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FLOODING IN IMO STATE NIGERIA: THE SOCIO-ECONOMIC IMPLICATION FOR SUSTAINABLE DEVELOPMENT

Duru Pat. N[1] --- Chibo Christian N[2]

[1,2]Department of Geography and Environmental Management, Imo State University, Owerri

ABSTRACT

The menace of flooding ravaging different areas of Imo state Nigeria has been a recurrent phenomenon in recent years. This research investigated the socio-economic implications of flooding for sustainable development of the state. The paper aimed at investigating, identifying and documenting the socioeconomic implications of flooding to sustainable development of Imo state. The study tried to identify various locations affected by flooding and also examined the positive and negative effects of flood to the area. 500 copies of questionnaires were distributed using systematic sampling in six local government areas of the state used for pilot survey. About 96.8 percent of the questionnaires was retrieved and used for the study. Collected data were presented using frequency tables, charts and percentages. The study identified various locations affected by flooding, years of severe flooding and also identified various effects of flooding in the state. Finally the paper concluded by making recommendations which includes discouraging development of areas prone to flooding among others.

Keywords: Menace, Flooding, Ravaging, Sustanainable development, Socio-economic, Floodplain, Environment.

1. INTRODUCTION

Flood is a body of water which rises to overflow land which is not normally submerged. Flood results from a number of causes of which the most important are climatological in nature (Okorie, 2010). Flooding has been observed globally as one of nature's damaging phenomena. It is one of the most serious environmental hazards. The high volume of storm water or rain water during rainy season can result in severe damage to properties and force several people to evacuate the area thereby rendering some people homeless.

Flood can occur in rivers when the flow rate exceeds the capacity of river channel. On land it occurs when the quantity of water on land exceeds the infiltration capacity. This unusual high rate of stream discharge often leads to inundation of land adjacent to the streams. Most floods are often caused by rainfall and intensified by various conditions. These conditions may include the following among others; the characteristics of the basin i.e. the geology, soil cover, topography,

vegetation cover and land use; the characteristics of the drainage network i.e. whether it is graded, dendritic or poorly drained; and the characteristics of the river channel i.e. if it flows through a flat plain or gorges or valley. Globally, flooding is one of the recent environmental problems experienced in almost all parts of the globe. In Europe, after three years of flooding in Eastern Europe, year 2000 saw a switch to a major flooding in western and Northern Europe and UK (Arokoyu and Weli, 2004). According to them, April 2000 started a very wet year for England with a total of 143mm falling over combined England-Wales regions. As a result of the intensity, about 80,000 lives were lost and properties worth over 10 million US dollar were damaged annually (WMO, 2003).In Africa, the second half of 1996 was relatively a time for flooding. In August 1996, heavy rain in Awash River Basin of Ethiopia caused widespread flooding affecting about 30,000 people (WMO, 2003). After the rainy season, further rainfall saw renewed flooding along Yangtze River delta. In Nigeria, the biggest and most destructive flood in the history of the country was experienced in September 2012. In South America, Peru was stricken by flood in 1998, a situation consistent with the effect of a warm El Nino southern oscillation (ENSO) phase. At this period, the western and coastal parts of Ecuador received up to 15 times their normal rainfall from November 1997 to may 2004 (Arokoyu and Weli, 2004). The result of the above was severe flooding and mudslide destroying properties worth 3 billion US dollar and killing more than 450 people (Bell and Helpert, 1999). The negative and destructive effect of flooding has caused and is still causing damages globally and Imo state Nigeria has had its share of the menace as will be further discussed in this paper.

2. STATEMENT OF THE RESEARCH PROBLEM

Flooding can happen on flat or low lying area when the ground is saturated and water either enters runoff or cannot run off quickly enough and so starts accumulating. This accumulated water is seen in some many places and in different locations in Imo state during and sometimes after rainfall in rainy seasons. The areas normally affected by flooding generally are areas that are on a flat or low lying areas located close to one river system. In Imo state, it has not been identified the general locations of areas affected by flood. In the light of this, this paper tries to identify the different locations affected by the menace of flooding in the area.

Some floods are seasonal in that they accompany monsoonal rains and submerge broad floodplains or delta plains. Some occur regularly when rain is particularly heavy or when winter snow starts to melt. Flood can also occur when water rises so fast that it may be impossible for all the water to escape from the path of the water. Also flood occurs when a river cannot cope with the amount of water entering its channel thereby creating an area generally referred to as floodplain. When weather and tidal condition increases sea level, coastal areas along the coast may be flooded. It has been observed that some of the above phenomena cause the flooding experienced Imo state. What is not yet known and therefore what this paper will investigate is the different types and causes of these floods observed in different locations of the state.From the history of creation of the earth by Almighty God, it was gathered that the entire earth was

flooded. This was the reason why God in Genesis 1:9 said "let the waters under heaven be gathered together into one place and let the dry land appear". (Gidion's International 1982). It is known that the flooding of the environment of Imo state has been there for so many years but the record of various years that has experienced severe flooding has not been documented especially the recent and devastating ones. This paper will also try to investigate and document the various years in the recent past that have experienced flooding and the nature of damages caused by it. Finally, flooding does not occur without leaving an imprint whether positive, negative or both in any area where it was experienced. In the light of this, the paper will also study and identify both the negative and positive (if any) effects of flooding in Imo state.

3. AIM AND OBJECTIVES OF THE STUDY

The major aim of this paper is to investigate, identify and document the socio-economic implications of flooding to sustainable development of Imo state.

The following objectives will be used as a guide to achieving the aim

i. identifying various locations affected by flooding
ii. examining and identifying different kinds/types of flood experienced in different locations of Imo state
iii. documenting various dates/years in the recent past that have experienced devastating effect of flooding
iv. identifying various effects (positive and negative) effects of flooding in Imo state
v. examining various measures taken by indigenes of the affected areas to minimize/curb the negative effect of flooding

4. RESEARCH QUESTIONS

Research questions for this paper will include the following

i. when was the day and year you experienced devastating flood in your area
ii. how have you been affected by flooding
iii. have you derived any benefit from flooding in your area
iv. what are the various activities that you consider as being cause(s) of flooding in your area
v. how long does the flood normally last when occurred in your area
vi. What activities have you engaged in to reduce or curb the effect of the flooding?

5. PRESENTATATION OF THE STUDY AREA

Created in 1976 by the late military head of state, General Murtala Muhammed, the 37 year old state was located in south east geopolitical zone of Nigeria which comprises of five states. Imo state lies between latitude $5^0$10'N – $6^0$00'N and longitude $6^0$40'E – $7^0$23'E of the Greenwich meridian. Its spatial extent according to Federal office of statistics is about 5,530sqkm. It is

bounded on the east by Abia, on the west by Rivers State and on the north by Anambra State . The study is concentrated on six local government areas selected two each from three senatorial zones that make up the state. The local government areas for this study are Isiala Mbano and Onuimo (Okigwe Zone), Ikeduru and Ahiazu Mbaise (Owerri Zone) and Orlu and Oguta (Orlu Zone).

The 2006 population census of the study area is shown in Table 1

Table-1. Population of the Study Area

Area	Population		Total
	Males	Females	
Imo	1,976,476	1,951,092	3, 927,536
Isiala Mbano	100,835	97,086	197,921
Onuimo	50,779	48,158	99,386
Ikeduru	75,025	74,712	149,737
Ahiazu Mbaise	86,376	84,498	170,824
Orlu	69,632	73,160	142,792
Oguta	72,549	69,791	142,340

Source: (National Population Commission, 2006)

The area lies within the tropical monsoon (AM) based on Koppen's classification of climate. Mean annual rainfall ranges from 2250mm t0 2500mm. The mean monthly temperature of the area ranges from 28^{0}C to 35^{0}C, while the annual mean monthly minimum air temperature ranges between 19^{0}C and 24^{0}C. Humidity is high in the area being about 80-85% in the rainy season and 60% in the dry season (Duru, 2008). This phenomena account for high rainfall in the area which normally starts from March or later and ends in October. The temperature and rainfall data of the area for a 10 years period is seen in Table 2

Table-2. Temperature and Rainfall Data of Imo State (1999 – 2007)

Year	Temperature (^{0}C)		Rainfall (MM)	
	Total	Mean	Total	Mean
1999	376.8	31.4	20,250.36	1687.53
2000	403.2	33.6	15,268.8	1272.4
2001	387.6	32.3	21,580.8	1798.4
2002	386.4	32.2	18,871.2	1572.6
2003	379.2	31.6	9,772.92	814.41
2004	367.2	30.6	28,893.6	2403.3
2005	406.8	33.9	20,734.8	1727.7
2006	392.4	32.7	24,63.5	2021.9
2007	385.2	32.1	37,011.2	2917.6

Data source: Extracted from Alvan Ikoku Federal College of Education Meteorological Station 2007

6. LITERATURE REVIEW

Flooding which often precede soil erosion is the second most destructive natural phenomenon on Nigerian environment after soil erosion (Obasi and Olemeforo, 1999).

Flooding is the temporary storage of large volume of water in a place or location where it is not wanted. Flood can occur when an abnormal large quantity of water which cannot be accommodated within the channel is supplied to the area. According to Ward (1978), flood since early times have been a major aspect of man's interaction with his environment and the epic stories of flood disaster are found in almost all the environment in the world. Ward also observed that defining flood is difficult partly because floods are complex phenomena and partly because they are experienced differently by deterrent people. He went further to emphasize that flood can come in many ways usually in valley bottoms of coastal areas and are produced by a number of influencing conditions. However for most practical purposes and certainly in popular usage, a meaningful definition of flood will incorporate a notion of damage and inundation. From the foregoing therefore, a flood is a body of water which rises to overflow the land which is not usually submerged. In this definition therefore, inundation is explicit and damage is implied in the definition of flood.Burton and Kate (1972), identified flood as one type of natural hazard even though the study of flood hazard has been for many years. They defined natural hazard in as those elements in the physical environment harmful to man and caused by forces external to him. As flood affects urban areas/ centre ,it overflows over urban streets, sufficient to cause significant property damage, traffic obstructions, nuisance and health hazards. It could be observed from the foregoing that flood hazard has caused several loses to man all over the earth. Different types of flood identified in various literatures are seasonal, flash flood, delta plain flood, coastal flooding, fluvial flooding, groundwater flooding, drains and sewer flooding, river flood, urban flood etc.

7. MATERIALS AND METHODS

To adequately execute this study, data was required on the following areas and on the following issues;

1. nature/types and characteristics of flooding in the area
2. causes of flooding in the area
3. various locations and areas affected by flood
4. measures undertaken to address the effects of flooding in the area amongst others

Data on some of the above issues were collected by direct fieldwork using sets of questionnaires and interview schedules. Other sources of data for this study were through secondary sources like library, internets, published articles, journals, textbooks and unpublished materials and the internet. Some of the data were obtained from direct observation and measurement in the field. The method of data collection was systematic sampling. Collected data is presented using frequency tables, percentages, charts etc.

8. DISCUSSIONS AND FINDINGS

Questionnaire administration was used to generate primary data that are used for this study. The questionnaires were administered in six local government areas of the state. This is presented in Table 3

Table-3. Questionnaire Administration

Location	No. Administered	No. Retrieved	Percentage
Isialambano	80	78	15.6
Onuimo	80	80	16
Ikeduru	90	85	17
Ahiazumbaise	80	77	15.4
Orlu	90	88	17.6
Oguta	80	76	15.2
Total	500	484	96.8

Source: Author's Fieldwork, 2013

500 copies of questionnaire were distributed among the six local government areas at the rate as presented in Table 3. A total of 498 copies were retrieved from the respondents. This represents about 98.8 percent of the copies administered. Almost 16 copies or 3.2 percent of the questionnaire were not retrieved from the respondents.

9. IDENTIFICATION OF VARIOUS COMMUNITIES AND LOCATIONS AFFECTED BY FLOODING IN IMO STATE

Since the entire landscape of Imo state is not flooded, the work tried to identify various areas and locations affected by flooding in the area. The response of the respondents is presented in Table 4

Different communities, locations and activities that are mostly affected by flooding can be seen in table 4. Analysis of the Table indicate that while Orlu is the most affected community in the area studied as indicated by 37 respondents or 7.6 percent of the sample population, farmland is the most affected activity by flood in Imo state as shown by 158 respondents or about 32.9 percent of the sample population. Flooding of market places takes the second position in the activities affected by flood in Imo state as indicated by 20.9 percent of the respondents. Areas that experience this phenomenon most are found in Atta (Eke Atta) (14 respondents) while Amaraku (OrieAmaraku) and Orlu are the next as indicated by 12 respondents each. Areas least affected by market flooding in the study area are found in Onuimo as indicated in Obinulo and Ikwuato each represented by 1 respondent. Flooding of commercial and residential areas and flooding of roads are other activities that experience a large impact of flooding in Imo state. This is indicated by 97 respondents (20.0 percent) and 79 respondents (16.3 percent) respectively. The comprehensive view of locations and activities affected by flooding with their respective degrees and magnitude is presented in Table 4.

Table-4. Communities and Locations Affected By Flood in Imo State

Local Govt.	Community	Locations Affected By Flood						Total
		Farmland	Markets	Commercial/ Residential	Road	Schools/ Churches	Others	
IsialaMbano	Ugiri Oka	10	2	6	2	-	-	20
	Anara	3	4	10	3	2	1	23
	Amaraku	5	12	11	5	2	-	35
Onuimo	Okwelle	10	3	6	4	5	1	29
	Obinulo	15	1	3	7	2	2	30
	Ikwuato	7	1	4	6	3	-	21
Ikeduru	Atta	6	14	7	4	3	-	34
	Akabo	10	6	4	7	2	-	29
	IhoDimeze	6	4	2	6	3	1	22
AhiazuMbaise	Amuzi	18	6	3	2	2	-	31
	Ahiara	10	9	5	1	3	1	28
	Ogbe	7	5	2	3	1	1	18
Orlu	Umuna	8	10	6	5	2	1	32
	Ogberuru	10	3	2	3	-	1	19
	Orlu	3	9	12	8	3	2	37
Oguta	Orsuobodo	11	4	5	5	2	-	27
	EziOrsu	10	2	7	4	3	1	27
	Opuoma	9	3	5	4	1	-	22
Total		158	101	97	79	39	11	484
Percentage		32.6	20.9	20.0	16.3	8.1	2. 3	100

Source: Author's Fieldwork, 2003

10. EXAMINATION AND IDENTIFICATION OF TYPES OF FLOOD IN IMO STATE

It was observed that not all the parts of Imo state have the same location extent and that different environment in the area have different environmental peculiarities associated with them hence not all the area have the same type and causes of flooding. Therefore in the bid to know different types of flooding ravaging different locations in the area, the responses of the respondents are tabulated in Table 5. Data in Table 5 shows different types of flood ravaging the study area which indicate that coastal flood is not a major problem in the state as is observed in only 1 local government area indicated by 20 respondents or 4.1 percent of the sample population. This type of flood experienced just only in Oguta Local Government area may be as a result of the proximity of the area to the coast. 28 percent of urban centers in Imo state are flooded. This is the response of 135 respondents. River flooding in the area has the highest respondents i.e. 136 respondents or 28.1 percent of the sample population while seasonal flood has just 62 respondents or about 12.8 percent of the respondents. It was also observed that the flooding of most urban areas in the state is as a result of construction of roads without adequate drainage system, erecting building on waterways and asphalting and tarring of most open spaces with concrete materials leads to flooding of the area by even a little rainfall.

Table-5. Types of Flood Affecting Different Locations in Imo State

Location	Flood Type				
	Coastal	Flash	River	Urban	Seasonal
Isiala Mbano	-	14	26	25	13
Onuimo	-	20	35	16	9
Ikeduru	-	35	10	25	15
Abo Mbaise	-	27	20	21	9
Orlu	-	20	24	34	10
Oguta	20	15	21	14	6
Total	20	131	136	135	62
Percentage	4.1	27.1	28.1	28.0	12.8

Source: Author's Fieldwork, 2013.

Information in Table 5 can be represented in Bar chart shown in Fig-1.

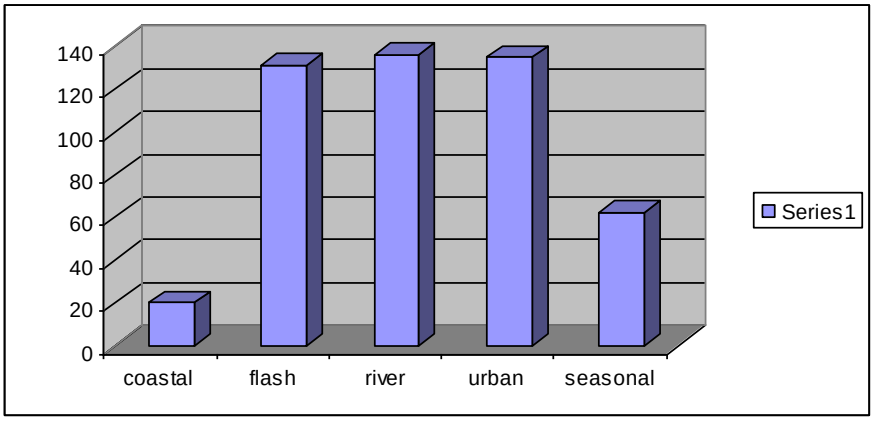


Table-6. Years of Devastating Flood in Imo State in the Recent Past

Location	Year(S)	Causes/Effects
Isiala Mbano	2009	Caused as a result of overflow of mbaa river. Affected mostly ugiri and other 5 communities. Farmland were flooded and roads were affected
Onuimo	Sept 2012	Caused as a result of overflow of okweregere river and obstruction of flow of water by hips of sand. Residential buildings were affected leading to destruction of properties and flooding of farmlands. Roads that link the villages destroyed and reptiles like snakes invaded the area
Ikeduru	2009	Caused as a result of heavy rainfall. Eke Atta market flooded destroying goods. Eze's palace and houses around the area inundated destroying properties. Covered the road leading to breakdown of cars. Lasted at least for two days
AhiazuMbaise	1993, 2005, 2010, 2011	Resulted from heavy down pores. Affected communities like ogbe, ahiara, obiohia etc. brought health hazard, destroyed buildings, roads, markets etc. Two lives were lost including an old woman and 8 months old baby
Orlu	1984, 1986, 2005	Caused by 18 hours torrential rain. Affected about 5000 people, destroyed properties worth millions of naira. Affected Duruaku street, Ebenato road, Amaigbo road, central school 1 premises, st. Joseph catholic church and a 12 month old child lost his life
Oguta	1947, 1969 2012	1947 and 1969 flood caused by heavy rainfall and 2012 caused by overflow of rivers and oguta lake. Two people drowned in oguta axis. All riverine areas inundated, cocoa plantations, ponds, farmlands, economic trees destroyed. Over 138 farm settlements destroyed. Almost 8000 persons rendered homeless

Source: Author's Fieldwork, 2013

11. VARIOUS YEARS IN THE RECENT PAST THAT EXPERIENCED DEVASTATING FLOODING IN IMO STATE

It was observed that flooding has been with man from the day of creation and Imo state environment is not an exception. The data in Table 6 shows some of the years that experienced devastating flood in the area in the recent past

12. EFFECTS OF FLOODING IN THE STUDY AREA

Flood impacts on individuals, communities and environment have both socio-economic and environmental consequences. As was observed in the study, its effect can be negative to some people while few others perceive flooding as having positive effect on the environment depending on the location and extent of flooding. In the bid to identify the effect of flooding in the area, the responses are tabulated in table 7.

Table-7. Effects of Flooding in Imo State

Effects	Respondents	Percentage
Loss of life and properties	126	26.0
Destruction of farmland and livestock	84	17.4
Deterioration of health condition due to waterborne diseases	28	5.8
Damage to roads and infrastructures	56	11.6
Displacement of people	63	13.0
Pollution of the environment	41	8.5
Improves the fertility of the soil along flood plains	31	6.4
Groundwater recharge	12	2.8
Hunting of animals	25	5.2
Increased fish production	18	3.7
TOTAL	484	100.0

Source: Author's Fieldwork, 2013

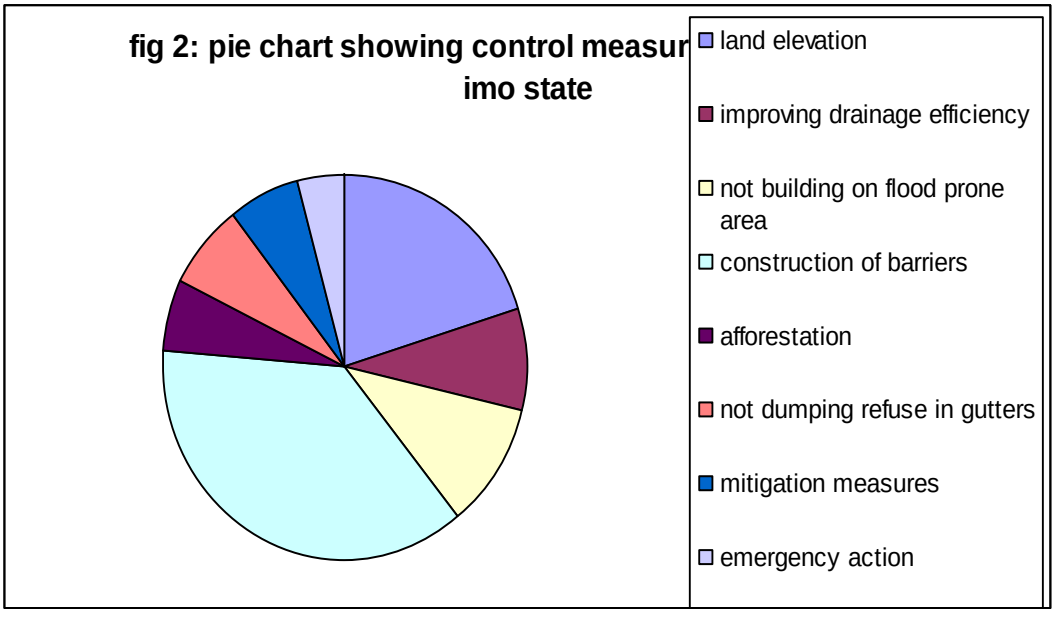
Analysis of the data in Table 7 reveals that about 82 percent of the people see flood as a destructive phenomena while a paltry 18 percent accept that flooding can be of benefit to socio-economic development of Imo state. Table 7 shows that loss of life and properties accounts for the highest negative impact of flooding in the area as indicated by 26 percent of the sample population whereas improving the fertility of the soil along floodplains for increased agricultural productivity is envisaged by people as the phenomenon where flooding can be seen as having the highest positive impact on the people as represented by 6.4 percent. The ratio of the greatest negative impact and greatest positive impact of flooding in Imo state can be seen from the Table 7 is 4:1. About 25 respondents (5.2 percent) of the sample population say that when a forest is flooded, it can lead to wild animals being forced out from their hidings, thereby increasing the quantity of bush animals caught. Other impacts of flooding on the environment of Imo state is seen in Table 7

13. MEASURES UNDERTAKEN BY THE INHABITANTS TO CONTROL FLOODING

It was observed that whether flood hazard is natural or man-made it is a very serious problem. In order to mitigate, avoid or reduce these problems of flooding, the local inhabitants engaged in some activities presented in Table 8 and in Fig 2

Table-8. Preventive/Control Measures to Flooding in Imo State

Preventive/Control Measures	No. Of Respondents	Percentage
Land Elevation	98	20.3
Improving Drainage Efficiency	40	8.3
Not Building on Flood Prone Areas	51	10.5
Construction of Barriers	181	37.4
Afforestation	28	5.8
Not Dumping Refuse in Gutters	35	7.2
Mitigation Measures	30	6.2
Emergency Action	21	4.3
TOTAL	484	100



Source: Author's Fieldwork, 2013

Information on the data in Table 8 shows that one major preventive/control measure adopted by the people in Imo state is elevation of land and construction of barriers like dwarf fence, dams and using of sandbags. These two actions take 20.3 percent and 37.4 percent of the respondents respectively. These two also represents over 50 percent of flood menace control measures. But the research also observed that in some situations where the flood is very severe, these two measures do not help to prevent the effect of flooding in the area. This was observed in a letter by the traditional ruler of Orlu, Eze Boniface C. Okereke, the President General Chief Chris Uzoagba and the Secretary General Chief Bob Onyeje sent to the then Governor of Imo

State Achike Udenwa on 27th June, 2005 on the menace of flood in the area. The letter titled, 'flood water claims human life in Uzoubi-umuna-orlu'. Part of the letter read thus "..... on the fateful day, flood was beyond the control of dwarf walls, as it pulled down the perimeter wall and covers all the rooms upstairs at number 1 Eze Okereke road". Other measures to control flooding in the area include not building on flood prone areas with 51 respondents or 10.5 percent of the sample population, improving drainage efficiency with 40 respondents or some 8.3 percent of the population etc as shown in Table 8.

14. CONCLUSION AND RECOMMENDATIONS

Flooding in Imo has been an environmental problem causing loss of lives and properties worth millions of naira. It has been observed in this study that there are several factors responsible for flood hazard in the state, hence any government policy directed or aimed at alleviating the flood must be seen as that which seeks to deal with all the identified causes simultaneously. Based on the findings, it was concluded that flooding does no one any good and it is something that must be fought at all cost. Though no community stays and prays for flooding, but it is paramount for one to be vigilant and careful about ways he or she litter his environment or cause any self imposing hazard. Anything that will facilitate flooding should be avoided to avoid occurrence. Flooding is something that no one can categorically tell when it will occur but we only do our best to avoid it taking us unawares in order to reduce the rate of destruction it might cause.

Having stated the above, the research makes the following recommendations

1. Government should discourage further development in flood prone areas. Since it is not easy to evacuate people living in the area, they should therefore be educated on the danger facing them and also be advised on better and more efficient adjustment techniques to reduce effects of flood
2. There should be proper channelization of water out of residential areas and cities. Adequate measures should be taken to make provisions of channels that can store water when there is excessive rainfall.
3. Dumping refuse along water channels should be discouraged. This can be achieved by enacting laws to prohibit dumping refuse inside gutters and water ways
4. Erecting buildings along water courses and swampy areas should be discouraged.

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