

Challenges of Poor Drainage Systems and Floods in Lagos Metropolis, Nigeria

By

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Abstract

Flooding is persistent in Lagos Metropolis. The objective of this paper is to ascertain the causes, magnitude, and effects; and to indicate directions for policy makers and urban dwellers. Topographical maps were used for data collection on the physical environment. Some physical measurements were made of the drainage channels and floods. 2,000 inhabitants of the metropolis were randomly selected and made to respond to some questions. In addition, authorities in professionally related fields including policy makers were made to make contributions. Intermittent supplies and torrential rainfall in its seasons are usually beyond the capacities of the channels. These are compounded by inadequate planning of the physical environment, wastes dumped in drainage channels and erosion passages, and deliberate or inadvertent physical structures that block free flow of water along the drains. Floods are as wide as 500m and above on each side of the channels and as high as 2.00m at some times and localities. There are some advantages associated with it. Living habits of the inhabitants have to change. Physical planning efforts have to be drastic, radical and deterministic towards sustainable drainage and erosion channels. There must be massive investment in dredging and re-dredging of the existing drainage network and channelization of the new suburbs. Floodable zones should be re-planned; and flood plains can be rehabilitated as parks and recreation centers.

Keywords: *Drainage Network, living habits, flood, infrastructure, Lagos Metropolis*

1. Introduction and Rational for Study

Environmental disasters have become common phenomenon in the world, (Oyegbile, 2008). According to him, from China to Mexico, Indonesia, United States of America, United Kingdom and Nigeria, there is no doubt that the world is under serious threat from the environment. But analysts have argued that the environment was only responding to the abuses heaped on it by man's activities (Christopherson, 1997 p.423). This has created a great burden for world leaders which is why the issue of environment ran neck and neck with matters of economy and poverty at the last meeting of the eight worlds most developed economies otherwise known as the G8 submit in Japan. 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 lots of 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. While the county authorities battled with the attendant social problems, the national weather service also had to warn that the flood was a potential threat to additional 10 cities along the Mississippi in Illinois and Missouri. Amtrak, the national passenger train had to halt its services on the California-Zephyr route between Chicago and Denver, its Empire Builder line between Chicago and St Paul, Minnesota, and its south-west chief route between Chicago and Kansas City because of the flood. Apart from this, world records of flood has it that recently, severe floods were experienced in Norway, China, Bangladesh, Ghana, the Netherlands, South Florida, that is, apart from the Mississippi-Missouri River Systems of 1993, and that of 1995, (Christopherson, 1997).

In India, over 14 million Indians 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. One church agency helped in 20 villages but there were 300 of such villages in one district of Chattisgarh alone, and international aid agencies were absent. Local Government help was limited to 200-500 rupees, and even that went only to a few homeless families, and a one-of ration of 7-10 pounds of rice. As in the recent flood in Argentina, corruptions by officials were widespread. The households headed by women were discriminated against and so also Dalit and Tribal families were refused of the meager compensations. Hunger and diseases stalked the India children and the poor in the region.

In Nigeria, recently (also in the month of 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 18) that at least five hundred people were rendered homeless and properties worth several millions of Naira were destroyed when the flood, occasioned by torrential rainfall ravaged Babura, a town in Jigawa State in a period of two days.

But even then, apart from the recent occurrences and experiences of flood, there is this long time occurrence of flood through creationists model. They are often criticized for being too vague to have any predictive value, (Gould 1980). A literal interpretation of the flood story in the book of Genesis in the Bible however, does supply certain physical consequences which can be tested against what can be observed and the implications of such an interpretation can be investigated (Gould, 1980 and Whitecomb and Morris, 1961). According to them, several questions remained unanswered: All models and theories about the flood said a lot of things about flood, its destructive power, suddenness, occasion and so on though there are several questions that remain unanswered: How could that large number of animals travel such long distances, and even for such large diverse carnivores to come to live near their preys and Noah; and how was the Ark loaded (Genesis 7:4-10); how were the animals catered for throughout the period the flood lasted. That Ark specified in the Bible would not have been large enough to carry a cargo of animals and food sufficient to repopulate the earth especially if animals that are now extinct were to be aboard, (Isaak 1998). He asserts that if the flood model were not riddled by all its problems, why should one accept it? According to him and Woodmorappe (1996), Whitecomb *et al* (1996), Brown (1997) and Gould (1980), what it does attempt to explain is already explained far more accurately, consistently and thoroughly by conventional Geology and Biology and the flood model leaves many other things unexplained, and unexplainable. Isaak (1998) in particular queried, 'if God is omnipotent, why not kill what He wanted to kill directly? Why resort to a roundabout method that requires innumerable additional miracles? The whole idea was to rid the wicked people from the world. Did it work?' A literal interpretation of this flood story in the Book of Genesis in the Bible however, does supply certain physical consequences which can be tested against what can be observed, and the implications of such an interpretation can be investigated (Gould 1980 and Whitecomb *et al* 1961).

However, from the whole old worldwide story from the book of Genesis 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. Both floods and flood plains they might occupy are rated statistically for the expected time intervals between floods. Thus we may have '5-year flood,' '10-year flood,' '50-year flood' etc, (Christopherson 1997 pp.446). Floods, 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 may be very devastating to any community and or nation that it might affect economically and socially. Though, sometimes, it is not without some advantages.

There have been preponderance occurrences of flood in the Lagos Metropolis in recent times. There have also 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. Above all, there is none, of recent, to describe the magnitude and criticality of the phenomena in the entire Lagos Metropolis with the attendant problems. The works of Adeaga (2008) and Oyebande (1983, 1990 and 2005) are either disjointed or sectional. They are not laconically on flood in the metropolis. Adeaga (2008) in particular, in his recent work on 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 the metropolis which is also an outskirt. The entire Metropolis and the Central Business District in particular require attention (Akosile 2008, Adeaga 2008 and Aderogba and Afelumo In Print). This work therefore aims at examining the drainage system of the whole metropolis, the flooding pattern, frequencies, causes, significances and absolute means of preventing disasters and chaos. The work is limited to the flood and its characteristics within the metropolis. Aspects of the coastal erosion and flood were avoided for another work on coastal erosion. An elaborate quantitative analysis of the drainage basin is avoided.

2. Lagos Metropolis, Drainage System and Methodology

Lagos Metropolis originates from Islands separated by creeks that fringe the southwestern mouth of Lagos Lagoon, and protected from the Atlantic Ocean by long sand spits such as the popular Bar Beach. The city sprawls over several large islands separated by creeks on a vast lagoon on the Bight of Benin, bordered by the Atlantic Ocean. The entire region lies within the coastal low land of south western Nigeria – generally less than 100m above sea level. The climate is tropical continental with rainfall throughout the year, and with double maxima. The natural vegetation is salt water mangrove swamp forest. But, this has been replaced by concrete surfaces, building and roofs of buildings, transportation land use, and at best, ornamental plants. What remains of the natural vegetation is very insignificant.

The conurbation has spread inland to include , Surulere, Mushin, Oshodi, Maryland, Ketu, Egbeda, Ipaja, Agege, Ijaye and others up to a stretch of about 100km east, west and northward of the original mainland. It was a city of 500,000 people in the late 1960s, and home to three million people by 1975. Its population currently stands at 7.938 million. It is still growing at an average rate of 5% per annum, (Nigeria, 2007). Explosive population growth defines Lagos: the city qualifies as a 'mega city' joining the likes of Sao Paulo of Brazil, Mexico City of United States of America, and Cairo of Egypt. The population of about 7,937,932 people made Lagos to be the most populous conurbation in Nigeria, that is, by the 2006 census and, of course, the most populous city in Africa. It has also been ascertained that it is the second fastest growing city in Africa (and the 7th fastest growing in the world, immediately following Bamako). The Government estimates Lagos' population could be 25 million by 2015 as rural Nigerians turn their backs on the countryside to move to this country's biggest city. According to the United Nations (2007), Lagos 'will be invested with such power that at many levels she will act as city state, that is, independent of national or regional mediation.'

The city is the economic and financial capital of Nigeria. With a total of 999.6km² in Land Area, the metropolis is made up of 16 Local Government Areas - all in Lagos State, See Fig. 1. Eti-Osa has the largest land area of 192.3km² followed by Alimosho and Ojo with 185.2 km² and 158.2km² respectively. The total population that made up the metropolis has the largest concentration at Alimosho, (1,277,714) followed by Ajeromi - Ifelodun (684,105) and Mushin (633,009). The average population density for the entire metropolis is 7,941 persons per km. See Table I. The density however is highest at Ajeromi Ifelodun (55,474) followed by Agege (41.671). The density is lowest at Eti-Osa (1,496 per km²) and Amuwo-Odofin (2364 person per km). Interestingly, the population of the metropolis is fast increasing per day because of the continuous immigration of people, skilled and unskilled, Nigerians and non-nationals into this mega city of West Africa. There is rarely no nation of the world that is not represented in Lagos. Nigerian citizens, ECOWAS member states are the most plentiful. These populations continuously negatively alter the natural landscape in various forms all over, (Aderogba and Afelumo, In Print, and Oyebande, 2005). It also inadvertently increases the amount of runoffs through intermittent supplies and base flows along erosion passage and sewage channels, (Christopherson, 1997 and Adejuwon, 1979 p. 423). It is not unknown that the living habit of the people is continuously leaving the drainage channels blocked and or sometimes narrowed (Adejuwon 1979 p. 423 and Aderogba and Afelumo, In Print). Lagos State may be the smallest of all the 36 States of Nigeria, and has none of the oil riches like the Delta Region, its 'unique energy' has made it the economic powerhouse of the county and given it increasing clout within the wider region. Nigeria now accounts for over 50% of West African GDP, and much of that is attributed to the economic strength of the Metropolis. The State Government is based on the island of Ikeja that is within the Metropolis. It is the city's industrial nerve centre. Lagos Island where most of the large banks, multinationals, department stores and key businesses sit is the financial heart of the nation. She is the financial, commercial and cultural centre of Nigeria. Though her statue as Federal Capital had seized since 1990 when the Capital was moved to Abuja, many of the ministries and diplomatic missions are still based in Lagos. Although her population is fuelling economic growth, it presents profound challenges too.



Figure 1: The 16 Local Governments that make-up the Lagos Metropolis

The city struggle to make a ‘viable society’ with big difference in the wealth of her people located in different parts of the metropolis, (Oyebande, 2005 and Olumide, 2008).

However, the Government has got to deal with the transport chaos, pollution, energy and power, waste management, poor drainage, flood and poverty that the uncontrolled growth causes. Not only does the lack of adequate public infrastructure made the lives of Lagosians much more arduous than they need be, it also acts as a significant control on the economic growth, and deters domestic and foreign investments. The State (Lagos State) accounts for about 12% of national economic output, and is the second most important contributor to national economic activity after the oil-rich River State. Clearly, the sheer size of the infrastructure deficit makes the metropolis and the state in general to shoulder the entire burden of providing new infrastructure by itself.

Incidentally, all of the inadequacies started since when Lagos ceased to be the political capital of Nigeria. Its infrastructure has not risen to respond to the growing population. Thus, there are huge gaps that need to be filled in forms of roads, railways, ferries, health care, education, sport facilities, water, waste management, drainage and floods in particular.

At the moment, Lagosians who can make up for the woeful provision of services themselves are sinking boreholes in their compounds for water and installing generators as an alternative to the city’s dire power supply. While some of these self sustaining efforts have been doing fairly well, the issues of waste management, poor drainage network, resultant floods and their consequences have been major bane to the government and people.

Table I: Local Government Areas that Form Lagos Metropolis and their Population Densities.

Local Government Area	Land Area (km ²)	Population (2006 census)	Population Density (inhabitant/km ²)
Agege	12.2	459,939	41,671
Ajeromi – Ifelodun	12.3	684,105	55,474
Alimosho	185.2	1,277,714	6,899
Amuwo-Odofin	134.6	318,166	2,364
Apapa	26.7	217,362	8,153
Eti-Osa	192.3	287,785	1,496
Ifako-Ijaiye	26.6	427,878	16,076
Ikeja	46.2	313,196	6,785
Kosofe	81.4	665,393	8,174
Lagos Island	8.7	209,437	24,182
Lagos Mainland	19.5	317,720	16,322
Mushin	17.5	633,009	36,213
Ojo	158.2	598,071	3,781
Oshodi-Isolo	44.8	621,508	13,886
Somolu	11.6	402,673	34,862
Surulere	23.0	503,975	21,912
Metropolitan Lagos	999.6	7,937,932	7,941

Source: National Population Commission, Abuja.

It is not unlikely that it is the large population coupled with the inability of the metropolitan governments to provide adequate infrastructure, and the living habits of the inhabitants that compounded the issues of wastes. 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, (Adejuwon, 1979 and Aderogba *et al*, In Print).

The pattern and situations of flooding in the metropolis had been studied for over ten years. The depth and width of the floods were determined by measuring distances on both sides of the channel from the centre of channels; and the marks made on walls of buildings and electric poles along the flood lines. The State Ministry of Environment and the Department of environment in the sixteen Local Government Councils of the Local Government Areas that made up the metropolis provided information on the historical development of the Metropolis, drainage systems, floods, challenges and consequences. Members of the public, two thousand (2,000) that were randomly selected in randomly selected locations responded to questions on causes, extent, severity and periodicity of flood and its challenges. They also offered suggestions.

Newspaper cuttings, reports and publications and data were cleverly used. Using the Isikawa Fish Bone Cause and Effect Analysis, the causes and effects and solution were brain stormed with twelve (12) experts in Urban and Regional Development, Urban and Regional Planning, Urban Transport Planning, Environmental Sciences, Water Resources 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, effects and solutions to the menaces of flood in the metropolis and elsewhere in the world. Directions for urban dwellers and policy makers are indicated.

3. Results

The system of the metropolis consists of many smaller basins. Each basin adjusted in size and shape to the magnitude of the drainage channels (streams) it serves. The hierarchies of the orders of the channels

are not very distinct because they have been distorted by human activities, (Christopherson, 1997, and DeBarry, 2004); but five: Ogun River at the extreme North East, Ilo River at the extreme North West, and Alapere - Maryland - Somolu - Unilag axis, Agege – Airport - Ejigbo axis and Mushin – Idiaraba - Lawanson axis and their streams are distinct. All of the streams have different local names as one move southward to the lagoon except Ogun River that maintains its name throughout its length within the metropolis. All of these are within the southwestern corner of the nation's Ogun - Oshun River Basin. As the Channels have been disturbed in their orders so also were the watersheds. With these attributes, it becomes difficult to determine the drainage density with the definition:

$$DD = TL \text{ of stream(km)}/T\text{Area (km}^2)$$

Where DD = Drainage Density;

TL = Total Length of Steams in the Basin (in Kilometers); and

TArea = Total Area of the Basin (in Km²)

The total number of streams (channels) is not distinct though the total area is known. There are several micro basins within the region with distinct Drainage Divides. Pen Cinema, Egbeda-Iyana Ipaja Axis, Ojota-Ketu axis, Palm Grove –Oshodi Axis, and Agege Central Point form the biggest divides. Aside those very distinct features are the major Islands: Victoria Island and Lagos Mainland. At Iju, Alapere - Maryland, Lawanson - Idiaraba, Oto - Ebute Metta - National Art Theater, Ejigbo - Festac-Ijegun-Satellite Town are the major swamps that correspondingly form the basins through which the runoffs from the Metropolis flow to the Creeks and Lagoon and eventually into the Atlantic Ocean. Very evident is the very low gradient through which the waters flow in their various orders. Again, the following are notable: Ilo, Bariga, Ojota, Mushin Olosha, Idiaraba, Alapere, Ikeja, Apapa, Amukoko, Badia, Surulere, Lawanson, Ejigbo, and Egbeda. Thus, waters flow very sluggishly and meander severally before they found their ways into the Ocean south ward: The metropolis is poorly drained.

The valleys are very wide but with very low gradients. Little downpours easily fill the shallow channels. These are however compounded by other various human activities and practices all over. In particular, the followings are most evident as the major causes of floods:

- The torrential rains are more intensive and heavier such that the drainage channels cannot contain the eventual run-offs;
- There are heaps of refuse and garbage dumped into the canal as well as the illegal structures that impede water ways;
- After each storm and flood, virtually nobody cared about what happened next. That is, the brushes, garbage and rubbish in the ditches, canals, drainage channels and throughout the flood plains remain unattended to and thereby compounding the slow movement and outright blockage of channels for the subsequent runoffs and its other contents;
- The topography is generally of low gradient and these attributes naturally prevent free and easy flow of water thus the sluggish and several meandering too;
- Mass exodus of people, services and materials into the region end-up in larger volumes of wastes and uncontrolled use of the physical environment whereby offices, markets, residential structures and facilities and equipment are sited and built along and across natural erosion passages and drainage channels;
- Physical and deliberate dumping of wastes in the drainage channels, erosion passages and gutters are not uncommon all over;
- Inadequate drainage channels that will conform with the natural topography are very evident; and Recently, the barriers erected for the smooth running of the Bus Rapid Transit (BRT) Scheme have been identified to be contributing to the incessant flooding.

Almost all the man-made channels empty their waters into the swamps and creeks before reaching the ocean. Since some of these empty their contents into the larger channels even though with lower gradients and shallow channels coupled with heavy downpour that characterize the region, (Adejuwon 1975), the

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floods result. Eventually, the slowly meandering waters also meet with artificial barriers and obstacles that are mostly man-made. These eventually result in great floods.

Table II: Public Views of Causes of Flood

Causes	No of Respondents	% Proportion
Lagoon/Ocean Surge	1010	50.50
Inadequate Drainage/Erosion Passage	1877	93.85
Refuse Dumps	1889	94.45
Natural Terrain/Topography	1025	51.75
Climate Condition/Torrential Rain	1892	94.60
Planlessness of Physical Environment	1804	90.20
Concrete Surfaces/Increased Surface Run-off	1028	51.14
BTR Barriers	767	38.35
Intermittent Supply and Base flow	1001	50.05
Structure on Drainage Channels	1868	93.40
Others (Specified)	686	34.30

Source: Field Work.

The 2,000 residents of the metropolis interviewed responded to ten (10) pre-identified causes of the floods. See Table II. A respondent picked more than one cause. Over 90% of the respondents picked inadequate drainage network (93.85%), Refuse Dumps along the Drainage channels (94.45%), erected physical structures such as buildings on the drainage channel (93.40%), Climate condition (Torrential Rainfall), 94.60%, and planlessness of the physical environment (90.20%) as the major causes of the floods. Lagoon and Ocean surges (50.50%) are restricted to the coastal and creek areas only. Concrete surfaces (51.44%) and natural topography (51.75%) are the responses of majority of the respondents from the Central Business District that have most of the residential, industrial and office premises. There is concentration of concrete surface areas here and there were great demands for the scarce land space in those areas. Torrential storms (94.60%) and BTR barriers (38.35%) are at opposite ends: The later is not much of the problems yet, but the former is a very serious and major cause of floods. See Table II. Over 50% saw intermittent supply and Base flow largely contributing to water in the drainage channels and consequently causing floods. Again, Table III shows Major Causes of Flood in Selected suburbs. Incidentally, a critical and close observation will show that major causes vary from suburb to suburb. Topography, planlessness of the physical landscape, (including reclamations, constructions, installation and erected physical structures across and along drainage channels and erosion passages), lack of drainage and dumping of refuse along drainage channels and erosion passages are common to almost all suburbs. Bariga and Victoria Island have Ocean and Lagoon Surges as part of the causes. Torrential storm is common to all of the suburbs but Base flows were not perceived to be significant cause anywhere. Adeaga (2008) writes about the North Eastern part suburb and as it is characteristic of some selected suburbs of the metropolis too:

Encroachment and development of the suburb best quality farmland, large scale massive deforestation and loss of surface vegetation are being carried out in an unplanned mode... the encroachment of urban facilities on Ogun River and its tributaries flood plains (waterways) and unprecedented land reclamation without strict adherence to land use, (natural topography) and water ways planning is evident as major causes.

Table: III Spatial Differences and Major Causes of Floods.

Locations	Three Major Causes.
Idi Araba	Topography/Planlessness/Wastes/Base flow/Storm
Badia	Refuse/Lack of Drainage/Topography/Storm

Okokomaiko	Lack of Drainage & Refuse/Topography/Storm
Oko'baba Ebute Metta	Topography/Refuse Waste/Lack of Drainage/Storm
Oko Oba (Agege)	Lack of Drainage/Refuse/Lagoon Surge/Storm
Lawanson	Storm /Refuse Waste/Topography/Planlessness
Victoria Island (Adeola Odeku)	Ocean/Lagoon Surges/Planlessness/Storm
Agbado	Topography/Planlessness/Storm
Mushin-Olosha-Idioro	Refuse Wastes/Planlessness/Storm
Amuwo Odofin	Topography/Planlessness/Wastes/Storm
Amukoko	Topography/Refuse/Planlessness/Storm
Bariga	Lagoon Surge/Topography/Planlessness/Storm
Ijaiye	Lack of Drainage/Refuse /Planlessness/Storm
Gbagada	Refuse and Garbage Dumps/Planlessness/Drainage /Storm

Source: Field Work.

It means flood is therefore being aggravated through numerous physical and social alterations of the natural environment which has increased the impervious surfaces at some areas, (Oyebande 1990) and occupancy of unsafe land and hazard prone regions without appreciable harmonizing schemes between nature and the developmental activities. Annual Average Frequency, extents (in terms of width and heights) and the number of days it lasted for selected locations are shown in Table IV. Average Frequency per annum is least (4) at Oko Oba (Agege), Agbado, and Ijaiye. It is highest (8) at Idiaraba, Okokomaiko, Mushin Idiolo Olosha and Amukoko. See Table IV. It is usually wide-spread probably because of the general natural topography and storm intensity. Idiaraba experiences more than 500m wide on the average. It is 591m; and there is no where it is less than 100meter wide. Similarly, there is nowhere the height is less than 1.00 meters at its picks except Bariga(0.94m) and Agbado (0.920).

Table IV: Average annual frequency and extent of floods in selected locations

Locations	Frequency	Width(m)	Heights(m)	Length of Period it lasted (Days)
Idi Araba	8	591	1.89	101
Badia	6	187	1.25	141
Okokomaiko	7	401	1.18	132
Oko'baba (Ebute Metta)	6	121	2.02	111
Oko Oba (Agege)	4	119	1.88	3
Lawanson	6	118	2.02	58
Gbagada	7	244	1.65	51
Victoria Island	6	109	1.01	48
Agbado	4	104	0.92	8
Mushin-Olosha-Idioro	8	325	1.50	11
Amuwo Odofin	6	281	1.02	62
Amukoko	8	229	1.10	88
Bariga	6	129	0.94	45
Ijaiye	4	109	1.41	5

Source: Field Work

Table V: Patterns of Length of Floods In Lagos Metropolis

Location	Length in Mouths
Idiarabara	6
Badia	6

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Okokomaiko	6
Oko'baba(Ebute Metta)	5
Oko'Oba(Agege)	3
Lawanson	5
Victoria Island	4
Agbado	4
Mushin	5
Amukoko	6
Bariga	5
Ijaiye	4
Gbagada	5
Amuwo Odofin	5

Source: Field Work.

Oko Baba (Ebute Meta) and Lawanson experience floods of over 2 meters high on the average and at its peaks, 2.02m. Idiaraba and Oko Oba (Agege), 1.89m and 1.88m respectively are next. It lasts several days at some points. It is only at Ijaiye that the existence of the flood does not last more than 5 days after the storm. It is more or less a permanent feature at some localities such as Badia, Idiaraba, Okokomaiko, Oko Baba and Amukoko where residents have resigned to fate particularly as long as the raining season lasts. It does not last for less than 80 days of the year, See Table IV. Some of the residents have made temporary and semi-permanent culverts and or bridges between their places of abode and or business centres and dry lands. Sometimes it last over 48 hours. The heaviest rainfall is experienced within the raining seasons. That is, between late May and early November. Intermittent supply of water to the drainage channels and erosion passages do not cause flood, but supplies from the torrential rains. It thus follows that the floods occur only during the rainy seasons but the flood occurrences are throughout all drainage channels and erosion passages. Only the length of period it exists differ from one location to another. It is for 6 months of the year in Idiaraba, Badia, Okokomaiko and Amukoko. It is only for 4 months at Agbado and Ijaiye. In other words, it is common and more pronounced for longer period of the year in the south and closer to the coast, (lagoons and creeks) than it is in the north (hinterland). See Table V. Locations such as Oko Oba (Agege) where it lasted just about three months of the year are not common.

4. Discussions

The agonies of flood have become the lot of nearly every nook and cranny of the metropolis. In various communities that have been experiencing it across the metropolis, the tales of woes and pains follow every heavy downpour that lasts more than three to four hours. It is more serious when the rain lasts more than four hours. This is peculiar to both residential areas like Ogba, Surulere, Lawanson, Oko Baba, Bariga and Alapere and industrialized and commercial areas like Victoria Island, Balogun and Ikeja. Down pours have resulted in serious floods leading to displacement of residents in their places of abode, businesses, and recreation centers and disruption of free flow of traffic and others.

A resident at Okokomaiko laments on an instance of flood in his area and how it affected him and his neighbors:

.... lived here for over ten years just heard a noise, it was my neighbor's fence that fell into my house [compound]. Immediately, I came to the Sitting Room to see what was happening, returned and saw rooms filled with water everywhere, sweeping away everything television sets, bags and boxes, and everything on water lost NI45,000 cash when would I recover what I have lost; not one million naira can over the years suffered from serious lack of infrastructure, no access roads, structures are not well planned, absence of drainages largely

owing to negligence on the part of governments. The situation now may be a tip of an iceberg if no action is taken to improve [correct] the situations.

The flood is usually very terrible that in the midst of the damages and lost of property and lives, many of the residents had no where to lay their heads thinking of the possibilities and helps that might not even come. For many of the victims, who may not have steady income, to get the destroyed structures back means looking for interim alternatives that may not even be there. For some that are tenants or perhaps squatting with friends or neighbors, they live at the mercy of circumstances.

It is an understatement to say that many can never sleep with their two eyes closed as any sign of rainfall could be best imagined than experienced. They basically lived at the mercy of the rains. That is, with the fear that the already soaked walls and foundations could collapse at any moment. For those with choice, their choices, at best were to move and squat with neighbors or relations at any instance of heavy and prolonged down pour. Those that have none keep alert as they envisage calamity even at the slightest sign of rains.

At Idiaraba, Mushin, Idioro Amukoko, Gbagada, Badia, Bariga and those other areas that aptly typifies the unprecedented floods are usually under frequent threat of health problems and diseases leading to epidemics. The enormous havoc brings the entire activities of the communities to stand still. Often, they have no knowledge of it until heavy downpour begins and start in very heavy run offs. The followings are some of the common consequences across the metropolis:

- The economic activities of the period it lasted are being drastically negatively disrupted. Many will be forced to stay back at homes rather than going about their normal businesses. They spend the days to tidy-up what remains of their homes and property and or trade wares.
- Residential buildings, offices, commercial and recreation centers are soaked to the foundation, collapsed and washed away and or may remain standing but become uninhabitable;
- The frequent occurrence of flood in all these suburbs have lowered the values of properties of all types while some occupants have relocated elsewhere;
- There have been lose of property- electronic, clothing, home utensils, trade wares and physical cash;
- Also, apart from property, there have been lose of lives – human, livestock and arable crops;
- Electricity supplies have been disrupted because it brings down electric poles (and cables), that may remain unattended to for months even though the community might have been suffering from irregular supply, the havocs heightened and compounds the pains ;
- While many have been sent packing out of their suburbs, most low- income families continue to live and battle with the annual danger;
- Some residents have turned to perpetual watchdogs because of fear of looming dangers posed by heavy and prolong rainfall and floods;
- Roads, rails, path ways and streets may be perpetually covered with water for days leading to traffic jams and most make shift access roads will be clustered by frustrating motorists;
- Most motorists sometimes get trapped as their vehicles wade through water and meander through the slums and side walks;
- Motorist in their usual ways mostly try to have access through adjacent streets, crescents, lanes and side walks, if any, because they usually get their wheels wedged in mud;
- Many commuters, in trying to beat traffic and reach their destinations wade through dirty and turbid flood water and trek substantial parts of their journeys;
- Commercial vehicle operators took advantages of the situations to temporarily increase transport fares;
- A lot of lives are at risks with the increase in mosquitoes as a result of stagnant waters, malaria attack is usually on the increase which is a serious challenge to the government even when there are efforts to combat and eradicate material in Africa; and.

- It sweeps away crops and leaves agricultural lands impoverished.

A Land Lord at Bariga has this to express about the conditions of his house and some others around his:

*... the houses were sinking and we had to evacuate from there....
the foundation too had become weak and there were indications
that the buildings will collapse at any time...*

Similarly, a long time resident at Lawanson affirmed that:

*.... you will see vehicles, home utensils, electronics and office
equipment and even human body stumbling and tumbling in the
running water or just floating on water, ... you can't even move
near if you are safe yourself. Houses, market stalls, business
centers float on water. After some days the water start to dry
up (retreat) and we will be left with very dirty turbid fowl smelling
water... no drainage channel... nobody cares about it.....*

There is no year flood would not destroy property and claim lives. The intractable traffic jams usually caused last for hours and sometimes it remains for days. Invariably, motorists usually find it almost impossible to move. But the floods are not without some benefits to selected communities in the metropolis. These include the Ilajes along the creeks, Area Boys, the unemployed and others as indicated below though some are not obvious:

- Occurrence of flood reminds the inhabitants of planlessness of the physical environment and the need to have a rethink about it;
- After floods come dry lands and the 'remains of flood' which sometimes provide Area Boys and destitute some useful item to live on;
- The flood plains provide fertile grounds for cultivation of arable crops (in the short period before the next raining season);
- Some residents took for granted the clearing functions of floods – rubbish from their houses dumped in the channels is inadvertently washed away in its season. Though these invariably block the channels and compound the extent of floods at the lower end of drainage channels; and
- Local craftsmen, masons and others get free water from floods, stagnant waters, pebbles, sand and debris with which they carry out their construction businesses.
- However, and on the whole, the generality of the metropolis identified and considered the disadvantages as outweighing the advantages.

5. Recommendation for Sustainable Development

Following from the foregoing discussions, drastic and concerted efforts must be taken to address issues involved about flood in the metropolis if live in it must worth living. Therefore:

- There must be rehabilitations of existing dump sites and creation of new ones that must be spatially efficiently located to be able to address the issue of wastes along the drainage channels and erosion passages;
- Building more sewage treatment facilities, privatization of sewage management system and installation of modern waste bins should be given high priority among government programmes and projects;

- Government should build waste - to - energy plants that will make use of the bulky and massive wastes generated per hour in the metropolis and indiscriminately dumped to block drainage channels and erosion passages;
- Metropolitan government should carry out proper estimation and mapping of floodable areas at acceptable risk level in order to provide essential tools needed towards attaining an integrated flood pre disaster and lead time scheme within the entire region;
- Development of an efficient erosion and flood control management, enforcement of environmental laws and regulations to meet international standard for the mega city are required;
- Construction, dredging and re-dredging and rehabilitation of existing drainage channels and canals are urgently required;
- Floodable areas should be devoid of residential and commercial buildings and offices but rehabilitated for recreations, parks and garages;
- There must be more stringent sanctions for environmental defaulters;
- The drainage network may be further decentralized but all runoffs must be channeled to the Lagoons and the Ocean;
- Idi Araba, Oko Baba (Ebute Metta), Lawanson, Okokomaiko, and Amukoko need special attention because water has been trapped at those localities without any appreciable outlet;
- Compliance with the law of nature by the physical planners and the entire citizenry is imperative;
- It will not be out of place for the weather forecasters to predict weather into the future by predicting torrential rains and impending floods to keep the inhabitants at alert;
- Attempts should be made to estimate fairly accurately, measurements of hydropaths of the discharges of the channels (including streams, rivers and prominent erosion passages) for purposes of planning;
- All forms of social and physical distortions to the drainage channels must stop, and government should enact and enforce laws and come up with the policies and programmes to back these; and
- The various Departments of Health and Environment should create sections that should be clearing the ditches, canals and drains immediately after floods. Otherwise, the remains may harbour floras and faunas, insects and disease carriers that may consequently lead to epidemics.

A respondent at Ijaye like another one at Mushin at the core has these to say and hinted and or advised thus:

.... we keep these open, the arteries open, so that the water can flow freely and it won't back up the entire community should help keep the flood risk to a minimum come outside and look around your own property and notice some trash or debris in a basin, rake it, bag it up residents can contact the Local Government Departments for assistance Immediately after storms, the Local Government crew should embark on the arduous tasks of removing the debris from the ditches, streets, pathways, roads, etc to ensure any standing water can flow smoothly. even if you don't live near river or the coast and you don't believe you will ever be flooded, it is important to remember water can still enter your home from overflowing drains and sewers.

Aside the areas currently severely affected by the occasional floods, there are several other areas that are being threatened. Similarly, it should be remembered that the metropolis is expanding by the day. Thus,

efforts should be made to plan along with such threatened and newly developing zones. It should be part of site and service schemes for the new areas, therefore.

Aside the aforementioned, beatification of the flood and floodable areas will not only beautify the sceneries, it will create recreation centers for the urbanites and provide employment opportunities for those that would be maintaining the centers; and the lawns and further reduce the trend of crime within the metropolis in particular and in the entire country in general.

6. Conclusion

The metropolis kept on experiencing increase in area extent and population size that is adversely affecting the physical environment generally and the drainage system in particular. Though the vegetation is strongly correlated with climate, and vegetation acts as a significant check on geomorphic processes, there is no form of vegetation that could moderate the processes any longer. Where there is any at all, it is tertiary vegetation. Thus, the free and easy abrasive erosion processes. Therefore, the floods are caused by a combination of events and processes.

If the John Playfair's Law were to hold here (Sanders, 1995 p. 290), the ubiquitous human activities and distortions have allowed other factors to come to play in the origin and development of valleys. Supplies of water to the channels are from steady base flows and intermittent supplies in large quantities. The base flows keep the channels flowing with water between rains. The contributions from homes, industrial plants and machines, markets, hotels and brothels, restaurants and bars are also enormous. But, the intermittent and the rain waters carrying the minerals and rocks of regional geology form major content of what are flooding the metropolis. During floods, the channels are filled with water, rubbish from various sources within and outside of the metropolis and even human bodies. These mingle with mineral and geological materials of the region being brought about by the abrasive actions of water and the various articles it might be carrying. Therefore, the basin(s) should be perceived as completely open systems with inputs from precipitations, mineral and rocks of regional geology, seepages and springs, wastes from homes, industries, hospital and maternity homes, commercial centers; and items subjected to flood.

It brings annual sorrow and woes to the inhabitants of some areas such as Badia, Amukoko, Idiaraba, Idiro, Bariga, Oko'baba, Mushin, Gbagada and Lawanson: It brings the inhabitants face to face with the reality of the gradual destruction of all they had lived for. Above all, there is every indication that torrential rainfall will continue to come in its seasons and it will continue to result in great floods and there is nothing to dispel the fact that if not expressly checked, the devastating effects will be on the increase. Incidentally, the damages a flood might cause increases as more people settle on vulnerable flood plains and block drainage channels. Calamities caused by floods have to be checked. There are indications that should there be any slightly heavier rain storm for a relatively longer period of time, and the landscape is further distorted, the incidence will be in greater dimensions; and it will be more disastrous. The work is unable to determine categorically at what interval of years the worse floods come. But it is certain that floods do occur every year.

All hands must be on deck to put monumental and drastic effort in place to check the floods. Weather forecast should alert the citizenry; and living habits and interactions with the physical environment must be friendly while defaulters must be legally dealt with.

In conclusion, incessant flood phenomena should not be persistent in the metropolis and, of course, in any settlement. Researches and investments should focus on the mapping of flood prone areas for purpose of planning. Physical Planning of upcoming suburbs should be in conformity with those in existence and the natural landscape.

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