THE EFFECT OF FLOOD ON LAND UTILIZATION IN OGBARU L.G.A. OF ANAMBRA STATE

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Abstract
The study examined flooding and flood losses in relation to land utilization in Ogbaru L.G.A of Anambra State Nigeria. Investigations were carried out to ascertain why severe flooding and flood losses has become an annual occurrence in the area. Laboratory analysis was also done on water samples collected from Agbo and Onuka Rivers to determine if the 2018 flooding affected adversely water quality in the area and finally the severity of 2018 flood disaster in study area, in terms of height of inundation. Results showed that presence of a water body, topography of the area and human encroachment are the major causes of the annual flood and flood loss in the area. Again the 2018 flood disaster resulted to pollution of River Onuka and River Agbo in the study area, with height of inundation being 110.3cm. The study further recommended measures to mitigate and abate completely the problem of flood in the area which includes adjustment of human settlements in the area, adequate land use planning, use of flood plain area for agricultural purposes, among other recommendations.
Key Words: *Flood, Land Use, Water Body, Hazard and Vulnerability.*

Introduction

As awareness on the need to preserve and protect our environment grows, it is becoming more glaring that unsustainable development is causing irreparable harm on the built and natural environment. This has resulted to several environmental problems; among these problems are pollution, desertification, ozone depletion and flooding. Flooding is a situation that results when land that is usually dry is covered with water. It may be as a result of a river overflowing its bank, heavy or prolonged rainfall and in some cases, be a result of dam breakage.

Floods disrupt normal drainage systems and overwhelm sewer systems. Thus raw or partially raw sewage spills are common in flooded areas. In addition, if the flood is severe enough, destruction of buildings that contain a large array of toxic materials (paints, pesticide, gasoline) can cause release of these materials into the local environment. This means that flooding can pollute the environment.

Ogbaru and its people have been experiencing annual flood over the years. There is always more interest in relief and rehabilitation and the desire to get things ‘back to normal’ as soon as possible whenever there is a flood incident in the area. Thus, the first step is usually to facilitate economic recovery from the flood and to meet immediate demands of the flood victims. The second plan, it seems, is to wait for the next event, thereby initiating a

continued cycle of flood disaster-relief-repair-flood disaster. Ultimately, the flood risk and vulnerability of the residents do not change.
This paper critically analyzed the reason flooding and flood losses are recorded in the area annually; the flood affects surface water quality in the area and finally the severity of the 2018 flood disaster in the area in terms of height of the flood water. Recommendations were also made so as to abate the annual flood incidents in the area.

Materials and Method

Field observations, field measurement and laboratory experiments were used for this study. The heights of flood water were measured using a calibrated measuring tape. Laboratory analysis was carried out on water samples collected from Agbo River in Iyiowa-Odekpe and Onuka River in Atani. The parameters tested for are Colour, Temperature, Turbidity, Electrical Conductivity, Sulphate, Lead, Total Suspended Solids, Total Dissolved Solids, Bio-Chemical Oxygen Demand, Dissolved Oxygen, Total Microbial Load, Total Coli Form Count, Escherichia Coli Count and PH Value. The Laboratory Analysis was used to determine water quality in the study area. The values obtained were compared against World Health Organization Standards. This helped to further determine whether the flooding in the study area affected water quality.

Result and Discussions

Reasons for Yearly Flooding and Flood Losses in the Study Area.

Field observations showed that Ogbaru L.G.A lies on the flood plain of the River Niger. Three factors are responsible for yearly flooding and flood losses recorded in the area.

(1) Presence of River Niger: Ogbaru L.G.A lies on the Niger flood plain of River Niger and all surface runoff from Ogbaru and its environs (Onitsha &Asaba) are channeled into River Niger. This has continued to make the river to rise in level and overflow its bank thereby flooding the surrounding areas. This has made the area to experience flooding every year especially during the rainy season.
(2) Land form: The study area has a very low lying (flat) terrain. This enables overflow water from the River Niger to submerge the whole area easily. The study area lies 0m above sea level and the highest point in the area is less than 1m above sea level – this is quite low. The relief is a plain land of heights ranging from 0-1m and characterized by swampy condition as a result of its alluvial mud content. The flat terrain of the study area also makes it easy for overflow water from river Niger to spread easily and cover the entire area.
(3) Population Boom and Land Use: This is the major cause of flood loss in the study area. Increased population and increasing human activities has continued to extend development and push people to live closer to the water body. Floods are part of the natural cycle of a water body and the benefits of such natural floods certainly outweigh the negative aspects.

Problem (flood losses) starts only when humans' interference exists on a large scale where such flooding occurs.

No doubt humans need a place to live, but it should be done in such a way not to make the inhabitants of an area vulnerable to flood hazards. From field observation of this research work, it was discovered that there is a poorly planned and inadequate location of settlements which has contributed to the growing flood hazards in the areas. There is no adequate regulation on land use in the study area, bearing in mind that it is a flood prone zone. The land use include, residential/Agricultural, industrial and commercial.

Result of the Analyzed Agbo and Onuka Rivers

Laboratory analysis was carried out on water samples collected from Agbo River, Iyiowa Odekpe and Onuka River in Atani. The water bodies serve as a source of drinking water and water for other domestic purposes for the people of the study area. The table below is the result of the analysis.

Table 1: Result of the Analysed Agbo River and Onuka River

Quality parameter/Units	Mean values (SD)		W.H.O Standard or concentration Unit	Remark
Colour (pt/Co scale)	30 (1.00)	28 (1.50)	15	a*, b* c, d*
Turbidity (NTU)	22 (1.0)	23 (0.872)	15	a*, b* c, d*
Temperature (^{0}C)	28 (1.00)	28 (0.500)	30	a*, b* c, d*
Electrical conductivity (NS)	56 (1.00)	46 (1.73)	100	a*, b* c*, d*
PH	7.34 (0.01)	7.1 (0.17)	6.5 – 8.5	a*, b c, d*
Sulphate. (Mg/1)	361 (2.65)	255 (3.61)	250	a*, b c*, d*
Lead (mg/l)	0.22 (0.0100)	0.21 (0.0170	0.05	a*, b* c, d*
Biochemical Oxygen demand (mg/1)	11.30 (0.361)	10.50 (0.173)	10.20	a*, b c*, d*
Dissolved oxygen Demand (mg/1)	2.0 (0.265)	3.1 (0.176)	5	a*, b* c*, d*
Nitrate (mg/1)	67 (1.00)	67 (0.917)	50	a*, b* c, d*
Total Dissolved solids (mg/l)	263 (1.00)	271 (1.73)	250	a*, b* c*, d*
Total suspended solids (mg/l)	42 (1.00)	39 (0.872)	30	a*, b* c*, d*
Total microbial load per ml	1104 (1.00)	1015 (1.00)	5 – 10	a*, b* c*, d*
Total coliform count (MPB/100ml)	170 (1.00)	150 (2.000)	0 – 2	a*, b* c*, d*
Escherichia cal count (MTN/100ml)	22 (1.00)	20 (1.00)	0	a*, b* c, d*

Key

a = Agbo River do not differ significantly from W H O
b = Onuka River do not differ significantly from W H O
c = Agbo River do not differ significantly from Onuka
a* = Agbo River differed significantly from W H O
b* = Onuka River differ siginificantly from W H O
c* = Agbo River differ significantly from Onuka

From the above table, it is obvious that both River which supply water to the community and its environs are polluted.

Pollution Index

Pollution index was computed using Lee et al formular which states that:

$$PI = \sum_{i=i}^{n} \left(\frac{(MS)i}{TLi} \right) \Big/ n$$

where M S = Mean concentration of Metal i

T L = Tolerable level of metal i

	Lead	BOD	TDS	TSS	TML	Sulphate	Nitrate	PH	DOD	Pollution index
Agbo	0.22	11.30	263.000	42.0000	1104.0000	361.0000	67.0000	7.3400	2.0000	13.60082
Onuka	0.21	10.5	271	39	1015	255	67	7.1	3.1	12.54763

Table 2: Pollution Index for Agbo and Onuka River

From table 2, Agbo River is more polluted than Onuka River with a pollution index of 13.6 as against Onuka with 12.55

Height Inundation

The average depth of the flooding shows the severity of flooding in the study area. From the field data obtained after the measurement of the inundation levels on walls of buildings (Table 3), the average depth of the 2018 flood incident in Ogbaru is 110.3cm. Inundation depth has the strongest influence on damage magnitude, as such nearly all damage functions are solely depth damage function during a flood event.

Table 3

Buildings	Depth (cm)	Locational parameter	
		Latitude (N)	Longtitude (E)
1	100.6	6^0 06’ 19.82”	$6^0$45’ 35.32”
2	103.1	6^0 06’ 11.19”	$6^0$45’ 32.73”
3	100.0	6^0 06’ 05.44”	$6^0$45’ 32.72”
4	103.1	6^0 05’ 59.28”	$6^0$45’ 31.09”
5	101.1	6^0 05’ 50.35”	$6^0$45’ 28.52”
6	103.0	$6^0$05’ 39.63”	$6^0$45’ 24.91”
7	100.0	6^0 05’ 31.23”	6^0 45’ 19.93”
8	102.5	6^0 05’ 12.59”	$6^0$45’ 09.13”
9	102.3	6^0 05’ 03.00”	$6^0$45’ 03.46”
10	101.3	6^0 04’ 47.98”	$6^0$44’ 57.57”
11	101.2	6^0 04’ 42.11”	$6^0$44’ 54.64”
12	100.0	6^0 04’ 40.18”	$6^0$44’ 39.38”
13	100.1	6^0 04’ 04.70”	$6^0$44’ 35.65”
14	100.2	6^0 03’ 55.80”	$6^0$44’33.32”
15	101.2	6^0 03’ 29.92”	$6^0$44’44.38”
16	101.5	6^0 02’ 58.89”	$6^0$44’ 40.31”
17	101.0	6^0 02’ 00”	$6^0$44’ 58”
18	100.0	$6^0$01’ 02”	$6^0$44’ 52”
19	100.0	$6^0$00’ 32.8”	$6^0$44’ 51”
20	100.2	5^0 59’ 54”	$6^0$44’ 40.69”
21	100.2	$5^0$59’ 56”	$6^0$44’ 20”
22	102.0	$5^0$58’ 58.9”	$6^0$44’ 05”
23	102.0	$5^0$58’ 24.63”	$6^0$43’ 56”
24	102.0	$5^0$57’ 0.3”	$6^0$43’ 44”
25	102.0	$5^0$56’ 31”	$6^0$43’ 15.9”
26	102.0	$5^0$55’ 40”	$6^0$43’ 04.88”
27	102.0	$5^0$55’ 19”	$6^0$42’ 53”
28	103.1	$5^0$53’ 46”	$6^0$42’ 29”
29	103.1	$5^0$52’ 17.88”	$6^0$41’ 03”
30	103.1	$5^0$52’01.55”	$6^0$41’ 03”
31	103.1	$5^0$51’ 57”	$6^0$40’ 55”
32	103.1	$5^0$51’ 55”	$6^0$40’ 48.55”
33	101.2	$5^0$51’ 49.39”	$6^0$40’ 45.89”
34	101.0	$5^0$51’ 53.11”	$6^0$41’ 41.41”
35	101.1	$5^0$51’ 50”	$6^0$41’ 40”
36	101.1	$5^0$51’ 47.88”	$6^0$42’ 41”
37	101.1	$5^0$55’ 32”	$6^0$43’ 52”
38	101.1	$5^0$53’ 31”	$6^0$41’ 06,4”
39	101.2	$5^0$52’ 22.8”	$6^0$41’ 45.9”
40	100.0	$5^0$51’ 53.8”	$6^0$41’ 42”
41	100.0	$5^0$51’ 51.7”	$6^0$41’ 43”
42	100.0	$5^0$51’ 48.76	$6^0$41’ 44”
43	100.0	$5^0$51’ 46”	$6^0$41’ 43.8”
44	100.0	$5^0$51’ 43.6”	$6^0$41’ 46.5”
45	100.0	$5^0$51’ 42	$6^0$41’ 43.6”
46	103.0	$5^0$51’ 39”	$6^0$41’ 42”
47	103.0	$5^0$51’ 08”	$6^0$41’ 58”
48	103.0	$5^0$51’ 08”	$6^0$41’ 49”
49	103.0	$5^0$51’ 05”	$6^0$41’ 50.6”
50	103.0	$5^0$51’ 02”	$6^0$41’ 52”

Conclusion and Recommendation

Presence of a large body of water (R. Niger), landform low lying/flat terrain and human activities on the flood plain are the main causes of yearly flood and flood loss in Ogbaru L.G.A. Human encroachment upon the flood plain of the River Niger account for the annual total flood losses in the area. Floods are acts of God but flood losses are largely acts of man. Floods are part of the natural cycle of water. The benefit of natural flood almost certainly outweighs the negative aspect. The rivers in the study area were also polluted after the 2018 flood incident with parameters tested for exceeding the maximum standard stipulated by W.H.O. Agbo river was more polluted than Onuka river with a pollution index of 13.6 as against Onuka with 12.55 and the average height of the depth of inundation for 2018 flood incident in the area is 110.3cm which is quite high.

Finally, a wise society would reap the benefits of over flow water (flood) and avoid many of its negative if they would choose to build cities in ways that can accommodate flood water without trying to avoid it. Attempting to go against nature is almost certainly a losing prospect in the end.

Recommendation

(1) Every state should have a comprehensive land use plan with template of the land, water and other related resources and hazard prone areas, proposals for every form of structural development should be evaluated within the context of that template with the objective of allowing no adverse impact of flooding on properties or natural functions of a resource.
(2) There should be adequate public awareness and education on dangers of developing flood plains. This will gradually lead to voluntary reduction in building on flood plains.
(3) The Government can consider relocation of existing settlement on flood plains like Ogbaru L.G.A. This can be achieved through proper and sincere planning that is devoid of politics and selfish interest.
(4) Flood plains can only be used for activities like planting of crops, open space recreation among others.

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