waters. The moveable property destroyed include vehicles, household property were submerged. Other effects were slowing down or the complete suspension of business activities and health related problems resulting from the flood events. Also the cost of transportation is increased and long hours of waiting for mobility and in most cases human portage or use of canoe is the last resort. Field survey revealed too that electricity and communication are cut out for days and no possible ways to correct the problem until the flood drains off.

The people of Ndokwa East LGA encountered so many problems during and after flood. The problems encountered are issues of infestation by diseases especially from pollution and mosquito bites and that the aesthetic value of the environment is reduced. There were cases of death recorded in the LGA.

The adjustment techniques employed was that caused by flash flood like raising building foundation above flood site, reclaiming land by earth filling low lying areas, controlling land use in flood prone areas, constructing more drains and culverts and cleaning city drains and culverts. The Ndokwa East people were ignorant of flood adjustment techniques resulting from river overflow. The only thing they did prior to the ecological hazard was dumping of refuse. Field observation shows the original motive of dumping the refuse was not to act as embankment but as dump site. Techniques such as building defenses as levees, bunds, reservoirs and weirs to prevent rivers from overflowing their banks were alien to the residents. Emergency measures such as sandbags or portable inflatable tubes were also not used. The river surge came as shock to residents and little or nothing was done to resolve the flood hazards. Only post flood actions were taken to rescue lives and property. The internally displaced persons were resettled in camps losing all or most of their belongings. The purpose of the warning signal was defeated from the day of issuance. The warning signal from government agencies was not adhered to because they did not trust the authenticity of the signal. Nothing of such has happened before in their live time so a lot of them did nothing to arrest the flood event.

### **Recommendations**

- The Federal, State and Local Government should enact a Flood Control Act aimed at appropriating funds openly and primarily for the purpose of flood control for the lower River Niger. That there should be cost-sharing ratio between the Federal Government and States in flood control.
- Wise land use management practices within flood prone areas as a neglected alternative to construction activities
- The government should enact legislation to control any further encroachments/ occupancy upon the floodplains.
- Effective land use planning as an effective alternative method of reducing flood damage.
- The Federal Government should create an agency like the Niger Valley Authority (NVA) akin to the Tennessee Valley Authority (TVA) aimed at applying alternative approaches to control flood damage, choosing to add land use planning methods to the popular structural measures already used to control the paths of floodwaters.
- Agencies should support a series of nationally significant academic studies, such as flood data, the comprehensive flood proofing study, programs to assist communities in obtaining comprehensive flood risk reports and floodplain management to collect flood information for community planning projects.
- Efforts should be geared on mapping floodplain and further researches aimed at demonstrating that flood prone lands could be used for multiple purposes that excluded residential and commercial development.
- Government should ensure an effective control of residential building development within floodplain areas.
- The Federal Governments should establish the National Flood Insurance Policy program aimed at providing relief from the impacts of flood damages in the form of Government-backed flood insurance.
- The Nigerian Meteorological Service should periodically provide predicted rainfall to forecast flood stages and warnings to communities and citizens.
- The Federal and State Governments should establish a Natural Hazards Center at the universities aimed at collecting and sharing information on how society prepares for, responds to, recovers from, and mitigates disasters.
- Public enlightenment on individual awareness of flood risk to reduce unwise use and development of flood hazard area. And to appreciate techniques to combat the disaster cycle of preparedness, response, recovery and mitigation.
- The Federal Government should established buyouts of flood-damaged properties as the first priority for flood mitigation funds.

### **VII. Conclusion**

The flood problem in the Niger River around Ndokwa East LGA was growing because more cultivation was taking place in the floodplain. The flood event in 2012 was aggravated as a result of the inevitable influence of human modification of natural conditions. Many of flooded communities were greatly affected because of insufficient flood warning system or the non-adherence of the people living in flood plains of impending disasters.

The 2012 flood event was arguably the greatest natural disaster to befall this nation in terms of total human misery and suffering.

With land use pressures and few incentives to stay out of the hazard areas, floodplain occupancy is increasing. Oblivious of the possibility of a flood disaster, individuals and public facilities were moving to and building in the floodplain and people continued to move into unprotected areas thus contributing to the rising level of flood damage with each passing year.

Individual awareness of flood risk falls far short of what is needed; People are attracted to riverine environments for a variety of reasons, usually related to economic necessity.

It is also clear that FEMA were not adequately ready for flood hazard management—emergency preparedness and response, natural resources, environmental protection, structural flood protection measures, planning, and economic development—may have been responsible for various aspects of flood hazard management.

Many individuals and communities affected by the flood of 2012 had never before had to deal with floods and their consequences. Because of their lack of experience, they did not know what to do then and in the post-flood recovery phase.

Over the last 50 years the nation has suffered from flooding of varying magnitude but none compared to that of 2012. It is evident from this study that the involvement of government agencies in an attempt to reduce loss of life, property damage, and social and economic disruption caused by natural hazards is mere lip service. The time is ripe for serious attention to be paid to how Nigerians responds to the threat of floods or we will be back to where we started from.



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