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A review of resilience to flood disasters and risk reduction measures: the case of Nigeria's Niger-Delta Region

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ABSTRACT
The ability of a system or society that is exposed to hazards to resist, absorb, accommodate and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions. However, developing resilience and/or coping capacities contributes to reducing disaster risk. This review showed that engaged communities enable priorities to be better defined and actions planned, responding to real needs and concerns and bringing about long-term change. When local citizens and communities have a voice, they can get involved in those decisions that will later affect them. Community involvement is not only about tapping local risk knowledge and communities' resourcefulness. This critical review also points out a number of gaps in measuring disaster resilience literature. First, a large portion of the resiliency literature is mostly conceptual with excessive emphasis on resilience in socio-ecological systems. In this context, there remains a lack of robust case studies which can test or validate the models and their theories. Second is the lack of policy relevancy of the outputs.

I. INTRODUCTION

One of the key challenges of disaster risk management (DRM) in Nigeria lies in the establishment of practical and precise ways of measuring resilience. Development actors all over the world have recognized the importance of resilience thinking. Attempts to estimate resilience can be grouped into quantification that is based on functionality, indicators and characteristics, access to food, activities, subjective perceptions and costs of resilience. So many efforts to measure resilience have largely focused on the use of objective frameworks and methods of indicator selection which typically depend on a range of observable socioeconomic variables such as levels of income, household social capital or access to social safety nets. Yet, objective methods have their uses, they suffer from well-documented weaknesses. Preconceptions, such as choice of indicators, context-specific nature of resilience and the difficulties of capturing the less tangible processes that contribute to resilience of individuals, all make the measurement difficult. It is a bit hard to measure adaptive capacity (that is ability to deal with change) since it has cultural, psychological, financial, technical, political and social components (Levine and Mosel, 2014). In quantifying resilience especially at the Community level, USAID (2013) identifies several units of analysis for resilience, which include people, households, communities, countries and systems (social, economic, ecological). Most challenging from a measurement perspective amongst these are communities and systems, especially if approached as units of analysis in their own right, rather than simply aggregates of lower units, as the concept and definition of resilience demands. Flood disasters pose immense problems for people, societies and cause damage, disruption and injury to lives and livelihood. The length of time a society takes to recover depends on a complex interplay of factors including the magnitude of the disaster, societal preparedness and economic wealth.

The study would provide a resilience framework and guideline to flooding in the Niger Delta area which would; prepare individuals as well as households in this flood prone areas to see the need to measure their resilience capacity in terms of access to information that will enable them improve their alertness and responsiveness to capacity building/preparedness. Households and by extension

communities within the Niger Delta of Nigeria would also be able to measure/estimate resilience at every point in time and put measures in place to reduce risks by assessing their own state of resilience and establishing priorities for strengthening it.

II. THE CONCEPT OF COMMUNITY RESILIENCE

Systems that are resilient are way less vulnerable disasters than less resilient places. To be able to validate this assumption, knowledge of how resilience is determined and measured is vital (Klein et al., 2003). Published articles and non-academic publications had several similarities in measuring resilience. Resilience measures are a function of different components, characteristics or aspects of a community. Authors in many publications had arrived at similar or comparable components. Some authors termed them 'capitals' such as social, economic, health, political, physical (Cocklin and Dibden, 2005; Mayunga, 2007; Callaghan and Colton, 2008). Others termed them 'aspects', 'resources', 'enablers', or 'outcomes. The difference was in emphasis, focus, or prioritization, but most publications had two or more similar components. As earlier noted, the conditions that define resilience are dynamic, so ultimately change with differences in spatial, social, and temporal scales. A community may be said to be resilient to environmental hazards at one time scale (e.g., short-term phenomena such as severe weather) due to mitigation measures that have been adopted but not another (e.g., long-term such as climate change). The temporal scale at which resilience is measured is another consideration of importance, since it will affect the variables and parameters chosen to develop general indicators as well as their availability. To measure resilience, the use of a Toolkit which considers the community assets when evaluating the communities is recommended (Figure 1). Assets comprising of people and their skills, experience and motivation, encompassing associations or groups of people working with common interests as volunteers, knowledge, institutions or paid groups of people who are structurally organized were identified.

Fig.1. Community flood disaster resilience (Arbon et. al., 2016)

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It is often difficult to quantify resilience in absolute terms without using external reference to validate the calculations (Schneiderbauer and Ehrlich, 2006). Thus, indicators are typically used to assess relative levels of resilience, either to compare between places, or analyze trends of resilience over time. Some criteria for selecting indicator include validity, sensitivity, reproducibility, scope, relevance, availability, affordability, robustness and simplicity, (Birkmann, 2006b). The most important of all of these is validity, which addresses the question of whether the indicator is representative of the resilience dimension of interest. Another important criterion is robustness, a characteristic that many existing vulnerability indices, for instance, exhibit significant shortcomings (Gall, 2007). Several condemnations of quantitative indicator approach have been noted by researchers, including subjectivity regarding variable selection and weighting, unavailability of certain variables, issues of aggregation to different scales and difficulties in validating results (Luers et al., 2003; de Leo´n and Carlos, 2006). However, quantitative indicators are useful in reducing complexity, mapping, measuring progress and setting priorities. Making them an important tool for decision makers.

There are several types of resilience and these require different forms of measurement. The resilience of ecological systems is influenced by factors like biodiversity, redundancies, response diversity, spatiality, governance and management plans (Adger, 2000; Adger et al., 2005; Brenkert and Malone, 2005; Folke, 2006). Social resilience can be increased through improvements in communications, risk awareness, and preparedness (Paton et al., 2000; Paton and Johnston, 2006). Social resilience can be improved through development and implementation of disaster plans, purchase of insurance and sharing of information to aid recovery process. Some of these are a function of the demographic characteristics of the community and its access to resources. Infrastructure resilience also embraces physical systems such as the number of pipelines, road miles, etc., as well as their dependence and interdependence on other infrastructure.

The more tightly coupled and interconnected the community's infrastructure, the less resilience it exhibits (Perrow, 1999). A high degree of interdependence reduces resilience (McDaniels et al., 2007; Chang et al., 2010). Community competence is another form of resilience that highlights those attributes of places that promote population wellness, quality of life, and emotional health (Norris et al., 2008). Community competence estimates how well the community functions before and after a disaster (Vale and Campanella, 2005). Despite these varied conceptualizations for describing and assessing resilience, none of these metaphorical and theoretical models have progressed to the operational stages where they effectively measure or monitor resilience at the local level (see Figure 2).

Fig. 2. Conceptual framework of community resilience (IFRC, 2012)

2.1 Adaptive capacity

Adaptive capacity can be said to be the ability of a system to adjust to change, moderate the effects, and cope with a disturbance (Burton et al., 2002; Brooks et al., 2005). Adaptive capacity can also be said to be the ability of a systems to adapt to diverse, long-term and future risks, and also learn and adjust/bounce back after a disaster (Malone, 2009). This involves taking deliberate and planned decisions to achieve a desired state of sustainability

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even in the face of a change or when events are about to change. According to some researchers, resilience is an integral part of adaptive capacity as shown in Figure 3 (Adger, 2006; Birkmann, 2006a; Folke, 2006), others view adaptive capacity as a main component of vulnerability (Burton et al., 2002; O'Brien et al., 2004; Smit et al., 1999) and a third perspective views it as a nested concept within an overall vulnerability structure (Gallopin, 2006; Turner et al., 2003). Adaptive capacity also includes the capability to bounce back better or rebuild, taking advantage of the shock or disturbance (Manyena et al., 2011), as well as learn from the legacy of recurrent shocks and stresses. To promote resilience within a system, a good understanding of adaptive capacity within the human environmental system and the scale at which they occur, is necessary.

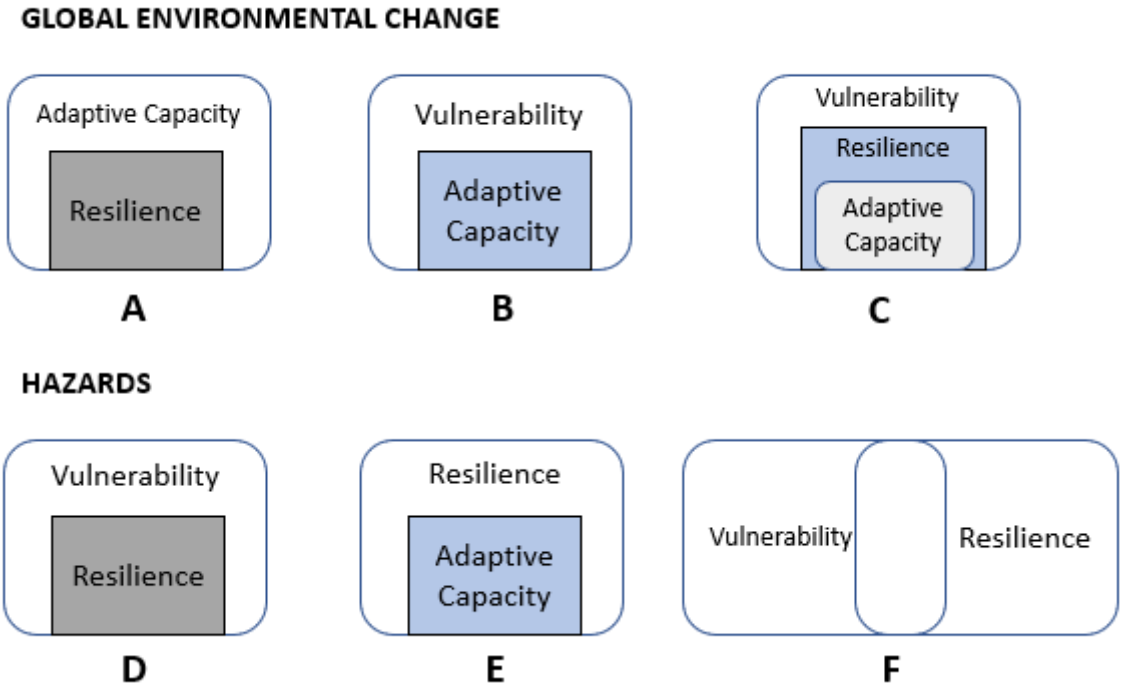

Fig. 3. Conceptual linkages between vulnerability, resilience and adaptive capacity (Cutter et al., 2008)

2.2 Absorptive capacity

Absorptive capacity can be said to be the ability of communities or systems to absorb and cope with changes of impacts of disaster risk. It also refers to the ability of systems, using available tools and resources, to face and manage emergencies, adverse conditions or disasters (Hudner and Kurtz, 2002). During and after a disaster occurs, to reduce the immediate impact on lives, livelihoods and basic needs absorptive capacity is applied. It is concerned majorly with 'functional persistence' i.e., the ability of a system to buffer, tolerate and endure the impacts of a disaster in the short term and avoid collapse like death and destruction of livelihoods (Blaikie et al., 2003; Folke et al., 2010, Bene, 2012). It can be said to be most visible form of coping capacity to disaster impacts. Absorptive capacity hinges on the ability of a vulnerable community to cope with the demands posed by disasters and disasters in turn depend on the resources they can access to bridge stress or shock periods to ensure maintenance of wellbeing (Levine et al., 2011). For a community to have an absorptive capacity, individuals/households will have to substitute one critical asset with another by ensuring diversity and redundancy in resources key to their livelihoods. This guarantees that, even if a hazard prevents access to a particular asset, a household/community should be able to draw on others to smoothen its consumption and maintain its wellbeing.

2.3 Transformative capacity

Transformative capacity can describe an unintended change, but it generally refers to a deliberate attempt to bring about the changes necessary in achieving a desired goal (O'Brien, 2005). The ability of community or system to adapt to, anticipate and absorb disasters can be influenced

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by transformational policy shifts that fundamentally change rules of an institutional (Béné et al., 2012). It is clear here that a combination of the absorptive and adaptive capacities will produce a transformative capacity, which completely increases a community's or systems resilience and thus promote sustainability. Transformative capacity to a great extent is propelled and made possible by a leadership and empowerment process Kotter (1995) and Olsson et al. (2014). stated that transformation requires leaders who see a need for change and then carry it through. Leadership, and in some cases key individuals, can therefore play a central role in influencing the transformative capacity of a community or system (Olsson et al., 2014). Leadership is therefore crucial both in recognizing needs and opportunities and in effectively communicating a change or early warning to others. Leaders can challenge the *status quo*, provide alternate DRR plans of what is possible, take advantage of policy windows and manage risks that may emerge in a system (Michaels et al., 2006). In totality, transformative capacity requires engagement with issues of power (Kapoor, 2007). It involves changes in the social structures that influence decision-making (in units that could include households, communities, businesses, government departments, non-governmental organizations) and changes in individual values, capabilities and choices. Most of the changes that are transformative therefore depend on altering existing power relations like gender dynamics, which involves recognizing the social and political processes that both undermine and constrain resilience. It also entails building greater transparency and inclusion of marginalized groups into formal and informal governance, policies/regulations and decision-making. Béné et al. (2012) states that within household, power changing relations may promoted through shifts in the domestic economy, such as providing conditional cash transfers to women to enhance their strategic position within the family.

Apart from leadership, innovative technologies and processes can also transform systems. Although innovation can be applied to many contexts, there exist an important distinction between approaches that strengthen the status quo and those that champion innovation with the potential for change (Pelling, 2010). Innovation of such is likely to be disruptive and may destroy (at least in part), livelihoods approach that exist, governance and business and the associated skills to enable transformation to occur (Francis et al., 2003). Since transformative capacity refers to the holistic and fundamental ways in which people's capacity to adapt to, anticipate and absorb shocks can be built, reshaped and enhanced. In the context of disasters and development interventions, to demonstrate the potential for transformation, any initiative must embody the following essential characteristics be catalytic, have impact at scale and produce sustainable outcomes (DFID 2014b). Catalytic effects imply the ability to leverage wider change, including the replication and financing of similar approaches by others (see Figure 4).

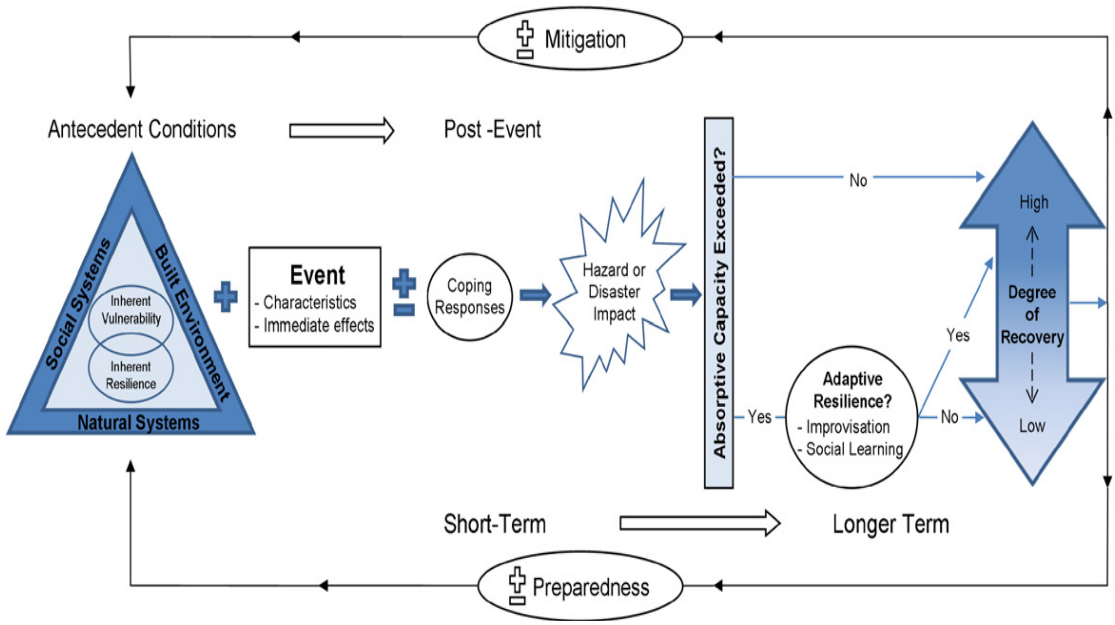

Figure 4. Schematic representation of disaster resilience of a place (DROP) model [Cutter et.al., 2008].

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III. FLOODING IN NIGERIA

Climate change is expected to increase the frequency and intensity of extreme events, including flooding. Across the world, flooding has an enormous economic impact and cost millions of lives. The number of large-scale natural disasters have significantly increased in the past few years; this results in considerable impact to human lives, environment and buildings, and substantial damage to societies. In Nigeria, flooding is the most common disaster where many states are increasingly suffering from annual flooding during the rainy seasons caused by increased precipitation linked to climate change (Aja and Olaore 2014). Unlike some natural disasters, flooding caused by rainfall can be controlled with proper planning and the provision of necessary infrastructure (Agbonkhese et al. 2014; Satterthwaite 2017). Flooding in Nigeria is mainly human induced with current poor urban planning practices and inadequate to non-existent environmental infrastructure contributing to and exacerbating the issue. The absence of a national Flood Risk Management (FRM) strategy or comprehensive flood risk maps, for instance, are indicators of the lack of attention paid to Nigeria's flooding problem (Oladokun and Proverbs 2016). This suggests designing and implementing adequate FRM strategies comprising proper spatial planning and infrastructure would help in controlling the floods which adversely impact Nigeria's sustainable development (Ouikotan et al. 2017). Although, urban infrastructure, underpinned by relevant legal and policy framework, forms the backbone of human settlements. Elements such as FRM measure aim at reducing the likelihood and/or impact of floods while spatial planning, also known as urban planning, town planning, land-use planning and physical planning, are methods employed by the public sector to shape the location, distribution and interlinkages of land use activities (Acheampong 2019; Ouikotan et al. 2017). Nigerian cities are characterized by poor infrastructure which impacts livability and sustainability. However, lack of relevant legal and policy frameworks is another indication of the low importance given to controlling and managing flooding in Nigeria at all three levels of federal, state and local governments and to date, little to no effort has been shown by the government to solve this problem (Cirella and Iyalomhe 2018; Okoye, 2019).

In the states of south-western Nigeria, the Niger Delta region, and communities downstream of dammed rivers in the North area, flooding is an occurrence with wide-ranging impacts. The flooding is mainly due to high rainfall which is prevalent in the Niger Delta and some southern parts of the country (Agbonkhese et al. 2014; Nkwunonwo et al., 2015). In 2012, Nigeria experienced its worst flooding in recent history (OCHA 2012; Nkeki et al., 2013; Toure, 2014). More than 2.3 million people were displaced, 363 lost their lives and another 16 million people were impacted in various ways and years of development gains were reversed (Nwigwe and Emberga, 2014; Oladokun and Proverbs 2016). Total losses were put at US$16.9 billion (Security 2013). In reality, the extent and nature of Nigeria's flooding are such that the actual figures for displacements, losses, and fatalities cannot be truly ascertained (Nkwunonwo et al., 2015; Cirella and Iyalomhe 2018).

The responses to emergency calls with regard to disasters have been very poor. Notable ones are the flood disasters in 2011 and 2012, which point to poor coordination of activities (Adefisoye 2015). In the 774 LGAs in Nigeria, response initiatives are worst and emergency services are dysfunctional because state governors failed to ensure that democratic structures are institutionalized at the grassroots level of the 36 states and 774 local councils (Onwabiko, 2012). Most of the states with SEMA have not assumed optimal operation since their existence (Adefisoye 2015). According to Adefisoye (2015), there is a lack of full backing by the law added to the non-conformity and non-compliance of its provision at the LGA.

IV. COMMUNITY RESILIENCE TO FLOOD IN NIGER-DELTA

Resilience is the ability of a system, community or society that is exposed to hazards to resist, absorb, accommodate and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions. It means the ability to "bounce" or "spring" back from a shock. Developing resilience and/or coping capacities contributes to reducing disaster risk.

The dynamic nature of coastal environment inspired Oyegun et al. (2016) to conduct a vulnerability assessment of coastal communities in the Niger Delta region inundated by sea rise level. The study analyzed the Digital Elevation Map 30 by 30 meters using Arc GIS 9.3 tools. Physical exposure was examined using seven variables of Geomorphology, Shoreline change, Relief, Regional Slope, Mean wave height, Relative Sea Level Change, and Tidal Range. Independent Sample Student t-test, and the Multiple Correlation Analysis tools were used. Findings revealed that the relief of

the entire area falls within 0 to 7 meters along the coastal stretch while inland to north eastern and north western sections of the study area lies at elevation of 1,800 meter above sea level. Vulnerability classification shows that middle and eastern part of the study area falls within the CVI of very Highly Vulnerable, and High Vulnerability. The study recommends institutional framework for an integrated coastal zone management and future research in areas of infrastructure and species vulnerability to inundation. Vulnerability to inundation and sea level rise using a 1: 5 or 1:10 meter resolution DEM should be employed to enhance more detailed spatial analysis of vulnerability across the Niger delta region. The likelihood that the growing population, rapid urbanization and extreme weather events over the years could induce flooding and its associated hazards in Nigeria prompted Oladokun and Proverbs (2016) study on the critical review and characterization flood risk management (FRM) practices in Nigeria with a view to highlighting current weaknesses and opportunities, as well as giving recommendations for practice and for further research. Databases of academic literature, covering a wide range of FRM issues, were systematically queried and mined using suitable keywords. A structured review of the resulting literature was carried out and several past flood events and associated responses reviewed as case studies. Absence of integrated FRM systems, lack of inter-agency coordination, substandard and weak infrastructures, inadequate drainage network, high urban poverty, low level literacy, cultural barriers and weak institutions characterize current FRM practices. The study recommends the adoption of an integrated approach to urban infrastructural development starting with a review of ongoing and planned infrastructural systems and projects with a view to optimizing their FRM capabilities while still meeting their intended purposes. The empowerment of more entrepreneurs into FRM solutions development and service delivery as well as the inclusion of FRM concepts and practices into the nation's educational curricula was also recommended. Nigeria also needs a multidisciplinary platform for generating effective strategic policies and efficient operational mechanisms for FRM.

Akukwe and Ogbodo (2015) examined the spatial analysis of vulnerability to flooding in Port Harcourt metropolis, Nigeria, by creating vulnerability indices and comparing these indices across the 13 zones that make up Port Harcourt metropolis. The integrated vulnerability assessment approach using indicators was adopted. The indicators were grouped into adaptive capacity, sensitivity, and exposure based on the Intergovernmental Panel on Climate Change definition of vulnerability. The data on these indicators were obtained from fieldwork, questionnaire, and map measurements. Principal component analysis was performed to obtain the first component scores which were used to weight the variables before calculating the vulnerability indices of the 13 zones. The vulnerability indices results show that Mgbuosimiri in Obio/Akpor LGA is relatively the most vulnerable, whereas the least vulnerable is Eligbolo. Cluster analysis was used to group the different vulnerability indices to produce a vulnerability map showing the spatial pattern of the different flood vulnerability levels (i.e., very high, high, low, and very low vulnerability levels).

The spatial pattern of the vulnerability levels increases toward the North West, south west, south, and north east, and decreases toward the central of Port Harcourt. However, the vulnerability map can be used for the reduction of damage potential by integrating its outputs into spatial planning and emergency planning. Nkwunonwo et al. (2015) study reflects on critical issue relating to flooding in Nigeria such as causes, impacts and remedies. Flooding which arguably has been more damaging for Nigeria has worsened recently due to a number of possible factors including rapid population growth, urbanization, poor urban planning and climate change especially in increased frequency and intensity of rainfall. Attempts to tackle the hazard in Nigeria appear to be limited by lack of flood data and other remote causes which are yet to be identified. In view of this background, the present study reviews the widespread flooding in Nigeria and efforts to tackle it. Over the period 1985 to 2014, flooding in Nigeria has affected more than 11 million lives with a total of 1100 deaths and property damage exceeding US$17 billion. Lagos state has experienced most of the floods while more frequent floods are recorded in Niger, Adamawa, Oyo, Kano and Jigawa states possibly due to the influence of rivers Niger, Benue, Ogun and Hadeja. It is argued that more robust and scientific approaches to flood risk reduction such as: flood modeling and vulnerability assessment are lacking. To align the focus of flood risk reduction in Nigeria with the objectives of such a task in more developed countries (such as the United States, United Kingdom and the Netherlands) which is among three fundamental issues to be addressed in Nigeria, the present study makes pivotal recommendations.

Joseph et al. (2014) investigated resilient reinstatement on lessons to be learnt from flooding incidents. The study was premised on the reality that flooding is recorded every year in all the states along the River Niger and its tributaries, frequently causing disasters but the magnitude of 2012 flood caught the country napping. Moreover, two thirds of Bayelsa State and Delta State are inundated by devastating floods for at least a quarter of each year. Communities along the River Niger-Benue system are also under threat of constant flooding. Vulnerability assessment which many regions of the world have commenced becomes the way forward. The study revealed that vulnerability of households and communities is eminent in the three of the Niger Delta States where it found that a total of 1,110 towns are at risk of being inundated and about 7,120,028 people risk displacement. The paper evolves a well-thought-out mitigation and adaptation measures which can be adopted by all stake holders including Governments at all tiers, community leaders and the vulnerable population.

V. FLOOD RISK REDUCTION MEASURES IN NIGER-DELTA

One of the strategies for the reduction of risk in the Niger Delta is the need for the establishment of Coastal Management Zone Authority in Nigeria. The battle for a coastal zone authority has been fought and won in several countries. A good and often-quoted example is the California coastal plan. This plan is a set of findings, policies, plans and recommendations designed to achieving a long-term protection of coastal resources. Countries such as Sir Lanka, Malaysia, Bangladesh, India and even Japan, have all established coastal management zone (Act) for effective way of evaluating coastal resources and the conservation. This awareness led Bell-Gam (1990) to propose a Coastal Management Zone Authority in Nigeria. The contents of that proposal may now be restated: "It is envisaged that this authority will operate through committee of the three tiers of government in Nigeria with funding from the Federal Government. It will undertake both development control and planning functions. Its research functions will be functionally organized to cover the gamut of problems threatening the national coastline such as flood, erosion, deforestation of the mangrove, weeds and pollution. It will have agency for land acquisition and development. It was also envisaged that this agency will control problems such as sewage disposal and would ultimately lead to the abandonment of the use of pit toilets in the settlements in the coastal zone and the ecological 1% fund of the Federal Government would then be channeled to such regional use rather than discrete uncoordinated projects" (Bell-Gam, 1990). It was then anticipated that the agency's links with state and Federal Governments should be able to resolve conflicts on land use, well as ensure free flow of information required for appropriate decisions. Secondly, this is need for establishing a flood control commanding system, at the Federal Level, and the Niger Delta, and the States having a flood controlling task, with the governors at each level as commanders and chief officials as executives from army units; departments of water, meteorology, planning, finance, police, commerce, transport and telecommunications, power, health, etc. and headquarters stationed in the Ministry of Water Resources to carry out daily work. In addition, under the commanding system, some institutions have been set up to do specialized work, such as forecasting and warning system to acquire information on climate, rainfall, flood, structure, calamity, etc. and operation systems to prepare and dispatch men, equipment and materials, and to do relief work.

VI. CONCLUSION AND RECOMMENDATIONS

This work contributes to the flooding literature and is likely the first paper to establish a clear relationship between flooding and sustainable development in Nigeria. To make any progress and ensure sustainable development, the anthropogenic causes of the floods in Nigeria need to be addressed; this requires reviewing urban and environmental planning and management and integration with FRM. The Government and concerned stakeholders have a key role to play in controlling flooding by putting the necessary infrastructure in place as a control measure. Based on the review of the existing framework, the following is recommended:

Flood control strategies should be regularly updated by the different tiers of government. There should also be regular inspection on adherence to land policies by the Ministry of Lands and Environment, which will put land owners in check on encroachment into wetlands and other restricted areas. Community organizations committed to disaster resilience building could make a useful contribution that builds household disaster resilience and provides a rewarding and constructive activity for their own organization and membership.

REFERENCES

[1]. Acheampong, R. A. (2019). "The Concept of Spatial Planning and the Planning System." In Spatial Planning in Ghana, 11–27. Springer international publishing. doi:10.1007/978- 3-030-02011-8
[2]. Adefisoye, T. (2015). 'An assessment of Nigeria's institutional capacity in disaster management', Scientific Research Journal (SCIRJ) 3, 37–48.
[3]. Adger, W. N. (2000). Social and ecological resilience: are they related? Progress in Human Geography, 24(3), 347-364.
[4]. Adger, W.N., Hughes, T.P., Folke, C., Carpenter, S.R. and Rockstrom, J. (2005). Social- ecological resilience to coastal disasters. Science 309 (5737), 1036–1039. Alexander, D., 1993. Natural Disasters. Chapman & Hall, New York.
[5]. Agbonkhese, O., E. Agbonkhese, E. Aka, J. Joe-Abaya, M. Ocholi, and A. Adekunle (2014). "Flood Menace in Nigeria: Impacts, Remedial and Management Strategies." Civil and Environmental Research 6 (4): 32–40.
[6]. Aja, G. N. and Olaore, A. Y. (2014). "The Impact of Flooding on the Social Determinants of Health in Nigeria: A Case for North-South Institutional Collaboration to Address Climate Issues." Developing Country Studies 4 (22): 6–12.
[7]. Akukwe, T. I. and Ogbodo, C. (2015). Spatial analysis of vulnerability to flooding in Port Harcourt metropolis, Nigeria. SAGE Journals, 23, 196-211.
[8]. Arbon, P., Steenkamp, M., Cornell, V., Cusack, L. and Gebbie, K. (2016), "Measuring disaster resilience in communities and households: Pragmatic tools developed in Australia", International Journal of Disaster Resilience in the Built Environment, Vol. 7 No. 2, pp. 201-215. https://doi.org/10.1108/IJDRBE-03-2015-0008
[9]. Bell-Gam, W. I. (1990). Development of Coastal and Estuarine Settlement. New Delhi: Sterling Publishers.
[10]. Béné, C., Godfrey Wood, R., Newsham, A., Davies, M. (2012). Resilience: new utopia or new tyranny? Reflection about the potentials and limits of the concept of resilience in relation to vulnerability reduction programmes. Brighton: Institute of Development Studies.
[11]. Birkmann, J., (2011a). First and second-order adaptation to natural hazards and extreme events in the context of climate change. Natural Hazards, 58(2), 811- 840, doi:10.1007/s11069-011-9806-8.
[12]. Blaikie, P., Cannon, T., Davis, I. and Wisner, B. (2003). At Risk: Natural Hazards, People's Vulberability and Disasters. Abingdon: Routledge.
[13]. Brenkert, A. and Malone, E. L. (2005). Modeling vulnerability and resilience to climate change: a case study of India and the Indian states. Climatic Change 72, 57–102.
[14]. Brooks, N., Aure, E., Whiteside, M. (2011). Measuring resilience: progress to date and proposed methodology: Presentation assessing the impact of ICF programs on household and community's resilience to climate variability and climate change.
[15]. Burton, Ian, Saleemul, Huq, Lim, Bo, Pilifosova, Olga, Schipper, Emma Lisa, (2002). From impacts assessment to adaptation priorities: the shaping of adaptation policy. Climate Policy 2(2–3), 145–159.
[16]. Callaghan, E. and J. Colton. 2008. Building Sustainable and Resilient Communities: A Balancing of Community Capital Environment, Development and Sustainability. Environment, Development and Sustainability. Vol.10, Issue 6: 931-942.
[17]. Chang, W.L., Mahendra, S., Zodrow, K., Dong, L., Yu-Chang, T., Braam, J., Pedro, J.J. (2010). Developmental Phytotoxicity of Metal Oxide nanoparticles to Arabidopsis thaliana. Environmental toxicology and Chemistry: International Journal 29 (3), 669-675,2010.
[18]. Cirella, G. T., and F. O. Iyalomhe. (2018). "Flooding Conceptual Review: Sustainability-focalized Best Practices in Nigeria." Applied Sciences 8 (9): 1558. doi:10.3390/app8091558.
[19]. Cocklin, C. and J. Dibden. (2005). Sustainability and Change in Rural Australia. Sydney: University of New South Wales Press.
[20]. Cutter, S. L., Lindsey, B., Melissa, B., Christopher, B., Elijah, E., Eric, T. and Jennifer, W. (2008). A place-based model forunder standing community resilience to natural disasters.
[21]. de Leo´ n, Villagra´ n, Carlos, Juan, (2006). Vulnerability: a conceptual and methodological review. In: University, U.N.(Ed.), Studies of the University: Research, Counsel, Education. Institute for

Environment and Human Security, Bornheim, Germany.
[22]. DFID (2014b). KPI15 Guidance. U.K.: Depart for International Development
[23]. Folke, C. (2006). Resilience: the emergence of a perspective for social-ecological systems analyses. Global Environmental Change16(3), 253–267.
[24]. Gall, M. (2007). Indices of Social Vulnerabililty to Natural Hazards: A Comparative Evaluation. PhD thesis, Department of Geography, University of South Carolina. URL http://webra.cas.sc.edu/hvri/education/docs/Melanie_Gall_2007.pdf.
[25]. Gallopin, G. C. (2006). Linkages between vulnerability, resilience, and adaptive capacity. Global Environmental Change 16, 293–303.
[26]. Hudner and Kurtz, (2002). 'Health disaster management: Guidelines for evaluation and research in the Utsein style'. Chapter 3: Overview and Concepts. Prehosp Disast Med 17. (Suppl 3), pp.31–55.
[27]. Joseph, R., Proverbs, D. and Lamond, J. (2014). Resilient reinstatement: What can we learn from the 2007 flooding in England? Flood Recovery, Innovation and Response IV, 184, pp. 175-186.
[28]. Kapoor, R. (2007). 'Introduction: Transforming self and society: Plural paths to human emancipation'. Futures. 39(5), pp.475–486.
[29]. Kotter, J. P. (1995). 'Leading change: Why transformation efforts fail'. Harvard Business Review. 73(2), pp.59–67
[30]. Levine, S. and I. Mosel (2014). Supporting Resilience in Difficult Places: A Critical Look at Applying the 'Resilience' Concept in Countries Where Crises Are the Norm. HPG Commissioned Paper. London: ODI.
[31]. Luers, A., Lobell, D., Sklar L. S., Addams C. L. and Matson, P. M. (2003). A method for quantifying vulnerability, applied to the Yaqui Valley, Mexico. Glob Environ Chang 13:255–267. doi:10.1016/S0959-3780(03)00054-2
[32]. Malone, E. (2009). Vulnerability and Resilience in the Face of Climate Change: Current Resarch and Needs for Population Information. Washington, D.C.: Population Action International. (Accessed 20th July 2015). Available from: www.globalchange.umd.edu/data/publications/Resilience_and_ Climate_Change.pdf.
[33]. Manyena, B., O'Brien, G., O'Kefee, P., and Rose, J. (2011). 'Disaster resilience: a bounce back or bounce forward ability?', Local Environment: The International Journal of Justice and Sustainability. 16(5), pp.417–424.
[34]. Mayunga, J. (2007). Understanding and Applying the Concept of Community Disaster Resilience: A Capital Based Approach, Summer Academy for Social Vulnerability and Resilience Building, pp.1-16
[35]. McDaniels, T., Chang, S., Peterson, K., Mikawoz, J. and Reed, D. (2007). Empirical framework for characterizing infrastructure failure interdependencies. Journal of Infrastructure Systems13(1),43–54.
[36]. Michaels, S. Goucher, N. and McCarthy, D. (2006). 'Policy windows, policy change, and organizational learning: Watersheds in the evolution of watershed management'. Environmental Management. 38(6), pp.983–992
[37]. Nkeki, F. N.; Henah, P. J. and Ojeh, V. N. (2013). Geospatial techniques for the assessment and analysis of flood risk along the Niger-Benue basin in Nigeria. Journal of Geographic Information System, 5, 123-135.
[38]. Nkwunonwo, U. C.; Malcolm, W. and Brian, B. (2015). Flooding and flood risk reduction in Nigeria: Cardinal gaps. Journal of Geography & Natural Disasters, 5, 136.
[39]. Norris, F. H., Stevens, S. P., Pfefferbaum, B., Wyche, K. F. and Pfefferbaum, R. L. (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. American Journal of Community Psychology41,127–150.
[40]. Nwigwe, C., and Emberga, T. (2014). "An Assessment of Causes and Effects of Flood in Nigeria." Standard Scientific Research and Essays 2 (7): 307–315.
[41]. O'Brien KL, Eriksen S, Schjolden A, Nygaard L (2005). What's in a word? Interpretations of vulnerability in climate change research. Oslo. Center Int Clim Environ Res (CICERO) Work Paper 2004:04–16
[42]. OCHA (2016). West Africa: Impacts of the floods, viewed 19 August 2018, from https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/wca_a4_l_impact_of_floods_20160822.pdf.
[43]. OCHA/IDMC (2009). Monitoring Disaster Displacement in the Context of Climate

Change. Findings of a study by the United Nations Office for the Coordination of Humanitarian Affairs and the Internal Displacement Monitoring Centre, Geneva, Switzerland.

[44]. Okoye, C. (2019). "Perennial Flooding and Integrated Flood Risk Management Strategy in Nigeria." International Journal of Economics, Commerce and Management, VII (9): 364-375.

[45]. Oladokun, V. and Proverbs, D. (2016). Flood risk management in Nigeria: A review of the challenges and opportunities. Int. J. of Safety and Security Eng., 6(3), 485-497.

[46]. Olsson L, Opondo M, Tschakert P (2014). Climate change 2014: livelihoods and poverty. Contribution of working group II to the fifth assessment report of the intergovernmental panel on climate change. Cambridge University Press, Cambridge

[47]. Onwabiko E. (2012). Human Rights Writers Association of Nigeria, viewed 12 June 2017, from www.huriwa.Blogspot.com.

[48]. Ouikotan, R., J. V. Der Kwast, A. Mynett, and A. Afouda (2017). "Gaps and Challenges of Flood Risk Management in West African Coastal Cities." Paper presented at the Proceedings of the XVI World Water Congress, Cancun Quintana Roo.

[49]. Oyegun, C. U.; Lawal, O. and Ogoro, M. (2016). Vulnerability of coastal communities in the Niger Delta region to sea level rise. Journal of Research in Environmental and Earth Science, 2(8), 01-08.

[50]. Paton, D., Johnston, D. (2006). Disaster Resilience: An Integrated Approach. Charles C. Thomas, Springfield, I L.

[51]. Paton, Douglas, Smith, Leigh, Violanti, John (2000). Disaster response: risk, vulnerability and resilience. Disaster Prevention and Management 9(3), 173–180.

[52]. Pelling, M. (2011a). Adaptation to Climate Change: From Resilience to Transformation, London: Routledge.

[53]. Pelling, M. (2011b). Urban governance and disaster risk reduction in the Caribbean: the experiences of Oxfam GB. Environment and Urbanization, 23(2), pp.383–400.

[54]. Perrow, C. (1999). Normal Accidents: Living with High-Risk Technologies. Princeton University Press, Princeton, NJ.

[55]. Satterthwaite, D. (2013). "How Does a Changing Climate Impact on Urban Poverty?" https://www.iied.org/howdoes-changing-climate-impact-urban-poverty.

[56]. Satterthwaite, D. (2013). "How Does a Changing Climate Impact on Urban Poverty?" https://www.iied.org/howdoes-changing-climate-impact-urban-poverty

[57]. Satterthwaite, D. (2017). "The Impact of Urban Development on Risk in sub-Saharan Africa's Cities with a Focus on Small and Intermediate Urban Centres." International Journal of Disaster Risk Reduction 26: 16–23. doi:10.1016/j. ijdrr.2017.09.025.

[58]. Schneiderbauer, S. and Ehrlich, D. (2006). Social levels and hazard (in) dependence in determining vulnerability. In: Birkmann, J. (ed.) Measuring vulnerability to natural hazards: Towards disaster resilient societies. Tokyo, Japan: United Nations University Press.

[59]. Toure, D. (2014). "Resident/Humanitarian Coordinator Report On The Use Of Cerf Funds Nigeria Rapid Response Floods." https://www.unocha.org/cerf/sites/default/files/CERF/ RCHC%20Report%2013-NGA-001.pdf

[60]. Turner, I. I., B. L., Kasperson, Roger E., Matson, Pamela., McCarthy, James J., Corell, Robert W., Christensen, Lindsey., Eckley, Noelle., Kasperson, Jeanne X., Luers, Amy., Martello, Marybeth L., Polsky, Colin., Pulsipher, Alexander., Schiller, Andrew. (2003). Framework for vulnerability analysis in sustainability science. In: Proceedings of the National Academy of Sciences of the United States of America, vol.100,pp.8074–8079.

[61]. USAID (2013). Community Resilience: Conceptual Framework and Measurement. Feeding the Future Learning Agenda.

[62]. Vale, L. J. and Campanella, T. J. (2005). The Resilient City: How Modern Cities Recover from Disaster. Oxford University Press, New York.