



Financial Assessment of the Flood Risk Preparedness of Some Selected States in Nigeria

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ABSTRACT

The impact of flooding transcends cultures, religions and geographies; such impact is associated with loss of properties and lives as well as disruption in community and business life. Flood risks are exacerbated by socio-economic factors including the action and inaction of governments. Previous studies on flooding within the study area have focused on the causes of flooding, the health effects of flood incidents and residents' coping measures. This paper will undertake a financial assessment of flood risk preparedness of some selected states within the north-central geopolitical zone of Nigeria with the view to highlighting the importance attached to flood risk in government budgets. This will be achieved through a review of literature to learn how studies of flood disaster costs were carried out in order to design an appropriate methodology for carrying out the research. The findings and methodologies applied in 15 papers on flood impact that were published between 2013 and 2018 were reviewed. Most of the papers adopted a quantitative approach; interviews, where used, served solely as a means of building up estimates of flood disaster costs. The suggestion that flood disaster costs research is best carried out using a quantitative approach was adopted in this paper and will be operationalized through questionnaires and document study. This will enable conclusions to be drawn as to the financial preparedness of governments to tackle flood disasters.

Keywords: *Costs; disaster; flood; risk; methodology.*

1 INTRODUCTION

The United Nations International Strategy for Disaster Reduction (UNISDR) produced by the UN Office for Disaster Risk Reduction has described floods as one of the most wide-ranging natural hazards globally. On the average floods affect about 70 million people each year (UNISDR, 2011). This means that the impact of flooding transcends cultures, religions and geographies; floods lead to loss of lives, disruption in community and business lives, damages to properties and assets. The risks of flooding are exacerbated by local socio-economic factors, which include increased population growth in coastal areas, non-sustainable agricultural practices as well as the impact of ongoing climate change. The recognition that flooding is a complex phenomenon, having political, economic, social and environmental dimensions consequently means that solely engineering solutions to flood problems will not suffice (Surminski and Eldridge, 2015). Similar to climate change however, flood damage has been on an increasing trend over the last century (Pielke, 2000), and annual damage costs are predicted to rise even more rapidly in the future (Ciscar *et al.*, 2011).

Increased flood problems in the states within the north-central geopolitical zone (such as Benue, Kogi and Niger States) and other areas of Nigeria have regularly (usually on an annual basis) disrupted socio-economic

activities and caused displacement of persons in affected areas. In Nigeria, flooding is associated with misery (Adeoye *et al.*, 2009). A case in point is that of the 2012 flood which occurred within the flood plains of the rivers Niger, Benue and their tributaries in Nigeria (Nigeria Hydrological Services Agency, 2013).

In September 2012 about twenty-seven states in Nigeria were affected by flood that covered one-third of the arable land and resulted in the deaths of more than three hundred persons. A further two million persons were displaced from their homes and farmland used for maize production and vegetable gardening (Shabu and Musa, 2015). The flood also destroyed other crops such as sorghum, millet, groundnut, beans, yam, cassava and sweet potatoes which were farmed along the banks of River Benue and its distributaries.

Previous studies on flooding within the study area have focused on the causes of flooding, the health effects of flood incidence and residents' coping measures (Ologunorisa and Tersoo; 2006, Ocheri and Okele, 2012; Shabu and Tyonum, 2013). Some of the studies looked at the social and economic impact of flooding (Oruonye, 2012; Duru and Chibo, 2014). Mngutyo and Ogwuche (2013) examined the control of flooding by government; however a financial analysis of the preparedness of governments to cope with flood incidents was not undertaken. Given the huge costs of flood damage in

Nigeria, and the low level of insurance uptake in the Nigerian economy, it becomes necessary to examine financially the level of preparedness of states that are susceptible to flooding in the north-central geopolitical zone of Nigeria.

This study is significant because it seeks to document expenditure on flood disaster management by government agencies and provide concise data on the size of government budgets for flood related activities. This knowledge will benefit both researchers and policy makers in the field of flood risk management because it is difficult to come across empirical data on the costs of flood management in Nigeria. The compilation of budgets for drainage, city planning and water transportation with specific reference to flood management is rare in the literature.

The aim of this paper is to undertake a financial assessment of flood risk preparedness of some selected states within the north-central geopolitical zone of Nigeria with the view to highlighting the importance attached to flood risk in government budgets. Three states within the north-central geopolitical zone will be covered in the study; these are the Benue, Kogi and Niger States, which are states through which pass Nigeria's two major rivers – the Niger and the Benue. The specific objectives of the study are to review literature to learn how studies of flood disaster costs were carried out and to design an appropriate methodology for carrying out the research.

1.1 FLOOD DISASTER RISKS

According to Arnell and Gosling (2016) by the turn of the millennium approximately 623 million people lived in flood-prone areas. This has made the search for more holistic management of flood an urgent necessity; structural mitigation measures such as dams and flood ways are no longer sufficient. Countries must move towards “more adaptive and integrated” approaches (Ward *et al.*, 2013). Simonovic and Carson (2003) have defined flood risk management in terms of the very wide range of activities aimed at reducing the potentially harmful impact of floods on people, economic activities and the environment. In the light of predictions of increasing trends in flood management costs (Pielke, 2000), Ciscar *et al.*, (2011) estimates that Europe's current annual flood damage costs are £5.2 Billion.

Nabangchang *et al.* (2015) examined the costs of the 2011 Bangkok flood, as an example of a 50-year flood. The inundation of greater Bangkok proceeded in three distinct phases. From March to April heavy rainfall led to flooding in southern Thailand; 61 deaths were recorded, in addition to damages to 600,000 homes and transportation infrastructure. In the second phase which occurred in mid-October, the Central Region, which is home to most of the industrial estates in Thailand, was flooded. Up to 3 meters of water was observed in areas. There was a resultant disruption in supply chains globally.

The final phase of the 2011 flood was documented by mid-November; it was estimated that 5.3 million people (8% of the total population of Thailand) were affected.

In their assessment of climate change implications for global river flood risk, Arnell and Gosling (2016) agreed that climate change has the potential to substantially change human exposure to the flood hazard. They however found considerable uncertainty in the magnitude of this impact, particularly as it involves rainfall. A key conclusion was that based on current projections, by 2050 approximately 450 million flood-prone people and 430 thousand km² of flood-prone cropland would be exposed to a doubling of flood frequency. This makes it imperative that preparations to mitigate such impact be started early. The roles played by politics, administration, and civil society may be key to surviving flood disasters. Thieken *et al.* (2016) reviewed how the measures that politics, administration, and civil society have implemented since 2002 helped with flood management. They found considerable improvements in consideration of flood hazards in urban development and comprehensive property-level mitigation and preparedness measures.

Planning for sustainable development requires the collection of relevant information the levels of risk that different areas are exposed to. The study carried out by Oriola and Chibuike (2016) attempted to accomplish this in the riverine communities of Edu Local Government Area of Kwara state, Nigeria. This resulted in the identification of three distinct risk zones; High, Moderate and low-risk areas. Three settlements fall into low-risk areas with elevations above 196m, two settlements located at between 110m and 196m are within moderate risk zone and six settlements in High-risk area with elevations below 110m. To limit exposure to flood damage, the study recommended public enlightenment on the implications of interactions between Man and the environment.

Rufat *et al.* (2015) profiled key drivers of social vulnerability to floods, based on a meta-analysis of 67 flood disaster case studies (1997–2013). Demographic characteristics, socioeconomic status, and health were identified as the leading empirical drivers of social vulnerability. Risk perception and coping capacity are poorly reflected in many social vulnerability indicators; yet these factors were prominent in the cases that were studied. Increase in river discharge on a global scale will drive increase in the frequency of floods in many regions of the globe (Parvin *et al.*, 2016). Rise in river volumes will be caused by increased precipitation and reduced evapo-transpiration.

1.2 FLOOD DISASTER COSTS

There has been a lot of interest in research into the costs of floods; however there does not appear to be a standard method of deriving such costs. While many estimates rely on the value of insured property, in many

areas of the world than are prone to flooding, an insurance culture has yet to take root. Thieken *et al.* (2016) found that with reference to floods of the year 2005, the June 2013 flooding in Central European countries caused damage amounting to €11.6 billion in Germany. Flood disaster costs are more difficult to estimate in Nigeria, where a lot of the flood recovery effort is informal and unstructured.

Parvin *et al.* (2016) reported on previous research showing that in Bangladesh, agricultural wages declined by 5% in flood-prone areas and by 14% in severely exposed areas during “extreme” floods. Households also experience up to 65% reduction in incomes during flood disasters. In Nigeria, Awopetu *et al.* (2013) used a post-2012 flood survey to show that 48% of respondents’ houses were swept away and about 12,000 people were displaced. Flood disaster costs in the 2010-2012 period in Pakistan included \$16 billion of physical capital losses and an estimated total flood recovery cost of US\$ 439.7 million for 2014 alone (Mujahid *et al.*, 2016).

Losses arising from flood disasters in the UK will likely be compounded by an absence of formal incentive mechanisms for risk reduction in the existing and proposed flood management schemes (Surminski and Eldridge, 2015). Although the mortality rate of natural disasters in Pakistan has declined the number of people affected by such disasters had risen almost three-fold. Population growth plays a large role in the increase in vulnerability to flood disaster risks.

In Nigeria, Shabu and Musa (2015) concluded that the absence of buffer Dams contributed to the increased socio-economic impact of the 2012 flood disaster. In addition, large segments of the population still live in highly unstable and vulnerable conditions; poverty is one reason why floodplain encroachment is increasing. In some cases where dams have been built, inflow of water beyond the retention capacity of the dam may result in unplanned releases of water which causes flooding of downstream low-lying areas (Ramirez and Rajasekar, 2015).

1.3 FLOOD DISASTER PREVENTION

Governments the world over have attended to the prevention of flood disasters with varying levels of commitment. Thieken *et al.* (2016) reviewed the considerable improvements in flood management in Germany from 2002 onwards. The research found that efforts targeted at prevention of floods included an increased consideration of flood hazards in spatial planning and urban development, more comprehensive property-level mitigation and preparedness measures, and a more targeted maintenance of flood defense systems. These efforts had the salutary effect of a reduction of damage during the 2013 floods.

Preemptive mapping of land in terms of flood risk susceptibility has been proposed by Oriola and Chibuike

(2016). This approach was applied by the researchers in Edu Local Government Area of Kwara State. The results revealed three distinct risk zones - High, Moderate and Low. Settlements at average elevations of more than 196m above sea level were classified as low-risk areas; elevations of 110m - 196m are prone to moderate risk zone while high-risk areas are at elevations lower than 110m. Such flood risk mapping can assist in guiding the types of activities and constructions that will be allowed in different areas of the study area. The study by Ramirez and Rajasekar (2015) described a similar mapping and modeling activity in the Surat area of India. The construction of the flood model of Surat utilized topography produced using elevation data collected from an extensive differential global positioning system survey and measurements of river cross-sections. The research modeled arrival of dam release discharge from the Ukai dam at Surat, flooding within Surat caused by dam release, and identified Surat infrastructure and population exposed to flooding.

Rufat *et al.* (2015) identified risk perception and coping capacity as serving as drivers of social vulnerability to damaging flood events. These drivers can be leveraged to improve flood prevention efforts. When populations at risk are aware of the risk facing them and the ways in which they can better cope with floods, the impact of flood disasters can be reduced considerably.

1.4 RELATED WORKS

A total of 15 papers dealing with different aspects of floods and the impact of flooding that spanned the six years from 2013 to 2018 were reviewed in this section and are presented in Table 1. Three of the studies were carried out in Nigeria; three in the UK; there was one paper each from Thailand, Vietnam, Malaysia, India, the European Union, Pakistan, Bangladesh, Germany and Sri Lanka. Only seven of the papers dealt specifically with the costs associated with flooding.

TABLE 1: SUMMARY OF FINDINGS OF RELATED WORKS

Author	Year	Place	Summary of findings
Awopetu <i>et al.</i>	2013	Nigeria	Flood victims expressed willingness to relocate from the flood prone area.
Surminski and Eldridge	2015	UK	Absence of formal incentive mechanisms for risk reduction in the existing and proposed flood insurance schemes.
Kantamani <i>et al.</i>	2015	UK	New estimates of England’s flooding costs for commercial and residential properties were found to be £1.6 Billion per year.

Author	Year	Place	Summary of findings
Nabangchang <i>et al.</i>	2015	Thailand	Median household economic costs were US\$3089, similar for poor and non-poor households as a percentage of annual household expenditures (53% and 48% respectively).
Chau <i>et al.</i>	2015	Vietnam	The estimated value of direct losses to the four main crops for a 1:10-, 1:20- and 1:100-year flood represent a percentage loss in value of 12, 56 and 62 %, respectively.
Shabu and Musa	2015	Nigeria	438,536 business outfits were affected and aggregate working days lost in trade and commerce was 881,400 days.
Ramirez and Rajasekar	2015	India	Modeled dam release discharge from the Ukai dam arrival, flooding within Surat and infrastructure and population exposed to flooding.
Rufat <i>et al.</i>	2015	EU	Demography, socioeconomic status, and health are leading empirical drivers of social vulnerability to damaging flood events.
Arnell and Gosling	2016	UK	Climate change has the potential to substantially change human exposure to the flood hazard, but that there is considerable uncertainty in the magnitude of this impact
Mujahid <i>et al.</i>	2016	Pakistan	Confirmed a suitable long run relationship among GDP growth and its determinants: agriculture growth, non-agriculture growth, investment and affected areas by flood.
Parvin <i>et al.</i>	2016	Bangladesh	Floods disrupt the agriculture, infrastructure, employment, and food distribution systems, but majority of the people are willing to live in this place despite floods.
Thieken <i>et al.</i>	2016	Germany	Considerable improvement in increased consideration of flood hazards in spatial planning and urban development,.

Author	Year	Place	Summary of findings
Oriola and Chibuikwe	2016	Nigeria	Classified study area into three risk zones; High (below 110m), Moderate (between 110m and 196m) and Low (above 196m).
Nayan <i>et al.</i>	2017	Malaysia	Goods (Mean = 1.56, SD = 0.894) and premises / stalls / kiosks (mean = 1.56, SD = 0.531) suffered highest losses.
De Silva and Kawasak i	2018	Sri Lanka	Low income households that depend fully on natural resources are most vulnerable to financial losses incurred through floods and droughts.

The three papers from Nigeria were focused mainly on socio-economic issues associated with flooding. Two of the papers (Awopetu *et al.*, 2013; Shabu and Musa, 2015) reviewed the 2012 flood in Benue state, while the third (Oriola and Chibuikwe, 2016) suggested how flood risk mapping could help ameliorate the effects of flood disasters. One of the UK papers recommended how insurance could be employed to mitigate flood impact (Surminski and Eldridge, 2015) while the second paper estimated flood water levels in properties and concluded that current estimates of flood disaster costs were too optimistic (Kantamaneni *et al.*, 2015). The third paper from the UK (Arnell and Gosling, 2016) attempted to develop predictions of flood impact up to the year 2050. It suggested that considerable uncertainty still surrounds such predictions.

The rest nine papers were on a variety of subjects that had floods as the common thread running through them. Nabangchang *et al.* (2015) in Thailand, Chau *et al.* (2015) in Vietnam, Mujahid *et al.*, (2016) and Parvin *et al.* (2016) all dealt with the effects of local floods in their respective study areas. Ramirez and Rajasekar (2015) in India described a methodology for modeling flood disaster risk from dam releases. Rufat *et al.* (2016) worked in the EU and reviewed the indicators for measuring social vulnerability to flood disasters. The research found that risk perception and coping capacities were often ignored in the development of such vulnerability indicators.

2 METHODOLOGY

The paper reviewed seven papers that were of a similar nature to this study because of their focus on the costs associated with flood disasters. The review was done for their methodological orientation and the results are presented in Table 2.

TABLE 2: RESEARCH METHODOLOGIES OF RELATED STUDIES

Author	Aim of study	Research Methodology
Awopetu <i>et al.</i> (2013)	Examined effect of flood on socio-economic status of residents.	Quantitative approach
Kantamaneni <i>et al.</i> (2015)	Evaluated damage costs for properties.	Conceptual framework.
Nabangchang <i>et al.</i> (2015)	Estimated economic costs of households' in the 2011 Greater Bangkok flood.	Primary data collected using in-person interviews.
Chau <i>et al.</i> (2015)	Estimated direct damage to crops.	Used ex-post data.
Shabu and Musa (2015)	Evaluated short and long term impacts of the 2012 flood disaster.	ECLAC methodology adopted.
Parvin <i>et al.</i> (2016)	Drew a "flood impact tree" to explore coping strategies.	Field investigation; questionnaire survey, focus group discussions.
De Silva and Kawasaki (2018)	Investigated relationship between disaster risk, poverty, and vulnerability of households.	Questionnaire survey.
<i>This study (Idachaba et al.)</i>	<i>To undertake a financial assessment of flood risk preparedness.</i>	<i>Archival budget data; structured, close-ended questionnaire survey.</i>

Kothari (2004) defines research design to be the arrangement for the collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. Based on a review of research methodologies employed in previous studies of a related nature, this paper will adopt a single method approach of a quantitative nature.

3 CONCLUSION

This paper has reviewed relevant literature on flood disaster costs; based on the findings from the review, a research methodology has been designed for the study. Further development of this study will employ the quantitative research approach proposed to collect data and examine government budgets for disaster management and urban development. This will enable conclusions be drawn as to financial preparedness of governments to tackle flood disasters.

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