

SOCIO-ECONOMIC DIMENSIONS OF VULNERABILITY TO FLOODING IN LAGOS METROPOLIS

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ABSTRACT

Flooding has become a major problem and issue on the political agenda in Lagos in recent years due largely to the increased frequency and intensity of these events. Climate change and anticipated increases in flooding will exacerbate the existing poverty among the urban poor which are in most cases worst hit by flooding. Thus, this study examines the nature of livelihood systems and how these shape victims' perception of floods on one hand, and the implications of the existing patterns of vulnerability created by socio-economic conditions on the households' ability to adapt to the effects of flood and coping among victims in Lagos. The study utilized data from both primary and secondary sources. The primary data include questionnaire administration and Focus Group Discussion sessions among those living in flood prone areas. The secondary data on the other hand, include data from the Lagos State Emergency Management Agency and the Ministry of environment on flood victims in the State. The findings support the argument that disaster management response in the city, just like in other areas in Nigeria, should shift away from this traditional response approach to focus increasingly on addressing the causes of vulnerability in order to mitigate the effects of disasters. The result of the study is useful in designing appropriate institutional interventions capable of transiting victims from being painful victims to developing adaptive capacity to live with recurring floods.

Key Words: Climate change; Urban vulnerability; Adaptation; Coping mechanisms, Flooding, Lagos.

INTRODUCTION

The Inter-governmental Panel on Climate Change (IPCC) Third Assessment Report (IPCC, 2001) concludes that settlements are among the human systems that are most sensitive to climate variability and change. Climate extremes is expected to

have devastating consequences for human settlements that are vulnerable to droughts and wildfires, floods and storm surge, heat waves, landslides and windstorms. The impacts and vulnerability of settlements to climate change are most visible in the urban

areas. The condition of the world's cities has often been described in terms of 'urban crises', implying complex problems, frequent breakdowns in services and a general lack of policy, programmes or funding (Bull-Kamanga et al, 2003). Indeed cities can be seen as crucibles of hazards that, without good management, generate extreme situations of vulnerability and risk for very large populations. In developing nations, problems are commonly associated with rapid growth, social inequalities, volatile flows of corporate investment, demographic change and environmental neglect. Natural disasters simply exacerbate the existing social, physical and economic problems (Bull-Kamanga et al, 2003).

Henderson (2004), revealed that this level of risk and vulnerability in urban areas of developing countries is attributable to socio-economic stress, aging and inadequate physical infrastructure. Indeed, according to Satterthwaite et al (2007), hundreds of millions of urban dwellers have no all-weather roads, no piped water supplies, no drains and no electricity supplies; they live in poor-quality homes on illegally occupied or sub-divided land, which inhibits any investment in more resilient buildings and often prevents infrastructure and service provision. A high proportion of this are tenants, with very limited capacities to pay for housing – and their landlords have no incentive to invest in better-quality buildings. Most low-income urban dwellers face serious constraints in any possibility of moving to less dangerous sites, because of their need to be close to income-earning opportunities and because of the lack of alternative, well-located, safer sites. Climate change provides an additional threat that

adds to, interacts with, and can reinforce existing risks, placing additional strains on the livelihoods and coping strategies of the urban poor (IPCC, 2001).

The current situation of urban centers with respect to climate change impacts was further buttressed by Zevenbergen et al, (2008). According to them, an unwanted side effect of the process of rapid urbanisation is the increased susceptibility towards flooding as a result of the concentration of people and assets in flood-prone areas – many urbanised areas are located along major water bodies. Furthermore, climate change may cause floods to occur more frequently and severely. This combination is likely to result in substantially larger flood impacts compared with former times, in which societies and environmental change drivers developed more slowly and societies continuously adapted to environmental changes (Zevenbergen et al, 2008).

Urban poverty has been described as one of the most daunting challenges currently facing Lagos (UN-Habitat, 2006). The average monthly household income for the 1.1 million inhabitants of the 158,000 households in the Lagos Millennium Development Goals Project (LMDGP) was about US\$170 (Abosedo, 2006). Also, despite the city contributing more than 60 percent of Nigeria's Gross Domestic Product, 65 percent of national investments and 65 percent of the nation's Value Added Tax (VAT), about 65 percent of the residents are estimated to live below the poverty level (Abosedo, 2006). The deplorable state of the urban form and poverty is indicative of the expected low resilience of most of the inhabitants of the city to external hazard stressors such as

those often associated with climate extreme events especially floods.

Lagos, like all other Nigerian urban areas exhibit many of the characteristics associated with urban decay which makes them some of the most vulnerable cities in the world as evidenced by the frequent negative impacts of environmental emergencies and extreme weather events (Olorunfemi and Raheem, 2007). Lagos is not exempted from the list of cities that have been plagued by flooding in the recent past. These flooding incidents have increased both in frequency and intensity and therefore have had significant impacts in terms of the accompanying disasters. According to Douglas et al, (2008), adaptation in Lagos apparently suffers from a non-inclusive urban governance approach and the unwillingness of local government to engage in the provision of basic public goods such as integrated drainage systems in informal settlements, which are often regarded as being outside accepted urban regulation and planning systems. This study, therefore, examines the socio-economic dimensions of vulnerability to flooding in Lagos. The specific objectives are to examine the nature of livelihood systems and how these are affected by flooding and the implications of the existing patterns of vulnerability created by socio-economic variables as well as households' ability to adapt to the effects of flood and coping strategies among the vulnerable households in the city.

CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

Flood is an overflowing or irruption of a great body of water over land not usually submerged (Oxford English Dictionary, 6th Edition, 2000). It is an extreme weather event naturally caused by rising global temperature which results in heavy downpour, thermal expansion of the ocean and glacier melt, which in turn result in rise in sea level, thereby causing salt water to inundate coastal lands (Adelekan, 2009). Floods emanates from a combination of meteorological and hydrological extremes. In most cases, floods are additionally influenced by human factors. Although these influences are very diverse, they generally tend to aggravate flood hazards by accentuating flood peaks. Thus flood hazards in built environments have to be seen as the consequence of natural *and* man-made factors (World Meteorological Station/ Global Water Partnership, 2008). Table 1 shows causative causes of urban flooding. Based on multifarious causes of urban flooding, four major types of urban flooding have been identified. These are:

- a) Local Floods
- b) Riverine Floods
- c) Coastal Floods
- d) Flash Floods

Table 1: Causative Causes of Urban Flooding

Meteorological Factors	Hydrological factors	Human factors aggravating natural flood hazards
• Rainfall • Cyclonic storms • Small-scale storms • Temperature • Snowfall and snowmelt	• Soil moisture level • Groundwater level prior to storm • Natural surface infiltration rate • Presence of impervious cover • Channel cross-sectional shape and roughness • Presence or absence of over bank flow, channel network • Synchronization of run-offs from various parts of watershed • High tide impeding drainage	• Land-use changes (e.g. surface sealing due to urbanization, deforestation) increase run-off and may be sedimentation • Occupation of the flood plain obstructing flows • Inefficiency or non-maintenance of infrastructure • Too efficient drainage of upstream areas increases flood peaks • Climate change affects magnitude and frequency of precipitations and floods • Urban microclimate may enforce precipitation events

Source: WMO/GWP, 2008

VULNERABILITY

Vulnerability is the most crucial component of risk in that it determines whether or not exposure to a hazard constitutes a risk that may actually result in a disaster. If the potential exposure to floods becomes reality, i.e. when flood waters physically encroach on people and infrastructure, then the vulnerability of people and infrastructure is decisive for the degree of harm and damage (Oelofse, 2002; Pelling, 2008). Three types of vulnerability can be distinguished:

- Physical vulnerability of people and infrastructure;
- Unfavourable organizational and economic conditions; and
- Attitudes and motivations.

The physical vulnerability of urban populations tends to increase as a result of the dense concentration of potentially dangerous infrastructure and substances in urban areas (bridges, solid and liquid

waste, chemicals, electric facilities etc.). The vulnerability to flood risks in urban settlements, particularly in developing countries in informal developments can be attributed to the following factors:

- Risk prone areas are the only areas that the poor migrants are able to afford
- Failure to perceive flood risks due to lack of knowledge till a flood strikes
- Infrastructure to reduce risk is not economically viable

This study adopts the framework developed by Heltberg et al, (2008). The framework presents and applies the social risk management and asset-based approaches to the context of climate change in general and flood risk in particular. The social risk management (SRM) and asset-based approaches provide a conceptual framework for understanding the sequential links

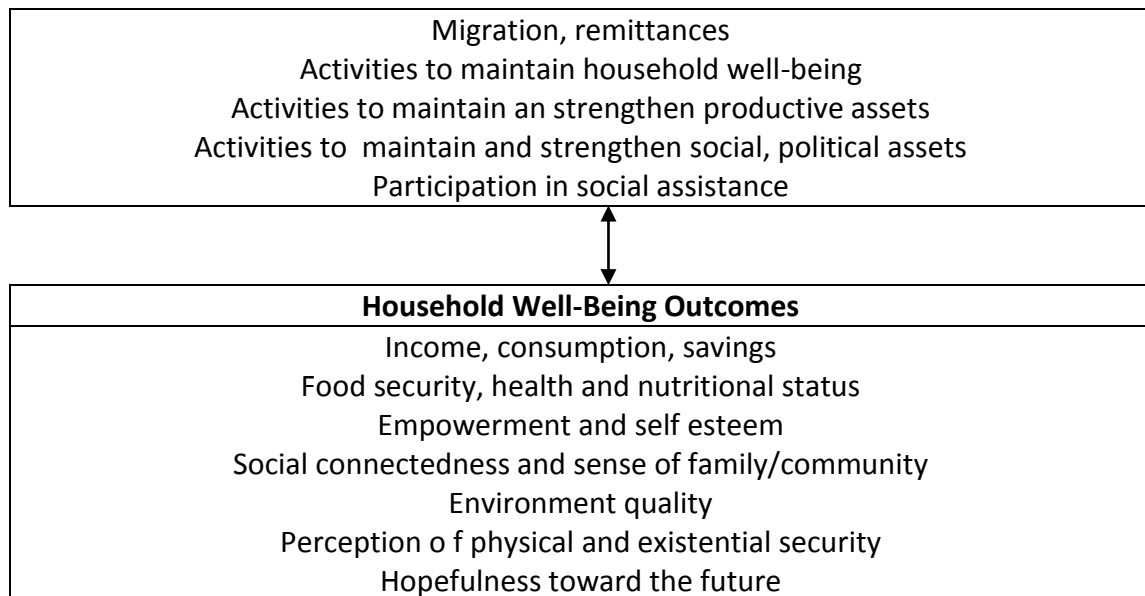
between risks; human exposure and sensitivity; the impacts of risky events; and risk management (or adaptation) strategies. This provides a unifying conceptual framework to examine the characteristics of the risks faced by households; how adaptation responses at multiple levels depend on livelihoods, policies, and institutions; and household vulnerability outcomes.

The analytical framework helps focus on the sequential links between climate risks, human vulnerability, and interventions to help manage vulnerability to climate change. Thus, household livelihoods and well-being depend on the interface between assets (broadly defined), the policy and institutional context, and risks (Figure 1). Risk affects the expected returns and variance of returns on assets and livelihood strategies, and

therefore household well-being and future asset accumulation. Households are poor because they have limited quantity and quality of assets; and their assets have low expected returns and high variance of returns. The combination and flexibility of assets also matters: Poor and vulnerable households tend to lack key assets and whatever assets they have are not mobile and of poor quality and location. Many poor rural households are also landless and depend on selling their labour, which is typically of low quality in terms of education, skills, and health and nutritional status. Furthermore, because of gender, class, or caste, some individuals and households can have limited access to markets and livelihood opportunities, including migration. This, in turn, limits labour productivity and returns to human assets.

Figure 1: Schematic Presentation of Asset-Based Approach





Source: Heltberg et al, 2008

METHODOLOGY

This study adopted the survey research design. The primary data were obtained using structured household survey questionnaire administered to residents and one Focus Group Discussion (FGD) held in the communities surveyed. The sampling was two stage comprising purposive and random. The selection of the neighbourhoods was purposive, based on information on the existing flood prone areas of the city (Gbadegesin et al, 2011, Merhotra et al, 2009, Adelekan, 2009) (see Figure 2). Also, Nigerian Meteorological Agency (NIMET) forecasted an estimated 1,200-1,700 mm rainfall in 2011 and specifically mentioned that communities located in the north-eastern part of the state, naturally susceptible to flooding, are expected to be worst hit during the heavy rainfalls. The Lagos State Government listed the flood-prone communities expected to be worst hit by the forecast to include Ikosi-

Ketu, Mile 12, Agiliti, Ajegunle and Owode-Onirin grounds (Vanguard, May 29, 2011 p.46; Daily Mirror, July 12, 2011.p. 33). Residents of the affected communities should move to higher grounds within the months of June to mid-September and October and possibly to January because the capacity of most of the canals cannot contain the volume of runoff expected from the rainfall. The questionnaire was designed to elicit information on the socio-economic characteristics of the respondents, impacts of flooding on them and their livelihoods, their coping mechanisms as well as their adaptation measures. In all, two hundred (200) questionnaires were randomly administered to households, 40 in each of the five communities. The data collected from the questionnaire survey were analysed using descriptive statistics including frequency tables, percentages and cross tabulations.

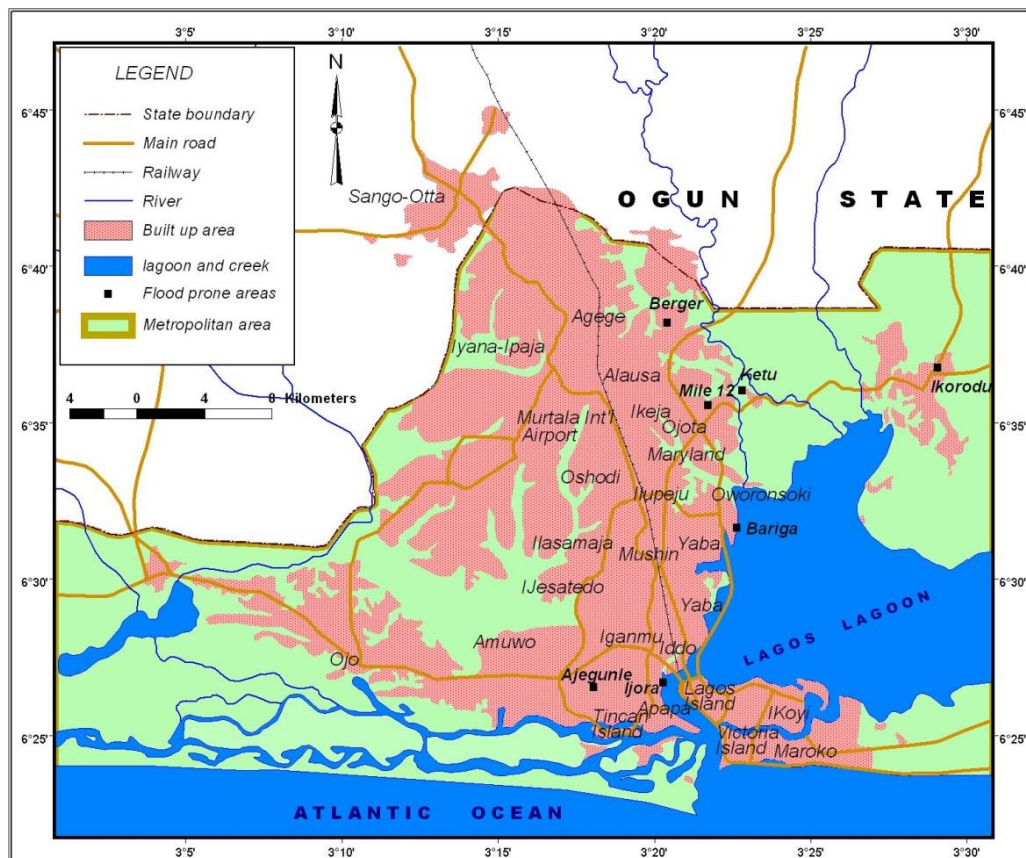


Figure 2: Map of Lagos showing flood prone areas

Source: Composed by Authors (2013)

RESULTS AND DISCUSSIONS

Socio-Economic Characteristics of Respondents

Out of a total of 200 questionnaire administered to respondents, 193 were retrieved representing 96.5% response rate. Of these, the majority (72.5%) were males. Table 1 shows that 43.0% and 31.1% of the respondents are between the ages of 26-35 years and 36-45 years respectively. Also, the majority (71.5%) of the respondents' are married while 45.1%

and 42.0% had secondary and tertiary education respectively. However, about 6.8% of the respondents had no formal education. 58.0% of the respondents had between 6-8 children, 35.8% had between 3-5 children while 6.7% had between 0-2 children. By inference, the respondents had an average of 4.4 children per household. Table 1 shows the age, marital status and educational qualification of respondents.

Table 1: Socio-Economic Characteristics of Respondents

Variables	No. of Respondents	% of respondents
Sex:		
Male	140	72.5
Female	53	27.5
Total	193	100.0
Age (Yrs):		
18-25	19	9.8
26-35	83	43.0
36-45	60	31.1
46-55	18	9.3
56-65	7	3.6
Above 65	6	3.1
Total	193	100.0
Marital Status:		
Single	51	26.4
Married	138	71.5
Separated	3	1.6
Divorced	1	0.5
Total	193	100.0
Educational Qualification:		
No formal education	15	6.8
Primary education	10	5.1
Junior Secondary	2	1.0
Senior Secondary	81	42.0
Tertiary	87	45.1
Total	193	100.0
Households Size:		
0-2	13	6.7
3-5	69	35.8
6-8	111	57.5
Total	193	100.0

Source: Fieldwork, 2013

Building Characteristics and State of Infrastructure of the Study Area

The state of city infrastructural facilities is one major factor influencing its vulnerability to flooding. The analysis of state of infrastructure and environmental characteristics focus on building

characteristics, location of building, availability of drainage facilities, method of waste disposal. The type, age, location and condition of housing occupied by the respondents are reported in Table 2. The Table also indicates the solid waste disposal methods utilised by the respondents.

Table 2: Characteristics of Housing Occupied by the Respondents

Age of Buildings:	No. of Respondents	%
Less than 5years	9	4.7
6-15years	49	25.8
15-20years	14	7.4
21-30years	46	24.2
Above 30years	72	37.9
Total	190	100.0
Building Condition:		
sound	48	24.9
Poor Need minor repair	67	34.7
Poor, need major repair	76	39.4
Total	191	100.0
Location of Building:		
Hilly terrain	9	4.7
Sloppy terrain	19	9.8
Flat terrain	68	35.2
Very close to river/stream	30	15.5
On flood plain or marshy land	67	34.7
Total	193	100.0
Materials for Building Construction:		
Lateriate/mud	1	0.5
Laterite/clay block	8	4.1
Cement /sand concrete	176	91.2
Corrugated iron sheet	3	1.6
Wooden materials	4	2.1
Others	1	0.5
Total	193	100.0

Types of Building:		
Story building	33	17.1
Bungalow detached	130	67.4
Bungalow terrace	24	12.4
Duplex	6	3.1
Total	193	100.0
Method of Solid Waste Disposal:		
Dump in nearby stream	28	14.5
Put in refuse bin/bag	34	17.6
Burn them	27	13.9
Dump on the street/compound	69	35.8
Drop in refuse dumps	35	18.1
Total	193	100.0

Source: Fieldwork, 2013

Table 2 indicates that about 37.9% of the buildings are above 30 years of age and 24.2% of the buildings are between the ages of 21-30 years old. Only 4.7% of the buildings are less than five years of age. The age of a house is an important factor in determining its physical condition. There is a close correlation between the age of buildings and the condition of its maintenance. The older a building becomes, the more the problem of its maintenance. Poor maintenance also increases the vulnerability of buildings to the vagaries of flooding. The high percentage of buildings (62.1%) with age above 20 years of age shows the high vulnerability of the buildings to flooding in the city. Results of the analysis indicate that more than 70% of the buildings either need minor or major repairs. Only 24.9% of the buildings are physically sound. The implication of this is that, in the event of flooding, majority (70%) of the buildings may not be able to withstand the impact

of the flood. Apart from the River View Estate, all the other neighbourhoods are filled with old and physically dilapidated buildings.

The location of a building plays important role in increasing or decreasing the vulnerability to flooding. Buildings located close to flood plains are more vulnerable to flooding than others on a higher ground. Analysis of data for this study shows that 34.7% of the buildings are located on flood plain or marshy land. By implication, most of the buildings in the study area are highly vulnerable to flood disaster due to their locations. Table 2 shows that majority (91.2%) of the buildings were constructed from cement/sand concrete which reduces the vulnerability of the buildings to the impact of flood. Table 2 further reveal the types of buildings respondents resided in and it indicates that majority (67.4%) of the respondents resided in detached bungalows. The impact of the type of building to issue of vulnerability to flood is that the higher

the building, the lesser the likelihood that it will be affected by flood.

Table 2 further shows poor management of solid waste by the affected communities. About 14.5% of the respondents dump their wastes in the nearby water bodies, 17.6% use refuse bin while 13.9% of them burn their refuse. Also, 35.8% and 18.1% dump their wastes on the streets and in refuse dumps respectively. All the wastes in the streets and others in the refuse dumps finally finds their way into the drainage systems which often results to blocking of the drains. The implication of this finding is that the communities are exposed to health hazards such as cholera and diarrhoea as well as flooding.

Impact of flooding on livelihood systems

Flooding, apart from causing destruction to lives and properties often cause significant damage to livelihood systems of many of the households. When asked the various ways by which the flooding and rainstorm disasters have eroded their livelihood systems, pauperisation and health problems appear to be the major dimension. For instance, as lamented by many respondents, the flooding incidents generally caused disruption of electricity for months affecting business activities, particularly trading. It should be noted that when electricity supply is unavailable for some time, it slows down economic activities among the traders and the artisans which, incidentally, constituted the highest proportions of those affected. Furthermore, flooding related disasters are associated with a number of health problems including bodily injuries as well as the attendant psychological trauma.

According to one of the participants at the FGD session:

“when one’s health is affected by disaster incidents, it becomes difficult, if not impossible, to continue with one’s means of livelihood. This is the singular most worrisome aspect of disaster impact”. The post disaster adjustment would have been easier if relief comes from government and non-governmental organisations on time”.

A gender dimension to this livelihood impacts is the fact that many women engaged in trading (where they derive income to support their homes) are badly affected during flooding. Furthermore, they are often left to cater for most adverse health impacts of flooding on children and other family members. According to a woman participant:

“Many of us women are rendered unemployed for upwards of three months after flooding as their livelihoods especially trading are badly affected. To worsen this situation, poor urban women’s economy is not diversified and thus entrenching the regime of poverty”.

Respondents’ coping mechanisms

Poor communities can be more vulnerable, particularly those concentrated in high-risk areas. They tend to have more limited adaptive capacities, and are more dependent on climate-sensitive resources such as local water and food supplies (see Satterthwaite et al, 2007). Respondents were asked how they cope with the immediate impacts of the flooding disaster and the adjustment process. The results presented in Table 3

shows that by and large, support from friends and relatives and personal savings accounted for the way large proportion of the victims cope with the immediate impacts of flood disasters. Even though government support sometimes come for some of them, many of the victims said the support did not come on time and it did not measure any closer to the degree of impacts suffered by the victims. Many of the vegetable farmers have no compensation or assistance from government. Assistance is mostly limited to destruction of properties, mostly houses. This calls to question the level of disaster response in Nigeria. It is an accepted fact that the agencies charged with disaster management in Nigeria, National Emergency Management Agency (NEMA) and its state counterparts (SEMA),

are incapable of responding promptly and managing the various disasters that had occurred in Nigeria in recent years. A major problem has been in the areas of funding and lack of modern equipment to respond to disasters in the country. According to some of the victims, many of them did not get relief materials until after six months especially those that had to do with materials to repair or rebuild damaged properties. The coping mechanisms employed by victims are as presented in Table 3. As revealed in the table, supports from friends and relatives (41.0%) constituted the bulk of assistance received by victims during and after the disasters. This is followed by whatever the victims can scoop up from their personal savings (23.7%). Support from government constituted only 21.3%.

Table 3: Coping Mechanisms employed by Victims

Coping Mechanisms	Frequency*	Percent
Personal savings	29	23.7
Support from friends and relatives	50	41.0
Borrowing from local money lenders	11	9.0
Borrowing from banks	6	4.9
Government donations	26	21.3

*** Multiple sources of coping mentioned by respondents**

Source: Authors' Analysis, 2013

Adaptation measures to flood disasters

Given the existing low level of knowledge of victims about climate change issues, it became difficult to elicit information from them on how to adapt to the problems. However, most of them are well aware of the factors that turn rainfall events to disasters. Interviews with the victims on measures they would need or are currently using to reduce impacts of flooding reveals that two broad measures

are required. These are the short term and the long term measures. Immediate, short term measures include improvement in the waste collection system and in the core areas, introduction of waste collection system to avoid drainage blockage. Secondly, drainage channels in the modern parts of the city have to be opened to allow free flow of water during heavy rainfall. But in the core, indigenous

areas, drainage channels would have to be constructed because they are currently non-existent. Furthermore, some of the victims especially those who are traders and artisans have decided not to keep too much of their goods in stock during the raining season to avoid heavy losses. Some also have decided to imbibe banking culture by keeping their money in the banks. There is, however, no mention of insurance among the respondents. It's something that is strange to more than 70% of them. The long term measures proposed by the victims include reinforcement of the houses in the indigenous areas or complete rebuilding of some of the houses. However, when asked if the victims would be willing to relocate from their present areas especially those in the worse hit areas, many of them said that they have never contemplated such a move. This was especially true among the old people in the surveyed communities.

As easy as some of these measures may seem, the existing level of poverty may hinder implementation of such measures. This is why government at the state and local level must come in. Government need to put in place measures to reduce the remote factors that exacerbate the intensity and impacts of flooding and rainstorm. Such measures include construction of drainage channels in all parts of the city, improved waste collection system in the city. The government would need to support both the victims and the non victims in reinforcing the existing weak structures in most parts of the city and especially in the indigenous area. But more importantly, there is need for government to enforce building regulations and to improve on city governance.

CONCLUSION

This study brings out the important issue of vulnerability, coping and adaptation to disasters caused by extreme weather events among the urban poor. It examined in some details the strategies adopted by the poor as disasters impact on their livelihood systems and the responses which they employ over time as they struggle to cope. The study revealed that the coping mechanisms employed by the poor, mainly in form of assistance from relatives and personal savings, may become less effective as increasingly fragile livelihood systems struggle to withstand disaster shocks. Also, the recurring disasters are rendering indigenous coping strategies less and less effective and thus are increasing the vulnerability of the poor.

It seems increasingly accepted that disasters should not be dealt with through humanitarian relief interventions alone. There is some evidence to support the argument that disaster management response in the city, just like in other areas in Nigeria, should shift away from this traditional response approach to focus increasingly on addressing the causes of vulnerability in order to mitigate the effects of disaster (Olorunfemi, 2007; Olorunfemi and Raheem, 2008). However, the approach tends to address only the visible signs of vulnerability, such as poor access to services, and generally fails to make a deeper analysis based on the maintenance of sustainable livelihoods by vulnerable people. Vulnerability is seen as a physical problem which can be addressed mainly through technical solutions such as infrastructure development which are at present grossly under provided. However, this approach

generally fails to take into account the views, capacities, knowledge and priorities of local people and is thus limited in effectiveness in truly reducing vulnerability.

The result of this study is useful in designing appropriate institutional interventions capable of transiting victims from being painful victims to developing adaptive capacity to live with recurring floods in many Nigerian cities. Most studies indicate,

with sufficient evidence, that climate will continue to change with far reaching implications on the environment and human livelihoods. Strategies to reduce vulnerability to hazards especially floods should be rooted in vulnerability analysis and greater understanding of both household-level and macro response options that are available to decrease the poor's exposure to climate risks.

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