

## **BUILDING CAPABILITIES FOR FLOOD DISASTER AND HAZARD PREPAREDNESS AND RISK REDUCTION IN NIGERIA: NEED FOR SPATIAL PLANNING AND LAND MANAGEMENT**

Oludare Hakeem Adedeji<sup>1</sup>, Bashir Olufemi Odufuwa<sup>2</sup>, and Olusegun Hezekiah Adebayo<sup>3</sup>

<sup>1</sup>Department of Environmental Management and Toxicology, University of Agriculture, Abeokuta, Nigeria

<sup>2</sup> Department of Urban and Regional Planning, Olabisi Onabanjo University, Ago-Iwoye, Nigeria

<sup>3</sup> Department of Geography and Regional Planning, Olabisi Onabanjo University, Ago-Iwoye, Nigeria

### **ABSTRACT**

This paper examined the level of preparedness and capacity building to tackle urban flooding in Nigerian cities. Firstly, the incidences of urban flood hazards, causes and impacts were examined; secondly, the role of urbanization as large creator of flood risk for much of the urban population was analysed. Thirdly, discussion was about the vulnerability, preparedness and coping strategies of the people to these hazards. Fourthly, an examination of the role of spatial planning, sustainable drainage systems and land use management in building capacities to tackle flood hazards was carried out. The paper concluded that lack of proper spatial planning and land use management coupled with incapacity of governments to ensure good urban governance exacerbate the cases of urban flood in Nigeria. A GIS-based spatial planning and land use management can be a versatile tool in building capacities for flood disaster reduction and preparedness to ensure sustainable urban development.

**Keywords:** Disaster Preparedness; Flood hazard; Spatial Planning; Sustainable drainage systems; Urban Vulnerability

### **INTRODUCTION**

In the past four decades, economic losses due to natural hazards such as, floods disasters have increased in folds and have also resulted in major loss of human lives and livelihoods, the destruction of economic and social infrastructure, as well as environmental damages during this period. (Munich Re, 2002). Recurring floods and other disasters have been identified as a serious threat to sustainable development. Floods cause about one third of all deaths, one third of all injuries and one third of all damage from natural disasters (Askew, 1999). Significantly, flood disasters result from human-created vulnerability which is an outcome of our interacting with the environment by some human activities such as designing and locating our infrastructure, exploiting natural resources, concentrating our population and so on (Hualou, 2011). The quality of the urban space is vital to sustainable livelihood; therefore, it is important to understand the relationship between sustainable development and disaster preparedness and management. Sustainable development is importance and it has come to have an

associated meaning (and sub-discipline, 'sustainability science' (Mollinga, 2010)) which focuses on the nature of communication and relationships surrounding development and the way in which development can be self-sustaining.

The trend in the frequency and intensity of disasters nationally and internationally is due to unpredictable climatic changes, severe flooding, fire, drought, terrorism, epidemics and urbanization especially in developing countries. One very important but frequently ignored aspect in disaster management efforts in Nigeria is risk assessment. Urbanization and lack of good local governance have been regarded as a major creator of urban flood risk (UN-ISDR, 2009, Darteh, 2010). Urbanization exacerbates the damages caused by flooding by restricting where flood or storm waters can go. Large parts of the ground with roofs, roads and pavements are covered, obstructing sections of natural channels and building drains that ensure that water moves to rivers faster than it did under natural conditions. In an urbanizing environment, the infiltration capacity is reduced by the replacement of ground cover with impervious urban surfaces (Odemerho, 1988). In the urban centres, the event of climate change impacts the environment either directly or via changes in water flows. Hydrological changes within the river systems are cause for concerns due to related the increase in flooding incidence or significant changes in base flows. In many cities in Nigeria there is lack/inadequate infrastructural provisions to curb flooding. Urban areas in the Nigeria are particularly vulnerable to flooding due to inadequate capacity of drainage structures; changes to ecosystem through the replacement of natural and absorptive soil cover with concrete; and deforestation of hillsides, which has the effect of increasing the quantity and rate of runoff, and through soil erosion and the silting up of drainage channels. According to ActionAid International (2006) flood hazards are natural phenomena, but damage and losses from floods are the consequence of human action. Flash flooding /urban flooding destroys the produce e.g. crop, rice paddy, fruit tree and vegetables thereby posing the risk of hunger to those engaged in subsistence farming and great loss to those engaged at a commercial scale (Kolawole *et al.* 2011).

With the increasing number of urban dwellers worldwide, the number of people at risk or vulnerable to flood hazards is likely to increase. Any increase in disasters, whether large or small, will threaten development gains and hinder the implementation of the Millennium Development Goals (UN-ISDR, 2008). Disasters such as poses serious challenge to the economy of a nation. It must be noted that the economic environment of a nation consists of its financial systems, social welfare, power sector, transportation, investments, commerce, manufacturing, and construction, banking among others. Disasters when they occur usually result in pains and huge losses to the economy and in most cases; it is always difficult to quantify the actual cost of damages and recovery. A single case of disaster such as the one that occurred Lagos, Nigeria on July 10, 2011 actually destroyed several years of developmental efforts. In flood disaster, there loss of lives, destruction of public utilities and disruption in the smooth functioning of the system that renders fear and uncertainties among the populace. In addition, there was the loss of livelihoods, damage to the environment, financial loss, and diversion of resources, epidemics, migration, food shortages and displacement of the people. The impact can be very high in the urban areas, because the areas affected are densely populated and contain vital infrastructure. A more disturbing issue is the lack of attention to the promotion of sustainable environmental management especially in disaster prone areas resulting in devastations which could have been averted.

Preventing and managing disaster situations effectively and ensuring sustainable regional development have being a source of major concern of academics, engineers, planners, decision-makers and different levels of government. In making plans and

decisions about disaster prevention and management, more considerations ought to be paid to the spatial features of disasters. Most natural hazards according to Curtis and Mills (2010) have patterns that have leave spatial footprints and within these patterns are human places, cultures and interactions. There is a clear nexus between environmental degradation and disasters in many regions of the world and it is those countries that suffer most from disasters are the same ones in which environmental degradation is proceeding most rapidly (Kötter, 2003). In addition, it is the poor people that are more vulnerability to disasters. Continuous and increasing occurrence of devastating disaster events such as urban flooding often poses substantive danger to the achievement of both sustainable development and poverty-reduction initiatives (UN-ISDR, 2009). The issue disaster reduction and risk management is rapidly being adopted into the policy agenda of affected governments as well as multilateral and bilateral agencies and NGOs. The International Strategy for Disaster Reduction (ISDR) through the Resolution UN General Assembly 54/219 aim to mobilize Governments, UN-agencies, regional bodies, private sector and civil society to unite efforts in building resilient societies by developing a culture of prevention and preparedness.

### **INCIDENCES OF URBAN FLOOD HAZARDS IN NIGERIA**

The incidence of flood events in Nigeria urban space has a long year of history of devastation of lives and properties. Extensive urban flooding is a phenomenon of every rainy session in Lagos, Maiduguri, Aba, Warri, Benin and Ibadan. Urban flooding is a constant occurrence in towns located on flat or low lying terrain especially where little or no provision has been made for surface drainage, or where existing drainage has been blocked with municipal waste and other materials. With urbanization rate of 5.5% yearly which is the highest rate in the world, Nigerian cities of today face numerous problems which include rapid urbanization, deteriorating environment, urban decay, un-cleared refuse, flooding, erosion and pollution (Babanyara et al., 2010; Etuonovbe, 2011). For instance, the first flood hit Ibadan, the headquarters of old western region, Nigeria (now the capital of Oyo State) was in 1948. Subsequently, serious flood disasters have occurred in Ibadan in 1963, 1978, April 30, 1980, 1985, 1987 and 1990 destroying many valuable things. Lagos metropolis recorded the first flood in early 1970s and till date, floods (both river and coastal floods) have become perennial event in the state. Most recently about 700 inhabitants of settlements along the River Ogun in Lagos state were evacuated to refugee/relief camp after a devastating flood that plagued the area around October 12, 2010 by the Lagos State Emergence Management Agency. The devastating flood disaster that occurred on the 26<sup>th</sup> of August 2011 caused a lot of woes to people around the Eleyele wetlands in Ibadan, south-west, Nigeria destroying lives and properties around Apete, Idi-Ishin, Apata, Odo-Ona Elewe, Oke-Ayo, Ologuneru and University of Ibadan where the university library and Zoological Garden were badly affected. The degradation of the Eleyele wetlands is seen as a major cause, compounded by anthropogenic impacts and the emerging reality of climate change.

The unprecedented rate of flooding in recent years implicates increasing rainstorms due to the on-going global warming and climate change. Low-lying coastal areas such as Lagos, Nigeria and other areas such as Ibadan and Abeokuta where the flood-plains have been abused due to haphazard physical developments, illegal erection of buildings and other structures and the unhealthy habit of dumping refuse and other solid wastes in the usually open channel drainage systems. While flood hazard is natural, human influence in the urban modification and alteration in the urban space can exacerbate the problem, while the disastrous consequences are dependent on the degree of human activities and occupancy in vulnerable areas (Ogba

and Utang, 2008; Postnote, 2007). Adelekan (2000) stressed that the creation of floods has been identified as the worst effect of rainstorms hazard and the construction of infrastructures such as highway and road and bridges in the flood plain frequently increase the magnitude of flood which consequently increases the damage to the properties and life. Large, impermeable surfaces and concentrations of buildings which disrupt natural drainage channels and accelerate runoff. In many instance, the patterns of urban form and buildings in Nigeria do not take current and future hazards into account, resulting in increased scales and levels of risk from floods.

### **CONCEPTUAL UNDERPINNING: DISASTER VULNERABILITY AND PREPAREDNESS**

Vulnerability to disasters describes the degree to which a socio-economic system or physical assets are either susceptible or resilient to the impact of natural hazards (Birkmann, 2006). UNDRO (1991) defined it as “the degree of loss to a given element at risk or set of elements at risk resulting from the occurrence of a natural phenomenon of a given magnitude and expressed on a scale from 0 (no damage) to 1 (total damage)”. Blaikie (1994) on the other hand define vulnerability as the characteristics of a person or group in terms of their capacity to anticipate, cope with, resist and recover from impacts of a hazard”, while UNDP (2004) said that it is “human condition or process resulting from physical, social, economic and environmental factors, which determine the likelihood and scale of damage from the impact of a given hazard”. It is determined by a combination of several factors, including awareness of hazards, the condition of human settlements and infrastructure, public policy and administration, the wealth of a given society and organized abilities in all fields of disaster and risk management. Recent studies especially in developed countries have emphasized the significance of people's vulnerability to hazards, rather than retaining a narrow focus on the hazards themselves (Mitchell (ed.), 1999; Twigg & Bhatt, 1998). It is particularly important to operationalise the term vulnerability. In addition, it is equally vital to crucial to recognize that vulnerability is balanced by peoples' capabilities and resilience, and that if they are perceived only or mainly as victims then the problem of what causes vulnerability may be evaded (Cannon, 2000). Vulnerability analysis is developed from a range of socio-economic approaches to hazards and what we could call 'the disaster of everyday life' (Blaikie et al, 1994; Cannon, 2000). Social vulnerability is a set of characteristics of a group or individual in terms of their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard. It involves a combination of factors that determine the degree to which someone's life and livelihood is at risk by a discrete and identifiable event in nature or society (Blaikie et al, 1994).

Vulnerability, according to Cannon (2000) can be considered in terms of five components:

*Initial well-being:* This appraises the initial nutritional and health status (both physical and mental) of people in everyday life (or before the impact of a hazard). It is indicative of their capacity to cope with illness and some types of injury resulting from a hazard such as flood.

*Livelihood resilience:* It is a measure of the capacity of an individual and/or their household to cope with the aftermath of a given hazard impact, and to reinstate their earning or livelihood pattern. This might include their likely continued employment, level of savings, loss of welfare benefits, loss or injury of supportive family members, hazard damage to their normal livelihood activity (for example in floods this might include damage to agricultural land by sediment deposits, sea-water incursion, toxic or sewage contamination, loss of dwelling place etc.).

*Self-protection:* This is concerned with the ability or willingness (readiness) of an individual and/or household (with a given level of knowledge of apparent risks) to provide themselves with adequate protection, or to be able to avoid living or working in hazardous places. It will be influenced by the level of knowledge of physical measures, and the capacity of people to implement them.

*Societal protection:* This refers to the ability or willingness of social and political structures at political or social levels above the individual or household, to provide protection (especially structural and technical preparations) from particular hazards. This might include local government, state government, national government, relevant organizations (e.g. fire department, civil defence, NEMA, NGOs), or community-based initiatives.

*Social capital:* This involves the 'soft' security provided by group or community capacities to enhance (or reduce) a person's resilience. This may include the degree of cohesion or rivalry that might affect rescue and recovery. There are various forms of social capital that may enhance or hinder recovery such as support networks (belonging to a church or other group), some of which may provide mutual aid in times of hardship.

It should however, be noted that each one of these is crucially linked to the likely severity of impact of a given hazard, and yet primarily they are all determined by political, economic or social processes. They also contains the possibility of both vulnerabilities and capabilities, with these varying over time (as individuals and groups subsist and compete within given livelihood possibilities), and being affected in regard to different types of natural hazards. The concept of vulnerability is oriented towards the perception of disaster risk and has a wide range of interpretations. Multiple definitions and different conceptual frameworks of vulnerability exist because several distinct groups have different views on vulnerability (Birkmann, 2006).

For the purpose of this paper, vulnerability can be understood to mean the potential of people to be killed, injured or otherwise harmed by the direct or indirect impacts of disaster. According to the World Bank Development Report, 'while no country in the world is entirely safe, lack of capacity to limit the impact of hazards remains a major burden for developing countries (World Bank, 2004). According to United Nations (2009) natural hazards strike hardest on the poor. United Nations (2009) Disparities in vulnerability to natural hazards arise from wide gaps in access to resources and capacities for risk reduction associated with poverty and sociocultural stratification. The most vulnerable are the women, aged and children, whose share of the impacts is disproportionately more than the males (Hannan, 2002). Vulnerable groups among the urban population who occupies the fragile ecosystems are often faced with severe environmental problems such as flooding (Gurenko, 2004). The devastation caused by the floods is a reflection of the lack of disaster preparedness nationwide. Most of the risk to urban populations is associated with the incapacity of local governments to ensure provision for infrastructure and for disaster risk reduction and disaster preparedness and general lack of proper planning in the urban areas. The consequences of inaccurate planning in most urban centres of developing countries like Nigeria are of interest to different stakeholders including those involved in research studies and policymaking processes related to sustainable development. This makes large sections of the urban population very vulnerable to any increases in the frequency or intensity of storms, floods or heat waves, and to increased risk of disease, constraints on water supplies or rises in food prices – which in wealthier, better-governed cities are usually easily adapted to (UN-Habitat, 2003, 2010).

It is believed the rapid urbanization process shown in developing countries will continue in the years and decades to come (Torrey, 1998), however its environmental and social consequences are unprepared for due to a lack of applied research on the urban system, and because of the intrinsic complexity of the system per se (Barredo and Demicheli, 2003). Preparing for the possible occurrence of flooding and its effects is vital in capacity building to reduce the impacts of the disasters and its attendant hazards. Majority of the people including the government are not adequately prepared for the level of devastation that usually accompanies such flood events. The concept of disaster preparedness has been used by many development professionals and practitioners from the biophysical and social sciences in diverse but technically precise ways (Suda, 2000; Chauhan, 2008). It is an important component of preventive development; however its usefulness is determined by the level of awareness of the affected people about the potential danger. The people must also be empowered to respond effectively to contribute to the development of their own communities on a sustained basis. The level of disaster preparedness depends on the existing capabilities at individual or institutional levels. At the institutional level, the establishment or improvement of monitoring and early warning systems that can ensure prompt and adequate preparation and response to disasters is seen as part of a preventive development strategy. Preventive strategies according to UNDP (1997) can be made more effective if the capacity and the will are there, the priorities are right, legal and institutional frameworks are developed, policies are implemented and the planned activities are well coordinated.

Creation of awareness among people living in disaster-prone areas of the imminent risk they face and how best to respond when it occurs can be done through a broad range of avenues which may be combined with indigenous technical knowledge to enhance local people's confidence and empower them to act when faced with adversity. This will also enable and foster increased participation among the local community to tackle the effects of the disaster. It is worth mentioning that the issue of preparedness is rooted in the question of what capacity exists in the country as a whole to effectively deal with natural and human-made calamities. The Global Facility for Disaster Reduction and Recovery (GFDRR, 2009), for instance is committed to helping developing countries reduce their vulnerability to natural hazards and adapt to climate change, however only 15 African countries are currently involve (this excludes Nigeria). The Ecological fund which was established in 1981 through the Federation Account Act 1981 and modified by Decree 36 of 1984 and 106 Of 1992 is bedevilled with several problems. The fund is mostly inadequate and often misapplied or misappropriated by successive state governments having to cope with these natural disasters amidst efforts to solve chronic economic problems of high unemployment and fiscal and balance of payment deficits. The level of preparedness and the capability to reduce vulnerability to disaster largely depends on the developmental stage of a country or a community and the balance between the strengths and imperfections in the functioning of its sectors, structures and institutions (Etkin et al., 2003; International Council for Science, 2008).

### **COPING STRATEGIES IN NIGERIAN CITIES**

Community has different perceptions on disaster and develops different efforts to overcome the floods. The capacities to cope with the disaster impact is however different depending on social groups; poor and rich, men and women, young and old, indigenous or non- indigenous, etc. Many have struggled to relocate out of their flood-prone neighbourhoods to better areas without success mostly due huge cost of rent. Being located in the flood-prone area, majority of the people are aware of the danger involved and they have tried to protect and cope with flood effects. There are many ways or of coping mechanism employed by the local people to deal with the negative impact of flood. These can be grouped as follows: economic,

technological/structural and social coping mechanisms. The definition of economic coping mechanism involves economic activities and diversification, including those strategies of the community linked to materials goods and resources, for instance, having more than one source of income. The technological/structural coping mechanism refers to the structural activities employed by households living the flood-prone area to cope with flood losses or damages. These include the construction of houses to prevent floods or the use of materials that can minimize the flood losses and damage. For instance people in flood prone areas such as Lagos, Ibadan and Abeokuta have taken to construct their house with reinforced material and some houses with second floor to protect their lives and properties against flood. The social/organizational coping mechanisms are those activities and or social relationship and network among the community and local government that can help people to minimize the flood losses and damage (e.g. the supply of relief materials and establishment of refugee camps house displaced people until the flood recedes) .It must be noted that local people behave and develop mechanisms for coping, that if well understood can guide local authorities and communities to develop in partnership adequate measures for avoiding or decreasing people's vulnerability and expand their opportunities for managing floods (UNFCCC, 2007).

### **BUILDING CAPACITIES TO REDUCE URBAN FLOOD DISASTER: ROLE OF SPATIAL PLANNING AND LAND USE MANAGEMENT**

Throughout the world, countries have recognised the need to formulate a clear regulatory agenda aimed at the prevention, management and reduction of disasters. A number of steps taking in the right direction would boost the capacity to confront most natural disasters such as flooding. Capacity building can be at the individual, institutional and systemic levels. Individual capacity depends on the availability, the knowledge and skills, as well as the performance of human resources. The capacity question focuses on all aspects of the emergency management system at national and local levels, and also includes an assessment of the political, cultural, social, economic and environmental factors which influence vulnerability to disasters. At the institutional level, capacity focuses on overall organizational performance and management capacities. They include, for example, the existence of an organization with a specific mandate on flood management. The systemic level focuses on the creation of enabling environment, such as the overall policy, economic, regulatory, and accountability frameworks within which organizations and individuals operate. Olowu (2010) emphasized that in many developing countries especially in Africa, the weakness of State infrastructures, absence of appropriate legal and policy frameworks and sometimes inadequate resources particularly render them more vulnerable to the gory consequences of large-scale disasters. Disaster management is still at infancy stage in Nigeria despite the fact that the year 1906 marks the earliest efforts at disaster management in Nigeria with the establishment of the Police Fire Brigade (now Federal Fire Services) with functions beyond fire fighting role to saving of lives, properties and provision of humanitarian services in emergencies. By 1999, the National Emergency Management Agency (NEMA) was established via Act 12 as amended by Act 50 of 1999, to manage disasters in Nigeria. NEMA was set up to tackle disaster related issues through the establishment of concrete structures and measures. Such measures as the education of the public in order to raise their level of awareness and reduce the effects of disasters in the Nigeria. The Agency has put in place structures that enable it detect, respond and combat disasters in a timely manner. Prevention is better and cheaper in disaster management due to the fact that if care is not taken, once there is a disaster the entire budget of a country may be diverted to contain it. States governments in Nigeria have been encouraged to establish their own separate Emergency Management Agencies (SEMAs) to complement the role of the federal agency in their areas.

Through SEMAs, the states would be seen to be more actively involved in the issues of disaster management and to prepare ahead of the untoward circumstances. Presently, only few states have so far responded positively in this regard. Moreover, some of these states have not properly empowered their SEMA to be functionally independent and proactive in the discharge of their responsibilities.

Understanding the spatial dimension of flood hazard and disaster and initiating disaster preparedness measures to mitigate and alleviate the suffering of the people. In recent times researchers have pointed out the fact that one of the ways to study and understand the flood behaviour is by generating the flood extent or flood risk map because such maps can then be used for spatial planning and management of land. In addition, there are also some researches concerning GIS-based integrated assessments of populations' vulnerabilities for famine, agricultural drought vulnerability (Wilhelmi and Wilhite, 2002; Pradhan, 2010) and economic vulnerability of households. Comprehensive geographical information is very critical for making important decisions because of the spatial coverage of most disasters and the fact that disaster management work usually involves a large number of different agencies working in different areas. It allows sharing of information in real-time, thus saving the time which have been spent to gather these resources. In addition, GIS provides a mechanism to centralize and visually display critical information during an emergency by showing an interactive flood risk map. Flood risk mapping defines the area at risk and should be the basis for all flood damage reduction programmes and subsequent actions. The purpose of a flood risk map is to:

- i. Increase public awareness of the areas at risk of flooding
- ii. Provide information of areas at risk by defining flood risk zones to give input to spatial planning.
- iii. Support the processes of prioritizing, justifying and targeting investments in order to manage and reduce the risk to people, property and the environment

Spatial planning and land management can provide various tools to prevent natural hazards (Kötter, 2003). In the context of flood disasters, spatial planning and land management can be used to support the following essential functions:

1. *Early warning system:* Spatial planning needs a detailed data base, to get sound information about the spatial development. In practise monitoring systems have to be extended systematically to inform about natural and environmental risks (UNDP, 1997; Uitto, 1998; Samarajiva et al., 2005). The efficient data acquisition needs special measurement methods that have to be investigated and implemented.
2. *Risk assessment and mapping:* Prevention of flood disasters needs comprehensive information and data about the reasons and effects of the hazards. Therefore a comprehensive vulnerability analysis need to be undertaken for disaster-prone areas, incorporating information about past disaster events, the socio-economic conditions of the population living in the affected area, and inventories of major structures liable to damage. Risk assessment and flood hazard mapping would then be used to delineate areas vulnerable to natural hazards and determine the frequency, intensity, impact, return period and other data in relation to each category of hazard.
3. *Prevention and reduction:* Spatial planning has to analyse the interrelations between the spatial influences and the environmental disasters in order to reduce the impacts.



4. *Risk Management:* During and after flood disasters, certain infrastructure (evacuation routes and spaces) and a database are needed to realise the emergency plan and risk management.
5. *Reconstruction:* When damages occur, there is the need to plan reconstruction of infrastructures. Spatial planning using GIS can assist the reconstruction efforts and also the future prevention of disasters.

GIS-based space technology can be used in different phases of dealing with natural disasters such as urban flood at phases which include: planning, mitigation and preparedness. At the planning phase, GIS can be a veritable tool for locating and identifying potential problem or disaster areas which is a core requirement in disaster management. It can be used to pinpoint flood hazard trends and start to evaluate the consequences of potential emergencies or disasters. Information derived from remote sensing and satellite imagery can play important roles in flood disaster management and crisis prevention. According to Perwaiz (2007), a flood preparedness plan (FPP) which is an integral component of the multi-hazard disaster management plan, is an action oriented document detailing specific actions to be undertaken prior to floods, which set the ground for effective execution of emergency response and recovery activities during and after floods. Flood preparedness planning is about putting in place a set of appropriate arrangements in advance for an effective response to floods. Some of the commonly identified flood preparedness activities include:

- a. Public awareness raising on flood preparedness, response and mitigation measures;
- b. Stockpiling of emergency relief materials i.e., food, fodder for livestock, emergency medicines, materials for temporary shelter etc;
- c. Installation of community-based early warning system for issuance of timely and effective flood warnings;
- d. Management of safe areas for temporary removal of people and property from a threatened location;
- e. Transportation to safe areas/ evacuation centre;
- f. Ensuring access to health and sanitation facilities

Geospatial technologies have the potential to handle emergency situations by identifying where, mitigation needs can be addressed. This process involves analysing the developments in the immediate aftermath of a disaster, evaluating the damage and determining what facilities are required to be reinforced for construction or relocation purposes. Utilizing existing databases linked to geographic features in GIS makes the task of monitoring these possible. Furthermore, at the preparedness phase the GIS are very crucial in the following ways:

- i. It can accurately support better response planning in areas such as determining evacuation routes or locating vulnerable infrastructure and vital lifelines and also supports logistical planning to be able to provide relief supplies by displaying previously available information on roads, bridges, airports, railway and port conditions and limitations.
- ii. It is also possible to estimate what quantity of food supplies, bedspace, clothes and medicine will be required at each shelter based on the number of expected evacuees.

- iii. In addition, GIS can display real-time monitoring for emergency early warning. This type of information and geographic display can be delivered over the Internet to the public.

Adequate planning is central to managing flood risk hence; it is widely held that urban drainage management must change to cope with greater urbanisation and climate change. Risks from flooding can greatly be reduced by a well-maintained flood control and sanitation infrastructure and public health measures (IPCC, 2007). Sustainable Drainage Systems (SUDS) is an alternative to conventional drainage is to mimic natural drainage, with the aim of reducing flooding and improving the quality of water draining from urban surfaces (runoff). The sustainable drainage systems (SUDS) may take the form of areas of vegetation like grassy banks of green roofs, or natural water storage features like ponds is even engineered components such as porous paving. The components of SUDS vary greatly, but one or more of the following is usually employed:

- a. Encouraging uptake of water by the ground ('infiltration'),
- b. Reducing peak flow rates of run-off ('attenuation'),
- c. Transferring run-off in a controlled manner to other site ('conveyance'),
- d. Capturing water directly on site for controlled discharge later ('storage').

SUDS also employ a range of natural process to purify urban run-off. Removal of sediments, biofiltration, biodegradation and water uptake by plants all help to remove pollutants. The SUDS principles have been well-known for many years and are widely used in many European countries; there has been no known up-take in Nigeria and many other developing countries of the world. The benefits of well-designed SUDS are:

1. A lower risk of flooding because runoff is reduced (although not when there are bigger storms);
2. increased recharging of natural groundwater levels;
3. Improved quality of water returned to water bodies;
4. Provision of an aesthetically-pleasing environment that encourages urban wildlife and biodiversity.

Disaster losses could reach over trillions of dollars in a single year therefore, disasters such as flooding presents challenges and even opportunities for the finance sector. Insurance measures is seen from the perspective of sustainable development as a beneficial for many developing countries for transferring risk from natural or man-made disasters. Very few people in developing countries are cover by insurance and more often the poor are completely left out of {insurance}, even though they are the most in need of protection. Although a flood can often be assigned to a single event type, on many occasions a combination of flood types and other natural hazards such as hurricanes, hailstorms and earthquakes may have occurred. In these circumstances, problems with insurance cover can arise if some occurrences are covered, but others are not (Collins and Simpson, 2007). It is therefore imperative for insurers to develop a better understanding of the livelihoods of the poorest groups and how disasters affect them to make sure they get pay-out triggers such as food price rises, or below- average rainfall right.

According to the Convention (Article 4.8) of the UNFCCC, insurance related actions constitute one of the three main means of response to the adverse effects of climate change such as recurring floods, alongside funding and technology transfer. They can enhance financial resilience to external shocks and provide a unique opportunity to spread and transfer risk. They

may provide incentives for risk reduction and prevention while engaging the private sector in climate change response action. In order to build the capacity to cope with the effects of natural disasters and also prepare for the unavoidable ones, governments should ensure that insurance coverage against natural disasters was readily available for social and economic infrastructure. Efforts should be made so the price of such insurance coverage do not become volatile or so expensive that a substantial portion of the social and economic infrastructure is either without coverage or under-insured. One of the benefits of promoting insurance-related actions is that it may help advance efforts on quantifying risks and potential losses due to climate change. Minimizing risk can result in a reduction of the rates for insurance, which thereby become more affordable.

## **CONCLUSION**

This paper have established that disasters such as flood can hamper development in all ramification, therefore there is the need to build the peoples' capabilities to prepare, manage, reduce and cope with the hazards associated with the disaster. It also revealed that ddisasters inhibit development and progress towards the Millennium Development Goals (MDGs). Although, it is quite difficult to quantify the effects of a disaster such as flood in urban area, however, one thing that is sure is that it increases in numbers of individuals below poverty thresholds, thus slow down efforts at sustainable development. One of the strategies in the promotion of sustainable disaster management is to strengthen national capacity in the government, public and private sector and NGOs in order to mitigate the effects of disasters such as flood. It is worthy to note that disaster prevention, mitigation and preparedness are better than disaster relief and response. There is the need for effective and timely spatial information of flood monitoring and their effect are essential for the flood prevention programme. Spatial planning using geospatial technologies such as GIS and remote sensing offers mechanisms to centralize and visually display critical information during an emergency. The paper also highlighted the usefulness of GIS-based space technology in different phases of dealing with flooding such as planning, mitigation and preparedness. GIS is vital for scientific investigations, resource management and development planning especially in the case of natural disasters such as floods. Furthermore, since there are several people and agencies involved in the prevention, response and management of disasters, a GIS gives the opportunity to agencies involved in the response to share information through databases on computer-generated maps in one location.

GIS can pinpoint hazard location and trends and start to evaluate the consequences of potential emergencies or disasters. It can accurately support better response planning in areas such as determining evacuation routes or locating vulnerable infrastructure which need to be salvage or protected. It can also be used for early warning system, risk assessment and mapping, risk management and reconstruction. The paper also proposed the adoption of Sustainable Drainage Systems (SUDS) in order to lower risk of flooding in the urban centres. This should be done coupled with the promotion of insurance-related actions that would help advance efforts on quantifying risks and potential losses so that risks can be minimised. Managing disasters using only a handful of stakeholders would be inefficient. Efforts should be made to recognize that the disaster management policy need to be strengthening there resilience and capacity of NGOs, private sector and the local community to cope with disasters while simultaneously building the capacity of the government machinery in disaster management. As part of means of promoting sustainable livelihood, Community-Based Disaster Mitigation (CBDM) is to a greater extent now seen NGOs, government agencies and likewise the affected communities as one of the important approaches to reducing disaster risks. This is because where the impact of disasters is felt more at the community level and it

is also where the risks can be reduced by the people themselves. When the risks are reduced through community efforts, they feel responsible for getting involved in the disaster mitigation process and this may lead to more effective and sustainable mitigation of the disaster thus contributing to achieving the overall goal of sustainable development.

For sustainable urban development, greater effort should be made with respect to flood risk management more fashioned along the Dutch policy that consists of three pillars:

- a. Prevention of flooding
- b. Sustainable, flood-proof spatial planning and building
- c. Emergency management and evacuation planning

The policy focus is predominantly on the prevention of flooding, with protection levels for the flood defences being legally mandated. For Nigeria as a nation to achieve sustainable urban development, there is need to increase the inherent strength and capabilities of all agencies, including the community to deal with disaster situations. This requires sustained initiatives encompassing social, economic and infrastructure issues. Even when peoples' capacity to tackle disasters is well built, it must be sustained on continuous basis to ensure sustainable livelihood. Furthermore, there is the need for mainstreaming disaster preparedness and management into core state, regional and national development planning efforts.

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#### **ABOUT THE AUTHORS:**

Oludare Hakeem Adedeji: Department of Environmental Management and Toxicology, University of Agriculture, Abeokuta, Nigeria.

Bashir Olufemi Odufuwa: Department of Urban and Regional Planning, Olabisi Onabanjo University, Ago-Iwoye, Nigeria

Olusegun Hezekiah Adebayo: Department of Geography and Regional Planning, Olabisi Onabanjo University, Ago-Iwoye, Nigeria.