

Socio-Economic Impacts of Flooding on the Residents of Port Harcourt Metropolis in Rivers State, Nigeria

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Received 25 December 2014; accepted 7 January 2015; published 14 January 2015

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Abstract

Floods are naturally occurring phenomena that are part of the physical and biological process which have shaped our nation's landscape. It occurs in Nigeria environment when there is heavy rain fall for prolonged period of time. The data collection for this research was by use of primary and secondary information; questionnaire was administered by face to face interviews and key informant surveys. Analytical technique was the univariate statistical methods. The results revealed that there is clear evidence of damages to properties and that there are hazards and risks faced by these households as shown in Tables 1-4 respectively. Table 3 specifically shows the financial losses incurred annually by residents to the tune 5 million naira and above. However, the continued hazards and risks as a result of flood incidence have affected their overall income which hitherto is found within (N20000.00 - N25000.00) about 22.8% of the respondents fall in this income bracket. Furthermore, the research also revealed that about 30% say the flood has affected their income, while 29.4% say their buildings are affected. Also about 37.8% of respondents say that the flood incidence occurs all through the rainy season. The research recommends an aggressive review of the Port Harcourt Master Plan and the implementation of the development control tools in the 1992 Urban and Regional Planning Law.

Keywords

Socio-Economic, Impact, Flooding, Port Harcourt

1. Introduction

Floods are repeatedly in the head lines of local, national and the international media. Most of the stories concern

comparatively minor events which cause little damage and are soon forgotten except by those most directly affected. Some, however, concern major disasters involving loss of life and the destruction of property. Not surprisingly, therefore, floods are the cause of most natural disasters affecting society. In a study of major natural hazards (excluding drought) on the world scale over a 20-year period, from 1947 to 1967, [1] ranked floods first out of sixteen disaster types responsible for either one million dollar damage or at least a hundred persons killed or injured. Altogether, floods account for about 30 percent of all natural disasters and 40 percent of fatalities recorded in these disasters.

A flood is a body of water which rises to overflow land, which is not normally submerged [2]. The problem of flood since the biblical times has been very devastating. The problem has been with river floods. But lately, another dimension to flood called urban flooding became prevalent. The continual changing nature of land use, increasing urban population and the replacement of natural vegetation cover with impervious surfaces has compounded the problem [3]. Consequently, floods have been redefined to reflect this occurrence. The term urban flood is defined as any overland flow over urban street sufficient to cause significant property damage, traffic obstructions, nuisance and health hazards [3]. It includes flash flood (water that accumulates quickly over streets and walkways and lasts temporarily) and flood pond ages (those that settle in depressions and last much longer).

Most urban flood disasters are manmade. Floods are natural phenomena, but man has put himself at risk by developing flood plains for settlements, agriculture, industry, and building roads, bridges and railways lines in floodable positions. Channels to drain the excess water during precipitation are in many cases not provided especially in less developed countries or are inadequate, but even when they are available, the flood problem in some cases persists [4].

2. Statement of Research Problem

In Port Harcourt Metropolis, as in other cities in Nigeria and the rest of the world, the flood situation is worsening. The situation is exacerbated by both natural and human factors. The natural factors are prolonged rainfalls, poor management of flood plains and wet lands. Human factors are urbanization, failure in engineering flood control structures, devastation of flood plains and wet lands by man. The effects of floods on the environment and man are devastating. On man, many lives are lost properties destroyed, crops worth millions of naira have always been lost and more over on the environment, its aesthetic values is tampered with as soil is washed away.

According to [4], floods are environmental hazards that occur regularly every year in different parts of Nigeria, with wide ranging effects. That of Port Harcourt, she opines, is annually especially in the metropolis, and because the city has an almost flat topography, the soil consisting largely of poorly drained silty clay mixed with sand. The flood damages are very great; the losses recorded are very enormous, the destructions are complete or partial impairment of the value of goods and services. Health challenges are recorded as a result of the action of the flood water and the debris they carry into and out of sanitary sewers into the streets which creates bad sanitary environment. Flooding according to [5] has affected real property value in Port Harcourt as flood prone properties remain in the market longer when offered for lease or sale compared to flood free properties. More so, their survey of household losses on flooding from 2003 to 2007 in Port Harcourt revealed a whopping loss of about 5 million naira annually [5].

It is in the light of the huge human and material losses accompanying floods in Port Harcourt Metropolis that this study was motivated.

3. Objectives of the Study

These are as follows:

- 1) The study will identify the possible hazards and risks faced by residents of Port Harcourt Metropolis as result of flooding;
- 2) The study will highlight the socio-economic impacts of flood on residents of Port Harcourt Metropolis.

4. Method of the Study

Port Harcourt was subdivided into four sub basin areas using [6] (1:20,000) and [7]. The latter formed the base maps. The sub basins are smaller part of the larger Niger Delta, using the existing rivers that drain the city, the Bonny River, Diobu creek, Amadi creek and Okpoka River, see **Figure 1**.

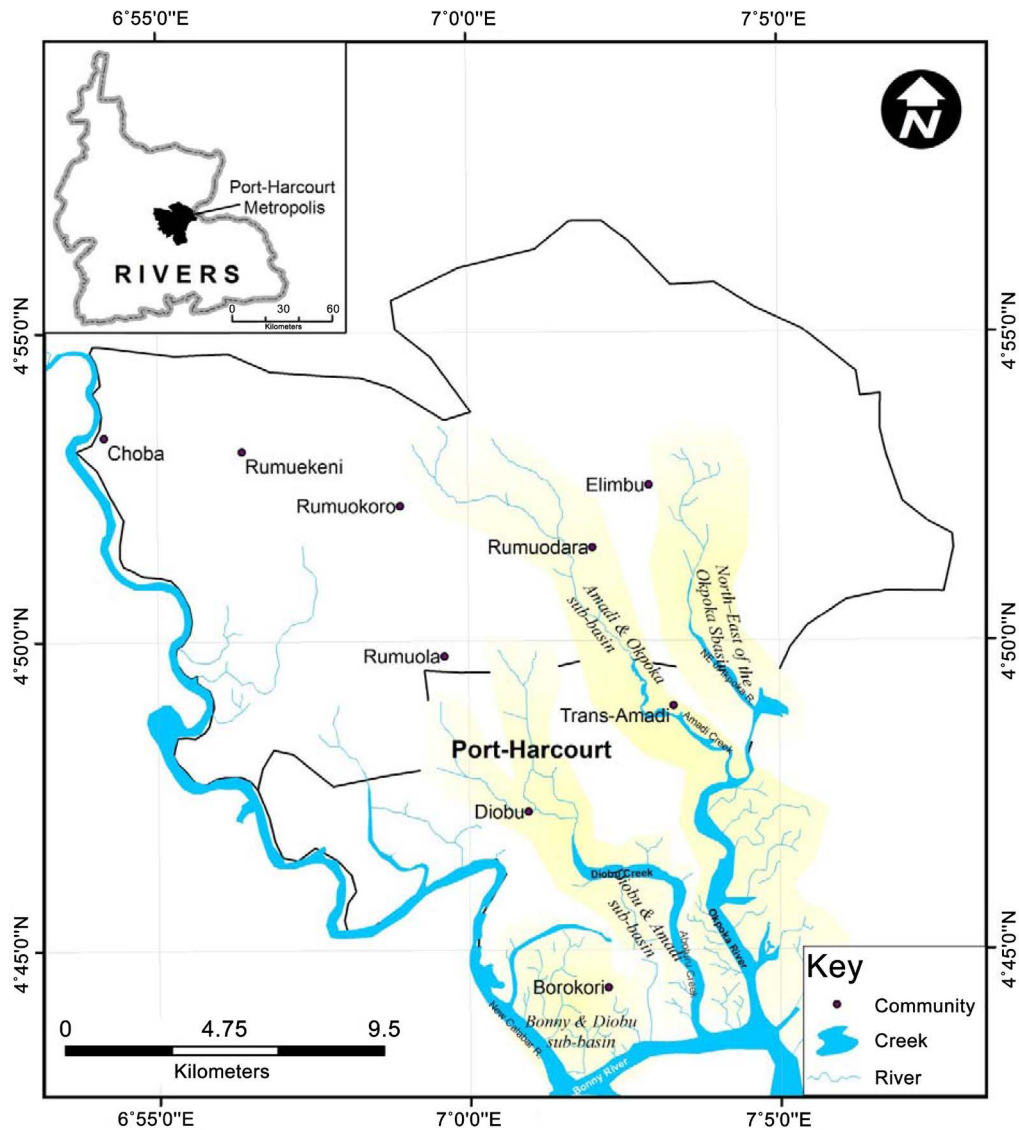


Figure 1. Port Harcourt Metropolis and the major drainage sub-basins.

The sub-basins are:

- 1) The area bounded by Bonny and Diobu Creek (SB I);
- 2) The area bounded by Diobu creek and Amadi Creek (SB II);
- 3) The area bounded by Amadi creek and Okpoka River (SB III);
- 4) The area on the northeast of the Okpoka River (SB IV).

Within these sub basins, the street map of Port Harcourt was super imposed on the SPDC map to select streets for the sample. Using the stratified random sampling technique, two streets each were chosen, from which houses were systematically chosen for questionnaire administration.

Data was collected from secondary and primary sources. Secondary sources included published and unpublished information such as [6] and [8]. The Primary sources included the use of preceded questionnaire which was administered by means of face to face interview with respondents. A total of four hundred (400) questionnaires were administered, one hundred each to the sub basins, and three hundred and twenty (320) were properly filled and returned. Thirty of the questionnaire were wrongly filled, therefore were not used, fifty were not returned. Direct measurement of drainage lines from houses to public facilities and flood velocity, direct observations and photographs. Also hazards and risks of floods on the socio-economic lives of the residents of the sub basins were identified.

5. Analytical Techniques

The study applied a variety of analytical techniques, especially univariate statistics (means, medians, modes, percentages, ratios and rates). The following formulae [9] for means and standard deviations from grouped data (e.g. for income) were found particularly useful:

$$\text{Group Mean } \bar{X} = \frac{\sum_{i=1}^k f_i m_i}{N} \quad (1)$$

where f_i = number of cases in the i^{th} category;

m_i = mid-point of i^{th} category;

k = number of categories;

N = number of cases;

\bar{X} = mean.

$$\text{Standard Deviation } S = \sqrt{\frac{\sum_{i=1}^k f_i x_i^2}{N}} \quad (2)$$

where f_i = number of cases in the i^{th} interval;

k = number of intervals;

X_i = mid-point of class;

N = number of cases;

S = standard deviation.

6. Results

6.1. Environmental Conditions in the Neighbourhood

Table 1 also shows the views of respondents on the flood impact on the residents. From the table, it reveals that the residents suffered loss of income, about 30% of respondents attested to that, also 29.4% said there was damage to buildings, while others say that the flood menace coupled with lack of income had made it impossible for them to relocate despite the flood damage and about 3.75% were indifferent.

The frequency of flooding in the sampled area as shown in **Table 2** revealed that the flood incidence occurs all through the rainy season period, about 37.8% of respondents attested to this. Other respondents say it occurs ten times (10) with 23.0%, 7 - 9 times with 19.4% respectively. The information in this table clearly shows that there is high impact of flood on the residents of the metropolis.

Table 3 illustrates the value of losses in financial terms by the residents of Port Harcourt Metropolis to flood incidence calculated in Nigeria currency. A total of 31% of respondents say they loss over five million naira annually to flooding in the city, 25% say they also loss over four million naira annually, 21% say above three million respectively. The losses could be property, collapse of buildings, and replacement of house hold items that were damaged by flood, or better still, complete relocation to other hired or built apartments. From these table it is very obvious, that flooding has caused untold hardship to residents of the Metropolis, and there urgent need to ameliorate the suffering of the people by the government.

6.2. Hazards and Risks Factors Identification and Analyses

The hazards and risks of floods on the socio-economic lives of the residents of Port Harcourt Metropolis are as follows and shown in **Table 4**:

- Loss of lives;
- Loss of property;
- Pollution of streets and houses;
- Pollution of source of water supply;
- Displacement of household members;
- Over flowing of soakaways, etc or septic tanks;

Table 1. Impact of flood in the neighbourhood.

Flood Impact	SB I		SB II		SB III		SB IV		Row Total	
	N	%	N	%	N	%	N	%	N	%
Loss of income	33	41.25	25	31.5	20	25.0	18	22.5	96	30.0
Damage to building (tilting/crack walls)	18	22.5	20	25.0	25	31.25	31	38.5	94	29.4
Loss of property and health impact	14	17.5	22	27.5	21	26.25	14	17.5	71	22.2
Disruption of economic/social activity	10	12.5	13	16.25	14	17.5	10	12.5	42	13.1
Indifferent	5	6.25	-	-	-	-	7	8.75	12	3.75
Total	80	100	80	100	80	100	80	100	320	100

Table 2. Frequency of flooding in the neighbourhood.

Frequency of Flood	SB I		SB II		SB III		SB IV		Row Total	
	N	%	N	%	N	%	N	%	N	%
1 - 3 times	5	6.25	-	-	8	10.0	-	-	13	4.0
4 - 6 times	12	15.0	13	16.25	10	12.5	15	18.75	50	15.6
7 - 9 times	14	17.5	20	25.0	12	15.0	16	20.0	62	19.4
10 times plus	18	22.5	22	27.5	14	17.5	20	25.0	74	23.0
All through the Rainy season	31	38.5	25	31.25	36	45.0	29	36.25	121	37.8
Total	80	100	80	100	80	100	80	100	320	100

Table 3. Value of loss in financial terms annually (in naira).

Value of Flood Loss in Naira	Total Respondents	%
Fifty thousand naira	-	-
Fifty one thousand naira - Two hundred thousand naira	-	-
Two hundred and one thousand naira - Three hundred thousand naira	2	0.63
Three hundred and one thousand naira - Four hundred thousand naira	3	0.93
Four hundred and one thousand naira - Five hundred thousand naira	5	1.6
Five hundred and one thousand naira - One million naira	10	3.1
₦1 m - ₦2 m	50	15.6
₦2 m - ₦3 m	70	21.9
₦3 m - ₦4 m	80	25.0
₦5 million and above	100	31.1
Total	320	100

Authors Research Finding (2012).

- Outbreak of epidemic;
- Incidence of diseases;
- Collapse of buildings;
- Cracking of walls/tilting of foundations of buildings;
- Poor waste disposal/litter of waste on streets on typical rainy day;
- Unsightly nature of the Metropolis especially after rain fall, etc.

According to [10], the four elements in risks assessment is taken into cognizance in the analyses, *i.e.* hazards identification, dose response evaluation, human exposure evaluation, and risk characterization.

Table 4. Social impacts analysis on the neighbourhood (Sub-basins I, II, III and IV).

S/N	Sensitivity	Hazard	Impact	Qualification	Likelihood	Consequence	Impact Rating
1	Flooding in the area last for 2 - 7 days, during rainy season.	Damage to buildings, properties, health impact from overflow soakaways, etc, obstruction of traffic, etc.	Loss of property, disease epidemic, death, traffic congestion, etc.	<ul style="list-style-type: none"> • Positive • Direct • Short term • Reversible • Local • Incremental 	High	High	Significant
2	The frequency of flooding in the area is all through the rainy season.	Poor crop yield, loss of income, damage to buildings/properties, health impact resulting from disease epidemic, low infrastructure development, etc.	Poor yield of crops, collapse of buildings, loss of properties, disease epidemic.	<ul style="list-style-type: none"> • Positive • Direct • Long-term • Reversible • Local • Non-incremental 	High	High	Significant
3	The type of flood in the area is usually urban flood.	Flash flood/flood pond age, temporary obstruction of activities, unsightly scenery, <i>i.e.</i> overflowing of drains/wastes.	Loss of property, loss of income, and loss in aesthetic value of the city.	<ul style="list-style-type: none"> • Positive • Direct • Short term • Reversible • Local • Incremental 	Moderate	Little	Minor
4	The greatest impact of flooding in the area is on income of residents.	Frequent replacement of household items, possible relocation, collapse/cracks of buildings, health effect by constant treatment in hospitals, etc.	Loss of income.	<ul style="list-style-type: none"> • Positive • Direct • Temporary • Reversible • Local • Non-incremental 	High	Great	Major
5	Does the flood affects buildings, etc.	There are evidences of cracked walls and possible collapse of building because of frequent flooding of the area.	Cracks on walls of buildings/collapse of buildings.	<ul style="list-style-type: none"> • Positive • Indirect • Temporary • Local • Incremental 	Medium	Moderate	Significant

Table 5 shows at a glance, the socio-economic status of members of the sampled neighbourhood. The age profile of respondents showed that, the highest group with 23.4% are those in the age bracket of 31 - 35 years old, while the least are those in the age bracket of 40 and above with 8.1%. The age category in the neighbourhood consists of youths of tertiary education age than adults. It was equally important that the general pattern of education, occupation and income level of respondents be ascertained. The result revealed that about 31.1% of the respondents are engaged in craft work, which is artisan, as their occupation. Also on the education category, the research showed that about 27.5% of respondents had other type of education such as skill acquisition in craft, mechanics etc. Similarly, about 20% of the respondents were unemployed, while 15% each are civil servants and self employed, 18.1% were professionals. On the income distribution, about 28.8% earn about ₦20,000 - ₦25,000 per month. This showed that most of the persons interviewed were in the low income category.

Furthermore, an environmental condition of interest was measured, that is the type of buildings found in the neighbourhood. It was also a parameter used to assess the impact of flooding in the area. From the investigations, **Table 6** shows that the type of building that were predominant in the entire neighbourhood were block of flats which was about 27.8% of the total housing stock, followed by the storey buildings with 27.5%, while others not specified type had 2.8% of the total stock of houses in the area. The investigations also revealed that the building types were significantly affected by the flood, causing cracks, fading of paint, dirt's from debris carried by runoff, and frequent water logging etc. These impacts were very significant in all the sub basins.

7. Summary of Findings

The extent and intensity of damage a flood event can cause is dependent on the duration, depth and velocity of the action [5]. **Table 2** reveals that 37.8% of the sampled respondents say that the flooding occurs all through the rainy season. Furthermore, about 30.0% of the respondents say that they have incurred huge loss in income

Table 5. Socio-economic characteristics in the Sub-basins (I, II, III and IV) row total.

Age Yrs.	N	%	Education	N	%	Occupation	N	%	Monthly Income	N	%
<20	41	12.8	Non formal	53	16.6	Unemployed	64	20.0	Less than ₦20,000	45	14.1
21 - 25	63	19.6	Primary	52	16.2	Civil servant	48	15.0	₦20,000 - ₦25,000	73	22.8
26 - 30	57	17.8	Secondary	56	17.5	Self employed	48	15.0	₦25,001 - ₦50,000	63	19.7
31 - 35	75	23.4	Post secondary	71	22.2	Artisans	102	31.1	₦50,001 - ₦100,000	56	17.5
36 - 40	58	18.1	Others (craft)	88	27.5	Professionals	58	18.1	₦100,001 - ₦150,000	53	16.6
Above 40	26	8.1	-	-	-	others	-	-	Above ₦150,000	30	9.4
Total	320	100		320	100		320	100		320	100

Table 6. House type.

House Type	SB I		SB II		SB III		SB IV		Row Total	
	N	%	N	%	N	%	N	%	N	%
Storey building	21	26.25	22	27.5	20	25.0	25	31.25	88	27.5
Bungalow	18	22.5	15	18.75	14	17.5	20	25.0	67	20.0
Block of flats	20	25.0	22	27.5	25	31.25	22	27.5	89	27.8
Rooming houses	15	18.75	18	22.5	21	26.25	13	16.25	67	20.0
Others specify	6	7.5	3	3.75	-	-	-	-	9	2.8
Total	80	100	80	100	80	100	80	100	320	100

as a result of the flooding, while 29.4% of the people say that the incident had caused damage to their building in form of cracked walls and tilting of the structure. This is indeed a high risk case if nothing is done to ameliorate the situation. On the conditions of the environment in terms of houses, the survey revealed that about 27.8% were block of flats and 27.5% of storey buildings were affected throughout the period of the flooding.

The ugly situation has affected the people adversely as social/economic activities are disrupted by the flood incidence, 13.1% attested to this and 22.2% says the flood has caused them the loss of property/health challenges (Table 2). Finally on the social impact analyses rating, a closer look shows that the impacts are very high and significant.

8. Conclusions and Recommendations

Flooding has been one of the most costly disasters in terms of monetary value, property damage and human casualties [4]. Flood hazards mean the threat to life or threat of damage to property as consequences of flooding. Flood hazards result from the combination of physical exposure and human vulnerability. Flooding has become more increasingly visible in various parts of the city, especially on atypical rainy days. Properties worth millions of naira are inundated by flood waters annually, while streets are littered with debris carried out from nearby rivers, soak away pits, etc. This makes the city dirty and unsightly. The type of flood identified in the city is called the urban floods which are of two folds: splash flood and flood pond ages.

Flooding in the metropolis has put lives at risk as identified in the social impact analysis in this paper; also most residents have incurred huge losses in terms of income and property damages resulting from flooding.

The continued flooding of the city as revealed in this paper contains three folds: firstly, the attitude of developers who build on natural drainage line; secondly, the non review of the master plan of the city and the non performance of the relevant agencies of government charged with the control of development. The research recommends an aggressive design of a drainage plan to be incorporated in the reviewed master plan of the city. The paper also suggests that government should assist the flood victims with some soft loans to ameliorate their plight annually. Finally, there should be strict penalty for every development on flood plains.

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