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ASSESSMENT OF THE ENVIRONMENTAL EFFECTS OF 2012 FLOODS IN AGULERI AND UMULERI, ANAMBRA EAST LOCAL GOVERNMENT AREA OF ANAMBRA STATE, NIGERIA

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ABSTRACT: *The study assessed the effects of 2012 flood in Aguleri and Umuleri in Anambra East Local Government Area. In doing this, questionnaire was administered randomly to the residents. The data generated were analyzed using frequency/percentage tabulation and Mann-Whitney U-Test statistical technique. The following hypothesis was tested: there is no significant difference between the environmental effects of 2012 floods in the two communities. The results showed that there is no serious variation between the health, personal, social, economic and post effects of 2012 flood in the two communities. Furthermore it also showed that the 2012 flood caused serious social, economic, personal and post effects on the inhabitants of the area. Consequent upon the findings, the study recommended that there should be flood hazard mapping in order to ascertain areas prone to flooding, so as to reduce the occurrence of flood in the area. It further recommended that the river channels in the area be constantly dredged from time to time so as to increase their capacity for retaining water. Moreover, it recommended that the inhabitants of the area be enlightened on the causes and effects of flood. Finally, it recommended that environmental laws, especially those relating to flood occurrence and management, and land-use be enforced. In addition, areas of future research should be: (1) to ascertain the after-effect (post effect) of flooding on agriculture in the area; and (2) to obtain a flood hazard map for the entire Anambra State, especially the Anambra East Local Government Area, so as to know the areas prone to flooding, and to adopt adequate flood management techniques.*

KEYWORDS: Floods, Environmental Hazard, Environmental Law, Flood Management

INTRODUCTION

Flooding is one of the major environmental problems facing man within the century. This is especially the case in most wetlands of the world. The reason of this is the general rise in sea level globally, due to global warming as well as the saturated nature of the wetlands in the Riverine areas. Periodic floods occur on many rivers, forming a surrounding region known as flood plain. Rivers overflow for reasons like excess rainfall. In extreme cases flooding may cause a loss of lives. As noted by Adeleye and Rustum (2011) torrential rains made rivers to overflow their banks and caused mud houses to collapse and also washed away livestock. In some places and cases, flooding has damaged bridges and caused overflow of dams, submergence of buildings, displacement of people from their homes, loss of people's valuables. The economy of a place can also be severely affected by flooding. Businesses may lose stock,

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patronage, data and productivity and disruption to utilities and transport. Tourism, farming and livestock can equally be affected. Vital infrastructure may also be damaged or disrupted. Electricity and gas supplies can be interrupted. Road links, railways, canals etc., may be blocked causing disruption to transport network and accessibility severely disrupted for local inhabitants, especially amongst those considered most vulnerable and loss of communications networks (Adeleye and Rustum, 2011).Although flooding, generally, is a bane to most people, floods can be quite beneficial. Actually, believe it or not, nature benefits more from natural floods than from not having them at all. What makes natural floods a disaster is when flood waters occur in areas populated by humans and in areas of significant human development. Otherwise, when left in its natural state, the benefits of floods outweigh the adverse effects (Bradshaw, Sodhi, Peh, and Brook,2007).However, too much sand deposit will do the opposite. For farmers that maintain their crops along rivers, they should not feel threatened by yearly flooding. This gives their farm lands better soil consistencies and keeps their land fertile resulting to better harvests each year. Instead of preventing the natural flow of river floods, it might be beneficial in the long run to allow the flood waters to encroach into their lands (Hill, 1976). It was how nature intended it to be in the first place. However, there may be limits to how much farmers can tolerate such natural occurrences. One has to increase production to feed the demands of the human populace.

Statement of Problem

Flooding is one of the most important environmental problems pervasive in Anambra state. Over 30% of the inhabitants of Anambra state live along the riverine area and survive mainly on fishing and agriculture. The problem of flooding due to sea-level rise and storm surges constitute a significant source of threat to life, property, livelihoods, and infrastructure in the riverine region Ezirim (2010).According to Nwilo (2011), flooding is among the most devastating natural hazards in the state claiming more lives and causing damages to properties and infrastructure than any other natural phenomena. Aguleri has a landmass of 380 sq. km with a total projected population of 18,317 people (NPC, 2006). A reasonable percentage of the landmass of Aguleri was inundated by the 2012 flood, this constitutes about large mass of land area submerged and large numbers ofpeople were made homeless or affected in one form or the other in this community. Umuleri has a landmass of 171.6 sq. km with a total projected population of 21,438 people (NPC, 2006). A large percentage of the landmass of Umuleri was inundated by the 2012 flood, this constitutes land area flooded and people were made refugees and lost their means of livelihood in this community. Unfortunately, most of these areas inundated are places where these towns carryout most of their economic activities like agricultural activities, fishing, industrialization, transportation activities and trading. This is to say, going by how flood plains of the areas are being ravaged, that these economic activities are in serious danger of being badly affected. The implications of this are that the inhabitants of the area and even people from distant places who depend on these activities are in serious danger of losing their means of livelihoods. This definitely will affect their lives.Several other problems where experienced by the people dwelling in the areas affected. These problems include migration of people, destruction of household properties, destruction of farm produce which lead to food scarcity causing hunger to the victims, overcrowding, spread of communicable diseases and water-borne diseases, people were attacked by animals washed into their homes, rate of crime and conflict increased as people resort to different social vices to survive. It is to this effect that this study seeks to assess the environmental effects of 2012 floods in Aguleri and Umuleri with a view to proffering solution to the menace.

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Aim and Objectives

The aim of this study is to ascertain the environmental effects of 2012 floods in riverine communities of Aguleri and Umuleri. This will be achieved through the following objectives.

1. to harness people's opinion about the effects of the flood,
2. to ascertain the most affected environmental parameters in the study area,
3. to ascertain the ways in which the flood affected the inhabitants of the area and
4. to determine the mitigation measures applied to remediate the effects in the study area.

Research Hypothesis

This work tested the following hypothesis:

1. Ho: There is no significant difference between the environmental effects of 2012 floods in the two communities.

Study Area

The study area is Anambra East Local Area of Anambra State, but specifically, using Aguleri and Umuleri towns as case studies. Anambra state lies within latitude 5º 40' Nand Longitude 7º 27' E on the south and latitude 6º 48' N and longitude 6º 37' E on the north. (Fig.1). It has a total land area of 4,416sqkm (geological survey Awka, 2000). Anambra state falls within the rainforest climatic region. It has a mean temperature of 33ºC and high annual rainfall ranging from 1, 400mm in the north to 2, 500mm in the south. The state exhibits two seasons – the rainy and dry seasons. The rainy seasons occurs from March to September, but early rainfall is usually in March with full commencement in April, and stops in the months of October each year, with a few showers in November to herald the dry season and the typical harmattan winds. The dry season lasts for four to five months from November to February. The natural vegetation found in the area is of two kinds, namely Tropical Rainforest and Tropical Savannah. The greater part of the state is mainly the tropical savannah, which in its original form, comprises single stand tall trees with grasses.

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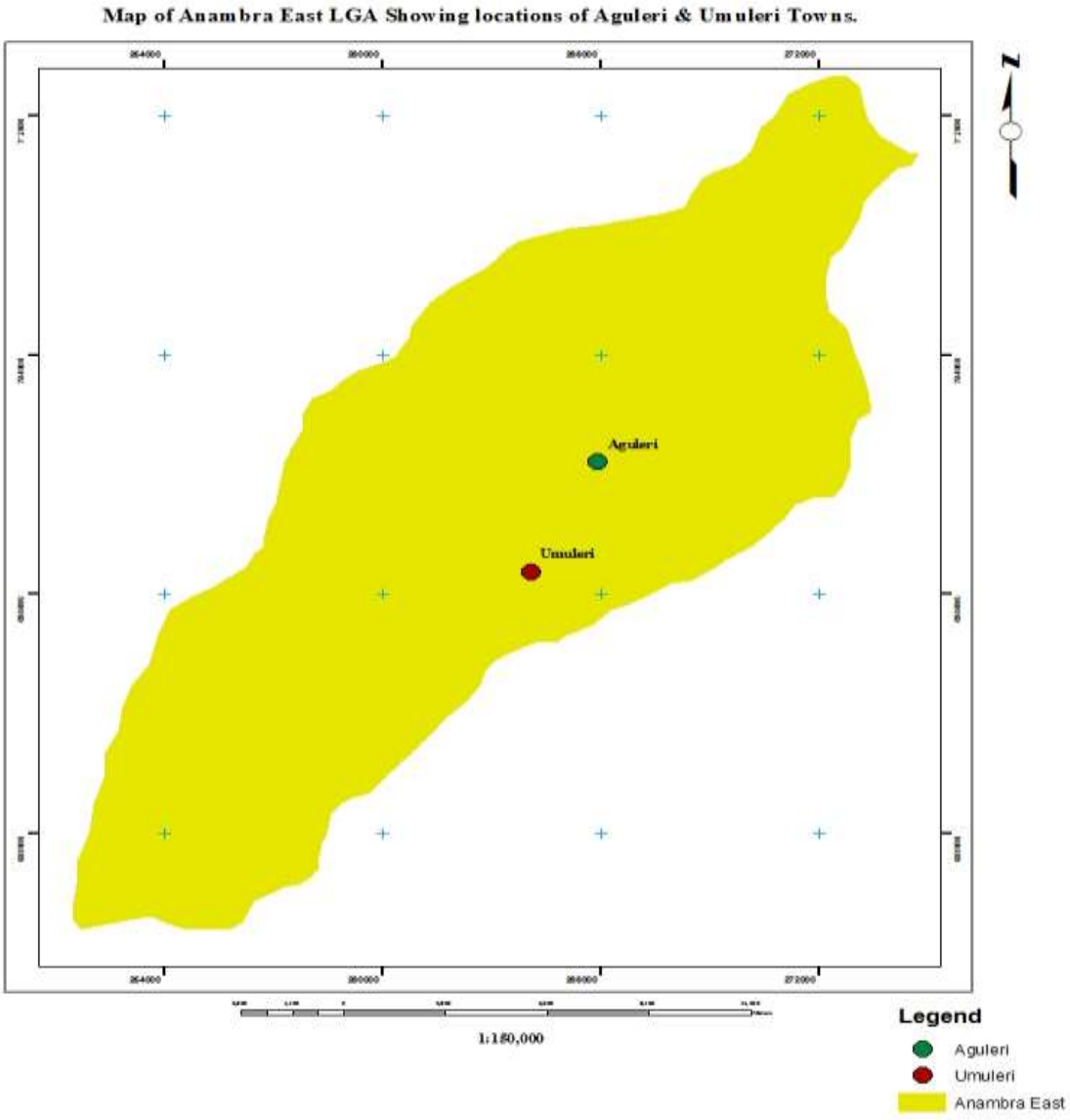

Fig 1.2 Map of Anambra East Local Government Area showing Aguleri and Umuleri

Conceptual framework of the research

The problems of flood can best be understood when one understands the concept of hydrologic cycle, which is the concept that describes the fluxes of water between the various reservoirs of the hydrosphere. The hydrologic cycle maintains a mass balance, which means that the total amount of water in the system is fixed and the cycle is in a state of dynamic equilibrium, that the hydrologic cycle is seen as the exchange of water through processes of phase exchange, precipitation, transportation and runoff. Earth's atmosphere is a great solar-powered heat engine that draws up water as vapour and cloud, and discharges water after condensation as rain and for snow. The precipitated water may complete its cycle by following via the rivers, streams and/or percolated down into ground water systems back to the oceans or may be shot-circuited back into the atmosphere by evaporation from the land surface or by transportation

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from plants. The hydrologic cycle is important is important in moving chemical elements, sculpturing the landscape, weathering rocks, transporting and depositing sediments and providing water resources Hutchinson and Ridgeway (1975).

The hydrologic cycle concept is illustrated below;

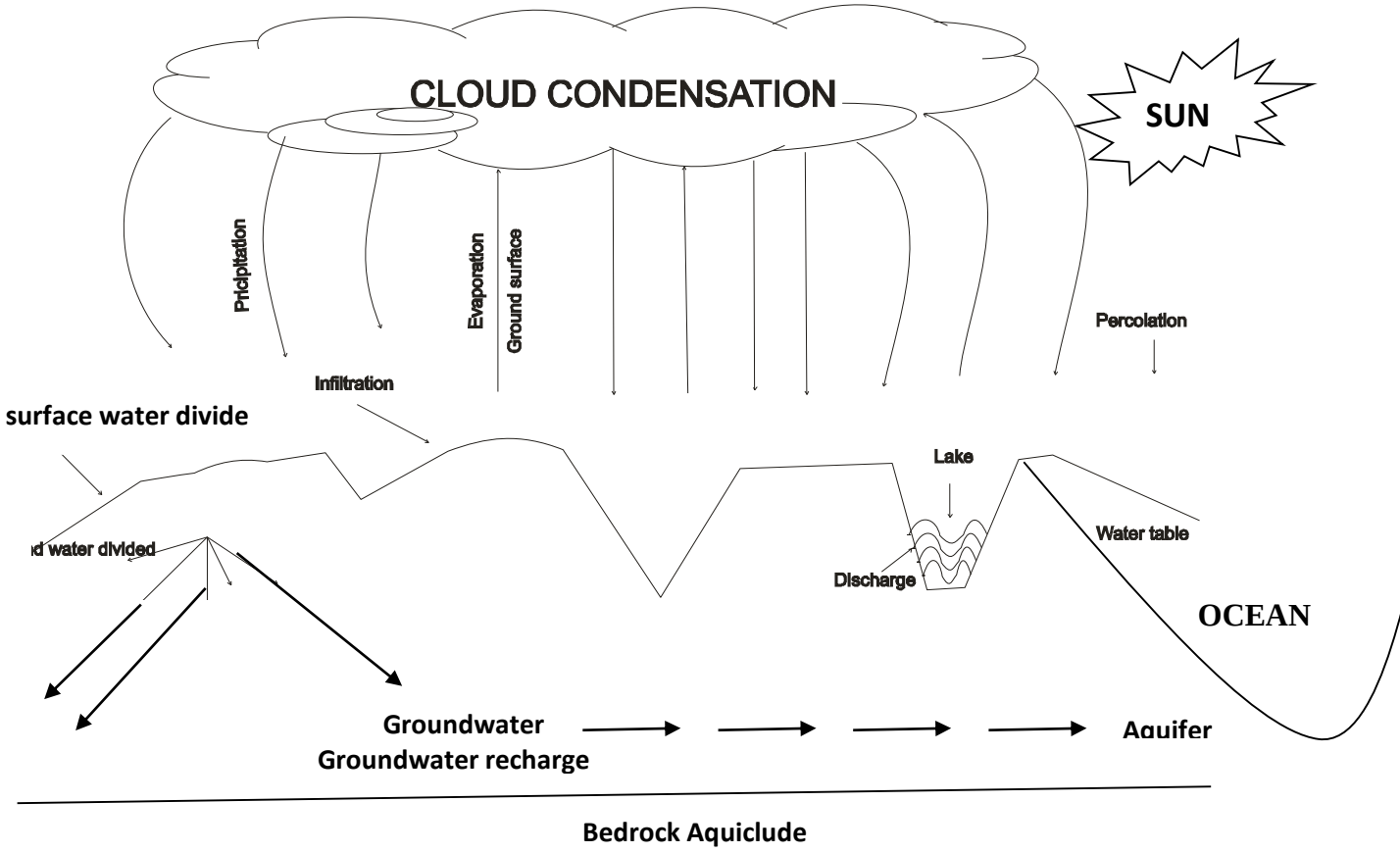

Fig.1.3: The Hydrologic cycle

Source: Egboka et al (1989)

LITERATURE REVIEW

Literature was reviewed on the Effects of flood as follows:

Health Effects

According to Gupta (2003), prolonged stagnation of the flood and storm water not only affects people's lives, but causes damages to agriculture, loss of wetlands and destruction of animal habitats and generates health problems due to contamination of the ground water in North-East India.

Abowei and Sikoki (2005) stated that excess nutrients especially phosphates, sulphates and nitrates are classified as pollutants in waste water. Large tonnage of phosphate enters rivers and lakes through super phosphate fertilizer washed by flood from soil and from chemicals used to improve the performance of detergents. Phosphate is considered a pollutant principally

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because of Lake Eutrophication resulting in algal bloom which causes decreased biological oxygen demand leading to contamination or pollution of the water body and causing health effects in living organisms and humans exposed.

Etuonovbe (2011) stated that flood has not only left several people homeless, destroyed properties and disrupted business activities, the floods ravaging communities bordering Ogun and Lagos States are also threatening to expose residents to an impending cholera, diarrhea, malaria, skin infections and other water-borne diseases epidemic.

Personal effects

Christie and Hanlon (2001) studied urban vulnerability to flooding in Africa and cited floods in Mozambique in 2000, which displaced around 4000 people in Maputo alone and crippled transport networks, breaking market links.

According to Mohapatra and Singh (2003), among all natural disasters, floods are the most frequent to be faced in India. On an average, floods have affected about 33 million persons between 1953 and 2000.

According to CECI (2004) currently, 70% of the 73 million people in Vietnam live in disaster-prone areas, with the majority of the people in the Central region. Losing crops and homes in floods and storms keeps many rural Vietnamese trapped in a cycle of poverty. This has been intensified in the recent years with major floods occurring more frequently, and thereby leaving the communities unprepared.

Huq, Kovats, Reid, and Satterth-waitte(2007) also studied urban vulnerability to floods in Africannations and cited heavy rains in East Africa in 2002 that brought floods and mudslides and forced tens of thousands to leave their homes in Rwanda, Kenya, Burundi, Tanzania and Uganda.

Morris and Edwards (2008) studied disaster risk and vulnerable population in Jamaica and they pointed out that, children of different ages will not necessarily be subjected to the same vulnerabilities. Very young children are especially vulnerable to health concerns and nutritional deficiencies. It is especially important for school aged children to continue to have access to education. And adolescents' whose lives are disrupted by disaster may be especially vulnerable to violence, abuse, sexual exploitation, teenage pregnancy, HIV/AIDS, and child labour. Even in the United States, children suffered after disastrous Hurricane Katrina: in New Orleans one year after the storm only 29% of schools were opened (Colten, Kate, and Laska 2008).

Socio-economic effects

Olaniran (1983) reported three (3) flooding events in Ilorin in just one decade, causing untold hardships and damages in the town.

Nxumalo (1984) also stated that the South Africa did not only suffer from the effects of the world economic recession but also economic stagnation due to the effects of natural hazards such as floods since government had to divert funds to deal with the impact of floods.

Du Plessis (1988) stated that in South Africa, the farming sector had been particularly hit by the successive floods of 1983, 1984 and 1985. Various farming products had to be imported to supply the domestic market. Further, grazing capacity had been reduced that some stock had

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to be thinned until only the studs remained. The outcome had been that in certain areas, farmers obtained no income and inexorably built up debt. The shrinking income of farmers had meant that they had invested less in farming implements, reduced their sowing and purchased less fertilizer. This in turn had led to the over production of certain farming requisites and chemicals which had necessitated rationalization in those industries.

Parker (2000) observed that in many African countries, floods create great natural threats to life, health and population. The exposure and vulnerability of human settlements and activities to floods is partly explained by the important role which flood plains play in African Societies and economics, and partly by the condition of societies and the resilience they are able to present in the face of disaster.

Previous studies also reported that communications and traffic are interrupted while many land areas are inundated, and industrial plants and commercial establishment are paralyzed during floods. Besides, untold hardship is experienced, especially by the most vulnerable groups (women and school children) whenever there is flood disaster in Lagos (Folorunsho and Awosika 2001).

Dixit (2003) stated that in Southern Nepal, flooding leads to large scale disruption of social and economic lives. The rivers bring large sediments whose deposition on agricultural lands harms productivity.

According to Lind,Mahesh, and Nathwani, (2008), the loss incase of flooding has many dimensions. In addition to economic loss and loss of life and injury, there may be irreversible loss of land, of historical or cultural valuables and loss of nature or ecological valuables.

Olayinka et al (2012) stated that some of the direct impacts of flood events include human casualties, physical damages to buildings, bridges, cars and other structures, economic breakdown that led to hardship due to investment lost, rebuilding cost of damages and impact on agriculture such as poultry farms, farmland and products.

Nwilo (2013) stated that recently, flood disasters of various magnitudes occurred in different parts of Nigeria causing catastrophic destruction of human lives, public and private infrastructures include road bridges, houses and farm lands. It threatened national security; submergence; shore line encroachments and erosion of coastal areas; reduction in national revenue from oil sector as well as impacting on the government's poverty reduction programme.

GAPS IN LITERATURE

Amongst other gaps the few that will be filled by this work includes;

1. None of the works did a study of the Aguleri and Umuleri flood incident of 2012, even when it was a national issue in 2012.

2. There are many effects of flood, none of the works reviewed was able to establish the actual effects of the 2012 flooding in the two communities in Anambra State of Nigeria and compare to know whether or not they flooding incidents had the same effects or different effects on the two communities as this is very essential in handling the problems of the affected communities and planning control measures.

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METHODOLOGY

Survey design was used to derive information used for the study. Questionnaire method was employed in collecting information on the causes of flooding in Aguleri and Umuleri, the effects of flood on social and economic activities, and impacts of flood on the residents of Aguleri and Umuleri. This methodology was chosen because the data needed for study assessed the population sample size affected by the flood. The population of Aguleri and Umuleri was collected from the national population commission and projected to 2013 and the sample size was determined using YaroYamine's formula.

Population Projection and Sample Size Determination

Population projection $Pn = P_o (1+r)^n$

Where Pn = Projected Population

P_o = Base year population

r = estimated annual growth rate of the entire population obtained from the National population commission

n = time lapse (in years)

Aguleri

$Pn = 9,160 (1 + 0.032)^{22}$

$Pn = 9,160 \times (1.032)^{22}$

$Pn = 18,317$

Umuleri

$Pn = 10,721 (1 + 0.032)^{22}$

$Pn = 10,721 \times (1.032)^{22}$

$Pn = 21,438$

The sample size determination using YaroYamine's Formula

$$S = \frac{N}{1 + N(e)^2}$$

Where:

S = Sample size

e = Margin of error assumed (0.05)

1 = theoretical constant

N = No of populations

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No of population for Aguleri – 18,317

No of population for Umuleri – 24,438

Source (NPC, 2006)

Sample size for both communities

$$S = \frac{N}{1 + N(e)^2}$$

$$S = \frac{39755}{1+39755(0.05)^2} \quad S = \frac{39755}{100.3875} \quad S = 396.02$$

Table 1: Sample Size Distribution of Questionnaire

Communities	Number of questionnaires distributed	Number of questionnaires returned	Percentage returned rate (%)
Aguleri	200	185	50.8
Umuleri	200	179	49.2
Total	400	364	100.0

Source: Author's Computation from Field work (2013)

From the table above, the number of questionnaire distributed and the percentage returned is shown.

RESULTS AND DISCUSSIONS

The discussions were approached from two ways: firstly, the discussions of the causes of 2012 flood in Aguleri and Umuleri and the various environmental effects of the 2012 flood as shown in the tables 3, 4, 5, 6, 7 below, and discussions based on the statistical analyses made.

Table 3: Percentage Response on Health Effects of 2012 Floods in Aguleri and Umuleri

S/N	Issues Raised	Frequency	Percentage
1.	**Any health problem as a result of the flood?**		
	Yes No	296 68	81.3 18.7
2.	**What type of health problem?**		
	Cholera Typhoid Hepatitis Diarrhea Dysentery Skin infection Others	12 38 22 48 52 124 68	3.3 10.4 6.0 13.2 14.3 34.1 18.7
3.	**Did you lose anyone as a result of the flood?**		
	Yes No	0 364	0 100

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4.	**How did you feel after the flood incident?**		
	Depressed Happy Angry Frustrated	107 0 132 125	29.4 0 36.3 34.3

Source: Author's Computation from Field work (2013)

From the table above, both communities were of conclusive agreement that there were no serious cases of sicknesses and diseases as people were sheltered in Fr. Joseph Memorial High School Aguleri and General Hospital Umuleri and immediate aid and treatment were rendered to them. They suffered mostly skin infection as a result of drinking and use of the polluted water but were treated immediately.Also, there were no reports of deaths in both communities as people were rescued immediately from the flood devastated areas. As a result of 2012 floods, the people affected in these communities were depressed and frustrated as their means of livelihood and household properties were drained by the flood.

Table 4: Percentage Responses on Personal Effects of 2012 Floods in Aguleri and Umuleri

S/N	Issues Raised	Frequency	Percent
1.	Were you displaced from your home?		
	Yes No	209 155	57.4 42.6
2.	Were you attacked by animals during the flood?		
	Yes No	198 166	54.4 45.6
3.	Did you lose any of your properties?		
	Yes No	236 128	64.8 35.2
4.	Did you lose any relatives?		
	Yes No	0 364	0 100
5.	Did the flood affect your children's education		
	Yes No	286 78	78.6 21.4
6.	Did the flood disrupt your personal programs/project?		
	Yes No	266 98	73.1 26.9

Source: Author's Computation from Field work (2013)

From the table above, the two communities agreed that the 2012 flood has caused several personal effects on the indigenes such as displacement of people from their homes, loss of personal activities and attack from animals with the following percentages of 57.4%, 64.8%, and 54.4% respectively.Also, both communities were of strong opinion that the 2012 flood disrupted the children's education as schools were shut down temporarily in the towns in order to provide shelter for the affected victims in the towns. The on-going projects/programs in the two communities were disrupted as they are flooded and cannot be continued.Furthermore, the two communities totally disagreed on losing any of their relatives but they agreed that animals especially reptiles were washed into their houses during the flood.

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Table 5: Percentage Response on Social Effects of 2012 Floods in Aguleri and Umuleri

S/N	Issues raised	SD		D		U		A		SA	
		F	%	F	%	F	%	F	%	F	%
1.	Traffic congestion	75	20.6	85	23.3	61	16.8	91	25.0	52	14.3
2.	Migration of people	17	4.7	25	6.9	47	12.9	213	58.5	62	17.0
3.	Increase in social vices	18	4.9	51	14.0	206	56.6	68	18.7	21	5.8
4.	Destruction of social infrastructures	12	3.3	29	7.9	60	16.5	174	47.8	89	24.5
5.	Impairment of communication	35	9.6	84	23.0	76	20.9	112	30.8	57	15.7
6.	Overcrowding of people in one place	17	4.7	61	16.8	43	11.8	164	45.0	79	21.7
7.	Loss of privacy	10	2.7	69	19.0	48	13.2	195	53.6	42	11.5

Source: Author's Computation from Field work (2013)

From the table above, the two communities were of divergent opinion on whether the 2012 flood caused increase in crime rate and traffic congestion. They both agreed that the 2012 flood caused migration of people as people were displaced from their homes, overcrowding of people because of the common shelter camps provided for the affected persons, impairment of communication, destruction of infrastructures and loss of privacy with the percentages 75.5%, 66.7%, 46.5, 72.3%, and 65.1% respectively.

Table 6: Percentage Response on Economic Effects of 2012 Floods in Aguleri and Umuleri

S/N	Issues Raised	SD		D		U		A		SA	
		F	%	F	%	F	%	F	%	F	%
1.	Loss of farmland	16	4.4	24	6.6	17	4.7	264	72.5	43	11.8
2.	Loss of farm produce	0	0	5	1.4	22	6.0	297	81.6	40	11.0
3.	Loss of income (fiscal cash)	16	4.4	17	4.7	12	3.3	288	79.1	31	8.5
4.	Increase in price of goods and services	2	0.6	11	3.0	15	4.1	302	83.0	34	9.3
5.	Submerging of agricultural land	11	3.0	27	7.4	20	5.5	267	73.4	39	10.7
6.	Loss of domestic animals	16	4.4	42	11.5	68	18.7	185	50.8	53	14.6
7.	Expenses on the government	19	5.3	51	14.0	86	23.6	182	50.0	26	7.1
8.	Loss of structural properties	7	1.9	22	6.0	19	5.3	291	79.9	25	6.9
9.	Loss of household properties	4	1.1	13	3.6	14	3.8	317	87.1	16	4.4

Source: Author's Computation from Field work (2013)

From the frequency/percentage table above, both communities were of comprehensive agreement that the 2012 caused loss of farmland, loss of income, loss of household properties, submerging of agricultural land, loss of domestic animalsand loss of structural properties with the following percentages 84.3%, 87.6%, 91.5%, 84.1%, 65.4% and 86.8% respectively.There is divergence opinion between the two communities on whether the 2012 flood has attracted expenses on the government as most of the reliefs they received were from individuals and non-governmental organizations.Also, both communities were of strong opinion that the 2012 flood caused loss of farm produce and increase in price of goods and services with 92.6% and 92.3% as response percentages.

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Table 7: Percentage Response on Post Effects of 2012 Floods in Aguleri and Umuleri

S/N	Issues Raised	SD		D		U		A		SA	
		F	%	F	%	F	%	F	%	F	%
1.	The crime rate increased in the area after the flood	35	9.6	84	23.0	76	20.9	112	30.8	57	15.7
2.	There is increase in the scarcity of food	12	3.3	29	7.9	60	16.5	174	47.8	89	24.5
3.	Many people were able to recover their lost properties	18	4.9	51	14.0	206	56.6	68	18.7	21	5.8
4.	There has been an increase in the rate of poverty as a result of the flood	14	3.9	13	3.6	14	3.9	307	84.3	16	4.3
5.	Some houses were totally washed away and destroyed	17	4.7	25	6.9	47	12.9	213	58.5	62	17.0
6.	Some houses were recovered after the flood	12	3.3	11	3.0	15	4.2	292	80.2	34	9.3

Source: Author's Computation from Field work (2013)

From the above table, both communities strongly agreed that the 2012 flood has exposed its indigenes to the problem of scarcity of food and an increase in the rate of poverty. This can be seen from the frequency/percentage of 72.3% and 88.6% respectively.Also, both communities agreed that some houses were totally washed away especially those built with mud and also some house were recovered after the flood event while some that collapsed are under reconstruction. There was serious problem of scarcity of food as farmland were totally submerged and farm produce washed away and this caused a serious increase in the rate of poverty as farmers couldn't harvest and sell their farm produce.Furthermore, they were of the opinion that people were able to recover their properties after the flood and they negatively responded on the increase in crime rate being as a result of 2012 flood.

Discussions on Statistical Analyses

In order to further the findings made, the data generated were subjected to statistical analyses to test the hypothesis earlier postulated as:

Hypothesis 1

Ho: There is no significant difference between the environmental effects of 2012 floods in the two communities.

Hypothesis 2 was tested using Mann-Whitney U-Test and independent samples T-test. The Mann-Whitney U-Test was used to compare the health, social, economic, and post effects of the 2012 floods in the two communities while the independent samples T-test was used to compare the personal effects of the 2012 floods in the two communities, this is because the personal effects data was the only data that has normal distribution. The results are shown in the tables below.

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Table 8: Mann-Whitney Testfor Heath effects of flood

Ranks

	Towns for health effects	N	Mean Rank	Sum of Ranks
Frequency for health effects	Aguleri	15	15.80	237.00
	Umuleri	15	15.20	228.00
	Total	30		

Test Statistics

	Frequency for health effects
Mann-Whitney U	108.000
Wilcoxon W	228.000
Z	-.187
Asymp. Sig. (2-tailed)	.852
Exact Sig. [2*(1-tailed Sig.)]	.870[a]

Source: Author's Computation from Field work (2013)

Also, from the table of Mann – Whitney test for Heath effects, the p – value is 0.870, we accept the null hypothesis and conclude that there is no significant difference in the Health effects of 2012 floods in Aguleri and Umuleri. From the above, it can be concluded that both communities agreed that the 2012 floods has affected their health and well-being. They were of the opinion that the 2012 flood has cholera, dysentery, skin infection, Typhoid, diarrhea and has also led to depression and frustration of people severely affected.

Table 9: Mann-Whitney Test for Social Effects of flood

Ranks

	Towns for Social effects	N	Mean Rank	Sum of Ranks
Frequency for Social Effects	Aguleri	35	35.27	1234.50
	Umuleri	35	35.73	1250.50
	Total	70		

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Test Statistics

	Frequency for Social Effects
Mann-Whitney U	604.500
Wilcoxon W	1234.500
Z	-.094
Asymp. Sig. (2-tailed)	.925

Source: Author's Computation from Field work (2013)

Also, from the table of Mann – Whitney test for Social Effects, the p – value is 0.925, we accept the null hypothesis and conclude that there is no significant difference in the Social Effects of 2012 floods in Aguleri and Umuleri. From the above, it can be concluded that both communities agreed that the 2012 flood has severely affected their social lives. They were of the opinion that the 2012 flood caused migration of people, increase in social vices, traffic congestion, impairment of communication, overcrowding in shelter camps and loss of privacy.

Table 10: Mann-Whitney Test for economic Effects of flood

Ranks

	Towns for economic effects	N	Mean Rank	Sum of Ranks
Frequency for economic Effects	Aguleri	45	44.59	2006.50
	Umuleri	45	46.41	2088.50
	Total	90		

Test Statistics

	Frequency for economic Effects
Mann-Whitney U	971.500
Wilcoxon W	2006.500
Z	-.331
Asymp. Sig. (2-tailed)	.741

Source: Author's Computation from Field work (2013)

Also, from the table of Mann – Whitney test for economic Effects, the p – value is 0.741, we accept the null hypothesis and conclude that there is no significant difference in the economic effects of 2012 floods in Aguleri and Umuleri. From the above, majority of the respondents in both communities agreed that the 2012 floods has disrupted economic activities. They firmly agreed that the 2012 flood caused loss of farmland, loss of farm produce, loss of income, loss of household properties, submerging of agricultural land, loss of domestic animals, and increase in price of goods and services and expenses on the government

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Table 11: Mann-Whitney Test for post effect of flood

Ranks

	Towns for post effects	N	Mean Rank	Sum of Ranks
Frequency for post effect	Aguleri	30	31.40	942.00
	Umuleri	30	29.60	888.00
	Total	60		

Test Statistics

	Frequency for post effect
Mann-Whitney U	423.000
Wilcoxon W	888.000
Z	-.400
Asymp. Sig. (2-tailed)	.690

Source: Author's Computation from Field work (2013)

Also, from the table of Mann – Whitney test for Post Effects, the p – value is 0.690, we accept the null hypothesis and conclude that there is no significant difference in the Post Effects of 2012 floods in Aguleri and Umuleri. From the above, majority of the residents in the two communities agreed that the 2012 flood destroyed houses especially those constructed with muds and people lost their household properties. They also agreed that some houses and properties were recovered after the flood and there was no report on any life being lost.

Table 12: T-Test for Personal effect of flood

Group Statistics

	Towns for personal effects	N	Mean	Std. Deviation	Std. Error Mean
Frequency for personal effects	Aguleri	12	92.5000	50.63865	14.61812
	Umuleri	12	89.5000	49.27382	14.22413

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Independent Samples Test for personal effects of flood

Dependent variables	Assumptions	Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Frequency for personal effects	Equal variances assumed	.005	.945	.147	22	.884	3.00000	20.39645	-39.29965	45.29965
	Equal variances not assumed			.147	21.984	.884	3.00000	20.39645	-39.30148	45.30148

Source: Author's Computation from Field work (2013)

Then for the independent samples T – test for the personal effects, we assume equal variances using the Levene's test (the p – value for the Levene's test is 0.945 which is more than 0.05).

The final conclusion is that no significant difference in the personal effects of the 2012 flood in both communities. The p – value that confirmed this is 0.884 which is greater than 0.05 when equal variances were assumed. This shows that both communities agreed the 2012 flood disrupted their programs/projects, children's education were affected as schools were shut down to be used as shelter resettlement camps. They also agreed on being displaced from their homes and lost some of their properties to the flood but they didn't agree on losing any of their relatives.

This research has dealt with analysis of issues pertaining to the effects of 2012 flood on the communities of Aguleri and Umuleri. The results of the hypothesis test discussed above detailed the adverse environmental effects on the host communities.

ENVIRONMENTAL EFFECTS OF 2012 FLOOD ON THE PEOPLE

Flooding affected homes leading to displacement of inhabitants as a result of collapse and submergence of buildings. Most times, lives are being lost as people are carried by flood waters into water bodies such as rivers and lakes, most people are drowned in flood water in their various houses. The washing of waste and chemicals into water bodies introduces pathogens and viruses causing diseases in these waters where majority of the people especially rural inhabitants gets through drinking water and other domestic water sources. Diseases ranging from typhoid, cholera, dysentery, skin infection and so on can be contracted from ingesting these unwholesome waters. Most of these diseases if not detected early can lead to death.

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The economic stress (budget on repair and reconstruction of damaged structures) acquired by the government due to the loss and destruction of property and structures is also an effect of flooding. The water logging of commercial farmlands lead to reduction of food supply or food shortages in the country and lack of income to the farmers affected, also the funds incurred on hospital and feeding of refugees in camps and government owned shelters and schools shut down to be used as camps are an economic stress laid on the government.

Increased displacement of people as a result of flooding affects people psychologically that is depression and frustration, this leads to high crime rates, prostitution and other social vices due to the homelessness and the survival of people who tend to engage in various illegal means to make ends meet. Most people, who lost their job and places of businesses with lots of mouth to feed, go into robbery as a means of sustenance. Also the overcrowding of these government shelter camps also tends to make people move about and commit crimes to survive.

Houses especially those constructed with mud were totally washed away and people lost their personal and household properties and those constructed with blocks were recovered after the flood has reduced. The benefits of the flood such as increase in nutrients on the farmlands are yet to be witnessed by the farmers of the area as this research was not done during harvest time.

CONCLUSION

From the work done, the following conclusions are drawn

- That flood has impacted on both social and economic activities in Aguleri and Umuleri in a number of ways including displacement of families, migration of people, poor health condition, traffic congestion, impairment of communication, loss of farmlands, loss of income, loss of household and structural properties, increase in the price of goods and services, destruction of social infrastructure.

- That there are not much significant differences between the social, health, personal, post and economic effects of 2012 flood in Aguleri and Umuleri.

- That flood is a manifestation of climate change, reducing greenhouse gas emission is essential to avoiding the worst parts of climate change, because mitigating alone is not enough. It is instructive to note that adaptation planning can limit the damage caused by climate change, as well as the long-term costs of responding to climate-induced flooding that are expected to increase rapidly in level in the decades to come. Adapting to the impacts of climate change is vital if we are to manage the risks of flooding. We can't ignore the consequences which is why we need to start adapting now.

RECOMMENDATIONS

- Flood Hazard Mapping: To reduce and manage properly the adverse consequences of flood in the country, there should be immediate Flood Hazard Mapping of the affected areas using best practiced modern technologies.
- Regular removal of constrictions along the river channels and water channel maintenance plan.
- Dredging is recommended along river channels in some areas to widen it up and give the channel the ability to contain excess water.

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- Construction of more dams in the country could also go a long way as a control measure. The federal government needs to act quickly to provide a permanent solution to flood problem. The plan to construct buffer dams between the Nigerian and Cameroonian borders as the solution should now be put in place.
- Capacity building to integrate climate change and its impacts into urban development planning involving local communities, raising public awareness and education on climate change and enabling representation at international meetings.
- Enforcement of extant city and building regulations,Authorities responsible for town planning should be more alert to their duties if meaningful and long-lasting solutions are to be found. Development control agencies and other governmental departments responsible for allocation of land for building purposes should ensure that such structures are not erected on water ways or areas that are prone to floods. Those who violate such regulations should be appropriately sanctioned no matter how highly placed to deter others from doing the same.
- Enlightenment campaigns are important to put an end to the habit of dumping refuse in drainages. Relevant government agencies in collaboration with non-governmental organizations should educate people both in rural and urban areas about the dangers inherent in blocking water ways. Community leaders and association, including the media should be involved in this sensitization campaign. More of such education should be done at primary and secondary schools. The National Orientation Agency (NOA) has a vital role to play in facilitating the success of the programme.
- Changes in water and land-use management policies: Devising land-tenure markets, appropriate town planning, and encouraging use of water ways for higher values such as transportation.
- The authorities in areas where people have been displaced by flooding should endeavor to ameliorate their suffering. Adequate relief materials should be provided to enhance the well-being of particularly children exposed to the harsh weather conditions in open camps. If need be, efforts should be made to resettle them elsewhere. Relief should not be limited to providing mattresses and blankets and food items, as the National Emergency Management Agency (NEMA) does when disasters strike, but should encompass measures to ensure that such occurrences have minimal impacts on people and the environment.
- There is a great need for agro forestry and green belt development in flood prone areas that is agricultural practices such as the planting of trees to retain extra water.
- Environment policy reforms, changes in urban and housing design, removal of laws that can inadvertently increase flood vulnerability.
- Appropriate infrastructure investments, build-up of unblocked drainage patterns, flood defenses, increasing investment; improved health care through flood shelters and assistance shelters as part of community emergency preparedness programs.

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