

PROBLEMS OF FLOODING IN IMO STATE, NIGERIA

OSUJI SABINA CHIAKA

DEPARTMENT OF URBAN AND REGIONAL PLANNING IMO STATE UNIVERSITY, OWERRI

IMO STATE, NIGERIA

Abstract

Flooding is a threat to human life and physical infrastructure including residential accommodation, commercial and industrial properties, roads, rail lines, bridges etc. due to the seriousness of the threat posed in Nigeria, the National Policy on Environment (1998) devoted a section of the document to it. Flood has been an old time disaster that had plagued man and his environment in the world at large. In the recent past, most parts of the states in Nigeria had witnessed flood especially during high rainfall frequency and intensity. The aim of this paper is to investigate the natural and human causes responsible for flooding in Imo State, Nigeria. Using questionnaire, the data for the study were analyzed. The results reveal heavy and prolonged rainfall, the houses built on the flood plain were submerged and farmlands were damaged, sitting due to water-borne erosion, resulting to the drains carrying large amounts of sediments which are deposited in the river channels, making the channel beds shallower and thus reducing channel capacity, population pressure and degree of urbanization, etc. The paper recommended sanctions and laws on urban land use to be made effective to protect the stream channels and drainage systems, the relevance and applicability of Sustainable Urban Drainage Systems (SUDS) designed to replicate natural systems that use cost effective solutions with low environmental impact to drain away dirty and surface run-off.

Keywords: Flooding, Problems, National Policy, Flood Management, Sustainable Urban Drainage Systems, Imo State.

Introduction

Flooding is a threat to human life and physical infrastructure including residential accommodation, commercial and industrial properties, roads, rail lines, bridges etc. Due to the seriousness of the threat posed in Nigeria, the National Policy on Environment (1998) devoted a section of the document to it. Flooding is a common environmental hazards common amongst Nigerian urban centers which has resulted in major disaster involving structural and erosional damages, disruption of socio-economic activities, transport, communication, loss of life and property, displacement of people, destruction of agricultural land, contamination of food, water and the environment generally.

Floods are among the most devastating natural disasters in the world, claiming more lives and causing more property damage than everyone would imagine. In Nigeria, though not leading in terms of claiming lives, flood affects and displaces more people than any other disaster; it also causes more damages to properties. At least 20 percent of the population is at risk from one form of flooding or another. More often, sovereign

states and national governments adopt remedial reaction, that is, a post-disaster reaction where relief materials are supplied to the affected victims. (Emeribeole, 2015).

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). 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 (Duru and Chibo, 2010). 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 (Duru and Chibo, 2010).

A common environmental problem in Nigeria is flood and it is said to occur when a body of water moves over and above an area of land which is not normally submerged. It could also be seen as the inundation of an area not normally covered

with water, through a temporary rise in level of stream, river, lake or sea.(Agbonkhese et al 2014). Nelson (2001) viewed flood as a natural consequence of stream flow in a continually changing environment. Sada (1988) defines flooding as unusually high rate of discharging; often leading to inundation of land adjacent to streams, and it is usually caused by intense or prolong rainfall.

Floods occur in Imo State when soil becomes saturated and its infiltration capacity is zero, runoffs cannot be contained in stream channels, natural ponds and constructed reservoirs, and the land surface becomes submerged, sweeping away all its content.

The paper focuses on problems of flooding in Imo State. The aim is to investigate the natural and human causes responsible for flooding in Imo State Nigeria.

Literature Review

Flooding is becoming an increasingly severe and more frequent problem in Nigeria. Unfortunately, the impact is more felt by the urban poor in such a way that recovery is unlikely to be achieved without external aid (Blaikie et al 1994). In order words, urban poor are most vulnerable to impact of flood because they set up homes in the floodplains. According to Action Aid (2006) four types of urban flooding can be recognized:

- a. Localized flooding which occur many times in a year due to few and blocked drains
- b. Small streams in urban areas rising quickly after heavy rains, but often passing through small culverts under roads;
- c. Major rivers flowing through urban areas;
- d. Wet season flooding in lowland and coastal cities.

According to Gwary (2008) and Adeoti (2010), flooding occurs in Nigeria in three main forms which are: river flooding, urban flooding and coastal flooding. The heavy rainfall coupled with bad human activities in relation to the environment and lack of drainage infrastructure in most Nigerian cities has left hundreds of people distressed and homeless. It should be mentioned

that flooding in cities can contaminate water supplies and intensify the spread of epidemic diseases, diarrhea, typhoid, scabies, cholera, malaria and other water-borne diseases.

Human activities such as rapid industrialization and urbanization, population growth, exploitation of natural resources and location of infrastructures exacerbate the occurrence of floods. Causal factors of flood in Nigeria which includes indiscriminate dumping of refuse on channels to channel adjustment and poor drainage conditions have been observed by Agbonkhese et al (2013).

The common and recurrent phenomenon of flooding in Nigeria occurs on a regular perennial basis in some parts of the nation. However, according to NEST (1991) the following geographical areas suffer from the hazard more than others in Nigeria:

- a. Low-lying areas in the Southern parts of the nation where annual rainfall is very heavy.
- b. The Niger Delta Zone
- c. The floodplains of the larger rivers of the Niger, Benue, Taraba, Sokoto, Hadeja, Cross River, Imo, Anambra, Ogun, Kaduna etc.
- d. Flat low-lying areas around and to the south of Lake Chad which may be flooded during, and for a few weeks after the rain.

The Niger Delta zone is subject to two types of flood, the floods of the rainy seasons which are the result of rainfall within Nigeria and especially rainfall in the Delta area itself which ranges from 2000mm to 4000mm per year and is concentrated in few months.

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 10million US dollar were damaged annually. In the United States of America, the Mississippi River caused damages put at several millions of dollars when it overflow its banks, flooding some cities,

towns, farmlands and major industrial installations over a distance of about 250km and ravaging Lowa before it heaped downstream. In May 2008, floods triggered by torrential rains killed dozens of people across China, while thousands of others were victims of landslides caused by the downpours (Christopherson, 1997) and Oyegbile, 2008).

Study Area

Imo State was created in 1976 by the late Military Head of State, General Murtala Muhammed, it has 27 Local Government Areas. The 41 year old

State is located in south eastern geographical zone of Nigeria which comprises of five states. Imo the Igbo Heart Land lies between latitude 5°10'N-6°00'N and longitude 6°40'E-7°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 State, on the West by River State, on the South by Delta State and on the North by Anambra State. Imo State comprises of 3 zones; Orlu, Owerri, and Okigwe zones.

Table 1: Places of Zone

Zones	Frequency	Percentage frequency
Orlu	126	33.2
Owerri	146	38.4
Okigwe	108	28.4
Total	380	100

Source: Field work, 2017

In Table 1, it is observed that Imo State has three zones. 380 copies of questionnaire were distributed to the three zones. Owerri zone had its share of 146 questionnaires copies which accounts for 38.4 percent, Orlu zone had 126 copies which accounts for 33.2 percent and Okigwe zone had 108 which accounts for 28.4 percent.

The area lies with the tropical monsoon (AM) based on Koppen's classification of climate. Mean annual rainfall ranges from 2250mm to 2500mm. The mean monthly

temperature of the area ranges from 28°C to 35°C, while the annual mean monthly minimum air temperature ranges between 19°C and 24°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 is seen in Table 2.

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

Year	Temperature (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

Source: Extracted from Alvanikoku Federal College of Education Metrological Station 2007

Materials and Methods

Data collection

The research covers Imo State which was divided into three senatorial zones and concentrated on six local government areas, from the three senatorial zones. Orlu and Oguta (Orlu zone), Owerri Municipal and Ikeduru, (Owerri zone). Okigwe and IsialaMbano (Okigwe zone). Data for the study were from primary and secondary sources. Survey methods using questionnaire, oral interview, direct observation, official records, private papers, internets, journals, library, textbooks were conducted. The stratified random and systematic sampling techniques were used in selecting data collection. 360 copies of questionnaire were

distributed in selecting data collection. Collected data is presented using frequency tables, and percentages.

To carry out this study, data was based on the following issues;

1. Types of flooding in the area.
2. Natural and human causes of flooding
3. Locations and affected areas by flood
4. Management strategies of flood control in the area.

Data analysis

Descriptive statistics were used in analyzing the data.

Results and Discussion

Table 3: Population of the Study Area

Area	Population		Total
	Males	Females	
Oguta	72,549	69,791	142,230
Orlu	69,632	73,160	142,792
Ikeduru	75,025	74,712	149,737
Owerri	110,009	105,029	215,038
IsialaMbano	100,835	97,086	197,921
Okigwe	272,647	263,118	535,765

Source: (National Population Commission, 2006)

Table 4: Six Local Government Areas Selected in the Three Zones

Area	Frequency	Percentage frequency
Oguta	58	15.3
Orlu	68	17.9
Ikeduru	60	15.8
Owerri	86	22.6
IsialaMbano	48	12.6
Okigwe	60	15.8
Total	360	100

Source: Field work, 2017

380 copies of questionnaires were distributed to the three zones. The questionnaires were distributed to their communities depending on the

zone each belongs. Owerri zone - Owerri Municipal had its share of 86 questionnaires which accounts for 22.6 percent, Ikeduru had 60 copies

which accounts for 15.8 percent. Orlu zone - Oguta had its share of 58 copies of questionnaire which accounts for 15.3 percent, Orlu had 68 copies which accounts for 17.9 percent. Okigwe

zone - IsialaMbano had 48 copies of questionnaire which accounts for 12.6 percent, Okigwe had 60 copies which accounts for 15.8 percent.

Table 5: The Communities Affected by Flood in the LGA

LGA	Comm	Mkts	FarmL	Com/Res	Rd	Schs/Chs	Others	Total
Oguta	Orsuobodo	2	10	3	3	2	—	20
	Opuoma	2	11	3	2	2	—	20
	Eziorsu	1	10	4	2	1	—	18
Orlu	Orlu	6	2	14	5	2	1	30
	Umunna	10	6	4	2	2	2	26
	Ogberuru	2	4	3	2	1	—	12
Owerri	Works Layout	2	8	4	10	2	—	26
	New Owerri	4	2	6	14	3	1	30
	Aladinma/ Okigwe Rd	1	3	4	18	4	—	30
Ikeduru	Akabo	2	4	4	8	2	—	20
	Ekemele	2	5	4	6	3	—	20
	Atta	4	3	3	6	2	2	20
Okigwe	Okigwe	2	4	9	4	1	—	20
	Ihube	2	7	6	2	2	1	20
	Amuro	1	6	8	2	2	1	20
Isialambano	Anara	2	2	4	6	1	—	15
	Amaraku	4	5	3	4	3	1	20
	Okwelle	2	3	4	3	1	—	13
	Total	51	95	90	99	36	9	380
	Percentage	13.4	25	23.7	26	9.5	2.4	100

Source: Field work, 2017

It was observed that some communities in Imo State were flooded. The areas and locations affected by flooding in Imo State are presented in Table 5. From the table 5, it was indicated that New Owerri, Aladinma and Orlu are the most affected communities in the area which indicate 30 respondents or 7.9 percent of the sample

population each, the most affected activity by flood in the area is road (99 respondents or 26 percent) followed by farmland (95 respondent or 25 percent), commercial/residential (90 respondents or 23.7 percent), market (51 respondents or 13.4 percent), schools/churches (36 respondents or 9.5 percent), others (9 respondents or 2.4 percent).

Table 6: Types of Flood Affecting Locations in the Area

Location	Types of Flood				
	Urban	River	Flash	Coastal	Seasonal

Oguta	10	18	12	14	4
Orlu	28	22	12	—	6
Ikeduru	14	12	24		10
Owerri	26	12	34	—	14
IsialaMbano	20	14	8		6
Okigwe	18	20	14	—	8
Total	116	98	104	14	48
Percentage	30.5	25.8	27.4	3.7	12.6

Source: Fieldwork, 2017

Table 6 reveals that the areas have different type and causes of flooding. 30.5 percent of urban centers in Imo State are flooded which has the highest respondents i.e. 116 respondents. Coastal flood is not a major problem in the state as observed in only 1 local government area as indicated by 14 respondents or 3.7 percent of the sample population. This is experienced only in Oguta local government area (Orlu zone) may be as a result of the proximity of the area to the

coast. Flash flooding accounts for 27.4 percent of response (104). River flooding has 98 respondents or 25.8 percent of the respondents. Seasonal flood has 48 respondents or 12.6 percent of the respondents. The flooding of most urban area in the state is as a result of the construction of roads with inadequate drainage system, building of houses on river banks and in flood prone areas.

Table 7: Natural Causes of Flooding in the Area

Variable(Metrological & Hydrological)	Frequency	Percentage Frequency
High intensely/prolong rainfall	216	57
Silting due to accelerated erosion	30	7.8
Fluvial floods	44	11.6
Ocean surges and tidal waves	12	3.2
Low lying topography and poor infiltration	48	12.6
Climate change	30	7.8
Total	380	100

Sources: Field work, 2017

Table 7 reveals that high intensely/prolong rainfall which has the highest respondents which accounts for 57 percent is the major cause of flooding in the area, fluvial floods which accounts

for 11.6 percent, low lying topography and poor infiltration (12.6%). Silting due to accelerated erosion (7.8%), climate change (7.8%) and ocean surges and tidal waves (3.2%).

Table 8: Human Causes of Flood in the Area

Variable(Human Action and Inactions)	Frequency	Percentage Frequency
Increased urbanization with population pressure and slum development	54	14.2
Deficient or improper land use planning	28	7.4
Non-compliance to, and non-enforcement of existing laws	40	10.5
Releasing of water from dams and dam collapse/failure	—	

Dumping of solid waste in natural waterways (resulting to their reduced capacity to retain water) and man-made drains (leading to their blockage)	152	40
Building of houses on river banks and in flood prone areas	32	8.4
Poor-to-no drainage systems	52	13.7
Major pipe bursts	22	5.8
Total	380	100

Source: Field work, 2017

It is observed that dumping of refuse of solid waste in natural waterways which accounts for 40% is the major human cause of area. Increased urbanization and population pressure and slum development (14.2%) poor-to-no drainage

systems (13.7%), non-compliance to and non-enforcement of existing laws (10.5%), Building of houses on river banks and flood prone areas (13.7%), Deficient or improper land use planning (7.4%), major pipe bursts (5.8%).

Table 9: Effects and Consequences of Flooding in Imo State

Variables	Frequency	Percentage Frequency
Loss of lives and properties	118	31.1
Destruction of farmland and livestock	66	17.4
Destruction of utility works, infrastructures and social amenities	38	10
Pollution of the environment	26	6.8
Homelessness and displacements	41	10.8
Groundwater recharge	8	2.11
Reduction in biodiversity esp. death of animals	7	1.8
Interruption to transport and communication systems	37	9.7
Increased fish production	7	1.8
Deterioration of health	32	8.4
Total	380	100

Source: Field work, 2017

It is observed that loss of lives and properties which accounts for 31.1 percent were mostly affected. Destruction of farmland and livestock (17.4%), interruptions to transport and communication systems (9.7%), Homelessness and displacement (10.8%), destruction of utility

works, infrastructures and social amenities (10%), deterioration of health (8.4%), pollution of the environment (6.8%), groundwater recharge (2.11%), increased fish production (1.8%), reduction of biodiversity esp. death of animals (1.8%).

Table 10: Preventive/Control Measures to Flooding in Imo State

Variables	Frequency	Percentage Frequency
Adequate drainage systems	36	9.5
Construction of embankments	89	23.4
Prohibition of certain types of buildings or activities in flood high risk zones	42	11.1
Land Elevation	78	20.5
Afforestation	26	6.8

Emergency Action	27	7.1
Assessment/Mitigation Measures	43	11.3
Discourage dumping of refuse in drainage channels	39	10.3
Total	380	100

Source: Field work, 2017

Table 10 reveals that construction of embankments is the major preventive/control measure adopted by the people in Imo State which accounts for (20.5%), Assessment/Mitigation measures (11.3%), prohibition of certain types of buildings or activities in flood high risk zones (11.1%), discourage dumping of refuse in drainage channels (10.3%), adequate drainage systems (9.5%), Emergency action (7.1%), Afforestation (6.8%).

Findings and Discussion

From the findings, flood has become an annual event in Imo State. Flood is generated by excessive precipitation (Chorley 2009) or a sudden increase in the volume of water through sudden downpour of rain (Grasswell, 2008). Rainfall in Imo State is high, it ranges from 2250mm-2500mm and it is concentrated in eight months of the year. Between 1980 to 2009, the total annual rainfall is 6110.5mm (NIMET, 2011 Lagos Nigeria according to Okorie, 2014). With this amount of concentrated rainfall, the moisture accumulation is such that soil is saturated with water and any other rainfall causes the land, streams and rivers to overflow and run into nearby buildings and cause damages in the environment.

Flood occurrence in Imo State was taken as a function of natural and human causes such as high intensely/prolong rainfall, low lying topography and poor infiltration, climate change, deficient or improper land use planning, major pipe bursts, the houses built on flood plain were submerged and farmlands were submerged, silting due to water-borne erosion, resulting to drains carrying large amounts of sediments which are deposited in the river channels, making the channel beds shallower and thus reducing channel capacity, population pressure, and degree of urbanization etc.

The respondents presented a great lost as a result of frequent flooding in the area of study such as loss of lives and properties, destruction of farmlands and livestock, deterioration of health, interruption to transport and communication systems, homelessness and displacements, destruction of utility works, infrastructures and social amenities etc.

Conclusion and Recommendation

This study has attempted to investigate the natural and human causes responsible for flooding in Imo State and identified the areas affected by flood. Flood menace have ravaged several towns in Nigeria, Imo in particular for several decades leaving in its wake loss of thousands of lives and tens of billions of naira worth of properties damaged which calls for holistic urgent action on our part as individuals and that of the government.

- Planning flood control should be undertaken during the early stages of urban development as this has a small cost compared to such control when the town/city is already developed. (Eziashi, 2015).
- Public participation on urban drainage management should be promoted and strengthened.
- Capacity building at all levels should be undertaking to provide support for the municipality, urban planners, architects, engineers and the public regarding flooding.
- Sanctions and laws on urban land use should be made effective to protect the river, stream channels and drainage systems (Yunana and Akoh, 2015).
- Environmental managers, policy makers and stakeholders in Nigeria should take a leaf from the Organization for Economic Co-operation and Development (OECD) countries on how to manage environmental problems especially

those contributing to flooding as observed in this study.

- Timely evacuation of materials scooped from the gutters will help instead of allowing the refuse stay unattended to which results in pushing back into the gutter when it rains.
- Indiscriminate erection buildings/structures along the natural and artificial drainage lines should be discouraged.
- Dumping of refuse along water channels should be discouraged, rather dump sites should be provided.
- Proper and adequate drainage is necessary from our streets and proper channelization of urban stream should be a major physical approach and be given priority.
- Government should prohibit further development or activities in flood risk zones.
- The relevance and applicability of Sustainable Urban and Drainage System (SUDS) designed to replicate natural systems that use cost effective solutions with effective solutions with low environmental impact to drain away dirty and surface run-off is recommend.
- Man should see himself as part of the environment and not as one created to subdue it.

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