Exploring Social Vulnerability to Natural Disasters in Urban Informal Settlements - Perspectives from Flooding in the Slums of Lagos, Nigeria

Inaugural-Dissertation

zur

Erlangung des Doktorgrades

der Mathematisch-Naturwissenschaftlichen Fakultät

der Universität zu Köln

vorgelegt von

Innocent Forba Nsorfon

aus Kamerun

Berichterstatter:
Prof. Dr. Boris Braun (Universität zu Köln)
Prof. Dr. Michael Bollig (Universität zu Köln)

Tag der mündlichen Prüfung: 28.11.2014

ABSTRACT

Within the last decades, there has been an extreme occurrence of natural disasters, especially in urban settlements. Due to this, there have been efforts to advance human understanding of social sources of vulnerability to these disasters in an attempt to reduce the high social and material costs. This study therefore explored social sources of vulnerability to natural disaster with focus on floods in informal settlements of Lagos. Lagos represents one of the cities with the fastest growing urban agglomerations in the world. About half of its population lives in informal settlements thereby exacerbating a high degree of vulnerability especially among slum dwellers. This study is based on a comprehensive household survey and key informants interviews as well as on focus group discussions. It documents the scale and frequency of flooding in informal settlements and the impacts as well as the household and community coping and adaptation mechanisms. It also explores the institutional responses and adaptations measures against the prevailing flood situation. The study also examines how factors such as lack of infrastructure, poor socio-economic and locational disadvantages contributes to the vulnerability of slum dwellers to floods.

The coping and adaptation mechanisms employed in this study depended upon the diversity and accessibility of the available options, economic affordability of the households and level of social networking. From this study, social capital plays a leading role in galvanizing mutual help among neighbours and different networks. Based on the exposures and management capacities identified in this study, recommendations were also made on how to enhance capacities to reduce flood vulnerability in Lagos informal settlements.

KURZZUSAMMENFASSUNG

In den letzten Jahrzehnten kam es zu einer Vielzahl von Naturkatastrophen vor allem in städtischen Räumen. Aus diesem Grund bedarf es einem besseren Verständnis insbesondere der sozialen Gründe für Verwundbarkeit gegenüber diesen Katastrophen, um die hohen sozialen und materiellen Kosten zu senken.

Die vorliegende Studie untersucht daher die sozialen Ursachen der Vulnerabilität durch Naturkatastrophen mit einem Fokus auf Hochwasserereignisse am Fallbeispiel informeller Siedlungen in Lagos, Nigeria. Lagos ist eine der am schnellsten wachsenden städtischen Ballungsräume der Welt. Mehr als die Hälfte der Bevölkerung von Lagos lebt in informellen Siedlungen, wobei die Verwundbarkeit der Bevölkerung in den Slums am größten erscheint. Diese Studie basiert auf umfangreichen Haushaltsbefragungen und Experteninterviews sowie Gruppendiskussionen. Im Vordergrund des Interesses steht die Dokumentation der Größenordnung (scale) und Häufigkeit (frequency) von Überschwemmungen in den informellen Siedlungen sowie deren Folgen. Weiterhin werden die Bewältigungs- und Anpassungsstrategien sowohl auf institutioneller als auch individueller und gemeinschaftlicher Ebene (household and community coping and adaptation mechanisms) untersucht. Dieses umfasst auch eine Analyse der Infrastrukturdefizite, sozio-ökonomischen Parameter und lokalen Standortnachteile, die zu einer erhöhten Vulnerabilität der Slumbewohner gegenüber Überschwemmungen beitragen. Die Wahrnehmung der betroffenen Menschen spielt eine wichtige Rolle für das Verständnis der sozialen Verwundbarkeit, denn die Wahrnehmung der Naturrisiken und der eigenen Exposition dieser gegenüber beeinflusst Bewältigungs- und Anpassungsstrategien einzelner Individuen und sozialer Gruppen.

Die Ergebnisse zeigen, dass die verschiedenen sozialen Gruppen innerhalb der informellen Siedlungen unterschiedliche Bewältigungs- und Anpassungsstrategien wählen, je nach Wahrnehmung, verfügbaren Optionen und Managementfähigkeiten. Weiterhin weisen die Ergebnisse dieser Studie darauf hin, dass Sozialkapital von entscheidender Bedeutung ist, da die Betroffenen auf gegenseitige Hilfe unter Nachbarn und über verschiedene Netzwerke angewiesen sind. Auf Basis dieser Ergebnisse gibt die Arbeit Empfehlungen zur Verbesserung der lokalen Situation, die zu einer Reduzierung der Vulnerabilität gegenüber Hochwasserereignissen in den informellen Siedlungen von Lagos beitragen können.

ACKNOWLEDGEMENTS

I would like to express the deepest appreciation to my supervisor, Prof. Dr. Boris Braun, who supported me in every step of this work. He continually and convincingly provided me valuable guidance, expertise and helpful suggestions throughout the completion of this thesis. This work would not have been possible without his inspiration, support and untiring help. I also wish to express my heartfelt appreciation to Prof. Dr. Michael Bollig who readily agreed to be my second supervisor and provided me with his valuable feedback and comments.

Finances have been a very big challenge during the course of this program. I am grateful for the financial support provided by Global Fund for Research and Development. Also, I would like to acknowledge the financial support received from the `"Graduate School of Geosciences, University of Cologne" through their Fellowship grant.

I am heartily thankful to the slum dwellers of Badia and Makoko in Lagos, whose collaboration facilitated the research process. Their hospitality and the generosity of their time in answering my endless and sometimes boring and worrying questions are highly appreciated.

Many thanks are due also to the various stakeholders in both the government and non-governmental sector in Lagos, who provided valuable information about my enquiries. Thanks to authorities of the Department of Urban and Regional Planning, University of Lagos for providing the necessary help needed in carrying out field work in Lagos. I cannot forget the students also from University of Lagos who assisted me in one way or the other during the fieldwork. The acknowledgement would remain incomplete without mentioning support from colleagues of the Institute of Geography, who have helped all through my stay in the institute in one way or the other.

Without the moral support from my family, this thesis could not have been feasible. I am deeply indebted to my partner Bibi Pamela, who have been understanding and supportive all this while. I dedicate this thesis to my parents with gratitude for bringing me up to understand the Virtues of self-discipline, steadfastness, perseverance, and patience.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

- BBC British Broadcasting Cooperation
- CBO Community Based Organization
- CRED Centre for Research on the Epidemiology of Disasters
- DFID Department for International Development
- DiMP Disaster Mitigation for Sustainable Livelihoods Programme
- DRU Disaster Response Unit
- ECLAC Economic Commission for Latin America and the Caribbean
- ECOWAS Economic Community for West African States
- EMV Emergency Management Volunteer
- ERA European Reservation Areas
- FANR Food, Agriculture and Natural Resources Sector Development Unit
- FBO Faith Based Organization
- GDP Gross Domestic Product
- GILA Great-Ibadan-Lagos-Area
- HBE Home Based Enterprises
- IADB Inter-American Development Bank
- IPCC International Panel on Climate Change
- LAL Learning about Livelihoods
- LDC Less Developed Countries
- LEDB Lagos Executive Development Board
- LEMA Local Emergency Management Authority
- LGA Local Government Area

- LSG Lagos State Government
- NDMF National Disaster Management Framework
- NDRP National Disaster Response Plan
- NEMA National Emergency Management Board
- NEPA National Electric Power Authority
- NERA National Emergency Relief Agency
- NGN Nigerian Niara
- NGO Non-Governmental Organization
- PAHO Pan American Health organization
- PAR Pressure And Release
- SADC South African Development Community
- SEMA State Emergency Management Agency
- SERAC Social and Economic Rights Action Center
- SoVI Social Vulnerability Index
- UN United Nations
- UNDP United Nation Development Programme
- UN-HABITAT United Nations Human Settlement Programme
- UNISDR United Nations/International Strategy for Disaster Reduction
- WFP World Food Program
- WHO World Health Organization

CHAPTER 1: INTRODUCTION

1.1 Problem Statement

Natural disasters are part of human history. But with the recent trend of urbanization in developing countries there has been a rise in population density which has increased interactions between the social components of these urban areas and their physical environment thereby producing unique and dynamic human dominated ecosystems. Frequently, one of the byproducts is a socially-driven amplification of losses from extreme natural events (IPCC, 2007a; Mitchell, 2005). Urbanization has also contributed to the human desire to occupy areas susceptible to natural disasters therefore resulting to a high level of vulnerability and putting life and property at risk. The trend of increasing hazards in the world today has served as a reminder that vulnerability to hazard remains significant even in the face of enhanced communications, advancements in the science of prediction, and considerable financial and technological investment in infrastructure to protect human settlements (Mitchell, 2003; Parker, 2000; Wisner et al. 2004).

Global climate change is enhancing the interactions between people and their environment. For example, in some areas the occurrence of river flooding and sea-level rise could produce substantial increases in flood risk (e.g. Bronstert, 2003). As losses grow, both tangible (physical and economic) and more intangible (e.g. pain and suffering), there is an urgent need to understand the relationship between people and natural hazards (Mileti, 2001).

There are also concerns about continued growth and development in hazard prone areas thereby interfering with natural systems and ecological processes (De Loe, 2000) and highlighting that human behaviour is a contributor to the problem of natural disasters. In

general, unsustainable land uses and development practices may often make a sizeable contribution to disasters like floods, and may increase vulnerability to disaster through promotion and adoption of unsustainable survival and coping strategies in the face of a flood hazard (Huq et al. 1999).

Natural hazards like flood events become actual disasters for many reasons, some related to the physical characteristics of the flood (size, duration, etc.) and others related to human or social factors. Disasters are primarily defined according to the vulnerability of human groups that are exposed to the event. That vulnerability is in turn affected or determined by a number of factors. Two frequently-cited categories of factors include the level of 'risk' at that location (particularly the probability of occurrence of the hazard event and likelihood of damage) and conditions that contribute to social vulnerability

"Social vulnerability" as a term includes a wide range of social, economic and political sources of vulnerability within a community or society (Blaikie et al. 1994). Social vulnerability to hazard is most easily understood in the context of the developing world where for example, poverty, population growth, and marginalization of some groups within society mean: 1) people live in less secure physical environments and 2) they have less access to resources should a hazard event occur. It is thus not surprising that much research on vulnerability has been done in poor nations. In a general sense, the vulnerability approach has as a goal to identify the (often) more subtle processes that can both directly or indirectly influence loss and hardship among human groups exposed to a hazard. They include for example, the nature of people's relationship with the environment, local knowledge of the hazard, local adaptive strategies, local decision-making processes, and the role of institutions in determining the interpretation of and response to disaster, including distribution of risk. These processes are highly complex and exist at multiple scales. These are also the same processes that are frequently

overlooked in decision-making when expedient solutions to flood risk are sought and adopted by decision-makers. They also can limit or enhance communities' capacities to be sustainable.

Hazards such as floods are managed within a broad context of social, political and economic forces. For example, economic and political forces at multiple scales may be implicated in encouraging livelihood activities in hazardous zones like in informal settlements (slums). At the international, national and local level, flood mitigation activities may be focused upon either technocratic solution to risk, or upon broader holistic policies and strategies that seek to promote sustainable communities. Such policies and activities, and the judgments and values upon which they are based, greatly influence vulnerability; they can provide incentives or disincentives related to how flood hazard is managed.

Vulnerability has been defined so far in various ways, with the definition often reflecting to a greater or lesser extent the discipline of the author. A definition of "vulnerability" suitable to this research refers generally to characteristics of a person (or group) in terms of their capacity to anticipate, cope with, resist, and recover from the impact of a hazard (Blaikie et al. 1994). When people are vulnerable to a hazard it can threaten their lives, livelihoods, property, infrastructure, economic productivity, natural resources, and regional prosperity (Huq et al. 1999). The responses they adopt to handle the risk can in turn have long-term implications for the sustainability of their communities. Both governmental and non-governmental organizations have a key role in managing vulnerability and response to hazards, whether natural or human induced. Historically, public policy related to hazard management has reflected early hazard research practice. Its focus was on mitigation, preparedness, response, and recovery (Jones and Preston, 2011). This focus used much traditional science (where causes and solutions are relegated

to discrete measurable aspects of disciplinary inquiry) to predict the consequences of hazards, to organize response plans, and develop mitigation options, but it had some serious limitations. The chief limitation in the case of flood hazard was that this approach failed to reduce losses and hardship from successive floods. Perhaps this limitation existed because hazards as agents of harm cannot be perfectly understood, nor can the consequences of mitigation activities be reliably and accurately predicted. Or, more importantly how people live where they live, what they do, and how they are likely to be impacted by a crisis are less dictated by science than by their social circumstances including their values, culture, and worldview. Increasingly in environmental literature, the objective aspects of hazards (primarily quantitative physical sciences) and the subjective aspects (related to social science concerns) are seen not so much as dichotomous but rather as interwoven characteristics of complex human-natural systems.

Vulnerability models, with their inclusion of social sources of vulnerability, work best where the social circumstances of people are well-understood. Yet recognizing that social factors greatly influence hazard response does not mean they are easily identified and evaluated. Social factors vary (to greater and lesser degrees) from community to community, culture to culture, thereby making a broad theoretical models of behaviour which poorly predicts human actions and the likely impacts of a disaster. These factors are, however, crucial to a vulnerability approach to hazard studies, especially at a local level. Vulnerability is thus highly contextual (Jones and Preston, 2007).

Conceptual frameworks and vulnerability typologies, which identify factors (including social ones) contributing to vulnerability to hazard, have been developed (Blaikie et al. 1994). These have helped in the analysis of vulnerability, including attempts to identify the complex causes and effects of vulnerability beyond the mere physical forces at play. Yet it is common practice in Nigeria to address the physical aspect of flood hazards

without the social dimension which leads to short-sighted unsustainable approaches with potentially alarming long-term consequences.

1.2 Informal Settlements: Natural Disaster and Vulnerability

Within the last decades, rapid urbanization and inadequate capability to cope with the housing needs of people in urban areas have contributed to one of the biggest urban challenges in developing countries: the expansion of urban areas and the creation of unplanned settlement areas as the sole option for newcomers. Most of the informal settlements are often located in marginalized, low-lying and environmentally fragile areas that are unsuitable for residential purposes, e.g. wetlands and floodplains.

Informal settlements or slums are defined in many ways, but in every cultural region they are mostly characterized by high densities, poor housing, inadequate basic infrastructure (such as portable water, drainage, sewage and garbage disposal) and they suffer from degraded environmental and health conditions. Informal settlements have often been interpreted as places of gross inequities and injustice (Davis, 2007), but at other times as centres of dynamism with great potential for change (Owusu, 2008), and occasionally as iconic places of cultural expression and solidarity (Cejas, 2006).

As pointed out in UN-HABITAT (2003), the term 'slum' is a “general context to describe a wide range of informal settlements and/or poor human living conditions”. Different criteria used to define “informal settlements” include physical, spatial, social and behavioural factors. However, the situation in the real world is much more complex- rapidly expanding squatter settlements comprise of simple shacks and permanent structures, with a population having a wide variety of social, tribal and economic backgrounds, thus escaping most of the definitions given by scholars. Every settlement is different with distinctive characteristics. On the other hand, informal or spontaneous

settlements are settlements whereby persons or squatters assert land rights or occupy for exploitation of land which is not registered in their names, or government land or land legally owned by other individuals (Kibwana, 2000a). Squatters are people who occupy land or buildings without the explicit permission of the owner (UN-HABITAT, 2003). Predictions for urban growth and consequent expansion of informal settlements in cities of developing world have been discussed by scholars (Brockerhoff, 1999; Drakakis-Smith, 1997; Gugler, 2003). Some studies have particularly focused on complex issues such as measuring slum populations in cities that have high rates of daily and/or floating migrants (UN-HABITAT, 2006a). However, a significant part of this literature is addressed to understanding: (1) the consequences of uneven development (Hardoy, 2001; McGranaham et al. 2001), (2) the changing spatial order of cities in developing countries (Marcuse, 2000), and (3) the challenges of advancing the basic living standards of low income populations of cities (Satterthwaite, 2009; Tipple 2005). Another strand of literature deals with increasing knowledge about the expanding informal economy in urban areas of developing world and puts particular emphasis on descending its growing macroeconomic connections (Altrock, 2012; Baumgart and Kreibach 2012; Becker, 2004; Pratap and Quintin, 2006).

Transformations associated with informal growth and agency of informal populations have been sometimes interpreted as processes of power and societal revolution (Soto, 1990), some of which have prompted the launch of slum upgrading and self-help programs by international development organizations, including the World Bank. Others look critically at the role of capitalist states and interpret informal settlements as the by-product of globalization (Davis, 2007). Other literatures focuses on innovative ways of interpreting informal settlements as "new contact zones" wherein it is possible to experience exotic spaces in different cultures and expand interpretations of impoverished

communities through exposure and increased travel (Azarya, 2004). Positive images of informal settlements are promoted by urban development professionals and scholars who emphasize the value of promoting "better shelter" as a policy goal rather than "slum up-grading". The latter term renders informal settlements and the people living in them as the disagreeable underside of modern society in developing countries.

25 years ago, Hardoy and Satterthwaite (1989) observed the connection between informal settlements and environmental impacts like natural hazards by stating that, in developing countries, "it is virtually always the poorest groups who suffer most from floods, landslides and other natural disasters which have become increasingly common occurrences". More recently, Warmsler (2005, p.11) echoed this also, stating that "the damage caused by the worldwide rise in disasters is felt most acutely by the almost one billion people living in informal settlements".

It is important to note that discussion on the environmental impact in informal settlements is two-sided. On the one hand, the conditions experienced in informal settlements because of both external threats from natural and manmade disasters, as well as internal threats deriving from the types of temporary housing and lack of services have their direct impacts on the residents. This aspect assesses informal settlements for their appropriateness as human habitats. On the other hand, the cumulative impacts of informal settlements in certain locations are significant for the city and region in which they are located, although there is a debate about how much worse these impacts are than those from formal settlements.

There is a longstanding recognition that careful and proactive land-use planning and community and housing design can reduce hazard-related losses (Burby, 2006; Smith, 2004; Tipple, 2005; UNISDR, 2007). Earthquake, tsunami, and flood resistant housing are but three examples of where small changes at the design level can result in significant

vulnerability reduction. Likewise, hazard susceptibility assessment and mapping is a well-established tool with which to structure decision making on the location of various types of community infrastructure (such as residential housing, recreation areas, and critical infrastructure including hospitals and water treatment facilities) and to identify zones where development should not be permitted.

However, the very nature of informal settlements challenges these approaches. Informal settlements, by definition, are created organically and incrementally through unassisted self-help (Napier, 2002, p.8) of hundreds or thousands of individual families, most of whom do not have a sophisticated understanding of sound land use planning, community design, or hazard resistant housing design principles.

Many types of disasters affect households whether resident in informal settlements or not, but there are two reasons that informal settlement dwellers are vulnerable. The first one is that the settlements are often located in hazardous situations, and the second one is that more general threats are harder to cope with and have greater physical and socio-economic impacts on people living in poverty in informal settlements. Global statistics on natural and non-natural disasters demonstrate the relative vulnerability of poor countries. While more than half of the natural disasters reported between 1991 and 2000 were in countries of medium human development, two-thirds of those killed were from countries of low human development and only two percent were from countries of high human development (UNCHS, 2001). While there is understanding that secure tenure and improved community involvement can contribute to reduction of vulnerability among residents of informal settlements, there is a lack of understanding of how best to address these issues in communities vulnerable to, or affected by natural hazards. Pelling (2003, p.44) concluded that the body of literature connecting disasters and urbanization is weakly theorized. Warmsler (2005) supported this in her review of a number of post-disaster

reconstruction cases where communities, homes, services, and community infrastructure were rebuilt in the same hazard prone areas and to approximately the same standard. She determined that the reconstruction process largely rebuilt pre-disaster level of risk and vulnerability.

Moreover, the home-based enterprises (HBEs) are commonly found in informal settlements (Tipple, 2005) which creates additional levels of vulnerability. If a natural disaster destroys or damages a resident's house it may also destroy or restrict the ability of that resident to earn a living, leading to poverty that persists long after the reconstruction process is finished. For this reason, livelihoods restoration is seen as a key component of "building back better" after a disaster, especially in informal settlements. Structural or engineered solutions are commonly constructed post-disaster to reduce risks but are not necessarily always the best disaster management technique (Abramovitz, 2001), especially if other complementary risk reduction approaches are not employed. Although dependency on engineered solutions is not a concern unique to informal settlement risk reduction, careful planning of any engineered structures is required to ensure that risks are indeed lowered, and to make the investment in such a project worthwhile.

Based on the aforementioned, this study focuses on informal settlements in Lagos, Nigeria considered to be vulnerable to multiple stressors and located in a risk-filled environment prone to hazards in which seasonal flooding represents one of them.

1.3 Megacity Lagos and the origin of its informal settlements

Lagos is one of the most rapidly urbanizing areas in the world, and Nigeria's most populous conurbation. Geographically, Lagos State covers an area of 3,475 km^2, about 757.55 km^2 of which are wetlands (Lagos State Government, 2011). It lies on the coastal flood plain of the Bight of Benin. Its growth has been phenomenal, both demographically

and spatially. From a population of about 25,000 in 1866, Lagos reached 665,000 by 1963, covering 69.9 km^2. It became over ten million in 1995 thus attaining, by UN definition, the status of a megacity. The population is projected to reach 18.9 million by 2025 (UN-HABITAT, 2014).

Lagos exemplifies many of the cities of the Global South, which face an escalating crisis in terms of the provision of basic services such as water, housing and mass transit systems. The striking paradox is that vast demographic expansion over the past two decades has occurred in a context of extensive economic decline. Lagos portrays the paradoxical characteristics of the contemporary African city as a dysfunctional yet dynamic urban form (Gandy, 1996). Occurring simultaneously with the global transformation in patterns of urbanization, there has been deterioration in the state of the city since the post-independence euphoria of the early 1960s, through the era of the 1990s when Lagos was being regarded as one of the worst cities in the world, up to its present transitional state. The history of Lagos in the last two decades of the 20^{th} century has been marked by severe deterioration in quality of life: high level of poverty, proliferation of slums, environmental degradation, dilapidated and congested road system, massive flooding, disrupted sewerage network, and increasing crime rates (George, 2010). In terms of spatial expansion from its original lagoon setting the sprawling city has engulfed a vast expanse of surrounding areas including over 50 different major slums (Abiodun, 1997) and this affirms that the vitality of Lagos's economy and its nodal position in the national economy and transport networks explain its growth, despite the breakdown of many basic infrastructure services and the difficulties caused by this for both economic enterprises and individual residents.

The genesis of the present dysfunctions of Lagos megacity has been historically traced to the failure of successive colonial administrations to tackle the problems of overcrowding,

disease and inadequate urban infrastructure (Echeruo, 1977; Gale, 1979) and the concomitant strategy of segregation between wealthy enclaves and the supposedly indifferent indigenous population (Peil, 1991). The cultural dualism between 'modernity' and 'tradition' reflected in a disproportionate concentration of urban infrastructure in the colonialists wealthy enclaves at the expense of the African majority (Olukoju, 1993). This, in part, led to the devastating public health crises culminating in the bubonic plague outbreaks of the 1920s, the establishment of the Lagos Executive Development Board (LEDB) and subsequent clearance-driven urban renewal efforts. Geographical and urban studies such as Ayeni (1977) and Pullen (1966) have described the city's post-colonial haphazard expansion as exhibiting little coordination between employment opportunities and affordable housing. The immediate post-independence era was also characterized by inadequate technical and administrative expertise for the management of cities (Williams and Walsh, 1968). Lagos has also been pivotal to debates that link urban governance with social and economic development, as evident in Olukoju (2003).

Lagos has been described as a city "on an uncertain trajectory which differs from recognized patterns of capitalist urbanization because the city is growing rapidly in a context of economic stagnation" (Gandy, 1996). It has largely developed independently of the efforts of city planners, through a process of "amorphous urbanism" (Gandy, 1996). The colonial state apparatus and its postcolonial successors failed to establish a fully functional metropolis through investment in the built environment or the construction of integrated technological networks. Also, corruptive consumption by political and military elites in connivance with Western financial agents ensured massive capital flights that might have otherwise been invested in social and physical infrastructures.

1.3.1 Demography

Most internationally renowned demographic organizations/agencies consistently estimate the population of the Lagos metropolitan area between 13.4 and 16.3 million, making it the largest metropolitan area in Africa (see also Kreibich, 2010). It is highly unfortunate that despite the status of Lagos as one of the largest and most dynamic megacities of the world today, there is no reliable population figure for the city. Most of the population figures adopted for planning and research purposes by reputable international agencies including the United Nations and the World Health organization (WHO) derive from scientific estimates and calculations despite numerous census exercises undertaken by the national government of Nigeria, which proved to be unreliable.

According to Badiane (2006), imprecision's have been the hallmark of many census conducted by African governments. The critical issue of census in Nigeria, unfortunately, as in many other parts of Africa has been highly politicized just like the pervasive and brazen massive election frauds. This persistent census fraud that has resulted in the cancellation of the results of several of such exercises over the last forty years in Nigeria is instigated by the fact that the allocation and distribution of the country's huge income from natural resources like crude oil and the representation in national government is dependent largely on the demographic figures (Nigerian Muse, 2007). Although the 2006 National Census credited the Lagos metropolitan area with a population figure of 7,937,932 the figure is highly unreliable as it contradicts existing realistic vital social data and is incongruent with the population growth rate of Lagos. The figure has been widely rejected within and outside Nigeria and has been challenged in the Nigerian courts. The figure is completely at variance with scientifically sound projections by the UN and reputable international population agencies and research groups worldwide. The more reliable population figure of Lagos State is given by the Lagos State Government as

17,553,924. It is considered more reliable because it is based on well-conducted enumeration for social planning, with actual figures from school enrolment, birth records, or housing statistics being in consonance with the figure. Since the inhabitants of the metropolitan area of Lagos constitute about 88 percent of the population of Lagos State, the population of metropolitan Lagos is therefore 15.5 million (Nigerian Muse, 2007). This figure also matches carefully calculated projections by almost all of the world's most reputable authoritative organizations on demography.

This is congruent with the assertion of Abosede (2006) who stated that the population of Lagos is 15 million. This is a more realistic population figure for meaningful and effective research and planning for Lagos, although it is a conservative figure, as Abiodun (1997) stated that the population of Lagos metropolitan area constituted 93 percent of the entire population of Lagos State according to the 1991 census.

According to Davis (2007), the present population size of Lagos is approximately forty times larger than they were in 1950. Trend in population growth of Lagos between 1868 and 2025 (a period of 157 years) is presented in Table 1.

Year of census	Total population	% increase from preceding figure	
1868	24,500		Compilation from census data
1873	29,408	1.4	
1903	41,000	4.0	
1913	72,853	2.15	
1920	97,782		
1930	272,140		
1954	469,520	4.28	
1965	663,529		
1970	1,400,000	6.08	UN population projection for Lagos
1990	4,800,000		
2011	11,200,000	4.08	
2025	18,900,000	3.71	

Table 1 : Trend of population growth in Lagos;
Source: author's compilation from George, 2010; demographic data, 2008; LSG, 2009; population census of Nigeria, 1952 and 1963 in Abiodun, 1997; UN-HABITAT, 2014

The Lagos metropolitan area population is more than two times larger than the cumulative sizes of the metropolitan areas of the next three most important cities in West Africa, that is Accra, Ibadan and Lome which have a total population of less than 8 million in their metropolitan areas (UN-HABITAT, 2014). Though Lagos constitutes less than 0.5 percent of Nigeria's land area, it accounts for about 10.0 percent of the population (IRIN, 2009). The population of Lagos comprises a large spectrum of the over 250 various ethnic groups in Nigeria (Encyclopaedia Britannica, 2010). In addition to this, there are large numbers of immigrants from neighbouring West African countries.

Unlike most cities of its size and complexity, Lagos is not a municipality; therefore, it has no central administrative authority. The city comprises separate local administrations known as Local Government Authorities (LGAs). The Lagos metropolitan area is,

therefore, a statistical division and not an administrative unit. Prior to 2002 Lagos State comprised of 20 local government areas (LGAs).

1	Ajeromi-Ifelodun
2	Agege
3	Apapa
4	Amuwo-Odofin
5	Alimosho
6	Badagry
7	Epe
8	Eti-Osa
9	Ibeju-Lekki
10	Ifako-Ijaiye
11	Ikeja
12	Ikorodu
13	Kosofe
14	Lagos Island
15	Lagos Mainland
16	Mushin
17	Ojo
18	Oshodi-Isolo
19	Shomolu
20	Surulere

Table 2: LGAs in Lagos Metropolitan Area;
Source: compiled by the author

1.3.2 Economy

The economy of Lagos metropolis consists of commercial, financial and industrial production and services, undertaken by the formal and informal sectors. The formal sector of Lagos economy is dominated by services and manufacturing sub-sectors. However, the

latter sectors have been shrinking due to the deteriorating economic situation of the country while the informal economy has been thriving. While the Nigerian Environmental Study Team in 1991 earlier averred that about 40 percent of all the industries in Nigeria were located in Lagos, UN-HABITAT (2008a) revealed that the Lagos metropolitan area now hosts about 70 percent of the industries in the country.

Entrepreneurship also thrives vigorously in Lagos, thereby, becoming the lifeline of the city's economy. The growth of the informal economy has been largely due to the harsh economic climate and the ingenious involuntary survival response of Lagosians to the twin problems of urban poverty and urban unemployment (Nwokoro, 2005). Due to its sheer enormity, Lagos dominates not only the Nigerian economy but also that of the Greater- Ibadan-Lagos-Accra (GILA) urban corridor. Lagos accounts for 26.2 percent of Nigeria's GDP, making its economy larger than the economy of any of the other ECOWAS countries, including that of Côte d'Ivoire (UN-HABITAT, 2008b).

1.3.3 Informal settlements (Slums)

Lagos can aptly be described as a city of slums or a mega slum, interspersed with few "oasis of sanity/order" mostly on the islands on its eastern side. The major defining characteristics of Lagos are the large nature of its slums and the traffic congestion, underscoring the obnoxious overcrowding in the city. That is, the houses are overcrowded, as well as the roads.

By the late 19th century, the growth of produce export and rising profile of Lagos as leading commercial centre was already attracting migrants from the Yoruba hinterland, as well as Europeans who came to serve in the "Colonial Service of Her Majesty" or as missionaries. Returnee slaves, mainly of Yoruba origin were also flocking to Lagos from Sierra Leone, Brazil and Cuba, by that time (Echeruo, 1977 in Olukoju, 2008). With the

influx of a large population of various people of different races and cultures, the unfortunate town planning policy of residential segregation by the colonial regime created separate European quarters on Victoria Island and Ikoyi while the indigenous African people lived in areas of the city with largely unregulated and haphazard development.

The Governor was empowered by the Planning Ordinance of 1902 to create special residential neighbourhoods to be known as European Reservation Areas (ERA), with each of these European neighbourhoods having its own Local Board of Health, with the responsibility of improving health in the reservation areas only. The earliest ERAs which were created Victoria Island, Ikoyi, and Apapa remain the foremost elite neighbourhoods in the city today. The segregation policy of that time laid the untoward foundation for the crass social inequality in Lagos today. The policy led to apathy and indifference of the government to the conditions and developments in the residential quarters of indigenous African people. Unregulated residential developments, therefore, emerged around the ERAs, as the indigenous domestic staff and others in the informal sector needed to live in close proximity to their masters. This was the origin of Obalende and Isale-Eko slums, which remain the major slum areas on the islands of Lagos today. The origin of slum settlements in Lagos, therefore, dates back to the early colonial period.

In 1917, the Township Ordinance No. 29 was promulgated for the control and improvement of the physical development of the city. However, according to Oduwaye, (2009), the Township Ordinance did not allow for appreciable developments in the indigenous quarters, underscoring the nonchalant attitude of colonial government to the planning of indigenous settlements, especially Isale-Eko, also known as Lagos Island. By 1928, the population density of the indigenous areas, especially Isale-Eko, was already very high at 90,193 persons per km^2, constituting 71.5 percent of the total population of the entire city, occupying a total land area of 4.4 square kilometres or seven percent of the

total land area of the city (Olomola, 1999). The implication of this was severe overcrowding, sub-standard and unhealthy housing, and the spread of diseases. The introduction of planning ordinances covering the indigenous areas became imperative with the outbreak of two lethal plagues in Lagos which claimed several lives. The two plagues which resulted from poor living and health conditions were: the post-World War I influenza epidemic and the bubonic plague between 1924 and 1930.

Subsequent post-colonial town planning and housing regulations have adopted the same prototype of segregation, rather than redress the unwholesome policy and creating a more humane and just physical planning and development programme. Consequently slum settlements have continued to cluster around the planned neighbourhoods which are usually created for the middle and upper class.

According to Adelekan (2010), most rich neighbourhoods in Lagos is surrounded by sprawling slums. Examples include the Surulere planned residential quarters which are surrounded by the slums of Itire and Masha; Akoka Estates, surrounded by slums of Bariga; Palm Groove Estate, surrounded by Mushin and Oshodi and Apapa residential estates (see figure 1). The design and planning of the Lagos urban space and the housing development strategy have been crassly myopic, focused mainly on the formal sector workers who constitute less than 35 percent of the city's population and neglecting the vast majority of the residents of the city. Consequently, the men and women of this vital group of the society, that is the low income group who constitute the informal sector which supports the formal sector, had to live somewhere outside the domain of government influence and impact, not by choice or rebellion, but because of neglect by the government. These over 10 million people who constitute the "foot soldiers" of the economy of Lagos live anywhere they can find shelter in swamps, dump grounds, or on the sewage filled lagoon. This phenomenon buttresses the assertion of Otchet (1999) that

Lagos is a city where anarchy prevails, rather than government and Lagosians respond to the chaos by relying on their own ingenuity to get by.

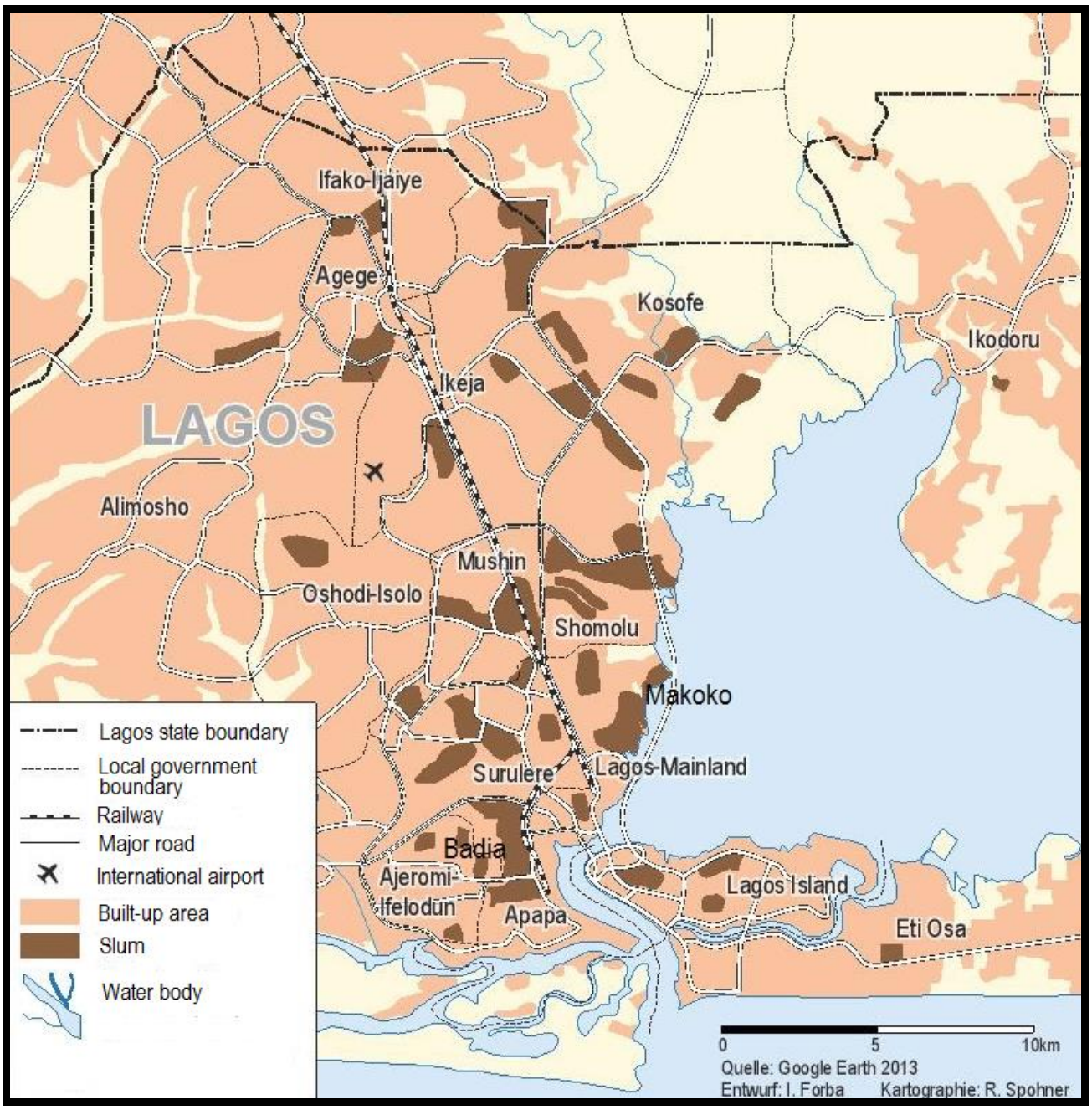

Figure 1: **Map of Lagos showing the major segments of the city and informal settlements**
Source: I. Nsorfon and R. Spohner

The town planning and housing development strategy of Lagos government lacks the most basic ingredient of any proper planning exercise which is the anticipation and provision

for future growth and expansion, signalling a woeful failure of the relevant organizations in formulating and implementing effective physical planning and development policies. The so-called town/urban planning in Lagos, from inception, seems to be confined to the needs of the existing population of formal sector workers or those who were being immediately resettled from a cleared/demolished slum only. An example of this is presented in Agbola, and Jinadu (1997), revealing that, in most of the cases where slum evacuees were offered government assistance, the scale of such assistance was inadequate and often misdirected. Evacuees consequently move to another existing slum or start a new one thus reinforcing the cycle of slum development, government inaction, and eventual slum clearance which leads back to the festering of new slums.

Aina (1989), identified four categories of informal settlements (slums) in Lagos and posited that, the slums of Lagos can be categorized hierarchically based on type and security of land tenure, characteristics of residents, in terms of status (indigenous or immigrant), gender, ethnic and national origin, means of livelihood, age and the length of time already spent in the settlement. The highest hierarchy level of Lagos slums is the most stable in terms of tenure and social structure. These slums are mostly the oldest and first generation core town settlements of indigenous people. These include Isale-Eko and Obalende. The second category of slums in Lagos consists of those settlements which are about 60-70 years old and were mostly established by Yoruba migrants. These include Ebute-Meta, Idioro and Mushin which developed around the middle class quarters established at Yaba. The land tenure here has also been regularized to a large extent, although the newest additions to these areas are squatter developments.

The third category of slums is that in which the settlement has primarily a squatter status. Settlements like these are mostly located on swamps, flooded plains, dump sites, on the lagoon, and in other precarious areas. These areas are mostly abode for the newest

migrants to Lagos, many of whom are from coastal communities in neighbouring countries like Benin, Togo and Ghana.

According to Agbola (2005) ‘a slum is only a slum to whom it is a slum’ and according to Marris (1961), a slum to a newcomer to the city is a foothold to better life and the bastion of interwoven network of mutually supporting relationships. UN-HABITAT, (2011) also describes the slum dwellers as “the people whose hard work is fuelling the city’s economic growth”.

1.4 Relevance of the study

Lagos is still growing as a megacity even with a slowing growth rate. This means all the problems presently faced will simply be multiplied in number and severity. The population of Lagos is growing fast largely as a result of immigration. Following the 2006 census of Nigeria, Lagos population showed an increase of 47 percent. Out of which 65 percent of the increase was due to migration and only 35 percent was natural growth. This tremendous inflow of immigrants is the main reason for increasing informality and proliferation of slums. Currently, more than 45 percent of the population is residing in unplanned settlements and is plagued by flood related problems (ActionAid, 2006).

Flooding is a big problem in Lagos, even with mild rainfalls streets are flooded and many times water rises to house levels. Intensity of rainfall in a short period, in the rainy season, leads to extremely high runoffs and floods. Lagos is partly extremely flat which makes the situation even worse and prevents the water discharge to the sea. Due to poor soil, in the process of infiltration only a small proportion of rainwater seeps into the ground. Also, poor urban planning together with other urban governance challenges contribute towards placing Lagos slum dwellers at highest risk. The fact that low-income groups cannot find safer sites contributes to these increased risks. While economic activity and urban

development often increase the environmental pressures that lead to flooding, it is the low-income settlements and poor groups within settlements that tend to be most at risk. Despite the risks faced by urban poor populations of Lagos on flood related problems, little attention has been paid to their vulnerability to this problem. Papers on human adjustment to urban natural hazards in developing countries appear in the academic literature but only as a minor theme. They are outnumbered by studies on haphazard urban development (Owei and Ede 2010) and lack of basic facilities (UN-HABITAT, 2003b) as well as spatial segregation and the growth of marginalized populations that are exposed to degraded environmental conditions (Marcuse, 2000). When natural hazards are addressed, the focus is on disaster impacts, relief and immediate coping strategies (Aragon-Durand, 2007; Whitehead, 2007). Hazard mitigation receives less attention compared to estimating risks (Wang et al. 2008), integrated risk management (Amendola et al. 2008; Wenzel et al. 2007) and technological solutions in support of preparedness and emergency response measures. A few papers focus on the design of strategies that would assist in the development of environmental change mitigation and adaptation practices, efficient systems of resource use, adaptive institutions (Manuta et al. 2010) and options of risk redistribution (IPCC, 2007a; Mills, 2005; Yucemen, 2005). However, there is a striking lack of data on the hazard response decisions of individuals, families and other local groups. Further there is a dearth of information about loss absorption and loss-shifting strategies employed by individual and collective local actors (IPCC, 2012). Although it is known that when loss redistribution, loss sharing, and loss shifting measures are embedded in long term adjustment mechanisms they can play a significant role in sustaining low income populations during and after times of crisis, apart from anecdotal evidence (Sumarto et al. 2003; Zeller, 2000), little has been published about the salience, structure, function and varieties of these strategies as they are actually practiced.

Though hazard scholars believe that the empowerment and integration of marginalized sections of urban society into formal hazard mitigation systems is necessary for management plans to be effective, genuine efforts to close loopholes and articulate grassroots hazard reduction schemes with sustainable urban development programs are rare (Wisner et al. 2011). In particular, there are few initiatives to analyse and reduce the vulnerability of slum dwellers in urban areas (Jones, 2004; Pelling, 2003; Waley, 2005; Zoleta-Nantes, 2002). There is a particular lack of information about loss sharing and shifting strategies adopted for long term recovery by marginalized communities in cities like Lagos.

This research attempts to address some of the above-mentioned gaps in knowledge. First, it examines the fast growing informal settlements of Lagos. Second, it focuses attention to the collective mechanisms of hazard response as well as individual responses. Third, it seeks to illuminate the organizational roles in the management of extreme natural events in Lagos slum communities.

In this research, community is based on the notion of connectedness to both a place and to the social webs that communities provide. Friedman (1996) in conducting research into the definition of community, quoted a respondent who said "community is a state of mind, but it is intimately tied to public place. The sense of community flourishes when the public place provokes pride and identity". Furthermore, the decision in this research to conduct much of the analysis at both household and community scale was influenced in part by the notion that they are often referred to as the smallest managerial unit that can make independent and indivisible decisions relative to which adjustment to hazard are adopted (Kates, 1971). In relation to exposure to risk, community and household ideology and activity influence individual perceptions and behaviour and communities respond to hazards based upon the wider context of conditions and pressures that exist whether they

are social, economic, political, or cultural (Jones and Shrubsole, 2001). These factors then are key to understanding how members of communities organize to manage their flood vulnerability, and what management strategies they adopt and which ones they reject.

1.5 Aims and Objectives

The purpose of this research is to better understand the management capacity (coping and adaptive strategies) in response to floods in vulnerable communities. Vulnerability to disasters is widely recognized to be linked to both social and biophysical conditions (Oliver-Smith, 2004; Pelling, 2003; Wisner et al. 2004). Social characteristics in particular have received increasing attention in the hazards and vulnerability literature (Wisner et al. 2004). However, in many cases, people are confronted daily with risks and hazards (for example, crime and violence, job loss, road traffic accidents, and fire risks) that influence their capacity to adapt to larger shocks such as flooding. Addressing these disasters is one way to increase the capacity to cope with environmental change, including any changes in the magnitude and frequency of extreme events. Poor people in urban environments are especially likely to be confronted with disasters (Davis, 2007).

This research considers such issues as household and community priorities and visions for the future, perceptions of vulnerability, community activities related to flood risk management, how local mitigation decisions are made, and institutional perspectives to disaster risk reduction. Drawing on fieldwork from informal settlements in Lagos, Nigeria, this thesis will portray that social vulnerability to flood events involves more than immediate relief efforts, but also addressing the underlying chronic risks and hazards of daily life. This means not only addressing the visible and obvious impacts, but also the politics and structures that create them. This however, cannot be done without understanding how people interpret and experience these risks and hazards. The resulting

data from the research provide a perspective on how it is to live with disaster risk and on how people cope with shocks manifested as floods. The thesis also aims to examine the contextual factors that influence adaptive capacity both at the community and household levels. To that end, the following specific objectives were targeted for the research:

- Explaining the processes of social vulnerability and explore the challenges being faced by slum dwellers in dealing with flood disasters in their everyday life.
- Assessing the management capacity (coping/adaptation mechanisms) that exists at household and community level in informal settlements of Lagos.
- Analysing role of institutions in the context of social vulnerability to flood in informal settlements of Lagos and
- Propose some recommendations for vulnerability reduction in informal settlements of Lagos.

1.6 Research Questions

- How are people exposed to flood and what impacts do they face during flood situations?
- How do households in informal settlements of Lagos cope with and adapt to floods?
- In what ways could coping and adaptive capacities being applied by the different communities be influenced in future?
- How do institutions create and perpetuate vulnerability in the context of flood risk management in informal settlements of Lagos?
- What options exist to reduce the vulnerability of slum dwellers in Lagos?

1.7 Organization of the study

Following the introductory chapter, this thesis document is organized as follows:

Chapter 2 presents the conceptualization and elaborates upon the adopted research design for the study. In this chapter, existing literature relating to the notion of flood and vulnerability has been reviewed chronologically, highlighting the paradigm shifts in research focus. Under the light of existing literature, a conceptual framework for the present study is discussed. This chapter also reviews the research methodology in which it described how empirical data collection was performed in different phases. The first phase was on household survey in which questionnaires were administered to different households in order to understand their vulnerability and management capacity at household level. Another phase was to understand community and institutional perspective in various aspects of social vulnerability. This was carried out through interviews with key informants from both government and non-governmental agencies. Focus group discussion was also carried out in order to garner community perspectives in relation to flood risk and management capacities. This chapter also provides reasons for the case study selection.

Chapter 3 reviews the situation of urbanization and flood risk management in the context of Nigeria with specific focus in Lagos. The chapter therefore addresses the urbanization process in Nigeria and how flood event has become one of the major natural disasters affecting urban areas in Nigeria. The chapter also look at flood risk research of Nigeria in general and the flood risk reduction strategies that are employed so far. The review of this chapter also examines the disaster management framework of Nigeria and how it is structured.

Chapter 4 discusses the various routes of flood exposures as persistent in the case study areas. It further explores different physical factors which predispose communities to be exposed to flood in their locational setting. Finally a Household Exposure Index is developed to assess the external dimension of flood-related vulnerability.

Chapter 5 describes the internal aspects of social vulnerability discussing how socioeconomic status, knowledge, awareness and social networking help in strengthening the coping capabilities, which influence a community's response towards flood hazard. The chapter brings forth the institutional and social constraints which hinder communities from helping themselves. Further, it makes a comparative study of people's perception of the exposure risk across the two studied slums and shows how perception plays an important role in getting the resource capacity functional.

Chapter 6 presents a summary of research findings and a proposed flood vulnerability framework for Lagos informal settlements. The proposed model which is built on the pressure and release model (Wisner et al. 2004; Blaikie et al. 1994) establishes the linkages and relationships between the central research theme and the other themes.

Chapter 7 concludes the thesis and on the basis of major findings, the chapter also provide suggestions and recommendations to show how best social vulnerability to flood can be reduced. It explicitly mentions the required actions and interventions, and also reiterates the need for building resilient communities in informal settlements. Further, the way forward is outlined.

CHAPTER 2: CONCEPTUALIZATION AND RESEARCH DESIGN

2.1 Introduction

This chapter talks about the state of art and introduces the conceptual framework with a focus on understanding why it is important to consider both the physical and social dimensions of flood risk. To answer the main theoretical question of this research, the following analytical questions are answered: What processes influence the flood hazardscape of informal settlements? What makes communities of informal settlements vulnerable to flooding? What constitute flood risk and how is the risk assessed? All these are explored through the lenses of a hazardscape and vulnerability paradigm that builds on the pressure and release (PAR) model of Wisner et al. (2004). Also, another theoretical question of this study seeks to understand human agency in relation to flood risk. Here it considers what human adjustments are made to both the physical and social dimensions of flood risk. This therefore requires the research to draw from Bohle`s (2001) double structure of vulnerability framework.

2.2 Conceptual Framework

Social vulnerability is seen as one dimension in vulnerability study focusing on human inability to withstand adverse impacts triggered by multiple stressors and shocks (Alwang, et al. 2001; Blaikie et al. 1994; Cannon, 2006; Oliver-Smith, 2004; Wisner et al. 2011). In this context of analysing social vulnerability to flood risks, the main focus remains to grasp the characteristics of households in terms of their susceptibility to harm caused by flooding situations and their capacity to anticipate and to cope with the situation within their given resources.

The study is conceptualized in two stages: firstly, looking at the interlinkages between the components of flooding and vulnerability and later social vulnerability of flood related threats is further developed and conceptually positioned at the nexus of uncontrolled urbanization led infrastructural stress on one hand and environmental-related problems on the other. The study conceptualization was largely inspired by the PAR model (Blaike et al. 1994; Wisner et al. 2004) and the double structure of vulnerability (Bohle, 2001) with emphasis on the construction of social vulnerability.

According to Bohle (2001), vulnerability can be seen as having an external and internal side. The external side is related to the exposure to risks and shocks and is influenced by Political Economy Approaches (e.g. social inequities, disproportionate division of assets), Human Ecology Perspectives (population dynamics and environmental management capacities) and the Entitlement Theory (relates vulnerability to the incapacity of people to obtain or manage assets via legitimate economic means). The internal side is called coping and relates to the capacity to anticipate, cope with, resist and recover from the impact of a hazard. It is influenced by Crisis and Conflict Theory (control of assets and resources, capacities to manage crisis situations and resolve conflicts), Action Theory Approaches (how people act and react freely as a result of social, economic or governmental constrains) and Models of Access to Assets (mitigation of vulnerability through access to assets). The conceptual framework of the double structure indicates that vulnerability cannot adequately be considered without taking into account coping and management capacity.

As regards the PAR model, the authors encourage a careful analysis of the social context in which disasters occur, and consideration of how linked social, economic and political variables can contribute to the progression of vulnerability in a society particularly over a large time scale.

The two approach was used base on the fact that it provides room for the investigation of relationships between natural hazards within the physical system and societal factors within the human-use-system. The framework therefore conceptualizes that human systems do not only contribute to vulnerability but have the ability to reduce vulnerability and risk within the study area, through actions including disaster risk management.

By using these approaches, there is a good opportunity to develop recommendations on hazard management especially for slum settlements in large cities which is one of the objectives of this thesis. It is important to note that conceptual understanding of slum communities is limited by the complexity of overlapping societal processes that converge in them. In particular, hazard managers are poorly informed about the types of spillover pressures on slum communities that flow from the institutional approaches adopted to address other socio-economic and environmental problems at different scales. Figure 2 below is an effort to clarify the PAR model adopted in this research.

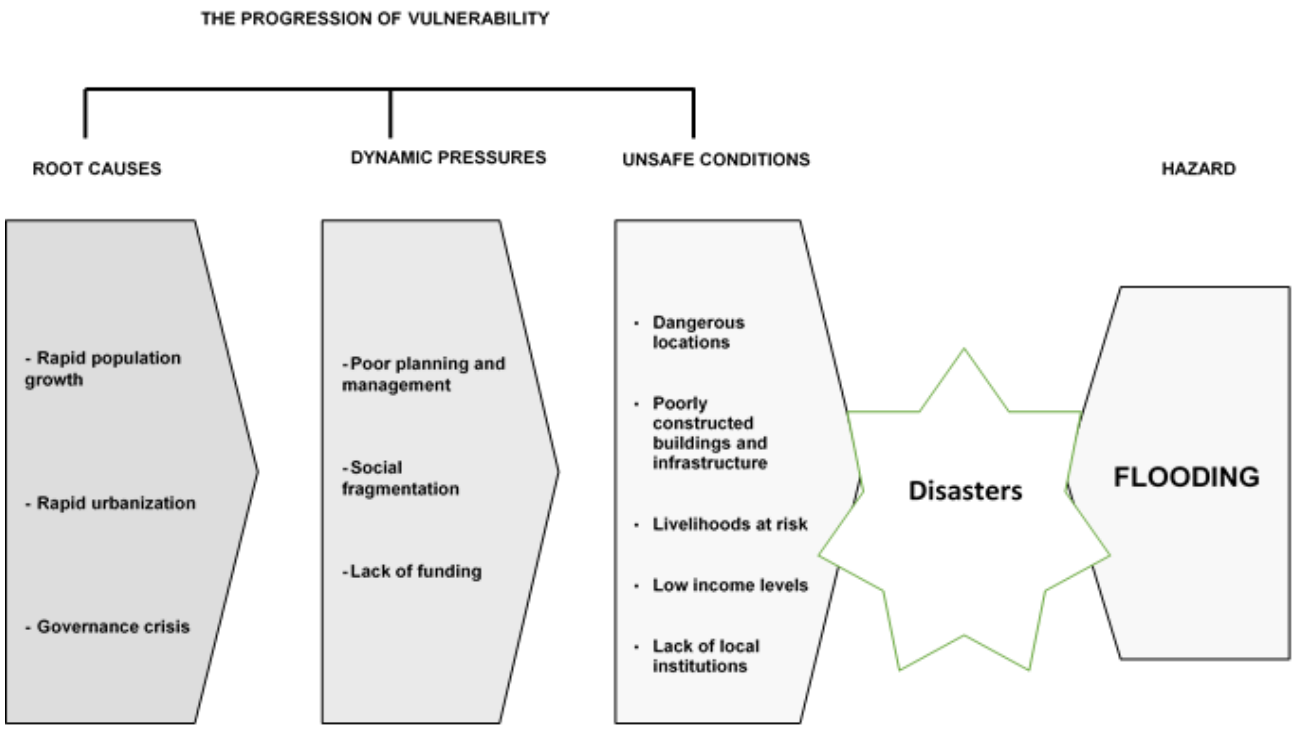

Figure 2: Pressure and Release (PAR) model
Source: own draft (Based on Blaikie et al. 1994; Wisner et al. 2004)

Figure 2 demonstrates the range of factors that influence the process of vulnerability in the PAR model. Driving forces of unruly urbanization and improper urban governance leads to much pressures in the form of infrastructural stress giving rise to a state of unsafe conditions. Prolonged exposures to harmful perturbations are counteracted by various compensating forces in form of coping measures depending upon social perception and resource capacity. After crossing the threshold, harmful perturbations get manifested as social and environmental implications. It is also important to note that people belonging to different socio-economic strata, gender and age groups adopt different management and adaptation strategies as well as develop varying levels of resistance to harmful exposures and thus are affected differently.

Base on the aforementioned, this research illustrates how cumulative pressures at every level (local and national) aggravate risks and vulnerability for urban slum dwellers. In addition to the impact of these foregoing pressures, the slum communities are also subject to physical risks like flooding. The societal adjustments that they deploy to offset disaster risks like flood impacts are influenced by socio-political entitlements, cultural ideologies, agency, and individual household characteristics. The study therefore determines the types of resources used by slum dwellers to address the manifold socio-environmental pressures and immediate hazard risks. In stressing the role of individual skills, cultural strategies and perceptions, social capital and livelihood entitlements, the study identifies frequently used hierarchical networks connecting resources from different sections of local and sometimes global society. These resources, depending on their scales of association, provide avenues for adjustments at the local level as well as adaptations at larger scales.

2.3 Flood and Vulnerability Research

Wisner et al. (2004) noted that the significant impact of floods on wealthy countries opened up a new debate around the need to allow rivers to run unconstrained by earthworks, embankments, artificial levees, concrete and walls. Rather it was argued that rivers should flow freely in their valleys enabling the flood plains to play their original role. This thinking influenced the types of policies that developed countries could advocate in LDCs i.e. it became difficult to advocate for 'tech-fix' (engineering) solutions because of opposition by NGOs and people's associations. A crucial element to this shift in thinking was the growing awareness that flood disasters are caused by people and not just water. This saw the media and popular conceptions of floods shifting significantly to suggestions that the disasters were happening because people and buildings were in the wrong places on flood-prone land (Wisner et al. 2004).

Approaches to flood research can be divided into two main categories: (i) a purely physical science approach and (ii) a more integrated approach that has a strong social element. The physical science approach to flood studies is concerned with the physical nature of floods where cause and effect is studied. Consequently this approach results in the classification of floods according to natural parameters or physical causes and resultant risk reduction or mitigation measures are focused on technical structural solutions for controlling the physical parameters. Smith (2004) for example classified the physical causes of floods into two types: (i) river floods and (ii) coastal floods and further indicated the triggers or environmental hazards that can offset flooding within these physical causes (figure 3).

Atmospheric hazards that create large amounts of rainfall are the most important cause of floods. Smith's (2004) classification of two primary causes of floods differs from

Alexander's (1993) four principal causes of floods that includes: (i) riverine floods, (ii) estuarine floods, (iii) coastal floods, and (iv) catastrophic causes that include dam bursts or the effects of earthquakes or volcanic eruptions. This could be understood by the fact that Smith grouped the two main natural causes in relation to other environmental hazards.

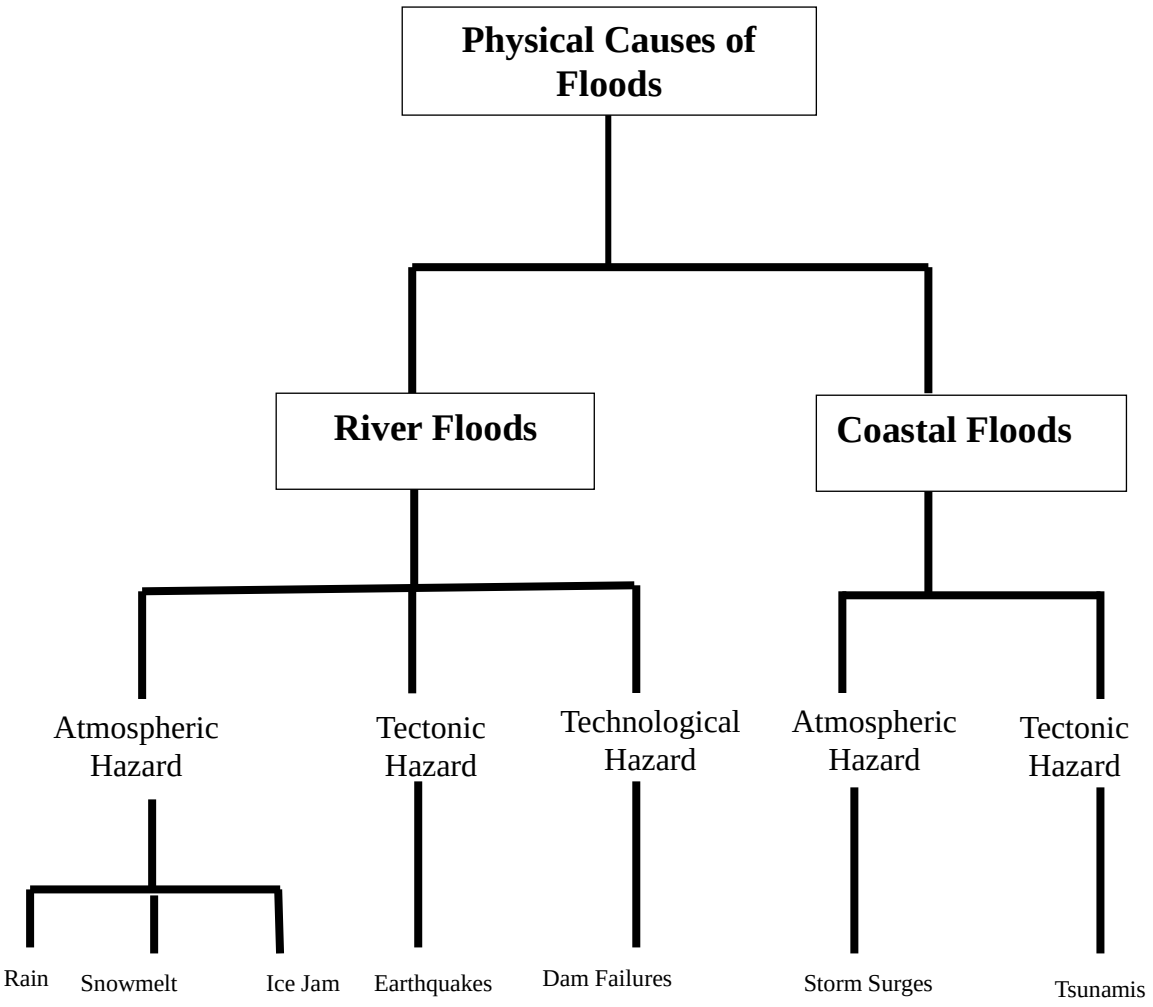

Figure 3: Physical causes of floods in relation to other environmental hazards
Source: reproduced from Smith, 2004

The following environments are classified as flood-prone environments by Smith (2004)

- Low-lying parts of major floodplains
- Low-lying coasts and deltas
- Small basins subject to flash floods
- Areas below unsafe or inadequate dams

- Low-lying inland shorelines

The physical science approach to studying floods can be divided into three further approaches or models that are determined on the disciplinary area of inquiry. These include:

- Hydrological models of floods utilized by hydrologists, geologists, physical geographers, and engineers. Hydrological modelling is predominantly applied to riverine type flooding, where discharge forms an important concept (Alexander, 1993). Discharge or stream flow quantity is graphically represented by hydrographs. When hydrographs are applied to floods these are known as flood hydrographs.
- Hydraulic models utilized by engineers where stream channel cross-sections are studied and how this transmits water flow (Alexander, 1993). This is particularly important to urban storm water design. Hydraulic models are however used in relation with hydrological models particularly to relate the hydrograph to the flood hazard (Alexander, 1993).
- Ecological models utilized by ecologists where flooding is viewed as part of the natural ecosystem and therefore viewed to be important for the sustained natural functioning of freshwater systems (Alexander, 2000b; Davies, 1996).

The hydrological model is the most commonly used model for studying floods particularly with relation to the significant impacts of floods to human society. According to this model of floods, floods can be explained as “water in the wrong place”, or “at the wrong time” (Hewitt, 1997). Alexander (1993) defines floods as “the height, or stage of water above some given point”. The shortcoming to this model however is the fact that it only considers riverine-type flooding as is evident in Alexander’s (2000b) definition of a flood: “the discharge that causes damage, or overtops the river banks or exceeds a specified

value". Within this hydrological model, Alexander (2000b) identified the following factors in influencing flood severity; rainfall characteristic, fixed catchment characteristics, catchment processes, and antecedent catchment moisture status. Rainfall characteristics involve depth, area, duration and movement of storm rainfall (Alexander, 2000b). Fixed catchment characteristics involve catchment size and slope, shape, drainage system density, cover, and the direction of the catchment slope relative to the direction of movement of the severe rainfall producing weather systems. The cover includes the surface material which may vary from pervious sand through to impervious rock, and vegetation. Catchment processes involve the potential infiltration rate, pond age and channel storage. Potential infiltration is the function of permeability and moisture content of the soil. Pond age is the proportion of the surface runoff that is trapped in pools caused by unevenness of the ground surface. Channel storage is the proportion of the runoff that is necessary for the passage of the flood through the system. Antecedent moisture status refers to the state of wetness of the catchment immediately before the commencement of the flood producing rain.

The integrated, more social-orientated approach to flood risk research predominantly focuses on the vulnerability of people with less emphasis on the physical parameters of the flood hazard. Consequently the responses to risk reduction measures under this approach are more oriented towards non-structural measures of human adjustments, preparedness, awareness and capacity building. The social approach to flood risk research can be categorized into four specialized approaches that are differentiated according to ideological, empirical and methodological knowledge.

The Human ecology approach considers the physical parameters but also place emphasis on human exposure and vulnerability (e.g. Burton et al. 1993; Hewitt, 1997; Tobin and

Montz, 1997). However the root causes of vulnerability are not adequately addressed in this approach.

The Political ecology approach places emphasis on considering social and economic assets together with physical resources as key dynamic pressures in examining vulnerability to flooding (e.g. Wisner et al. 2004; Pelling, 2003). This approach however does not adequately analyse the physical flood hazard.

A Hazardscape approach (Mustafa, 2005) that combines three approaches within resource geography – pragmatism, human and political ecology along with the landscape idea in cultural geography is based on empirical knowledge. In this approach flood hazard is seen as a hybrid hazard where various physical, social and technological factors intersect. The hazardscape concept engages the social structural basis of vulnerability as well as the power-knowledge dynamic governing policy and popular discourses on flood hazard (Mustafa, 2005).

The above analysis indicates that the different causes of floods is characterised by its own elements, and it is surrounded within its own environment. In this study, the vulnerability system is the urban informal settlements, which is seen as a community composed of interacting elements where different processes are carried out using various types of resources. In this context, the study define the community through its components and interactions, and also show how individual interactions is vulnerable to floods.

2.4 Urban Flood Risk

2.4.1 Urban risk context

Urbanization refers to an increase in the proportion of national populations living in urban areas (Satterthwaite et al. 2007). Pelling (2003) noted that a relationship exists between urbanization and disasters. This therefore gives rise to the widely used term of

"developmental risk" where it is realised that disaster risk is largely an outcome of poor (or unsustainable) developmental practices. Satterthwaite et al. (2007) stated that if disasters are seen as unusual events (usually 'natural' events), that requires rapid response then it is not seen as conventional urban research. However, if disasters are understood to be caused by urban development (or exacerbated by urban development) then these would form part of urban research. Indeed, any urban researcher with an interest in poverty and vulnerability needs to integrate an understanding of the current or potential impact of extreme weather events into their work. Satterthwaite et al. (2007) suggested that it is important to understand how the processes that shape urbanization create or increases risk to a range of hazards. This therefore raises a discussion around the "vulnerability of city populations and of specific groups within them to environmental hazards". Pelling (2003) stated that risk in cities is the outcome of a variety of processes and ideas that are best represented in the metaphor of a city as an evolving biological system. Here, there is no simple one-way line of causality in the production of human or environmental conditions, nature does not cause natural disasters, rather risk in the city is an outcome of a myriad of feedback loops and thresholds and competing ideas, mechanisms and forms. Pelling found Drakakis-Smith`s (1997) framework on the five components of sustainable urbanization that includes social, economic, political, demographic and environmental components to be useful in illustrating the interrelationship of the five components. This therefore demonstrates the necessity of placing any policy to mitigate risk in the broader context of urban life including within the larger regional and global physical and human systems (Pelling, 2003).

The Urban Vulnerability framework developed by the PeriPeri initiative (Nomdo and Coetzee, 2002), which drew on the LAL framework, facilitates thinking within the 'urban context'. This framework attempted to understand, monitor and address urban

vulnerability by emphasizing the following; urban livelihood systems, the impact of household relations on the former, the asset base of households, the influence of macro processes and structures, the different interconnected structures and processes in the urban environment, how urban governance facilitates the above and how urban strategies either increase or decrease households security in the urban environment. Lewis and Mioch (2005) further observed that urban disasters are the result of a combination of inefficient urban management, inadequate planning, poorly regulated population density, inappropriate construction practices, ecological imbalance, and infrastructure dependency to name but a few (also see Pelling, 2003; Satterthwaite et al. 2007). They therefore argued that good governance is a necessity in reducing urban vulnerability. Good governance to them involved inclusive decision-making by all stakeholders (national and local government, private sector, media, and civil society).

Renn (2008) differentiated between governance at national and global levels. He further promoted the concept of risk governance. Risk governance is explained as follows: It looks at the complex web of actors, rules, conventions, processes and mechanisms concerned with how relevant risk information is collected, analysed and communicated and how management decisions are taken. Encompassing the combined risk relevant decisions and actions of both governmental and private actors, risk governance is of particular importance in situations where there is no single authority to take a binding risk management decision but where the nature of the risk requires the collaboration of, and coordination between a range of different stakeholders. Risk governance not only includes a multifaceted, multi-actor risk process but also calls for the consideration of contextual factors such as institutional arrangements and political culture, including different perceptions of risk (Renn, 2008).

Nomdo and Coetzee's (2002) urban vulnerability framework, Lewis and Mioch`s (2005) discussion on good governance for risk reduction and Renn`s (2008) promotion of risk governance strengthens Pelling's (2003) statement that policies to reduce risk should be placed in the broader context of urban life including within the larger regional and global physical and human systems.

There is an abundance of published and unpublished literature echoing the sentiments that due to poverty and a lack of resources in the urban environment, it is the urban poor who are most vulnerable to hazards. These urban poor are most often located in informal settlements with poor housing conditions in unsanitary and dangerous environments and are less often able to cope with these hazards (for example, Benjamin, 2005; Lewis and Mioch, 2005; Mustafa, 2005; Pelling, 2003; Satterthwaite, 2011; Tipple, 2005).

2.4.2 Urban floods

Smith's (2004) concept of environmental hazards and Mustafa's (2005) concept of a hazardscape where hazards are seen as being hybrid since physical, social and technological factors intersect are most clearly evident with respect to urban floods. Mustafa's hazardscape was in fact developed through studying urban floods. The published and unpublished literature clearly indicate that processes of urban development, particularly unsustainable urban development plays a significant role in shaping and exacerbating urban floods by increasing artificial hard surfaces, inappropriate land use, and inappropriate waste water management. (ActionAid, 2006; Alexander, 2000b; Lee et al. 2006; Mustafa, 2005; Nchito, 2007; Pelling, 2003; Satterthwaite et al. 2007; Smith, 2004).

Different types or forms of flooding can be identified as relevant to cities of the south, especially with reference to Africa. ActionAid (2006) identified four types of urban

flooding in six selected African towns and cities. The first type is referred to as "localised flooding due to inadequate drainage". This leads to ponding (Benjamin, 2005) and overland surface run-off (DiMP, 2008). Secondly, such urban areas experience flooding from small streams whose catchment areas are almost entirely within the built-up area (ActionAid, 2006). The third type of flooding in these urban areas are from major rivers on whose banks the towns and cities are built. Fourthly, such urban areas experience coastal flooding from the sea or by a combination of high tides and river flows from inland. ActionAid (2006) noted that the first and second types of flooding occur more frequently in African towns than the third type. The fourth type occurs where settlements are built on coastal wetlands and mangrove swamps like the case of Lagos which is the focus of this study.

The main impact of urbanization with regards to flood risk is by altering the hydrology (of rivers and streams) and the geomorphology of the natural landscape (Lee et al. 2006). This is illustrated in table 3 below.

Alter hydrology of rivers & streams	**Alter geomorphology of natural landscape**
Increased run-off peak flows and total volumes	Increased erosive force of stream channels may in the long term change the stream profile.
Increased impervious surfaces (roads, pavements) which prevent infiltration of precipitation thereby changing hydrology.	
Impervious surface channel sediments and pollutants into drainage networks and in so doing increases storm water run-off	
Decreased surface storage of storm water results in increased surface run-off	Increased cross-sectional area of stream channels (through artificial channels) increases erosion along banks
Increased stormwater discharge relative to base-flow discharge results in increased erosive force within stream channels	
Culvet, outfalls etc. replace low order streams resulting in more variable base-flow and low-flow conditions.	Upland deforestation due to urban development increases soil erosion within catchments and therefore increasing the sediment load of streams.
Decreased groundwater recharge results in decreased groundwater flow, which reduces base flow and may eliminate dry season stream flow.	

Table 3: Impact of urbanization on flood risk.
Source: modified from Lee et al. 2006.

From the literature it becomes evident that urbanization exacerbates urban flood risk through local human factors. These include urban growth, the occupation of flood plains, and poor solid waste and storm water drainage management exacerbated by the negative practices of dumping into river and storm water systems by ill-informed residents. Unplanned or poorly regulated or informal settlements in particular that are often located on flood plains and wetland or river fringes and where no organized storm water drainage systems exist are susceptible to flood risk. Poor housing construction materials and building standards, coupled by poor site locations either close to rivers or wetlands or areas with high water tables increase the susceptibility of especially poor residents to flood risk. As a result urban flooding is becoming an increasingly frequent and severe problem for the urban poor (ActionAid, 2006) where their livelihoods are negatively impacted. There are also disruptions to the urban infrastructure that may have negative secondary impacts to the urban economy. The literature also warns of the potential negative impacts of climate change of increased intensity and frequency of severe storm events to urban flood risk where increased flooding and losses are to be expected (Action Aid, 2007; Alam et al. 2007; Huq et al. 2007; IPCC, 2012; 2007; Satterthwaite, 2011).

Based on the existing academic literature, it can be concluded that urban flood is a problem in Nigeria and particularly in Lagos in which most aspects of flood problems and related risks are not well documented. As regards flood issues in Lagos, some specific studies have been carried out with much focus on the structural aspects, very less social research has been done. Most of the existing literature on flooding in Lagos are mainly institutional reports by the National Emergency Management Board (NEMA) and Ministry of Environment. From the various review of the reports, it is clear that the management, of late is aware of the flood and its related risk in the city. Since 2002, there are reports which elaborate the existing condition of flood problems in the city and call for

immediate steps in this regard. But the area of vulnerability of the disadvantaged groups has been considerably neglected which is therefore the focus of this study.

2.5 Vulnerability

Vulnerability has been studied by various discipline including economics, sociology, anthropology, disaster management, environmental science and health through different approaches which have been adapted over time. The term “vulnerability” is often used in a number of contexts prominently in development literature and relief field and as a fundamental aspect of global environmental change. It is increasingly being viewed also through the lens of social sciences (Adger, 2006; Bohle, 2001; Chambers et al., 1989; Philips and Fordham, 2009; Wisner et al. 2004). The point of concern for geographers, among all these, remains the spatial dimension of social vulnerability while some social geographers have also talked about vulnerable people. The focus here is primarily on people who for whatever reasons are reckoned to be at risk of being hurt, damaged and discriminated (Knox, 1989). A range of vulnerability definitions developed over the period of time has been brought together in table 4.

Susman et al. (1983: 264)	Vulnerability is "the degree to which different classes of society are differentially at risk, both in terms of the probability of occurrence of an extreme physical event and the degree to which the community absorbs the effects of extreme physical events and helps different classes to recover".
Chambers (1989: 1)	He defines vulnerability as: "the exposure to contingencies and stress and difficulty coping with them. Vulnerability has thus two sides: an external side of risks, shocks and stress to which an individual or household is subject; and an internal side which is defencelessness, meaning a lack of means to cope without damaging loss".
Watts and Bohle (1993: 45-46)	Vulnerability is defined in terms of exposure, capacity and potentiality. Accordingly, the prescriptive and normative response to vulnerability is to reduce exposure, enhance coping capacity, strengthen recovery potential and bolster damage control via private and public means.
Blaikie et al. (1994: 9)	Vulnerability means "the characteristics of a person or group in terms of their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard. It involves a combination of factors that determine the degree to which someone's life and livelihood is put at risk by a discrete and identifiable event in nature or in society".
Pelling (2003: 5)	Defines vulnerability as the "exposure to risk and an inability to avoid or absorb potential harm". In this context, he defines physical vulnerability as the "vulnerability of the physical environment"; social vulnerability as "experienced by people and their social, economic, and political systems"; and human vulnerability as "the combination of physical and social vulnerability".
UNISDR (2004: 16)	Defined vulnerability "as a set of conditions and processes resulting from physical, social, economical, and environmental factors, which increase the susceptibility of a community to the impact of hazards". These conditions are shaped "continually by attitudinal, behavioral, cultural, socio-economic and political influences at the individuals, families, communities, and countries."
Adger (2006)	Vulnerability is the state of susceptibility to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt
IPCC (2007)	Vulnerability is the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.

Table 4: Selected definitions of vulnerability
Sources: compiled from Dow (1992); Cutter (1996); Hogan and Marandola (2005); Brauch (2005a), Villagrán de León (2006), IPCC (2007)

Vulnerability has been defined in various ways, Blaike et al. defined vulnerability as "the characteristics of person or group in terms of their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard" (Blaike et al. 1994: 9).

Chambers also defines vulnerability as the exposure to contingencies and stress and difficulty coping with them. Vulnerability has thus two sides: an external side of risks, shocks and stress to which an individual or household is subject; and an internal side which is defencelessness, meaning a lack of means to cope without damaging loss (Chambers, 1989). Coping would require people to reduce their physical exposure to a hazard and access resources needed to restore normalcy.

Watts and Bohle further refined the understanding of vulnerability and elaborate upon the space of vulnerability; "Vulnerability is a multi-layered and multidimensional social space defined by the determinate, political, economic and institutional capabilities of people in specific places and specific times" (Watts and Bohle, 1993). In their view space of vulnerability is defined by three distinctive processes: "human ecology, expanded entitlements and political economy" (Bohle, Downing and Watts, 1994: 39). They further reiterate that vulnerability implies some form of external as well as internal dimensions that increasingly predispose people to risk and it further suggest integrating the micro perspectives more closely for a better understanding of vulnerability (Bohle et al. 2006).

Eventually, focus is changing from vulnerability to resilience. Vulnerability comes from a loss of resilience (Holling, 1995). Resilience is emerging as a key concept in the rapidly growing field of socio-ecological studies. The concept of resilience emerged in ecology and the social sciences during the 1970s in recognition that nature is inherently dynamic. Its intervention was specifically linked to critiques of equilibrium theories of environmental sciences (Franklin and Downing, 2004).

Recent developments in the field of vulnerability has further tried to broaden its perspective to include cultural, psychosocial and subjective determinants and impacts arising from natural disasters and from the experience of risk and hazard, as well as the incorporation of the notion of resilience, sensitivity, social capital and collective action in several studies (Wisner et al. 2011). It emphasize that an adequate understanding of vulnerability would require consideration for biophysical, economic, political, and social aspects of risk (Cutter et al. 2009; Wisner et al. 2011).

Risk is also closely tied to vulnerability and has been seen as an important component. Communities which are vulnerable are probably the ones more at risk. However, the determinants of both biophysical vulnerability and risk are essentially the same as hazard and social vulnerability. The natural hazards community, which emphasizes risk, and the climate change community, which emphasizes vulnerability, are essentially examining the same processes. However, this has not always been immediately apparent due to differences in terminology. Both are ultimately interested in the physical hazards that threaten human systems and in the outcomes of such hazards as mediated by the properties of those systems, described variously in terms of vulnerability, sensitivity, resilience, coping ability and so on (Brooks et al. 2005).

The above discussion highlights that most of the definitions of vulnerability revolve around biophysical, spatial or social aspects. Since the term vulnerability is used in a number of contexts with different disciplinarily foci, they all have invisible yet implied adjectives preceding them (Wisner et al. 2011). Hence, natural vulnerability, infrastructural vulnerability, economic vulnerability and social vulnerability are distinguished. “The vulnerability of people and places is an inherently geographical problem, one that necessitates a spatial solution” (Cutter et al. 2009). It is rather impossible to separate spatial and social aspect of vulnerability; in fact much empirical

evidences are there suggesting that social vulnerability is closely connected with spatial structures and processes (Ravallion and Wodon 1997; Pender and Hazell, 2000).

After achieving a broad understanding of different aspects of vulnerability, risk and capacity, focus of attention is shifting towards it analysis and measurement methods. Studies from Chambers et al. (1989); Davies (1996); and Scoones (1996) concur to a common conclusion that aggregated approaches, which make generalizations about social groups in rural settings are inadequate.

"Research on social vulnerability frequently deals with elements that are difficult to measure either because the factor of interest is difficult to quantify or the data is precarious" (Warner, 2007: 18). It is rather difficult to translate local information about social vulnerability into numbers and values upon which political decisions can be based.

Certain commonly used methods for vulnerability assessment evolved are indicator approaches, household modelling approaches, income estimation approaches and domestic resource capacity approaches.

By and large all the above-mentioned approaches aim at identifying numbers of geographic locations of people vulnerable to food insecurity and famine, classifying them as slightly, moderately, highly or extremely highly vulnerable. Household income is used as the framework for vulnerability. Households are divided into socio-economic groups and data are sought on various finite and objective indicators. These data are further combined with other subjective data to draw information on current levels of vulnerability in the various groups relative to baseline vulnerability. All these approaches suffer their share of drawbacks. Measurement of vulnerability in terms of risk-response-outcome components will continue to be a difficult undertaking since each discipline has its own reasons for defining and measuring vulnerability (Alwang, Siegel and Jørgensen, 2001).

The next step in vulnerability research is to move beyond measurement and aim at creation of tools to analyse the underlying causes of defencelessness and sort possible solutions (Birkmann, 2006). "We are either too focused on local social dynamics (qualitative case studies) or too analytical (empirical global models) to adequately address and explain the complex interactions between social, natural, and engineered systems" (Cutter, 2003, p.8). What is needed now is a set of methodologies that can be used to transfer the findings of specific case studies to larger geographical areas (Bankoff, Frerks and Hilhorst, 2004).

2.5.1 Conceptualizing social vulnerability

Academia has been continuously interested in analysing all issues pertaining to vulnerability arising from physical, social, anthropologic, economic, and environmental to technical or engineering causes with the purpose of characterizing it to promote awareness on the subject (Villagrán de León, 2006). But even within the academic context, usage of the term 'vulnerability' sometimes remained unclear. Economists have talked about it in terms of market vulnerability and social scientists use it for social defencelessness, hazard and disaster study focuses on the biophysical vulnerability at risky locations while regional food insecurity highlights the inherent vulnerability of the system. Thus, it sometimes becomes unclear whether we are referring to place or people to be vulnerable, whether it is the situation at a place which is vulnerable or the status of individuals making them vulnerable to particular event which strikes them unexpectedly.

The different uses of the term have emerged from different disciplinary foci (Wisner, 2004). It is the inherent flexibility of the term which makes it applicable in a number of contexts. Research groups and professionals in academia, hazard and disaster management agencies, climate change community and development agencies have been working to

develop a common understanding of vulnerability but the broadness of the term makes it difficult for scholars to strictly bind it. Nevertheless, what commonly emerges out of various definitions of vulnerability stemming from both natural and social science disciplines is "potential to be harmed from events", which may be natural or anthropogenic and "capability to withstand the event".

Vulnerability is rather a relative concept. In order to better understand the term, it is important to know what is vulnerable and to what it is vulnerable as well as when, why and where such vulnerability or defencelessness strikes. The 4 Ws are therefore essential to be answered in order to identify or define the type of vulnerability one is talking about. Arising out of the permutation and combination of answers to the 4 Ws are the different types of vulnerability:

Answering the WHAT questions, vulnerability can be physical, social, economical and institutional. Pelling (2003) defines physical vulnerability as the vulnerability of the physical environment, social vulnerability as experienced by people and social groups in their socio-political system and human vulnerability as a combination of physical and social vulnerability. Klein and Nicholls (1999) see natural vulnerability as one of the determinants of social vulnerability. Brooks (2003) regards social vulnerability as a determinant of biophysical vulnerability, whereas Cutter (1996) regards the biophysical and social dimensions of vulnerability to be independent which interacts to produce the overall place vulnerability (Cutter, Boruff and Shirley, 2003)

Identifying the nature of vulnerability through WHEN questions, it can be concluded on the basis of available literature that defencelessness may occur or strike at a particular event (the exact time of which may be unknown), may be seasonally as in the case of seasonal drought or flood, it may occur every day which may be associated with the permanent condition of a marginalized place or people or it may be a periodic

phenomenon. Lavell (2010) defines vulnerability at two levels of risk: exceptional vulnerability, which is associated with exceptional events and everyday vulnerability associated with permanent conditions of poor and marginalized poor people such as malnutrition, poverty, illiteracy, domestic violence and alcoholism, etc. As similar situation was referred to as recurrent vulnerability by Watts and Bohle (1993). The time factor is also an important dimension influencing vulnerability as it specifies the condition and status of a place or person at any given instant of time (Bohle, Downing and Watts, 1994).

Looking at vulnerability through WHY questions, which try to specify the reasons for defencelessness, a number of external and internal causes appear. According to Cardona (2011), vulnerability emerges as a consequence of physical fragility or exposure, socioeconomic fragility and lack of resilience. Wilches-Chaux (1993) on the basis of cause of origin proposed several dimensions of vulnerability: physical, environmental, economic, social, political, technical, ideological, ecological, institutional, educational and cultural, etc. Furthermore, vulnerability may also arise due to political weaknesses like a weak democratic system, unfavourable public policies, limited linkages between governments and civil organizations, inefficient handling and management of citizens demands and incapacity to meet them (ECLAC-IADB, 2000).

WHERE questions to vulnerability takes us closer to Cutter's notion of vulnerability of people and places to be "an inherently geographical problem that necessitates a spatial solution" (Cutter, 2001: 8). It is more specific for the occurrence of disasters in certain specific geographical areas, e.g. the coastline community is more at risk for disasters like tsunami. Likewise defencelessness towards infection is more pronounced due to exposure to harmful occurrences at particular places (sudden disease outbreaks like H5N1 avian flu and SARS in cities).

Another approach to vulnerability has been proposed by Polsky et al. (2007). It relates to global change vulnerability with "the likelihood that a specific coupled human-environment system may experience harm from exposure to stresses associated with the alteration of societies and the biosphere, accounting for the process of adaptation". In this context, the environment and human systems are considered as a single entity which is vulnerable with respect to global climate change in terms of three characteristics; exposure, sensitivity and adaptive capacity (Villagrán de León, 2006). Additionally, within the Hazard Management Group, Dilley et al. (2005) define the physical system vulnerability in terms of fragility curves for infrastructure and quantified as a function of hazard intensity while social vulnerability is mentioned as being a complex function of social, economic, political and cultural variables.

The Pan American Health Organization (PAHO, 2000), defines vulnerabilities in health facilities as structural vulnerability referring to buildings and infrastructures which are required for physical support. Non-structural vulnerability comprises of element which are essential to the functionality in relation to health aspects.

Administrative or organizational vulnerability in this regard refers to the drawbacks in the administrative processes and in the functional coordination between the different sections and departments.

Alexander (2000) makes an explicit connection between vulnerability and the research conducted to assess it, recognizing that vulnerability can be reduced or enhanced depending upon the type of action taken towards the casualty or destruction with respect to a particular element. Deprived vulnerability arises when the research results are not disseminated or used in order to alleviate and eliminate the destruction, while wilful vulnerability arises when such knowledge is deliberately ignored, thereby enhancing vulnerability.

The different vulnerability types as discussed above emerged as per the need to understand the condition through various perspectives and disciplines. However, all the above cited conceptualization of vulnerability distinguishes natural vulnerability from social vulnerability. Although considerable research has examined biophysical components of vulnerability (Mileti, 1999), we currently know very less about the social component of vulnerability. Socially created vulnerability is largely ignored mainly due to the problem of adequate quantification (Cutter, Boruff and Shirley, 2003). Social vulnerability is also closely linked to risk and there is extensive discussion on how social groups manage a variety of risks they face (Rakodi, 2002; Siegel and Alwang, 1999). But still it emerges to be important to treat social vulnerability as a separate but linked topic to risk reduction and the pursuit of overarching development goals focusing on people, thereby making the debate more people-cantered, considers the complex social systems as a whole and takes into account even the non-structural solutions (Warner, 2007). Examples of social vulnerability could be widening economic gaps and power relations that exclude certain social groups from getting the benefits of developments. In this respect social vulnerability has also emerged as a policy relevant research area.

The 21st century has seen the onset of greater threat to environment and human security (Höppe and Pielke, 2006; IPCC, 2012) calling for researches addressing people and contributing to policy design to improve environmental and human health security. This saw the dynamic evolution of security paradigm which inseparably links humans and their social system and strives to achieve freedom from fear, freedom from hazard impact and freedom from want (UNDP, 2012).

The above discussion can be concluded by highlighting the importance for distinguishing social vulnerability from general vulnerability studies primarily due to increasing need for:

- Understanding complex social-environmental system and their linkages
- Focusing primarily on ‘people’ and ‘society’
- Emphasizing human security
- Improving environmental conditions and access to basic amenities; more so among the most vulnerable population
- Considering non-structural solutions as well for risk reduction
- Achieving greater societal resilience

It also becomes important to understand the various underlying factors and root causes for social vulnerability and rethink risk and vulnerability through a holistic perspective taking into account the day to day activities and stresses (as opposed to concentration on only one time extreme events, natural hazards and disasters). It would then further emphasize the necessity to focus on special social groups i.e. women, children, economically deprived, socially marginalized and even the politically underprivileged ones.

2.5.2 Approaches for analysing social vulnerability

Amongst the different dimensions of vulnerability mentioned above, social vulnerability is mostly focused on social defencelessness to withstand adverse impacts triggered by multiple stressors including challenges of poverty, inequality, political factors, environmental and social problems. Social vulnerability is also viewed as the degree to which humans, and the things they value, are susceptible to loss when affected by hazardous and disastrous events. It emerges as product of exposure, inadequate protection measures and/or limited capacities to absorb and rebound from loss (Mitchell, 2005). Though there are numerous definitions focusing on one aspect or other depending upon respective research discipline and focus area (Cannon, Twigg and Rowell, 2005; Cutter, Boruff and Shirley, 2003; Cannon, Frankenberger, Blaikie et al. 1994) some

commonalities can still be drawn. Important point to note with social vulnerability are its multifaceted character and numerous dimensions involving characteristics like economic, socio-demographic and other social factors which forms the basis for vulnerability study of individuals, households and communities. Perhaps one of the definitions that best synthesizes all these different aspects of social vulnerability is that presented by Cutter, Boruff and Shirley (2003, p. 244) Social vulnerability is partially the product of social inequalities those social factors that influence or shape the susceptibility of various groups to harm and that also govern their ability to respond. However, it also includes plane inequalities those characteristics of communities and the built environment, such as the level of urbanization, growth rates and economic vitality that contribute to the social vulnerability of places.

This definition among other aspects highlights inequality to be the root cause of social vulnerability. Since marginalized groups of poor, women, children and elderly are amongst the vulnerable social groups who tend to be most affected because of persistent social vulnerability of structural and political factors non conducive policy directives, unsustainable and skewed development, lack of pro-poor initiatives and missing political commitments (Warner, 2007). Social vulnerability can also be linked to unfavourable social processes, political policies and lack of societal resilience. Other factors that enhance social vulnerability from the coping side includes lack of information and awareness, gender discrimination, limited political representation and access to power relation, lack of effective social networking and cooperation, differential social customs, differences in beliefs, and lack of common viewpoints (Cutter, Mitchell and Scott, 2000; Lindell and Perry, 2001; Putnam, 2000). Whereas, physical fragility like poor house construction, lack of infrastructure facilities enhances social vulnerability from the exposure side (Cardona, 2004).

Social vulnerability is "crucially about characteristic of people" (Cannon, Twigg and Rowell, 2005: 5) and differential impact upon them when faced with stresses. Therefore, it combines a complex set of characteristics including person's initial wellbeing, his livelihood and resilience, degree of self-protection afforded by his affordability and willingness and his level of access to social capital (Cannon, Twigg and Rowell, 2005).

However, social vulnerability is not only a pre-existing condition that affects a community or group's ability to be prepared and recover from an unexpectedly harmful event (Warner, 2007), it also determines post-disaster conditions via its influence on perception, decision and level of effective response. As social vulnerability is created through interaction of multiple stressors also including various social, cultural and political forces, it needs to be resolved also through social means considering non-structural solutions (Alwang, Siegel and Jørgensen, 2001; Cannon, Twigg and Rowell, 2005).

Wisner (2004, pp.183-193) distinguished four approaches on social vulnerability: i) demographic; ii) taxonomic; iii) situational; and iv) contextual or proactive. He criticized that many studies on social vulnerability have not sufficiently valued local knowledge and coping capacities. He further supported the need to understand why and how local knowledge is rendered inaccessible and find out ways in which people can be empowered to reclaim local knowledge and appreciate its usefulness. In this study, social vulnerability is focused on natural disaster with particular reference to floods and is considered to be a function of (i) their exposure to floods through various routes like infrastructure, settlement, waste management issues, etc., (ii) the capacity of households to cope and adjust themselves from flood hazards, and (iii) the sensitivity of the population to flood hazards both directly and indirectly.

Despite the concerns about the limitations of generalization about social vulnerability arising from the interests of varying practitioners, several attempts to measure

vulnerability and to develop indicators of vulnerability have been developed (e.g. see Diriba, 1999; Leichenko and O'Brien, 2002; Cutter, Boruff and Shirley, 2003). Diriba looks into social vulnerability with respect to food security and offers some direction towards methods of its analysis. Accordingly, approaches to social vulnerability analysis include:

- Indicator approach: This involves identifying the number of objective indicators capturing different aspects or dimensions of vulnerability.
- Household modelling approach: Mix of objective data and household and community surveys to develop a sample of how a household responds to risk.
- Income estimation approach: it aims at estimating income levels to see if sufficient income was generated to help people overcome risk conditions.
- Domestic resource capacity approach: it takes into consideration the community's ability to either collectively or individually allocate resources to mitigate risk.

Other similar efforts to estimate vulnerability in respect to global change and food security issue is attempted by understanding and identifying why populations are food insecure (e.g. Eldridge, 1997; SADC and FANR, 2000).

Following the bottom up approach, a few studies also attempted to understand what have been the root causes of vulnerability. A good example of this is seen in the application of vulnerability indices to climate change (Downing, 2001). Leichenko and O'Brien (2002) further suggest that macro vulnerability indicators need to be combined with local level survey based investigations in order to understand the linkages between them.

Based again on the indicator method, an index of social vulnerability to environmental hazard (SoVI) for the United States was constructed by Cutter, Boruff and Shirley (2003) using a factor analytic approach, wherein 42 variables were reduced to eleven independent

factors that accounted for about 76 percent of the variance. These factors were then placed in an additive model to compute a summary score.

The approach for social vulnerability analysis pursued in this study combines elements from the above mentioned approaches: a detailed quantitative as well as qualitative investigation focused on 300 households from two different informal settlements in the megacity Lagos. The range of qualitative method included recording of everyday experiences and responses related to flood management problems in the household and the immediate neighbourhood. Questionnaires administered in these household covered other related quantitative aspects too such as demographic characteristics, dwelling period and household income.

2.5.3 Components of social vulnerability: exposure, coping capacity and people's perception

Most of the frameworks dealing with vulnerability view it in terms of exposure and coping capacity, other frameworks also refer to it as the external and internal sides of vulnerability (Chambers, 1989; Bohle, 2001). Similarly for Birkmann, 2006; Birkmann and Fernando, 2008; Cardona, 2004; 2011; and Carreño and Barbat 2012, social vulnerability originates as a consequence of three factors: physical fragility (exposure) which is equivalent to external vulnerability, socio-economic fragility (susceptibility) and societal response or lack of resilience which is equivalent to internal side or coping capabilities. Additionally, the outcome of exposure opposed by coping capabilities is also an important determinant of vulnerability. Therefore, identification of routes or means of harmful exposure, capacity to cope and resultant implications are important for holistic characterization of social vulnerability.

Risk and exposure are closely tied to vulnerability and can be seen as a function of vulnerability itself (Vogel, 1998). To be at risk is to be under threat of harm (Pelling, 2003). Risk in human terms is a situation in which human values (including humans themselves) are at stake and where the outcome is uncertain (Jaeger et al. 2001). Many risks are eco-centric, i.e. they are linked to environmental problems or related to environmental conditions (Jaeger et al. 2001) which threaten human security via greater probability of exposure.

The two sides of vulnerability in Chamber's (1989) and Bohle's (2001) model recognizes the relationship between risk, vulnerability, coping capacities and assets. Elaborating Bohle's double structure of vulnerability where the external side of social vulnerability relates to the exposure to risks and shocks and is influenced by Political Economy Approaches (e.g. social inequities, disproportionate division of assets), Human Ecology Perspectives (population dynamics and environmental management capacities) and the Entitlement Theory (which relates vulnerability to the incapacity of people to obtain or manage assets via legitimate economic means).

Opposing to the exposure side, the coping/internal side is influenced by action theory approaches taking into consideration the ways used by individuals and social groups to act to the event or stressful condition, either willingly or under compulsion, models of access to assets which refers to peoples responses and mitigation effort via their access to various types of assets, including economic, personal, socio-political as well as the social networking aspect of the group, primarily focusing on the social differences and lastly the institutional theory which focuses on the prevalent organizational arrangements and processes influencing social group's control over resources, assets and thereby capabilities to effective responses. The more assets an individual or a group controls less is the vulnerability, as the assets increases their capacities to cope with the risks and stressful

situations. Thereby the capacities to successfully manage stress would automatically call for conducive institutional arrangement for effective action.

The strength of this model is its capacities not only to explain vulnerability but also its causes and origin (Villagrán de León, 2006). Vulnerability analysis that addresses the complexities, dynamics and challenges of rapidly growing urban areas should seek to bring together various dimensions of vulnerability by means of an integrated approach (Bohle et al. 2006). Thereby, apart from the exposure and coping dimensions, the manifested outcomes, people's and institutional responses and limitations for the same are equally important to be considered for better understanding social vulnerability and paving the ways for policy intervention in the required direction.

Studies on natural disasters have mostly focused on the outcome of vulnerability, also taking into consideration the exposure and routes of such exposures, but people's response to the given disasters has been rather underrepresented. It is important to analyse how people respond to them and to better understand the factors influencing their responses in order to have a complete picture of social vulnerability. This in turn depends upon people's level of understanding and awareness of the problem and their perception towards its impact's severity.

It is important to note that people's perception plays an important role in understanding social vulnerability. The manner in which an individual or social group perceives existing problem affects the extent of their exposure and moulds their response towards it. Moreover, it is perception which influences people's response towards events in general and ones occurring over long time in particular. Furthermore, it gets their resource capacity functional.

With this view in mind Bohle's model of the double structure of vulnerability has been modified to encompass people's perception aspect, their level of stress endurance and the manifested implications and outcomes

As mentioned above that the major strength of this double structure of vulnerability is its ability to trace down the cause of vulnerability, which was tested in the field study done with respect to vulnerability related to flood management. Improper flood management creates a range of exposure which is regarded as a matter of risk that threatens humans and the ecosystem.

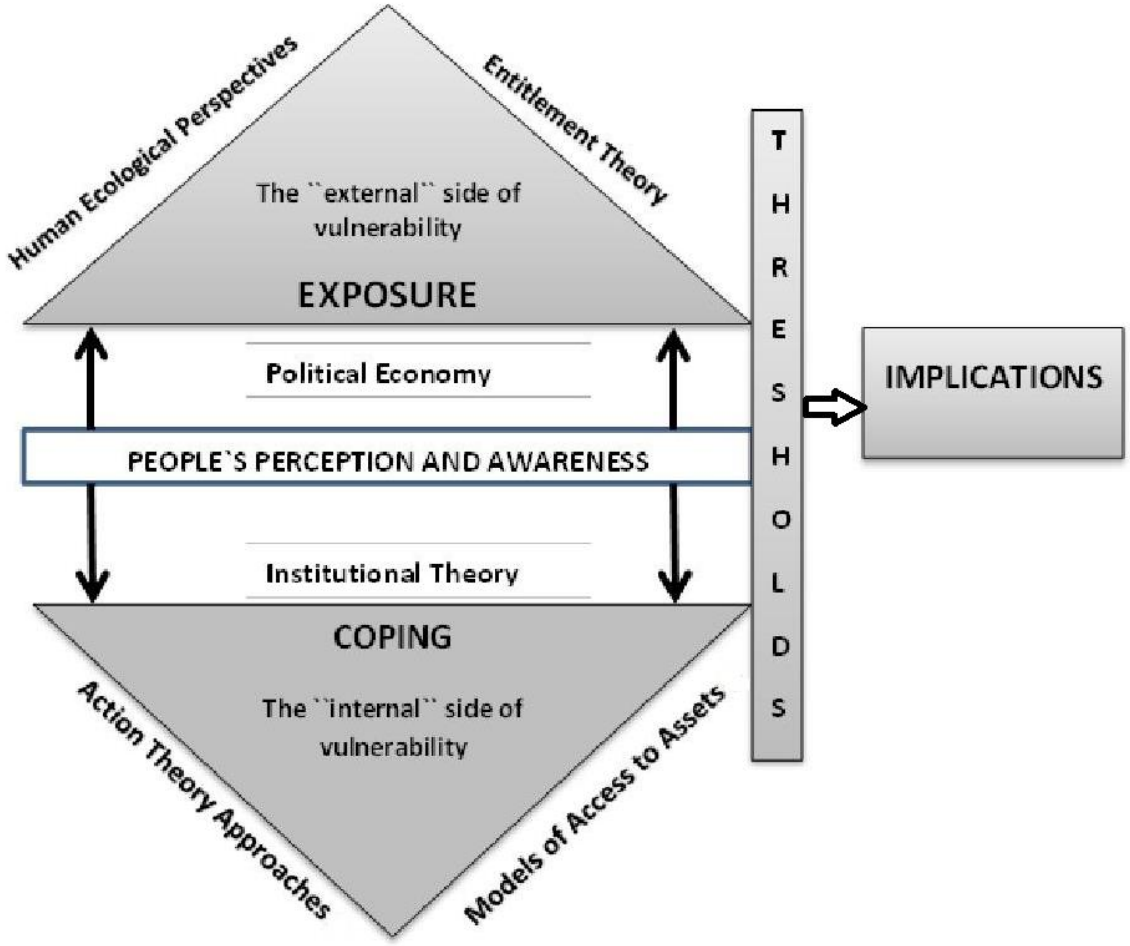

Figure 4: Various dimensions of social vulnerability
Source: own draft (modified after Bohle, 2001)

With regard to exposure there exist community's capacities to cope and respond effectively towards it, which among other factors is also highly influenced by people's

perception, awareness and available options. At a given time and place, interaction between exposure of a social group or community and internal capability and social networking of that community filter through their sensitivity and endurance thresholds and manifest itself in various form of negative implications.

In all cases of vulnerability the outcome is primarily seen on social groups and their environment, in the sense how they are affected by adverse outcomes. Outcomes are not necessarily exposure-specific, but relate to many different risk factors and uncertainties. Therefore, in order to grasp a better understanding of household vulnerability to floods it is necessary to analyse the different contributory risk factors too like structure of local governance and civic management, access to public resources, managerial efficiency, accessibility, level of economic self-sufficiency of social groups and their capabilities to self-help/defence.

2.6 'Internal Side' of Social Vulnerability: People's Perception and Management Capacity

Coping capacity is a function of perception (of the risk and ability to cope), possibilities (e.g., options available for its prevention, mitigation and coping) as well as private and public actions (IPCC, 2001). In general it refers to 'the means by which people or organizations use available resources and abilities to face adverse consequences, involving management of resources both in normal times as well as during crises or adverse conditions' (UNISDR, 2004:16). In this study, the elements of internal side of vulnerability focus on people's perception of the hazard as well as their coping and adaptive mechanisms to overcome or at least mitigate the negative implications of adverse conditions created by floods.

While coping capacity is more directly related to an extreme event, adaptive capacity refers to a longer time-frame and implies that some learning either before or after an extreme event is happening (Peltonen, 2006). Coping capacity is viewed usually in the short term and adaptive capacity usually viewed as occurring over longer time-frames. Both in this case have been classed together as management capacity for a consistent understanding. It is important to note that strengthening of management capacities lowers the vulnerability of a system, community or household through increased resilience.

Coping is a highly complex and dynamic issue, not only in times of acute crisis but also in coping with every day or seasonal risks (Bohle, 2001). The concept of coping and adaptation in light of access to resource has been used both explicitly and implicitly in natural and social sciences (Adger, 2006; Blaikie et al. 1994; Watts, 1983), environmental risks (Blaikie and Brookfield, 1987), climate change (Downing, 1991), political ecology (Oliver- Smith, 1998), and entitlement to food security (Cannon, 2006; Sen, 1981).

As pointed out by Bohle, three main strands of theoretical discussions, namely action theory (i.e. the means and ways used by people to act), model of access to assets (i.e. access to assets of different nature that allows people to mitigate their vulnerability) and the crisis and conflict theory (i.e. the capacity to manage crisis situations and the resolution of conflicts) seem to be most relevant to grasp the whole range of coping and adaptation capabilities (Bohle, 2001). Naturally, all three approaches overlap in multiple ways, and they are also closely linked to the external/structural context in which they are embedded. But all these are influenced and would be triggered by people's perception of the situation. Human beings or social groups act and respond only on the basis of the impression formed of the existing condition depending upon their level of understanding and prior experiences. Therefore, all these three strands are largely encompassed within the influence zone of people's perception. It seeks to integrate these concepts into a

comprehensive but simplistic model to serve as a framework for analysing the 'internal side' of vulnerability.

Figure 5: Conceptual model for analysing the 'internal side' of social vulnerability Source: own draft adapted from Bohle, 2001

Figure 5 therefore portrays the different dimensions. The first dimension here focuses on action-oriented approaches, especially on the interaction and dialectic relationship between the external and internal side of vulnerability in terms of existing structure and agency. It refers to the means and ways used by the people to act, either by free will or as a result of external constraints. It also depends highly to what extent marginally located and underprivileged population have options to cope with prolonged exposure risks or to what extent their coping strategies are determined by structural/institutional limitations. A second approach which is closely linked to action theory is the concept of access to 'assets', especially to coping resources and strategies. This strand focuses on

understanding the role that access to various assets (including personal, economic, socio-political, infrastructural assets) plays in providing security to the social group or individuals. The starting point of this strand of discussion is the observation that assets which people control contribute to mitigate their vulnerability and strengthen their resilience towards risks. The more assets they control, the less vulnerable they are and the greater are their capacities to successfully cope with risks, even in their everyday life. Social assets here play a particularly important role, for such assets are often the only form of "coping" that a group is left with during a period of heightened risk. The whole question of access to control over assets is closely linked with the political system of the region under consideration and in which way various groups of people are embedded in the basic structures and dynamics of society, economy, and polity. This leads finally, to conflict and crisis theory approaches. Issues of access to control over resources occur usually in highly contested spaces and arena of risk and criticality, and the capacities to successfully manage risk situations will be a basic determinant for successful or less successful coping means (Bohle, 2001). Empowerments and rights that are exercised within a particular setting determine the access to resources (e.g., infrastructural resources in this particular case) and are therefore also a key dimension to analyse vulnerability. Analysing individual ability to reduce risk calls for identifying the accessibility of the infrastructural provision along age and gender lines. Further aspects to be analysed within this framework of vulnerability are the challenges arising from the tension between objective and perceived elements of vulnerability and risk. Vulnerability may be differently perceived or experienced by the vulnerable themselves (Kasperson et al. 2005a). The experiential or perceptual dimensions of vulnerability are not easily measured primarily because the impacts of environmental change that create perceptions of insecurity themselves may not be obvious (Adger, 2006). The coping capacity including

awareness and willingness to act during time of external stress is widely influenced by differential perception by individuals and understanding of the available options as well as one's own status and ability to overcome the same. Thereby, it becomes clear that the opposing elements of vulnerability – coping capabilities and adaptive capacity – are extremely complex.

The pressure and release (PAR) model identifies the environmental stresses and progression in social vulnerability, including forces that relate to adaptive capacity (Blaikie et al. 1994; Wisner et al. 2004). In majority of past literature, vulnerability does not explicitly deal with responses in terms of coping and adaptations methods itself but to the forces that facilitate the processes of risk management. Capabilities (in terms of social and economic advantages) are often latent due to the circumstantial factors (Wisner, 1993) and only surface or get functional when a hazard strikes or during the time of exposure stresses. Such operationalization of capacities is also highly influenced by people's perception of hazard risk and the sense of fear of being negatively impacted depending upon their knowledge of risk severity.

Yohe and Tol (2002:26) analyse the adaptive capacity of human systems in terms of different determinants which include a variety of systems, sectors, and location-specific characteristics:

- The range of available technological options for adaptation
- The availability of resources and their distribution across the population
- The structure of critical institutions, the derivative allocation of decision-making authority, and the decision criteria that would be employed
- The stock of human capital including education and personal security
- The stock of social capital including the definition of property rights
- The system's access to risk spreading processes (e.g. insurance systems)

- The ability of decision-makers to manage information, the processes by which these decision-makers determine which information is credible, and the credibility of the decision-makers themselves
- The public's perceived attribution of the source of stress and the significance of exposure to its local manifestations.

It, therefore, indicates that available options, awareness, ability of decision making and people's perception are all important determinates to analyse adaptive capacity of any studied system and may be operational at different levels of management.

2.6.1 The relevance of social and economic capital in social vulnerability

It has been recognised that a range of economic, social, political and cultural factors shape the coping capacity of population and also serve to shape their ability to make changes (Smit and Wandel, 2006; Woodward and Scheraga, 2003). Political, demographic and global economic processes have put coping strategies under pressure and have given rise to vulnerability and to reproduction of vulnerability over time which affect the allocation and distribution of resources between different groups of people (Wisner et al. 2004). In the "disaster pressure model", Wisner et al. (2004) extensively explained the progression of vulnerability from root causes through dynamic pressures resulting in local unsafe conditions. In this model, government policies and programs are considered the result of unequal power relations that create vulnerability and unsafe conditions at the local level. Although local people do not use the concept of vulnerability to describe their worsening situation, they feel the stress, face difficulties, talk about risks and make risk-taking or risk-avoiding decisions.

Most poor people, moreover, choose a wide variety of options to try and increase their adaptability or minimize their risk in times of stress and shock (Berkes, 2007) and further try to diversify their interests (Brown, 2011).

Socio-economic factors are not only important in understanding the level of access to resources to undertake prevention, coping and adaptation (Pelling et al. 2008) but also in underpinning the behavioural context of social groups. The social context matters for collective action (Rudd, 2000), which is an important aspect of coping capabilities that helps in reduction of vulnerability and constitutes resources that individuals can undertake to increase their wellbeing. Beyond instrumental benefits, social interaction and networking also lead to the development of trust, belief and cooperation within members, which again facilitate in strengthening their capabilities. This complex outcome of social relationships, interactions, social norms and institutions is referred to as 'social capital' (Coleman, 1987; 1990; Ostrom, 1999; Woolcock, 1998). It is a productive asset that enables individuals to better fulfil their aspirations through access to goods and services via their social network and collective actions (Castle, 1998; Rudd, 2000: 135).

It is important to note that an incapability to manage crisis situation does not exist in isolation. It is rooted into the wider political economy of resource (physical as well as infrastructural) accessibility and use as well as the relationship among the community members. Social capital helps in networked relationships and is produced through norms of trust and reciprocity among members (Dasgupta, 2003). Some coping and adaptation will occur autonomously through individual responses whereas other aspects will require greater foresights, planning and policy implementations on the part of the government (Stern, 2007) as well as trust in the governance system and responsible behaviour on the part of social communities.

The most vulnerable populations who, usually, control very few economic, political, infrastructural, and personal assets rely upon social assets in the sense of being integrated into social networks of mutual trust, shared norms and reciprocity. Social networking of people in form of community organizations and religious groups are many times seen as the only support providers during crisis and period of adverse conditions. In this respect, the social capital offers a base for networking and collective action, thereby strengthening capabilities to act towards problems, further determining the speed and direction of adaptation and coping measures. Collective action is facilitated via trust and reciprocity.

Efficiency of social capital is further linked to the effectiveness of information dissemination among members and the level of assured trust and cooperation. This would further assist in community participation and developing a common vision for community development. As social capital also draws attention to the operation of power and flow of resources and information (Pelling and High, 2005) it can play an important role in decision making and collective actions. Apart from other factors and economic security, it is important for a conscious community to look into the adverse implications of the ongoing problems, evaluate its implications and discuss alternative for its solution through individual and collective actions. This would provide an efficient social base and strengthen their capabilities towards facing adverse situations during stress.

2.6.2 The role of social capital

There is much debate about what exactly is meant by the term ‘social capital’ (Cox and Caldwell, 2000; Pawar, 2006; Putnam, 1998). In the context of this research, it is taken to mean the social resources, relationships and networking upon which people draw in pursuit of their objectives of securities and wellbeing. Defining in Putnam’s words, social capital means “features of social life – networks, norms and trust – that enable participants

to act together more effectively to pursue shared objectives" (Putnam, 1995: 664-665). These are developed through networks and contacts, membership of more formal groups and relationships of trust, reciprocity and exchanges that facilitate co-operation and may provide the basis for informal safety nets amongst the poor (DFID, 1999). Membership of associations can extend people's access to and influence over other institutions and also be forceful in influencing political groups as well as governmental agencies to look into their needs. This can happen through the action of people's groups which are also an attraction as a potential vote bank for political groups. But at the same time such association may not be really helpful in dealing with risks of larger dimensions. Tudawe (2002) further highlights how such "forms of mutual assistance" for poor households are not adept at coping with major risks because such are poor-to-poor ties can often only provide a small amount of support for a limited time, or sometimes just emotionally.

Social networking, cooperation and interaction directly influence mutual bonding which is important and effective in encouraging "community participation", which has proved to be an important tool in solving the community problems at local level. It can also be effective in improving the management of common resources (natural capital) and the maintenance of shared infrastructure (physical capital). Social networks facilitate innovation, the development of knowledge and sharing of that knowledge thus highlighting close relationship between social and human capital.

Social capital, like other types of capital, can also be valued as a good in itself. It can make a particularly important contribution to people's sense of wellbeing through common identity, honour and belongingness (DFID, 1999). In order to secure social capital and networking it is important to have mutual trust and a common identity. Additionally the group needs to establish believe in one another and in the work they are attempting. The strength of social networking is in a direct relation with its effectiveness.

Good social networking (including social capital) can be effective in enhancing coping capabilities of people (Braun and Aßheuer, 2011; Lohnert, 2007; Valdivia et al. 2003). At the same time social networking is considered 'good' and effective primarily if it is successful in facilitating coping and adaptation thereby strengthening security.

In conclusion, it is important to note that the above analysis of literature further suggests that a major proportion of vulnerability study till date has paid little attention to the urban poor. There exist very few research works on vulnerability related to natural disaster and their prolonged exposures to harmful environmental problems. This study therefore attempts to address some of this by examining the little studied, but fast growing megacity of Lagos with a special focus on poor populations who are at risk to natural hazards by paying particular attention to collective and individual mechanisms of hazard response strategies.

The research also attempts to highlight the importance of alternative support networks, and to examine how marginal populations such as slum dwellers in Lagos acquire support from other formal and informal social organizations through networks, and how they deal with risks of hazards. It suggests that alternative sets of support developed by slum dwellers are products of a transforming society caught in an intersection of traditional and modern social structures, legal and illegal identities, and finally technocratic and democratic approaches to decision making. The study focuses on societal adjustments that use locally available resources to produce required knowledge of the processes that affect acquisition, accumulation, arrangement and management of such resolutions.

2.7 Research Methodology

To understand fully the depth and breadth of vulnerability, management strategies and risk perception issues requires multiple research techniques, an approach which has been adopted in this research (see figure 6). According to Denzin and Lincoln (2000), triangulation has the strength to combine multiple observations, theories, methods, and empirical materials and cover any concerns about using a case study. It also serves to clarify meaning and verify interpretations, generalizations and evaluative judgments (Flick, 1998).

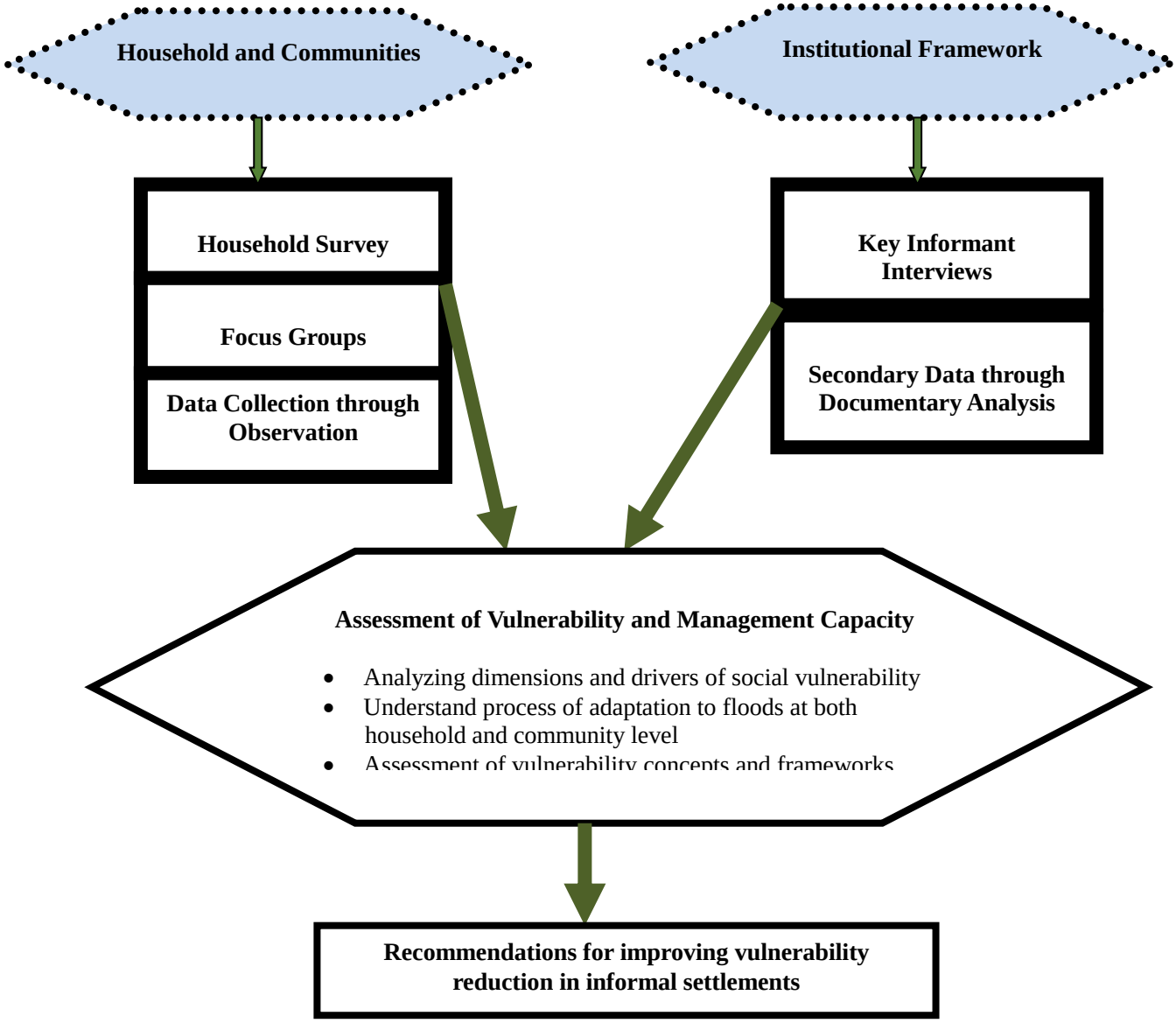

Figure 6: Description of research design

2.7.1 Data sources

2.7.1.1 Surveys

The survey consisted of a structured questionnaire which was administered to households in both Makoko and Badia slums respectively. In these neighbourhoods, random walk sampling was conducted and 300 households (180 households in Makoko and 120 households in Badia) were selected for a detailed questionnaire survey. The questionnaire used for this study was based on the "Dhaka project" (Aßheuer and Braun) from the Institute of Geography, University of Köln. The survey comprised both structured and open-ended questions. These surveys were conducted by the author, with the help of three students from the University of Lagos (who were carefully trained to administer the designed questionnaire). The selection of households was made using the random walk sampling by following a random route in which households were interviewed as they were encountered.

Data was collected on aspects ranging from the socio-economic status of the slum dwellers, their extent of losses from floods, coping and recovery mechanisms. The structured questionnaire contained different sections like: basic information profile on socio-economic status of the respondents including their legitimate or non-legitimate status as residents, employment status. Also, the questionnaire included aspects of physical vulnerability, infrastructure availability, access to basic amenities; methods adopted by individuals to immediately survive from floods; government, NGO and other institutional support or aid and relief received; access to formal and informal financial facilities, and sources of credit and loans; specific loss sharing mechanisms adopted and sources applied to share and reduce losses. The aim was to understand household`s lived experiences within the flood areas. The questions explored the nature of household

organization, social and communication networks, residents' views of their households in the context of living with a flood threat, participation in and awareness of flood mitigation activities, and perceptions of local vulnerability to flood. The individual questions helped the researcher explore household characteristics and social processes that influence action (or inaction) related to coping with the flood risk.

Key informants of the households were interviewed, including both male and female participants. This allowed facilitating the understanding of gender based differences in the perception of the respondents.

Sensitive questions (such as religion, marital status and the exact income of the family etc.) were generally avoided if the respondent was not willing to answer. The interviewer`s impression whether the informants were responding openly and honestly was also taken into consideration in deciding about continuing of the interview. Besides, the availability of time for responding was essential for obtaining all information. Therefore, sometimes it was necessary to make adjustments during the interviews (i.e., shortening of questions). At times questions were asked in Yoruba or Igbo (the native languages) in order to secure better and uniform understanding of the posed questions.

The survey questionnaires were structured to have both closed and open-ended questions, with open-ended questions used in instances where the respondents' personal view on an issue was needed. The surveys were conducted through face to face administration in order to be certain that all those to be sampled have been contacted. Household interviews lasted for 45 minutes on average.

2.7.1.2 Qualitative interviews

Interviews were one of the main methods used for qualitative data collection. This was carried out at the community and household level and also with key informants in the research area.

Interviews at community level

Community and household perspectives related to flood vulnerability management and adaptive mechanisms were examined at an individual level and at a community level in this research. This was deemed most appropriate for two reasons. A 'community' by definition can be conceptualized as a collective with shared values and norms, sharing a common history and identity. Equally important, the level of community is where many mitigation decisions and hazard vulnerability analyses are made (Yodmani, 2001). It was also necessary to gather data at the individual level and this was carried out using semi structured interviews. According to Bernard (2011), semi-structured interviews have much of the free-wheeling quality of unstructured interviewing but are based on the use of an interview guide. Semi-structured interviews allowed greater flexibility within the interview structure through the use of open-ended questions to allow the respondent to express their thoughts on a subject freely. Though interviews were based on a guide some instances that required additional understanding of pertinent issues in the various study groups or where the respondent's knowledge of certain matters was more relevant, unstructured questions were used to probe these areas further.

During the interview process, especially with households, the researcher was conscious guiding against bias. Though interviews targeted the household heads, in case where their spouses were present or grown-up children, they were also asked similar questions to maximize the accuracy of information given with regards to some questions. This was

relevant with questions that concerned coping strategies and livelihood activities, because it was realized that the respondents were keen to express their problems and could in some instances exaggerate information that was given, especially regarding living conditions and assistance received from government and other nongovernmental organizations. Corroboration of statements sought on the basis that reliability and credibility of the data being gathered depended on the accurate presentation, interpretation and correlation of information gathered from the respondents.

Interviews with key informants

The key informant interviews here were carried out with teachers, local politicians, head of communities, religious leaders, and traders in order to gain insights into institutional perspectives in relation to issues like vulnerability reduction or community participation in decision making as well as new directions in which flood risk management may be moving in informal settlements.

The key informant interviews consisted of semi-structured interviews with ten key individuals who represented decision-making institutions, those who were themselves local decision-makers, or those who were influential within non-government organizations or community groups involved in flood management in the city of Lagos. Informants were determined through contacting key agencies and organizations, or municipal leaders, and asking them to identify the person they considered best suited to represent perspectives of their agency in relation to flood-related matters.

To ensure participants' anonymity and permit them to offer critical insights into their own organization, their specific organization is not named. However, the interviewees were all affiliated with one of the following types of institutions in the Lagos municipality: federal departments with flood management mandate, local government departments for

managing flood risk, non-governmental agencies with emergency response and recovery mandate and grassroots activist groups (community-based). Interviews were in-person and lasted approximately one hour. Respondents were asked to answer the questions from the perspective of an employee of their organization. The semi-structured format of the interviews allowed for qualitative data collection; the focus was on eliciting a range of rationales, assumptions, and potential values stances held by informants' respective organizations. Hence, questions were deliberately exploratory and open-ended.

All interview data were transcribed using MAXQDA. A data set was developed using responses to each question and sub-questions, categorizing information according to responses (coding). These detailed categories were organized into broader themes that emerged from the data. In some cases responses also were accompanied by experiences, behaviours or rationales that were highlighted in interpreting the data. Recurring issues were noted as were novel / contradictory perspectives. Following this, responses and categories were cross-referenced with the institutional affiliation of the respondent (community-based group, non-community based NGO, federal agency).

Focus group discussions were also carried out in order to obtain data on combined local perspectives that also informed about the underlying ironies, contradictions, and tensions in these communities. Furthermore, observation and participation in community development activities were undertaken during visits to these settlements to increase the sense of place and understand the interaction within households and between residents and their local environment.

2.7.2 Secondary information

Secondary data was collected from literature and documents concerning the issues under investigation. These were collected from various sources and searched for evidence on the

issues under investigation. Documents were collected from government ministries, research institutes, universities, and NGOs who have worked in the area. Some secondary data were collected from internet sources and via library facilities, through which the few journal articles and publications on the floods of Lagos were sourced.

2.8 Case Study Selection

The two slum communities were selected based on the fact that the community is at risk from constant flooding and have suffered from recent flood events. Members of the community are often engage in mitigation actions, the population size is of more than one thousand people. The decision to focus the research on communities with populations of more than a thousand in size was based on the consideration to facilitate values analysis as larger communities are typically characterized by more diversity in management strategies and more transient populations making identification of common values and social relationships more easy. Some secondary elements came to light that were also considered: type of community initiative related to flood vulnerability and level and type of economic activity. While applying these criteria to the selected communities, it provided more diversity in community characteristics, the primary purpose of the study was not to compare the perspectives in the two communities but rather to be aware that contextual differences exist which may explain some perspectives related to issues of social vulnerability to flood. After applying the criteria above, the two communities selected for this research work were Makoko and Badia slums.

2.9 Methodology of Analysis

Both quantitative and qualitative methods have been adopted for analysing the information gathered from household questionnaires, interviews and secondary sources.

Quantitative information was organized in arrangements based on topics like occupation, income, family type, property ownerships, access to infrastructure, amenities, financial services, decision making process, extent of flood impact, type of losses incurred, sources of support, etc. Depending on the nature of data, suitable statistical and cartographic techniques are applied for their representation in supporting the arguments of the study. Data is also represented through simple self-explanatory tables, diagrams and picture profiles. Results from focus groups and answers to open-ended questions of slum households were textually analysed to determine the underlying themes, frameworks and perceptions about the flood problem, and register the role of socio-economic practices in facilitating its mitigation in these communities.

Social vulnerability is explored through the dimensions of exposure, resource capacities, implications and response. Exposures to flood is investigated on the basis of factors like demographic characteristics of the slum communities, settlement and infrastructure status. Also, resource capacity dimension were investigated through factors like knowledge and awareness, role of social capital as well as institutional and political economy. Institution in this case mostly refers to the local organizations in the case study area. Additionally a detailed comparative analysis of exposure and management capacity (coping and adaptive) of households in different slum communities is done to get people's view of the problem and better understand the constraints and expectations.

In addition to answers from focus groups and surveys, observation and ethnographic methods were used to understand and evaluate lifestyles, resources and attitudes of slum dwellers about their vulnerability, potential risk from recurrent floods, their perception on the causes of these losses and responsibility for dealing with it. This assessment helped in determining the general attitude of the targeted low-income population towards hazard vulnerability and loss reducing mechanisms.

CHAPTER 3: URBANIZATION AND FLOOD RISK MANAGEMENT IN THE CONTEXT OF NIGERIA AND LAGOS

3.1 Introduction

This chapter outlines what a flood risk management scheme should entail followed by a discussion of flood risk management in Nigeria. Current flood risk reduction best practices in the developing world are then examined, with the chapter concluding with a discussion of the prevailing legal framework and strategies for flood risk management in Nigeria.

3.2 Urbanization Process of Nigeria

In Nigeria, the urbanization process is similar to what obtains in several other developing countries, as the growth and complexity of human settlements and in particular the rate of urbanization has been phenomenal (Ujoh et al. 2010). Considering its 2006 population figure of over 140 million people – the highest in Sub-Saharan Africa (Jiboye, 2011), available data however shows that the country has been growing at the rate of 5.5 percent annually from 1980 to 1993, and recently, its growth has increased to the rate of 5.8 percent from 2005 to 2014, which has resulted in a total urban population of 62.66 million people (or, 43 percent of the national population). By projection, this proportion is expected to increase to more than 60 percent by 2025 (UNDP, 2012). Consequently, Nigeria has one of the highest urban growth rates, having cities ranked among the fastest growing in the world. Not only is the country experiencing one of the fastest rates of urbanization in the world, its experience has also been unique in scale, pervasiveness and historical antecedents. This process has resulted in a dense network of urban centres (Oladunjoye, 2005), thereby constituting a major problem to the urban residents whose

quality of life and living conditions have deteriorated considerably (Ajala, 2005; Jiboye, 2011). However, it has been established that the degrading condition of the cities' environment in most developing nations affects the socio-economic and national development (Olukoju, 2008). Therefore, a major developmental challenge facing the nations - particularly those within the developing world is how to cope with the increasing urbanization and minimize its adverse consequences on the cities' environment as well as the overall wellbeing of the people (Jiboye, 2011).

Coupled with the rapid population growth, the urban areas of Nigeria are also centres where most of the ongoing economic development is located. As a result, it is no surprise that emerging trends show that urban hazards are becoming more common in these places. An estimate of different types of disasters that have affected urban places in Nigeria between 1980 and 2010 shows 85 events; natural (18) and technological (67) (CRED 2010). These calculations do not include large area disasters that affected regions that contain cities. Although technological events like transportation accidents and industrial explosions are frequent in cities, they generally affect limited numbers of people in specific locations. Natural events usually affect a larger number of people in cities and result in large scale losses. Furthermore, hazards in such urban settings are particularly complicated because any kind of extreme event triggers a hybrid set of events with natural, technological and social components (Mitchell, 2008).

Hydrological events like floods are increasingly common in most urban areas of Nigeria. Overcrowded cities without adequate drainage systems to draw off excess water during the rainy season have developed into a serious flood problem. Likewise some of these urban areas are built on poorly drained marshlands which therefore make them susceptible to flood. As in other major cities in less developed countries, there is a constant problem of garbage and waste disposal in most cities in Nigeria which therefore results to frequent

sewage back up especially in the poorer lowland sections.

Another common occurrence associated with urbanization in Nigeria is the issue of slum formations and urban degeneration especially in major cities like Lagos and Ibadan (Fourchard, 2003). Over the past decades, these problems have constituted major challenges to sustainable urban development. Official response to the situation through urban renewal, slum upgrading and outright clearance has been counter-productive in stimulating any form of sustainability. There is no doubt that Nigeria's rapid urbanization has brought about various socio-economic, cultural and environmental problems, particularly, degradation of the physical urban environment which exists in the nature of loss of biodiversity and green-house warming, desertification, degradation of agricultural land, air and water pollution, slums, insanitation, overcrowding, housing congestion, crime and violence, and several other demeaning situations (Daramola and Ibem, 2010; Jiboye and Omoniyi, 2010; Omisore and Akande, 2003).

In conclusion, a review of hazard events in urban areas of Nigeria indicates that the country`s urban areas suffers from significant amounts of natural risks and that these natural risks are increasing, possibly as a result of physical environmental changes only distantly connected with humans. This is aggravated by the unwise development practices which are carried out in most urban areas coupled with the inadequate provisions for local social circumstances which have therefore increased risks from natural processes and social vulnerability.

3.3 Flood event as one of the major disasters in Nigeria and Lagos

Flooding is becoming an increasingly severe and more frequent problem in African cities. Unfortunately, the impact is more felt by the urban poor in such a way that recovery is unlikely to be achieved without external aid (Blaikie et al. 1994). In other words, urban

poor are the most vulnerable to impact of flood because they occupy the floodplains for settlements. Coupled with lack of attention to household waste collection, construction and maintenance of drainage channels, flood disasters are becoming more pronounced (Douglas et al. 2008; Satterthwaite et al. 2007). It should, however, be noted that, flooding is a natural phenomenon that has surmounting effects on human livelihoods. Nelson (2006) viewed flood as a natural consequence of stream flow in a continually changing environment. Sada and Odemerho (1988) defines flooding as unusually high rates of discharging often leading to inundation of land adjacent to streams and it is usually caused by intense or prolonged rainfall. The occurrence of flood represents a major risk to riversides populations and floodplains, in addition to causing substantial impacts on the environment, including aquatic fauna and flora, and river bank erosion. Flooding is often exacerbated by human activities (Olanrewaju and Fadairo, 2003) such as the presence of riverside infrastructure (dams, piers, lands) and by poor development practice including riverside development, excessive cleaning, encroachment upon water ways, dredging which may cause changes in the hydrological balance of water-ways involved.

In Nigeria, particularly in cities, flooding is a critical environmental problem or major hazard that is continuously affecting the effective functioning of urban environment, especially in the areas of sustained infrastructure and services which are germane to sustainable livelihood. It often arises as a result of the extension of urban areas unaccompanied by development of strong drainage systems, adequate planning and disaster management strategies.

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

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

In Lagos which is the focus of this study, the environment is characterized as coastal with wetlands, sandy barrier islands and beaches. Water is the most significant topographical feature in most of Lagos State. Water bodies (sea, lagoons, rivers, creeks, and swamps) cover about 40 percent of the total area. Most of the land areas covering for example the informal settlements have an elevation of less than 15 metres above sea level. The land surface generally slopes gently downwards from north to south and is particularly low-lying and flat. The elevation of the built up area of Lagos city as a whole ranges between 1 metre in the coastal areas to about 15 metres above sea level. The climate in Lagos is tropical with two main seasons, the rainy and dry seasons, which usually last from April to October and November to March respectively. Floods usually occur during the rainy season which are aggravated by poor surface drainage systems of the coastal lowlands. Evidences have clearly shown that the frequency and severity of floods disasters in Lagos over the years have increased considerably (IPCC, 2007). The current increase in flood incidence and its associated risks experienced across Lagos have been attributed to global sea level rise and increase in the intensity and volume of local rainfall. For instance, in early 2011, the Nigeria Institute for Oceanography and Marine predicted a significant increase in the volume of rain especially in the Southern part of the country (Nigeria) where Lagos is located. The volume of rainfall was predicted to be between 1,200 and 2,700 millimetres as against 300 and 1,100 millimetres in the North. In the past few years, flooding has become a common feature in Lagos. Recent flood occurrences of the years 2010, 2011, and 2012 point to the fact that the situation is getting worse. Flooding has indeed been identified as one of the major obstacles to sustainable development in Lagos

especially among the slum population (Ministry of Economic Planning and Budget, 2010). It is paradoxical as noted by Adelekan (2010), in the last ten years that the frequency of rain days per annum has reduced in Lagos whereas the severity of rainstorms has increased and therefore resulting into more flood hazards with devastating effects on the residents' livelihoods, particularly the slum dwellers.

Originally covered with mangrove swamps, Lagos has experienced significant land cover changes due to reclamation activities to secure more land for urban development. Land reclamation is mostly achieved through filling up of swamps and floodplains, and destruction of mangroves and wetlands have generally reduced the flood storage capacity of the urban land. Rapid and largely unplanned urban growth has resulted in land use changes and subsequent changes in the hydrological fluxes in the urban watershed thereby increasing flood hazard and risk. The flooding in Lagos can not only be attributed to the lack of infrastructure like good drainage systems but a myriad of other issues as well, as shown below.

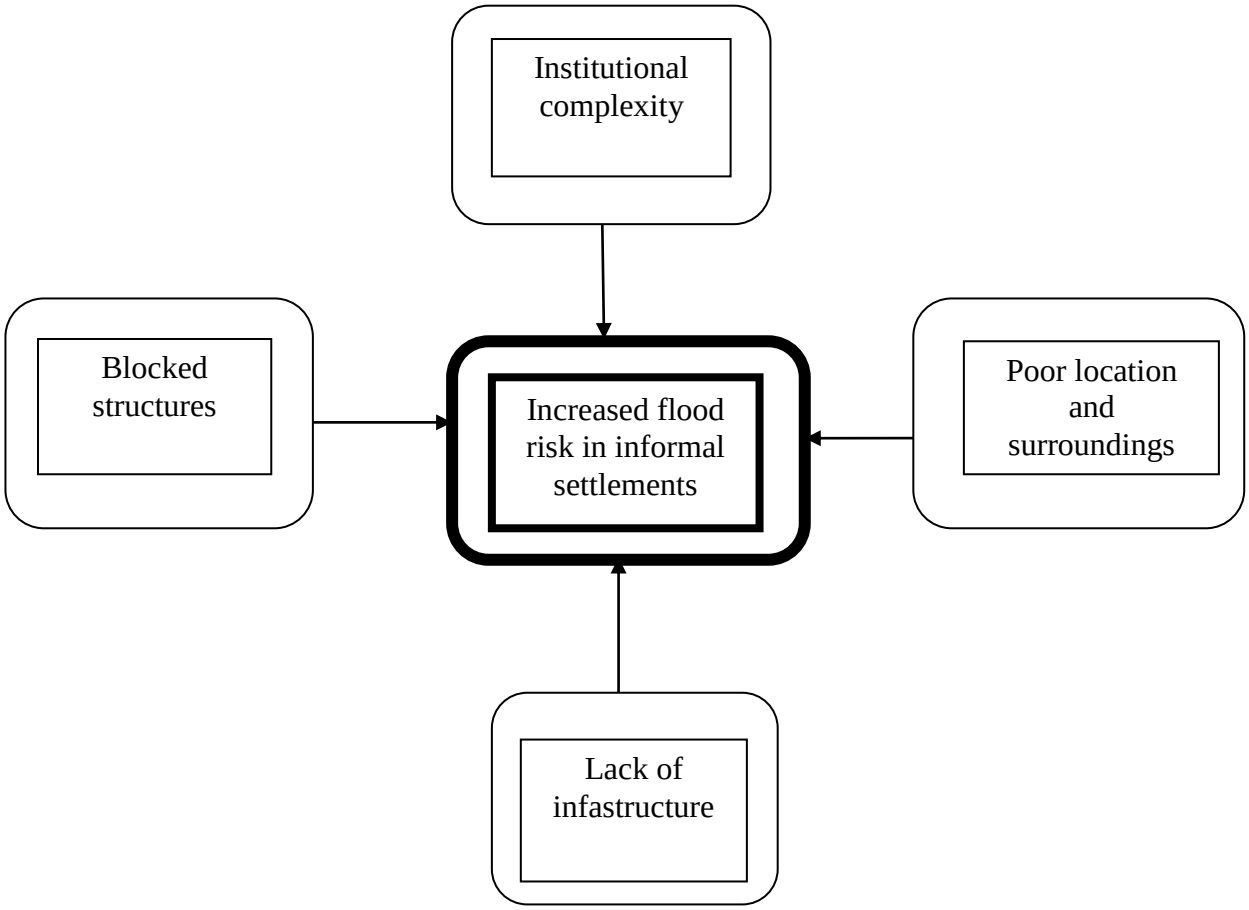

Figure 7: Factors that increase flood risk in informal settlements of Lagos

While in most of the informal settlements in Lagos there is no provision for good drainage systems, the city authorities only make provision for basic level of services which includes retention ponds around the area, drains around paved roadways, and formal trenches. However, in many cases, these basic services are ineffective due to consistent blockages. There are three main types of blockages which are common to these systems: silt accumulation, man-made blockages and rubbish build up. Silt accumulation can be attributed to grey water, which accrues within the trenches. Resident´s dispose of wash water and latrine contents in these areas, resulting in large amounts of grey water. Rubbish blockages are perhaps the most debilitating to the catchment system. The lack of skips or improper location of skips (rubbish collection bins) within these areas results in residents disposing of their rubbish in retention ponds, trenches, and streets. This trash subsequently

ends up in the drains and causes blockages.

Figure 8: Silt accumulation, man-made blockages, and rubbish build up
Source: own photos from the field, 2011

One important factor which also contributes to flooding in informal settlements of Lagos is the fact that flood risk management is often not a priority at household and community levels. Though this is not the case for all residents, there is little motivation for residents to properly protect their homes from flooding because often they believe that it is the responsibility of the government to protect the area from flood disaster. While some do have the means to prevent flooding within their homes, others lack the means and

knowledge of how to do so. The location of these settlements also plays a large part in increasing the risk of flooding. The informal settlements are situated along the coast, an area of lower elevation thereby making them susceptible to the accumulation of water. Though the area is unsuitable for living due to this risk, there continues to be a great influx of residents.

3.4 Flood risk research in Nigeria

Floods occur in Nigeria in three main forms; coastal flooding, river flooding and urban flooding (Folorunsho and Awosika, 2001; Ologunorisa, 2004). Coastal flooding occurs in the low-lying belt of mangrove and fresh water swamps along the coast. River flooding occurs in the flood plains of the larger rivers, while sudden, short-lived flash floods are associated with rivers in the inland areas where sudden heavy rains can change them into destructive torrents within a short period of time. Urban flooding on the other hand occurs in towns, on flat or low-lying terrain, especially where little or no provision has been made for surface drainage, or where existing drainage has been blocked with municipal waste, refuse and eroded soil sediments. Flood scenarios have been reported by many studies in Nigeria and most of these researches examined extensively the causal factors among which are high river levels, concentrations of overland flow following heavy rainfall, limited capacity of drainage systems and blockage of waterways and drainage channels (Folorunsho and Awosika, 2001; Ologunorisa, 2004).

3.5 Institutional arrangements vis a vis flood risk management in Nigeria

Institutions, as used in this study, refers to government response procedures, policies, regulations, guidelines as well as to government agencies engaged in planning and

managing flood emergency conditions or in helping victims to cope and recover speedily from extreme flood events.

The disaster management institution in Nigeria is the National Emergency Management Agency (NEMA) established by the Federal Government under the National Emergency Management (Establishment) Act in 1999. It is important to note that this law is what is regarded as the disaster management law in Nigeria. This law essentially established the NEMA and made provisions for staffing and finance. Provisions are also made in this Act for the establishment of agencies of equivalent status to the NEMA at the state and local government levels; the State emergency Management Agency (SEMA) and the Local Government Emergency Agency (LEMA)

Unfortunately, there is no comprehensive law on disaster management in Nigeria which addresses important issues in disaster risk reduction like early warning system, hazard mapping, risk information, community participation in disaster risk reduction etc. although the NDMF has policies which address some of these issues. With regards to Early Warning System, there is only talk about early warning for flood and epidemics and not for drought and every other disaster plaguing Nigeria.

NEMA has a preliminary contingency plan in place, called the National Disaster Response Plan (NDRP), this establishes a process and structure for the systematic, coordinated, and effective delivery of Federal assistance to address the consequences of any major disaster or emergency declared by the President of the Federal Republic of Nigeria.

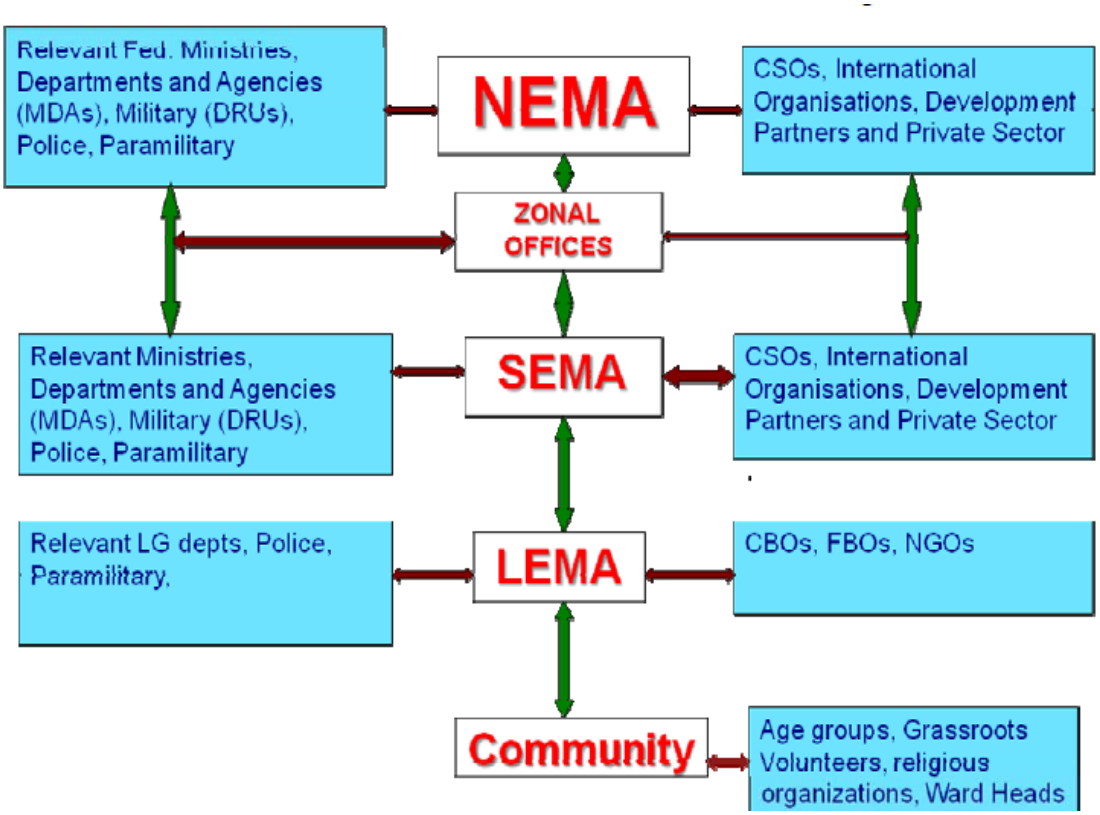

Figure 9: Disaster Management Framework of Nigeria; Source: NEMA, 2011

From the diagram it can be viewed that at the federal level NEMA is the lead agency for managing disasters through its six zonal offices spread across the country (Fagbemi, 2011). At the state level, the Federal Government mandated the establishment of State Emergency Management Agencies (SEMAs) and at the local level, mandated the creation of Local Emergency Management Agencies (LEMAs) (Fagbemi, 2011; NDMF, 2010). All three emergency management agencies are charged with the responsibility of developing capabilities prepare, prevent, respond to, and recover from disasters (NDMF, 2010). Other players in Nigeria`s emergency management system include, but are not limited to, the military, police, para-military, and CSOs (NDMF, 2010). In addition, Disaster Response Units (DRUs), which can be summoned from military formation across the country, are also important players in Nigeria`s emergency management systems (NDMF, 2010).

When a disaster occurs in any community, the first responders are community institutions like Community Based Organizations (CBOs), Faith Based Organizations (FBOs), and Non-Federal Governmental Organizations (NGOs) (NDMF, 2010). The effort of this community emergency management structure is complemented by Emergency Management Volunteers (EMV) and if more resources are needed, SEMA and NEMA can bring in additional resources (NDMF, 2010)

Analysis by Adelekan, 2010; Adebayo and Oruonye, 2013, indicates that institutional approaches have not improved the ability of the Nigerian population to anticipate and cope with major flood hazards. They indicate several factors which are responsible for this. Some of the factors include:-

- Absence of prior planning that addresses issues which boost flood-loss potential such as unwise land use practices etc.
- Limited resources availability in threatened communities.
- Poor land use policies
- Absence of up to date flood control acts
- Inadequate number of sustainable flood control strategies especially in low lying coastal and southern urban areas of the country.
- Lack of up-to-date flood outline maps and weak regulatory framework

Agbola et al. 2012 also noted that the weakness of existing institutional frameworks for flood disaster management contributed to the 2010 to 2012 flooding in Nigeria. Manifestations of the weak institutional frameworks are reflected in many detrimental activities taking place in Nigeria cities.

CHAPTER 4: SOCIAL VULNERABILITY: EXPOSURE TO FLOODS IN THE CASE STUDY AREAS

This chapter is a sequel to the previous ones, which focused on the fact that informal settlements in Lagos are facing serious issues of constant flood that have implication of harmful exposures. In this regard, I will explore in depth the external dimension of flood related social vulnerability and their routes.

4.1 'External Side' of social vulnerability: exposure to harmful perturbations

External vulnerability or exposure to threats may take place as a result of numerous causes and may occur simultaneously from many sources and through multiple routes which may be influenced by factors like settlement in hazardous areas, spatial segregation, environmental pollution, land use pattern and level of socio-economic status. Poor urban pockets face serious environmental problems. Social groups inhabiting these poor urban areas are often exposed to harmful perturbations in and around their houses which are created primarily due to lack of adequate public services (McGranahan, Leitmann, and Surjadi, 1997). Inadequate sanitation, flooded narrow lanes with stagnant wastewater, uncollected solid wastes and pest infestation are all common characteristics of vulnerable areas correlated with threats to human and environmental health securities through direct, indirect, continuous and delayed exposures.

Exposures that are beyond individual control affect many people simultaneously, though showing implications of differential magnitude depending upon individual sensitivity. The variations in the sensitivity to exposure occur due to differences in the characteristics of the population and their behavioural habits. The attributes of a community influence and

the level of exposure that they experience within their immediate setting. The socio-economic conditions of the community vary in the same environment thereby, influences the level of exposures. Other features of the community like period of stay, income levels and house types are all determinants of the magnitude of exposure.

In Lagos, social groups with low income levels living in informal settlements which are areas susceptible to floods are relatively more exposed than their privileged counterparts living in other parts of the city. Continued and prolonged exposure to floods makes the communities vulnerable to various kinds of environmental risks. The problem may not be attributed solely to the improper management of flood but certainly also to people's perception; their own resource capabilities and social networking along with their sensitivity and endurance level which determine the severity and magnitude of resulted impacts.

4.2 Factors influencing exposure to floods in the case study areas

Based on data derived from extensive household survey, indicators were identified to pin down factors influencing flood exposure and evaluate varying levels of household exposures. The external side of social vulnerability, i.e. exposure to floods, is analysed here by taking into account different demographic, residential and habitual characteristics. Core indicators aim to represent at least in a generalized form some of the factors which can trigger negative implications on the household members at their present dwelling. The indicators take into consideration the demographic (sex, age and family size), educational and occupational characteristics.

On the basis of theoretical information as well as knowledge about the study area, the indicators used for the study were selected before field work and was later modified during the course of field work and are therefore area specific, aiming at household

exposure analysis in a relative manner. The assessment is household-centred one but very informative as it traces the routes of exposures and the reasons for such exposures in the given setting of various surveyed areas. An unavoidable element of judgment cannot be ruled out in the selection of indicators, which in this case reflects the knowledge and understanding of the problem by the author through experiences gained during the intensive field work. The individual factors will now be dealt in greater detail.

4.2.1 Demographic characteristics of the studied communities

Interpretation of occurrences cannot be reliably carried out without reference to the target population. The family or household level is at the base of any socio-economic process undergoing at a region; therefore, outlining the demographic characteristics of the population covered is a prerequisite to understand the processes occurring there. Exposure is largely dependent upon the dynamic relationship between the population characteristics and their endurance thresholds.

For this study, care was taken to only include households which have been staying in their present place of residence for at least three years to ensure they had been enduring the existing flood problem in the area for a considerable time period and were well informed about the existing situation. The major demographic characteristics of the study area, namely population, age and sex characteristics are discussed below.

4.2.1.1 Household size characteristics

Household size can influence vulnerability and the capacity to cope with risk and hazardous events (Buckle et al. 2000). For example, too many individuals in a household can affect emergency response to a hazard event and can stress a household's capacity to reduce loss and recover after impacts have been incurred (King and MacGregor, 2000).

Single member households on the other hand may respond more quickly if well informed of emerging risk. However, single member households may have reduced kin and community networks, and lower capacity to mitigate local level risk (Berry, 2003). Large families with young or elderly dependents also have a limited ability to respond and recover, and rely more heavily on household income (Berry, 2003). Large household sizes may be advantageous to the response and recovery efforts, for example, when a higher number of individuals within the working age are contributing to household income and capacity (Glavic et al. 2003). In this study, average household size is seven members. About 65 percent of the total households in the surveyed areas have between 4 and 8 family members. Single member households represented 3 percent of households in the sample with a substantial percentage representing households with 2-3 people (18 percent).

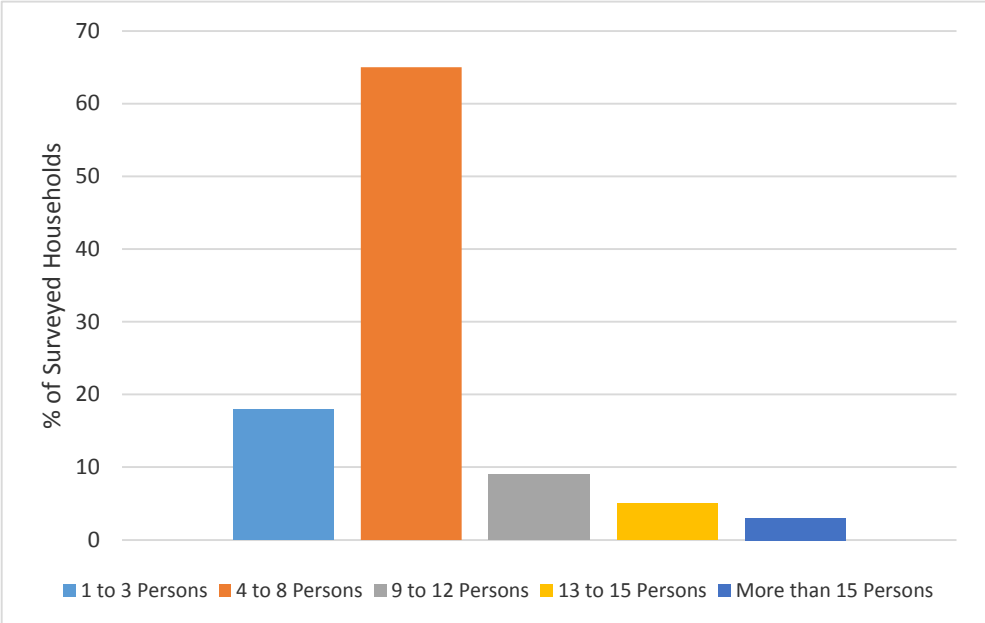

Figure 10: Household size in case study areas
Source: own household survey, 2011 (N = 300)

In the context of this study, it can be assumed that households with larger family size are

at a higher risk of flood exposure, while households with small family size are at a lesser exposure risk and those households in between these two extremes are taken to be at moderate flood exposure risk.

4.2.1.2 Age characteristics

Age can be an important indicator of exposure and vulnerability of a population largely due to their nature of involvement in physical activity, endurance capacity and level of immunity. It is particularly important in informal settlements like the slums of Lagos where the number of children are high. Being too young and too old in a hazard-prone region can affect the ability and capacity of an individual to respond and recover (Cannon, 2000). Based on data from the case study areas, the proportion of population among the age group of less than 20 years was relatively high and constituted a major share of small children in the different families.

Population within the economically active age group of 20-59 years was high in both settlements. They constitute the most productive, economically active and spatially most mobile group. This age group was also conscious of the persistent flood problem affecting their community and was enthusiastic about sorting a solution. They were also active in forming different types of social and political networking in order to take care of the existing problems.

Age	Frequency	Percentage (%)
20 – 29 Years	86	28.7%
30 – 39 Years	110	36.6%
40 – 49 Years	65	21.7%
50 – 59 Years	27	9.0%
60 Years and above	12	4.0%
Total	300	100%

Table 5: Age range of head of households
Source: own household survey, 2011 (N = 300)

From the household survey, 7 percent of the interviewees indicated they have lost either a family member or close relative due to flood and most of those who lost their lives were either children (<20 years) or elderly people (60 years and above) This therefore supports the fact that children and the elderly are more susceptible to flood related problems due to direct exposure. From focus group discussions with school teachers and community heads, it was also reported that children are also more vulnerable because of their playing attitude in which they often fall in standing water. In the context of the present study, it is confidently assumed that people within the age group of 0-19 years and 60 years and above were comparatively more exposed than the others. Households with more family members within the age group of 0-19 and above 60 are considered to be at a greater flood exposure risk.

The study also revealed that women-headed household's, particularly elderly women (60 years and above) with young children or grandchildren, were more vulnerable. This was proven from the analysis that most of this households often have a very small income base.

4.2.2 Settlement and infrastructure status of the communities

Settlement status is an important factor to be considered when talking about physical exposures to flood in the study area. There is a direct relation between the settlement status and the provided level of infrastructure. According to secondary data from government records, about 50 percent of total population of Lagos are currently living in informal settings with limited infrastructural facilities like sanitary facilities. The type of houses and materials used for construction also vary from one slum neighbourhood to the other. For example, while most of buildings at Badia are constructed of sandcrete blocks, those at Makoko are constructed of wooden planks, iron roofing sheets, nylon sheets and paper cartons.

According to the grouping made by the Federal Ministry of Housing and Environment, Lagos (1982), sanitary facilities include toilets, bathrooms, kitchen, and water supply and refuse disposal while the general facilities include electricity supply and road accessibility. As regards sanitary services, findings made from the study reveal that pit latrine is rampant in the area, which accounts for about 70.3 percent. Only 5.2 percent use modern day water closet while a whole 24.5 percent do not have provision for this facility at all. Such buildings only make use of mobile latrine (3.6 percent), bush and dunghill (12.5 percent), stream and drainage channels (8.6 percent) or squatting in the neighbouring houses. Without any doubt, this condition has innumerable attendant problems. All this contributes to the deplorable condition of the area. It makes the area look ugly, stinking, unhygienic and unattractive. Even some with modern toilets lack good septic tanks while a large number of them could not get water in their toilet. Besides, the condition of bathroom, kitchen and water facilities is ridiculous in the case study areas with a large proportion of the buildings examined having these facilities, only that they are substandard, inadequate or inconveniently located. Many of the bathrooms are just small

enclosures, some of which are made of non-durable materials like bamboo, rusted iron sheets, or planks at the backyard. The use of firewood and charcoal for cooking is prevalent; hence many of the buildings have their kitchens located at the backyard, except for the few ones that use kerosene stoves as supplement to cook at the passage or right inside their rooms.

Figure 11: Structure of houses in Makoko slum in Lagos
Source: own photos from the field, 2011

The main source of water supply is largely through underground well water. Some of which have shallow depth. This therefore poses some problems because the water is not treated before use. Only few, about 10.5 percent, of the respondents enjoy some assess of tap water which is collected from outside and stored in tanks by water dealers and later on sold to them, of which it is not regular.

Figure 12: Water supply tanks in Makoko and Badia slums of Lagos
Source: own photos from the field, 2011

From this situation, the existing water supply does not guarantee quality water supply in the area and portable water shortages, which may be due to water pollution and damage to water supply following flood events, were noted by 96 percent of respondents, hence the slum dwellers are at greater risk of contracting acute water borne diseases. The state of waste disposal in the study areas is generally poor. Over 80 percent dispose their refuse indiscriminately, some in open spaces (35.3 percent), some into the lagoon (20.5 percent) and some through burning (14.7 percent) within residential environment thereby causing air pollution while (13.2 percent) disposes theirs at road sides and drainages.

Household Facilities	Kitchen, Bath and Toilet	**10.0%**
	Kitchen and Toilet	**15.3%**
	Kitchen and Bath	**14.7%**
	Bath and Toilet	**21.5%**
	No Kitchen, Bath and Toilet	**38.5%**
Source of Water Supply	Tap water/Water vendor	**10.5%**
	Underground well	**75.5%**
	River	**15.0%**
Toilet Facilities	Pit Latrine	**70.3%**
	Septic Tank	**5.2%**
	No Facility	**24.5%**
Waste Disposal Method	Open Spaces	**35.3%**
	Lagoon	**20.5%**
	Burning	**14.7%**
	Road sides/Drainages	**13.2%**

Table 6: Social amenities in the slums of Lagos
Source: field survey 2011

On the aspect of general facilities, the main source of electricity supply to the slum communities is through the National Electric Power Authority (NEPA) which accounts for over 50 percent of the sampled households. About 15 percent generate their own power using small generators while 35.8 percent depends solely on local lamps. For those who depend on electricity from NEPA, they pointed out that there are cases where the area is put in total darkness for weeks or sometimes months. Depending on the level of infrastructure provision and access by the residents of the different slum settlements they can be assumed to be at varying degree of exposure. The inhabitants of Makoko settlements who are taken to be at the highest level of flood exposure risks due to their location and the nature of their infrastructures while those of Badia are considered to be at a moderately high level of exposure risk because they have some possibilities in managing some sort of alternatives in their infrastructural settings. This confirmed from one of the

focus group discussions in Badia, where participants in this discussion confirmed that infrastructures like drainages plays some role in flood exposure. They confirmed that there are neighbourhoods within the community that have benefited from an improved drainage system and therefore they experience less flooding than areas where the drainage system was poor.

4.2.3 Period of stay

Exposure to flood for a prolonged period of time is bound to bring about environmental degradation/pollution and eventually show its effect in various forms of health impacts. Thereby, the period of stay in the slums is an important indicator for analysing the level of household exposure to the effects of flood. The informal settlements surveyed had existed there for decades, therefore, the period of stay for majority of respondents was long enough to be considered for exposure analysis. 56 percent of the total households surveyed have been living at their current location for more than 20 years; 28 percent had spent 10-20 years, 13 percent had spent 3-10 years and only 3 percent households were newcomers and had been staying at their present household for less than 3 years.

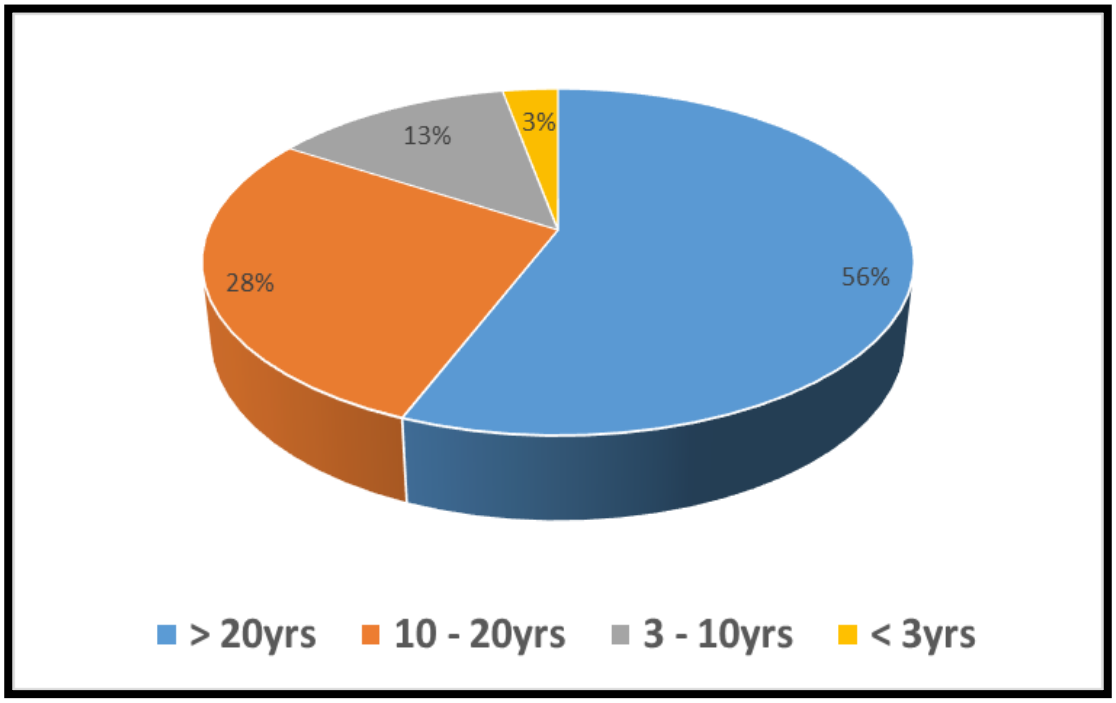

Figure 13: Period of stay in the respective slums for the surveyed households Source: own household survey, 2011 (N = 300)

Living in unsafe conditions which is frequently prone to flood means the inhabitants are undoubtedly directly and indirectly exposed to its effects through contamination of facilities like drinking water sources as well as direct physical contact with continuous standing water. In the context of the present study, people living in their current households for more than 20 years were taken to be exposed to the flood conditions for a prolonged time and have somehow learn how to deal with the disaster, therefore they were classed under least exposed, while the new comers in the location residing for less than 3 years during the time of the survey were considered to be more exposed and the rest of the households residing there for more than 3 but less than 20 years were subsequently considered at moderately low to high level of exposure.

4.3 Household Exposure Index

In the context of the present study household exposure assessment aims at systematically

evaluating the exposure dimension of vulnerability at household level. The Household Exposure Index is a composite of various parameters towards indication of the level of household's exposure to flood. It is based on the similar approach used in the development of Human Development Index, where various elements measured in different units are aggregated together (UNDP, 1997). This method of constructing an index involving normalization of indicators had been successfully used in numerous earlier studies too (Briguglio, 1995; Cutter, Boruff and Shirley, 2003; Nakamura et al. 2001; Van Dillen, 2002). Unlike the Human Development Index, all the indicators in this case are given the same importance by assigning equal weights.

The household exposure index is calculated with specific focus on the relationship between the slum settlement status of the target households and flood implications faced due to direct exposure. The construction of the Household Exposure Index is based on the idea that a combination of different advantageous and disadvantageous factors would help in determining the overall level of household exposure to flood implications. Therefore the selection of multiple indicators was necessary for identifying which household is at greater exposure risk and where. It would further be helpful in tracing the causes for exposure and simultaneously can be used to identify preventive options and structural alternatives to enhance chances of protection against flood hazards. Moreover, it can also be helpful for planners and decision makers to identify areas of interventions, give them scope for reviewing prior actions and policies as well as make necessary rectifications. The indicators to flood exposure were derived from the factors that cause an individual/household to be at greater flood exposure risks as discussed in the preceding section, though it must be mentioned here that the selection of the indicators was based on personal judgement of the author on the grounds of knowledge and understanding of the problems gained during the course of intensive fieldwork. The selected indicators

represent aspects of demographic and living conditions, slum status, and house types etc. that are representative for the whole study area.

As mentioned earlier, these indicators were categorized under three heads. Firstly, demographic characteristics of the surveyed population including information about age and family size. Secondly, settlement status, which highlights information about the type of house and the period of stay and thirdly, a set of indicators on physical exposure to flood, gauging proximity to open drainage or canal and frequency of drains overflowing.

On the basis of these five selected indicators (Age, family size, period of stay, type of house and proximity to lagoon, canal/drainage), a Household Exposure Index (HEI) was developed. Each indicator has been rated on a 5 scale score ranging between 1 and 5, where a lower score indicates a larger contribution to exposure and higher score indicates less contribution to exposure, thereby following an inverse relationship between the score and level of exposure.

Therefore, the HEI is defined as an average aggregate of all the indicator scores, which can be quantified as:

$$\textbf{HEI} = \frac{\textbf{Total score}}{\textbf{Total number of indicators}}$$

The main aim of developing such an index is to compare the surveyed households on the basis of their exposure levels to floods with one aggregate value. It is to show who is more exposed to flood and is potentially at higher risk and where. These set of indicators reflect the core determinants of flood exposure which is the external dimension of vulnerability. Since the indicators are substitutable, it can only give a general picture of household exposure and therefore the result needs to be interpreted carefully. This index would later be analysed with the coping capabilities of households and together with people's

perception and impact dimensions to assess the overall social vulnerability of the surveyed population in the informal settlements of Lagos.

No.	**Score** / **Indicators**	1-3	4-5
1	Age	More in age group 1-20 and above 60 years	More in age group less than 60 years
2	Family size	More than 7 with head of household above 60 years	1 – 3 persons in the household
3	Period of stay	Less than <3 years	10 years and more
4	Infrastructure	House construction method, flood protection method	House construction method, flood protection method
5	Proximity to lagoon, canal/drainage	Less than 2m away	More than 2m away

Most Exposed | Least Exposed

Exposure Index = Total Score/Number of Indicators (5)

Index value ranges between Minimum (1) to Maximum (5)

1.0 – 3.0 = Highly Exposed

4.0 – 5.0 = Less Exposed

Table 7: Household exposure index key
Source: own draft

This Household Exposure Index was calculated for all the 300 surveyed households. A combination of scores earned by individual households on the basis of their security and vulnerability to flood related exposure risks categorized them to highly expose and less expose households. Based on this classification made from the household exposure index, a comparison was made between these group of households to see which factors contribute more to highly exposed households and which contribute for least exposed households.

Highly Exposed Households			Less Exposed Households	
Number of households	**184 (61.3%)**		**116 (38.7%)**	
Indicators	**Characteristics**	**Percentage**	**Characteristics**	**Percentage**
Age	More in age group 1-20 and above 60	35 (19.0%)	More in age group of less than 60 years	76 (65.0%)
Family Size	More than 7 (between 1-20 years) with head of household above 50 years	40 (22.0%)	1 – 3 persons in the household	24 (20.0%)
Period of stay	Less than 3 years	29 (16.0%)	10 years and more	98 (84.0%)
Infrastructure	House construction method (carton/ paper, bamboo, corrugated iron sheets) and poor flood protection method	184 (100%)	House construction method (mud and cement) and good flood protection method	12 (10.0%)
Proximity to lagoon, canal/Drainage	Less than 2m away	125 (68.0%)	More than 2m away	18 (15.0%)

Table 8: Comparison between highly exposed households and less exposed households

From table 8, which compares the exposure status of the surveyed households, it can be concluded that the locus of exposure to flood related perturbations in the case of highly exposed households (61.3 percent) in informal settlements of Lagos is embedded in the infrastructural status of the households i.e., the type of house (100 percent) which refers to the construction materials used. Table 8 also reveals that locational status of the households plays a great rule i.e. their proximity to the lagoon, canal/drainage (68 percent) contributes highly to the exposure level of households. All this comes to confirm the fact that unsafe conditions and marginalization of social groups to disadvantaged locations partly determines the cause of their vulnerability in a city's urban setting.

Strategy	Frequency	Percentage
Use of Sandbags to block flood water	110	95.0%
Use bamboos and Planks for raising height	116	100%
Raising furniture to about 3-4 metres	65	56.0%
Building of shelves for valuable items	27	23.3%
Digging of trenches	116	100%

Table 9: Methods used in reducing exposure to flood by less exposed households

By comparing the less and highly exposed households on the basis of the type of infrastructure used in flood protection, 95 percent of the households which are less exposed attest to the fact that they use sandbags to block floodwater from entering homes. All the respondents (100 percent) also use bamboos and planks to raise the height of furniture, especially wardrobes and beds, as such, preventing flood from damaging clothes, documents and other valuable items. About half (56 percent) of the respondents from this group confirmed, they raise their furniture to about 3 to 4 meters off the floor to ensure that, floodwaters that enter their houses will not damage items in wardrobes and drawers. To add to that, respondents (27 percent) said they have also made shelves in their houses to keep their belongings any time it floods. The study also revealed that all households (100 percent) in this less exposed group dug trenches in their homes to divert the course of floodwater from their homes.

As already mentioned in chapter 4.2.1.2, age indicator contributes to the level of exposure in this study, 78.6 percent of household heads highlighted that flooding prevented their children (1-20 years) from attending school because their school uniforms and books got wet in the flood and classrooms were not usable.

"*During heavy floods school children stay in the house for more than two weeks for the flood water to drain and get classrooms ready for effective teaching and learning."* (A primary school teacher in Badia).

According to community heads during focus group discussion, makeshift bridges on huge gutters are removed and carried away by the flood water and thus children are afraid of being drowned should they fall into the gutters. They are therefore prevented from going to school by their parents for the sake of their safety. This really affects the learning process of the children because of the infrequent attendance to school.

Most household heads (73 percent) in the two studied communities also noted recurrent visits by at least one member of their household to health centres because of ill health from waterborne diseases, intestinal diseases and malaria. The study also revealed that 85.7 percent of those who suffered from at least one of these diseases were between the ages of 1-20 years.

During focus group discussion, one community head from Makoko slum recounted the fact that there have been many occasions where flooding has caused the death of people, especially of children and the aged. He gave account of the 2010 flood, in which about 10 people died as a result of flooding in his locality (Makoko). Therefore the mental health aspects and consequences of repeated flooding can be far-reaching and difficult to cope with in future.

Table 8, also revealed from the study that period of stay plays an important role for the less exposed households, 84 percent of these households are not newcomers. They have lived in the slum area for more than 10 years and therefore have the necessary experience to deal with floods. Most of them have experienced flood at least 4 to 5 times. Also with their long stay in the slums, these households have a good setting for creating inter- and intra-community interaction and share knowledge about the problem and learn from

experiences of each other and this goes a long way to improve their level of awareness, which facilitate their timely response and strengthens their management capabilities. As indicated in table 8, it can be concluded that what make the slum dwellers in Lagos more exposed to natural disasters like flood lies in their infrastructural status, i.e. the type of houses they live in and the limited flood protection infrastructure which are in place like lack of embankments. The table also portrays that age group and years of stay in slums contributes in reducing the exposure level of slum dwellers in Lagos.

CHAPTER 5: MANAGEMENT CAPACITY AND PEOPLE`S PERCEPTION

5.1 Introduction

Vulnerability is conceptualized as being constituted by components other than exposure and sensitivity to perturbations or external stresses. This refers to the capacity to cope, adapt and move in the direction of negating the harmful effect. After analysing the exposure aspect related to flood I will now explore the internal side of social vulnerability in terms of coping capacity, social and economic capital as well as role of people's perception. This chapter further describes the factors that influence adaptive capacity and people's perception which in turn influence their capability to act and moulds their responses itself. Appropriate indicators are selected which represent the household resource capacity. Base on the reviewed literature, resource capacity and people's perception are associated predominantly with economic status, level of awareness as well as prevailing political economy.

In this case study of flood vulnerability, some of the determinants of management capacity operate at the macro (national or state) level, which calls upon policy responses and organizational capabilities. Other determinants operates at micro (community) level and are more influenced by the capabilities of households and individuals. Thus, successful management in terms of prevention, coping, adjustment and adaptation requires coordination across these scales.

5.2 Factors influencing people's perception and management capacity in the case study areas

People's perception about the adverse implications of flood risk and about their own capabilities to face them is greatly influenced by socio-economic factors and also by the reaction of local government and organizations. It is important to note here that, the proper functioning of people's strategies, adoption and accessibility of the preventive measures depend upon the complex political economy as well as institutional sensitivity. If the responsible organizations are sensitive towards public grievances, quick and effective in their responses then it helps greatly in enhancing their reliability and building up people's trust in them. Thereby, a community feels more confident about effectively dealing with problems during the period of stress. Individual factors that influence perception and operationalise resource capability cannot be identified and analysed independently or as separate entities. They frequently act in conjunction with each other and appear to be mutually inclusive. The entire list of factors which influences people's perception and resource capacity and accordingly mould their choice of mitigation options are now taken as thus:

Socio-Economic Status

- Occupation and household income
- Educational status

Knowledge and Awareness

- Nature of problem
- Earlier experience
- Knowledge of impact severity
- Available mitigation options

Role of Social Capital

- Existence of people's group
- Effectiveness of social networking
- Constraints to community participation

Institutional and Political Economy

- Institutional response
- Constraints upon self-help

5.2.1 Socio-economic status

5.2.1.1 Occupation and household income

According to recent figures from the Lagos State Government, Lagos has one of the highest average household income as compared to other cities in Nigeria. The average household income in Lagos is 89,000 NGN (US$ 550) per month (Pyramid Housing Research, May 10, 2012). But according to the field survey, the majority (80 percent) of surveyed households on an average earn less than 24,000 NGN (US$ 150) per month; they are either workers in service jobs or labourers.

The occupational status of respondents in the study areas as shown in table 10 indicates that 11 percent of the respondents were civil servants, 36.6 percent of the respondents were petty traders or considered themselves as business men or women, 17.4 percent were engaged in fishing, 28 percent were drivers (bus, motorcycle, vespa), 3.7 percent were retired and 3.3 percent were unemployed. The result here clearly shows that a relatively large number of the respondents was involved in informal activities especially in petty trading which has direct effect on their daily income and standard of living. This further explains the level of poverty in this area.

Occupational Status	Frequency	Percentage
Petty trading/business	110	36.6%
Civil Servant	33	11.0%
Fishing	52	17.4%
Drivers (Bus, motorcycle, vespa)	84	28.0%
Retired	11	3.7%
Unemployed	10	3.3%
Total	300	100%

Table 10: Occupational status of households
Source: author`s field survey, 2011 (N = 300)

For the income level of the slum dwellers, this was categorized into lower, middle and high income households (Table 11). The lower income households earn less than 45,000 NGN (US$270) a month and represented 88.7 percent of the surveyed population while the middle income group, those who earn between 46,000 – 70,000NGN (US$280 - US $420) a month, represent 10.7 percent and the high income group, those who earn more than 80,000 NGN (>US$480), represent 0.6 percent of the surveyed population.

Monthly Household Income Nigerian Naira (NGN)	Frequency	Percentage	Category
<20,000	121	40.3%	**Low Income Households**
21,000 – 35,000	83	27.7%	
36,000 – 45,000	62	20.7%	
46,000 – 55,000	26	8.7%	**Middle Income Households**
56,000 – 70,000	6	2.0%	
80,000 and above	2	0.6%	**High Income Households**
TOTAL	300	100%	

Table 11: Household income per month
Source: author`s field survey, 2011 (N = 300)
Naira (N) = Nigeria Currency, 1 Naira = 0, 00610 US Dollars during the period of this research

The low income levels in these communities contribute to increasing the vulnerability of the people to environmental hazards including floods. This can be observed from table 12 which indicates that most of the head of households belong to the low income level with regards to the classification of income levels of households.

Occupational Status	Frequency	Percentage	Average monthly income of head of household	Average duration of residence of head of household	Average age of head of household
Petty trading/business	110	36.6%	15,000 NGN	17.3 Years	43.2
Fishing	52	17.4%	35,000 NGN	20.5 Years	35.5
Driver (Private, bus, motorcycle, vespa	84	28.0%	40,000 NGN	10.7 Years	28.3
Civil servant	33	11.0%	60,000 NGN	7.4 Years	32.5
Retired	11	3.7%	Unknown	28.6 Years	65.7
Unemployed (Housewife)	10	3.3%	Unknown	10.5 Years	27.8
Total	300	100%			

Table 12: Characteristics of head of households in the surveyed slums
Source: author`s field survey, 2011 (N=300)

From this study, it was also realised that head of households belonging to the middle and also high income were compelled to reside in informal settlements because of the scarcity of housing and comparatively cheaper land rent of the unauthorised areas. From table 12, it can be seen that formal occupations like civil servants were the ones belonging to the middle or higher monthly income level with an average of 60,000 NGN. The study also revealed that those from this income group do not stay long in the slum areas with just an average duration of residence of 7.4 years.

The major reason for choice of settlement for most households as indicated in figure 14 was low cost of housing (92 percent) and livelihood opportunities (85 percent). Most of these heads of household had migrated to the city from neighbouring states looking for jobs and in the absence of proper housing facility had to squatter.

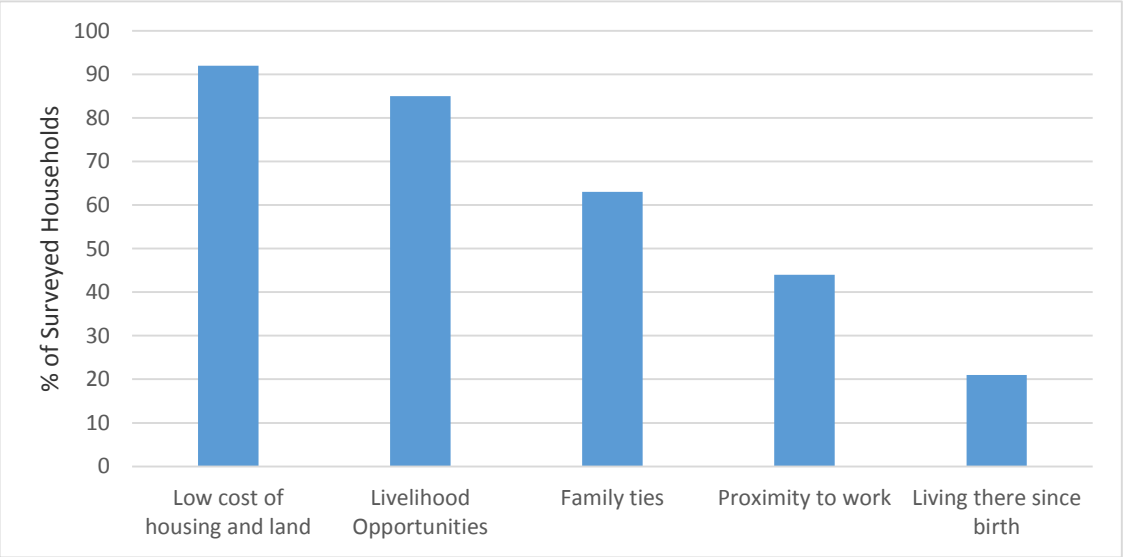

Figure 14: Reasons for settlement choice
Source: own household survey, 2011 (N = 300)

On the aspect of saving, only one third of the respondents (30.9 percent) said they had savings. However, it is very difficult for slum-dwellers to save money. From the household survey and focus group discussions, it was revealed that people who manage to accumulate some savings are often expected to use these to support family members,

neighbours and others in emergency situations, for instance in cases of illness. Most of the respondents who said they had savings kept them at their houses or ‘ajoh’ group (family lottery), with less than 10 percent having bank accounts. With their restricted access to financial institutions also means there are very limited possibilities to get formal credit. Many people borrow money from an ‘ajoh’ group (family lottery), neighbours and family members. It is important to note here that with sufficient economic assets to rely upon, people have a range of choice to choose the option during problem period and can manage with the risk faced during disasters like flood.

Depending upon the affordability, households could adopt prevention and coping measures of varying effectiveness. In this respect, financial affordability was a very important factor which enabled households to choose the options for solving their flood problem as households or to endure the situation and continue to be exposed to the hazard risk. This is confirmed when comparing the income level for the different respondents. Respondents considered to be under the lower income level face significantly higher risk and lack the means to cope than households which fall under the middle and high income level because they have the possibility to save some money which can be used in future and they can also afford a good infrastructure like blocking the entrance of their buildings with a cement block, purchase of sand bags and construction of wooden bridges. At the same time, most of the households who fall under the lower income level depend for their livelihood significantly more on natural resources, such as fishery, and on petty trading which is often impossible to carry on with the activity when there is flood.

It was interesting to realise from this study that with households considered to be at the lower income level, flood problem though existing had less risk priority as they had other problems more pressing to face, e.g. earning daily income for living etc. Although being

the most exposed groups from physical and infrastructural point of view, flood risk was of a less priority for these groups further leading to aggravation of their overall vulnerability.

5.2.1.2 Educational status

The level of education of the respondents has been interpreted as an indicator which can speak about the households understanding of the overall problem and capacity to work towards its mitigation as well as their awareness and keenness to act for risk prevention.

The level of education only of the head of household cannot speak clearly about the whole household. Therefore, the other aspect like the type of occupational activity engaging most of the people was also taken into consideration.

The education/ qualification of respondents in the study area as shown in table 13 reveals that 19 percent of respondents have no formal education, 24.7 percent have primary education, 46 percent have secondary education and 10.3 percent of respondents have tertiary education. It can be deduced that the majority of the respondents in the study area were secondary school certificate holders. This has significant effect on the level of literacy in the study area and the way people perceive their environment.

Education	Frequency	Percentage
No Formal Education	57	19.0%
Primary	74	24.7%
Secondary	138	46.0%
Tertiary	31	10.3%
Total	300	100%

Table 13: Educational qualification of households
Source: own household survey, 2011 (N = 300)

Relocation to a safer place may get better security to the household against exposure to the risky perturbations by better access to basic infrastructure but the internal capabilities towards mitigation in case of a hazard outbreak remain low for such groups. Poor education, low income and social vulnerability co-existed in the form of a vicious circle.

It was also evident from this study that with low education and skill, job options are limited, thereby resulting to poor income being earned to the family. This is proven in table 12, where majority of the head of households are involve in jobs such as driving, fishing and trading which do not require any formal education nor skill. Also, limited financial resources results to poor infrastructural accessibility and lack of coping options against the stress from floods thereby placing most households at higher level of vulnerability.

5.2.2 Knowledge and awareness

The way a person forms his or her opinion about the risk and its possible consequences depends upon the direct experience of the person involved and experience of others in near surroundings (Hauger et al. 2003). The internal capacity of individuals to cope with or face stress to a great extent also gets influenced by prior knowledge and awareness. The extent of preparedness of a community speaks not only of their adaptability but also of their knowledge and awareness of risk (Pantelic et al. 2005). This recalls the ideas about future impacts as well as lessons learnt from prior experiences which depend upon household or community's knowledge about the nature of risk, its impact severity and available mitigation options. Each of these factors is individually explained below.

5.2.2.1 Knowledge about the nature of flood risk occurrence

There always remains a considerable degree of uncertainty about the occurrence of serious floods, therefore knowing the nature of risk and problem goes a long way in preparing for its prevention, thereby strengthening management capabilities. People's idea about the nature of risk influences their perception towards it and moulds their choice of prevention and coping strategies. Nature of flood related problems differed across the studied informal settlements. In the Makoko slum, 65 percent of the respondents reported that flood related problems in their community and around their household was a frequent problem.

"Flood problem is a normal problem in our neighbourhood because as you can see, we are living inside water year in year out, so at times is just that in some seasons the level of water increases. So since we already understand the type of risk which can come from this flood situation, we have learn how to manage with it" (Ekose, Makoko Slum)

"We do not have any other place to go, so we just have to understand and develop strategies which we can use to manage with the flood situation here because this place is the only option for us to have a place to stay" (James, Makoko Slum)

In Badia slum, 36.7 percent of respondents acknowledged, they face the havoc from flood only seasonally (during the rainy season) this is due to the fact that they have a relatively well-developed drainage infrastructure.

"At first, we were suffering in this community heavily from this flood all year round but for the past three years we carried out intensive community work and dug some drainages in the neighbourhoods, we only suffer the issue of flood in the rainy season" (Adebola, Badia Slum)

The study also revealed that due to the frequent occurrence of floods in the households and immediate neighbourhood, communities in Makoko informal settlements were better

mentally prepared to face flood risk and subsequently adopted preventive behaviours than compared to those residing in the Badia informal settlement.

5.2.2.2 Earlier experience

People have a variety of modes of understanding risks and such perceptions will change considering the experience of the individual and the social and cultural setting in which these understandings are formed (Prowse, 2003). In this sense it should be recognised that risk perception and assessment are grounded in the cultural norms and values that govern a society and are embedded in the relationship that social communities have with their physical and social environment (Oliver-Smith, 2004). The study revealed that understanding the pattern of flood risk and finding means to prevent its next occurrence is to a large extent influenced by the individual's earlier encounter with the same or learning process by other's experience.

The study also revealed that prevention of an unexpected flood disaster is not constrained solely by imperfect information but also by risk denial by a household or slum community. From household survey and focus group discussion, respondents also acknowledge the frequent nature of flood related risks and their potential consequences, but often place the responsibility of the threat to a higher authority such as the government and other civic agencies.

"Although we live here, we are aware of the type of risks we are taking but we do not have any other option since our government is very corrupt and cannot take care of its people. Normally the government should have look for a way to provide us with a better place to live or improve on the infrastructure in this area against flood but they cannot do it" (Ikena, Makoko Slum)

Nonetheless, the study confirmed the fact that experiences of earlier implications strengthen coping and adaptation through learning from the same and modifying measures accordingly. This is highly supported by the fact that households which are in good setting for inter- and intra-community interaction, share knowledge about the problem and learn from experiences of each other. This increases their awareness, facilitates their timely response and strengthens their management capabilities.

5.2.2.3 Knowledge of impact severity

The alarm bell about a potential threat turning into a disaster is triggered only if the social community or individual are aware about the severity of its impact on the life security and wellbeing of themselves and their community. Based on focus group discussions and household survey on issues of related risks associated with floods, almost all the respondents accepted the fact that they were aware of risks like health risks – prevalence of malaria, water pollution, etc. The respondents who participated in both the household and focus group discussions attest to the fact that after facing numerous cases of stomach problems (dysentery and diarrhoea) in their households, avoiding consumption of untreated water which was considered to be polluted by sewage leakages as a result of flooding was common, so they switched to other sources of drinking water (e.g. buying water or using water purifiers). The respondents (community and household level) added that although they are aware of such flood related risks in their neighbourhood, they cannot do much in this regard as it was solely up to the government to look into the related problems and manage it.

"Yes we are aware of the type of secondary effects of this constant flooding in our community but we cannot do otherwise because we do not have the money to look for house somewhere else in Lagos. What we need is for the government to resettle us

somewhere else or improve on the infrastructure of our community so that flood water cannot enter our houses" (Ijoya, Badia Slum)

Such awareness of the impact as well as the ignorance of civic agencies warns them to be precautious against the prolonged exposure of harmful flood risk and adopt preventive behaviours and measures in accordance to their capabilities. In this respect the households added that they had been cleaning the canals and drainages on their own but it is difficult to maintain such cleanliness and solve problems like waste disposal in order to curb flood in the neighbourhood. *"At times the main problem of flooding in this community is because people dump waste into the canals and drainage which is difficult to stop but we have adopted a strategy to organise some sort of community work to be cleaning the canals but at times it is not effective because not everybody is participating"* (Nwanku, Community Head Badia Slum)

Most heads of households (75 percent) which had experienced the atrocities of flooding had also considered improvement in their housing structure (e.g., raising the house entrance which could prevent water from entering houses). In this manner knowledge of impact severity helps in being prepared and thereby helps getting the necessary action in place even before the event happens and consequently enhances management capabilities.

5.2.3 The role of social capital in the case study areas

The role and effectiveness of social capital in coping and adapting with the flood related risk as observed in the surveyed areas varied across socio economic, cultural and religious status. In the succeeding section existence of people's group, effectiveness of social networking and constrains to community participation is analysed to understand its importance in strengthening capabilities for management of flood risks.

5.2.3.1 Existing social networks in the study areas

From the household survey carried out, 85 percent of household heads were migrants from different states of Nigeria apart from the Lagos state. The study also revealed that since the majority of the slum dwellers are migrants, they tend to exercise strong bonding ties and this was realised when the head of households were questioned on the status of their inter-household relationships. 78.6 percent agreed to always share their problems and happiness with their neighbours, friends and relatives.

"If you live here and you do not interact especially with your neighbours and make some good friends, then it's going to be very difficult for you. When I have a problem or I have something to celebrate, the first person I always try to first contact is my neighbour" (Okeke, Badia Slum).

Also one important point which brought out the existence of strong bonding ties in the two studied slums was the fact that through interviews and intense discussion with household heads and participants of focus group discussions, most of them point out the fact that, their neighbours are people from the same native village or have an extended family relationship. Also, apart from the strong bonding ties that exist in the studied slum communities, linking ties to landlords also exists in which over 30 percent of the responding households, for instance, stated their landlord would intervene in case of misunderstanding among neighbours. Also some landlords contribute in rebuilding after flood events.

The survey revealed the role of networks as one of the most important asset for the people living in informal settlements of Lagos. Based on data collected from the case study areas, it indicates 90 percent of the head of households who participated in this study are embedded in dense social networks.

Manifestation		Frequency	Percentage
Households with many relatives in the same slum (N=300)		167	55.6%
Mutual assistance among neighbours in everyday work and difficult situations (N=300)		277	92.4%
Actors involve in the resolution of dispute in slum	Landlord (N=300)	78	26.0%
	Community Leaders (N=300)	245	81.7%
	Police (N=300)	34	11.3%
Membership in local organizations	Local NGO (N=300)	30	10.0%
	Community based organizations (N=300)	173	57.7%
	Church groups (N=300)	272	90.6%
Level of trust in other people (N=300)	Trust	277	92.4%
	No trust	23	7.6%

Table 14: Overview of the forms of networks present in slum households
Source: own household survey, 2011 (N = 300)

Apart from family and neighbour interaction, some organizations carry out development work in the slums and also provide relief items during flood disasters. These organizations can be categorized into two: international and domestic. International organizations include the International Red Cross foundation. The internal organizations can be sub-divided into local, regional and national. The local organizations include community based organizations; the National Emergency Management Agency (NEMA) and religious bodies. Support from these organizations is mostly in the form of food items and clothing. This study also revealed that religious groups play an important role as regards social networks in the studied slums. This is because about 70 percent of the respondents from the case study areas always gave credit to their religious network for always providing help when flood strikes and this is backed by the fact that over 90 percent of the surveyed households are members of either a Christian (80 percent) or Muslim (10 percent) group. Government institutions played limited role according to the respondents.

Just 10 percent said they received support from the government. Most of the support provided is mostly relief efforts in the form of food and water.

It was also discovered that shared norms also play a decisive role. The data showed that people have faith in solidarity. 82 percent of the respondents believe that they would receive help from the community if they were in trouble. Personal reciprocity was also self-evident for them as 83 percent of the households interviewed expect to be supported in times of crisis by somebody they helped at an earlier occasion.

The aspect of enforceable trust can also be observed in the slums of Lagos with 92.4 percent of the household heads of this study indicating their trust in neighbours and their community members. The sense of community is very strong among the slum dwellers and therefore they know that they can trust the solidarity within their neighbourhood and their efforts to help others will not be in vain.

"We always like to stand as one in any situation and help each other because we are poor and the government and rich people around do not care about us" (Musa, Makoko Slum)

Only 7.4 percent of the respondents indicated they have no trust to neither their neighbour nor community members. It was realised that most of the head of households who felt under this group were mostly newcomers (those who have spent just about 4-5 years in the community) or might have got a problem with a neighbour. For example one head of household explained to me the reason why he does not have good relationship with some members of his community because they dug trenches in their homes to divert the course of floodwater from their homes which end up making him to suffer the effects. So one action taken by a household might bring serious challenges to others in the communities. Another example pointed out by a respondent is how his neighbour built a flood protective wall by using sand bags to block water from entering his house and it resulted in channelling more flood water to his house. All this generates conflict between neighbours

and therefore destroys the trust and relationship they have for each other.

Emeseka, a 41 year old man from Badia slum expounds the problem of putting structures on watercourses: *"Those members of the community who build diversion structures in the waterways refuse to remove their structures from there to enable the free flow of the [flood] water and as a result of this, sometimes this causes quarrel between those who are affected by the flood as a result of the structures in the waterway and those who cause it".*

Focus group discussions, also revealed that the level of trust is high in the studied slums because most of the slum dwellers carry out their financial dealings with their neighbours or community members in the form of 'ajoh' (family lottery). This is because 95 percent of the head of households do not have access for any loan in a bank, so in case they need something like a loan this can only be through this 'ajoh' which serves as a revolving fund in these slum communities.

"I do not have a bank account not to talk of taking a loan from the bank. If I need a loan today for any social or economic reason, I can only go to our ajoh group to borrow money and since they have the trust for me, they will give me the money and I will pay back installmentally" (trader, Badia slum)

It can be concluded that the basic components of social capital are well implemented in the social fabric of informal settlements in Lagos. A good indicator for this is the feeling of trust and safety within the slums. The findings also show that almost everybody feels safe in his or her neighbourhood (84 percent) and almost everybody would lend money to neighbours (75 percent). As a matter of fact, this safety also help households to stay in the slum community with little or no problem (see also Braun and Forba 2013).

5.3 Household Management Capacity Index

The capacity of a household to cope with flood exposure risks depends to a great degree on the environment of the community and their adaptive capacity which is reflective of the economic resources, social capital and political processes of the region.

Hence analysis of household capability to endure flood stress in the informal settlements of Lagos incorporates a significant range of parameters in building quantitative and qualitative pictures of the underlying processes and outcomes. These relate to ideas of resilience by identifying key elements of the system that represent adaptive capacity in terms of social capital and other assets and the impact of extreme event thresholds on creating vulnerabilities within systems (Pelling and High, 2005; Adger and Brooks, 2003). Some indicators like the household income, level of education and social capital were selected from the questionnaires administered during the field survey to work out a household management capacity index. It needs to be mentioned here that all the factors discussed so far above were not included for indexing because not all of them were quantifiable and thereby could not be hierarchically categorised. But, nevertheless, the selected factors reflect household management capacity in a generalised manner.

Keeping in parity with the scaling of indicators done in the preceding chapter of exposure analysis, each of the selected indicators were rated on a 5 scale score ranging between 1 and 5, where a lower score indicates lower resource capacity and vice versa thereby following an inverse relationship between the score and level of household resource capacity. The Household Management Capacity Index Key constructed on the basis of some identified parameters discussed above is specific for the surveyed area. Aspects related to the level of socio-economic status, knowledge and awareness of the households about the nature of problems and mitigation options, the level of social networking and

role of social capital were the main descriptors that determined the household's management capacity. The main aim of such a Household Management Capacity Index is to compare the surveyed households on the basis of their management capacity that enables them to endure the flood exposures and related stress. The Index key so developed was further applied to the 300 surveyed households to get a composite picture of all the households' status.

No.	Scores / Indicators	1 – 3	4 - 5
1	Income Level	< 20,000 NGN – 50,000 NGN	>50,000 NGN and above
2	Educational Level	-No Formal Education -Primary -Secondary	Tertiary Education
3	Member of community organization	No	Yes
4	Level of Social Networking	Poor	Good
		Low Capacity	High Capacity

Table 15: Household management capacity index key
Source: own draft

All the indicators are assumed to have the same weight, therefore the HMCI is defined as an average aggregate of all the indicator score, which can be quantified as:

$$\text{Household Management Capacity Index (HMCI)} = \frac{\text{Total score}}{\text{Number of indicators (4)}}$$

Index value ranges between Minimum 1 to Maximum 5

1.0 – 3.0 = Low Management Capacity

4.0 – 5.0 = High Management Capacity

A combination of scores was earned by individual households on the basis of their level of educational, economic and social capital which were aggregated, standardised and classed under high, medium and low resource capacity categories for making comparative analysis of 300 households easier to handle. Since the indicators here too are substitutable and thereby the same total score and index can be derived through the combination of different situations, For example, both a poor and a rich household can get same score by gaining or losing on other aspects like education or social networking Therefore, it is important to be careful while interpreting the index on household basis and factors about individual management capacity.

Households with Low Capacity			**Households with High Capacity**	
Number of Households	269 (89.7%)		31 (10.3%)	
Indicators	**Characteristics**	**Percentage**	**Characteristics**	**Percentage**
Income Level	Households whose monthly earnings is less than 21,000 – 50,000 NGN and livelihood disrupted during flood disasters	234 (87.6%)	Households whose monthly earnings is more than 60,000 NGN and still have income earnings despite flood disasters	20 (64.4%)
Education	Head of households with no formal, primary nor secondary school education.	260 (96.7%)	Head of households with tertiary level of education	19 (61.3%)
Member of Community organization	Active participation in local community organization	265 (98.5%)	Active participation in local community organization	31 (100%)
Level of Social Networking	Good relationship with neighbours, friends and landlord	246 (91.4%)	Good relationship with neighbours, friends and landlord	31 (100%)

Table 16: Comparison between households with low management capacity and households with high management capacity

The study revealed that, from the group with low/moderate management capacity, 96.7 percent of the households did not have formal education or ended education in primary or

secondary level which therefore limit their ability to have a good job and therefore are involve in the informal sector (small trading, fishing, driving) which are jobs highly affected during flood disasters. This is confirmed by 87.6 percent of this group who pointed out that during floods their economic/livelihood activities are interrupted. Some of the head of households who are drivers acclaimed they go to work late or do not go to work at all when the area is flooded. This according to them leads to low income returns.

"Movement is restricted. People have to stay indoors and sometimes even break into their roofs till the floods subsides…" (George Mba, Badia slum).

Some respondents also lamented that they often pass through the flood at the peril of their lives because they must still earn a living whether floods or no floods. Since majority of respondents interviewed were in the informal sector, they disclosed that it becomes increasingly difficult in getting involve to their job in the event of any floods.

Baraka (37 years: Makoko slum), *a fisherman shared his experience as, "Personally, I cannot work for about a month after the floods. Since movement is restricted and thus, I cannot go to the river to carry out my job…"*

The study also revealed how the management capacity of household heads who are traders is being affected. They pointed out that when flooding occurs, the water enters their shops and destroys their wares including items like rice, sugar, clothes, and shoes that were for sale. According to them, it takes them about one to two months after a flooding incident to come back to their business. The market place becomes muddy and people do not come to the market to buy from them. As a result, traders do not regularly open their shops to engage in business. This situation reduces the income traders make and therefore affects their management capacity against floods.

"…the makeshift bridges on the gutters in front of our shops sometimes get washed away by the floods and this prevents us from entering our shops to salvage some of the items. I

used to sell both clothes and shoes. The clothes could be washed by the floods and if flood water happens to soak the items, their value reduces and some of the shoes get ruined and cannot be sold which create a lot of losses in this my small business" (Adamu, 33 years: Badia slum).

Also one important aspect that affects those with low management capacity as revealed in the study is the fact that savings and further investment becomes a huge challenge for the slum dwellers because the little money that they have is channelled into paying of health bills and replacing basic needs as well as repairing damaged property. It therefore suffices to say that, the disruption of economic activities of people who are affected by the incidents of flooding makes them vulnerable and unable to save or re-invest in their sources of livelihood in order to improve their living conditions.

As can be seen from table 16, participation in community activities and social networking plays a very important role in both households with least and high management capacity. This is because of support they receive during flood disasters because of their membership and social networking. Household heads and community heads pointed out that the support is mostly informal, small-scale, restricted to sympathetic and empathetic gestures, visits and donations by persons and organizations with close ties (family friendship, religious and other forms of relationship). 90 percent of households from both group revealed that religious groups and neighbours are the most likely sources to be approached after floods for help. The households confirmed that after flood events, immediate relief always come from nongovernmental organizations, private and local agencies. NGOs (35.3 percent); private and religious groups (64 percent); government (14.7 percent). This underscores the relatively limited role played by government. Some households (25 percent) confirmed they at times receive support from more than one agency. For example, they receive support from NGOs and religious associations. 36.8 percent of

households with high management capacity revealed from this study that during the heavy rainy months – June, July, August and September they pack most of their valuable property and send it to friends and family members who often do not experience flooding for safe keeping.

Bisih, a thirty-five year old seamstress had this to say:

"Around this time [rainy season] I send my valuable things to my friend's place for safe keeping. This is because we have a very good relationship and I trust her."

It is important to note here that household's management capacity is influenced to a large extent by the socio-economic and awareness level descriptors. The socio-economic characteristics explain quite directly the reason why a person or a community is more socially vulnerable to prevailing environmental conditions.

Aßheuer (2014) also confirmed the high exposure level of Dhaka`s informal settlements to floods with similar indicators. Aßheuer`s study in Dhaka also confirmed that social capital plays a central role in the management capacity of households to floods though the manifestations might be different. It is also important to realise from the Dhaka studies that religious groups play an important role in the manifestation of this social capital though in Dhaka is more of Muslim as opposed to Lagos which is more of Christianity.

5.4 Constraints to community participation

Co-operating for a common solution is surely effective and it also holds true even in the present context of socio-structural deprivation. Results from discussions held with key stakeholders from the Local Government Areas (LGA) representing the slum communities and focus group discussions indicate that under the prevailing political and economic situation, community participation seems to be the effective instrument to help the different communities cope with the stress of flooding through united efforts. The

participants in the discussions were very instrumental in implementing community participation for solutions to basic common problems and considered the potentials of community participation to be a possible common solution towards self-help to strengthen their management capabilities. While some community representatives indicated some constraints in enabling successful community participation in activities. Common constraints as reported by the participants were lack of co-operation and trust in some neighbourhoods. This is confirmed in table 14 where 7.4 percent of household heads indicated lack of trust among neighbours and community members, and lack of knowledge and organizational skill as the main factors limiting the effectiveness of community participation.

The results from the discussions carried out in this study with regards to the above topic also revealed the need for external aid in the case study areas on aspects of strengthening the different local organizations, either directly through capacity building, leadership training or injection of resources or indirectly through creating an open, democratic environment in which they can flourish. This I believe would make their operation more effective, induce confidence in the membership to be fruitful and further contribute in encouraging and enhancing participation towards management of crisis at community level.

5.5 Role of institutions in social vulnerability within informal settlements in Lagos

Institutions in this study encompass the working of organizations, both public and private and the functioning of policy and legislation. Analysis in the present context of this study digs deeper into the roles and responsibilities of the concerned civic body, their accessibility by the communities of Lagos informal settlements and their level of

sensitivity towards the prevailing problems of flood risk. In Lagos, elaborate plans and policies exists to take care of disaster management and this is being managed by the National Emergency Management Agency (NEMA). NEMA was established via Act 12 as amended by Act 50 of 1999 to manage disasters in Nigeria. The primary objective of NEMA is to coordinate the provision of immediate and timely succour to disaster victims. This involves providing relief materials, establishing camps (where necessary) for internally displaced persons and ensuring proper and efficient management of the camps. Their disaster risk management is designed to protect livelihoods and the assets of communities and individuals from the impact of hazards through the following:

- Mitigation: reducing the frequency, scale, intensity and impact of hazards through the provision of infrastructure (construction of earth bunds, gabion cages, contour planting, check dams, strengthened dwellings and public buildings, raised river banks, re-forestation and storm drains) and other non-infrastructure measures (public health campaigns, vaccination programmes both for livestock and humans, introducing new agricultural practices such as short maturation or drought resistant varieties of cereal crops, promoting dialogue between communities in conflict, relocation of settlements, and awareness and education programmes);
- Preparedness: strengthening the capacity of communities to withstand, respond to and recover from hazards, and of government, implementing partners and concern to establish speedy and appropriate interventions when the communities' capacities are overwhelmed;
- Advocacy: favourably influencing the social, political, economic and environmental issues that contribute to the causes and magnitude of impact of hazards.

Based on focus group discussions held with community heads and interview carried out with local staffs working with NEMA, it indicated that the strategy of NEMA so far have

been focused primarily on response after disasters in which the approach tends to address only the visible signs of vulnerability such as provision of services and generally fails to make deeper analysis based on the maintenance of sustainable livelihood systems of vulnerable people like the slum dwellers of Lagos. This study confirmed through the focus group discussions and household surveys that vulnerability from the perspective of government is seen as a physical problem which can be addressed mainly through technical solutions such as infrastructure development which are usually not provided at the appropriate time and are limited to specific localities. In areas where these structural measures are implemented, it fails to take into account the views, capacities, knowledge and priorities of people in informal settlements. Also, government policy on some issues like waste management instead make informal settlements more exposed to flood as revealed in the study. Through focus group discussions and household survey in Badia slum, respondents pointed out that the waste service takes trash from rich communities and dump it in their neighbourhood which therefore contributes in blocking the drainage system and resulting to flood and health risk.

"*Our neighbourhood is being used as swamp and trash infill area which sometimes failed to settle, creating serious health risks to us living here and we have complained about this to authorities of this local government area and no action is being taken"* (Ifuwa, Badia Slum)

Apart from NEMA on the part of the government who is involve in flood response, some local NGOs and community based organizations in Lagos are working to increase the influence of a wide range of stakeholders but have challenges with regard to secure funding. Attempts to influence the process under the leadership at the federal level are generally not considered successful due in part to public participation processes that are perceived as flawed, and lack of resources and expertise at the local government level.

There is also a significant belief among slum dwellers that decisions regarding which alternative mitigation projects to undertake are made in advance of public participation processes. This implies that public participation activities are more symbolic than substantive.

Through documentary evidence, it was revealed that there are policies which promote public involvement in flood management decisions, but it was difficult to confirm if some of the policies were made in true collaboration with communities through these public processes. Documentary also confirmed that decisions still rest largely with authorities at the federal levels whose consultation with the slum communities appears more dictated by political necessity than a firm belief that public participation is indeed an essential part of the best practices to address vulnerability. What is a very hopeful sign is that other non-governmental agencies and organizations, some local and some international (e.g. Nigerian Red Cross, SERAC, UN-HABITAT) are committed to inclusive processes and are working to both encourage the necessary partnerships and influence as much as possible interactions with local stakeholders. As seen in this research, some local NGOs like the 'Passion House-Lagos' are intimately involved in environmental and flood risk management issues and are advocating for public involvement processes due in part to a different set of institutional values as compared to government agencies.

Through focus discussions with representatives from different groups in the slum communities, it was evident that there is an under-appreciation for local knowledge when decisions are made. For example, representatives from Badia slum gave accounts on the situation of river channels that link their community with Lagos lagoon. "They revealed that they had several observations about how the river channels has behaved historically, and the different changes which has occur as a result of recent flood events and because of this they were very concerned about the implications of these changes for vulnerability

purpose and so they tried report on this to the government authority concern but until this moment they are yet to have a meaningful dialogue with these government authorities to lay out their concerns", this therefore precludes their concerns being incorporated in flood risk management planning. Another representative from Makoko slum during the focus group discussion talked on how their slum community was frustrated because their concerns about the height of a dike were dismissed on the basis that the experts' models showed the height of the dike to be sufficient for a flood similar to past ones. This is in an area in the slum in which the slum dwellers have distinct memories of water reaching markedly higher than the dike height during past floods. These interactions between federal personnel and community people which fail to include local knowledge in decision-making have been evident in other jurisdictions as reported by Brown and Damery (2002). They claim that local information about river behaviour under extreme conditions appears to be largely disregarded by official management institutions as they go about their business of protecting communities.

The study also confirmed through focus group discussions with community heads that Institutional response to floods is also hindered by false promises from politicians, lack of transparency and prevalence of widespread corruption among NEMA officials responsible for disaster management.

"When election time is approaching, most politicians come to our community and make promises like improving on our infrastructure to combat against flood if voted into power. All this is done in order to canvass for vote from us but after he is voted into power, nothing is done". (Community head from Makoko)

Another community head also said:

"Some of the engineers from the government who are supposed to carry out feasibility studies and recommend infrastructural projects of our community for financing are

corrupt. They ask us to bribe them before they can recommend infrastructural projects like building of embankments in our community" (Community head from Badia)

In order to find a way forward, this study looked at the role of institutions in reducing vulnerability to flood in the slum communities of Lagos in future by asking the key stakeholders from both government and non-governmental organizations if they will like to promote a collaborative adaptation decision making processes in future, all of them viewed such approach as actually essential to improving vulnerability reduction efforts. They both saw local involvement as one mechanism to enhance capacities to improve information flow and knowledge transfer to and from at-risk communities, and ultimately will improve decisions made.

CHAPTER 6: SUMMARY OF MAIN FININGS AND PROPOSED FLOOD VULNERABILITY FRAMEWORK FOR THE INFORMAL SETTLEMENTS OF LAGOS

6.1 Introduction

The vulnerability approach to flood hazard emphasizes the need to look at broader conceptualizations of how communities and their households become unsafe, including looking beyond the threat of exposure to investigate social sources of vulnerability. These sources of vulnerability are found in how people actually live in slums, and the social, economic and political processes that impact the choices they make to mitigate flood risk. This study therefore looked at such processes by exploring the social vulnerability of two different communities and their households to flood hazard.

In this chapter, the aim is to summarize and synthesize the key findings based on the main themes, the chapter therefore answers the research questions and provide a framework that summarizes the dimensions and drivers of social vulnerability based on findings from the study.

6.1.1 Summary of findings from question one

(How are people exposed to flood and what impacts do they face during flood situations?)

The locus of exposure to various flood related harmful perturbations in the case of informal settlements in Lagos is embedded in the high population density, age structure, infrastructural problems (buildings and flood protection infrastructure) and the locational problem, since most of the slums in Lagos are located in lands ill-suited for building. All these factors therefore contribute to the high exposure level of the slum households and their communities to flood. Also the incapability and gross neglect of government

authorities in providing flood protection services of acceptable standard to the slum dwellers also increases their exposure.

Impacts of flooding to the slum communities of Lagos are enormous with impacts on individual, household and community levels. At the community level, the impacts are grave and affect the functioning of the community and its members. It destroys community critical facilities like sources of drinking water, roads, bridges, schools, etc. At the household level, flooding disrupts the livelihood structure of households because during the periods of flood events, head of households cannot carry on with their income earning activities. Flooding also impacts households by creating financial burdens to them because people have to use their savings or borrow money to rebuild or take care of the sick.

One important impact of flooding in the slum communities of Lagos which is worth noting relates to the mental health of residents, since the studied communities acknowledged that as a result of the frequent flooding of their communities, they lived in perpetual fear of future flood events and the possible outbreak of an epidemic. The stress and trauma of people have a serious impact on their personal well-being. The study confirmed that one of the major impacts of flooding among slum dwellers is the panic and fear among people associated with deaths of loved ones.

6.1.2 Summary of findings from question two

(How do households in informal settlements of Lagos cope with and adapt to floods?)

Human response to hazard encompasses all the ways in which the negative effects of an event, outbreak, risk or threat can be reduced. It exists even before the occurrence of an event (as preventive strategies) and operates after the event (as coping and adaptation strategies). Responses and adaptation strategies are imperative part to be understood

within the slum communities where social communities are constantly adjusting, adapting and responding to multiple stresses. Learning from the success of past responses and preventing adoption of failed strategies would strengthen the effectiveness of response towards future anticipated events and help in being better prepared for the unknown ones.

Most of the coping and adaptive measures employed in Lagos informal settlements are both structural and non-structural. Individuals and the community as a whole try methods that will ensure that, in an event of flooding their properties and lives will not be affected. Secondly, they try to put in place measures that will make them more resilient to the adverse effects of flooding incidents. These measures are mostly adopted to minimize the negative impacts of flooding incidents on lives and properties. They design modifications using local knowledge and skills to their buildings do contribute towards reducing the magnitude of flood damage and their vulnerability to flooding incidents. Some of the structural measures taken by households do not really solve the problem. It was observed that an action undertaken by one household might bring serious challenges to others in the communities. There existed limited preventive measures since most of the measures applied are coping measures like repairs and rebuilding of structures which are usually undertaken after a flood incident. These measures are largely unplanned actions which are taken by individuals and households as they deem appropriate. These types of measures are therefore considered to have limited effect on reducing the risk of floods in the long run because the majority of the slum settlements in Lagos are located in places like creek areas, stream channels and other naturally flooding zones. Therefore, permanently mitigating the hazard is impossible. Furthermore, since not every household is able to invest the money, the ability or inability to adopt structural adjustments also produces differential vulnerability from floods within the same neighbourhood.

Apart from structural measures, support networks plays a very important role in helping

slum communities of Lagos in their flood management process. These support networks are mostly in the form of close ties like family friends and religious groups. International and domestic organizations like the Red Cross also play an important role in providing support to the communities. The sense of community work also help the slum dwellers in coping with floods.

Experience plays a great role. Some households because of their long stay develop knowledge and skills which are used in dealing with flood situations at both the household and community level. This indicates, they have somehow adapted to this prevailing situation. They are no longer bothered to see or get exposed to flood situations. They seem to have mentally accepted the prevailing pathetic condition of their neighbourhood and remained satisfied as long as they could protect their household and community before or after floods.

6.1.3 Summary of findings from question three

(In what ways could coping and adaptive capacities being applied by the different communities be influenced in future?)

It is important to note here that so far the problem of flooding in Lagos as a whole is not mainly because of excessive rain or climate change: the predicament is mostly created by poor urban management strategies and legislations which are implemented by the government. There exist a pervasive problem of corruption and favouritism which has led to government response to flood problems to be reactionary in many of the slum communities in Lagos. The coping and adaptive capacities of the slum dwellers could therefore be influence by one of government policy on slum eviction in which most households believe in future, government's reaction to flooding will be to clear them off from their present settlements, a tactic common across government regimes since 1955,

and commonly opposed by adaptive resistance and rioting (Adelekan, 2010). So through eviction, households have to look for different alternatives for settlement and have to start developing new strategies for coping and adapting to flood in their new environment.

It is also worth noting that the federal and state governments have failed to draft laws appropriate to their existing population, instead inappropriately enacting adaptations of British legislation (such as the building code) and other outdated and ill-suited colonial rules. This approach allows the government at any time to exclusively demolish structures which are considered illegal like the informal settlements. Also most of the networks which exist in the slums of Lagos are characterized by extreme fragmentation, qualities which diminish their capacity to influence decision making process thereby creating the possibility of affecting their future adaptive capacity.

6.1.4 Summary of findings from question four

(How do institutions create and perpetuate vulnerability in the context of flood risk management in informal settlements of Lagos?)

In order to understand how institutions create and perpetuate vulnerability in the context of flood risk management, it was first of all important to know who has the authority and responsibility to make mitigation decisions on aspect of flood risk management in the slums of Lagos. Decision-making clearly lies in the hands of the federal government agencies, with communities such as those studied having poorly developed means of influence, with local government agencies and occasionally local community groups to represent local interests. This finding means weak institutional organization coupled with poor urban governance leads to numerous obstacles which directly hinders efficient management and adequate infrastructural access on one hand and indirectly threatened human health and environmental security on the other. Under such circumstances, the

slum communities even if they have potentials to help themselves find it increasingly difficult to deal with the problem of securing a safe livelihood as they are faced with numerous economic, political and legal hindrances acting as limiting factors towards their developmental attempts. Thereby making them more vulnerable to natural disaster like floods.

This study further showed that top down decision making processes and assertion of authority by government agencies is a dominant feature of flood risk management in Lagos informal settlements. In a society with belief in democratic principles and ideals, participatory processes that are somewhat illusory create a high level of mistrust towards authorities. They are also inconsistent with cooperative participatory values. In this study's findings, the slum communities saw themselves as quite removed from decision making, and government agencies that are dominant institutions involved in flood risk management issues appeared comfortable with, and dependent upon their authority. Also lack of planning and multiple structural institutional set up, scarce funding, undue political interference and local organizational obstacles contribute in creating and perpetuating vulnerability in the context of flood management in the Lagos slums.

6.1.5 Summary of findings from question five

(What options exist to reduce the vulnerability of slum dwellers in Lagos?)

Actions and interventions are needed at every stage to combat the progression of social vulnerability emanating due to flood in informal settlements of Lagos. Till date, the only available solution to flood problems being applied by government are primarily structural solutions, which have shown little or no result in alleviating flood problems. It is, therefore, important to highlight the need for non-structural solutions. A balanced combination of structural as well as non-structural solutions (educating social groups,

raising awareness and capacity enhancement) is necessary for dealing with the prevailing flood problems.

Time bound actions to reduce flood related risk by efficient response need to be taken at the national, regional, community as well as household level, and further linked to each other. All the actions need to be explicitly defined within a time-bound policy framework.

Also, social learning activities can initiate the development of strategies to reduce the vulnerability of slum dwellers to flood hazards. Social learning brings multiple stakeholders to share, think, and act together, and build upon common knowledge, skills, and awareness (Schusler et al. 2003; Tschakert, 2007). Activities can include meetings, workshops, and pilot projects involving different actors from both government and non-governmental organizations.

Additionally, community training and the development of local preparedness and evacuation plans can also help in vulnerability reduction in Lagos slums. This can be carried out by both government, non-governmental organizations and community based organizations thereby creating a platform for shared responsibility.

6.2 A Summarized Overview of Underlying Causes of Social Vulnerability to Floods in Lagos Informal Settlements Based on the PAR Model

The purpose of this research was to explore the less well understood factors that impact flood vulnerability in informal settlements of Lagos. The research also looked at institutional perspectives on issues that compromise the slum community of Lagos and household management capacity over flood risk. Drawing on the initial framework of this research, the interesting results from the research are summarised using the PAR model. It describes the social creation and progression of flood vulnerability in informal settlements of Lagos and this is linked with the main research themes.

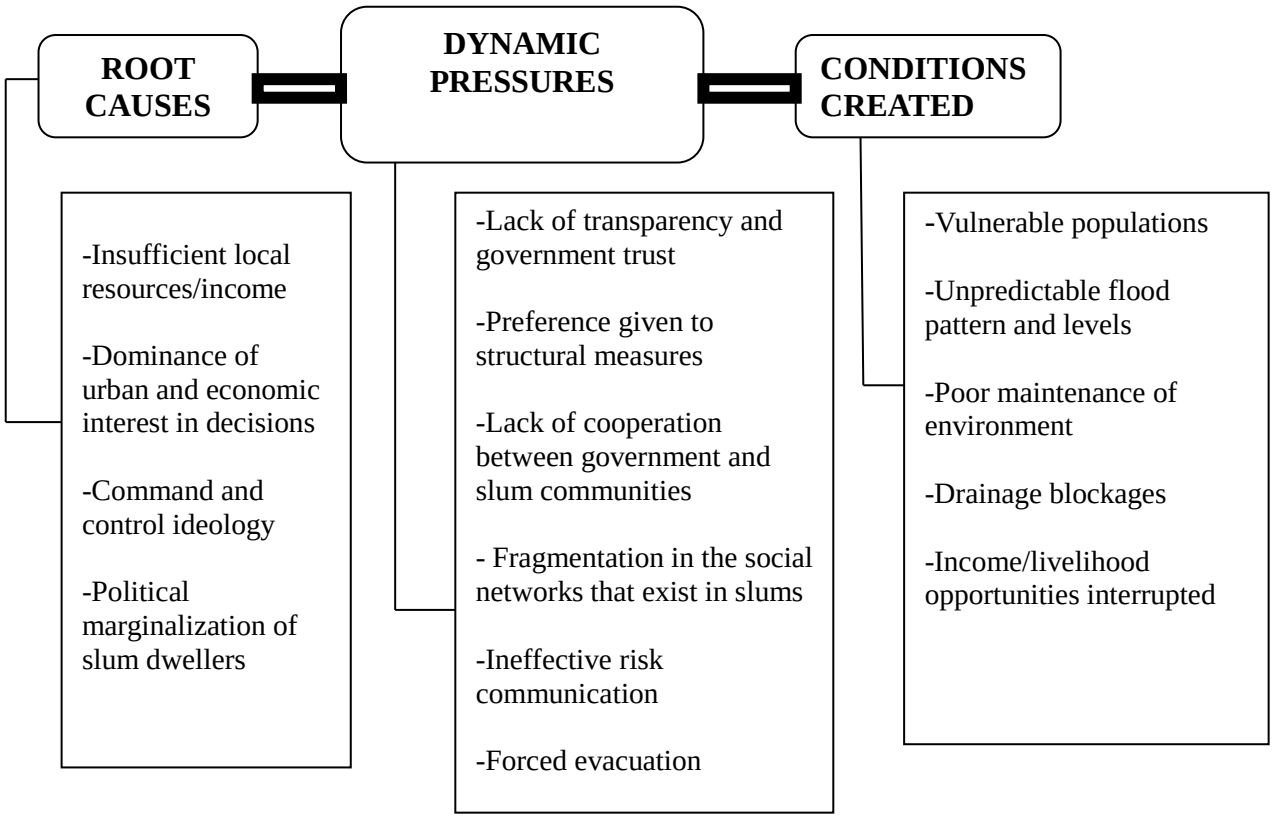

Figure 15: Progression of social vulnerability in informal settlements of Lagos Source: adapted from Wisner et al. 2004

The original framework was a generic disaster model termed the 'Pressure and Release Model' (PAR) by Blaikie et al. 1994; Wisner et al. 2004. It depicted disaster as occurring at the juncture of two opposing forces, those generating social vulnerability on the one side and physical exposure to a hazard on the other side, with increasing pressure on people arising from either side as a result of both their vulnerability and the actual impact (and severity) of the hazard event (Blaikie et al. 1994). The adaptation of the framework developed in this research includes the progression of vulnerability side of the PAR model only, showing the progression of vulnerability in informal settlements of Lagos by identifying the root causes, dynamic pressures, and specific conditions (outcomes) that describe vulnerability in this context.

Dynamic pressures are the institutional and location-specific processes that "translate the

effects of root causes both temporally and spatially into unsafe conditions" (Wisner, et al. 2004). For example, a lack of communication that is caused by the root causes of political marginalization can lead to a further lack in trust and transparency between the government and the public. Communities that do not have a communication plan are further marginalized by their inability to bring emerging issues and changes into the existing policy environment. The community may rely more heavily on command and control management strategies as public cooperation decreases and accountability increases from a lack of public trust. The non-recognition policy and the frequent use of forced evacuation by the government to slum dwellers for example, illustrates that they are negatively effective by top-down approaches, and this presents a dynamic pressure in informal settlements.

The most prevalent root cause contributing to the process of vulnerability is the aspect of marginalization where the respondents who took part in the interviews and the survey unanimously agreed that a lack of involvement in local decision-making was a root cause of their amplified risk perceptions and inability to cope with future risk. When slum dwellers and officials of local government area in the study were asked to consider their vulnerability to future flooding, most agreed that the slum area was marginalized from the risk management process and that risk was not effectively reduced through centralized risk-management efforts. The local head of slum communities indicated they have become more responsible for risk management for the past years, but have not acquired more resources and training to accompany these responsibilities. The community heads were concerned about how to address a diverse range of environment and resource issues in management systems with which they have not traditionally been involved.

Respondents also indicated that floods were a political issue in slums and that the timing of elections and flood events had a profound impact on risk management priorities and

attention because during election campaigns promises are made for the improvement of infrastructures to help the slum communities but after elections nothing is done.

The dynamic pressures that result from such root causes of flood vulnerability can be found both external to and internally within the slum communities studied. With the system of institutionalization of hazard management in Lagos which leads to lack of secure linkages and cooperation between government decision makers and slum communities and this goes a long way to limit broader participatory capacities. Also a lack of cooperation at the national and local government levels also contribute to poor decision making on issues of flood risk management. This has the potential to increase vulnerability to flood.

Institutions themselves identified that insecure funding for flood mitigation and lack of transparency especially among government officials is an issue that compromises their mitigation activities in the city as a whole. When it comes to decisions to mitigate risk, the allocation of resources and financial investment are in structural solutions to flood vulnerability; the technological and structural approaches to mitigating risk also depend upon a limited number of techniques– most often constrained to a form of cost benefit analyses to determine mitigation strategies. Such techniques have limited ability to consider a broad range of social costs related to flood mitigation, particularly over the longer term.

With regards to decision making, many slum dwellers in this study had little awareness of mitigation options for their communities, and the details related to, for example, emergency response plans or dike maintenance. In part this may be related to a lack of flood-related communication linkages outside of the communities, which contributes to poor participatory processes for flood management decision making. Within communities, the apparent preferences for structural measures mean that mitigation decisions are largely

viewed as outside of the realm of community expertise. Overall, the majority control over mitigation decisions remains external to the community level and is reinforced by a lack of community involvement for vulnerability reduction. Finally, the root causes and dynamic pressures discussed above result in several unsafe key conditions that are indicative of flood vulnerability in the slums of Lagos; these conditions are at risk to continue without significant abatement unless there is a restructuring of priorities and values in the slums, and creation of new vulnerability reduction strategies.

For example, an obvious source of vulnerability is ill-advised development in the slums; this development has however been facilitated through an over-reliance on structural measures like building of dikes, and a lack of integrated flood management approaches.

In summary, the diverse causes and factors influencing vulnerability seen in this framework suggest that the problem of social vulnerability must be addressed at multiple levels and involve many stakeholders. Vulnerability reduction must be an exercise in interdisciplinary thinking and decision making, and address fundamental beliefs about hazard creation and amelioration, including who ought to be responsible for addressing social sources of vulnerability in society. Most important, vulnerability reduction efforts in informal settlements of Lagos will clearly require the ability to integrate understandings that encompass social, economic and political variables as well as the biophysical aspects of the problem of creating safer slum communities.

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS: KEY STEPS FOR FUTURE ACTIONS

7.1 Introduction

The previous chapters have proven that fast growing cities like Lagos are not only threatened by consequences of sudden external shocks and hazardous events but they are also prone to slow risk events as well as a mixture of social segregation, disparities, conflicts, inadequacies and stresses which generate harmful social, economic and environmental consequences. Communities inhabiting these large urban centres are frequently subjected to risk and social vulnerability due to lack of environmental services and denial of basic rights. In this context, the present case study explains various aspects of flood-related risks that urban citizens are living with and the level of social vulnerability they are subjected to in connection with flooding. This chapter therefore concludes the present research and makes some broad recommendations on the basis of its findings. It further discusses probable solutions for more improving flood management in Lagos informal settlements and finally points out the scope and limitations of the study

7.2 Major Findings

The findings of the present study, which are based on empirical field work, support the theoretical concept that social vulnerability is the defencelessness of certain individual/households/social groups against stresses which impact them through harmful implications of multiple types. The degree of social vulnerability is determined by the outcome of struggle between their exposure to flood problems, related stresses and their coping capabilities. In this respect some of the major findings about flood related social vulnerability in informal settlements of Lagos are listed below under the following heads:

Exposure side:

- Results from secondary data and observation from field work indicates the rate of urbanisation in Lagos is faster than the capacity of local government to adequately manage it. This is reflected in almost all the sectors but most prominently in housing, water supply, sanitation, waste disposal and health care where plans have failed to achieve their goals.
- Based on data from household surveys and focus group discussions, the study revealed that planning for only structural solutions to problems of flooding has shown limited results. Extension of physical infrastructure without its proper maintenance and direction to the public for its correct usage is largely a wasteful endeavour with only limited solution to the problem.
- With regards to results from household surveys and discussions with some key stakeholders from the non-governmental sector, it is evident that households in Lagos informal settlements are exposed to multiple threats to their basic rights, health security and overall wellbeing, which cannot be granted by only considering physical exposures to hazards, infrastructural stresses and other harmful environmental perturbations or solely by strengthening their economic capabilities.
- Data from household survey and focus group discussions indicates that unsafe conditions as reflected in specific situations of the different slum settlements and marginalization of social groups to the disadvantaged locations partly determines the cause of their vulnerability in the city's urban setting.

Coping and Management side:

- Results from household surveys indicates, coping and adaptation mechanisms depend upon the diversity and accessibility of the available options, and level of social networking.

- Results from the household survey also revealed that the socio-economic attributes of households remain a supportive factor; households lacking knowledge and awareness about the available options for preventing, coping and adapting remained socially vulnerable to the prevailing stress.
- Results from focus group discussions, the household survey and interviews with key stakeholders at both government and non-governmental level confirmed that people's perception plays a very important role in determining the overall vulnerability of social groups. It influences the level of risk awareness among individuals and social groups. The manner in which an individual or social group perceives existing problems affects the extent of their exposure and simultaneously moulds their response towards it.
- Also, based on household interview and discussions with key stakeholders within and out of the slum communities, the prevailing institutional and political environment of informal settlements, level of cooperation among the residents and effectiveness of community participation are important in influencing the overall resource capabilities and resilience of the slum community.

Another important finding from this study following discussions with community heads and some key stakeholders in the government and non-governmental sector is the fact that there is a failure to incorporate capacities among stakeholders that in fact can be utilized to reduce vulnerability. The data in this research illustrated, for example, high levels of social capital and cooperative decision making within the communities studied which could potentially be utilized in risk management. Numerous community values identified in this research-mutuality, volunteerism, community attachment, etc. are significant community resources that should be used to create more flood resilient communities. In fact, such community characteristics that are indicative of social cohesiveness are

important indicators of a community's ability to reduce the emotional and physical impacts of disaster, and are consistent with vulnerability approaches (Shrubsole, 2007).

7.3 Recommendations

One important aim of this research was to provide recommendations on how social sources of vulnerability to floods might be addressed in Lagos informal settlements.

7.3.1 The need for strengthening existing networks

One important recommendation that will help in reducing the vulnerability of informal settlements of Lagos to floods is the need to secure networks that are already informally in place and operating successfully. Since the results as indicated in chapter 5.3 confirms that social capital plays a very important role in management capacity but is often fragmented, therefore is the need to identify and strengthen existing networks. A well-developed loss redistribution system is a safety network for populations that are in imminent risk from hazards like floods. As indicated in the findings, the slum population of Lagos already show a certain degree of ability to mobilize networks of support for economic assistance at different scales. To have a resilient system in this community, it is therefore important to harness existing networks and consolidate them to reduce exploitation and randomness. For example, humanitarian assistance networks between affected households and church groups are inconsistent and are based on the church group´s sense of responsibility and their ability to acquire an arrangement. Although these types of assistance were observed in high numbers and hence contributed to the coping capacity of slum dwellers in Lagos, randomness makes for an unsustainable and unpredictable system. However, if the strategy is institutionalized, then loss redistribution will become more robust and effective. Furthermore, this type of risk reduction could be applied to other types of crises

as well. In addition, with exposure to global processes and consequent options and strategies, slum dwellers of Lagos as confirmed in the study are also exploring ways to reduce their risks and add safety nets further afield. These mechanisms are flexible and designed to fit the requirements of slum communities. Supporting and building on them would add and consolidate their resilience. Moreover, another reason strengthening the existing networks is because of the fact that affiliations used for support by the slum dwellers of Lagos are of a socio-cultural-political and economic nature.

Also, to make the existing networks more consistent, it will be important to identify and support different civic agencies in order to produce innovative layers of safety and support networks. A vibrant civic society and networks with memberships of different civic identities could generate diverse ways of integrating marginal populations with structurally separate agencies. In this way, new clusters of alliances like local and global; state and private institutions are formed which are later initiated in urban society, adding new layers of safety from different approaches to produce a balanced hazard mitigation and adaptation system.

7.3.2 Expand the use of non-structural measures through improved leadership and use of more diverse tools for economic and social assessment of mitigation alternatives

Interviews with key stakeholders from the government in this study revealed that structural measures are what they think can help in flood mitigation in informal settlements of Lagos. There was some reference as well to the importance of forecasting and of emergency response, which are examples of nonstructural measures. Members of NGOs were the only ones who seemed highly cognizant of the need to expand the repertoire of options in discourse about flood vulnerability.

Some NGOs (e.g., Nigerian Federation of Red Cross and Red Crescent Societies) might serve as an important resource in bringing a wider range of mitigation options into regional and community discussions and decision making. NGO's involved in this study sought to further the goal of broader based planning, sustainability, and more consideration of human variables in hazard creation, all of which are key features of the vulnerability perspective in hazard management. Most importantly, their existence indicates that there are already established NGO's that are structured to promote the cause of vulnerability reduction and could presumably take a leadership role. They already have cooperative relationships with multiple stakeholders and a very inclusive perspective in decision-making. They may well be better able to facilitate the participation of slum residents and groups in addressing flood risk than government personnel or government consultants. Ironically, while they appear to be less constrained philosophically than government agencies in terms of how they view social vulnerability, they are constrained by lack of formal mandate and funding. The challenges for these pioneering organizations include, for example, insecure funding, unstable political support, and a lack of authority to move beyond conceptualization of their sustainable planning vision to actually implementing their ideas. There is tension between their values/perspectives and those of some authorities who are socially sanctioned to conduct flood mitigation activities. A truly cooperative approach to flood management issues must address these tensions through open dialogue and sharing of decision-making power.

To practically implement a new broader vision for managing flood risk – inclusive of an array of non-structural approaches also would greatly challenge the status quo related to mitigation decision-making processes. This would be a highly desirable and proactive approach to vulnerability. Both decision-makers (agencies and authorities) and decision-making processes should be subject to critique. This suggests a higher standard would be

applied to the determination and defence of preferred mitigation actions by authorities. Finally, there is a need for research and investigation into alternative decision making frameworks within this context, or an expansion of available tools to include social impacts of mitigation actions. The over-reliance on engineering assessments and traditional cost-benefit analysis fails to capture and account for the social impacts of mitigation, many of which cannot be readily quantified.

7.3.3 Develop policies to enhance a proactive role for government in vulnerability reduction and to provide incentives to local communities to take responsibility for the assessment and addressing of local vulnerabilities

Generally, results from this research as indicated in chapter 5.6 that government policy has been weak with regard to addressing social vulnerability problems of Lagos and especially to informal settlements. Evidence of this is found in the government policy which always rely on the legal status of slum dwellers or the policy of evicting slum dwellers as a solution to flood disaster. It is essential that mandated authorities, in relation to all flood related matters, promote the notion that vulnerability creation or amelioration must be a fundamental consideration when all development or mitigation decisions are undertaken. They should be clear that they have been assigned to undertake roles on behalf of society and in consultation with the broader community. Serving society is the ‘raison d’etre’ of any government. The government ought to be clearly able to rationalize their conception of the ‘public good’ and work cooperatively with stakeholders to define the meaning of the term in the context of mitigation decisions, public interests are not served when the government is perceived as autonomous and inflexible.

Improving policy for vulnerability reduction is ultimately highly dependent upon political will. The adoption of a precautionary principle in policy development rather than a

reactive approach to vulnerability reduction (following a disaster) would be a logical first step. Consistent with Tobin and Montz's comments (1997), policy development that encourages perhaps even mandates in this instance more nonstructural measures should be identified and helped to gain support at a local level. Placing mitigation under an appropriate level of local community control would be one way to deal with inadequate local involvement in mitigation activities, inadequate assumption of responsibility for vulnerability creation, and general lack of awareness of human creation of vulnerability. The research findings in this study attest to the fact that these are all significant contributors to social vulnerability to flood in Lagos informal settlements. Local control also allows residents to incorporate mitigation in community visions of the future, and make small adjustments to reduce vulnerability over the long term. Community governance was historically been a reality for many nations (Shaw and Goda, 2004) this research also highlighted that there are financial and political obstacles to addressing social vulnerability to floods in Lagos informal settlements, several of which were discussed in the preceding recommendation. From the perspective of government informants there were several main concerns that are seen as barriers to this, like the fact that there is always inadequate assurance of financial and other resources to plan and implement mitigation actions into the future due to the electoral cycle and the possibility of loss of political will to prioritize flood mitigation. These financial and political constraints were also seen as deterrents to the realization of sustainable flood management practices. Also, there were indications from this research that government institutions change but slowly and are constrained by a narrow set of values and lengthy history. As a consequence, there were many thoughtful comments made about a need for organizational change that will permit some new, creative and cooperative approaches to be adopted and thereby making the issue of addressing social vulnerability of slum dwellers to flood a

priority. Particularly, it would be advantageous if the political leadership could begin to structure a vulnerability reduction strategy in consultation with other stakeholders.

7.4 The Way Forward

The present study takes a step forward in the analysis of social vulnerability. It identifies points where effective action and intervention is needed in order to alleviate vulnerability of informal settlements of Lagos to flood. The study also provides insights into the scope of community participation and reiterates the importance of co-operation and social networking in building up the community's resilience towards hazards. This study also highlights the loopholes in the present community as well as government responses towards flood management in the informal settlements of Lagos. Therefore, the recommendation of the study to adopt a balanced mix of structural and non-structural solutions can serve as a basis for effective action planning and related policy implementation at the organizational level which can be helpful in dealing with flood management problems.

This study also portrayed the fact that vulnerability is not simply a static property of marginalized people in the informal settlements of Lagos that are at risk to flooding, it is a constantly changing condition that alters with spatial, structural and temporal changes. Hence, one of the primary conclusions of this research is that vulnerability is a continuously emergent phenomenon that ebbs and flows in response to an array of upward and downward pressures. They include downward pressures of social and environmental forces at the global, national and local scales, forces that are changing the system of rewards and penalties that influences the lives of the settlements inhabitants, and upward counter-forces that are continuously cultivating and rearranging the coping resources available to these populations.

The downward forces are formidable, they tend to convey the image of a city burdened by massive problems that increase vulnerability gaps among diverse population groups in the city. The forces illustrate how socio-economic and political transitions in the city play a crucial role in the spatiotemporal distribution of vulnerability in the city. Furthermore, under these conditions, flood mitigation programs are excessively skewed towards technocratic and physical alterations in local environments and are not informed by in-depth understanding of vulnerability in such transforming conditions. Policies implemented at larger scales of society have uneven impacts at the local urban scale, often marginalizing impoverished and already excluded sections of urban society. The case of Lagos shows that the existing flood mitigation policy does not incorporate the ongoing changes in socio-environmental characteristics of the city, and is not sensitive to the layers of socio-ecological vulnerabilities produced by these changes.

This study also revealed that the upward processes of loss absorption and redistribution are heavily reliant on the social capital of informal settlements and carry real seeds of hope. "Marginal" populations, under the influence of changing socio-economic and political characteristics, acquire and maintain multiple sources of assistance to recover after hazards like floods. The networks of support range from local social connections such as families and friends, to informal and formal economic arrangements with other members of society. These forms of loss sharing and risk redistribution, operating informally yet systematically between marginalized households with structurally and spatially separate groups of population, signal the existence of coping strategies that have not been adequately explicated and explored by hazard scholars. Furthermore, research in hazard mitigation has concentrated on developing productive interdependencies between global, national and metropolitan levels emphasizing the critical role that alliances between institutions at each level can play in improving hazard mitigation in society. The

emerging role of linkages between local agencies and households with public and private institutions in different levels of society are crucial but missing in the efforts at finding means to mitigate hazards and adapt to climate risks like flood.

REFERENCES

Abiodun, J. (1997), The challenges of growth and development in metropolitan Lagos. In: Rakodi, C. (Ed.). The urban challenge in Africa: Growth and management of its large cities. Tokyo, United Nations University Press, pp. 192-222.

Abosede, F. (2006), Housing in Lagos megacity: Improving liveability, inclusion and governance. Paper presented at the international conference on "Building Nigeria's capacity to implement economic, social and cultural rights: Lessons learned, challenges and the way forward". Abuja. 27th - 28th September.

Abramovitz, J. (2001), Unnatural Disasters. Worldwatch Paper 158, Washington DC, Worldwatch Institute.

ActionAid (2006), Climate change, urban flooding and the rights of the urban poor in Africa: Key findings from six African cities. London, ActionAid International.

Adebayo, A. and Oruonye, E.D. (2013), An assessment of the effects of the 2012 floods in Taraba State, Nigeria. Paper delivered at the annual national conference, organized by the association hydrological science at University of Agriculture, Abeokuta. 10th - 12th September.

Ade-Kunle, Ifesanya (2012), The role of government agencies in urban housing delivery: Insufficient political will and ineffective housing administration in Lagos Metropolis – Case Study of Ajegunle, Lagos. Institute for European Urban Studies, Bauhaus University Weimar.

Adelekan, I. (2010), Vulnerability of poor urban communities to flooding in Lagos, Nigeria. Environment and Urbanization 22 (2), pp. 433-450.

Adetunji, A.M. (2006), Flood in Nigeria. Lagos, National Open University of Nigeria, Regent Publishers.

Adger, W.N. (2006), Vulnerability. Global Environmental Change 16 (3), pp. 268-281.

Adger, W.N. and Brooks, N. (2003), Does environmental change cause vulnerability to natural disasters? In: Pelling, M. (Ed.). Natural Disasters and Development in a Globalising World, London, Routledge, pp. 19-42.

Adeoti, O. (2010), Development of river basin organizations in Nigeria. Research Journal of Soil and Water Management 3 (1), pp. 91-100.

Agbola, B.S.; Ajayi, O.; Taiwo, O.J.; and Wahab, B.W. (2012), The August 2011 flood in Ibadan Nigeria: Anthropogenic causes and consequences. International Journal of Disaster Risk Science 3 (4), pp. 207-217.

Agbola, T. and Jinadu, A. (1997), Forced eviction and forced relocation in Nigeria: The experience of those evicted from Maroko in 1990. Environment and Urbanization 9 (2), pp. 271-288.

Agbola, T. (2005), The housing debacle. Inaugural lecture delivered at the University of Ibadan. 4th August.

Aina, T. A. (1989), Many Routes Enter the Market Place: Housing Submarkets for the Urban Poor in Metropolitan Lagos, Nigeria, Environment and Urbanization 1 (2), 38-49.

Ajala, A.S. (2005), Globalization and health care system: A case of inequality in access to healthcare delivery in Nigeria. Journal of Development Alternatives and Area Studies 24 (3), pp. 41-49.

Alam, M. and Rabbani, M.D. (2007), Vulnerabilities and responses to climate change for Dhaka. Environment & Urbanization 19 (1), pp. 81-97.

Alexander, D.E. (1993), Natural disasters. Dordrecht, Kluwer Academic Publishers, and London, University College of London Press.

Alexander, D.E. (2000), Confronting Catastrophe. New perspectives on natural disasters. Harpenden, Terra publishing, and New York, Oxford University Press.

Alexander, W.J.R. (2000), Flood risk reduction measures. Department of Civil Engineering, University of Pretoria, Pretoria.

Altrock, U. (2012), Conceptualizing informality. Some thoughts on the way towards generalization. In: McFarlane, C. and Waibel, M. (Eds.): Urban informalities: Reflections on the formal and informal. London, Ashgate, pp. 171-193.

Alwang, J.; Siegel, P.N.; and Jorgensen, S.L. (2001), Vulnerability: A view from different disciplines. Social protection discussion paper No. 0015. Washington DC, The World Bank. Available at: www.worldbank.org/sp. 17.09.2015

Amanze-Nwachukwu, C. and Ogbu, A. (2007), Kupolokun Cries over Pipeline Vandalisation. Lagos, ThisDay, 15th January.

Amendola, A.; Linnerooth-Bayer, J.; Okada, N.; and Shi, P. (2008), Towards integrated disaster risk management: Case studies and trends from Asia. Natural Hazards 44 (2), pp. 163-168.

Aragon-Durand, F. (2007), Urbanization and flood vulnerability in the Peri Urban interface of Mexico City. Disasters 31 (4), pp. 477-494.

Aßheuer, T.; Thiele-Eich, I.; and Braun, B. (2013), Coping with the impacts of severe flood events in Dhaka's slums – the role of social capital. In: Erdkunde 67 (1), pp. 21-35.

Aßheuer, T. (2014), Klimawandel und Resilienz in Bangladesch: Die Bewältigung von Überschwemmungen in den Slums von Dhaka. Megacities and Global Change/Megastädte und Globaler Wandel. Band 14. Stuttgart, Franz Steiner.

Ayeni, M.A.O. (1977), Living conditions of the poor in Lagos. Ekistics 43 (255), pp. 77-80.

Azarya, V. (2004), Globalization and international tourism in developing countries: Marginality as a commercial commodity. Current Sociology 52 (6), pp. 949-967.

Badiane, A. (2006), African cities: Some theses for a new beginning. Paper delivered on the conferment of honorary doctorate degree of the Federal University of Technology, Minna, Nigeria. 12th December.

Bankoff, G.; Frerks, G.; and Hilhorst, D. (2004), Mapping Vulnerability: Disasters, Development and People. Earthscan, London.

Baumgart, S. and Kreibich, V. (2012), Informal urbanization - historical and geographical perspectives. In: disP 187 (4), pp. 12-23.

Becker, K.F. (2004), The informal economy: A fact finding study, Swedish International Development Cooperation Agency (SIDA), Stockholm, Sweden.

Benjamin, M.A. (2005), The concatenating nature of health risk to primary school aged children in the informal settlement of Masiphumelele. Unpublished honours thesis. University of Cape Town.

Benjamin, M. A. (2008), Analysing urban flood risk in low-cost settlements of George, Western Cape, South Africa: Investigating physical and social dimensions. A thesis submitted to the University of Cape Town.

Berkes, F. (2007), Understanding Uncertainty and reducing vulnerability: Lessons from resilience thinking. Natural Hazards 41 (2) pp. 283 – 295.

Berkes, F. and Jolly, D. (2001), Adapting to climate change and social-ecological resilience. Conservation Ecology 5 (2), p. 18.

Bernard, H.R. (2011), Research methods in anthropology: Qualitative and quantitative approaches. Fifth edition. Lanham, Altamira Press.

Berry, L.J. (2003), Community vulnerability to tropical cyclones. Natural Hazards 30 (2), pp. 209-232.

Birkmann, J. (2006), Measuring vulnerability to promote disaster-resilient societies: Conceptual frameworks and definitions. In: Birkmann, J. (Ed.). Measuring vulnerability to natural hazards - towards disaster resilient societies. United Nations University Press, Tokyo, New York, Paris, pp. 9-54.

Birkmann, J. (2007), Risk and vulnerability indicators at different scales: Applicability, usefulness and policy implications. In: Environmental Hazards 7 (1), pp. 20-31.

Birkmann, J. and Fernando, N. (2008), Measuring revealed and emergent vulnerabilities of coastal communities to tsunamis in Sri Lanka. Disasters 32 (1), pp. 82-105.

Blaikie, P.; Cannon, T.; Davis, I.; and Wisner, B. (1994), At Risk: Natural hazards, people's vulnerability, and disasters. London, Routledge.

Blaikie, P. and BrookWeld, H.C. (Eds.), (1987), Land Degradation and Society. Methuen, London.

Bogardi, J.; Villagran, J.; Birkmann, J.; Renaud, F.; Sakulski, X.; Affeltranger, C.; Mensa, A.; and Kaplan, M. (2005), Vulnerability in the Context of Climate Change. Paper presented at the International Workshop "Human Security and Climate Change". Asker, Norway. 21st - 23rd June.

Bohle, H.G. (2001), Vulnerability and criticality: Perspectives from social geography. International Human Dimensions Programme on Global Environmental Change (IHDP) Newsletter Update 2, pp. 1-7.

Bohle, H.G. and Watts, M. (1993), The space of vulnerability: the causal structure of hunger and famine. Progress in Human Geography 17 (1), pp. 43-67.

Bohle, H.G.; Downing, T.E.; and Watts M. (1994), Climate change and social vulnerability: Toward a sociology and geography of food insecurity. Global Environmental Change 4 (1), pp. 37-48.

Bohle, H.G. and Brklacich, M. (2006), Assessing human vulnerability to global climatic change. In: Ehlers, E. and Krafft T. (Eds.). Earth System Science in the Anthropocene. Berlin, Springer, pp. 51-61.

Brauch, H. G. (2005a), Threats, Challenges, Vulnerabilities and Risks in environmental human security. SOURCE Paper No. 1. Bonn, United Nations University Press.

Braun, B. and Aßheuer, T. (2011), Floods in megacity environments: Vulnerability and coping strategies of slum dwellers in Dhaka/Bangladesh. Natural Hazards 58 (2), pp. 771-787.

Braun, B. and Forba Nsorfon, I. (2013), Überschwemmungen und Überleben in den Slums von Lagos und Dhaka. Geographische Rundschau 65 (10), pp. 20-27.

Briguglio, L. (1995), Small Island States and their economic vulnerabilities. World Development. 23 (9), pp. 1615-1632.

Brockerhoff, M. (1999), Urban growth in developing countries: A review of projections and predictions. Population and Development Review 25 (4), pp. 757-778.

Bronstert, A. (2003), Floods and climate change: Interactions and impacts. Risk Analysis 23 (3), pp. 545-557.

Brooks, N. (2003), Vulnerability, Risk and Adaptation: A conceptual framework. Working paper 38, Tyndall Centre for Climate Change Research, University of East Anglia, Norwich.

Brooks, N.; Adger, W.N.; and Kelly, P.M. (2005), The determinants of vulnerability and adaptive capacity at the national level and the implications for adaptation. Global Environmental Change 15 (2), pp. 151-163.

Brown, C. (2011), Decision-scaling for Robust Planning and Policy under Climate Uncertainty. World Resources Report, Washington DC. Available at: http://www.worldresourcesreport.org. 17.09.2015.

Brown, J. and Damery, S. (2002), Managing flood risk in the UK: towards an integration of social and technical perspectives. Transactions of the Institute of British Geographers 27 (4), 412–426.

Buckle, P.; Mars, G.; and Smale, S. (2000), New approaches to assessing vulnerability and resilience. Australian Journal of Emergency Management 15 (2), pp. 8-14.

Burby, R. (2006), Hurricane Katrina and the paradoxes of government disaster policy: Bringing about wise governmental decisions for hazardous areas. Annals of the American Academy of Political and Social Science 604 (1), pp. 171-191.

Burton, I. (1997), Vulnerability and adaptive response in the context of climate change. Climatic Change 36 (1), pp. 185-196.

Burton, I.; R.W. Kates; and G.F. White (1993), The Environment as Hazard (2nd Ed.). Guilford Press, New York.

Cannon, T. (2008), Reducing people's vulnerability to natural hazards: Communities and resilience. WIDER Research Paper 34. United Nations University, Helsinki.

Cannon, T.; Twigg, J.; and Rowell, J. (2005), Social vulnerability, sustainable livelihoods and Disasters. Report to DFID, Conflict and Humanitarian Assistance Department (CHAD) and Sustainable Livelihoods Support Office, London. Available at: www.livelihoods.org/static/tcannon_NN197.htm. 25.07.2012.

Cannon, T. (2006), Vulnerability analysis, livelihoods and disasters. In: Amman, W.; Dannenmann, S.; and Vulliet, L. (Eds.). Risk21: Coping with Risks due to natural hazards in the 21st Century. London, Taylor and Francis, pp. 41-50.

Cardona, O.D. (2011), Disaster risk and vulnerability: Notions and measurement of human and environmental insecurity. In: Brauch, H.G.; Oswald Spring, Ú.; Mesjasz, C.; Grin, J.; Kameri-Mbote, P.; Chourou, B.; Dunay, P.; and Birkmann, J. (Eds.). Coping with global environmental change, disasters and security: threats, challenges, vulnerabilities

and risks. Hexagon Series on Human and Environmental Security and Peace Vol. 5. Berlin, Heidelberg, New York, Springer, pp. 107-121.

Cardona, O.D. (2004), The need for rethinking the concepts of vulnerability and risk from a holistic perspective: A necessary review and criticism for effective risk management. In: Bankoff, G.; Frerks, G.; and Hilhorst, D. (Eds.). Mapping Vulnerability: Disasters, Development and People. London, Earthscan, pp. 37-51.

Carreño, M.L. and Barbat, A.H. (2012), Holistic evaluation of the seismic urban risk using the fuzzy sets theory. Bulletin of Earthquake Engineering 10 (2), 547-565.

Castle, E.N. (1998), A conceptual framework for the study of rural places. American Journal of Agricultural Economics 80 (3), pp. 621-631.

Carpenter, J.P.; Daniere, A.G.; and Takahashi, L.M. (2004), Cooperation, trust and social capital in Southeast Asian urban slums. Journal of Economic Behavior & Organization 55 (4), pp. 533-551.

Cejas, M.I. (2006), Tourism in shantytowns and slums: A new "contact zone" in the era of globalization. Intercultural Communication Studies 15 (2), pp. 224-230.

Chambers, L.W.; Shimoda, F.; Walter, S.D.; Pickard, L.; Hunter, B.; Ford, J.; Deivanayagam, N.; and Cunningham, I. (1989), Estimating the burden of illness in an Ontario community with untreated drinking water and sewage disposal problems. Canadian Journal of Public Health. 80 (2), pp. 142-148.

Chan, N.W. (2000), Reducing flood hazard exposure and vulnerability in peninsular Malaysia. In: Parker, D.J. (Ed.). Floods, Vol. 2. London and New York, Routledge, pp. 19-30.

Coleman, J.S. (1987), Norms as social capital. In: Radnitzky, G. and Bernholz, P. (Eds.). Economic Imperialism: The economic approach applied outside the field of economics. New York, Paragon House, pp. 135-155.

Coleman, J.S. (1990), Foundations of social theory. Cambridge, Harvard University Press.

Commission for Africa (2005), Our Common Interest. London, Report of the Commission for Africa.

Cox, E. and Caldwell, P. (2000), Making policy social. In: Winter, I. (Ed.). Social capital and public policy in Australia. Melbourne, Australian Institute of Family Studies, pp. 43-73.

CRED (2010), Annual disaster statistical review: the number and the trends. Brussels, Centre for Research on the Epidemiology of Disasters.

Cutter, S.L. (1996), Vulnerability to environmental hazards. Progress in Human Geography, 20 (4), pp. 529-539.

Cutter, S.L.; Boruff, B.J.; and Shirley, W.L. (2003), Social vulnerability to environmental hazards. Social Science Quarterly 84 (2), p. 242.

Cutter, S.L. (2001), A research agenda for vulnerability science and environmental hazards. In: IHDP Update, Newsletter of the International Human Dimension Programme on Global Environmental Change 2 (1), pp. 8-9.

Cutter, S.L.; Mitchell, J.T.; and Scott, M.S. (2000), Revealing the vulnerability of people and places: A case study of Georgetown County, South Carolina. Annals of the Association of American Geographers 90 (4), pp. 713-37.

Cutter, S.L.; Emrich, C.T.; Webb, J.J.; and Morath, D. (2009), Social vulnerability to climate variability hazards: A Review of the Literature. Hazard Vulnerability Institute, Department of Geography, University of South Carolina, Columbia.

Damery, S.L. and Brown, J.D. (2002), Managing flood risk in the UK: Towards an integration of social and technical perspectives. Transactions of the Institute of British Geographers 27 (4), pp. 412-426.

Danjibo, N.D. (2009), Islamic fundamentalism and sectarian violence: The 'Maitatsine' and 'Boko Haram' crises in Northern Nigeria. Peace and Conflict Studies Paper Series, Institute of African Studies, University of Ibadan, pp. 1-21.

Daramola, A. and Ibem, E.O. (2010), Urban environmental problems in Nigeria: Implications for sustainable development. Journal of Sustainable Development in Africa 12 (1), pp. 24-144.

Dasgupta, P. (2003), Social capital and economic performance: Analytics. In: Ostrom, E. and Ahn, T.K. (Eds.). Foundations of social capital. Cheltenham and Northampton, Edward Elgar, pp. 309-339.

Davies, S. (1996), Adaptable livelihoods: Coping with food insecurity in the Malian Sahel. Science, Technology and Development 14 (1), pp. 144-156.

Davis, M. (2004), Planet of slums: Urban involution and the informal proletariat. New Left Review 26 (5), pp. 5-34.

Davis, M (2007), Planet of slums. London, Verso Publishing.

De León, J.C.V. (2006), Vulnerability: A conceptual and methodological review. SOURCE No. 4, Bonn, UNU - Institute for Environment and Human Security.

De Loe, R.C. and Kreutzwiser, R. (2000), Climate variability, climate change and water resource management in the Great Lakes. Climatic Change 45 (1), pp. 163-179.

Denzin, N. and Lincoln, Y.S. (Eds.) (2000), The handbook of qualitative research (2nd ed.). Thousand Oaks, Sage.

DFID (1999), Sustainable Livelihoods Guidance Sheets. London, Department for International Development. Available at: http://www.nssd.net/pdf/sectiont.pdf. 20.02.2011.

Dilley, M.; Chen, R.S.; Deichmann, U.; Lerner-Lam, A.L.; and Arnold, M. (2005), Natural disaster hotspots: A Global Risk Analysis. Washington, DC. World Bank Publications.

DiMP (2008), Weathering the storm: Participatory risk assessment for informal settlements. Cape Town, PeriPeri Publications.

Diriba, G. (1999), Concept of household food system. In: VAM Report Mozambique. Available at: http://www.wfp.org/operations/vam/country_experience/mozambique_vam. 15.04.2012.

Douglas, I.; Alam, K.; Maghenda, M.; Mcdonnell, Y.; Mclean, L.; and Campbell, J. (2008), Unjust Waters: Climate change, flooding and the urban poor in Africa, Environment and Urbanization 20 (1), pp. 187-205.

Downing, T.E.; Butterfield, R.; Cohen, S.; Huq, S.; Moss, R.; Rahman, A.; Sokona, Y.; and Stephen, L. (2001), Climate change vulnerability: Linking impacts and adaptation. Nairobi, Kenya, Governing Council of the United Nations Environment Programme.

Downing, T. (1991), Vulnerability to hunger and coping with climate change in Africa. Global Environmental Change 1 (5), pp. 365-380.

Drakakis-Smith, D. (1997), Third world cities: Sustainable urban development. Basic need and human rights. Urban Studies 34 (5), pp. 797-823.

Echeruo, M.J.C. (1977), Victorian Lagos: Aspects of nineteenth century Lagos Life. London, Macmillan Press.

ECLAC-IADB (2000), A matter of development: How to reduce vulnerability in the face of natural disasters. Seminar "Confronting Natural Disasters: A Matter of Development", New Orleans. 25th - 26th March.

Eldridge, C. (1997), Initial findings on the 1992 drought in Zambia, Malawi and Zimbabwe. Save the Children Fund - UK, Southern African Regional Office, Mbabane.

Encyclopedia Britannica (2010), Nigeria, Encyclopedia Britannica. Available at: http://www.britannica.com/EBchecked/topic//Nigeria. 15.04.2012.

Etuonovbe A.K. (2011), The devastating effect of flooding in Nigeria. Paper presented at the Bridging the Gap between Cultures. FIG Working week, Marrakech, Morocco. 18th - 22nd May. Available at: http://www.fig.net/resources/proceedings/fig_proceedings/fig2011/papers/ts06j/ts06j_etuonovbe_5002.pdf.

Etzioni, A. (1996), The new golden rule: Community and morality in a democratic society. New York, Basic Books.

Fagbemi K. (2011), Nigeria's national progress report on the implementation of the Hyogo Framework for Action (2009-2011). Preventionweb. Available at: http://www.preventionweb.net/english/hyogo/progress/reports/v.php?id=15560&pid:223. 10.02.2012.

Fernandez, J.S.M.; Bendimerad, F.; and Cardona, O.D. (2006), Application of indicators in urban and megacities disaster risk management: A case study of Metro Manila, Earthquakes and Megacities Initiative, Topical Report. Available at: http://www.preventionweb.net/files/MISReport.pdf. 10.03.2011.

Fernandez, M. (Ed.) (1999), Cities at risk: Environmental degradation, urban risks and disaster in Latin America, LA RED – The Network for Social Studies on Disaster, Lima.

Few, R. (2003), Flooding, vulnerability and coping strategies: Local responses to a global threat. Progress in Development Studies 3 (1), pp. 43-58.

Field, J. (2003), Social capital. London, Routledge.

Fischer, F. (2003), Reframing public policy: Discursive politics and deliberative practices. Oxford, Oxford University Press.

Flick, U. (1998), An Introduction to Qualitative Research. London, Sage.

Folorunsho, R. and Awosika, L.F. (2001), Flood Mitigation in Lagos, Nigeria through wise management of solid waste: A case of Ikoyi and Victoria Islands. Paper presented at the UNESCO-CSI workshop, Maputo. 19th – 23rd November.

Folke, C.; Carpenter, S.R.; Elmqvist, T.; Gunderson, L.H.; Holling, C.S.; Walker, B.H.; Bengtsson, J.; Berkes, F.; Colding, J.; Danell, K.; Falkenmark, M.; Gordon, L.; Kaspersson, R.; Kautsky, N.; Kinzig, A.; Levin, S.A.; Moberg, F.; Ohlsson, L.; Olsson, P.; Ostrom, E.; Reid, W.; Rockstrom, J.; Savenije, S.; and Svedin, U. (2002), Resilience and sustainable development: Building adaptive capacity in a world of transformations. ICSU Series on science for sustainable development, No. 3. International Council for Science, Paris.

Fourchard, L. (2003), Urban slums reports: The case of Ibadan, Nigeria. Understanding slums: Case studies for the Global Report on Human Settlements. Institut Francais de Recherche en Afrique (IFRA), University of Ibadan, Nigeria. Available at: http//www.ucl.ac.ukdpu projectsGlobal_ReportpdfsIbadan.pdfIbadan. 10.04.2011.

Franklin, S. and Downing, T. (2004), Resilience and vulnerability. Poverty and vulnerability programme: GECAFS project, Stockholm Environmental Institute. Available at: http://www.gecafs.org. 15.04.2011.

Friedman, D. (1996), Community: Just what is all the talk about? Metropolis. Available at: http://www.metropolismag.com/html. 10.09.2010.

Füssel, H.S. and Klein, R.J.T. (2006), Climate change vulnerability assessments: An evolution of conceptual thinking. Climatic Change 75 (3), pp. 301-329.

Gale, D. (1979), Middle class resettlement in older urban neighborhoods. Journal of the American Planning Association 45 (3), pp. 293-304.

Gandy, M. (1996), Crumbling land: the post modernity debate and the analysis of environmental problems. Progress in Human Geography 20 (1), pp. 23-40.

George, C.K. (2010), Challenges of Lagos as a megacity. AllAfrica, Lagos. Available at: http://allafrica.com/stories/201002221420.html.

Gilbert, A. (2007), The Return of the Slum: Does Language Matter? International Journal of Urban and Regional Research 31 (4), 697-713.

Gittell, R.J. and Vidal, A. (1999), Community organizing: Building social capital as a development strategy. Thousand Oaks, Sage.

Glavic, S.; Hastings, P.; and Childs, I. (2003), Demographic projection as a tool for analyzing trends of community vulnerability. Australian Journal of Emergency Management 18 (3), pp. 9-19.

Godschalk, D. (2003), Urban hazard mitigation: Creating resilient cities. Natural Hazards Review 4 (3), pp. 136-143.

Grothmann, T. and Reusswig, F. (2006), People at risk of flooding: Why some residents take precautionary caution while others do not? Natural Hazards 38 (1), pp. 101-120.

Gugler, K. (2003), Corporate governance and investment. International Journal of the Economics of Business 10 (3), pp. 261-289.

Gwary, D. (2008), Climate change, food security and Nigeria agriculture. Workshop on the challenges of climate change for Nigeria, NISER. 19th - 20th May.

Haque, C.E. and Etkin, D. (2007), People and community as constituent parts of hazards: The significance of societal dimensions in hazards analysis. Natural Hazards 41 (2), pp. 271-282.

Haque, C.E. and Burton, I. (2005), Adaptation options strategies for hazards and vulnerability mitigation: An international perspective. Mitigation and Adaptation Strategies for Global Change 10 (3), pp. 335-353.

Hardoy, J. E. and D., Satterthwaite (1989), Squatter Citizen: Life in the urban third world. London, Earthscan.

Hardoy, J.E.; Mitlin, D.; and Satterthwaite, D. (2001), Environmental problems in an urbanizing world. London, Earthscan.

Hart, K. (2006), Bureaucratic form and the informal economy. In: Guha-Khasnobis, B.; Kanbur, R.; and Ostrom, E. (Eds.). Linking the formal and informal economy: Concepts and Policies. Oxford, Oxford University Press, pp. 1-18.

Hauger, M.B.; de Roo, C.; Geldof, G.D.; and Mikkelsen, P.S. (2003), Whitepaper on Risk Perception, Risk Assessment and Risk Management. In: The DayWater Context, Project under EU RTD 5th Framework Programme. WP4 / T 4.1 / D 4.1 – CO. Available at: http://daywater.enpc.fr/www.daywater.org/REPORT/D4-1-Whitepaperrisk.Pdf.

Hewitt, K. (1997), Regions of risk: A geographical introduction to disasters. Essex, Addison Wesley Longman.

Hewitt, K. (2002), Natural Hazards. In: Munn, T. (Ed.). Encyclopedia of Global Environmental Change, vol. 3. Chichester, John Wiley, pp. 479-493.

Hogan, D.J. and Marandola, E. (2005), Toward an interdisciplinary conceptualization of vulnerability. Population, Space and Place 11 (6), pp. 455–471.

Holling, C. (1995), "What Barriers? What Bridges?"In: Barriers and Bridges to the Renewal of Ecosystems and Institutions. Edited by L. Gunderson; C. S. Holling; and S. Light. New York, Columbia University Press.

Holling, C.S. and Meffe, G.K. (1996), Command and control and the pathology of natural resource management. Conservation Biology 10 (2), pp. 328-337.

Höppe, P. and Pielke, R., Jr. (Eds.) (2006), Workshop on climate change and disaster losses: Understanding and attributing trends and projections. Final Workshop Report, Hohenkammer, Germany. 25th - 26th May. Available at: http://sciencepolicy.colorado.edu/sparc/research/projects/extreme_events/munich_workshop/workshop_report.html. 23.10.2010.

Huchzermeyer, M. (2003), Housing for the poor. Negotiated housing policy in South Africa. Habitat International 25 (3), pp. 303-331.

Huq. S.; Kovats, S.; Reid, H.; and Satterthwaitte, D. (2007), Editorial: Reducing Risks to Cities from Disasters and Climate Change. Environment and Urbanization 19 (1), pp. 3 – 15.

Huq, S.; Karim, Z.; Asaduzzaman, M.; and Mahtab, F. (1999), Vulnerability and adaptation to climate change in Bangladesh. Dordrecht, Kluwer Academic Publishers.

Ibem, E.O. (2011), Challenges of disaster vulnerability reduction in Lagos megacity area, Nigeria. Journal of Disaster Prevention and Management 20 (1), pp. 27-40.

IFRC (2001), World Disasters Report 2001: Focus on Recovery. Geneva, International Federation of Red Cross and Red Crescent Societies, pp. 9-33.

IPCC (2012), Summary for policymakers. In: Fields, C.B.; Barros, V.; Stocker, T.F.; Qin, D.; Dokken, D.J.; Ebi, K.L.; Mastrandrea, M.D.; Mach, K.J.; Plattner, G.K.; Allen, S.K.; Tignor, M.; and Midgley, P.M. (Eds.). Managing the risks of extreme events and disasters to advance climate change adaptation: a special report of the working groups I and II of the Intergovernmental Panel on Climate Change. Cambridge, Cambridge University Press.

IPCC (2007), Climate change: the physical science basis. In: Solomon, S.; Qin, D.; Manning, M.; Chen, Z.; Marquis, M.; Averyt, K.B.; Tignor, M.; Miller, H.L.: Contribution of working group 1 to the fourth assessment report of the Intergovernmental Panel on Climate Change. Cambridge, Cambridge University Press.

IPCC (2007a), Synthesis report: Contribution of working groups I, II and III to the fourth assessment report of the Intergovernmental Panel on Climate Change. Geneva, Switzerland.

IPCC (2007b), Industry, Settlement and Society. In: Parry, M.L.; Canziani, O.F.; Palutikof, J.P.; van der Linden, P.J.; and Hanson, C. E. (Eds.). Impacts, adaptation and vulnerability: Contribution of working group II to the fourth assessment report of the Intergovernmental Panel on Climate Change. Cambridge, Cambridge University Press.

IPCC (2001), Climate Change 2001: Impacts, adaptation, and vulnerability. Cambridge, Cambridge University Press.

IRIN Africa (2009), Lagos, the mega-city of slums. IRIN. Available at: http://www.irinnews.org/Report.aspx/Report. 14.06.2010

Jaeger, C.; Carlo, C.; Renn, O.; Rosa, E. A.; and Webler, T. (2001), Risk, uncertainty and rational action. London, Routledge.

Jiboye, A.D. (2011), Shelter for the urban homeless: The challenge for sustainable cities development in Nigeria. The Built & Human Environment Review 4 (2), pp. 14-21.

Jiboye, A.D. and Omoniyi, S.S. (2010), Environmental sustainability and urban growth in Nigeria. Journal of Environmental Research and Policies 5 (1), pp. 43-50.

Jones, B. (2004), The Geography of Vulnerability: Who is at risk to multiple hazards in greater Vancouver, British Columbia, Canada? PhD thesis, University of Waterloo, Canada.

Jones, B. and D. Shrubsole (2001), The link between vulnerability and assessment criteria: Preliminary exploration of the promise and reality. Emergency Preparedness Guide, Canada.

Jones, R.N. and Preston, B.L. (2011), Adaptation and risk management. WIREs Climate Change 2 (2), pp. 296-308.

Kamanga, L. (2003), From everyday hazards to disasters: The accumulation of risk in urban areas. Environment & Urbanization 15 (1), pp. 193-204.

Kasperson, J.X.; Kasperson, R.E.; and Turner B.L. (1995), Regions at risk: Comparisons of threatened environments. Tokyo, United Nations University Press.

Kasperson, R.E.; Dow, K.; Archer, E.; Caceres, D.; Downing, T.; Elmqvist, T.; Eriksen, S.; Folke, C.; Han, G.; Iyengar, K.; Vogel, C.; Wilson, K.; and Ziervogel, G. (2005), Vulnerable people and places. In: Hassan, R.; Scholes, R.; and Ash, N. (Eds.), Ecosystems and human well-being. Current State and Trends 1. Island Press, Washington DC, pp. 143-164.

Kates, R.W. (1971), Natural hazard in human ecological perspective: Hypotheses and models. Economic Geography 47 (3), pp. 438-51.

Kelly, P. and Adger, W. (2000), Theory and practice in assessing vulnerability to climate and facilitating adaptation. Climatic Change 47 (4), pp. 325-352.

Khandlhela, M. and May, J. (2006), Poverty, vulnerability and the impact of flooding in the Limpopo Province, South Africa. Natural Hazards 39 (2), pp. 275-287.

Kibwana, K. (2000a), Land Tenure, Spontaneous Settlement and Environmental Management in Kenya. In: Wanjala, S. C. (ed.), Essays on Land Law. The Reform Debate in Kenya, Faculty of Law, University of Nairobi, pp. 105-136.

King, D. and Macgregor, C. (2000), Using social indicators to measure community vulnerability to natural hazards. The Australian Journal of Emergency Management 15 (3), pp. 52-57.

Klein, R.J.T. and Nicholls, R.J. (1999), Assessment of coastal vulnerability to climate change. Ambio 28 (2), pp. 182-187.

Knox, P.L. (1989), The vulnerable, the disadvantaged and the victimized: Who are they and where they live? In: Herbert, D.T. and Smith, D.M. (Eds.). Social problems and the city: New perspectives. Oxford, Oxford University Press, pp. 32-47.

Korff, R. and Rothfuß, E. (2009), Urban revolution as catastrophe or solution? Governance of megacities in the Global South. Die Erde 140 (4), pp. 355-370.

Kreibich, V. (2010), Metropolis: Our common future in the urban age? An introduction. Keynote paper presented at the 'Our Common Future' Conference of the Volkswagen and Mercator Foundations, Hannover-Essen. 2nd – 6th November. Available at: http://www.ourcommonfuture.de/fileadmin/user_upload/dateien/Reden/Kreibich_Session11_Opening_Notes.pdf. 12.08.2011

Lagos State Government (2009), Bureau of statistics: Lagos GDP Reaches N3.5 Trillion. Daily Trust. Available at: http://allafrica.com/stories/html. 02.01.2010.

Lagos State Government (2011), Bureau of statistics, Ministry of Economic Planning and Budget, Lagos.

Lavell, A. (2010), Unpacking climate change adaptation and disaster risk management: Searching for the links and the differences: a conceptual and epistemological critique and proposal. International Union for Conservation of Nature - Latin American School of Social Sciences. Bogota, Colombia.

Lee, S.Y.; Dunn, R.J.K.; Young, R.A.; Connolly, R.M.; Dale, P.E.R.; Dehayr, R.; Lemckert, C.J.; Mckinnon, S.; Powell, B.; Teasdale, P.R.; and Welsh, D.T. (2006), Impact of urbanization on coastal wetland structure and function. Austral Ecology 31 (2), pp. 149-163.

Leichenko, Robin M. and Karen, L. O'Brien (2002), "The Dynamics of Rural Vulnerability to Global Change: The case of southern Africa." Mitigation and Adaptation Strategies for Global Change 7 (1) pp. 1–18.

Lewis, D. and Mioch, J. (2005), Urban vulnerability and governance. Journal of Contingencies and Crisis Management 13 (2), pp. 50-53.

Lindell, M. K. and R. W. Perry (2000), Household adjustment to earthquake hazard: A review of research. Environment and behaviour 32 (4), pp. 461 – 501.

Lohnert, B. (Ed.) (2007), Social networks: Potentials and constraints: Indications from South Africa. Verlag für Entwickungspolitik, Saabrücken, pp. 73-113.

Lloyd, P. (1979), Slums of Hope? Shanty towns of the third world. Manchester, Manchester University Press.

Mantua, N.; Tohver, I.; and Hamlet, A.F. (2010), Climate change impacts on streamflow extremes and summertime stream temperature and their possible consequences for freshwater salmon habitat in Washington State. Climatic Change 102 (1), pp. 187-223.

Marcuse, P. (2000), "Cities in Quarters." In: Watson, Sophie and Gary, Bridge (eds). A Companion to the City. Oxford, Blackwell Publishers, pp. 270-281.

Marcuse, R. and Wilkinson, J. (2002), Whose Poverty Matters? Vulnerability, social protection and PRSPs. London, Childhood Poverty Research and Policy Centre.

Marris, P. (1961), Slum Clearance and Family Life in Lagos, London University Press.

Matsimbe, Z. (2003), The role of local institutions in reducing vulnerability to recurrent natural disasters and in sustainable livelihoods development: Búzi, Mozambique. Available at: http://www.fao.org/3/a-ae079e.pdf.

McGranahan, G.; Pedro, J.; Jacob, S.; Charles, S.; and Marianne, K. (2001), The citizens at risk: From urban sanitation to sustainable cities. London, Earthscan.

Mehta, M.D. (1995), Environmental risk: A macrosociological perspective. In: Mehta, M.D.; Ouellet, E. (Eds.). Environmental Sociology: Theory and Practice. North York, Captus Press, pp. 185-202.

Mileti, D. (1999), Disasters by design: A reassessment of natural hazards in the United States. Washington DC, Joseph Henry Press.

Mileti, Dennis and Lori, Peek (2001), Hazards and sustainable development in the United States. Risk Management 3(1), pp. 61 – 70.

Mills, E. (2005), Insurance in a climate of change. Science 309 (5737), pp. 1040-1044.

Ministry of Economic Planning and Budget (2010), Urban and regional planning division. Ikeja, Lagos State Government.

Mitchell, J.K. (2005), Urban disasters as indicators of global environmental change: Assessing functional varieties of urban vulnerability. Earth system science in the anthropocene. Berlin, Springer Verlag, pp. 132-152.

Mitchell, J.K. (2008), Perspectives on alternatives: Differentiation and integration in pursuit of a better fit between society and nature. Progress in Human Geography 32 (3), pp. 451-458.

Mitchell, T. (2003), An operational framework for mainstreaming disaster risk reduction. Disaster Studies Working Paper 8, London, Benfield Hazard Research Centre, University College London.

Monica, Morris-Oswald (2007), The social construction of vulnerability to flooding: Perspectives and values from the Red River Basin. A thesis Submitted to the Natural Resources Institute, University of Manitoba.

Mustafa, D. (2005), The production of an urban hazardscape in Pakistan: Modernity, vulnerability, and the range of choice. Association of American Geographers 95 (3), pp. 566-586.

Nakamura, T.; Hutton, C.; Kunbao, X.; Gavidia, J. (2001), Assessment of vulnerability to flood impacts and damages, Nairobi, Kenya, United Nations Centre for Human Settlements.

Napier, M. (2002), Informal settlement integration, the environment and sustainable livelihoods in sub-Saharan Africa. Paper presented at the conference “Improving post-disaster reconstruction in developing countries”. Montreal, University of Montreal. 23rd - 25th May.

National Emergency Management Agency (2011), National Disaster Management Framework (NDMF). Available at: http://www.preventionweb.net/files/nigherianationaldisastermanagementf.pdf. 20.07.2013.

National Bureau of Statistics (2005), Social Statistics in Nigeria. Abuja, National Bureau of Statistics.

Nawagamuwa, A. and Viking, N. (2003), Slums, squatter areas and informal settlements: Do they block or help urban sustainability in developing contexts? Paper presented at the 9th international conference on Sri Lanka Studies. Matara, Sri Lanka. 28th - 30th November.

Nchito, W.S. (2007), Flood risk in unplanned settlements in Lusaka. Environment and Urbanization 19 (2), pp. 539-551.

NDMF (2012), Nigerian National Disaster Management Framework: A policy framework for disaster risk management in Nigeria. Available at: http://www.preventionweb.net/english/hyogo/gar/2011/en/bgdocs/hfa/_nga_NationalHFAprogress_2009.pdf. 20.07.2013

Nelson, S.A. (2006), River systems and causes of flooding. New Orleans, Tulane University.

Nigerian Muse (2007), Errors, miscalculations, omissions in Lagos census figures. Available at: http://www.nigerianmuse.com/20070207234037zg/sections/important documents/document-errors-miscalculations-omissions-in-lagos-census-figures. 04.03.2010.

Nomdo, C. and Coetzee, E. (2002), Urban vulnerability: Perspectives from Southern Africa. Oxford, Oxfam and Periperi Publishing.

Neekhra, V. (2008), Growing Vulnerability Crisis: Will slums ever reduce or improve? In: Kidokoro, T.; Okata, J.; Matasumura, S.; and Shima, N. (Eds.). Vulnerable cities: realities, innovations and strategies. Tokyo, Springer, pp. 77-104.

Nwokoro, I. I. (2005), Environmental health inequalities of women in metropolitan Lagos: A spatio-temporal analysis. A Ph.D. thesis presented to the Department of Urban and Regional Planning, University of Ibadan, Nigeria.

O'Brien, K.L. (2009), Do values subjectively define the limits to climate change adaptation? In: Adger, W.N.; Lorenzoni, I.; and O'Brien, K.L. (Eds.). Adapting to climate change. Values, thresholds, governance. Cambridge, Cambridge University Press, pp. 164-180.

Oduwaye, L. (2009), Challenges of sustainable physical planning and development in metropolitan Lagos. Journal of Sustainable Development 2 (1), pp. 159-171.

Okude, A. and Ademiluyi, I. (2006), Implications of the changing pattern of land cover of the Lagos coastal area of Nigeria. American-Eurasian Journal of Scientific Research 1 (1), pp. 31-37.

Oladunjoye, A.O. (2005), Nigeria: Implementation of the sustainable cities programme in Nigeria. Localizing Agenda 21 Programme. Nairobi, Kenya, United Nations Programme for Human Settlements (UN-HABITAT). Available at: www.unhabitat.org/scp - http://ww w.unhabitat.org/la21. 10.02.2012.

Olanrewaju, D. and Fadairo, G. (2003), Flooding as an induced environmental problem: A case study of Ala River in Akure, Nigeria. Journal of Nigerian Institute of Town Planners 16 (1), pp. 85-96.

Oliver-Smith, A. (2004), Theorizing vulnerability in a globalized world: A political ecological perspective. In: Bankoff, G.; Frank, G.; and Hilhorst, D. (Eds.). Mapping vulnerability: disasters, development and people. London, Earthscan, pp. 10-25.

Oliver-Smith, A. (1996), Anthropological research on hazards and disasters. Annual Review of Anthropology 25 (1), pp. 303-28.

Oliver-Smith, A. (1998), Global changes and the definition of disaster. In: Quarentelli, E.L. (Ed.). What is a disaster? Perspectives on the question. London, Routledge, pp. 177-194.

Ologunorisa, E.T. (2004), An assessment of flood vulnerability zones in the Niger Delta, Nigeria. International Journal of Environmental Studies 61 (1), pp. 31-38.

Olomola, A.O. (1999), Historical preview of town planning in Lagos before 1929. In: Laseni, A.M. (Ed.). Urban and regional planning in Nigeria: A collection of readings. Nigerian Institute of Town Planners, Lagos.

Olorunfemi, F.B. (2008), Disaster incidence and management in Nigeria. Research Review 24 (2), pp. 1-23.

Olorunfemi, F.B. and Raheem, U.A. (2007), Urban development and environmental implications: The challenge of urban sustainability in Nigeria. The Australasian Review of African Studies 28, pp. 74-96.

Olukoju, A. (2008), Local and global dynamics in the transformation of the port city of Lagos since the nineteenth century. A paper presented at the international conference "On the Waterfront: culture, heritage and regeneration of port cities", Liverpool. 19th - 21st November. Available at: http://www.english-heritage.org.uk/publications/on-the-waterfront. 14.04.2012.

Olukoju, A. (1993), Population pressure, housing and sanitation in West Africa's premier port city, Lagos, 1900-1939. Journal of the Australian Association for Maritime History 15 (2), pp. 91-106.

Olukoju, A. (2003), Infrastructure development and urban facilities in Lagos, 1861-2000. Institut de Recherche francais en Afrique, Ibadan.

Omisore, E.O. and Akande, C.G. (2003), The roles of all tiers of government and non-governmental organizations (NGOs) in environmental conservation. In: Adekunle, V.; Okoko, E.; and Adeduntan, S. (Eds.). Proceedings of the conference on challenges of environmental sustainability in a democratic governance. Environment and Behavior Association of Nigeria, Lagos, Nigeria. 26th - 27th November.

Ostrom, E. (1999), Coping with tragedies of the commons: Annual review of Political Science 2, pp. 493-535.

Otchet, A. (1999), Lagos: The survival of the determined. UNESCO Courier. Available at: http://www.unesco.org/courier/1999_06/uk/dossier/txt13.htm. 15.07.2012.

Owei, O.B. and Ede, P.N (2010), The challenges of sustainable land use planning in Nigeria cities. The case of Port Harcourt. Paper presented at the 46th International Society of City and Regional Planners (ISOCARP) Congress. Nairobi, 19th – 23rd September.

Owusu, G. (2008), Indigenes and migrants access to land in peri urban areas of Ghana's largest city of Accra. International Development Planning Review 30 (2), pp. 177-198.

Pan American Health Organization, PAHO/WHO (2000), Principles of disaster mitigation in health facilities, Mitigation Series, Washington, D.C.

Pantelic, J.; Srdanovic, B.; and Greene, M. (2005), Postmodern urbanization and the vulnerability of the poor to natural disasters. Third urban research symposium, land development, urban policy and poverty reduction. Brasilia, Brazil. 4th - 6th April.

Parker, D.J. (2000), Floods. Oxfordshire, Routledge.

Parry, M. and Carter, T. (1987), Climate impact assessment: A review of some approaches. In: Wilhite, D.; Easterling, W.; and Wood, D. (Eds.). Planning for drought: toward a reduction of social vulnerability. Boulder, Westview Press, pp. 165-188.

Pawar, M. (2006), Social Capital. The Social Science Journal 43 (2), pp. 211-226.

Peil, M. (1991), Lagos: The city is the People. London, Belhaven Press.

Pelling, M. (Ed.) (2003), Natural disasters and development in a globalizing world. New York, Routledge.

Pelling, M.; High, C.; Dearing, J.; and Smith, D. (2008), Shadow spaces for social learning. A relational understanding of adaptive capacity to climate change within organizations. Environment and Planning 40 (4), pp. 867-884.

Pelling, M. and High, C. (2005), Understanding adaptation: What can social capital offer assessments of adaptive capacity? Global Environmental Change 15 (4), pp. 308-319.

Peltonen, L. (2006), Coping capacity and adaptive capacity. Centre for urban and regional studies. Helsinki University of Technology, Finland. Available at: www.gtk.fi/slr/article.php. 18.11.2012.

Pender, J. and P., Hazell. (2000), Promoting Sustainable Development in Less-Favored Areas: Overview. Brief 1 in J. Pender and P. Hazell (eds.), Promoting Sustainable Development in Less-Favored Areas. 2020 Vision Initiative, Policy Brief Series, Focus 4. Washington, DC, International Food Policy Research Institute.

Phillips, B.D. and Fordham, M. (2009), Introduction: Chapter 1. In B.D. Phillips; D.S.K. Thomas; A. Fothergill; and L. Blinn-Pike (Eds). Social vulnerability to disasters. CRC Press, Boca Raton, Florida.

Polsky, C.; Neff, R.; and Yamal, B. (2007), Building comparable global change, vulnerability assessments: The vulnerability scoping diagram. Global Environmental Change 17 (3), pp. 472-485.

Pratrap, S. and E., Quintin (2006), The informal sector in developing countries: output, assets and employment. WIDER research paper 130, UNU – WIDER, Helsinki.

Prowse, M. (2003), Towards a clearer understanding of vulnerability in relation to chronic poverty. Chronic Poverty Research Centre Working Paper No 24. Manchester, Chronic Poverty Research Centre.

Pullen, G. (1966), Some problems of rapid urbanization in Lagos, Nigeria. Tropical Geography 23, pp. 55-61.

Putnam, R.D. (1995), Bowling alone: America's declining social capital. Journal of Democracy 6 (1), pp. 65-78.

Putnam, R. (2000), Bowling alone: The collapse and revival of American community. New York, Simon & Schuster.

Putnam, R. (1998), Social capital: Its importance to housing and community development. Foreward. Housing Policy Debate 9 (1), pp. 5-8.

Rakodi, C. (2002), A livelihoods approach: Conceptual issues and definitions. In: Rakodi, C.; and Lloyd-Jones, T. (Eds.). Urban livelihoods: A people centred approach to reducing poverty. London, Earthscan, pp. 3-22.

Ravallion, M. and Wodon, Q. (1997), Poor areas, or only poor people? Journal of Regional Science 39 (4), pp. 689-711.

Renn, O. (2008), Risk Governance: Coping with uncertainty in a complex world. London, Earthscan.

Rudd, M.A. (2000), Live long and prosper: Collective action, social capital and social vision. Ecological Economics 34 (1), pp. 131-144.

Sada, P. and Odemerho, F. (1988), Environmental issues and management in Nigeria development. Ibadan, Evans Brothers.

SADC and FANR (2000), Proceedings of the high level vulnerability assessment technical consultation meeting. Southern African Development Community and Food, Agriculture and Natural Resources Sector Development Unit. Kariba, Zimbabwe. 25th - 28th September.

Sandman, P.M. (1989), Hazard versus outrage in the public perception of risk. In: Covello, V.T.; Mccallum, D.B.; and Pavlova, M.T. (Eds.). Effective risk communication: The role and responsibility of government and nongovernment organizations. New York, Plenum Press, pp. 45-49.

Sangeeta, P.; and Quintin, E. (2006), Are labor markets segmented in developing countries? A semiparametric approach. European Economic Review 50 (7), pp. 1817-1841.

Satterthwaite, D. (2011), What role for low-income communities in urban areas in disaster risk reduction? Background paper to the 2011 global assessment report on disaster risk reduction, Geneva, pp. 16 – 17. Available at: http://www.preventionweb.net/english/hyogo/gar/backgroundpapers. 18.11.2012.

Satterthwaite, D.; Huq, S.; Pelling, M.; Reid, H.; Romero, L. P. (2007), Adapting to climate change in urban areas, the possibilities and constraints in low- and middle-income nations. Human settlements discussion paper series. Climate Change and Cities No. 1, London, International Institute for Environment and Development.

Satterthwaite, D. (2009), The implications of population growth and urbanization for climate change. Environment and Urban 21 (2), 545-567.

Schusler, T. M.; D. J. Decker; and M. J. Pfeffer. (2003), Social learning for collaborative natural resource management. Society and Natural Resources 15, pp. 309 – 326.

Shrubsole, D. (2007), from structures to sustainability: A history of flood management strategies in Canada. International Journal of Emergency Management 4 (2), 183 – 196.

Scoones, I. (1996), Hazards and opportunities: Farming livelihoods in dryland Africa: Lessons from Zimbabwe. London, Zed Books.

Sen, A. (1981), Poverty and famines: An essay on entitlement and deprivation. Oxford, Clarendon Press.

Siegel, P.B. and Alwang, J. (1999), An asset-based approach to social risk management: A concept approach. Social protection discussion paper 9926. Washington DC, The World Bank. Available at: www.worldbank.org/sp. 17.09.2015

Singh, R. (2009), Wastewater problems and social vulnerability in Megacity Delhi, India. Department of Geography, University of Cologne, Cologne.

Smit, B. and Wandel, J. (2006), Adaptation, adaptive capacity and vulnerability. Global Environmental Change 16 (3), pp. 282-292.

Smith, A. (2004), Theorizing vulnerability in a globalized world: A political ecological perspective. In: Bankoff, G.; Frerks, G.; and Hilhorst D. (Eds.). Mapping vulnerability: Disasters, Development and People. London and Sterling, Earthscan, pp. 10-24.

Soto, H.d. (1990), The Other Path: the invisible revolution in the third world. New York, Perennial Library.

Stern, N. (2007), Economies of climate change: Stern Review. Cambridge, Cambridge University Press. Available at: http://mudancasclimaticas.cptec.inpe.br/~rmclima/pdfs/destaques/sternreview_report_complete.pdf.

Sumarto, S.; Suryahadi, A.; and Pritchett, L. (2003), Safety nets or safety ropes? Dynamic benefit incidence of two crisis programs in Indonesia. World Development 31 (7), pp. 1257-1277.

Susman, P.; O'Keefe, P.; and Wisner, B. (1983), Global disasters: A radical interpretation. In: Hewitt, K. (Ed.). Interpretations of Calamity from the viewpoint of human ecology. Boston, Allen & Unwin, pp. 263-283.

Tierney, K.J.; Lindell, M.K.; and Perry, R.W. (2001), Facing the unexpected: Disaster preparedness and response in the United States. Washington, Joseph Henry Press.

Timmerman, P. (1981), Vulnerability, resilience and the collapse of society: A review of models and possible climatic applications. Environmental Monograph 1. Institute of Environmental Studies, Toronto, University of Toronto.

Tipple, Graham (2005), Housing and urban vulnerability in rapidly developing cities. Journal of Contingencies and Crisis Management 13 (2), pp. 66-75.

Tobin, G.A. and Montz, B.E. (1997), Natural hazards: Explanation and integration. New York, Guilford Publishing.

Tschakert, P. (2007), Views from the vulnerable: Understanding climatic and other stressors in the Sahel. Global Environmental Change 17 (4), pp. 381 – 396.

Tudawe,I. (2002), Chronic Poverty and Development Policy in Sri Lanka: Overview Study CPRC Working Paper No. 9, Institute for Development Policy and Management, University of Manchester.

Ujoh, F.; Kwabe, I.D.; and Ifatimehin, O. (2010), Understanding urban sprawl in the federal capital city, Abuja: Towards sustainable urbanization in Nigeria. Journal of Geography and Regional Planning 3 (5), pp. 106-113.

UNCHS (Habitat) (2001), Cities in a Globalizing World, Global Report on Human Settlements. London. Earthscan.

UNDP (1997), Human Development Report. New York, Oxford University Press.

UNDP (2012), Fighting climate change: Human solidarity in a divided world. New York, UNDP, pp. 166-168.

UN-HABITAT (2003), The challenge of slums: Global report on human settlements, United Nations Human Settlements Programme. London, Routledge.

UN-HABITAT (2003b), Slums of the world: the face of urban poverty in the new millennium. Nairobi, UN-HABITAT.

UN-HABITAT (2014), The state of African cities, 2014: reimagining sustainable urban transitions. Nairobi, UN Habitat.

UN-HABITAT (2006a), The state of the World's Cities: The Millennium Development Goals and urban sustainability: 30 years of shaping the habitat agenda. London, Earthscan.

UN-HABITAT (2008a), The state of African cities: A framework for addressing urban challenges in Africa. UN-HABITAT, Nairobi, Kenya.

UN-HABITAT (2011), Cities and climate change: Global report on human settlements 2011. London and Washington DC, Earthscan.

United Nations (2011), Department of economic and social affairs, population division: World Population Prospects: The 2010 revision, New York.

UNISDR (2002), Living with Risk: A global review of disaster reduction initiatives, UN Interagency Secretariat for the International Strategy for Disaster Reduction, Geneva. Available at: http://www.adrc.asia/publications/LWR/LWR_pdf/index.pdf.

UNISDR (2007), Building disaster resilient communities: Good practices and lessons learnt. United Nation, Geneva. Available at: www.unisdr.org/we/inform/publications/596. 17.09.2015.

UNISDR (2004), Terminology: basic terms of disaster risk reduction. UNISDR, Geneva.

Valdivia, C.; Gilles, J.L.; Jetté, C.; Quiroz, R.; and Espejo, R. (2003), Coping and adapting to climate variability: The role of assets, networks, knowledge and institutions. In: Insights and tools for adaptation: Learning from climate variability. NOAA office of global programs. Climate and Societal Interactions, Washington DC, pp. 189-199.

Van Dillen, S. (2002), A measure of vulnerability. Geographica Helvetica 57 (1), pp. 64-77.

Vogel, C. (1998), Vulnerability and global environmental change. Land Use Cover Change Newsletter 3, pp. 15-19.

Waley, P. (2005), The vulnerability of cities: Natural disasters and social resilience. Geographical Journal 171, pp. 190-191.

Wang, J.; Pei-jun S.; Xiang-sheng, Y.; Hui-cong, J.; and Lai-yin, Z. (2008), The regionalization of urban disasters in China. Natural Hazards 44 (2), pp. 169-179.

Warmsler, C. (2005), Managing urban risk: perceptions of housing and planning as a tool for reducing disaster risk, Global Business and Economics Review 4 (2), pp. 11-28.

Warner, K. (2007), "Perspectives on social vulnerability: Introduction". In: K. Warner (Ed.), Perspectives on social vulnerability. Bonn: Studies of the University, Research, Counsel, Education (SOURCE) No. 6, pp. 14-22.

Watts, M. and Bohle, H.G. (1993), The space of vulnerability: the causal structure of hunger and famine. Progress in Human Geography 17 (1), pp. 43-67.

Watts, M. (1983), On the theory of poverty: Natural hazards research in context. In: Hewitt, K. (Ed.). Interpretations of calamity from the viewpoint of human ecology. Boston, Allen & Unwin, pp. 229-260.

Watts, M. (2002), Hours of darkness: vulnerability, security and globalization. Geographica Helvetica 57 (1), pp. 5-18.

Wenzel, F.; Bendimerad, F.; and Sinha, R. (2007), Megacities – Megarisks. Natural Hazards 42 (3), pp. 481-491.

Whitehead, J. (2007), Anatomy of a disaster: The neo liberal state in Mumbai's 2005 floods. Focaal 49, pp. 81-98.

Williams, B.A. and Walsh, A.H. (1968), Urban government for metropolitan Lagos. New York, Praeger Publishers.

Wilches-Chaux, G. (1993), La Vulnerabilidad Global. In: Maskrey, A. Los Desastres No Son Naturales. La RED. Tercer Mundo Editores, Botoga. Available at: http://www.desenredando.org/public/libros/1993/ldnsn/index.html. 14.04.2011.

Winchester, P. (1992), Power, choice and vulnerability: A case study of disaster mismanagement in South India. London, James & James Science Publishers.

Wisner, B.; Gaillard, J.C.; and Kellman, I. (Eds.) (2011), Handbook of hazards and disaster risk reduction. London, Routledge.

Wisner, B.; Blaikie, P.; Cannon, T.; and Davis, I. (2004), At risk: natural hazards, people's vulnerability and disasters (2nd ed.). London, Routledge.

Wisner, B. (1993), Disaster vulnerability: Scale, power and daily life. GeoJournal 30 (2), pp. 127-140.

Woodward, A. and Scheraga, J.D. (2003), Looking to the future: Challenges for scientists studying climate change and health. In: McMicheal, A.; Campbell-Lendrum, D.; Corvalán, C.; Ebi, K.; Githeko, A.; Scheraga, J.; and Woodward, A. (Eds.): Climate Change and Human Health. Geneva, World Health Organization, pp. 61-78.

Woolcock, Michael (1998), Social capital and economic development: Toward a theoretical synthesis and policy framework. Theory and Society 27 (2), pp. 151-208.

Yodmani, S. (2001), Disaster risk management and vulnerability reduction: Protecting the poor. Paper presented at the Social Protection Workshop: Protecting community's social funds and disaster management, Manila. 5th - 9th February. Available at: http://unpan1.un.org/intradoc/groups/public/documents/apcity/unpan025924.pdf.

Yohe, G. and Toll, R.S.J. (2002), Indicators for social and economic coping capacity: Moving toward a working definition of adaptive capacity. Global Environmental Change 12 (1), pp. 25-40.

Yucemen, M.S. (2005), Probabilistic assessment of earthquake insurance rates for Turkey. Natural Hazards 35 (2), pp. 291-313.

Zeller, M.S. (2000), Many borrow, more save, and all insure: Implications for food and micro finance policy. Food Policy 25 (2), pp. 143-167.

Zoleta-Nantes, D. (2002), Differential impacts of flood hazards among the street children: The urban poor and residents of wealthy neighborhoods in metro Manila, Philippines. Mitigation and Adaptation Strategies for Global Change 7 (3), pp. 239-266.

APPENDIX

APPENDIX 1: QUESTIONNAIRE

Introduction:

I am……., we have come for a survey for Mr. Innocent`s PhD research on vulnerability to flood. To understand how you manage with the flood situation. The information collected from you will be used mainly for academic purpose.

Interviewer		
Exact id of study site:		
Date of the interview		
Starting time of the interview:		
House Information (Through observation)	*Distance of house from drainage, canal or lagoon*	*1. < 2m 2. >2m and above*
	Construction Type	*1.Bamboo, 2.wood, 3.cement 4.mud, 5. Cartoon, 6. others*

a. Personal Information of the interviewed household

1.01	How many persons live with you for more than six months a year and eat with you from the same dish?	Number of persons and their respective ages

1.02	*Position of the household member*	*Age in years*	*Sex*	*Marital status*	*highest educational qualification*	*Occupation*
Legend	*1.head of household* *2. wife/husband*		*1 male* *2 female*	*1. married* *2 divorced* *3 widow* *4 single*	*1. Primary Education* *2.Secondary School Education* *3. University education* *4. Illiterate*	*1. Trading/business,* *2. Fishing* *3 Driving* *4.Security guard,* *5. Civil Servant* *6. Housewife* *7. No work* *8. Retired*

2.0 Dimensions of experienced floods:

2.01	How many times did flood water enter your house since you live here?	times
2.02	How high did the water reach in your house from the floor at that year?	[metre]
2.03	How long did the flood water usually stay in your house?	[days] [weeks] [months]

3.0 Flood forecast

3.01	*Do you usually get a flood forecast in yaour area?*	*1 Yes 2 No*
3.02	*If yes: How many days did you get the information before flood reached your area?*	*days before*
3.03	*How did you get the information that the flood will come?*	*1. Newspaper, 2. Radio, 3. TV, 4 neighbours, 5.Friends, 6. Relatives, 7. community leaders 8. Other*
3.04	*Was that information important for you?*	*1. very important. 2. important, 3. Little important. 4 Not important*

4.01	*Do members of your household get ill because of flood, e.g. having diarrhoea, cholera, fever*	*1 Yes 2 No*
4.02	*If yes: How many family members got ill?*	*Persons*

4.03	*Age of that family member*	*What kind of disease did s/he get? Fever, diarrhoea, typhoid, cholera etc. [write disease]*	*How long was s/he ill [in days /weeks/months*	*How much money did you have to spend for medical treatment? [Naira]*
4.04	*Have you recorded any death in your household because of flood?*			*If yes, how many and their ages*

4.0 Effects on Health and Feeding

4.05	*Do the occurrence of flood affect the eating habit of*	*1. Yes 2. No*

	your household?	
4.06	*If yes, how*	*1. we did not cook* *2. it was very difficult to cook.* *3. It was a bit difficult to cook.* *4. Others*

5.0 Effects on Infastructure

5.01	*Do the occurrence of flood cause damages to your house / room?*	*1 Yes 2 No*
5.02	*If yes: How bad does the damage look like?*	*1. Beyond livebility 2.repairment needed 3.minor damage.*
5.03	*Was the damage repaired?*	*1 Yes 2 No*
5.04	*How much do you usually spend for repairs?*	*Naira*
5.05	*Who paid most of the money?*	*1.Myself 2.landlord 3.Government 4. NGO, 5. other*
5.06	*Did anyone help you to repair it (e.g. working time or with money or advice)?*	*1 Yes 2 No*
5.07	*If yes: Who helped you to repair the damage?*	*1.Neighbors, 2.relatives, 3.friends, 4.Government, 5.landlord, 6 NGO 7. Church*

6.0 Effects on Finances

6.01	*In situations of flood, do you continue with your job?*	*1 Yes 2 No 3. Yes, but less*
6.02	*If No, For how long?*	*Days/Weeks/Months*
6.03	*Which reason made you not to continue with your job?*	*1.working area flooded, 2.no scope to get to working place, 3.had to stay at home to take care of household, 4.illness. 5. other*
6.04	*Did your income decrease or increase during flood periods?*	*1.no income at all, 2.highly decrease, 3. some decrease, 4. no change, 5. increase.*
6.05	*Did you usually participate in any voluntary work during flood periods?*	*1 Yes 2 No*
6.06	*If Yes: What kind of voluntary work?*	*1. Relief distribution, 2. Medical treatment support, 3. Repairing of streets, 4. Enforce embankment, 5. Giving shelter, 6. Repair of houses.* *7. Other*

6.07	*What is your average monthly income?*	*Naira/month*
6.08	*Did you have any savings before flood usually occurs?*	*1 Yes 2 No*
6.09	*If yes: How much Naira did you have?*	*NGN*
6.10	*How much money did you have to take from your savings to overcome flood problems related?*	*NGN*

7.0 Coping measures of households

External help / relief distribution

7.01	*Did you usually get any relief distributions during flood events?*	*1 Yes 2 No*
7.02	*If yes: From whom do you get relief distribution? (multiple answers possible)*	*1.government, 2.NGOs, 3.private person , 4. private organizations, 5. church groups*
7.03	*What did you get? (multiple answers possible)*	*1. Pure drinking water, 2. food, 3. cloth, 4. money, 5.medicine*
7.04	*Was that relief of great help for you?*	*1.Yes, it was great help, 2.It was helpful, but little 3.it was far too small to be of any help.*
7.04	*If no: Why did you not get relief?*	*1. Nobody provided us. 2. We did not need it. 3. We did not ask/felt shy. 4. We could 5. Others*

8.0 Maintenance of livelihoods

Usage of social capital

8.01	*Did your household get any help – other than relief distributions - from other persons during that flood?*	*1 Yes 2 No*
8.02	*If Yes: Who provided what?*	*[answer below]*
8.03	*If no: Why did you not get any help?*	*1. Nobody provided us. 2. We did not need it. 3. We did not ask/felt shy. 4. Others*

Possible List of those who gave help		List what they gave
A	relatives in Lagos	
B	relatives outside Lagos	
C	friends in Lagos	
D	friends outside of Lagos	
E	neighbors	
F	landlord/employer	
G	private people	
H	working colleagues	
I	Church groups	
J	NGOs	
K	Others	

8.04	*Did you usually help other people during floods occurence?*	*1 Yes 2 No*
8.05	*If Yes: How many times did you help them during the flood or later?*	*1. one time, 2 sometimes, 3. often, 4. All the time*
8.06	*How do you oftenly help them during this flood period? {multiple answers possible}*	*1. food, 2. clothes, 3. GAVE money, 4. help to repair, 5. take care of children, 6. shelter, 7. advice 8. others*
8.07	*During the ocuurence of flood, are you oftenly disappointed from anybody from whom you expected support, but did not get it?*	*1 Yes 2 No*
8.08	*If yes: Who was that?* *Multiple answers possible*	*1.relatives in Lagos 2.relatives outside Lagos 3.neighbours, 4.friends in Lagos, 5.friends outside of Lagos, 6.patron at working place 7.landlord 8.NGO, 9.Government (multiple answers)*

9.0 Usage of financial capital

9.01	*Do you usually take loan during or after flood disaster?*	*1 Yes 2 No*
9.02	*If yes: From whom did you take the loan1?* *(three answers possible)*	*1. relatives in Lagos, 2.relatives outside Lagos 3.neighbours, 4.friends in Lagos, 5.friends outside of Lagos, 6.landlord 7. bank, 8.NGO, 9.*

		employer, 10. local moneylender, 11.ajoh group 12. Other
9.03	*How much Naira did you borrow?*	*Naira*
9.04	*At what interest rate?*	*_____%*
9.05	*What did you do with the loan? (three answers possible)*	*1. repair house, 2.buy food, 3.buy medicine, 4.went to doctor, 5.pay rent, 6.buy clothes, 7.by assets to work, 8.start small business, 9. Other*
9.06	*How much of the loan do you still have to repay?*	*Naira*
9.07	*If not "0 Naira" to repay: How long will it take you to repay the rest of the loan?*	*months*
9.08	*Did your household provide loan to anybody?*	*1 Yes 2 No*
9.09	*If yes: How much loan did you provide?*	*Naira*
9.10	*To whom did you provide that loan? (multiple answers possible)*	*1.relatives in Lagos, 2.relatives outside Lagos 3.neighbours, 4.friends in Lagos, 5.friends outside of Lagos, 6.landlord 7.others*

10.0 Usage of physical capital

10.01	*Did any of your household members have to leave the building because of the flood water?*	*1 Yes 2 No*
10.02	*If yes: How many members of your household had to leave the house because of the flood?*	*persons*
10.03	*Then, where did most of them go to?*	*1.Floodshelter/school 2.stayed on elevated road 3.at relatives house 4.on boat 5. on the roof of own house 6. Other*
10.04	*How long did they stay there?*	*days*

11.0 Preparations

11.01	*Did you store any dry food before the flood came?*	*1 Yes 2 No*
11.02	*If yes: What kind of dry food did you store?* *[multiple anwers possible]*	
11.03	*Did you organize material before the flood to protect your house from flood water?*	*1 Yes 2 No*
11.04	*If yes: What did you organize?* *[multiple anwers possible]*	*1. Sandbgas, 2. Bamboos, 3. Building shelves, 4. digging trenches, 5. Raising furnitures 6. others*

12.0 Present situation of the household

How often did you agree to the following statements during the last two weeks?

	Over the last two weeks	*All of the time*	*Most of the time*	*More than half of the time*	*Less than half of the time*	*Some of the time*	*At no time*
12.01	*I have felt cheerful and in good spirits*						
12.02	*I have felt calm and relaxed*						
12.03	*have felt active and vigorous*						
12.04	*I woke up feeling fresh and rested*						
12.05	*My daily live has been filled with things that interest me*						

13.0 Access to social resources

13.01	*If you need to borrow a substantial amount of money, say ……, to whom would you turn to? multiple answers possibles.*	*1.relatives in Lagos, 2.relatives outside Lagos 3.neighbours, 4.friends in Lagos, 5.friends outside of Lagos, 6.landlord 7. bank, 8.NGO, 9. employer, 10. local moneylender, 11. Ajoh group 12. others*
13.02	*If there is a problem in this neighborhood – struggle between two neighbors – who will intervene?* *(multiple answers possible)*	*1.Policer; 2.Landlord 3. Community Leader 4.the neighbors 5.nobody*

Membership in NGO or Common Initiative Group:

13.03	*Does your household participate with any NGO or CIG at present in this area?*	*1 Yes 2 No*
13.04	*For how long is your household a member?*	*Years*
13.05	*In which activity is that member involved?* *[three answers possible]*	*1. micro credit, 2.health, 3.education, 4. Others*
13.06	*How many relatives of you live here in this slum?*	*……relatives*
13.07	*How do you interact with your neighbors?* *(multiple answers possible)*	*1.dispute, 2.not at all, 3.gossip, 4.discuss personal problems, 5.work together, 6.help each other in difficult situations*
13.08	*How do you describe the relation to your neighbors:*	*1.Very good, 2.good, 3.fair, 4.bad/mistrust*
13.09	*Do you trust your neighbors in general in terms of lending and borrowing?*	*1. Very much, 2.some, 3.not at all.*
13.10	*Do you have friends with whom you can share your joys and sorrows?*	*1. Yes, many 2. Yes, some. 3. Yes, one. 4. Nobody*
13.11	*Do you think that if you support another person, he also will support you as to his/her ability?*	*1. Yes, 2. no 3.It depends*
13.12	*Do you think that if you give anything to the community, you also will benefit in the long run from the community?*	*1. Yes, 2. no 3.It depends*

14.0 Access to infrastructure

14.01	*Who is the owner of this house/land?*	*1. My Landlord, 2 government, 3.own house, 5.nobody*
14.02	*Do your house have any of this facilities?*	*1.Kitchen, 2.Bath*
14.03	*Do you have a toilet?*	*1. Yes, 2. No*
14.04	*If yes, which?*	*1. Pit latrine, Septic tank*
14.05	*Which source does your household use for drinking water?*	*1.Tap water, 2. Underground well 3. River 4. Others*
14.06	*How does your household dispose waste?*	*1. Open space, 2. Lagoon, 3. Burning 4. Road sides 5. Drainage 6. others*
14.07	*Do you think you move from this place within next one year?*	*1 Yes 2 No*
14.08	*If yes: Why are you going to move? {three answers possible}*	*1. Slum will be evicted by owner. 2. Slum will be evicted by government. 3.It is too expensive, 4.We do not like the house, 5.We do not get along with neighbors, 6.we move to a place with better house structure, 7 place with better infrastructure 8.we go back to our village, 9.crime is too high, 10.health situation is not good here, 11.we go to a place which is higher elevated, 12.sanitation is too bad here. 13. work 14. other*
14.09	*Can you remember what were the reasons that your household came here to this area (and not to any other area in Lagos)? (multiple answers possible)*	*1. cheap, 2. we wanted to live in own house.3. we were evicted. 4. Family ties. 5. Because of opportunities in Lagos. 6. Proximity to work. 7. Was born there.* *8. Other*

Key informant interviews

1. a) Describe the nature of your organization`s involvement in flood management, including any guidelines that dictate your involvement in the slums of Lagos

   b) Describe how your organization works with slum communities (preparation, response and recovery)

2. a) What is the process for making and influencing flood management decisions from your point of view?

   b) Who is involved? [targets actual decision-making processes]

3. a) What is your perception of how vulnerable slum communities are to flood?

   b) What variables do you think most influence the level of vulnerability?

4. If you were to anticipate future changes to how flood management decision is done in Lagos and particularly the role of slum communities in influencing actions relevant at a local level, what changes might those be?

APPENDIX 2: PICTURES

Water logging in the drainages of Badia slum
Pictures by Nsorfon, 2011

Waste brought in from different areas in Lagos and dumped in the slum of Badia
Pictures by Nsorfon, 2011

House Infrastructure in Makoko slum
Pictures by Nsorfon, 2011

House Infrastructure in Badia slum
Pictures by Nsorfon, 2011

Appendix 2: Declaration

Ich versichere, dass ich die von mir vorgelegte Dissertation selbständig angefertigt, die benutzten Quellen und Hilfsmittel vollständig angegeben und die Stellen der Arbeit − einschließlich Tabellen, Karten und Abbildungen −, die anderen Werken im Wortlaut oder dem Sinn nach entnommen sind, in jedem Einzelfall als Entlehnung kenntlich gemacht habe, dass diese Dissertation noch keiner anderen Fakultät oder Universität zur Prüfung vorgelegen hat, dass sie − abgesehen von unten angegebenen Teilpublikationen − noch nicht veröffentlicht worden ist sowie, dass ich eine solche Veröffentlichung vor Abschluss des Promotionsverfahrens nicht vornehmen werde. Die Bestimmungen der Promotionsordnung sind mir bekannt. Die von mir vorgelegte Dissertation ist von Prof. Dr. Boris Braun betreut worden.

Es liegen keine Teilpublikationen vor.

Köln, September 2015

_____

Innocent Forba, Nsorfon