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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 environmental 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. Independent samples T-Test and Mann-Whitney U-Test statistical techniques were used due to the nature of the data generated. The following hypotheses were tested; namely: (1) there is no significant difference between the causative factors of 2012 floods in the two communities and (2) 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 causes and health, personal, social, economic and post effects of 2012 flood in the two communities. In addition, the result also proved that anthropogenic activities induced the 2012 flood in the community. 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: Environmental Effects, Floods , Aguleri, Umuleri, Anambra, Nigeria

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

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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, 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

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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.

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 identify the causes of 2012 floods in the area.
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.
4. To determine the mitigation measures applied to remediate the effects in the study area.

Research hypothesis

This work tested the following hypothesis:

Ho: There is no significant difference between the causative factors of 2012 floods in Aguleri and Umuleri.

Ho: There is no significant difference between the environmental effects of 2012 floods in Aguleri and Umuleri.

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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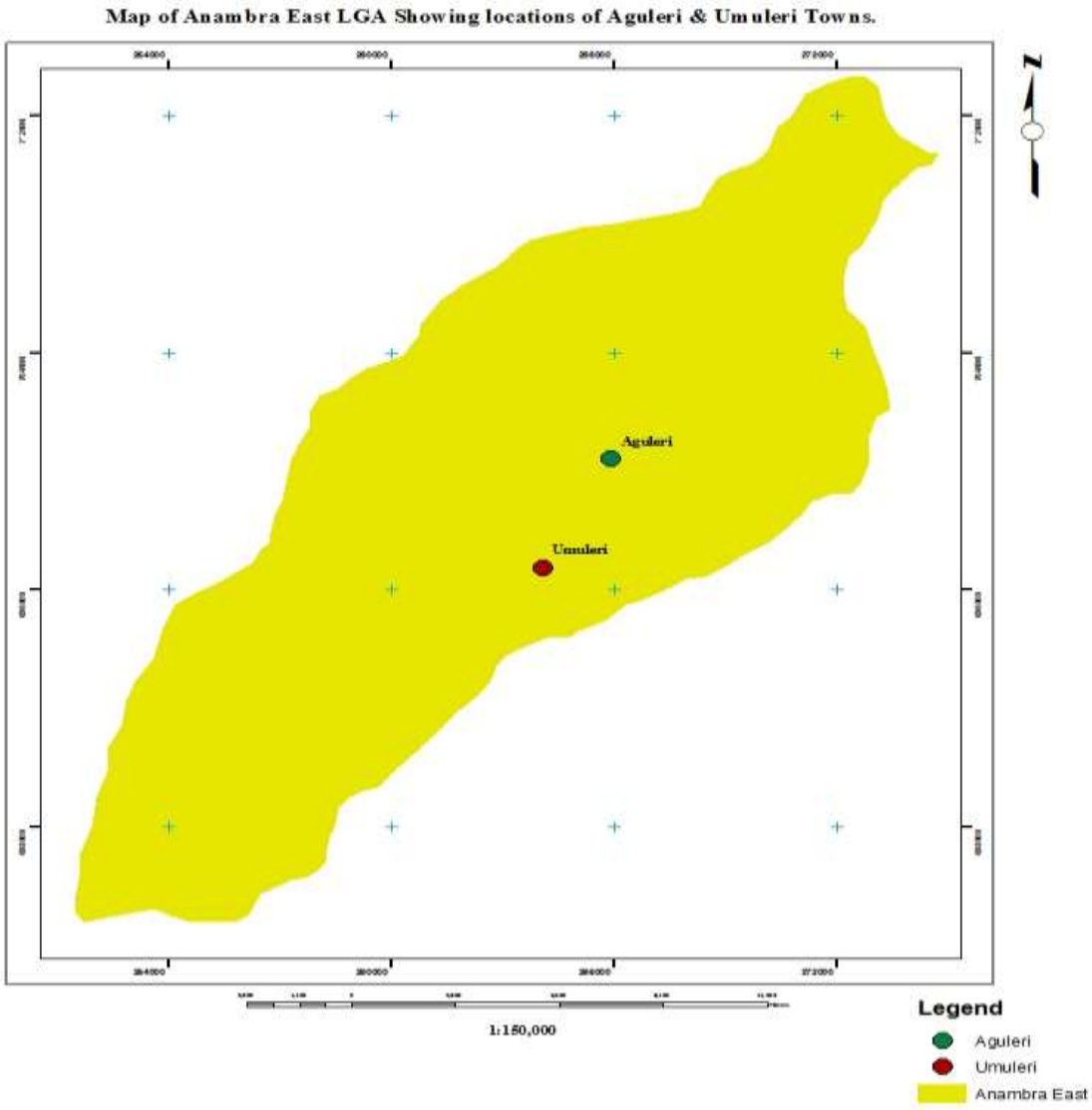

Fig 1.2 Map of Anambra East Local Government Area showing Aguleri and Umuleri

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

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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 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;

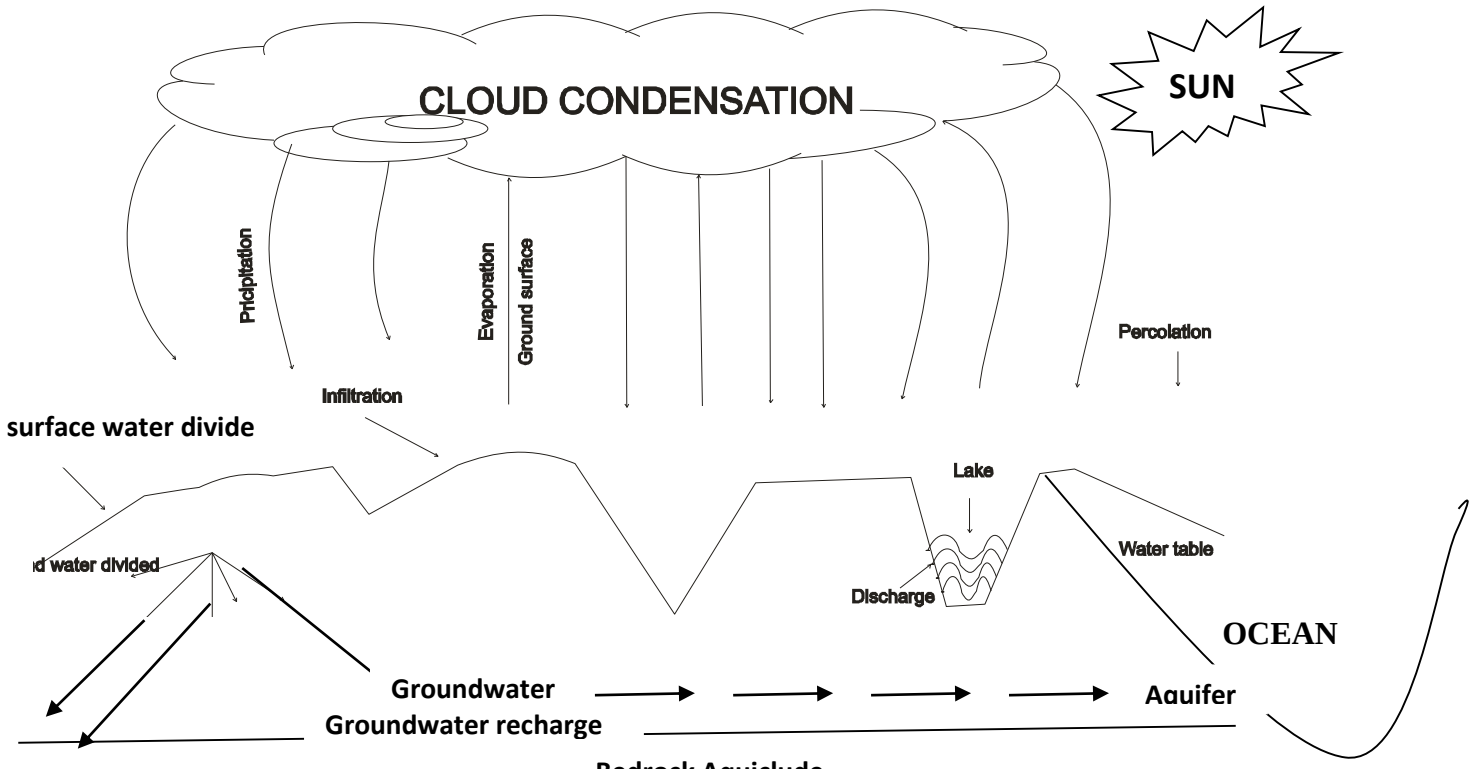

Fig.1.3: The Hydrologic cycle
Source: Egboka et al (1989)

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.

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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

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

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

$Pn = 21{,}438$

1) 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

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.

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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 2, 3, 4, 5, 6, 7 below, and discussions based on the statistical analyses made.

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Table 2: Percentage Response on Causes of 2012 Floods in Aguleri and Umuleri

S/N	1ssues raised	SD		D		U		A		SA	
		F	%	F	%	F	%	F	%	F	%
1.	Damage of pipe-borne water	64	17.6	140	38.5	85	23.4	42	11.5	33	9.9
2.	Drainage failure	54	14.9	62	17.0	115	31.6	75	20.6	58	15.9
3.	Heavy rainfall	18	4.9	37	10.2	47	12.9	206	56.6	56	15.4
4.	Increase in development	29	8.0	43	11.8	78	21.4	128	35.2	86	23.6
5.	Blockage of flood channels through erection of structures	22	6.0	34	9.3	76	20.9	167	45.9	65	17.9
6.	Overgrazing and agricultural activities	32	8.8	45	12.4	53	14.6	148	40.6	86	23.6
7.	Over population	28	7.7	44	12.1	92	25.3	125	34.3	75	20.6
8.	Bush burning	36	9.9	52	14.3	43	11.8	137	37.6	96	26.4

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

From the table above, there was a concurrence of the fact stated in the frequency/percentage tables of each of the communities. The respondents generally agreed that heavy rainfall, increase in development as a result of over population, blockage of drainage channels through erection of structures with the following percentages 72%, 58.8%, 54.9%, 63.8% respectively.Also, the communities agreed on bush burning being a cause with percentage of 64% as a causative factor

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of 2012 flood as the land was rendered bare by the burning. Rainfall intensity increased over the years causing flood events in different areas and Aguleri and Umuleri experienced it in 2012.Furthermore, both communities were of divergent opinion of drainage failure and damage of pipe – borne water as a causative factor of the 2012 flood in the towns.

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	296	81.3
	No	68	18.7
2.	**What type of health problem?**		
	Cholera	12	3.3
	Typhoid	38	10.4
	Hepatitis	22	6.0
	Diarrhea	48	13.2
	Dysentery	52	14.3
	Skin infection	124	34.1
	Others	68	18.7
3.	**Did you lose anyone as a result of the flood?**		
	Yes	0	0
	No	364	100
4.	**How did you feel after the flood incident?**		
	Depressed	107	29.4
	Happy	0	0
	Angry	132	36.3
	Frustrated	125	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.

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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.

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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.

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DISCUSSIONS ON STATISTICAL ANALYSES

In order to further the findings made, the data generated were subjected to statistical analysis. In doing this, the Mann-Whitney U-test and Independent samples T-test was used to test the hypothesis postulated. From the calculations made, considering that the calculated values which are----------are greater than the tabulated, which is 0.05, it shows that there is no significant difference between the causative factors of the 2012 flood and that there are no significant differences in the environmental effects of the 2012 flood in two communities

CONCLUSION

From the work done, the following conclusions are drawn

- That anthropogenic activity like construction on flood plains, deforestation, bush burning, drainage failure, over grazing and agricultural activities, over population and urbanization trigger and aggravate flood activities in both Aguleri and Umuleri towns in Nigeria.
- 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 causes of 2012 flood in Aguleri and Umuleri.
- 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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REFERENCES

Abowei, J.F.N. and Sikoki, F.D. (2005) Water Pollution Management & Control, Double Trust Publications Co., Port Harcourt, Pp.236

Bariweni, P.A., Tawari,C.C.andAbowei,J.F.N.(2012). "Some EnvironmentalEffects of Flooding in the Niger Delta Region of Nigeria".***InternationalJournal of Fisheries and Aquatic Sciences,*** Vol.1, No.1,Pp. 35-46.

Adelye, A. andRustum, R.(2011). "*Lagos,(Nigeria) flooding and influence of urban planning"*. ***Journal of Urban Design and Planning***,Vol. 164, No.3,Pp. 175-187

Bradshaw, C.J., Sodhi,N.S.,Peh,S.H.andBrook,B.W.,(2007). "*Global evidence thatdeforestation amplifies flood risk and severity in the developing world"*.GlobalChangeBiology, Vol. 13, Pp.2379-2395

Center for Education and Career Innovation(CECI),(2004). "*Capacity building for adaptation to Climate Change"*.Vulnerability assessment report, Hue.

Christie, F., and Hanlon, J., (2001). "*Mozambique & the great flood of 2000"*The International African Institute, Oxford

Coltn, C.E., Kate, R.W., &Laska, S.B., (2008). "*Three years after Katrina: Lessons forcommunity resilience"*. EnvironmentMagazine, *Vol.*50, No.5

Crossman, M.,Richardson, D., and Milne, J.,(2006). Proceedings of the Civil Engineers."*A partnership approach to Managing FloodRisk*".***Civil Engineering Journal***, Vol. 159 No.2, Pp.41-45.

Du Plessis, B. (1988). "*Drought, Floods a Major Setback*". The Citizen. 17 March, 2011

Durotoye, B. (2000)."*Geo-Environmental Constraint in the Development of the Niger Delta Areaof Nigeria"*.(Akinjide,Oshuntokun" Eds. – Environmental Problems of the NigerDelta. Fredrick Ebert Foundation, Lagos.

Ezirim, G. E. (2010). *"Climate Change and National Security: Exploringthe Conceptual andEmpirical Connections in Nigeria*". ***Journal of Sustainable Development in Africa.***Vol. 12, No. 4.

ISSN 2053-4108(Print), ISSN 2053-4116(Online)

Etuonovbe, A.K. (2011). "*The devastating Effect of Flooding in Nigeria*". Paper presented at the FIG Working Week, Marrakech, Morocco 18-22 May, 2011.

Folorunsho, R., and Awosika,L., (2001). "*Flood Mitigation in Lagos, Nigeria throughWiseManagement of Solid Waste: a case of Ikoyi and Victoria Islands*". Nigerian-Paper presented at the UNESCO-CSI workshop, Maputo 19-23 November 2001

Gupta A. (2003). "*Flood and floodplain management in North East India: An ecologicalperspective"*. Proceedings, 1stInternational Conference on Hydrology and Water Resources in Asia Pacific Region, Vol. 1, Pp. 231-236.

Hill, A.R., (1976). *The environmental impacts ofagricultural land drainage*.***Journal ofEnvironmental Management***. Vol.4, Pp.251-27

Huq, S., Kovats, S., Reid, H. and Satterth-waitte, D. (2007). Editorial: "*Reducing Risks to Citiesfrom Disasters and Climate Change*", Environment and Urbanization, Vol. 19, No1, Pp. 3-15.

Jimoh,H. I.andAlao,L. I. (2009).***Pakistan Journal of Social Sciences***Vol. 6, No 1, Pp. 19-25

Lind, N., Mahesh, P. and Nathwani, J. (2008). "*Structural Safety: Assessment and AffordingtheControl of Flood Risk"*. ***Journal***Vol.31, No.2, Pp.143-147.

Manuta, J. and Lebel, L (2005) "*Climate change and the risks of flood disasters in Asia: crafting adaptive and just institutions" Human Security and Climate Change"*. An International Workshop organised by Global Environment and Security project (GECHS), near Oslo, 21–23 June 2005

Ministry of Environment, (2006)."*Land Forms in Anambra State*".Vol. 17.Anambra State

Mohapatra, K.P. and Singh, D.R. (2003)."*Flood Management in India"*.***Journal,***Vol. 28, Pp. 131-143

Morris, K.N. & Edwards, M.T. (2008)."*Disaster risk reduction and vulnerable populations in Jamaica: Protecting children within the comprehensive disaster management framework"*. Children, Youth and Environments.Vol. 18 No. 1, Pp. 389-407.

National Population Commission(NPC), (2006). "*The Nigerian national population censusresults".*

ISSN 2053-4108(Print), ISSN 2053-4116(Online)

Nott, J. (2006). "*Extreme Events: A Physical Reconstruction and Risk Assessment"*.
Cambridge University Press. New York.

Nxumalo, S. (1984). "*Economy takes Battering on Swaziland*". Rand Daily Mail, Vol.2, 27 February

Nwilo, P.C. (2013). "*Geospatial Information in Flooding and Disaster Management inNigeria"*.7th Annual lecture of Faculty of Environmental Sciences, NnamdiAzikiwe University, *Awka*. June, 6, 2013.

Olaniran,J. O. (1983).***Journal of Geography,***Vol.7 No.3, Pp. 271-277

Parker,J.D. (2000). "*Floods"*.Tangler and Francis, National Academy Press, Asian Disaster Preparedness Centre, Thailand

Powell, W.G., (2009). "*Identifying Land Use/Land Cover (LULC) Using National Agriculture Imagery Program (NAIP) Data as a Hydrologic Model Input for Local Flood PlainManagement*". Applied Research Project, Texas State University-San Marcos, and Retrieved from: http://ecommons.txstate.edu/arp/296/

Rosenberg, D.M. and Snor, N.B.(1975). "*Ecological Studies of Aquatic Organisms in the Mackenzie and Procupine, River Drainages in Relation to Sedimentation"*, Environment Canada, Fisheries and Marine Service Technological Report No. 547, Pp.86

SabineLandau and Brian S. Everitt, (2004)."*A Handbook of Statistical AnalysisUsing SPSS*".
A CRC press company Boca Raton New York Washington, D.C.Pp.40-42.

Sinclair, S. and Pegram, G. 2003. "*A Flood Now-casting System for the eThekwini Metro"*.:*Urgent Now-casting using Radar-An Integrated Pilot Study*". Water ResearchCommission (WCR).Silowa Printers, South Africa, Vol.

Smith, K.and Ward, R.(1998). "*Floods*:*Physical processes and Human Impacts"*.John Wiley and son, England

Snoussi, M., Ouchani, T. and Niazi, S. (2008)."*Vulnerability Assessment of the Impact of sea-level rise and flooding on the Moroccan coast: The case of the Mediterranean East Zone"*. ***Journal***.Vol.77, No. 2, Pp.206-213.

ISSN 2053-4108(Print), ISSN 2053-4116(Online)

Thompson, M.T., (1964). "*Historical Floods in New England"*. Geological Survey Water-Supply Paper 1779-M, United States Government Printing Office, Washington, D.C.

Uchegbu, S. N. (2002). Issues in Environmental Management(second edition). Spot lite Publishers, Enugu

United States Environmental Protection Agency (USEPA), (2002). "*Water Quality Monitoring forCoffeeCreek (Porter County, Indiana"*.RetrievedFrom: http/www.usepa/research.htm.modecode = 62-28-00-00, (Accessed on: September 29, 2006)

Welch, H.E.,Symons, P.E.K. and Narver,D.W. (1977). "*Some Effects of Potato Farming andForest Clear Cutting on New Brunswick Streams, Fisheries andMarine Service"*. Environment Canada Technical Report, No. 745, St. Andrew's New Brunswick.

ISSN 2053-4108(Print), ISSN 2053-4116(Online)