



Qualitative Studies of Recent Floods and Sustainable Growth and Development of Cities and Towns in Nigeria

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Key words

*Physical environment,
Floods,
Living habits,
Challenges,
Cities and towns*

Abstract

Extreme weather events have caused havoc to lives and properties in recent years. Research and development have also been focused on these global phenomena. The situation is getting alarmed in Nigeria. The aim of the paper is to study incidences of floods in Nigerian cities and towns. Topographical Maps of 25 cities and towns were studied. Floods, drainage channels, run-offs and effects of human activities on floods were observed and studied. Interviews were conducted with 20 professionals, urban dwellers and twenty Local Government Chairmen of the cities and towns. There was a questionnaire that was administered among 2,000 urbanites. It collected data about the frequency, sizes and havocs caused by floods. Some of the cities particularly Lagos, Warri and Port-Harcourt are under the sea level with average gradient of less than 1:100,000. Run-offs are increasing in volume and areas of coverage but relatively drainage channels are inadequate; and they have been blocked through the adverse living habits of the urban dwellers. Waste waters are contributing as base water to rain water in the drainage channels. These result in grievous consequences of flood. All forms of transportation are affected each time it comes; lives, farm lands and properties are lost; and economic activities are grounded. Human factors are predominantly the cause. More attention has to be paid to urban physical planning

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1 Introduction

There is no doubt that the world is under serious threat from the environment: From China to Mexico, Indonesia, United States of America, United Kingdom and Nigeria, analysts have argued that the environment was only responding to the abuses heaped on it by man's activities (Christopherson, 1997). The concern is that the world may be getting close to extinction through natural disasters unless immediate actions are taken; and the signs are just too apparent to be ignored (Christopherson, 1997 and Oyegbile, 2008). Specifically, in May 2008, floods triggered by torrential rains killed dozens of people across China, while thousands of others were victims of landslides caused by the downpours. China is not alone. In the United States of America, the Mississippi River caused damages put at several millions of dollars when it over flew its banks, flooding some cities, towns, farmlands and major industrial installations over a distance of about 250km and ravaging Iowa before it heaped downstream. Apart from the Mississippi-Missouri River Systems of 1993, and that of 1995, world records of flood have it that recently severe floods were experienced in Norway, China, Bangladesh, Ghana, The Netherlands and South Florida, (Christopherson, 1997). In February 2000, a cyclone swept across Mozambique which left some 950,000 people homeless as floods devastated huge areas of low-laying lands. Roads, homes, bridges and crops were destroyed.

Journalist, Greg Barrow, as quoted by Kerski and Ross 2000, flew over the striking area and filed this report for BBC, London, United Kingdom:

... wave of brown water has swept through the Save River valley. Trees have been uprooted, houses lie in ruins and debris are floating. Those who survive the flooding have been stranded on rooftops and in trees. Beneath them the bloated corpses of livestock float in the waters... to rescue the survivors. Pilots say some people have been trapped in trees for days without food or water... the people wave frantically, motioning to their mouths and stomachs with their hands to show that they were hungry. When the rescue helicopters came to winch them to safety, there were desperate scramble ... lifted around 300 survivors to higher ground but their work is difficult, fuel supplies was low... There were lacks of coordination in caring for the flood victims... up to 40,000 people were believed to be trapped by the flood (Kerski and Ross, 2005).

It is over 14 million Indians that were victims to the flood of August 2007 in Sathya Sai Baba, a major human settlement, of that region, (<http://www.awakenedwomen.com/flood.htm>). The nation's government could not organize any emergency relief immediately. Rather, it spent over \$1.6 billion on Hawk Jets. Hunger and diseases stalked the India children and the poor in the region. In a similar writing, Wright (2011) reports the devastating flood of Lahore, Pakistan in July 2011 where transportation systems were halted and businesses were closed down for days.

In Nigeria, apart from the Ogunpa Stream in Ibadan that killed several people and completely grounded socio-economic activities in 1980, recently (August 2008), the residents of Makurdi were thrown out of their residences and their farmlands left impoverished after two days of heavy down pour of rainfall. It was described as very disastrous, (Taiwo, 2008). He also reported in Thisday (August 18th) that "at least five hundred people were rendered homeless and properties worth several millions of Naira were destroyed when a flood, occasioned by torrential rainfall ravaged Babura, a town in Jigawa State in a period of two days". Akani and Bilesanmi (2011) report how a Lagos flood forced Lagosians to relocate as a result of heavy rain of 7th and 8th of July 2011 not knowing there was going to be a more devastating torrential rain that will result in "more disastrous floods in Lagos Metropolis" in the following week, (Mordi, 2011 and Amaize, (2011).

Often, "Send down the rain" is the supplications of Nigerians early in the years in expectation of bountiful harvests. In the recent years, the rains came indeed, but in torrents, giving rise to deadly floods instead, causing harvests of pains. From Lagos, Ibadan, Abeokuta, Calabar, Port-Harcourt and Warri in the southern region through Ilorin, Abuja, Lokoja and Mina in the Middle belt to Kano, Kaduna Jalingo, Maiduguri and Gombe in the North, the rains came down and floods came-up, washing away streets, battering dams, collapsing bridges, submerging buildings, killing people, trapping some in their homes and separating thousands of others from theirs. "Nothing is spared by the marauding floods", (Adedeji, Kuyoro, Adeola and Adeyemi, 2011).

However, from the whole old worldwide story from the book of Genesis (Brown 1997, Genesis 7:4-10, Isaak, 1998 and Adedeji, et al 2011) and the recent experiences and records, it is clearly known that a flood is a high water level that overflows the natural (and or artificial) levees along any portion of a stream. It is common throughout the world and it is a natural response of a river or stream or mere drainage valley/channel that has too much water to cope with. Heavy rainfall (combine with snow melt in the temperate regions) causes channels to be overtopped, and flood waters surge over the neighboring floodplain. It is usually "very large body of water covering the land that were usually dry and beyond its banks"-destroys farm lands, property, industrial installations, roads, railways, residences and it carries people away. In other words, it is usually abrupt, accidental, destructive and harmful. It is usually very devastating to any community and or nation it affects economically and socially. Though, sometimes, it is not without some advantages (Pilgrim and Cordery, 1993; and Aderogba, et al., 2012).

Occurrences of floods in the cities and towns of Nigeria in recent times have been great concern and challenge to the people, Governments and researches, (Akintola, 1982; Oriola 2000; Aderogba, 2012; and Aderogba et al 2012). There have been journalistic and non-quantitative reports of flood for several parts of Nigeria including Lagos. But they are superficial and lack directions for professionals and policy makers

(Aderogba, 2011). Above all, there is none, of recent, to describe the magnitude and criticality of the phenomena with the attendant problems. The works of Adeaga (2008), Oyegbile (2008) and Oyebande (1990 and 2005) are paraphrasing, disjointed or sectional. They are not laconic. Adeaga (2008) *Flood Hazard Mapping and Risk Management in Part of Lagos N.E* is only on mapping of the hazards caused by flood in the North Eastern part of Lagos Metropolis. Similarly, the work of Aderogba (2011) on the *Challenges of Global Warming and Floods in Lagos Metropolis, Nigeria* is an expository of the poor planning of the physical environment of Lagos Metropolis and poor living habit of the residents vis-a-vis the resultant floods. The entire nation requires attention (Akosile 2008; Adeaga 2008; and Aderogba, et al., 2012). More importantly, the frequency of occurrence and in several parts of the nation with the attendant havocs call for concern and serious attentions too, (Oriola 2000; Akani and Bilesanmi, 2011; and Aderogba, 2012). The objective of this work is to study the peculiarity of the incidences of flooding in Nigerian cities and towns, its challenges; and proffer solutions for sustainable development in the face of global warming. Emphasis is on the cities and towns of Nigeria.

2 Nigerian Physical Environment

Nigeria lies within the tropical region of West Africa with an area of about 923,768 km² that is made up of 910,768 km² of land and 13,000 km² of water with a geographical coordinate of 10:00⁰ North, and 8:00⁰ East. Comparatively, it is slightly twice the size of California State of United States of America. Total land boundary is about 4,037 km. This is made up of Republic of Benin (773 km) to the west, Cameroon Republic to the east (1,690 km), Chad in the north east (87 km) and Republic of Niger (1,497 km) in the north. Coastline is 853 km. Her maritime claim is 200m (or to the depth of exploration of continental shelf), 200 nm of exclusive economic zone and 12 nm of territorial sea. The varieties of the physical conditions made Afolabi (1973) to describe it as a region of contrast.



Figure 1: Nigeria Physical, Major Towns, Road Network and Railways
(Source: Federal Ministry of Environment, Maps Department, Abuja)

Figure 1 describes the physical environment of Nigeria in terms of its relief and drainage (and, of course, major road network, railways, and major cities and towns). The region is predominantly lowland that stretches northward along both banks of Rivers Niger and Benue from the coast. There is nowhere along this zone that is more than 200 meters. Port-Harcourt, Warri and Lagos are at the sea level. The rest of the territory is between 200 and 1,000 meters above sea level except the northern and Adamawa Highlands (1,000-2,000 meters above sea level) that have their highest points at Shere-Jos Plateau (north central), Gote and Shebshi Mountains (north-east). These are not less than 2,000 meters anywhere. The elevation of between 1,000 and 2,000 is dotted by bounhardts and Yoruba (Kukuruku) Hill in the West and Udi Hill in the East. Lake Chad in the extreme north-east is share by Nigeria and the Republic of Chad. The entire region is naturally drained into the Lake Chad by Rivers Jamaare, Hadejia, Banga, Kamadugu Gana, Ngadda, Yedseram and their tributaries into the Lake Chad in the northeast; and by Rivers Niger, Bunue, Ogun, Osse, Oshun, Cross Rivers and their tributaries into the ocean in the south. See Figure 1. Aside these, there are drainage channels and canals, natural and man-made, of various sizes and capacities that drain the cities and towns. Supply of water into these channels are from rains, seepage from the ground, springs, waste waters from homes, hospitals and maternity homes, manufacturing plants, hotel, motels, brothels and recreation centers, car wash centers, schools and colleges, research institutions and others. But over 83.50% come from rain water, (Ologe 2002).

Human activities such as dam construction, irrigation, bridges and others have impacted on free flow of water in the drainage channels, rivers and streams. Particularly at the urban centers, construction of roads, buildings, factories, manufacturing plants, farmlands and others have reduced their channels and or have attempted diversion of the natural courses of others. The vegetation cover typically reflects rainfall patterns, soil types and variations in altitude. In general, rainfall diminishes from the south and south-east towards the north. The coast has rain during all months of the year while the north has rain for approximately half of the months of the year. In the coastal regions, the annual rainfall is of the order of 4,000mm dropping to about 500mm in the extreme north. The assured supply of rainfall, especially during the rainy season, and the consistent high temperature throughout the year make for plant growth everywhere, (Afolabi, 1973). But urban activities of man have changed the face of the earth. What is often found is man-made: Roof top of buildings, concrete surfaces and bare grounds.

Road constructions, residential and commercial buildings, hospitals and maternity homes, schools and colleges, research institutes, markets and stores, filling stations and others demanded for concrete surfaces all of which have increased surface run off from rainfall and the wastes waters which have inadvertently added to the waters in the rivers, streams and drainage channels. Apart from those that are found dotting the outskirts of major cities and towns, manufacturing and other industrial processes and productions are most concentrated at the urbanized Lagos-Sango/ Ota-Abeokuta-Ibadan industrial Axis, Kano-Kaduna-Jos Triangle, Assaba-Onitsha-Benin-Sapele-Warri Sector and Aba-Port-Harcourt-Enugu-Onitsha-Owerri Complex.

Cities and towns are increasing in number, area extents, population sizes, and functions. It is not unlikely that it is the large population coupled with the inability of the city governments to provide adequate infrastructure, and the living habits of the inhabitants that are compounding the issues of wastes, (Adejuwon, 1979 and Aderogba, 2012). They are also of the opinion that apart from the few designated Dumps, wastes litter roads, streets, markets, store areas, schools and office premises, gutters, erosion passages, drainage channels and pathways-to the points of embarrassment.

3 Materials and Methods

The pattern and parameters of flood in twenty five cities and towns were studied for eight years. It was among the cities and towns that the questionnaire was administered among the urban dwellers. They are administrative, commercial, tourist, educational and industrial cities and towns with multiplicity of other urban functions.

The widths of the floods were determined by measuring distances on both sides of the channels—from one side to the other of the drainage channels. The marks made on walls of buildings, trees and electric poles along the flood lines (to the floor of the channel) relatively show the marks from where the depths were determined. All the sampled cities and towns were toured to study the characteristics and behavior of the drainage channels before, during and after rains. The rains of 2011 were observed; and substantial data and information were obtained from the consequent nation-wide floods. State Ministries of Environment and the Departments of Physical Planning in the states of the selected cities and towns provided information and data on the physical environment, planning, government efforts and challenges of inadequate drainage and floods. Departments of Environment in randomly selected Local Government Council Areas housing the selected cities and towns also provide data and information on floods, frequency, spread and cost of destructions cause by erosion each time it occurred. They also provided information on the historical development of the sampled cities and towns vis-a-vis drainage systems, floods, challenges and consequences. The Federal Ministry of Environment and Physical Planning provided data and information on average annual number of floods, human lives claimed, spread (width) and height in meters, estimated cost of lost materials and relief materials (distributed) in Naira between 1981 and 2011. Members of the public, two thousand (2,000) that were randomly selected in randomly selected cities and towns responded to the twenty five questions on causes, extent, severity, effects, frequency and periodicity of floods and its challenges. They also offered suggestions.

Newspaper cuttings, reports and journal publications were cleverly perused, shrewdly and extensively used. A Field Assistant each was employed for each of the sampled cities and towns; and each toured over 80% of the Study Area within the months of June and November for five years between 2007 and 2011. Measurements were made of the heights and width of the floods and what remains of the floods each time they visited. The residents were able to give accounts of how it happened, and ravaged the communities. Most of the time, they were also quick to suggest temporary and permanent solutions. Records of six Meteorological Stations were used. Using the Isikawa Fish Bone Cause and Effect Analysis, the causes, effects and solutions were brain stormed with twenty (20) experts that were made up of professionals in Urban and Regional Development, Urban and Regional Planning, Urban Transport Planning, Environmental Sciences, Water Resource Management, Geography and Hydrology, Climate Change, Health Care Delivery, Trade and Commerce, Government, and Trade Unions. They were able to come out expertly with the causes, the effects and solutions to the menaces of flood in Nigeria urban centers and elsewhere in the Third World. Directions for urban dwellers and policy makers were indicated. The technology of combating flood is not the concern of this work.

4 Results

Width, depth, frequency and durations floods lasted were observed in 25 cities and towns. Table I shows these parameters. Each respondent picked more than one choice. The mean width observed for the nation was 188.00m. It was 747.00m for Lagos, being the highest followed by Ibadan (525.45m), Aba (235.00m), Makurdi (228.73m) and Ilorin (225.25m). It was least at Kano (110.00), Osogbo (111.00m), Sokoto (114.25m), Abeokuta (115.00m) and Jalingo (115.05m). The experienced mean depth/height was 8.10m for the nation. It was least at Abuja (6.20m) and Ilorin (6.55m); but up to 11.88m in Lagos. Again frequency of occurrence was highest in Lagos, 10 times per annum. It is not less than 4 times per annum anywhere. See Table 1. The mean longest duration floods lasted in the territory is 10.44 days. The least was Abuja-4days. Lagos was as high as 25 days on the average.

Table 1. Selected Flood Parameters in Selected Locations.

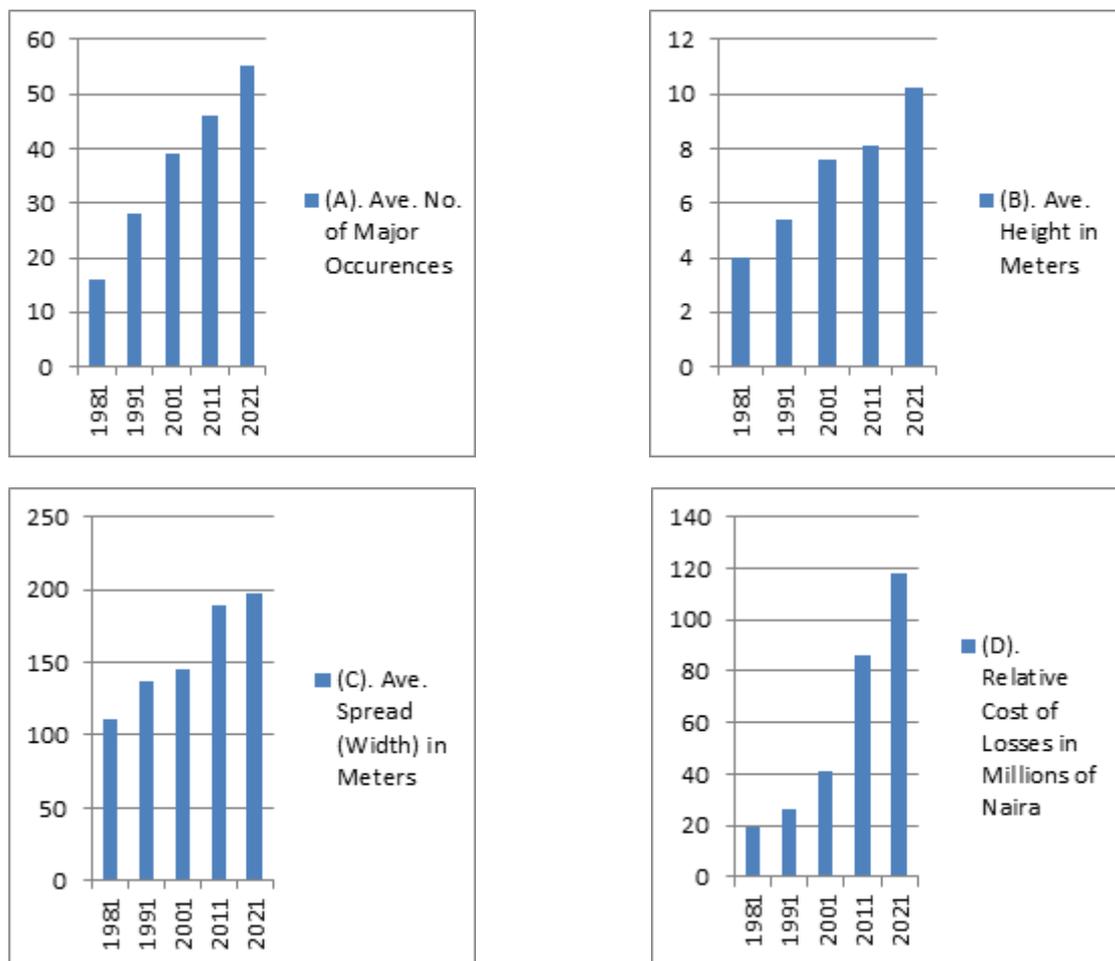
Location	Mean Width (meters)	Highest Experienced Height (meters)	Mean Frequency (Per Annum)	Mean Longest Durations ever lasted (days).
Assaba	125.00	7.88	6	10
Abuja	163.00	6.20	5	4
Abeokuta	115.05	7.32	6	8
Aba	235.00	7.54	5	15
Ibadan	521.45	9.20	3	7
Owerri	124.04	8.21	5	7
Warri	221.25	7.28	6	16
Benin City	198.00	8.90	8	12
Jalingo	115.00	7.37	4	5
Enugu	147.72	7.35	5	6
Lagos Metropolis	747.00	11.88	10	25
Kano	110.00	9.72	3	8
Kaduna	128.00	9.53	5	12
Katsina	122.00	6.25	4	11
Sokoto	114.25	7.02	6	4
Port-Harcourt	121.21	8.12	4	18
Ondo	124.75	7.80	8	11
Ogbomosho	118.00	9.55	3	12
Osogbo	111.00	9.73	8	13
Onisha	128.00	7.65	4	4
Calabar	213.00	7.53	8	11
Makurdi	228.73	8.78	7	12
Maiduguri	117.00	6.74	8	7

Location	Mean Width (meters)	Highest Experienced Height (meters)	Mean Frequency (Per Annum)	Mean Longest Durations ever lasted (days).
Ilorin	225.25	6.55	8	12
Gombe	126.30	8.40	9	11
Mean	188.00	8.10	5.92	10.44

(Source: Aderogba, 2011, Field work).

Climate change and global warming might be adequate explanation for the unusual and frequent torrential rains, (Bailey 1989; Brown 1997; Dow and Dowing, 2006; and Kershi and Simon, 2005).

Figure 2 further shows historical attributes of the most dasterdized floods between 1981 and 2011 – a period of thirty years: Average number of major occurrences (A); average heights in meters (m) (B); average spread (width) in meters (C); average relative cost of loss of properties in millions of Naira (D); average number of lives claimed (E); and average amount of relief package that had to be expended in millions of Naira (F). Year in year out, these parameters have been on the increase. See Figures 2(A), 2(B), 2(C), 2(D), 2(E) and 2(F). Number of major occurrences that affected major cities and towns, claim lives, disrupted economic and social activities and others were just 19 in 1981.



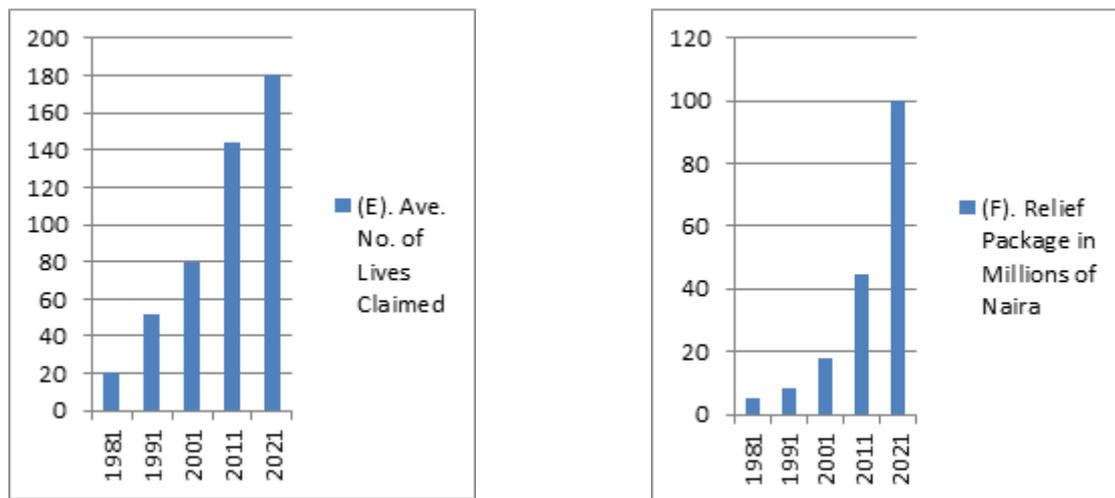


Figure 2: Characteristics of the floods 1981-2021
(Source: Aderogba Field Work)

This increased to 86 in 2011, see Figure 2(A). Average height attained and observed in meters was 4.0 in 1981. It became 7.6 in 1991 and 8.1 in 2011; see Figure 2 (B). Each time it occurs, regardless of the region, losses are counted in Naira and Kobo. It has always been in several millions of Naira; and it has always been on the increase; see Figure 2 (D). Lives lost each year have been increasing too. It was just 21 recorded in 1981, 52 in 1991 and 144 in 2011. See Figure 2 (E). The Relief Packages have not been the same amount too. Only ₦5million was expended by individuals, groups and the nations (put together) in 1981. The Figure rose to ₦44.80 million in 2011. If unabated, by projection, major occurrences will be 181 by 2021; it will attain a spread of 198 meters; loss may cost as much as ₦65million; and lives that will be lost may increase to 181 per annum. Relief Package from individuals, groups and nations may be put at ₦100million. See Figures 2(A), 2(B), 2(C), 2(D), 2(E) and 2(F).

But the question is; what are the major causes of the floods? Aside others that were specified, 25 variables were responded to by the randomly selected two thousands urbanities in the twenty-five sampled cities and towns. See Table 2.

Table 2. 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/ Planlessness	1874	98.70

Causes	No of Respondents	%Proportion
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: Aderogba, 2011, Field Work)

Illegal structures on drainage channels (98.95%); Poor physical planning/ planlessness (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 2) 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%. See Table 2.

Table 3. Estimated shortfall in Drainage Channels in Selected Cities and Towns

Cities/Towns	Estimated Shortfall in Drainage Channels (%)
Abuja	27.25
Abeokuta	63.48
Aba	68.75
Ibadan	56.78
Owerri	59.45
Warri	78.86
Benin City	83.75
Jalingo	76.65
Enugu	48.75
Kano	54.45
Kaduna	67.55
Katsina	62.45
Sokoto	56.75
Bauchi	64.65
Akure	58.55
Ondo	56.75
Ogbomosho	54.58
Osogbo	59.35
Onisha	78.75
Calabar	48.75
Makurdi	65.25
Maiduguri	69.50
Ilorin	63.00
Gombe	68.65
Mean	61.78

(Source: Aderogba, 2011, Field Work)

It is estimated that the required drainage channel is short by about 61.78%. (See Table 3.); and “the existing ones are only about 30% maintained”, (Amaize, 2011). There is nowhere the estimated shortfall in the drainage channels is less than 50.00% except at Abuja (27.25%) and Calabar (48.75%). It is as high as 78.75% and 76.65% at Onisha and Jalingo respectively. The floods bring about economic and social activities to standstill as motorists would have to snail through flooded roads while pedestrians would wade through shoulder-high rain water wherever and whenever it is possible at all. Reptiles, birds, insects and others, apart from man, are usually driven out of their natural habitats, (Oriola, 2000; and Aderogba, 2012).

The rains of 10th and 11th July 2011 started at about 05:00 am in most parts and lasted throughout the day, nonstop for over 17 hours 35 minutes in the north and about 10 hours in most parts of the north. As it persisted, there were unusual rise in the water levels of canals, drainage channels, erosion passages, gutters, streams and rivers and their tributaries, and lakes and lagoons. A resident in Ajose Adeogun (Victoria Island) in the south has this to say:

The water level has rose incredibly so that the channels that are meant to discharge water from the roads and drainages are completely locked because of the high tide and because both the Atlantic Ocean and Lagoon that receive water from other channels have risen more than usual.

Mordi (2011) gave a journalistic summary of the flood incidences in the south as a result of the Sunday 10th/Monday, 11th July, 2011 as follows:

Lagos counted 10 dead ... from the rains which cascaded on the state continuously for 17 hour ... Residents, businesses, and the government ... counting their loses, as flood water rendered thousands homeless, cars damaged, and shops and roads filled with silts ... the most devastating flood. All public schools and private ones were closed ... At least 10 persons drowned in a canal because they could not distinguish between the roads and the drainage channels. ... a woman and her baby aged few months. Thousands of others were sacked... Some are temporally sheltered in churches and mosques... collapsed and buried a teenager in the rumble ...a man died instantly when a fence fell on him... 22-yr old boy was retrieved... from sewage cistern... five girls were found dead in a restaurant on Allen Avenue... rainfall made them to pass the night in a poorly ventilated room where they inhaled fumes... Channels Television did not air its Sunrise Daily News package as its presenters could not make their ways to ...Rhythm 97.7fm... was temporally shot down... submerged vehicles, generators and equipment... major markets were deserted as... people weeping and shedding tears... properties had been damaged... commercial hubs, including Victoria Island, Lekki, Obalende, Ikeja, Ojuelegba, Oshodi and Alagbado were grounded. Banks, companies and schools sent their workers and pupils back home... Ikeja, Ojuelagba were flooded and all the workers were asked to stay at home.

He similarly describes the situation at Kaduna, in the north, for the same 10th and 11th July, 2011 as dreadful and devastating; the memory of which cannot easily be forgotten by any:

... her mother left her for the shop but met her on top of water in the room... came out to find cars, house roof, refrigerators floating on water. ...Residences were sent parking from their homes for days. ...family of five was on tree for five hours before rescue could come ...never forget.

Governments, individuals and organizations remarked sorrowfully and passionately:

... we did not sleep in our house yesterday night, the rooms were taken over by flood; we were scared because the rain did not stop until about 11pm... to run to our church... where we passed the night.came back from church service at about 7pm to meet our one room apartment... overtaken by flood.....lost almost everything.....only retrieve the cloths I hung before I left for church. If I had known that the rain would fall the whole day....

Alarmed by the volume of floods, Lagos State Government issues an advisory alert. It warned residents to stay off the roads; and declared holidays for all public schools in the entire State. The Governor, Babatunde Fashola, inspected some of the areas affected; and emotionally sympathized thus:

Those who are in buildings marked as structurally unstable or those who built on canals should leave the buildings immediately because we are coming to take possession, we are not going to risk human lives anymore. My sympathy goes to the people affected in the flood. I condole with people who lost children and property; they should know that I am with them. appeal to President to help with funds, to relocate and resettle flood victims. write to the Federal Government on the failed portion of the Lagos-Abeokuta expressway.....have virtually lost that road and traffic will be terrible.

See the Appendix: It shows the captions, opinions, titles and others in Nigeria dailies and magazines that report the flood incidence from around the country in print media. Meanwhile, the Federal Meteorological Agency warned and alerted of yet another impending torrential rainfall in the weeks ahead. These are pointers to measures that must be applied; and urgently too.

On the factors responsible for the causes, an Ishikawa Fish Bone Analysis carried out with the twenty experts in Urban and Regional Development, Urban and Regional Planning, Urban Transport Planning, Environmental Sciences, Water Resource Management, Geography and Hydrology, Climate Change, Health Care Delivery, Trade and Commerce, Government, and Trade Unionism is displayed in Fig.3.

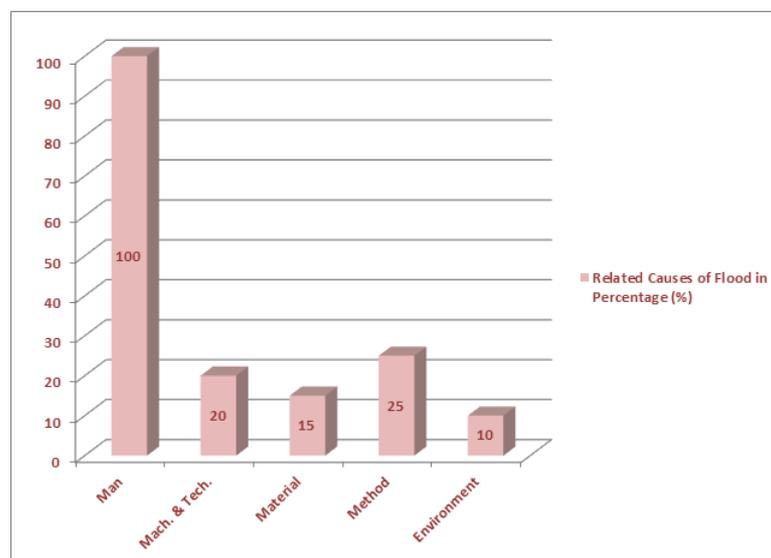


Figure 3: Factors Responsible for the Floods.
(Source: Aderogba, 2011, Field Work)

For this work, Ishikawa Fish Bone analyses is modified to include Environmental Factors as a major cause related to the problem of Flood, that is, in addition to Man, Machine (and Technology), Materials and Methods. Therefore, considering what could be major factors, Man; related is ranked highest (100.00%) and Environment related is ranked least (10%); and insignificant. Machine and Technology (20%), Materials (15%) and Methods of preventing and combating floods (25%) are not major issues. Each respondent/expert supported more than one factor. Detail discussions of these are beyond the scope of this paper. But it is obvious that human factors have to be addressed.

5. Discussion

The growth and development of the cities and towns are very rapid though not with commensurate infrastructural development: Many have come a long way – some due to historical background, or functions as trade/commercial centers, seat of government, administrative, tourist, cultural, industrial, business and financial and economic centers of the nation; and they contain over 35.50% of the Nigerians living in Nigeria and a host of other nationals resident and or working for their livings in Nigeria. Urban functions kept on

increasing and so also rural-urban migration of skilled, semi-skilled and unskilled unabated. It appears urban governments care least about what must be done to reduce urban problems. One of such challenges is flood. Floods in the cities and towns are becoming common phenomenon whereas it is not a welcome scene anywhere, anytime, because of its destructive and devastating effects. Hitherto Independence, and some decades after, the cities and towns experienced floods that come and last for weeks on roads, streets, lanes and crescents; and sometimes became exclusively permanent features of some communities. The pattern changed in the recent past to flash floods whereby the flood will come and disappear in less than three to four hours in few locations. There is a third phase of it: Occasioned by torrential rains, floods now become reoccurring incidences leading to great threats to urban lives; loose of lives and property and rendering thousands of residents homeless; changing the face of the earth and disrupting the unsustainable traffic, among others. The intensity – heights, spread, frequency and havocs are now increasing. The rain of the week of July 10th and 11th 2011, though forecast, took the residents aback: The flood took over, shut down and grounded and incurred agony on the residents and governments as all count losses. The habitat of animals and plants were affected: Insects, reptiles, rodents and vermin were driven out of their natural habitats, sought alternatives and became dangerous to man. The incidences call for attention of authorities such that the State Governments, such as Lagos State, had to declare holidays for the public schools. It may be said to be next to Tsunami. For some days, it became major new items in the national and international dailies and magazines. See the Appendix showing the prevalent newspaper headlines, captions, editorials and others of the week on different cities and towns and different regions of the country. It was a national experience as Mordi, (2011), a news paper free lance writer reports:

GRA Efur, Delta state, Ministry of Health, Enugu cuts off Impassable Enugu-Onisha Express way Orhuwhorun Road, Warri Delta state. East-West Road, Rumuokoro, Port-Harcourt; Panic as flood sacks Agbor. The two faces of flood Kaduna River sent families packing for days. Over 27% of the land surfaces were covered by floods, at least for over ten hours. In over 38.33%, one cannot see where the roads were and where there were drains. Houses were submerged and cars were seen tumbling and stumbling. In that month, places that had never experience flood became no go areas.

In the far north, the number of occurrences, spread, heights, and havocs were only mild in a few cities and towns compared to what obtains in the south. But, farmlands, roads, railways, schools and colleges, hospitals and maternity homes, residences and others were washed away. Families were forced to relocate, businesses were paralyzed; and lives of animals and human beings were lost.

This work may not be able to establish that the torrential rain is as a result of the general global warming. But, the living habits of the residents, the planlessness (or near it) of the physical environment, none conformance to the natural physiographic characteristics of the landscape and general poor living habits of the inhabitants – at homes, manufacturing industries, offices, markets and stores, workshops, recreation centers and others leave the drains blocked leading to flooding. It is of interest to note, for instance, that canals and drainage channels have been silted and filled up with sand, plastic cans and bottles, sachets of pure water, carrier bags and others that will never degrade. Drainage channels, erosion passages and others have been blocked or , at best, narrowed by physical buildings, construction and reconstruction rubbles; and or by various activities of the urbanites.

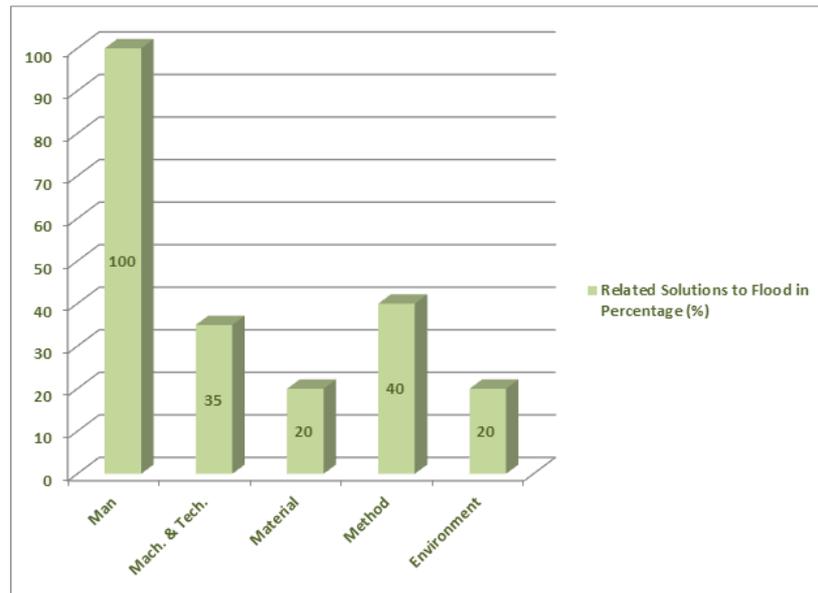


Figure 4. Factors Related to Solutions to Flood Challenges.
(Source: Aderogba, 2011, Field Work)

People, organizations, businesses, and even governments have not been abiding by the environment laws. It may certainly not have been as enormous as it were if the drainage channels were adequate and the aspects of blockages of the existing drainage channels and canals were not there. It has not been recognized by all that each house or drainage in any street or along any road is part of a whole community. The last 30 years have experienced considerable physical development-construction and reconstruction of roads, offices, markets and store, manufacturing industries and others without any appreciable infrastructures such as drainages, roads and canals to support them. These are challenges that need to be challenged, head on.

If not for the negative aspects of floods, it is important to recognize that annual floods have been promoting settlements based on thriving agricultural communities in river valleys. A case in point is the annual floods of River Nile in Egypt that gave rise to the whole civilizations that depended absolutely on the fertile silt settling on floodplains of River Nile; and the water for irrigation. But dwelling along flood plains is high risk.

While proffering solution to the challenges of these floods, 20 professionals sum it up that 100.00% could be found to be Man related, 40.00% Methods, 35.00% Machine and Technology, and 20.00% Materials and Environment related. See Fig. 4. Again, detail discussions of these are beyond the scope of this work. However, if these trends should remain unabated, the extent of flood and its devastating consequences will be geometrically compounded by 2021. See Figures 2 (A), (B) (C), (D), (E), and (F).

6. Recommendation and conclusion:

The cities and towns have come a long way with multiplicity of functions; and housing substantial proportion of Nigerians and other nationals. There have been physical growth and development but not with ancillary facilities and amenities to go along with them. But they must be capable of standing the test of time for sustainable development; and to e able to meet the Millennium Development Goals.

Towards averting the annual tragedy of floods often occasioned by torrential rains and living habits of the residents, the three ties of government should step up rehabilitation activities that would ensure major roads and drainage channels across the cities and towns free of encumbrances and serviceable.

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.

The Ministry may have to enforce the drainage clearing through “persuasive approach”, while the city governments beef up supervision of any identified problem areas.

If the cities and towns will withstand the test of time, meet the Millennium Development Goals and perform the urban functions to the admiration of the urbanites and respect the law of nature, the challenges of floods must be challenged. It should be remembered too that global warming and climate change is a world-wide challenge that must be challenged. All hands must be on deck to challenge the challenges.

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.

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;
- While canals may be further opened and widened, side drains and gutters could have removable precast concrete or steel cover for ease of maintenance;
- 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 floodability of new suburbs in the processes of planning;
- The management of River Basin Development Authorities should be magnanimous enough to provide the engineering and technical solutions that can effectively take care of flooding in their respective areas of jurisdictions;
- Following from above, urban Physical Planning Departments should not be oblivious of global warming and consequences on climate – more torrential rains, increased run offs more floods and the inadequate drainage channels;
- Weather forecasts and forecasters should be more proactive to weather events that could lead to torrential rainstorms that may subsequently result in floods, and havocs;
- 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.

In conclusion, physical planners and policy makers should know that natural disasters such as floods have destructive power; could be very sudden, occasional and others. These therefore are pointers to appropriate planning and forecast. For the cities and towns, and Nigeria generally to achieve the ambition of improving environmental management and accelerated development, for sustainable growth and development of the cities and towns and the nation at large, there must be redoubled efforts to scale-up flood control and management, climate change mitigation and adaptation initiatives.

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APPENDIX

Selected Headlines, Captions, Titles, Cartoons and Editorials on Floods in Nigerian Cities and Towns between January, 2011 and July, 2012.

The followings are selected headlines, captions, titles cartoons, editorials, opinions and others on various occurrences of floods in various cities and towns of Nigeria between January, 2011 and July, 2012.

- “Ibadan flood disaster”
- “A bloody flood confrontation”
- “Flooding arising from heavy rainfall hits Calabar”
- “No tears when there is abundant free water”
- “... after the shower of disaster ...”
- “Employment generating floods”
- “Babura under water”
- “Floods ravage Lagos: One drowns at Ketu”
- “Hoodlums attack helpless victims”
- “Residents take refuge on rooftops”
- “Flood: Fashola orders pupils to stay from public schools”
- “Canoe operators charge ₦100 per drop at Surulere”
- “Government appeals for clam, blames Atlantic Ocean, Lagoon”
- “How three year-old boy died in Lagos flood... two days after birthday”
- “Environment and flood, the worse is yet to come”
- “Deaths, destructions trail Lagos savage floods”
- “11 children drown in canal, three adults die”
- “Thousands displaced, section of express way collapsed”
- “... toured affected areas, promises to seek FG help”
- “David’s death brought two important social issues to the fore”
- “Flood of pain, tears: ‘Monkey bridges’ to the rescue”
- “Floods: ... residents go fishing”
- “Oshodi-Apapa Express Way: Matters arising”
- “Four waitresses, baby died on wet night”
- “No road: The ever busy Alaba-Oshodi express way trapped in the flood at Rainbow Bus Stop”
- “This flood is no respecter of any Oba”
- “ residents cry out, count losses over blocked canal”
- “Umbrella, shower cap sales boom”
- “The case of flood in Lagos metropolis”
- “Nigeria and flood”
- “Blaming Governments for floods”
- “Flood, flood, flood, flood, everywhere flooded”
- “Killer floods: cities under threat”
- “A Tsunami in the making”
- “The Day the Heavens open up in Nigeria”
- “The damage was avoidable”
- “.....and caused a breach of traffic protocol”
- “Heroes of the flood”
- “Confronting the Flood Menace”
- “Sacked from their homes by flood”
- “Flood: Senators urged FG to release ecological funds to Lagos”
- “Heavy down pour yesterday destroyed several property and virtually shut down Lagos state”
- “Floods sacked residents”
- “Sacked by the flood? There is room to let here”
- “Flood takes over Lagos after a heavy rainfall, yesterday”
- “Nightmare as heavy rain sacks residents”
- “Agony in Owerri as city is flooded after heavy rain”
- “Human bridges, pathway to flooded homes”
- “Residents count losses as rain persists in Calabar”
- “Two-day rain grounds Lokoja”
- “Flood: Time to communicate on foot”
- “10 die in Imo flood disaster”
- “In Saturday’s Calabar flood, two died”
- “Mayhem in Benue: How 15 persons lost their lives and several houses destroyed”
- “Sacking a whole school is not a big deal”

Source: Aderogba, K. A. (2011). A Compilation from the Nigerian Dailies and Magazines of the week of 10th July, 2011.