

## ENVIRONMENTAL HAZARD: CLIMATE CHANGE AND FLOODING, THE IMPACT ON THE BUILT ENVIRONMENT IN NIGERIA

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### ABSTRACT

Flood is the most frequently and devastating natural disaster that kills people in thousands. Its consequences are profound, particularly on people in the less developed countries as in Nigeria. The impact is more pronounced in low laying areas due to rapid growth in population, incessant dumping of waste in drainages, decaying infrastructures and lack of proper environmental planning, resulting in lost of lives, properties, spread of diseases and displacement of people. Flood is worsened by climate change and inadequate preparedness. This paper seeks to look at the issues of flooding; causes, impacts, and suggesting ways of preventing and mitigating flood disaster in Nigeria. Data were sought through secondary sources by reviewing journals and other literatures related to the subject. The article contends that prevailing effect of climate change, particularly flooding affects almost everything in our cities; it demands urgent attention in form of environmental and infrastructure planning, enhanced public enlightenment programmes among others.

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**Keywords:** Environmental Hazard, Climate, Flooding, Built Environment.

### INTRODUCTION

Over the last 20 years, climate change has become an increasingly high profile issue both from social, economic, and psychological viewpoints. Climate change is currently threatening the world order by causing significant economic and ecological dislocations and by bringing about greater water stress and scarcity, on one hand, and on the other hand, causing increased frequency of storm surges, and heavy rainfall of long duration or high intensity. Its potential consequences are profound, particularly on people in the less developed countries of the world, such as Africa, Asia, and Latin America (Odufuwa *et al.*, 2012). Climate change has wide-ranging effects on the environment, and on socio-economic and related factors, including water resources, agriculture and food security, human health, terrestrial ecosystems and biodiversity and coastal zones (Kolawole *et al.*, 2011). For the U.N. Secretary-General Ban Ki-moon (2009), in Leonard I. Ugwu *et al.*, (2013) climate change affects every aspect of society, from the health of the global economy to the health of our children.

One of the most frequently occurring and devastating natural disasters, occasioned by climate change, is *flood* (Potschin, 2009). Nelson (2001) views flood as a natural consequence of stream flood in a continually changing environment; while Sada and Odemerho (1998) in Leonard I. Ugwu *et al.*, (2013) define it as unusually high rates of discharging, often leading to inundation of land adjacent to streams, which is

usually caused by intense or prolonged rainfall. Flood, simply put, refers to a flow of water over areas which are habitually dry. It is noteworthy to mention that excess of water in itself is not a problem; rather it is when excess water interacts with natural and man-modified environments in a negative sense, causing damage, death and disruption to the ecosystem, that problem results. Commenting on the impacts of floods on national development, Action Aid (2006) reported that flood is a major natural disaster that prevents Africans growing population of city dwellers from escaping poverty and stand in the way of United Nations 2020 goals of achieving significant improvements in the lives of urban slum dwellers. The recent reported cases of flood disasters across the globe buttressed the point being made by the Action Aid International. For instance, within the month of September 2012 alone, Nigeria witnessed the most devastating flood disaster in the past decade, which killed over 148 people, including a local chief in Delta State; displaced more than 64,000 people, and destroyed properties worth millions of Naira (Daily Sun, October 14, p.5) in Leonard I. Ugwu *et al* (2013).

According to UN-Water (2011) floods, including urban flood is seen to have caused about half of disasters worldwide, and 84% disaster deaths in the world was attributed to flooding. Askew (1999) in Odufuwa Bashir O. *et al*, (2012) reiterated that floods cause about one third of all deaths, one third of all injuries and one third of all damage from natural disasters. It is displeasing to note that, Urban areas in Nigeria are particularly vulnerable to flooding due to inadequate drainage system; changes in 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.

Low-lying coastal areas such as Lagos and other cities like Ibadan and Abeokuta where the flood-plains have been abused due to haphazard physical developments, illegal erection of buildings and other structures as well as unhealthy habit of dumping refuse and solid wastes in open channel drainage systems are particularly prone to flood disasters; flooding in most Nigerian cities is a major environmental challenge that deepens the horizon of poverty both directly and indirectly; and widens the inequality gaps between the have and have-not (Odufuwa Bashir O. *et al*, 2012). The need to reinvent Nigerian cities towards achieving flood free cities is imperative. A number of recommendations and conclusions were provided at the end of this article.

#### **TYPES OF FLOODING**

According to Ezeabasili A.C *et al* (2013), urban flooding can be classified in the following: overbank flooding, flash flooding, coastal flooding, overland flooding, infiltration flooding and engineering issues (man made). Bariweni P.A *et al* (2012) classify flooding as: tidal flooding, fluvial flooding, and flash flooding.

Angela Kesiena E. (2011) opined that flooding occurs throughout Nigeria in the following forms: coastal flooding, river flooding, flash flooding, urban flooding, dam

burst levee, dam spill. However, urban and flash flooding are the most common type in Nigeria.

- **Flash Flooding:** Flash floods are associated with rivers in the inland areas where sudden heavy rains can change them into destructive torrents within a short period (Angela Kesiena E, 2011). Flood from rivers, particularly in recognized floodplains, can usually be predicted with good accuracy. However, flash flood from sudden downpours continue to challenge the capability of detection and forecasting systems (Bariweni P.A et al (2012). Water over about 250mm in depth may carry debris particularly in urban locations and can be very cold. Even travelling at low speeds, this can make it extremely hazardous to people caught in it.
- **Urban Flooding:** Occur in towns located on flat or low lying terrain especially where little or no provision has been made for surface drainage, or where existing drainages has been blocked with municipal waste, refuse and eroded soil sediments. Extensive urban flooding is a phenomenon of every rainy season in Lagos, Maiduguri, Aba, Warri, Benin and Ibadan. (Angela Kesiena E. 2011). In August 1988 for instance, 142 people died, 18,000 houses were destroyed and 14,000 farms were swept when Bagauda dam collapse following a flash flood. Urban flooding such as the Ogunpa disaster which claimed over 200 lives and damaged property worth millions of Naira in Ibadan, are common occurrence. (Angela Kesiena E. 2011).

#### **CAUSES OF FLOODING**

Table1 shows selected causes of flood in a research conducted by Kofo A. Aderogba 2012. Twenty five (25) variables in twenty five (25) cities and towns, responded by two thousand (2000) people.

Table I: Selected Causes of Floods

Causes	No. of Respondents	% Proportion
Torrential Rain	1482	74.10
Base water flow	116	5.80
Spring water flow	110	5.50
Car wash operations	88	4.40
Watering flowers	68	3.40
Filled/silted/dirty drainage channels	1843	97.15
Social cultural activities	1212	60.60
Ocean/Lagoon surge	1185	59.25
Illegal Channelization of Drains	1211	60.55
Constructions and Reconstructions	1575	73.75
Blockage of Canals	1941	97.55
Inadequate Drainage Channel	1886	94.30
Non-Compliance with Regulations	1629	81.45
Illegal Structure on Drainage Channels	1879	98.95
Encroachment/Land Reclamation	1818	90.90
Poor heeding to predictions	72	36.00
Poor Physical Planning	1874	98.70
Global Warming and Climate Change	1143	57.65
Government Policies and Programmes	1528	76.40
Negligence	1177	56.85
Collapsed Bridges/Culverts	175	8.75
Farming along Flood Plains	1081	54.50
Nature of Terrain	785	34.25
Others (specified)	68	3.40

Source: Kofo A. Aderogba (2012)

From table 1 above, Illegal structures on drainage channels account for (98.95%); poor physical planning (98.70%); blockage of drainage channels (97.55%), filled/silted/dirty drainage channel (97.15%) are the major causes of the floods. other causes are torrential rainfall (74.10%); construction/reconstructions and rubbles that came out of the processes (73.75%), inadequate drainage channels (94.30%), non-compliance to regulations (81.45%), encroachment on drainage channel and land reclamation (90.90%) and Government policies and programmes (76.40%), (See Table I) are the major causes. Responses on base water flow (5.80%), spring water flow (5.50%), and others specified, (3.40%), are not significant. Causes due to physical terrain are only 34.25%.

### CLIMATE CHANGE

Climate change is an attributed cause of flooding because when the climate is warmer, it results to: heavy rains, relative sea level will continue to rise around most shore line, and extreme sea levels will be experienced more frequently (Bariweni P.A *et al*, 2012). Climate change is therefore likely to increase flood risk significantly and progressively over time.

Climate change is an issue that is related to economic, social, cultural and physical environment of any nation. It is a vital environmental factor that shape and re-shape various activities of human beings in a society. The United Nations Framework Convention on Climate Change (UNFCCC) in Odufuwa Bashir O. *et al* (2012) defines climate change as a change of climate which is attributable directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over a comparable time periods.

African Institute of Applied Economics, in Odufuwa Bashir O. *et al* (2012) posited that human factors (industrialization, technology development, urbanization, deforestation and burning fossil etc) and natural factors (solar radiation quality and quantity, astronomical position of the earth) are notable causes of climate change. Climate change is making weather less predictable, especially in developing countries like Nigeria where facilities to predict and manage weather conditions are not adequate. The unpredictability of rainfall in recent times has caused untold hardship during the raining season. Climate change works in an indirect way to aggravate urban flooding by altering the pattern of flooding in the flood prone areas. The primary cause of flooding in many parts of the world is directly or indirectly related to rainfall and the catchment areas of major river systems (Odufuwa Bashir O. *et al* (2012) Climate change also works in an indirect way to aggravate urban flooding. However, urban flooding is not just related to heavy rainfall or extreme climatic events; it is also related to changes in the built up areas themselves. Despite the knowledge of climate change and its impacts especially in urban environment, it is disheartening to note that, most Nigerian cities find it difficult to provide in advance resilient and adaptation measures that will cater for the hazards such as increased floods resulting from global climate change.

### **IMPACTS ON THE BUILT ENVIRONMENT**

Arayela (2008) in Gabriel Fadero *et al* (2010) defined the built environment as man made surroundings that provide the setting for human activity, ranging from the large scale civic surroundings to the personal spaces. In general context, built environment refers to all buildings and spaces between them such as street and squares as well as civil and mechanical engineering works such as roads, drainages, sewage disposal, plumbing and so on.

The impacts of flooding on the built environment have increasingly assumed from significant to threatening proportions, resulting in loss of lives and properties (Brody S.D *et al*, 2007). Apart from houses that collapse by flooding, school buildings and bridges sometimes collapse as well. Markets places and farmlands are submerged for weeks and sometimes are washed away. Both arable and agro-forestry were swept away. Farm animals lost their lives to flooding while many culverts/ bridges collapsed and electric poles destroyed. Flood also causes diarrhea and water-borne diseases. It makes the individual, communities and nation poor through disruption of services and the degradation of agriculture land. Degrade the environment, spread infestations; soil and water are polluted by chemicals. Causes soil infertility through leaching and erosion of rich top soil. (Aliyu Baba Nabegu, 2014) observed that data from the disaster management agencies at the state and federal levels indicate that on average it takes 24- 43 months to repair electricity poles and reconnect electricity, whereas repairs to roads and bridges takes 18 - 56 months. With regards to schools

and hospitals it takes 9 - 16 months. Alalade and Sanusi (2006) in Ismail Wahid A. *et al* (2014) claimed that flood like any other environmental problems, consumed a considerable amount of public fund which could have been used to develop other sectors of the Nigerian economy like transportation, education, security etc that could have moved the country from its present stage of under development to a developed country.

## RECOMMENDATIONS

Although flood is a natural phenomenon, human activities exacerbate it. Most flood victims fell devastated and are emotionally and psychologically traumatized. Floods cannot be eliminated because human beings cannot stop nature from taking its course; rather, floods can only be managed and their impacts on the environments and human beings minimized. (Leonard I Ugwu *et al*, 2013).

In order to minimize the impacts of floods on the physical as well as in the social environments, the following actions are recommended:

1. **Mass Education on Flood-Prevention:** Because human activities exacerbate floods, workshops and seminars should be organized for those living in flood-prone areas with a view to impacting the knowledge to them so that they will become aware of how their interactions with environment could exacerbate flood.
2. **Early Warnings:** Our meteorological stations should be equipped with up to date gadgets, which will help meteorologists predict accurately climate variables and pass the same information to the government and the public, respectively. This is important because early warnings will help government take proactive actions on how to prevent the occurrence of floods, if possible, but if not, provide appropriate intervention strategies that will minimize their impacts on environment and people.
3. **Provide Emergency Agencies with Up-To-Date Equipment:** Government should provide the employees of the emergency agencies with state-of-the-art equipment that will help them in the effective distribution of relief materials to the victims of natural disasters. Similarly, there should be mobile clinics to flood-prone areas equipped with drugs and other logistics to enable the staff come into the needs of the victims with ease.
4. The Ministries of Works and Infrastructure of each state should be tasked by their respective state Governments to ensure free drainage channels and erosion passages in all nooks and cranny of the states (Kofo A.A, 2012). The Ministry may have to enforce the drainage clearing through "persuasive approach", while the city governments beef up supervision of any identified problem areas.
5. Residents, manufacturing industries and assembly plants, offices, markets and stores, hospitals and maternity homes, schools and colleges and others should be compelled to ensure that their surroundings, the drainage channels and

erosion passages are clean, clear and free of refuse before, during and after rainy seasons. That is, everyone must cultivate the habit of weekly clearing of drains in his surroundings.

6. In particular, it is imperative that:

- There must be legislations that must deal with the use of plastic bottles and cans, sachets, such as pure water sachets, carrier bags and other non-degradable material not only in the urban centers but throughout the country;
- The national monthly environmental sanitation should be enforced and sustained. The exercise may be observed at more regular intervals to rid homes, work environments and others of dirty made up of waste waters, plastic junks, waste foods, abandoned/condemned home utensils and appliances, unserviceable tools and equipment and others, and properly disposed of them without necessarily hindering free flow of water along erosion passages, gutters, drainage channels and canals;
- There must be urgent government interventions to remedy the situations in the cities and towns to save them from more serious calamity. There must be dredging and re-dredging of canals and drainage channels. Government is the only authority that can identify illegal structures. It is better late than never; and the time is now to clear the drainage channels, canals and erosion passages of illegal structures and silts;
- Residents, as group and as individuals, and corporate bodies should be implored and encouraged to embark on some palliative measures such as dredging and re-dredging of drains, erosion passages and others; and construction of embankments and channelization of some routes that are prone to flooding;
- Governments should deploy reasonable human and material resources to free all floodable areas across the built-up areas from incessant floods; and should be conscious of flood ability of new suburbs in the processes of planning;
- It is high time Nigerians and particularly urbanites heed to the forces of nature and any natural changes in the systems when predicted; and
- Green Areas, besides urban rivers, streams, canals and other drainage channels should be encouraged and enforced.

## **CONCLUSIONS**

Climate change is currently threatening the world order by causing significant economic and ecological dislocations and impacting negatively on the general health conditions of the displaced persons, including their mental health. One off-shoot of climate change is flood, which today is the most frequently occurring and devastating natural disaster that kills people in thousands worldwide and causing inestimable damages to properties. There is an urgent need for a collaborative effort

of both government and stakeholders to support town planning, engineering and other professional agencies to combat flooding in Nigeria to avoid its long-range consequences. For every individual, develop your plot with deep or wide drainage system, and don't dump wastes in the waterways (it's perilous to you in your living domain. The media should also assist in educating the public on flood consequences. "The environment remains our most valued possession and legacy which we must all strive to protect. Let us all join hands in protecting our common interest.

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