

Usman A. Raheem^{1*}, Felix B. Olorunfemi²

¹Department of Geography and Environmental Management, University of Ilorin, Ilorin, Nigeria; e-mail: adebimpeusman@gmail.com.

* **Corresponding author**

²Nigerian Institute of Social and Economic Research (NISER); PMB 05, U.I P.O, Ibadan, Nigeria; e-mail: felixba2000@yahoo.com

URBAN VULNERABILITY AND ADAPTATION TO EXTREME WEATHER EVENTS: A CASE STUDY OF RAINSTORM VICTIMS IN ILORIN, NIGERIA

ABSTRACT. Nigeria is a disaster prone country. The disasters which often result into environmental emergencies like flooding are worsened by the degradation of the country's environment and natural resources. Floods, rainstorms and droughts affect households each year in Ilorin and contribute to endemic poverty in most parts of Kwara State. Anticipated increases in extreme weather events will exacerbate this. Using data from both primary and secondary sources the study examines the urban vulnerability and adaptation to climate change among flood and rainstorm victims in Ilorin, Nigeria. The primary data include questionnaire administration to victims in the affected areas of the city. The secondary data on the other hand, include data from the Kwara State Emergency Management Agency on flood victims in the State between 2002 and 2007. This study brings out the important issue of vulnerability, coping and adaptation to weather induced disasters among the urban poor. The study revealed that the indigenous coping mechanisms employed by the poor may become less effective as increasingly fragile livelihood systems struggle to withstand disaster shocks. Also, many of these long-term trends are rendering indigenous coping strategies less effective and thus are increasing the vulnerability of the poor.

KEY WORDS: climate change, disasters, flooding, vulnerability, adaptation, Nigeria

INTRODUCTION

The twin-issues of climate change and global warming have attained global dimensions evident by their recurrent discussions at the UN General Assembly, the Bali, Kyoto Conferences and other International Meetings. Global climate change, driven largely by anthropogenic activities, is a growing threat to human well-being in developing and industrialized nations alike. Significant harm from climate change is already occurring, and further damages are likely [Gwary, 2008].

The vulnerability situation, the present and predicted impact of climate change on urban areas is particularly worrisome. According to Satterthwaite et al [2007], the scale of the devastation to urban populations and economies caused by extreme weather events in recent years highlights their vulnerabilities. Worldwide, there has been a rapid growth in the number of people killed or seriously impacted by storms and floods and also in the amount of economic damage caused; a large and growing proportion of these impacts are in urban areas in low- and middle-income nations (Fig. 1a and b).

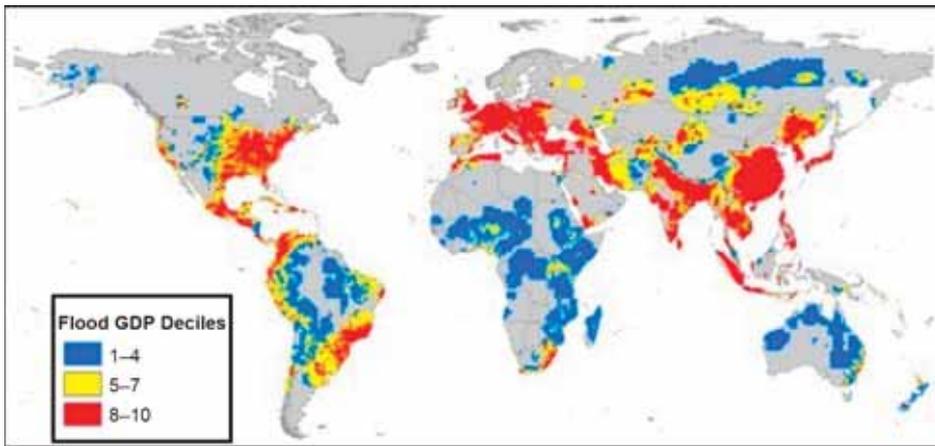


Fig. 1a. Economic losses from flood disaster

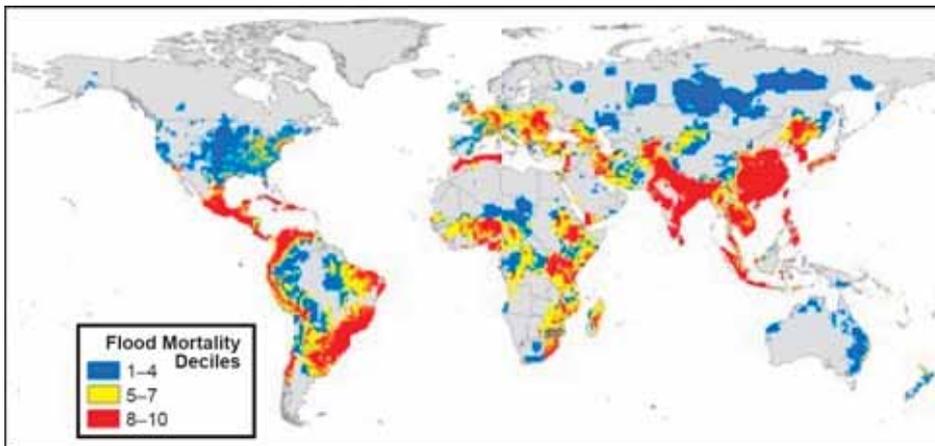


Fig. 1b. Flood disaster mortality

[World Bank Hot Spots: Dilley, Chen, Lerner-Lam et al, 2005]

Climate change is likely to have been a factor in much of this, but even if it was not, it is proof of the vulnerability of urban populations to floods and storms whose frequency and intensity climate change is likely to increase in most places.

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.

The issue of climate change in Nigeria borders on the fact that current development strategies on poverty reduction tend to

overlook climate change risk. In effect, the existing poverty reduction strategies are continuously challenged by climate change which often time deepens poverty. The country lacks capacity to anticipate and respond to climate change and variability related risk [Gwary, 2008, Kumuyi et al, 2008, Gbadegesin, et al, 2010]. There is no adequate information on seasonal forecast of climate variability to enable preparedness to climate related disaster. Early warning facilities are grossly underutilized.

A cursory look at the situation in Nigeria reveals that most of the recent disasters are weather related and studies have linked these weather related disasters to climate change. Most prominent among these disasters is flooding which has continued to occur more frequently with high intensity in many parts of the country. It is in this regard that the study examines more closely the vulnerability and adaptation to flooding among the victims of rainstorm and flood disasters in Ilorin metropolis. Floods, rainstorms and droughts affect households each year in Ilorin with the poorest being the most vulnerable people in the city and which also contributes to endemic poverty in most parts of Kwara State. Global climate change and anticipated increases in extreme weather events will exacerbate this. Practical methods for minimizing negative impacts of flood can be found by building on actions that families are taking and designing interventions in a way that they accommodate the changing social and natural dynamics. This requires addressing the underlying factors of household vulnerability which is often glossed over or neglected in most disaster relief studies and action. This study hypothesizes that attempts made by households- with or without -the help of external agencies, help them to adapt to flood and rainstorm hazards and to regain livelihoods. One of the benefits of local level case studies of adversely affected communities is the understanding of the intricacies of how households with varying backgrounds deal with multiple stresses; and the ability to recover from economic

and social disequilibria created by the event. This also depends, a lot, on the conditions and dynamics of both human and natural systems which vary in time and space. The findings of case studies like this will assist in designing policies that easily adjust to local realities and prevent the characteristic policy failures.

VULNERABILITY AND ADAPTATION TO EXTREME WEATHER EVENTS: SOME CONCEPTUAL ISSUES

Climate research had paid greater attention to the mechanics of alterations in the environment while a scanty attention had been paid to the vulnerability of the population to the impact produced by the alterations. The study of vulnerability is therefore at its infancy often defined variously and in tandem with the ongoing research. Simply defined vulnerability refers to the capability of the population to be wounded from a perturbation or stress of environmental or socio-economic origins. It is the exposure and susceptibility to harm or damage emanating from environmental conditions like flood, erosion, and other extreme weather events. According to the Intergovernmental panel on Climate Change (IPCC) in its Third Assessment Report (TAR), Vulnerability is defined as the “degree, to which a system is susceptible to or unable to cope with adverse effects of climate change, including climate variability and extremes... (it is) a function of the character, magnitude and rates of climate variation to which a system is exposed, its sensitivity and its adaptive capacity” [IPCC, 2001 p. 995].

In the context of this paper, vulnerability is understood to mean the tendencies of people to be killed, injured or otherwise harmed as a direct consequence of the occurrence of extreme events like storms or floods on the one hand; or the severity of damages to climate-sensitive livelihood resources on the other. It is also hypothesized that because of the variation in the socio-economic background of people, vulnerability to the impact of extreme

weather events also varies. Apart from this, the nature of cities in developing countries may also precipitate increased vulnerability for the residents in many respects. For instance, not only that the concentration of people and dwellings produces its own risks, but also because of the dangerous conjunction of such residential dwellings and industrial land uses.

Based on the above, the sensitivity and adaptive capacity of human societies are crucial to the degree to which such societies may be vulnerable. By adaptation, we refer to the degree to which adjustments are possible in practice, processes or structures of systems to projected or actual changes in climate. This can be spontaneous or planned in anticipation of changes in conditions [Kasperson and Kasperson, 2001]. Extreme weather conditions present one of the variations to which human and natural systems rarely adapt easily. In other words, spatial and temporal deviations from annual average conditions are common. Social and economic systems like health, transportation and water resource management often adjust to accommodate the deviations from the normal conditions without necessarily causing hardship to the surrounding population of man and animals. It is only during spontaneous and extreme deviations in climate that many of the human and natural subsystems are found wanting and unable to adjust to accommodate the deviations because such changes or their magnitude were not anticipated or planned for.

Thomas et al [2005] developed a conceptual model of the ways in which adaptation and coping with major livelihood disturbances, including climate extremes, may be constructed. According to them, the responses that can occur at the household level are influenced by motivators and barriers to the decision process. This includes aspects of the household's behavioural intention and context, such as available assets (capital and resources), cohesion, values and ambition, social structures, networks and flows of information, altruism,

self-efficacy, and individual experience and knowledge. All these contribute to what actually take place in the 'response space' which is also affected by the locational context in terms of environmental resources and other opportunities, and external socio-political factors.

Identifying what occurs (and why) in the response space is important in terms not only of outcomes (adaptation or coping) but also in terms of the potential to identify whether adaptation has generic characteristics. This would allow the processes of adaptation to be understood and their potential transferability, into the future and to new contexts, to be assessed. It is therefore important to identify critical elements within the response space in terms of how people behave and have learned in respect of recent historical and current climate variability and change, in order to examine their wider relevance to the adaptation process especially among those whose livelihoods are nature based.

Within the conceptual model, individuals and communities have some autonomy to choose adaptation pathways and locate themselves within the adaptation space. The degree to which they are autonomous is, of course, constrained both by the wider economic and political environment but also by antecedent decisions that partly lock them into particular pathways. A key issue then is to identify whether any location or pathway is in any sense superior to any other. This is a normative issue: the success of adaptation clearly involves judgement regarding values and priorities and depends on who is making decisions within the adaptation process. Nevertheless, there are widely accepted notions that successful adaptations should reduce the risks associated with present day and future climate for all involved, and should not reduce the options for future actions. While the assessment of adaptation is inevitably normative in nature, identifying successful and potentially unsustainable adaptations is important both for policy purposes as well as to highlight how the

issue of adaptation can become a crucible for amplifying, or potentially resolving, existing conflicts over development, progress and the allocation of resources.

There are various geographical scales and social agencies involved in the process of adaptation. Individuals may adapt to climate in response to the impact of extreme events. Other adaptations may be undertaken by governments on behalf of society, sometimes in anticipation of change, but again, often in response to specific events. Thus adaptations can be anticipatory and planned (disaster preparedness) or spontaneous and reactive (disaster recovery) [Smit and Pilifosova, 2001].

It is important to consider if it is possible to distinguish coping from adaptation, since to do so may have particular relevance in formulating policies at national and sub-national levels to deal with the impacts of climate change. While policy initiatives by governments may represent adaptations for the sector as a whole, at the local or regional scale, adaptations and their likelihood of adoption will vary depending upon local circumstances. Thus, insights from empirical evidence could make an important contribution to understandings of the various dimensions of adaptation to extreme weather events, especially within disaster prone urban areas.

According to Thomas et al [2005], recent insights into the resilience of social and ecological systems are particularly relevant here. Since resilience is a technical term related to the properties of a system, it can be assessed through indicators that measure, in the context of specific configurations and disturbances, the ability of a system to:

- absorb shocks and retain its basic function;
- self-organise, for example through social institutions and networks; and
- innovate and learn in the face of disturbances.

Elements of resilience theory is taken on board to define successful adaptation as *adaptation that increases social resilience*. The benefits of this approach are that it recognises that there is no single pathway within the adaptation and vulnerability space in our conceptual model, which allows for considerations of variables across scales and contexts. Additionally, it allows the role of governance to be integrated, since a resilient adaptation is likely to require legitimate and inclusive institutions if collective and self-organised (and hence autonomous) actions are to be facilitated in a sustainable manner [Agrawal, 2002].

THE STUDY AREA

Ilorin, the capital city of Kwara State, Nigeria, is the setting for this study. The city is located on latitude 8° 10'N and longitude 4° 35'E marking a divide between the southern forest Zone and the Northern grassland of Nigeria. The vegetation, in most parts, is guinea savanna interspersed by trees of different species. The dominant streams are Asa, Aluko, Okun, Amule, and Agba. The Asa River is of particular influence on the direction of growth of the city. The situation of the city between the dry North and the wet South of Nigeria gave Ilorin the apt description as the "gate way" between the North and the South of the country" [Adedibu, 1980]. The climate is therefore tropical wet and dry characterized by a distinct wet and dry seasons. The mean annual temperature is about 26,80° c with five hours average daily sunshine. The mean annual rainfall is about 125 mm. It is important to note that the above locational and physiographic characteristics possess (sometimes significant) implications for human health on one hand and economic and social development on the other.

Ilorin is a typical traditional African city whose urban history predates colonialism in Nigeria. The city therefore falls into the category of third world cities described as reputed for their dualistic internal structure [Mabogunje, 1968]. The physical development of Ilorin

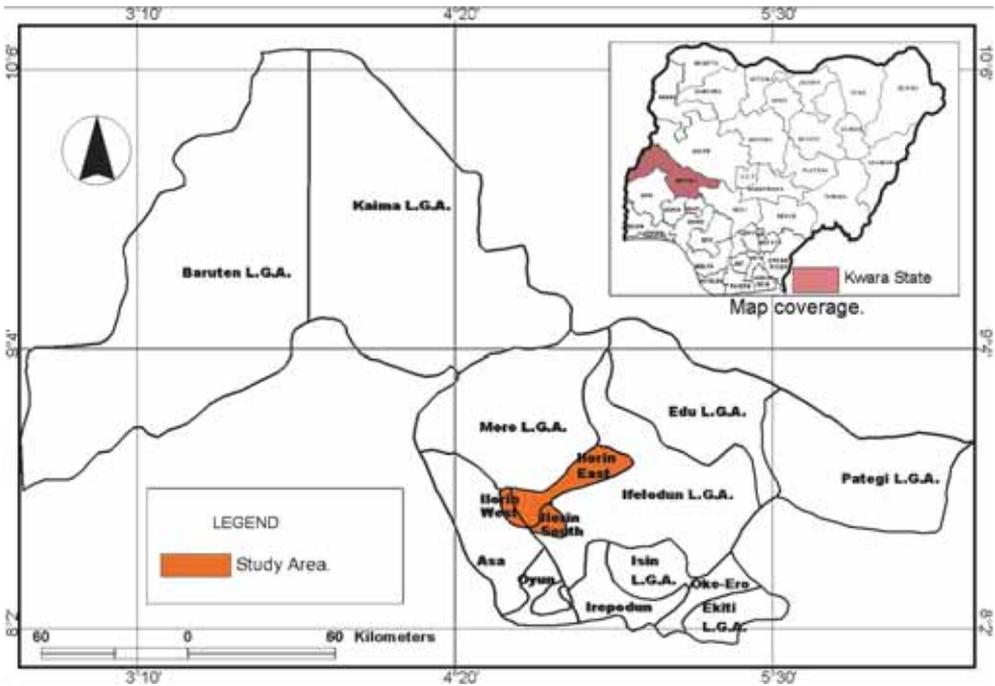


Fig. 2. Map of Kwara State and the Study Area

also translates into significant change in the population of the city. For instance, from 36,300 inhabitants in 1911, Ilorin has a population of about 208,546 in 1963, 532,088 people in 1991 and a projected population of about 765,791 by the year 2006 at the rate of 2.84% annually. The facts of urbanization, development of the modern commercial/industrial economy and the multiplier effects of these factors on natural increase had combined to produce the changes in population described above. Figure 2 is a map of Kwara State showing Ilorin.

Frequent rainstorms and flooding in Ilorin has made it one of the most vulnerable cities in Nigeria in the recent past not only because the number of such incidents had increased in the last few years but also because the severity had translated into extensive damage to properties and the livelihoods of the people.

DATA AND METHODS

In order to study the vulnerability and adaptation methods of flood victims in Ilorin, the study utilized both primary

and secondary data. The secondary data were collected mainly from the National Emergency Management Agency, Kwara State office. The data collected include the details of various disaster incidents in the State between 2002 and 2007. Aside this, data were collected from households that occupied the properties destroyed by rainstorms and floods during the period under review.

For the primary data, the focus was on the disaster victims within the city. According to the Kwara State office of the National Emergency Management Agency (KWEMA), between 2002 and 2007, a total of 30 episodes of flood and/or rainstorm events occurred that affected different parts of Ilorin metropolis. These effects included collapsed buildings and damage to properties. About 4,012 households were reported to have been affected by the incidents [KWEMA, 2007]. Out of these, the researchers were able to trace only 2100 households during the reconnaissance survey for the purpose of this study. The inability to reach all affected households was due to the displacement

that followed rainstorm and flood events. This led to some households changing their residents more than once within a period of five years. Thus, a total of 110 households were sampled, representing 5% of the total number of households that were located during the preliminary survey.

A structured questionnaire was administered to them in addition to oral interviews and on the spot assessment of the victims' houses to determine the extent of damage to properties. The questionnaire elicited information on the socio-economic characteristics of the victims, their opinion of government handling of the situation, their coping mechanisms with the disaster incidents as well as their adaptation measures. The questionnaire also elicits information on how the disaster affected their livelihood systems. Furthermore, the victims were asked about their perception of the causes of frequent rainstorms and flooding incidents, and their understanding of climate changes issues. Data were collected on the characteristics of the victims' houses including age of the building, material used for the construction of the external wall, material for the roof, materials used for the floor, type of dwelling and nature of ownership and neighbourhood characteristics.

Ilorin is traditionally divided into 4 socio-cultural and economic areas: the estates, inner city, frontier native areas and the suburban. These areas are further subdivided into 20 wards. Using the data obtained from NEMA in respect of the number of buildings affected by rainstorm and flooding, the data was organized according to wards from where geographic information systems (GIS) generated map was used to show the spatial variation in flooding/rainstorm severity among the wards. (see figure 3). Furthermore, a multiple linear regression model was tested to see the determinants of the vulnerability of houses to rainstorm and flooding. Specifically, the model was designed to see how housing and neighbourhood characteristics determined the impacts

of rainstorm and flooding on houses. The dependent variable was represented by the number of houses affected by rainstorm and flooding. The independent variables used for the model were the characteristics of the buildings such as age, materials for the wall and the roof etc (these constitute the house quality). Apart from house characteristics, neighbourhood attributes were also used. The neighbourhood attributes were aggregated into one variable called the neighbourhood quality index. Neighbourhood quality index (NQI) was derived from composite of variables which include presence or absence of tarred roads, drainage, solid waste collection system, green areas, odour, health facilities, and pipe borne water. Where a variable is available it is 1 and otherwise 0.

The model was then formulated as follows:

$$\text{NHD (Y)} = b_1 (\text{HTT}) + b_2 (\text{HCB}) + b_3 (\text{HIR}) + b_4 (\text{DT}) + b_5 (\text{NQ})$$

where: Y (NHD) – Number of houses destroyed; X_1 (HTT) – Number of houses older than 20 years; X_2 (HCB) – Number of houses constructed with materials other than concrete – blocks; X_3 (HIR) – Number of houses with inferior roofs; X_4 (DT) – Dwelling; type X_5 (NQI) – neighbourhood quality.

RESULTS AND DISCUSSIONS

Socio-Economic Characteristics of Respondents

The results of the analyses provided in Table 1 shows that males constituted the highest percentage of respondents (74,55%). This is not surprising considering the fact that most households in the city are male headed due largely to socio-cultural and religious factors. More than two thirds of those interviewed are married (86,37%). Also, more than two thirds are above 36 years of age. Specifically, the largest proportions of the respondents (40,0%) are above 50 years of age. Again, this is not surprising considering the fact that most

Table 1. Socio-Economic Characteristics of Respondents

Socio-economic Characteristics		Frequency	Percentage
Sex	Male	82	74.55
	Female	28	25.45
Age	20 and below	–	–
	21–35	28	25.45
	36–50	38	34.55
	Above 50	44	40.00
Marital status	Single	9	8.18
	Married	95	86.37
	Others	6	5.45
Education	No formal education	18	16.37
	Primary	36	32.76
	Secondary	40	36.40
	Tertiary	16	14.57
Occupation	Civil servants	10	9.10
	Farming	31	28.21
	Artisan	42	38.22
	Trading	22	20.02
	Unemployment/retired	5	4.55
Household size	1–3	27	24.57
	4–6	43	39.13
	7–10	28	25.48
	10 and above	12	10.92

of the inhabitants of the core/indigenous areas which are often mostly affected by flooding/rainstorm are old people. With respect to the level of education obtained, 16,37% have no formal education while only 14,57% have tertiary education. Most of the respondents are artisans (38,22%), 28,21% farmers and another 20,02% are traders. It is clear from the results that only 9,10% of the respondents are engaged in the formal sector. This result is very peculiar to situations obtained in many similar neighbourhoods in the Nigerian urban areas. With respect to the household size, close to 80% of the respondents have more than 4 people in the household.

Spatial Pattern of Flooding/Rainstorm Incidents in Ilorin

An analysis of the Data obtained from NEMA office shows that the impacts of the

flooding/rainstorm disaster incidents were more in the traditional, core areas of the city going by the number of properties damaged. Figure 3 is a map of Ilorin showing the severity of the disaster incidents.

It should be noted that the traditional, core areas of the city are characterised by high population and the people in these areas are most at risk of all environmental emergencies. This is because basic infrastructures are either not available or old and weak. The houses are also too old or are made of low quality materials. The existing situation has increased the anxiety on the part of the people that future incidents will continue to have higher impacts. The next section which discusses the characteristics of the affected buildings from data collected from the field further confirm the fact that most of the buildings in most parts of the city

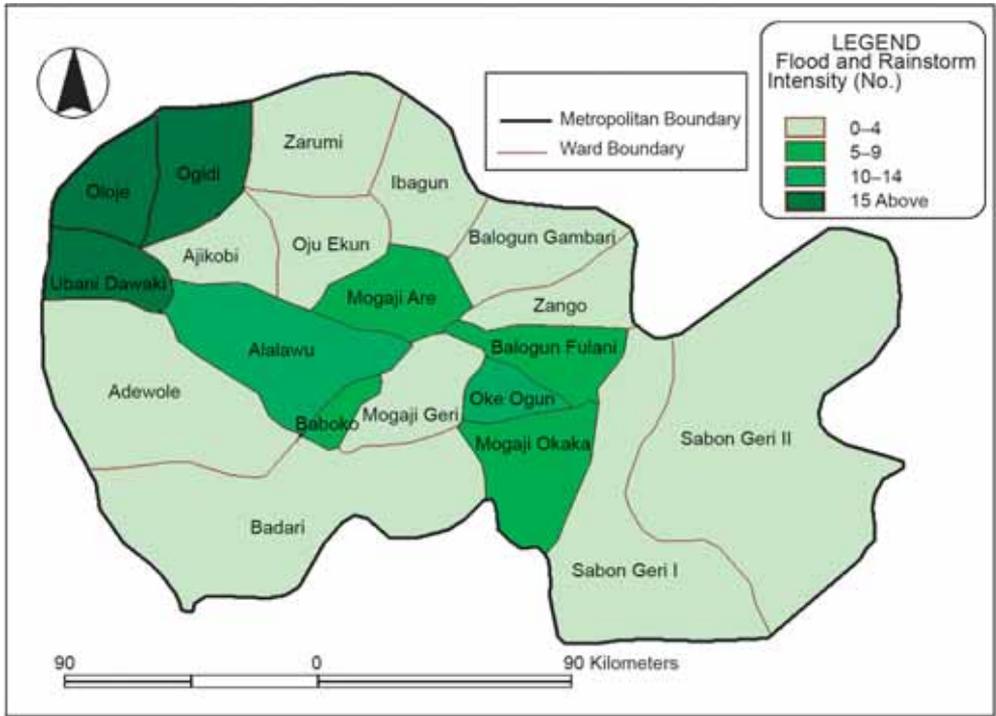


Fig. 3. Map of Ilorin Metropolis showing the Severity of Floods and Rainstorm Intensity

especially the core, indigenous areas cannot withstands rainstorm or severe flooding whenever they occur.

Characteristics of Affected Buildings

Data on the attributes of respondents' houses were collected. This data becomes important considering the fact that the structure of a building directly affects its resistance to rainstorm and flooding. A random survey of the buildings in the most affected areas shows that the houses are not of very good materials and hence they are highly vulnerable to various kinds of disasters.

The results presented in Table 2 shows that more than a half (60%) of the houses are more than 30 years of age, more than one third (37,3%) constructed with mud bricks. About 64,6% roofed with metal sheets which have turned brownish and fragile over the years. More than two third of the houses have their floor made with earthen floor, out of which about 12,7% are not plastered at all. The houses are mostly multi family

house (35,5%). The implication of this is that more people are exposed to risks when ever disasters strike in the area, especially the core/indigenous areas.

The result of the multiple linear regression model tested to see the determinants of the vulnerability of houses to rainstorm and flooding shows that the house characteristics and neighbourhood quality contribute significantly to vulnerability to rainstorm and flooding. The 'r' value obtained for the model is 0,65 while the R^2 is 0,43 (Table 3). This result is interpreted to mean that the independent variables contribute 43% to the explanation of the determinants of vulnerability of houses to flooding. Furthermore, the unstandardized regression coefficients shows that HTT (age of building) contributed most to this explanation among the independent variables.

Impact of Flooding on Livelihood Systems

Flooding and firestorm disasters, apart from causing destruction to lives and properties

Table 2. Characteristics of Affected Buildings

Characteristics		Frequency	Percentage
Age of building (years)	1–10	4	3.63
	11–20	12	10.92
	21–30	28	25.48
	31–40	51	46.41
	42 and above	15	13.65
Materials for External wall	Bricks	65	59.15
	Concrete plates	3	2.73
	Mud bricks	41	37.31
	Wood logs	1	0.91
Materials for the roof	Asbestos sheets	10	9.10
	Metal sheets	71	64.61
	Tiles	2	1.82
	Mood thatch	17	15.47
Material for the floor	Tile	12	10.92
	Concrete	18	16.38
	Plastered earthen floor	66	60.06
	Unplastered earthen floor	14	12.74
Type of dwelling	Detached house	10	9.10
	Multi family house	39	35.49
	Separate apartment	7	6.37
	Rooms in a large dwell	36	32.76
	Others	18	16.38
Nature of ownership	Owner occupied	43	39.13
	Family owned	45	40.95
	Rented house	18	16.38
	Others	4	3.64

Source: Authors' Analysis.

Table 3. Coefficients*

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	6.595	6.058		1.089	0.295
VAR00001 HTT	0.251	0.863	0.091	0.291	0.775
VAR00002 HCB	5.927E-02	0.494	0.029	0.120	0.906
VAR00003 HIR	-0.592	0.793	-0.201	-0.746	0.468
VAR00004 DT	8.001E-02	0.669	0.030	0.120	0.907
VAR00006 NQ	-6.625	2.408	-0.594	-2.751	0.016

* Dependent Variable: VAR00007 NHD.

can also cause significant damage to livelihood systems of the victims. This has been the case with the victims which this study focused on. The damage or destruction to livelihoods systems would be seen to have compounded the existing poverty situation among the victims. 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 some respondents, the incidents generally caused destruction of electricity in some areas for months, trading, one of the major occupation of the victims staled, and crops washed away on farms, especially among those in the suburban. 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, the disasters are associated with a number of health problems including bodily injuries as well as the attendant psychological trauma. According to one of the victims, "when one's health is affected by disaster incidents, it becomes difficult, if not impossible, to continue with one's means of livelihood". According to him, 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 number of women in the inner city and Frontier Native areas depend on irrigated vegetable farming around the flood plains of Asa, Aluko and Amule- the three dominant

streams that flow in most parts of the metropolis. During flood events, vegetable farms are washed away and the land remain flooded for a long time after. Women are rendered unemployed for upwards of three months when they can start all over. To worsen this situation, poor urban women's economy is not diversified and thus entrenching the regime of poverty.

Coping Mechanisms Employed by Victims

Poor communities can be especially vulnerable, in particular 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). The victims were asked how they coped with the immediate impact of the flooding/rainstorm disaster and the adjustment process. The results presented in Table 4 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 the disaster. Even though government support came for most 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. This calls to question the level of disaster response in Nigeria. It is an accepted fact that the agency charged with disaster management in Nigeria (NEMA) is 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

Table 4: Coping Mechanisms employed by Victims

	Frequency*	Percent
Personal savings	29	23.7
Support from friends and relatives	50	41.00
Borrowing from local money lenders	11	9.01
Borrowing from banks	6	4.91
Government donations	26	21.31

* Multiple sources of coping mentioned by respondents.

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 as presented in Table 4

Adaptation Measures to Rainstorm and Flooding Disasters in Ilorin

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. Interviews with the victims on adaptations measures they would need or are currently using 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 as move. This was especially true among the old.

As easy as some of these adaptation measures may seem, the existing level of poverty may hinder any 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 climate change induced disasters among the urban poor. It examined in some detail the strategies adopted by poor neighbourhoods as disasters impact on their highly complex livelihood systems and the sequence of responses which they employ over time as they struggle to cope.

The study revealed that the indigenous coping mechanisms employed by the poor may become less effective as increasingly fragile livelihood systems struggle to withstand disaster shocks. Also, many of these long-term trends are rendering indigenous coping strategies less and less effective and thus are increasing the vulnerability of the poor.

It seems increasingly accepted (although not consistently implemented) that disasters shouldn't 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. 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 may not even be provided at the appropriate time. 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 the study is expected to be useful in designing appropriate institutional interventions capable of transiting victims from being painful victims to developing adaptive capacity to live with recurring floods in Nigeria. Most studies indicate, with sufficient evidence, that climate will

continue to change with far reaching implications on the environment and human livelihood.

The climate change and variability are likely to worsen the prospects for poverty eradication unless action is taken to become response-capable. This requires a focus on reducing vulnerability, achieving equitable growth and improving the governance and institutional context in which poor people live. Strategies to reduce vulnerability 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 risk. Increasing the response-capability of Nigeria will require information on seasonal forecast to enable the preparedness to climate variability as well as longer term climate prediction data to ensure that strategies to reduce vulnerability also reflect the underlying longer-term climate trends. ■

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Usman A. Raheem (PhD) teaches human geography at the University of Ilorin, Nigeria where he has put in more than 15 years of teaching and research. His research interests cover the broad area of medical geography with emphasis on Urban health, climate change and Disaster Risk analysis. He has participated in several international conferences and training workshops (6th International Human Dimensions Programme (IHDP) – Germany, 2005, 5th International Human Dimensions Workshop – New Delhi, 2008, Bergen Summer Research School (BSRS) on Global Development Challenges – Norway, 2009 and 4th International Training Workshop on Global Environmental Change and Human Health in Urban Areas, China, 2012. He is a member of the International Society for Urban Health, USA, International Society for Ecological Economics (ISEE), International Association for Research in Income and Wealth (IARIW) and Association of Nigerian Geographers (ANG). He is currently the Regional Coordinator (Africa), with Felix B. Olorunfemi, for the Earth System Governance Fellows Network. www.earthsystemgovernance.org/people/. He has published widely in reputable local and international research journals.



Felix B. Olorunfemi (PhD) is a Senior Research Fellow at the *Nigerian Institute of Social and Economic Research (NISER)*, Ibadan. He obtained his PhD in Geography from the University of Ibadan, Nigeria in 2004 with funding assistance from the Council for the Development of Social Science Research in Africa (CODESRIA), Dakar, Senegal. He is also a Research Fellow of the Earth System Governance Project and executed a fellowship programme awarded by Global Change SysTems Analysis for Research and Training (START), Washington DC, under the African Climate Change Fellowship Programme (ACCFP) in the University of Cape Town, Climate Systems Analysis Group, South Africa in 2010. The fellowship project focused on flood risks and sustainable adaptation in selected informal settlements in the City of Cape Town.