

**Disaster Risk Reduction and Local Knowledge in Flood-Prone
Communities: A Nigerian Case Study**

by

Uchenna Uzoma Okoroji

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners. I understand that my thesis may be made electronically available to the public.

Abstract

There has been a long debate regarding the value of traditional/indigenous/local knowledge in disaster risk reduction. Often viewed as ‘backwards’, governments instead have emphasised ‘advanced’ technologically sophisticated and economically expensive approaches to DRRM (generally equated with ‘Western science’). Increasingly, however, it is recognised that local participation and ways of knowing are essential for long-term DRRM. This is formally articulated in numerous inter-governmental and governmental documents. Despite this recognition, the gap between saying and doing remains wide. There continues to be an over-reliance on techno/economic approaches to DRRM led by state actors, while local people and contexts are broadly ignored. In many cases, DRR plans are little more than empty proclamations. When disaster strikes, people are left to fend for themselves; where the government is involved, it is generally in a reactive, crisis-management way.

In this thesis, the author examines the case of Nigeria. He describes the Nigerian setting. He analyses the formal government position on DRRM, in particular reflecting on the ways that government foresees local participation and contributions to DRRM. He then looks at three case studies of disaster events in three different states of Nigeria. Each community was hard hit by flooding in 2012. They were again hard hit by flooding in 2017. The author reflects on the event and the outcome of each occurrence in each case: what was the

preparedness setting? What were the effects on the community? How did the community react? How did these actions align with government DRRM policy, programming and action? It is hypothesised that, in the context of evolving global attention to DRRM mainly through the Hyogo and Sendai frameworks, one would anticipate different events and outcomes in the study areas. Put differently, five years after the 2012 flood events, the effects of the 2017 flood should have been better prepared for, so leading to less intense negative local level side effects.

The author reveals that the 2017 flood event was similar in effect to the 2012 event. Indeed, interestingly people failed to heed early warnings from authorities regarding impending flood and recommended action. While it is beyond the scope of this thesis to analyse why this is so, one can reflect on the actions taken by local people in each case and examine them for the potential to build bridges with state authorities, so drawing local action and understanding into alignment with government claims regarding DRRM.

Key Words: Social Resilience, Local Knowledge, Climate Change, Coastal Communities, Flood Management.

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Dedication

This research work is dedicated to Mrs Chioma Ethel Okoroji, who despite being widowed at a young age, saw to it that her children get education and aspire to greatness.

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List of Acronyms

CREED – Centre for Research on the Epidemiology of Disasters

DRRM – Disaster Risk Reduction Planning and Management

GDP – Gross Domestic Product

HFA – Hyogo Framework for Action

IWC – International Whaling Commission

IDP – Internally Displaced Persons

LDC – Least Developed Countries

NDMF – National Disaster Management Framework

NEMA – National Emergency Management Agency

NERA – National Emergency Relief agency

NIMET – Nigerian Meteorological Agency

PNG – Papua New Guinea

SFDRR – Sendai Framework for Disaster Risk Reduction

SDG – Sustainable Development Goals

TEK – Traditional Ecological Knowledge

UNISDR – United Nations International Strategy for Disaster Reduction

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Chapter 1: Introduction

1.0 Background:

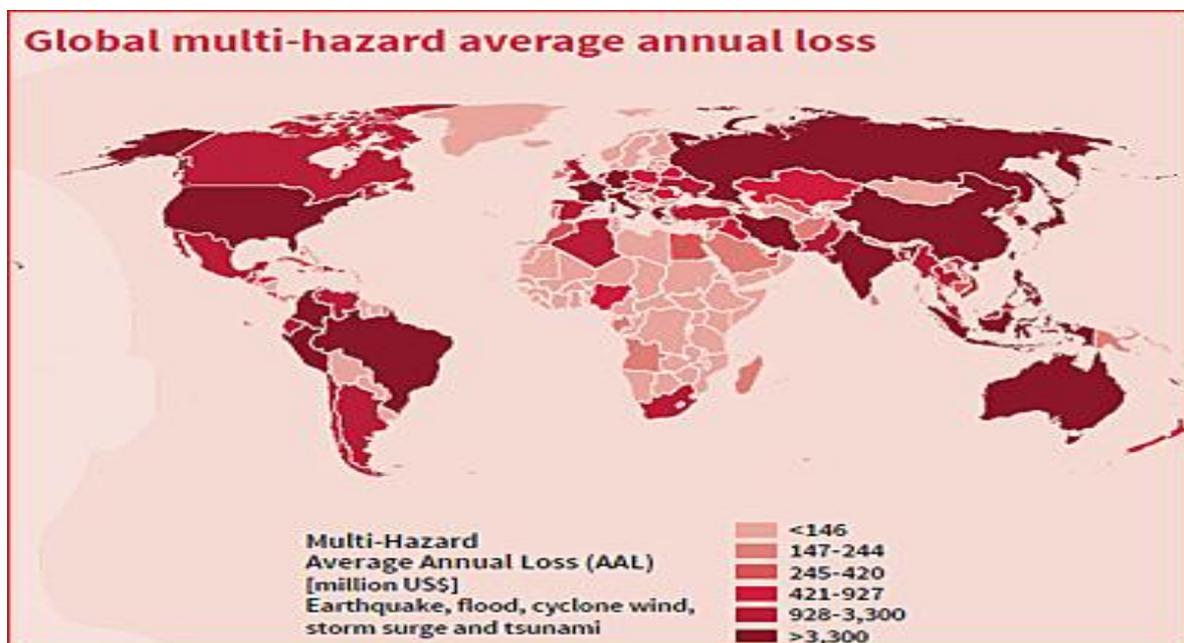
This thesis project seeks to contribute to the literature of disaster risk reduction and the role of local knowledge in influencing the coping strategies of vulnerable communities in developing countries with focus on Nigeria. This study is informed by the existing gap in the literature describing the coping strategies of at-risk communities in West Africa and how local knowledge informs and strengthens social resilience¹. The UNISDR defines a disaster as “ a serious disruption of the functioning of a community or society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope with using its own resources.”

Anthropogenic climate events experienced the world over suggest a worsening weather. There abounds evidence of melting glaciers, warming oceans, extinction of plant and animal species, drought, and disease outbreak, all of which are attributed to climate change. It is, therefore, no surprise that Skoufias (2003) asserts that natural disasters including floods and weather extremities will affect households through the destruction of physical and human capital stock (i.e.

¹ Local knowledge is often referred to in different terms, but not limited to traditional knowledge, indigenous technical knowledge, peasant knowledge, traditional environmental knowledge and folk knowledge. Depending on the term used, it evokes diverse meanings (see Brokensha et al.1980; Sillitoe 2000; Fernando 2000). This thesis adopts the term “Local Knowledge” to imply that people have a detailed knowledge about their environment and community.

human lives). Noy and Vu (2010) assessed the impact of the disaster in a developing economy(Vietnam) and discovered that lethal disaster events affect the growth of the macroeconomy. In a World Bank policy research paper, Raddatz (2009) suggests that economic output of low-income countries dealing with climate change related disasters is significantly affected. Simulations carried out in the World Bank report identify a one percent decline in the gross domestic product (GDP) of developing countries due to climate disasters. In Figure 1, we see the annual loss due to disasters such as earthquakes, flood and tsunami (UNISDR Annual Report,2015).

Figure 1. Global Assessment Report on Disaster Risk Reduction 2015



Source. UNISDR Annual Report 2015 p.17

Extreme weather events increase the debt burden of developing countries, and on an annual basis, emerging economies have incurred \$35 billion in cost due to natural disasters (Mirza, 2003). Diley & Heyman, (1995) are of the opinion that the financial and human cost occasioned by droughts and floods are among the highest in the world when compared to other disasters. On the continent of Africa, increasing cases of droughts, flood, landslides, disease outbreaks and weather extremes will worsen further the already fragile conditions of human health, infrastructure and food security.

Few (2003), posits that the changing climatic conditions will disproportionately impact the developing nations with increased frequencies of flood. It is estimated that global sea level rise will affect low-lying coastal and riverine communities and cost affected countries a significant portion of their national income (Boko et al. 2007). Many cities and smaller settlements in Africa are located along the coast, thus increasing their vulnerability to the extremities of weather. As one example of this, Mozambique experienced a devastating flood in the year 2000 that left in its wake massive destruction of lives and properties. Mirza (2003) states that these floods caused over 700 deaths, left over 500,000 households homeless and significantly impacted urban infrastructure and agricultural livelihoods of rural dwellers. Similarly, in September of 2009, Burkina Faso, Senegal, Ghana, and Niger were inundated with floods that resulted in the displacement of 600,000 people (Di Baldassarre et al. 2010). However, regardless

of their spatial classification, most at-risk communities have evolved in their environment, and developed local knowledge of dealing with disasters. In their assessment of coping mechanisms of coastal communities in Bangladesh, Alam and Collins (2010) attribute their survival to their application of indigenous warning systems to prepare for and deal with impending cyclones. These systems and practices are intertwined with architecture, agriculture and religion. The authors describe practices such as building homes on plinths 10 feet above sea level, planting trees around homesteads to protect households from the raging winds, cultivating crops that may survive the monsoon floods and the reverence of deities to prevent floods. In the central region of Vietnam, Tran et al (2007) identify the application of local knowledge by residents in building construction and productive economic activities. Also, Marfai et al (2008), reiterate the use of local knowledge by residents in Semarang, Indonesia. Homes are reportedly built on higher ground and small dykes constructed in front of homes.

The scholarship on the use of local knowledge by vulnerable communities also describes the impact of culture and religious affiliations on the relevance of coping strategies. In a bid to withstand the onslaught of cyclones and flood, some communities resort to divination and ritual sacrifices to deities and gods. Although certain religious practices may raise questions in the scientific community, Mitchell (2003) is of the opinion that the role of religion (prayer) in disasters is poorly understood and that disaster risk reduction efforts will be more

effective when there is respect for the cultural and religious beliefs of people. Culturally, warnings about various disasters are contained in folklores. Pareek and Trivedi (2011) enunciate the impact of culture and tradition on the coping strategies adopted by coastal communities in Rajasthan, India. The authors identify warnings and ideas related to disasters contained in religious books used by the communities. In one instance, the religious book (sutra) described the significance of wind direction on weather and agriculture. In their field work, they document that community members imbue meanings to the position of the sun, and, for example, the cry of a specific bird is thought to help predict rains and floods. Also, Galliard and Texier (2010) believe communities do not assess risk in simple terms; rather their assessment reflects a blend of economic and religious considerations. The authors give an example of a Javanese community located on the slopes of Mt Merapi Volcano, and suggest that the community considers the volcanic activities of the mountain as a reflection of their normal daily lives and events. These observations about local disaster/hazard knowledge appear to be similar across the continents of Africa, Asia, North America and Latin America/Caribbean.

It bears emphasis to state that, there exists a need to strengthen the adaptive capacities of developing countries. This concern stems from the fact that much of the livelihood of communities in the continent is tied to the physical environment, (in particular direct access to land & water). Brown, Hammill and McLeman

(2007) attest that designing and implementing strategies for adaptation can create or resolve conflicts. Cannon and Muller-Mahn (2010), assert that until now, development studies have focused on scientific approaches in the discourse of climate change with little or no cognizance for mutual perspective or interactive relationship between science and the local economy. Indeed, humanitarian aid has poured into the developing economies, but the efficacy of this aid in respect to increasing extreme climatic events is debatable.

The inclusion of ideas from at-risk communities in the disaster planning process, engenders success and enhance cooperation. Ahrens and Rudolph (2006) identify participation, the rule of law, transparency, equity and accountability as important factors to be embodied when implementing a sustainable development and disaster risk reduction program. However, in much of the developing economies, the factors above are lacking thus negatively impinging on the efficiency of disaster management policies. Corruption, bureaucracy and a gradual eroding of social values threaten the ability of developing states to attend to disaster management. In a study of post-disaster housing projects in Colombia, El Savador and Turkey, Davidson et al. (2007) identify a lack of commitment by community members that adopted the top-down approach, where project managers made decisions about projects. The authors assert that there was a disconnect between communities and project operators. Conversely, projects that involved community members in the decision-making process recorded more progress and

helped build capacity. Similarly, McEntire (2001) suggests that disaster managers must not be the sole administrators of projects. It, therefore, suggests that enhancing the capacity of vulnerable communities is important especially in the era of global warming and its attendant ills.

1.1 Thesis Statement:

Climate change will initiate sea level rise and trigger extreme weather events, with grave consequences for vulnerable communities. For example, Carey (2005) and Slenning (2010) suggest that melting glaciers will alter weather events and increase the severity of rains, droughts, floods and incidences of disease outbreak. In the development context, at-risk communities have devised traditional techniques over time to cope with environmental hazards within their locality. The top-down approach of administering disaster risk reduction policies and regulatory provisions has returned significant benefit to vulnerable communities but these will achieve more if complemented with local knowledge. This dissertation seeks to identify the local hazard coping mechanisms of vulnerable communities, describe the relevance, and evaluate the extent to which state disaster regulations incorporate local knowledge. It is hypothesized that disaster risk reduction planning and management will be suboptimal in the absence of local knowledge, thereby increasing at-risk communities' vulnerability to climate change, climate variability, and extreme weather events. It is hypothesised that

the interaction of local and scientific knowledge will result in the enhanced resilience of vulnerable communities, specifically in relation to flooding.

1.2 Research Question:

The primary research question of this thesis is: With specific relation to flooding, how has local knowledge informed and shaped the coping mechanisms of vulnerable communities? Secondary questions follow: Are these forms of knowledge incorporated into state planning for DRRM? If so, how so? Are there opportunities for creating best planning practice for DRRM that includes traditional as well as contemporary scientific knowledge? This research project will contribute to the body of knowledge around disaster risk reduction and climate resilience by formulating a model that depicts interactions between western and local knowledge.

This thesis engages the literature around the coping mechanisms of vulnerable communities, with emphasis on the role local knowledge plays in the disaster risk reduction process. Chapter One provides an introduction of the subject of discussion and chapter Two argues the relevance of local knowledge in disaster risk management by reviewing the literatures relevant to the subject. Chapter Three describes the methods that were employed in the research, and chapter Four provides the results from the content analysis and subsequently discuss its implication with reference to the literature review. Chapter Five provides case

studies of vulnerable communities and chapter Six introduces a conceptual framework designed by the researcher for disaster risk reduction at the local level. Chapter seven contains conclusions from the research thesis.

Chapter 2: Literature Review

Disaster risk reduction and management (DRRM) forms a major part of policy in all regions of the world. Nations must statutorily set aside a portion of their national income to combat the negative effects of natural and physical disasters. This project seeks to evaluate the role of local coping mechanisms of at-risk communities in the disaster risk reduction process, and the possibility for better aligning state determined, scientific planning for DRR with locally determined, traditional processes. This review will seek to introduce the concept of local knowledge, to (or “intending to”) argue its relevance and importance in the disaster risk reduction process. Relevant literature will be assessed to provide information on recent happenings around the world.

2.1 A warm earth and its consequences.

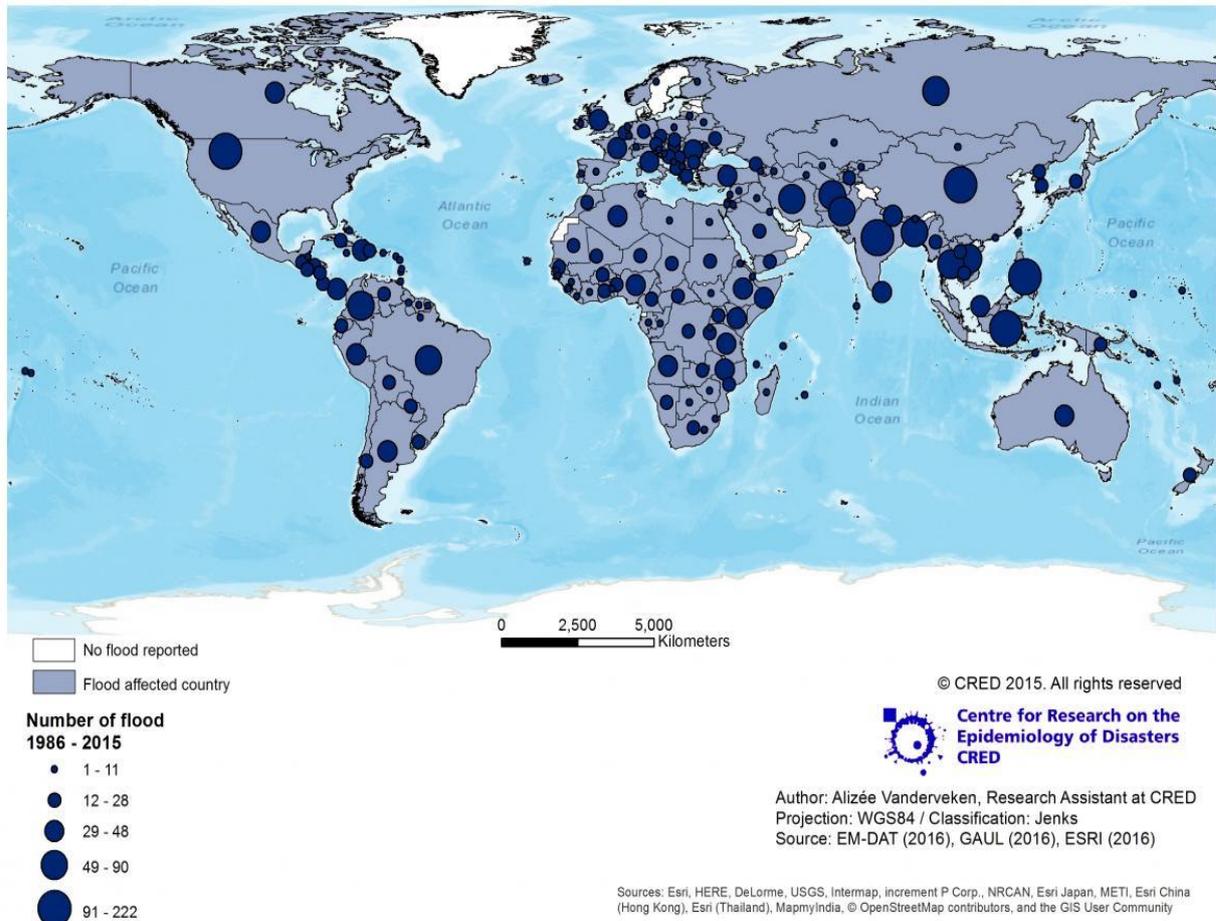
The majority of researchers assert that increased warming of the earth’s atmosphere will lead to climate change which will in turn cause a significant sea level rise, and impel flooding events across the globe. Indeed, Levitus et al (2001) adduce to the warming of the earth’s atmosphere and the role of humans in worsening the climate systems. The earth is warming at an increasing rate, and research suggests that if it carries on this way, the fate of human race is at risk. A warmer atmosphere posits consequences that transcend the economic, social and environmental spheres of human wellbeing. Roessig et al (2004) confirm that

climate change will pose a danger to the marine ecosystem to the extent that communities that depend on fishing will be affected by changing fish distributions. Similarly, a warm climate portends severe risk to the coral reefs of the world's ocean (Hoegh-Guldberg et al, 2007). The authors argue that coral bleaching will become pervasive with the warming of the earth atmosphere. Interestingly, the erosion of the corals by climate change threatens the sustenance of economies and welfare. Furthermore, Haines and Parry (1993) make a case for the direct impact of a warming climate on the health status of humans. They argue that adaptability to climate extremes in humans ebbs markedly through middle age and into old age, thus suggesting why mortality from coronary diseases and strokes peaks during heat waves. The authors also predict an increase in vector-borne and other communicable diseases due to the prevalence of climate change. For example, they suggest that increased temperature and rainfall could occasion additional outbreaks of cholera and malaria in the tropics. Epstein (2001) believes the warming of the earth's atmosphere has informed a resurgence and redistribution of infectious diseases, regrettably in both plants and animals. In the study of climate change and its attendant effects, little is known about the fate of plant life. However, Anderson et al. (2004) describe new plant diseases as a consequence of the anthropogenic introduction of pathogens and parasites, with severe implications for agriculture, conservation and biodiversity.

Barnett and Adger (2007) agree that climate change may impact human security, to the extent that migration and violence may ensue, especially in the developing countries of the world. They argue that the decline in the welfare of citizens will cause them to migrate to urban centres, thus increasing the demand for urban infrastructure. The knock-on effect is a marked growth of political pressure on the state to provide necessary services, and in the event that the required services are not adequate, skirmishes and deteriorating social relations among residents could begin to emanate. The relationship between climate change and violence may assume various dimensions, and is corroborated by Reuveny (2007) who opines that climate-induced migration may prompt violence in the receiving areas. He substantiates his claim by putting forward a conceptual model that offers insights into the alleged causes of conflict between environmental migrants and their hosts. The model identifies competition, distrust, and other auxiliary conditions as principal culprits in the declining relations. The United Nations Intergovernmental Panel on Climate Change has warned of pronounced sea-level rise because of an anthropogenically effected temperature increase (Cazenave and Cozannet, 2014). In recent times, the researchers have provided evidence of a rapid melting of the world's glaciers and ice-sheets, and with it, an increased incidence of floods and storm surges. To this end, Horton et al. (2014) posit a median sea-level rise of 0.6-1.0m at low temperatures, and 2.0m-3.0m at high temperatures, to the warming of polar glaciers. A sea-level rise of this magnitude

will portend serious dangers of coastal flooding for vulnerable communities. Interpreting data from the CRED (2016) international disaster database, it is evident that the incidence of flooding across the globe is on the increase. Nicholls (2002), in a simulation of global sea-level rise, posits that it will cause an increase in coastal flooding among other discomfoting impacts. Thus, the author makes a case for proactive steps to help prepare for the possible implications of a warmer climate. Figure 2 indicates an increasing trend in flood events across the globe (CRED,2016). It indicates an increasing trend in flood events in the developing nations of Africa and Asia, with attendant consequences to the inhabitants, infrastructure, businesses and environment of the regions. The increased trend in reporting flood events can be ascribed to better data gathering capacities and media coverage, and the large number of people susceptible to the impact of flood.

Figure 2. Global Flood Occurrence



Source. Centre for research on the epidemiology of disasters 2016.

2.2 What is Local Knowledge?

Local knowledge refers to knowledge peculiar to people and communities, practised over generations and evolved through time to enable its adherents to cope with changing climatic conditions (Fabiya & Oloukoi, 2013). Agrawal (1995) submits that the classification of knowledge into local and western is marked by failures, and their difference may lie in their characteristics and subject matter. Dekens (2007) defines local knowledge as emanating from the

relationship communities/inhabitants have developed with the environment in which they inhabit. The concept of local knowledge has been subject to ambivalence, resulting in it being called different names. Davidson et al. (2001) confirm the ambiguity in the definition of local knowledge by submitting that in the age of post-colonization and post-modern musings, it has become difficult to draw a clear boundary in the description of local knowledge. There exist oppositions to the concept of local knowledge. Briggs (2005) opines that it is not helpful to consider local knowledge as a universal knowledge, suggesting that it is not shared across all members of differing cultures. The author argues that local knowledge is specific to time and place. Leach and Mearns (1996) suggest that knowledge developed by local people is not easily transferable, thus impeding the efficacy of local knowledge outside of its socio-political environment. Briggs and Sharp (2004) allege that the decontextualization of what constitutes local knowledge has led to absurdities in its interpretations. They identify the binary tension between western scientific knowledge and local knowledge to have stifled and distorted the contents of what constitutes local knowledge. Thus local knowledge is not given an opportunity to contribute to development.

It is important to state differences may exist in the use of the term indigenous knowledge, traditional knowledge and traditional ecological knowledge, but at their core, they serve the purpose to help communities adapt to changes in their environment. Traditional knowledge/indigenous knowledge/traditional

ecological knowledge may be considered as non-quantitative, anecdotal and unscientific due to its varying forms and homogeneity across cultures and geographical space (Hobson,1992). Riedlinger and Berkes (2001) describe traditional knowledge as emanating from the extensive use of land by communities guided by their observations of variations in weather and climate. Similarly, Berkes et al. (2000) posit that traditional ecological knowledge (TEK) originates from local developed practices of resource use by local communities.

It is common place to find literature and journals using terms such as Traditional Ecological Knowledge (TEK) to describe the knowledge base of local coping strategies². In recent time, there has been an increased interest in the efficacy of local knowledge in disaster risk management, and it is informed by the observed adaptive capacities of local communities toward extreme weather events. Gomez-Baggethun et al. (2012) document the role of local knowledge in helping residents of Donana, South West Spain cope with environmental crises. The authors identify coping mechanisms to include; veneration of a local deity, pooling of resources together, seasonal spreading of production to ensure harvest of food throughout the year, and reallocation of family homes when flooding risks increased.

² Indigenous coping strategies take different forms, such as rain seeding, cloud reading, cultivating crops on terraces, observing animal behaviours and building homes on plinths above flood waters.

Technological solutions may not always offer a full proof solution to disasters, to this end, Few (2003) reiterates the limitation of engineered solutions to climate change. Similarly, Yin and Li (2001) aver that human intervention has worsened the flood risk in the Yangtze river basin. The construction of levees is blamed for the silting up of the Yangtze River, thus leading to a remarkable rise in the flood level. For developing countries, the cost of acquiring engineering controls for disaster risk reduction may prove to be too much, and even where construction is feasible, quality control issues may threaten its integrity. Also, the competence to manage such sophisticated structures may be lacking.

Furthermore, (Dekens, 2007) corroborates the case for local knowledge with the assertion that technological solutions to disaster risk reduction tend to emphasise one-off solutions and tend to trigger significant environmental impacts. Short-term gains here reflect the quick - fix nature of technical solutions in the disaster risk context. Much of technological solutions to disasters seek to provide immediate protection and will require maintenance to remain functional. Plate (2002) posits that engineered river works have received opposition due to its geomorphic adjustments of rivers, in the construction of dams, dykes and embankments. The author furthers his argument by citing the impairment of flora and fauna, which consequently impacts the welfare of communities. It can be adduced that the situation in Lake Chad (West Africa) mirrors the argument furthered by Plate (2002). The damming of the rivers that feed Lake Chad has

contributed to its drying up, with severe consequences for communities that depend on it.

However, it is important to state that worsening climatic conditions may have also contributed to the disappearance of the Lake (Onuoha, 2008). Similarly, Airoidi et al. (2005) acknowledge that structural flood defence mechanisms have resulted in the artificialization of coastal areas. It implies changes to vulnerable landscapes, alteration to species diversity and the introduction of new habitats. Indeed, structural flood defence serves an important purpose. Nonetheless, they also impose danger to the environment. In developing countries, the siting and construction of such controls (dams) impacts the livelihood opportunities of resettled communities.

Yankson et al. (2017) describe the building of the Bui dam in Ghana as negatively impacting the communities around the dam. The authors conclude that the construction of the dam gave benefits to the Ghanaian government and Chinese, while denying communities in the affected area access to land, water and food, and thus further worsening the pre-existing poverty situation in the area³. Msilimba et al. (2009) discuss the political implication of water resource governance in the Songwe river basin of Southern Africa. Results from the author's research suggest that the proposed developments (river diversion and

³ The Ghanaian authorities earn profits by selling electricity generated by the dam to its teeming consumers in adjoining cities. Loan repayments to the Chinese financiers, earns them profits and benefits the Chinese economy.

dam constructions) by the governments of Tanzania and Malawi do not portend positive benefits for the communities living within the Songwe river Basin.

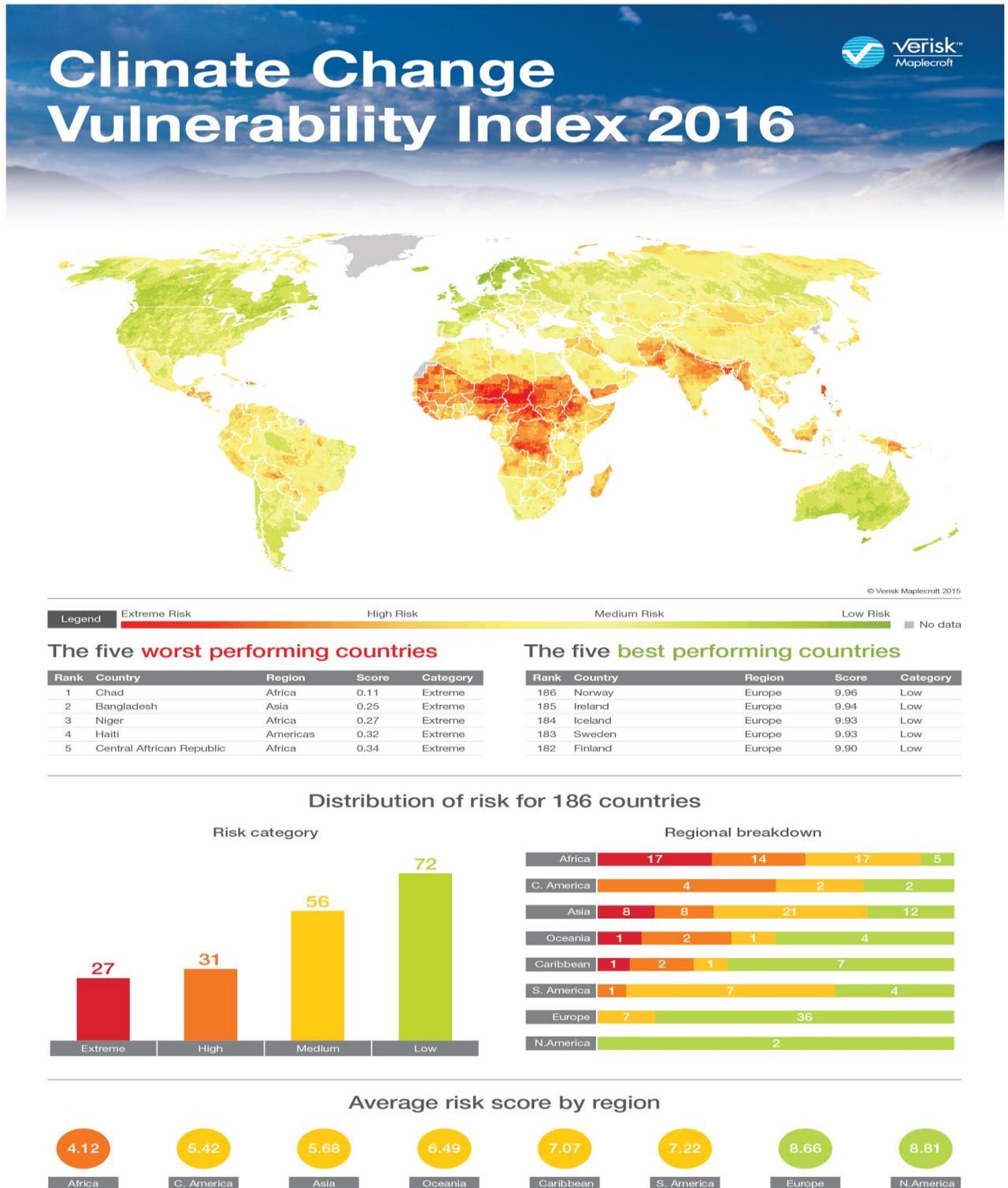
It is of particular importance to state that local knowledge on the coastlines of Africa, Asia and the Caribbean entails flood prediction and recovery initiatives. Also, local knowledge is expressed in different forms in the various communities: stories, proverbs, dances, beliefs, rituals and agricultural practices. However, there appears to be a loss of this knowledge due to a plethora of factors, and it is beyond the purview of this dissertation to discuss this trend (See Ezeanya, 2016 and Studley, 1998). The term traditional knowledge and scientific knowledge is used in this thesis to identify the context from which knowledge originates. However, local knowledge is adopted throughout the thesis to describe knowledge possessed by local communities about their environment and living conditions.

2.3 Local Knowledge and Flood Management.

The world over, communities at risk of flooding have existed and persevered despite the recurring onslaught of extreme weather events and disasters. Wisner (1995) agrees that many rural people have encountered severe natural occurrences and even climate change. Figure 3 depicts the vulnerability of the developing nations to climate change due to their lack of preparedness for climate change, and changing weather patterns. A regional breakdown of data for 36

countries suggests that 17 countries in Africa are at extreme risk, 14 countries are at high risk, and 5 countries are at low risk. The susceptibility of the continent of Africa is further compounded by a low risk score of 4.12. Africa is evidently less prepared than many other regions for the implications of climate change, thus, the continent as a whole receives a high vulnerability rating (Maplecroft Verisk Climate Change Vulnerability Index, 2011).

Figure 3. Climate Change Vulnerability Index 2016



Source. Maplecroft Verisk Climate Change Vulnerability Index (2011).

Research literature, books and documentaries are laden with instances where local knowledge employed by communities has helped preserve life and properties in the event of a disaster. For example, Mercer and Kelman (2008) document the coping mechanism of a riverine community in Papua New Guinea, where a community rejected a regional government enactment, requiring the village to relocate to higher grounds. Rather, they chose to stay, and avoid flood impacts by employing their local knowledge of ways to deal with seasonal flooding⁴. Similarly, Arunotai (2008) describes the knowledge base of a traditional group (Moken) in Thailand and explains how this knowledge helped them survive the 2004 Indian Ocean Tsunami. The author posits that an oral legend about “waves” informed the villagers about warning signs of the approaching Tsunami and what to do to avoid its effects. The “legend of the seven rollers” is a sacred oral story native to the Moken and its describes the giant waves from the sea in the event of a Tsunami⁵. Indigenous coastal communities in Canada have also been observed to possess local knowledge for dealing with floods. Newton (1995), in a field study of three indigenous coastal communities across the North West Territories and the province of Ontario, affirm that local

⁴ The community built their homes on elevated platforms, cultivated flood resistant crops, and observed the swelling of the river bank by marking its level on rocks.

⁵ The legend of the seven rollers warned of giant waves. Residents are implored to run to high ground and stay away from the shores of the ocean.

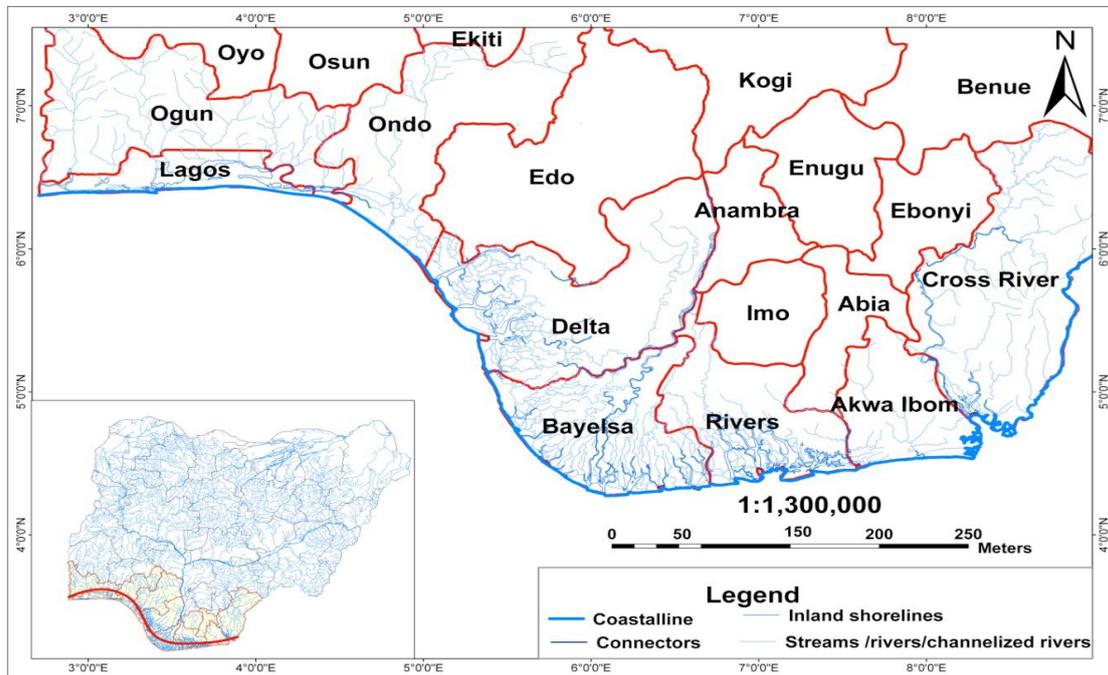
communities have developed experiential knowledge of coping with floods. Their intricate knowledge of weather patterns informs their perceptions, which subsequently informs preparation for flood events, and response and recovery in the study communities are influenced by this local knowledge acquired over time or passed down by previous generations. Mavhura et al. (2013) analyse the role of local knowledge in flood management and disaster risk reduction in two communities in the Muzarabani district, Zimbabwe. These communities are flood prone and have employed local knowledge to help mitigate and cope with floods through selection of crop varieties, selection of building materials, and farm practices. The authors also discovered that households commonly planted drought resistant seasonal crops to be sold in the local market. Homesteads were built preferably to float in flood waters and essential household items stored on raised platforms.

The cases described do not differ significantly from what has been observed in the coastal communities of Nigeria. A vast majority of coastal communities on the Nigerian coastline are situated on the fringes of the Atlantic Ocean and inland rivers and creeks thus exposing them to the recurring incidence of floods, occasioned by the variations in weather conditions. It can be adduced that their closeness to the ocean is influenced by their livelihood patterns and vice versa⁶

⁶ Coastal and riverine communities in Nigeria primarily depend on artisanal fishing activities and agriculture for their sustenance. Also, cultural and religious orientation of vulnerable communities, reflects their closeness to the sea.

(Fabiyi & Oloukoi, 2013). Coastal and riverine communities in Nigeria are multi-ethnic with substantial differences in cultural and religious traditions. However, there exists a synergy in the presence and application of traditional knowledge in the event of floods. Veneration of tribal deities is common practice among coastal and riverine communities in Nigeria: these communities hold cultural beliefs which reflect the variability of the river and ocean currents, and are embodied in cultural events such as annual festivals to appease deities. Field work conducted by Fabiyi & Oloukoi (2013), in coastal communities in Southern Nigeria, identified local meteorological signals and knowledge acquired by these communities. The authors confirm the existence of lunar observations; at the sighting of a new moon, villages prepare for floods. It is important to state that this does not suppose the occurrence of a flood at the sighting of a new moon. They also identify cloud reading as one of the practices common in coastal communities. According to their study, villagers confirmed studying the behaviour of aquatic animals in a bid to predict floods. Building styles are also linked to the incidence of flooding in the communities, as houses are built on stilts and on high ground. Figure 4 shows the coastal areas in Nigeria and their proximity to the Atlantic. Urban cities such as Lagos, Uyo, Port Harcourt and Yenagoa will not be spared the effect of global sea level rise (SLR) which will accentuate coastal flooding and flash floods due to the hardening surface of the landscape. Also, communities lying on flood plains and lagoons will be impacted.

Figure 4. Coastal States in Nigeria



Source. *Indigenous Knowledge System and Local Adaptation*

2.4 Local Knowledge for Disaster Risk Reduction.

The role of local knowledge in disaster reduction strategies have been recognised by the United Nations, and several disaster events around the world have proved the effectiveness of local knowledge. In 2005, the United Nations launched the Hyogo framework for action, still under the ambit of the international strategy for disaster risk reduction. The Hyogo Framework for action 2005-2015: Building the resilience of nations and communities to disasters (HFA) is a global strategy to reduce disaster risks. It is the outcome of negotiations at the World conference on Disaster Reduction which held in Kobe, Hyogo, Japan, in 2005. The HFA

propagates the concept of disaster preparedness by doing away with the traditional dichotomy between natural and human induced disaster. Five priorities for action is contained in the HFA: (1) To ensure disaster risk reduction is a national and local priority with a strong institutional basis for implementation, (2) To identify, assess and monitor disaster risks and enhance early warning, (3) To use knowledge, innovation and education to build a culture of safety and resilience at all levels, (4) To reduce the underlying risk factors, and (5) To strengthen disaster preparedness for effective response at all levels. Enia (2013) avers that a mid-term review of the HFA by the United Nations, reveals an uneven implementation and progress across member countries. Conversely, Oluwo (2013) is of the opinion that the HFA makes a commitment for meeting its target by proposing the establishment of a global platform, national platform and progress reports. Also, Kniveton et al. (2013) believe the HFA priority 3 makes a case for the application of local knowledge in the disaster reduction process.

At the expiration of the mandate for the Hyogo framework, the Sendai framework for disaster reduction was promulgated to improve the strength and weakness of the previous frameworks. The Sendai Framework for Disaster risk reduction (SFDRR) builds on the achievements of the Hyogo framework and aims to protect ecosystems, critical infrastructure and livelihoods from disasters. SFDRR is a 15-year term global strategy (2015-2030), that addresses the need for understanding disaster risk through its global targets and indicators. There are

seven global targets proposed in the SFDRR: (1) Substantially reduce global mortality by 2030, (2) Substantially reduce the number of affected people globally by 2030, (3) Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030, (4) Substantially reduce disaster damage to critical infrastructure and disruption of basic services, (5) Increase the number of countries with national local disaster risk reduction strategies, (6) Extend international cooperation to developing countries through adequate and sustainable support to complement their national action to implement the framework, and (7) Increase the availability of and access to multi-hazard early warning systems and disaster information. At the heart of the framework, is the resolve to engender health resilience for at-risk communities and those affected by disasters and emergencies.

The global targets and indicators set out in the SFDRR serve to encourage political commitment and financial resources, but indicators are not without limitations (Maini et al. 2017). The authors argue that measurement of the indicators requires robust and complete data which may not be readily available. Also, wrong analysis of data may cause indicators to mislead policy and planning. Prior and Roth (2015) identify shortcomings in the SFDRR and surmise that when measured against the Yokohama strategy and HFA, the SFDRR could hardly be considered a giant leap for global DRR strategy. The authors aver that the removal of concrete numerical targets and de-linking conflicts and disaster rob the SFDRR

of important milestones. Afrose (2017) argues that the SFDRR promotes the concept of “build back better” by strengthening planning and efficient monitoring and evaluation, promoting disaster assessments and building financial resilience. Similarly, Zia and Wagner (2015) affirm, the advancement of early warning systems in the Sendai framework offers opportunities for disaster relief and recovery. In an evaluation of the UNISDR framework(s), Diallo (2015) contends that local knowledge is indeed recognised as a valuable tool necessary to build the resilience of local communities, but its influence wanes in the implementation of community disaster risk measures. Table 1 compares the Hyogo and Sendai frameworks, identifying their differences.

Table 1. Hyogo vs Sendai

Hyogo	Sendai
Recognizes the growing incidence of disasters of hydrometeorological origin.	It seeks to fill gaps prevalent in the Hyogo framework.
Argues for the integration of disaster risk efforts into policies, plans and programmes with a focus on prevention, mitigation, preparedness and vulnerability reduction.	Establishes timelines for achieving objectives.
Advocates for the introduction of gender perspectives in disaster risk plans and decision-making processes.	Introduces the concept of “building back better” in the post-disaster/rehabilitation phase in a bid to avert the creation of new risks.
Disaster prone developing countries and small island developing states deserve to be aided cope with disasters.	The framework expounds on the types of assistance required by disaster prone countries to include: finance, technology transfer, capacity building and international cooperation

Makes a case for the establishment of early warning systems for effective prediction.	Prioritizes the need to safeguard the health of people, and the ecosystem that supports life.
Seeks to address gaps in the Yokohama strategy.	

The Hyogo and Sendai frameworks prescribe indicators for monitoring and assessing implementation. The convergence of three United Nations landmark agreements including the Sendai framework, the sustainable development goals, and climate change agreements, offers the opportunity to improve participation in disaster risk strategies, mitigation and adaptation (Aitsi-selmi et al., 2015). Similarly, Wilkinson et al. (2016) opine that bringing together the commitments in the disaster policies, and SDGs could offer a coherent approach to addressing climate induced displacement.

Technological/scientific disaster risk reduction strategies may not have identified adequate solutions to the disaster related problems of developing countries. Some researchers argue that such imposition of ideas have done more harm than good (Briggs, 2005 and Shizha, 2006). Grenier (1998) affirms that development planning has failed to achieve sustainable development; rather dependencies have been created. It is widely known that a majority of development solutions are alien to the traditional and cultural beliefs of those being planned for, thus necessitating its abandonment. The exclusion and displacement from Eurocentric scientism have left rural people wary of intervention from external authorities (Wisner, 1995). Increasingly, development practitioners have given credence to

the efficacy of local knowledge in improving the coping and adaptive capacities of rural coastal communities (Rumbach and Foley, 2014).

Assessment of disaster events around the world, reveals that local knowledge and institutions have played important roles in safeguarding lives and properties. McAdoo et al. (2008), posit that the possession of local knowledge by a section of the population in the Solomon Islands saved their lives during the 2007 Tsunami. The authors assert that residents' local to the island understood the dynamics of earthquakes and the emptying of the ocean around them as being signs of an impending Tsunami⁷. However, immigrant communities on the island lacked this knowledge, thus suffering huge losses. In 2004, a Tsunami was recorded in the Indian Ocean and lives, and properties were lost. However, an island community off the coast of Indonesia is said to have survived by virtue of a folklore (smong) which described a Tsunami and informed on steps to take in the event that it happens. The Simeulue Islands people's survival in the 2004 Tsunami is a celebrated case depicting the prowess of local knowledge in disaster risk reduction. Baumwoll (2008) suggests that the Simeuluean's success calls for the inclusion of local knowledge in disaster risk reduction programmes.

⁷ An earthquake that registered 8.1 on the Richter scale hit the Solomon Islands and generated waves 12m high. Local indigenous residents were knowledgeable of Tsunami's. Thus, when the lagoons around their homes emptied after the earthquake hit, they ran to higher grounds. However, immigrant communities on the island not knowledgeable of Tsunami's, went to observe the exposed sea bed and were affected by the waves that followed the quake.

Rumbach and Foley (2014) describe how the indigenous composition of communities on the island of American Samoa enabled their response and survival during the Tsunami that hit the island in 2009. Three earthquakes hit the South Pacific Ocean in the vicinity of Samoa and minutes later, a Tsunami struck. Immediately, the fa'a Samoa villages aided by their local institutions (age grade committee and women group) initiated rescue of residents trapped in the surging ocean wave, before emergency services from the central government arrived. It can be argued, therefore, that local institutions can aid response and recovery in the event of a disaster. There is a growing realisation that local knowledge may have something to teach the West, in that it may increase the scientific understanding of natural events (Breidlid, 2009). With the increased warming of the earth and melting of the glaciers, development practitioners and institutions have called for an interactional expertise between scientific and local knowledge. This knowledge sharing between different paradigms is informed from climate simulations which suggest that the developing nations will be at the receiving end of extreme climatic events. To this end, Nyong et al. (2007), asserts that there is a need to integrate local knowledge into formal DRR, and climate mitigation and adaptation policies. The need to engender the cooperation of rural vulnerable communities in climate change and DRR programs can be adduced to be one reason for the increased interest in local knowledge. A synergy between local knowledge and science will help to improve existing disaster risk control

measures for efficient administration. It is noteworthy that the knowledge base of local knowledge can improve the resilience of communities. Ecologists believe that local knowledge is vital to the conservation of biodiversity, and in the dispensation of sustainable resource management. Gadgil et al. (1993) argue that management based on the simplification of complex ecological systems by science have resulted in environmental degradation. By contrast, traditional ecological knowledge acquired over time by communities dependent on the natural environment is replete with knowledge about the characteristics of flora and fauna local to their environment. The authors surmise that the preservation and use of this knowledge will help conservation strategies. The integration of local knowledge with western scientific information will empower local communities to deal with climate extremes (Fabiya and Oloukoi, 2013).

2.4.1 Value of Local Knowledge (Preparedness and Post-disaster recovery)

Previous discussion has described the multiple roles of local knowledge in disaster preparedness, response and recovery. Hiwasaki et al (2014) document how coastal communities in Asia have developed techniques to prepare for and mitigate hydro-meteorological changes. In their research, the authors describe how communities predict rainfall and strong winds by closely observing the changing characteristics of clouds, wind direction and animal behaviour. Similar to the events described by Fabiya and Oloukoi (2013), the texture of clouds informs the communities decision to prepare for floods. Furthermore, local

technical knowledge in building and construction has influenced at-risk communities' preparation for disasters. Walshe and Nunn (2012) in their study of disaster risk reduction and the place of local knowledge in Vanuatu, conclude that the local "kastom knowledge" is an important tool for the island country. The authors argue that local knowledge, in the form of storytelling helped save lives in the Tsunami that hit the country in 1999. Stories of Tsunamis are embellished with local customs, to inform the local populace of the dangers lurking in their immediate environment and provide guidance on what to do in the event of a disaster.

Disaster risk reduction also entails post-disaster recovery activities. Many local communities possess the ability to engender cooperation and cohesion in disaster recovery, and this is confirmed by Lambert (2014) in his study of indigenous Maori people and their responses to the earthquake that hit Christchurch, New Zealand. The author affirms that kinship and hospitality were displayed by the Maoris, to the effect that neighbours opened their doors to residents who may have lost their homes in the ensuing disaster. Also, traditional meeting places were made available to provide temporary accommodation. Enarson (1998) argues the gendered disparity in the disaster risk reduction discourse, by asserting that women play a major role in environmental crisis given their roles as food producers, caregivers and custodians of local knowledge and environmental

resources. It is evident from case studies cited that local communities possess the skills and knowledge to prepare for disaster.

Table 2. Disaster Indicator and Response in Selected Countries

Place	Threat	Response	Comment
Indonesia (Simeule)	Tsunami	Run to high ground	A local folklore ‘Smong’ describing the signs of a Tsunami, helped the villagers survive
Thailand (Moken)	Tsunami	Run to high ground	Possession of knowledge about weather events and local folklore, helped the village survive
Vanuatu	Tsunami	Run to high ground	Local knowledge, provided the villagers with the necessary information to survive a Tsunami
New Zealand	Earthquake	Seek shelter	Communities rallied together to help their affected neighbours

Source. Adapted from the Value of Indigenous Knowledge for Disaster Risk reduction

Table 2 identifies the threat and responses to varying disaster types in different countries. Local knowledge takes varying forms to inform adaptation in at-risk communities. Oral renditions, cloud reading, cultural beliefs and social relations are common forms of adaptive strategies adopted.

2.4.2 Does Western Scientific Knowledge Complement Local Knowledge?

The complementarity of local knowledge with science has been questioned on all aspect of influence. Regardless, research exists to suggest that it is possible to seek an interactive relationship between the different paradigms of knowledge. Huntington (2000) presents three examples where traditional ecological knowledge and science have complemented each other to achieve significant milestones for society: 1) the bowhead whale census, 2) Alaska beluga whale committee and 3) Exxon Valdez oil spill. A ban was imposed on the harvest of bowhead whales by the International Whaling Commission (IWC), and this impinged on the traditional activities of whaling communities living around the shores of Alaska⁸. The whaling communities formed a group to fight the ban, and this resulted in a census to help establish a good fishing quota for the whales. Initial census by the IWC produced a census figure that was keenly contested by local Eskimo communities and prompted a second census that involved a partnership between scientists from the Commission and the whaling communities, thus enabling communities to apply their local knowledge in the mapping of the migratory pattern of the whales. Their partnership resulted in a census result that was more accurate and acceptable to both parties.

⁸ The Alaska Eskimo Whaling Commission comprises of eleven whaling communities: Gambell, Savoonga, Wales, Little Diomedea, Kikalina, Point Hope, Point Lay, Wainwright, Barrow, Nuiqsut and Kaktovik.

The case of the Alaska Beluga Whale Committee was a lesson learnt from the bowhead saga. The author describes the beluga whale committee as an organisation that engendered cooperation between scientists and local communities. Invasive and intrusive technologies such as satellite tag implants and radio collars otherwise considered disrespectful and cruel to the animals by the native residents were employed in tandem with local knowledge of the environment possessed by communities. The collaboration has culminated in the promotion of better ecology for the Beluga whale and a management of its stocks in the Alaskan Shore. The grounding of the oil tanker Exxon Valdez, released an estimated 38,000 tons of crude oil into the water bodies around Prince William Sound, Alaska and the spill was blamed for the dearth of herrings' fish stock. However, collaboration between the natives and scientists, have helped improve the herring population in the area.

In the disaster risk context, there appears to be a paucity of case studies where science and local knowledge have worked together to improve the resilience of local vulnerable communities. Interestingly, Mercer et al. (2010) through participatory action research in Papua New Guinea (PNG) developed an integrated framework for reducing the vulnerability of communities to environmental hazards. The framework was designed such that communities prescribed the appropriate local knowledge for coping with different environmental hazards and the researchers with their scientific knowledge acted

as guides⁹. The framework was designed in stages by carrying out participatory action research in three communities; Kumalu, Singas, and Baliau. Community engagement informs the first stage in the framework. The researchers having agreed on the communities to include in the research, approached them to develop rapport and explain the aims and objectives of the research. Assessing the vulnerability of the communities to different inherent hazard types, is the focus of the next stage. The vulnerability level of the communities is established by identifying extrinsic factors outside the control of the communities and intrinsic factors resulting from extrinsic ones, which the community can address¹⁰. The third stage in the framework process entails the identification of indigenous and scientific strategies used to cope with intrinsic factors affecting the vulnerability of the communities. The final stage involves the iteration of results from step 2 and step 3. Interactive strategy which comprising of local and scientific knowledge is developed, to reduce the community's vulnerability to environmental hazards. This stage is participatory as it involves members of the community and the researchers who analyse their vulnerability level and specify strategies to improve their resilience to hazards.

⁹ The communities planned and implemented adaptive strategies designed by the community members and fine-tuned by the researchers. The researchers confirm that in the years following their visit, they have been a marked increase in the resilience of the communities to flood risk.

¹⁰ Extrinsic factors refer to anthropogenic and non-anthropogenic processes beyond the control of the communities, and intrinsic factors refer to coping strategies which leave communities vulnerable and are a product of the extrinsic factor. For example, the swelling of rivers caused by excess rain, leads to flood events, which cause the communities to build on high grounds (unstable land), thus exposing them to the ills of landslides.

The literature review attempts to make a case for local knowledge in the disaster risk process. Methodology and framework to be employed in this research, is discussed in the next chapter.

Chapter 3: Methodology

Disaster management regulations in Nigeria will be analysed contextually to confirm the extent to which it recognises the adequacy of local knowledge. Also, multiple embedded case studies of vulnerable cities/townships will be employed to ascertain the role of local knowledge in flood risk management. It is pertinent to note, that the analysis of secondary data describes the approach to be employed.

The textual analysis of the disaster management framework and the inquiry from the case studies will provide information on the role of local knowledge in disaster management strategies between government establishments and at-risk communities. The North Central region is plagued by recurrent flood events. Communities in this region are bounded by River Niger and River Benue, thus providing good examples of flood prone communities. The flood events in 2012 affected parts of the communities selected for this study and was adjudged the worst in a decade. Ministries, departments and agencies of government in the areas affected reacted to the flood events with a promise to forestall future occurrence. A reoccurrence of floods in 2017 impacted livelihoods and disrupted businesses in the selected communities, thus offering the opportunity to evaluate state response and coping strategies in the area when compared to the previous flood event of 2012. Also, the shift from the Hyogo to Sendai framework when assessed with Nigerian disaster planning, suggests that perhaps adequate

measures were not taken to ensure the implementation of objectives from the Sendai framework to help forestall/reduce impacts from flood.

This research will employ the use of content analysis and case studies to elicit information and discuss the subject of interest.

3.1 Research Context

The choice of Nigeria for this study stems from the warnings from the Intergovernmental Panel on Climate Change and numerous environmental groups who affirm that climate change will hit the developing nations of the world the worst. Nigeria is the economic hub of West Africa and possesses a high population compared to its neighbours. Analysis employed in the Nigeria case study is tied to primary and secondary objectives; a review of the National disaster management framework, and development of a framework to fill in identified gaps. The results are presented as follows: the first section introduces the national disaster management framework and attempts to itemise the codes and categories generated from the National disaster management framework. The second section provides discussions of critical findings from the analysis.

3.2 The Qualitative Approach

A qualitative approach to research appeals to different academic backgrounds, with Social Science and Natural Science dominating in its usage. Morgan and

Smircich (1980) are of the opinion that the use of qualitative approach is informed by the type of study to be carried out. Similarly, Gephart (2004) describes qualitative research as being descriptive and relying on words and talk to create text. Literature abounds, that describe different types of approach/methods to conduct qualitative research. Nonetheless, Bryman and Bell (2016) differentiate qualitative approach from quantitative, by suggesting the former is usually inductive, interpretivist, constructionist and Naturalistic. The authors further posit that qualitative researchers object to the notion of reliability and validity. Thus they offer alternatives, trustworthiness and authenticity. Their discourse on the elements of the concepts above suggests that trustworthiness comprises of four criteria: transferability, credibility, dependability and confirmability.

While the qualitative approach has garnered accolades and support across research fields, it is pertinent to note that it has its limitation and critics. Bryman and Bell (2016) agree to the common limitations of the qualitative approach, thus labelling it as subjective, difficult to replicate, the problem of generalisation and a lack of transparency. Malterud (2001) opine that qualitative research offers the opportunity to increase the understanding of complex phenomena, through triangulation. Summarily, it can be deduced that the primary goal of qualitative research is to see through the eyes of the people being studied.

3.3 Content Analysis

Content analysis is a research methodology that involves a blend of both qualitative and quantitative approach. Hsieh and Shannon (2005) describe content analysis as a widely used qualitative research technique with three distinct approaches. Also, Elo and Kyngas (2007) define content analysis as a systematic means of describing the phenomenon. The authors aver that through content analysis, it is possible to test theory and enhance the understanding of data. Stemler (2001) makes a case for content analysis enhancing the reliability of inference from a text, yet also posits that poor categorisation, selection of themes and codes may lead to reliability problems.

3.3.1 Coding

Qualitative researchers organise data into categories and themes to (or “intending to”) make sense of a phenomenon or explain it. Neuman and Robson (2012) affirm that ideas and evidence are interdependent. Bryman and Bell (2016) define coding as a review of notes, transcripts, materials and labelling items that share similar themes and possess theoretical significance. The authors posit that coding is an integral part of data analysis, informed by the research question(s). Coding entails organising text materials and projecting its meanings in themes and categories. Basit (2010) is of the opinion that the choice of coding in qualitative

research is informed by the availability of funds, the expertise of the researcher and project size.

Figure 5. Types of Coding

Types of coding	Explanation
<i>Open coding</i>	<i>The process of breaking down, examining, comparing, conceptualising and categorising data. This process of coding yields concepts, which are later to be grouped and turned into categories.</i>
<i>Axial coding</i>	<i>A set of procedures whereby data are put back together in new ways after open coding, by making connections between categories. This is done by linking codes to contexts, to consequences, to patterns of interactions, and to causes.</i>
<i>Selective coding</i>	<i>The procedure of selecting the core strategy, systemically relating it to other categories validating those relationships, and filling in categories that need further refinement and development. A core category is the central issue or focus around which all other categories are integrated.</i>

Source. *Basics of Qualitative Research*, Corbin and Strauss (1990).

3.4 Deductive Approach

This method is used where existing theory exists about a phenomenon and would benefit from further analysis and description. Hsieng and Shannon (2005) refer to this approach as “Directed Content Analysis”. Elo and Kyngas (2007) describe the deductive approach, as a retesting of data in a new context, and it is based on previous research work. In the field of disaster risk reduction, the scholarship is replete with discussions on the top-down and bottom-up dichotomy. Content analysis of the disaster management framework for Nigeria against the top-down and bottom-up orientation will offer explanations as it pertains to vulnerable communities and their resilience against floods.

3.5 Case Studies

Cooper and Morgan (2008) are of the opinion that case study as a research method helps to understand situations of uncertainty, uniqueness, instability and value conflict. However, Simons (1996) is of the opinion that a common disadvantage of case study research is the difficulty of generalising from a single case. The author argues that if generalisation is acknowledged, it offers the opportunity to yield unique and universal understanding of case's being studied. This research work will rely on newspaper reports and journal articles about the flood events and coping mechanisms of residents. Jick (1979) define triangulation as a vehicle for cross-validation of distinct methods. There will be an iterative process of traversing between results from the content analysis of Nigeria's national disaster management framework and results from the embedded case studies to inform the design of a framework that informs cooperation between government agencies and residents of flood prone areas.

3.6 Study Area

The United Nations Economic Commission for Africa (2015) suggest that 94 disaster events occurred in Nigeria between 1980 and 2010, impacting 6,306,441 people and costing the economy \$188 million. Adebimpe (2011) posits that flood is the most widespread natural hazard in Nigeria. Joshua et al. (2014) document disasters that have occurred in Nigeria and characterize them as;

Industrial/technological, Civil strife and Conflicts, and Natural Events. Similarly, Okoli (2014) list disasters in Nigeria to include; Auto crash, Boat mishap, Terrorism, Pipeline explosion, Oil spills, Landslide/Erosion, Drought, Floods, Disease outbreaks and Mine collapse. Table 3 identifies the disasters prevalent in the 36 states of Nigeria. There is a prevalence of Flood across the Northern and Southern states, and Drought in the Northern states.

Table 3. Natural Hazards in Nigeria

Hazard	Geographical Area
Floods	Urban areas with poor drainage; settlements located in low-lying river flood plains; settlements fringing the Niger, Benue, Cross, Katsina Ala, and Imo rivers.
Landslides	Hilly terrains, particularly in the south-eastern part of Nigeria with Cretaceous sedimentary geological formations.
Soil erosion	Widespread across the country but occurs particularly in areas undergoing rapid deforestation, intensive agriculture and rapid urbanization without adequate provisions for protecting topsoil.
Gully erosion	Predominantly in Anambra, Cross River, Akwalbom, Imo, Benue, Abia, Enugu, Ekiti, Kogi, Edo and Plateau states. It is caused by devegetation of sloppy terrains and the impact of high intensity rains, which cause overland flow, riling and gulling.
Coastal erosion	The most severely affected areas are the coastal areas of Lagos, Ondo, Delta, Bayelsa, Rivers, Akwalbom and Cross River states. An estimated 25 million people (28% of the population) live in coastal zones and are at risk of coastal flooding.
Windstorms	At the onset of the rainy season, rainfall is usually accompanied with strong winds. Wind speeds of up to 200 km/h have been recorded. The winds are usually associated with the tropical easterlies and coincide with thunderstorms. They occur virtually countrywide.
Drought and desertification	Mainly areas within the Sudan-Sahel ecological region, including areas north of the 11th parallel north (Borno, Yobe, Adamawa, Taraba, Sokoto, Bauchi, Katsina, Kano, Gombe, Kebbi and Zamfara states).
Sandstorms	All states within the Sudan-Sahel ecological region are vulnerable (Borno, Yobe, Adamawa, Taraba, Sokoto, Bauchi, Katsina, Kano, Gombe, Kebbi and Zamfara states). They are caused by the propagation of north-easterly trade winds across the Sahara desert into these northern states.
Pest invasion	Pests of various types occasionally attack agricultural lands (locusts and quails are common). When it occurs, the farmlands of whole communities are ravaged, leaving people impoverished. All areas of the country are vulnerable.

Wildfire	All areas are at risk of wildfire but the Sudan, Guinea and derived savannah ecological regions and the drier parts of the rainforest are particularly susceptible. Fires are usually seasonal and are often caused naturally by lightning flashes or through uncontrolled bush burning.
Volcanic activity	Volcanic activity is common on the Biu and Jos plateaus and in the Benue valley. Plateau, Adamawa and Taraba States are most susceptible.

Source. United Nations Economic Commission for Africa. (2015).

Flood events are common in Nigeria. Lagos state, the commercial hub of Nigeria lies on the coast of the Atlantic Ocean and suffers the debilitating effects of Floods. Adelekan (2016) asserts that Flood events are caused by heavy rainfall. In July 2011, a seventeen-hour precipitation event inundated Lagos with 233.3mm of rainfall and caused Floods that claimed 25 lives and displaced 5393 persons from their homes (Adelekan,2016). In Southern Nigeria, Flood constitutes a major disaster. Chiadikobi et al. (2011) confirms the impact of Flood on residents of Port Harcourt, Rivers state.

The early 1970's heralded a great famine that spread across much of the Sahel and Northern parts of Nigeria. Watts (1983) argues that a 7-8-month dry period followed by an intense but short wet season may have altered the precipitation pattern and brought about drought, which in turn caused the famine. Odjugo (2010) opines that decreasing rainfall and increasing temperature has led to the incidence of drought and desertification experienced in Northern Nigeria. Drought and desertification has resulted in the encroachment of sand dunes, water scarcity, ecological degradation and emigration of people and animals (Odjugo

an Ikhuoria, 2003). The impact of drought is multi-pronged, and it is affirmed by Obioha (2009) who is of the opinion that agricultural production and livelihoods have suffered negative consequences prompting government and aid agencies to intervene. Bello et al. (2012) are of the opinion that drought has influenced the cultivation of certain crops in Northern Nigeria. The authors suggest that millet, maize and beans are planted as a means of adaptation, rather than the preferred crops (Groundnut and Guinea corn). Drought and desertification have resulted in the reduction of arable lands for cultivation, thus informing new farming practices. The reoccurrence of droughts has enabled the spread of disease carrying vectors, thus impacting livestock and human health (Hotez and Kamath, 2009). The areas to be studied are Benue and Kogi states, because of their susceptibility to fluvial floods. Benue and Kogi states are bounded by two major rivers in Nigeria (Benue and Niger). The area constitutes important agricultural lands and is referred to as the food basket of Nigeria. Recurrent flood incidents in the area have claimed lives and destroyed properties with serious consequences for the economy of Nigeria. Flood events will be analysed for year 2012 and 2017 to inform the discourse of this research.

3.7 Limitations of The Study

This research would have benefited from actual field visits, to gather data and gain insight from at-risk communities. The lack of funds did not afford the opportunity to make field visits. There was also a paucity of literature on local

knowledge in Nigeria. Despite the aforementioned shortcomings, this research work will offer a better understanding of disaster management practice in Nigeria and offer possible solutions to improve the existing measures and enhance the resilience of flood prone communities. The methods adopted in the research is discussed in the next chapter.

Chapter 4: Content Analysis and Case Studies

Nigeria may not be rightly described as a disaster-prone country, yet it has experienced large scale emergencies that have cost lives and properties. Nigeria is the economic hub of West Africa, with its coastlines in the south bounded by the Atlantic Ocean. Much of its cities and economic hubs are built on the shoreline of major rivers. Similarly, there are over 3,000 local settlements and fishing communities inhabiting the coastlines of Nigeria (Fabiya and Oloukoi, 2013). The National Emergency Management Agency (NEMA) is the sole federal institution mandated to undertake and implement disaster management responsibilities. In a bid to improve NEMA's operational efficiency, the National Disaster Management Framework (NDMF) was developed. The core purpose of the NDMF is, to guide disaster management activities in the country. The National Disaster Management Framework was subjected to content analysis in order to evaluate the extent to which the NDMF recognises the inputs of local communities in the disaster risk reduction process

This chapter presents the results of the content analysis of the disaster management framework in Nigeria and case studies of specific communities in states that were ravaged by floods in 2012 and 2017 and inquire about the role of local knowledge in disaster risk management and discuss how the events were managed to inform gaps in the disaster management process. An exhaustive search for materials that speak to the essence of the research topic was conducted.

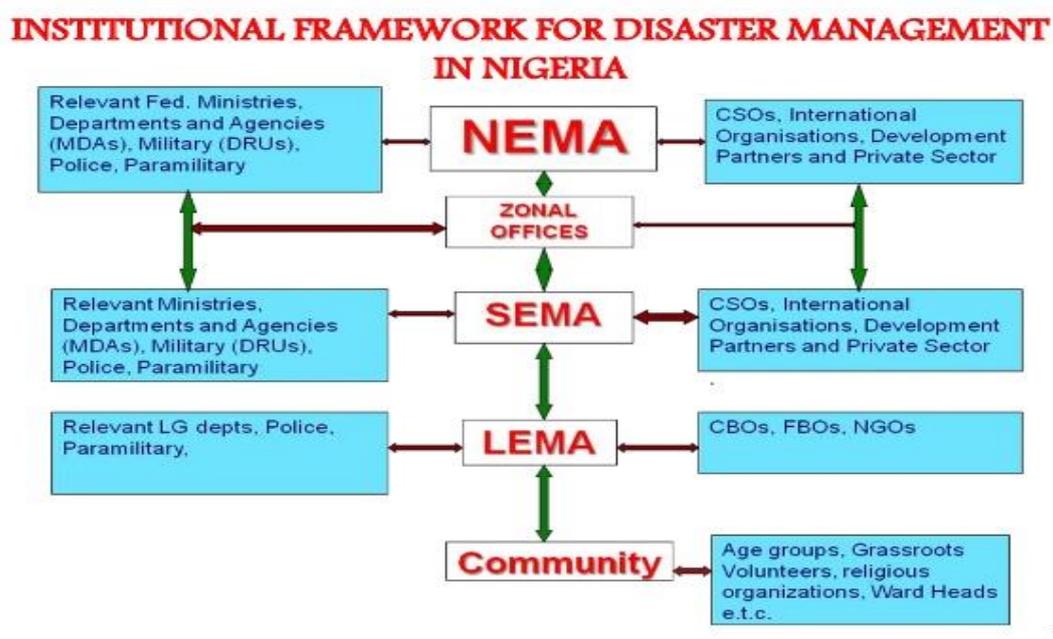
Numerous repositories of academic institutions, research bodies and government agencies were queried to identify relevant policy documents, conference papers and articles. Also, newspaper articles provided data and information relevant to the case studies. 4 journal articles, 3 newspaper reports, and 2 policy reports from government agencies were consulted for Kogi state. Benue state comprised of 3 journal articles and 1 newspaper report.

4.1 National Disaster Management Framework

The “National Emergency Management Agency” (n.d.) suggest disaster management in Nigeria dates back to 1906 with the establishment of the fire brigade, and with each passing government (Military and Democratic), disaster management remained an ad-hoc arrangement under the office of the head of state. The devastating drought of 1972/73 in Nigeria, prompted the creation of a national emergency relief agency (NERA) in 1976. In a bid to embolden disaster management, the federal government of Nigeria (FGN) commissioned an inter-ministerial body to evaluate disaster reduction strategies. Consequently, backed by a decree of the military regime, the status of the NERA changed to that of an independent institution supervised by the office of the presidency. In 1999, the National Emergency Management Agency (NEMA) was established to replace the defunct emergency relief agency and with a mandate to manage disasters nationwide. The National Emergency Management Agency encountered challenges and difficulties in implementing its proposed disaster management

strategies, thus necessitating the National Disaster Management Framework to correct gaps and improve the delivery of disaster management in Nigeria (“National Emergency Management Agency”, n.d.). Figure 6 depicts the hierarchical relationship of disaster management authorities in Nigeria.

Figure 6: Hierarchy of Authority.



Source: National Disaster Management Framework pp. 21.

The national disaster management framework serves to improve consistency and engender efficacy among the stakeholders involved in the disaster management process. Table 4 describes the open codes and their properties derived from searching the framework for words that connote or support the application of local knowledge. It affords the opportunity to understand the structure of the document being reviewed.

Table 4. Open Codes from the National Disaster Management Framework and their ascertained properties

Open Codes	Mentions	Properties
Consultation	2	
Collaborate	8	
Community	32	Community Participation is encouraged.
Participation	10	
Community Participation	4	
Community Response	2	The framework appears to support collaboration with local communities.
Local	43	
Local Participation	0	
Traditional	2	
Knowledge	2	
Traditional Ecological Knowledge	0	
Traditional Knowledge/Local Knowledge/Indigenous Knowledge	0	
Science/Scientific	0	
Scientific Knowledge	0	

Source: Adapted from An Overview of Content Analysis (2001).

The content analysis of the framework reveals codes that suggest a collaborative strategy is encouraged. The NDMF ascribes relevance to the local governments in the planning of disaster management strategies. Disaster management planning in the NDMF allude to the role of community institutions and proposes community response as an important tool. Collaboration between state agents and relevant stakeholders in the disaster risk process is enshrined in all thematic areas of the framework. For example, the framework stipulates that emergency management authorities at all levels shall collaborate with other stakeholders to ensure coherent and relevant disaster risk reduction planning is undertaken nationwide, and consistent with the national disaster risk reduction management plan. Therefore, it is deduced that local knowledge is favoured in the disaster risk management strategies prescribed by the NDMF.

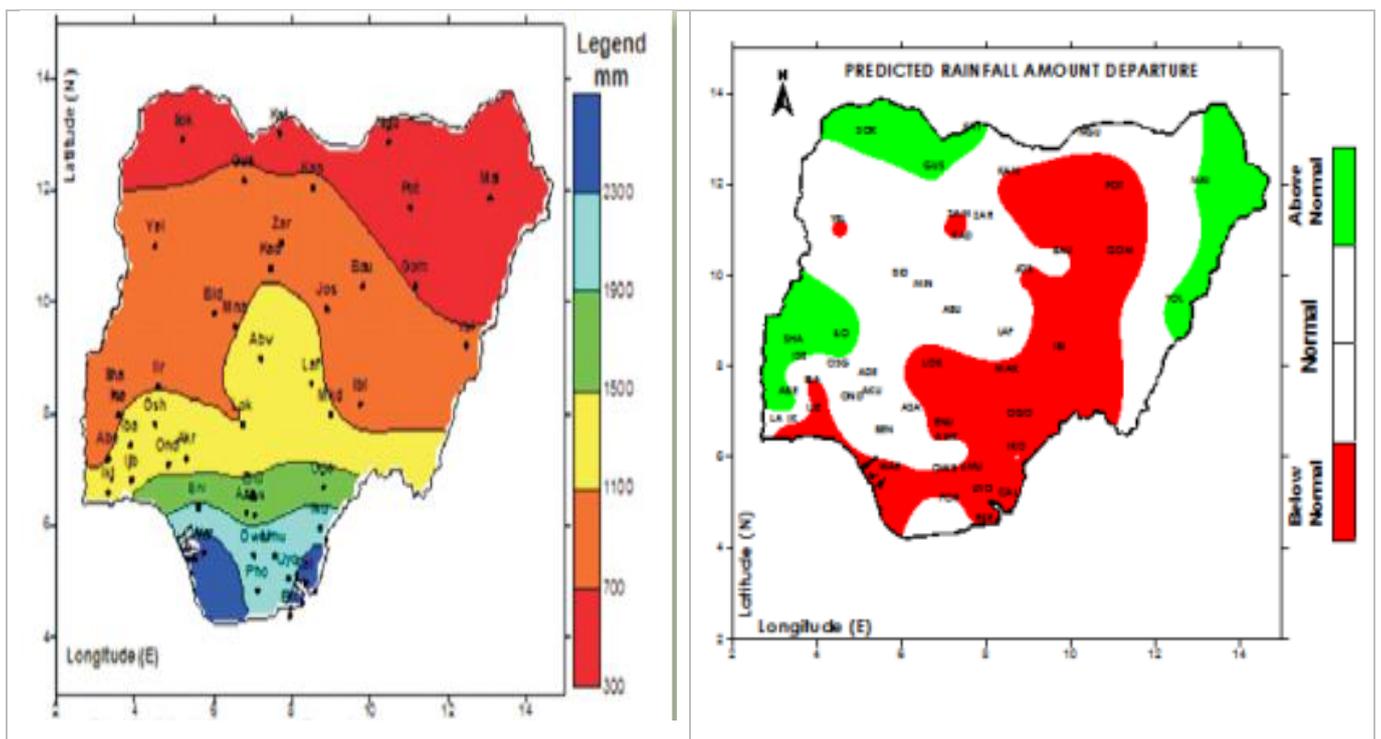
The case studies involve three states in the Niger-Benue Basin, a flood prone area in the North-Central geo-political zone of Nigeria.

4.2 Kogi State:

Kogi state is situated in the North-Central zone of Nigeria. It is called the confluence state, as a result of the confluence of River Niger and River Benue in its capital, Lokoja. The state lies on latitude 7.49 N and Longitude 6.45 E, and its geological feature comprises of sedimentary rocks and alluvium along the river

beds, thus, promoting agriculture. Average annual rainfall ranges from 1016 mm to 1524 mm, with a maximum temperature of 33.2 °C. The city of Lokoja is low-lying, with over 60% of its built area lying on the floodplains of River Niger (Samuel et al., 2017). Figure 7 depicts the annual rainfall predictions for 2012 and its deviation for 2017. Lokoja, Makurdi, and Jalingo were expected to receive rainfall in the region of 700-1500mm in 2012. In 2017, rainfall in the region was expected to be below normal compared to previous predictions.

Figure 7: Annual Rainfall Prediction



Source: Nigerian Meteorological Agency

Anunobi (2014) describes Lokoja as a riparian town consisting of an extensive floodplain favourable for agriculture and fishing. The author confirms the

recurrent flooding of the floodplains beginning in September and peaking in November. As the state capital, it is no surprise that much of the town is primarily built up to accommodate commerce and industry. The socio-economic characteristics of Lokoja evince the cluster of neighbourhoods ranging from medium density to high density (Samuel et al., 2017). Aderoju et al. (2016) affirm that communities native to the floodplains are often connected to their environment in spiritual and ritualistic terms, to the extent that ritual cleansing is carried out to pacify natural spirits and deity to avert floods.

4.2.1 Event

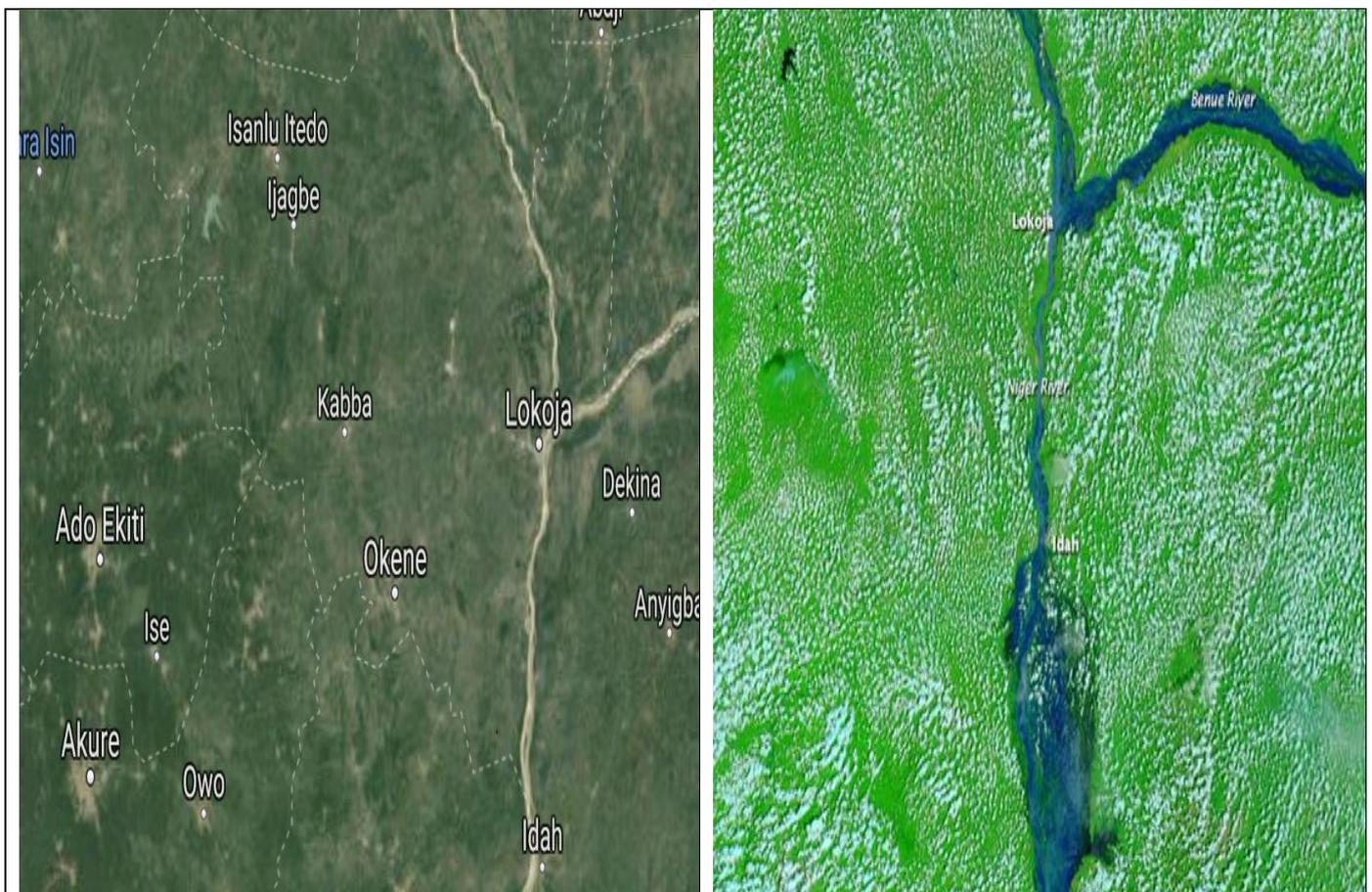
The Nigerian Meteorological Agency (NIMET) in their seasonal rainfall prediction in January 2012, warned about imminent floods in various parts of Nigeria, as a result of heavy rainfall (Njoku, 2012). The agency advised the federal and state governments to prepare for the rains by cleaning their drainage systems, creating awareness for residents in the affected region, and carrying out maintenance of dams in their jurisdiction. Nine local governments in the state sustained severe damages, with over 2000 homes submerged in flood water (Njoku, 2012).

4.2.1.1 Flood Event of 2012

The floods that occurred in 2012 were adjudged the worst in four decades (“Lingering hardship and floods”, 2014). Kogi state experienced much of the destruction across the country, with 1.3 million people displaced and 413 lives

lost, farms destroyed, homes washed away, and roads cut off. Figure 8 describes the level of flood waters that enveloped Kogi state. It is deduced from the map that the floods stretched for miles, impacting villages along its route.

Figure 8: Flood waters in Kogi.



Source: Earth Observatory.

The floods are also attributed to the opening of dam spillways without proper consultation (Bashir, 2014). Heavy rains in August and September resulted in excess run-off and overflow of reservoirs in Nigeria and its neighbours (Cameroun and Niger). In a bid to relieve pressure on the dams, spillways for the

Lagbo dam, Shiroro dam and Kainji dam were opened thus leading to flooded river banks. Kogi state shares its boundary with ten other states which transcend the South – West, North – Central, South – East, and North – Western parts of Nigeria. The disruptions in transportation impacted commerce and trade, thus causing a spike in food prices. Figure 9 shows the blockage of an important highway. The Lokoja -Abuja carriageway is an essential route for the movement of people and transportation of food between the Northern states and Southern Nigeria. The floods of 2012 resulted in its closure and with dire consequences for farmers and commuters.

Figure 9: Severed transportation route



Source: Geospatial Techniques for the Assessment and Analysis of Flood Risk along the Niger-Benue Basin in Nigeria.

4.2.1.2 Flood Event of 2017

Rainfall prediction for 2017 was expected to be below normal. However, Davies (2017) suggest that flood in Kogi state has caused the displacement of over 10,000 people. Heavy downpour in September which lasted several hours resulted in flood waters in Ganaja and Sarkin-Noma axis of Lokoja city. Other areas affected by the flood include; Ajaokuta, Bassa, Igalamela/Odolu, and Koton Karfi. Also, the Lokoja – Abuja highway was submerged thus impacting traffic. Figure 10 shows flood waters in a residential area of Lokoja.

Figure 10: Flood waters in Lokoja



Source: Nigerian Meteorological Agency

4.2.2 Response

The investigation into the role of government and its agencies, reveals that warnings from the weather agency were not heeded. Also, in the wake of the flood, monetary donations were made by well-meaning Nigerians and corporate organisations to the state treasury to the tune of \$2,118,412.12 (Bashir,2014). There exist no records, at least to the public, to explain how the funds were spent to ameliorate the sufferings of those impacted by the flood.

Daramola et al. (2016) in their assessment of flood prone communities in Kogi and other affected states document observed coping strategies to include: relying on rain water for drinking, relying on oil lamps and candles, taking refuge in religious establishments and squatting with friends/relatives. The use of herbs to treat diseases is also identified by the authors. Similarly, Anunobi (2014) in a study of the flood risk of Shinkatu community, a sub-urban neighbourhood on the outskirts of Lokoja, identifies coping strategies employed by residents. The author identifies flood proofing techniques used by the community to include: the use of waterproof sheets in buildings, and the use of sandbags and sealants to block possible water escape routes. Also, relocation from flooded premises and elevation of buildings with high foundation is a common practice employed. In September 2017, flood wreaked havoc in parts of Kogi State. A joint assessment by disaster risk managers from relevant agencies in the state and representatives

from the National Emergency Management Agency offers information about the coping strategies employed by some communities. Osikoya (2017) reveals that in Western Kogi (Yagba, Mopamuro) residents were observed to use sand bags to prevent flood waters into their homes and businesses, and in Lokoja some residents were observed to remain in their homes and wait out the floods.

Newspaper reports confirm that development partners such as religious bodies and non-governmental organisations set up camps and emergency clinics in the affected areas, in a bid to relieve the suffering of the inhabitants. The state government is alleged to have built houses in the state capital, with the intention to resettle residents of affected communities. The resettlement agenda of the government suffered setbacks occasioned by the numerous complaints of residents and traditional rulers querying the location of the houses from the affected areas.

4.3 Benue State

Benue State is named after River Benue. It is the 9th most populous state in Nigeria, with a population density of 99 persons per Km². Benue state lies within the lower Benue trough and shares boundaries with five other states and Cameroun. It is low-lying and made up of riparian wetlands fertile for agriculture. Figure 11 shows the communities that comprise Benue State. Flood events in

Benue state impact communities as far as Vandeikya due to the rivers and tributaries that surround the state.

Figure 11: Map of Benue State.



Source: A severe flooding event in Nigeria in 2012 with a specific focus on Benue State.

Markurdi town lies within the floodplain of the lower River Benue valley and serves as the administrative headquarters of Benue State. The town is drained principally by River Benue, which divides it into Makurdi North and South. Hula and Udoh (2015) opine that the low topographical relief of the area results in the floods experienced by residents. The National Population Census figure shows that Makurdi is home to 300,377 persons.

4.3.1 Event

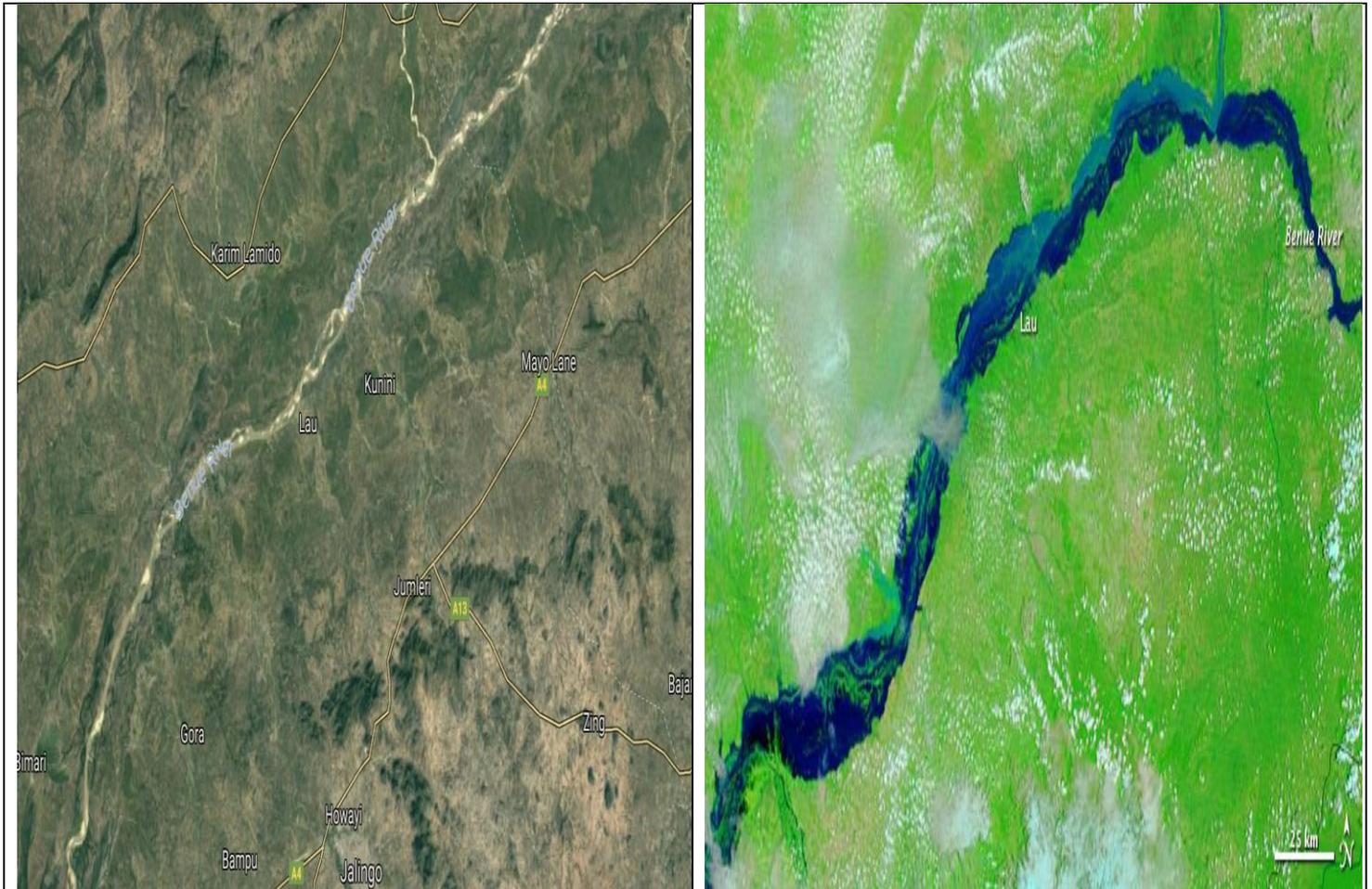
Flood has ravaged different parts of Benue State. It has impacted livelihoods and caused displacements of people from their homes. The low relief nature of Makurdi town, high water table, Urbanisation and human activities are identified as some of the causative factors of recurrent floods in the area (Clement, 2012).

4.3.1.1 Flood Event of 2012

Benue State was one of the states ravaged by floods in 2012. Severe flooding was experienced across all the major towns on the banks of River Benue. Despite the warnings by the weather agency to prepare for increased rainfall and floods, Agada and Nirupama (2015) submit that a visit to the major cities, reveals drainage and canals silted with sand, plastic and other non-decomposable garbage's, buildings sited on drainage channels and erosion passages. Similar to the situation in Kogi, heavy downpour and the opening of the Lagbo dam spillway is fingered to be the cause of the flood. Homes, farmlands and valuable belongings were lost to the raging flood waters. Ojigi et al. (2013) assert that flood in Makurdi township displaced 112,362 persons and inundated 932.46 km² of land. Newspaper reports surmise that flood waters ravaged and swept away buildings and farmlands within 10 kilometres radius of the bank of River Benue. The devastation of the flood stretched to communities in Apa, Agatu, Guma and Otukpo, with attendant difficulties experienced by residents of these areas. Figure

12 shows the stretch of the Benue river flooded in 2012. The flood waters submerged buildings and polluted water systems.

Figure 12: Map showing the stretch of River Benue flooded in 2012



Source: A severe flooding event in Nigeria in 2012 with a specific focus on Benue State.

4.3.1.2 Flood Event of 2017

In August 2017, a 72-hour downpour resulted in flooding of Makurdi, the state capital (Duru, 2017). The recent flood event is considered to be worse than the floods experienced in 2012. Reports emanating from the state, suggest that

110,000 persons have been displaced, and no lives lost. The flood affected six local governments (Makurdi, Buruku, Guma, Tarka, Logo and Agatu), causing widespread devastation in its wake. Farmlands, roads and homes were reported to have been washed away. Figure 13 depict flooded homes in Makurdi township in September.

Figure 13: Flood Waters in Makurdi



Source: Nigerian Meteorological Agency

4.3.2 Response

Again, camps were set up to accommodate displaced persons and relief materials doled out to meet the needs of camp residents. The reaction of the government to the recent flood event is hampered by the paucity of funds. It is on record that Benue State owes its workers nine months' salary amidst other debts owed service providers. From the preceding, it is evident that disaster management response is somewhat reactive. Coping strategies reported by the news media reveals that households and communities clean up drains and construct their homes on elevated foundation level. Post-assessment study of coping strategies employed by residents of Makurdi reveals that construction of new drainage channels and sand removal from existing drains as standard practice (Shabu and Tyonum, 2013). Similarly, Hula and Udoh (2015) in their research, ascertain flood risk reduction measures employed by residents in Makurdi to include: relocation, use of sandbags, and raising the foundation of buildings. Similarly, Ocheri (2012) identify the construction of temporary bridges in flood ravaged areas as one of the coping strategies employed by residents. Figure 14 shows the use of sandbags to abate flood waters in a residential neighbourhood in Makurdi.

Figure 14: Sand Bags used for flood abatement



Source: Coping measures of flood-prone areas in Makurdi.

4.4 Adaptive Responses of Some Communities in Nigeria

Flood is endemic in almost all the regions in Nigeria, and communities have developed strategies to adapt and improve their resilience. However, the literature informing the role of local knowledge is scarce. Therefore, it can be deduced that academic research may not have given priority to these forms of knowledge. Fabiyi and Oloukoi (2013) provide evidence of uses of local knowledge across communities in 4 local government areas that traverse the western and southern parts of the country. The authors confirm the existence of flood related local

knowledge and practices and its entrenchment in past experiences, culture and religious orientation.

Religious practices in the study areas involve the veneration of ancestral spirits. Cultural practices include the marking of the traditional calendar at the onset of the rainy season and the observation of traditional meteorological signals; lunar observation, sea animal behaviour, cloud study, water colour observation and leaves and particle observation.

Table 5. Local Signs and Local Knowledge of Flood Occurrence in The Selected Communities.

Communities	Local Perceptions/Signs of Flood	Ecological Indicators	Indigenous Knowledge Applications
Abereke	Heavy rainfall of more than two hours signifies potential flooding. 2 hours after a particular wind or storm	Loss of some vegetation species: <i>opepe</i> (<i>Sarcocephalus latifolius</i>), <i>abura</i> (<i>Mitragyna ciliate</i>)	Efforts are made to bring the domestic animals and other valuables into safe place. The floodwater often come at night
Ori Oke	Approaching full moon shows flood is likely to come from the sea		Fishermen are cautioned

Araromi	<p>Consultation of Ojuoluweri river god, to know how strong and disastrous the flood will be in advance</p> <p>There is yearly prediction of flooding by the priest of the water god</p> <p>When oriro, orika and ini months approach</p>		The domestic cooking fireplaces are raised on a platform albeit temporarily.
Obefela	<p>Thick clouds signify heavy rain and flooding when the moon is getting fuller.</p>		High tides are known by all and preparations are made to avert losses
Awoye	<p>Calculation of months predict the high tide period (November, December, January – February)</p> <p>Fullness of the moon</p>	<p><i>Loss of some vegetation species: raffia palm, opepe, abura</i></p>	Preparations are made to reduce damages from flood disasters. They have relocated the king's palace twice due to flooding and subsidence.
Ayetoro	<p>Full moon</p> <p>Rainy season, when it rains more than two times a week between 11 and 15 of January.</p>		

Source: Adapted from Fabiyi & Oloukoi (2013). p. 12.

Table 5 illustrates the pre-flood local knowledge adopted by at-risk villages in some of the communities studied. The knowledge base of the communities encompasses different facets of communal living. Summarily, the role of local knowledge in the communities studied by the authors includes: (a) In Abereke community, the loss of a particular vegetation (Opepe), informs the decision to prepare for floods. Livestock and valuables are moved to safer grounds. (b) Cloud readers warn that an approaching full moon heralds the onset of floods from the sea. Therefore, fishermen are cautioned to be careful. (c) Veneration of deities in the communities inform the decision to prepare for flood. (d) Communities possess knowledge of months of the year that bring about high tides from the sea. At the onset of the high tide season, preparations are made to reduce damages from floods. Similarly, Olorunfemi and Raheem (2013) posit that poor communities in the south-western state of Kwara, cope with floods by turning to relatives and accessing personal savings.

The communities studied by Fabiyi and Oloukoi (2013) are largely coastal and rural. Conversely, the communities studied in this research are urban settlements and largely riverine with similar coping strategies. It is not likely that the same form of knowledge in the rural areas will be practiced in urban areas. Perhaps, similarities may exist among rural communities regardless of their geographical location.

Chapter 5: Discussion

This thesis began with arguing for the role of local knowledge in disaster risk reduction albeit promoting interactional expertise between science and local knowledge. The results of the analysis conducted, reveal that local knowledge is limited in application in the town centres and the disaster management framework makes a case for collaboration and participation of communities in the disaster risk process. More significantly, the exercise informs the researcher that communities vulnerable to floods continuously strive to protect their homes and business from the onslaught of flood waters. The contention of the researcher is that while the NDMF makes a case for collaboration, it doesn't identify or define opportunities that will engender cooperation between local communities and state agents. The framework suggests a uniform approach for all disaster type. Consequently, it fails to address the disaster risk peculiar to coastal and riverine communities appropriately.

5.1 Perceived Gaps Between Policy and Implementation

While the framework makes provisions and enactments that posit efficiency in disaster management practice in Nigeria, the case studies reveal that implementation is near absent. Implementation involves activities carried out to achieve objectives of established policies. It entails converting material, financial,

technical and human inputs into outputs. Makinde (2005) opines that the absence of critical factors such as communication, resources, disposition or attitudes, and bureaucratic structure, leads to implementation problems of public policies. The disposition/attitude of departments and agencies of government in the areas studied, is rather reactive. It appears that government presence is noticed only when disaster strikes. Resources such as human capital, finance and land needed to implement the NDMF suffer setbacks.

Disasters regardless of its form/type occur on land and is a collective responsibility of all levels of government in dealing with it. However, in the case of Nigeria, at the onset of a disaster, the debate arises as to whether it occurred on federal or state land. Braimoh and Onishi (2007) avers that the Land Use Act of 1978 has not been able to replace the customary land administration system, rather it has largely improved access to land for government, high net-worth individuals and corporate organizations. Thus, access to land for low-income earners is achieved through informal arrangements, and such land are located in peri-urban locations that lack basic social services. Also, land hitherto designated as green space, parks, watersheds and natural drain pathways have been converted to other uses, such as building residential homes and markets. On the 8th and 9th of July 2017, heavy rains in Lagos (a coastal urban metropolis) resulted in floods that destroyed properties and disrupted business activities (Fasan, 2017). The flood was prevalent in the Lekki peninsula and Victoria island axis

(neighbourhoods with proximity to the Lagos lagoon). Urban planners and stakeholders knowledgeable of the situation have blamed the incidence on the development of a new ultra-modern city (Eko Atlantic) on a former beach site. The skewed land administration regime favours political decisions and limits the role of traditional institutions in decision making. This may inform the limited role of local knowledge in disaster management as evinced by the case studies.

While the act establishing the National Emergency Management Agency mandates the creation of branches in states across the federation; the reality is that not all states have complied with this directive. This is confirmed by the findings by Adedeji et al. (2012) that not all state in the federation have complied with the directive to create emergency agencies and where they exist, they are not functionally independent and equipped to perform their duties. The states argue that their budgets do not provide for the creation of new parastatals. It is argued that this argument is flawed, given the cost of governance imbued by the politicians. The budgetary situation in Nigeria as argued by Adeolu and Osabuohien (2007) suggest that the rising proportion of allocations to support government administrative structures has permitted a high incidence of poverty and influenced economic collapse of vibrant sectors. Furthermore, an evaluation of the capital budget of Nigeria for the 2012 fiscal year by Ogujiuba and Ehigiamusoe (2014) reveals that only 51% of appropriated funds were utilised.

It, therefore, suggests that departments and agencies were starved of funds to carry out their operations.

5.2 Crisis of Trust

Flood warnings issued by the Nigerian Meteorological Agency was not acknowledged in both 2012 and 2017. Residents in the affected areas rather than depend on government, prepare for floods on their individual/collective terms. Akinola (2007) posit that the wide gap between state and society, is a result of centralised administrative and governance arrangements which has robbed state structures of people-oriented institutions. The author asserts that self-organized arrangements in rural communities in South-Western Nigeria provided infrastructural facilities at the cost of \$ 1,546,071 as against \$ 20,452 spent by government on the same type of facilities. The reactive role of state agencies in disaster management may also contribute to the erosion of trust for government initiatives.

Tajudeen and Adebayo (2013) confirm the non-existence of Internally Displaced Persons (IDP) camps of a lasting nature in Nigeria. It is common practice to find schools, hospitals, and military barracks converted as temporary shelter and for a limited period. The management of displaced persons occasioned by flood incidents is fraught with maladministration. The case study of Benue State reveals case where displaced persons was sacked from camps to make way for students

resuming school. In Kogi state, the government mulled the idea to resettle displaced communities in towns/cities far from their homes and livelihoods. It is argued that the experience of flood ravaged communities in the camps further worsens their disposition to government initiatives. Makinde (2005) speaks to the essence of communication in policy implementation. The situation in the areas studied, do not signal proper information sharing between federal, state and local governments. A robust information dissemination strategy is needed to help enshrine disaster risk reduction strategies.

5.3 Streamlining Disaster Management Practice

The areas studied reveal that residents have developed local knowledge to cope with floods. Coping strategies observed reflects the complexity of the environment in which people reside. Paul and Routray (2010) affirm that coping strategies differ according to geographical locations. Coping strategies employed by residents in the areas studied differ from those observed by Fabiyi and Oloukoi (2013) in their field study of communities in the Niger-Delta region. Local knowledge in Lokoja, Jalingo and Makurdi do not possess spiritual/religious undertones. Regardless of their differences, the local knowledge possessed by flood prone communities is important in sustaining their livelihood. The differences in local knowledge, suggest disaster strategies must recognize the differences between communities and regions in their domain. It speaks to the essence of planning for different disaster types.

Given the warnings and experiences emanating around the globe regarding the effect of climate change, it is expedient that the Nigerian government as a matter of priority must empower residents of cities, townships and rural communities with the necessary tools to plan and implement their coping strategies. The existence of numerous actors at both state and federal levels necessitates some form of planning and coordination. States across the country must be allowed to organise their disaster management practice to align with their resources and environmental concerns. The national agency rather than seek to regulate the branches may opt to provide guidance and support to the states. Guthiga and Newsham (2011) describe a project in Kenya, where the Meteorology department and rainmakers in a local community shared knowledge to improve weather prediction. The authors confirm convergence of results between the scientist in the weather office and local knowledge holders. They argue that integration of local knowledge in climate policies is encouraged with further gains for cooperation and implementation of disaster risk strategies.

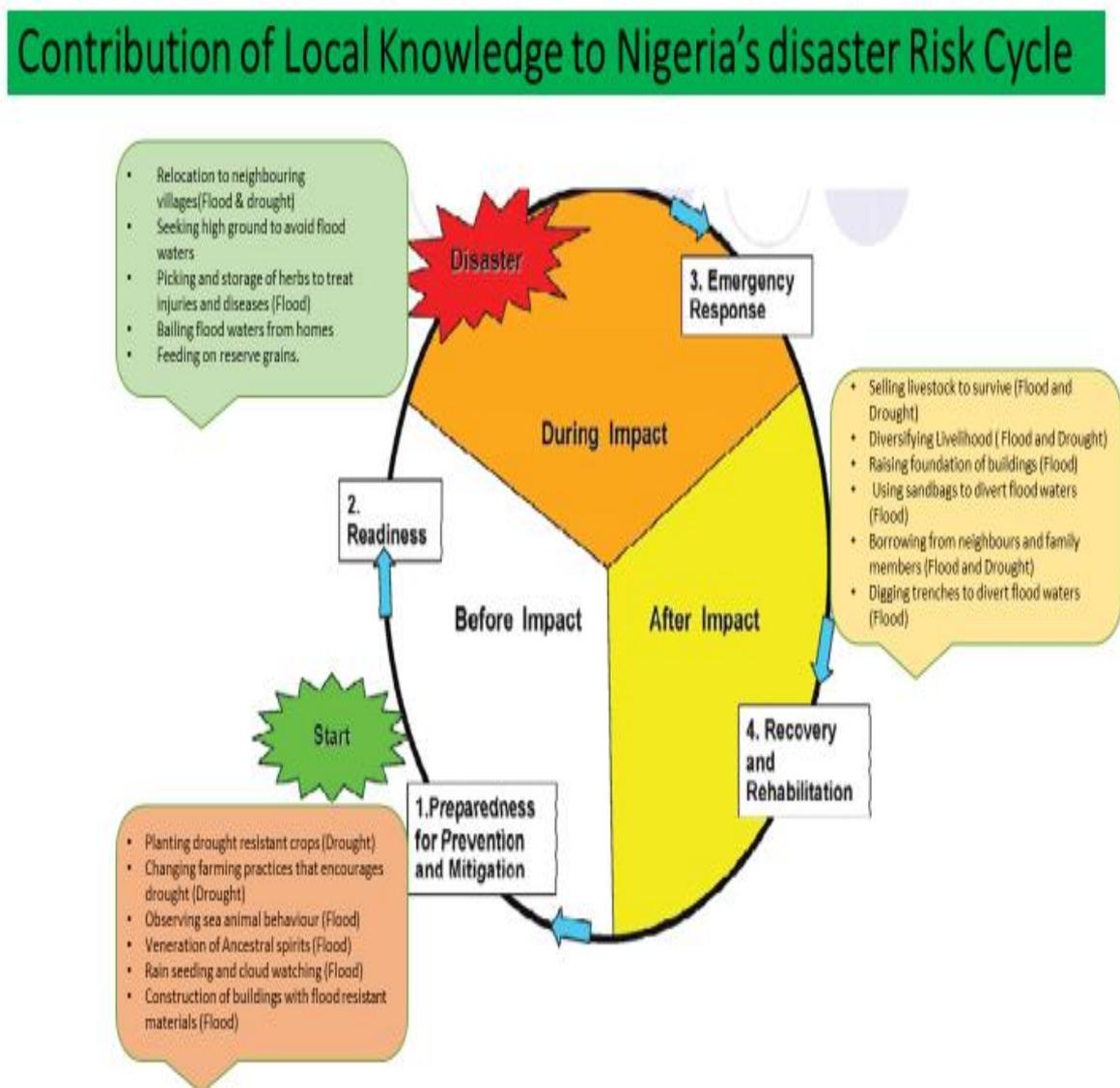
The results obtained from this research seeks to inform policy, particularly the need to review the National Disaster Management framework. It is important that the framework defines strategies and programmes that encourage participation of at- risk communities. Figure 15 describes the potential contributions of local knowledge to Nigeria's disaster management cycle. The role of local knowledge in described across the different stages of the cycle. At the onset of a disaster

event, local knowledge can help at-risk communities prepare for floods and droughts respectively. In drought-stricken areas, local knowledge can inform the decision of farmers to plant drought resistant crops. Likewise, rain seeding and cloud watching can help coastal and riverine communities prepare for flood. Local knowledge has been proven to save lives and preserve livelihoods during disasters. The Simeulue Island case study is a classic example. After the impact of a disaster, it is imperative that recovery and rehabilitation is encouraged. To this end, local knowledge exists in communities that can engender recovery. The framework designed by Mercer et al. (2010) emphasize the cooperation between science and local knowledge. The final stage in the process framework entails integrative approaches identified by the communities to address their vulnerabilities, and it aligns with figure 15. Figure 15 offers disaster managers in Nigeria the opportunity to appreciate the contributions of local knowledge in enhancing the resilience of at-risk communities. A comprehensive vulnerability assessment will improve the contents of the model and afford the Nigerian authorities the opportunity to plan for disasters at every stage of the disaster management spectrum.

Disaster management strategies of the government rather than adopt a centralized structure, may seek to empower communities and local governments by empowering them to plan their disaster reduction strategies based on their peculiar disaster profile. While the Hyogo and Sendai frameworks make

important contributions to disaster management practice, Figure 15 seeks to bring disaster planning by local institutions close to national strategies. Collaboration between science and local knowledge holds the key to improve disaster response and reduce vulnerabilities.

Figure 15: Local Knowledge and Disaster Management Cycle



Source: *Urban Flood Disaster Management* pp.32.

Chapter 6: Conclusion and Recommendations

The incidence of disaster is spread across the different nations of the world. However, Alcantara – Ayala (2002), is of the opinion that the impacts of natural disasters are higher in the least developed countries (LDC). The author furthers his argument by suggesting that geographical location and geomorphological settings influence the occurrence of disasters; developing countries are located in regions predisposed to floods, and seismic activities. Also, the economic, social and cultural characteristics may pose some form of vulnerability to disaster. Toya et al. (2001) in their empirical analysis of economic losses from disasters conclude that a greater ease of access, a healthy financial sector, education and a small government may improve the resilience of countries to disasters. The political situation of most developing countries offers a glimpse into why the impact of disasters is high. Cohen and Werker (2008) assert that natural disasters may offer governments the opportunity to redistribute power, by focusing disaster infrastructure in regions that are loyal to the government. The authors also argue that government at the national level will pay less attention to disaster mitigation at the local level, given that the national income is not impacted by the occurrence of a natural disaster.

Kuban (1996) avers that the initiation of disaster preparedness and maintaining momentum for disaster reduction policies is the most significant role of

government. It is expected that disaster risk reduction will be prioritised given the worsening climatic condition. Opportunities exist for collaboration between public institutions and development partners. Most importantly, the people being planned for must be given a voice in the planning process vis-à-vis integrating local knowledge into disaster planning. Local knowledge is not a static form of knowledge. It has evolved overtime and possess the ability to guarantee buy in into policies by local communities. Drawing on the findings of this research, a list of recommendations that can improve disaster management practice in Nigeria is proposed:

- Review the National Disaster Management Framework to empower local communities to plan their disaster management strategies.
- Ensure adequate budgetary allocation to disaster management agencies.
- Promote consultation between state agencies and local institutions, in a bid to develop effective early warning systems and share information
- Clearly define disaster management strategies for riverine, coastal and inland communities.

In a dynamic field of research such as disaster management, this research work presents gaps in the current structure of disaster management practice in Nigeria, thus paving the way for future research to improve the vulnerability of at-risk communities to disasters. Furthermore, it is recommended that the following

actions be implemented in the short term, to begin the process of re-orientation of disaster management practice in Nigeria:

- The federal government in conjunction with state governments must commission participatory action research with a view to identify the traditional knowledge(s) practiced by communities across the 6 geopolitical zones. Researchers domiciled within the study regions should be mobilized to carry out the research.
- An assessment of disasters prevalent in the different temporal/vegetative zones that make up the country.

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