An Assessment of the Factors Responsible for Flooding in Ibadan Metropolis, Nigeria

Olawuni, O.Peter.[1]   Popoola. A.Sheyi[2]   Bolukale,A.Toyin[1]   Eluyele. K. Peter[3]   Adegoke . J . Olufemi[4]
1.Department of Urban and Regional Planning, Obafemi Awolowo University Ile- Ife, Nigeria
2.Department of Urban and Regional Planning, Osun State College of Technology Esa-Oke, Nigeria
3.Department of Estate Management, Osun State College of Technology Esa-Oke, Nigeria
4.Department of Quantity surveying, Osun State College of Technology Esa-Oke, Nigeria

Abstract

This study examined factors responsible for flooding in Ibadan metropolis, Nigeria. Data for the study were obtained through questionnaire administered on residents in flood prone areas of the metropolis. These were residential areas within less than 15m, between 16-30m and within 31-45m to major rivers in Ibadan metropolis. In each of these strata, there were 327,219 and 189, residential buildings. Twenty percent (20%) of the buildings was systematically selected for survey in each stratum out of which 11.7% of buildings in less than 15m to the river had incidence of flooding, 8.8% and 1.4% of buildings within 15-30m and 31-45m respectively had been flooded at one time or the other. Residents attributed causes of flood in the metropolis to one or more factors. It was established that indiscriminate dumping of waste was the major cause of flooding in Ibadan metropolis (33.2%). Other causal factors were poor channelization (29.4%), flood plain encroachment (19%), and Pave surface (13.2%). Only excessive rainfall (5.3%) while clearing of drainage (36.4%) was the major actions of the residents toward reducing flooding in the area. The study concluded that various factors were responsible for flooding in Ibadan and strategies to reduce this menace must address each of the factors.
Keywords: Flood, Disasters, Waste, Drainage, Environment.

1.0 Introduction

Across the globe, floods have posed tremendous danger to people's lives and properties. Floods cause about one third of all deaths, one third of all injuries and one third of all damage from natural disasters (Askew, 2007). In Nigeria, the case is not different as a number of flood occurrences had been recorded in major towns and cities. Indiscriminate dumping of refused, Encroachment upon, and Poor channelization of drainages coupled with the Excessive rainfall are the cause of urban flooding. It has also been noted that flood disasters is aided by unethical human activities along flood plain (Fadairo and Olarewaju, 2009). According to Adebayo (2006), the threat to lives and properties by flood is now becoming an annual event in urban centers of many countries globally. The advent of civilization in developed world had given much attention to flood control and prevention. In contrast, flood has remained unabated in developing countries like Nigeria (UNESCO, 2009). In the context of this study, the term urban flood can be defined as any overland flow over urban streets sufficient to cause significant property damage, destroyed businesses, Polluted water resources and health hazards. Consequently, floods are environmental hazards that occur regularly every year in urban centers in different parts of the country. (Onokerhoraye, 2008; Akinyemi, 2009; Nwaubani, 2010; Edward, 2007). Although many floods in Nigeria urban centers have caused many damage which are soon forgotten except by those people directly affected, some have result in major disasters involving structural and erosional damage, disruption of socio-economic activities, transport, communications, loss of life and property, displacement of people and destruction of the urban environmental in general.

Occurrences of floods disaster in the cities and towns of Nigeria in recent times have been great concern and challenge to the residents, Governments and researches, (Akintola, 1992; Oriola, 2000 and Aderogba, 2012). For instance, reports have shown that devastating flood had occurred in Osogbo (1992, 1996, 2002 and 2010), Yobe (2000), Akure, (1996, 2000, 2002, 2004, and 2006) and the coastal cities of Ogun, port-Harcourt, Calabar, Uyo, Warri. In Ilorin, flood disasters have been recorded in 1986, 1994 and 2001, during the flood event of 2001 alone, 24 houses were submerged and 136 peoples had to be evacuated (Adeaga, 2008). The flood waters also washed away vegetable and sugarcane farmlands while many roads in the city were rendered impassable (Olaniran, 2003).Only 2010 alone, over 15 communities and farm plantations worth millions of naira has been submerged by flood in Shonga district, Edu Local Government Area of Kwara State (Adeyinka, 2012). The disaster was not unconnected with release of water from Kainji Dam which subsequently flooded.

In the low-lying coastal city of Lagos, the menace of floods is an annual event in virtually all parts of the metropolitan area. From Victoria Island to Ikoyi, from maroko to agege, from isolo to Oworonsoki, Lagos flood have no respecter of any persons. The same was true of other areas such as Awolowo Road, Ikeja, Ijora causeway, Agbo-Malu,Apapa and the Apapa-Oshodi Expressway (Egunjobi, 2007). Some people in certain parts of the city were trapped in their homes because of flood water which was waist high. They had to be rescue by people who provided them by all kinds of materials like old bath tubs and refrigerator frames as canoes for a price. Some

sewage tanks overflowed and mixed with underground water tank thereby polluting people's drinking water for many days (Okereke, 2007).Urban flood disasters are also features of urban centers in semi-arid Sudan Savanna environment to the north of Nigeria. In August, 2008, Kano experienced a rainstorm described as one of the heaviest in a 90-years instrumental record and the rains lasted for a few days. The rain storm generated floods in various parts of Kano city. The rain storm and flood water which it produced was caused by the Bagauda Dam near the city with a storage capacity of 34 million cubic liters of water to reach an unprecedented volume of 146 million cubic liters before it collapsed in august 17th,2008. The havoc brought by the collapse of the dam and rainfall flood resulted in loss of 246 lives, destruction of 18 000 houses, washing away of 14,000 farms, displacement of 207,000 people and damage to residences and infrastructure worth about 650 million Naira (Kabiru, 2009). There was another wave of urban floods in the northern parts of Nigerian in September and October, 2004 in which major urban centers such as Kano, Kaduna, Bauchi, Maiduguri,Yola and Sokoto were subjected to floods which rendered many inhabitants of these cities homeless. Against this background, the paper intends to look at the factors responsible for urban floods and suggest ways to ameliorate it in order to ensure disaster free environment.

In Ibadan, the history of urban flood goes back to the early 1940s.The first flood recorded in the city occurred in 1948 when the Gege-river which flows through a section of the city drowned the houses of those living in the first and second stratum of the river (bank). In 1963 a two-days heavy down pour between July 9th and 10th respectively caused considerable damage to property along the banks of the major rivers that pass through the city. Trees, vehicles and houses were swept away in June 1978 by the flood that followed a two-day heavy rainfall that totaled 137mm. On 17th August 1980, the city was again ravaged by the flood waters of swollen rivers and streams when many lives were lost, over 1000 people were rendered homeless, and property estimated at over #407 million damaged. In addition, damages were done to roads, railways, bridges, motor parks, and markets. Again in late August 1985, a more considerable devastating flood occurred causing damage to property worth over #200 million. The story was the same in May 1987 with floods damaging property worth over # 151million.Flooding was not witness in the city again, until three years later. The flood that took place in April 1990 destroyed almost all the structures, worth over #2million, near the major rivers in the city while more than 30 lives were lost, 100 houses damaged, and over 15,000 rendered homeless. Others floods in Ibadan were those of 1995, 1998, 2001, 2003, 2007 April 2010 and June/July 2011,August 26th 2012 and The most catastrophic and most publicized flood that hit Ibadan occurred on August 13th 2013. It was caused by a twelve-hour downpour from the night of August 12th through the following morning. By the time the rain stopped, over 37 lives had been lost, 32,000 residents rendered homeless and property worth over #300 million destroyed. The occurrence of flood in an urbanized area like Ibadan is very high and these make it a good case study so as to know what could be responsible for it. Such a study will assist in making recommendations for the strategic planning in Nigeria cities.

2.0 Material and Methods

Ibadan the capital of Oyo state comprises of five local Government Areas; Ibadan North, Ibadan Northeast, Ibadan west, Ibadan southeast and Ibadan southwest with respective headquarter at bodija, iwo-road, Onireke, Mapo and Oluyole. The peculiarity of these five areas is that they converge at Mapo. The city has been selected because of the increased heterogeneous population over the years and annual occurrence of flood due to the presence of Ogunpa, Kudeti, and Orogun rivers. Ibadan is located approximately on latitude 7^0 22' north of the equator and $3^0$53' East of the Greenwich Meridian. The city has succeeded in becoming a large empire from around 1860s to the 1890 .Ibadan witnessed a rapid growth when it became the Western province headquarters in 1939. According to NISER (1988) and Fadare (1997), the built up area of Ibadan
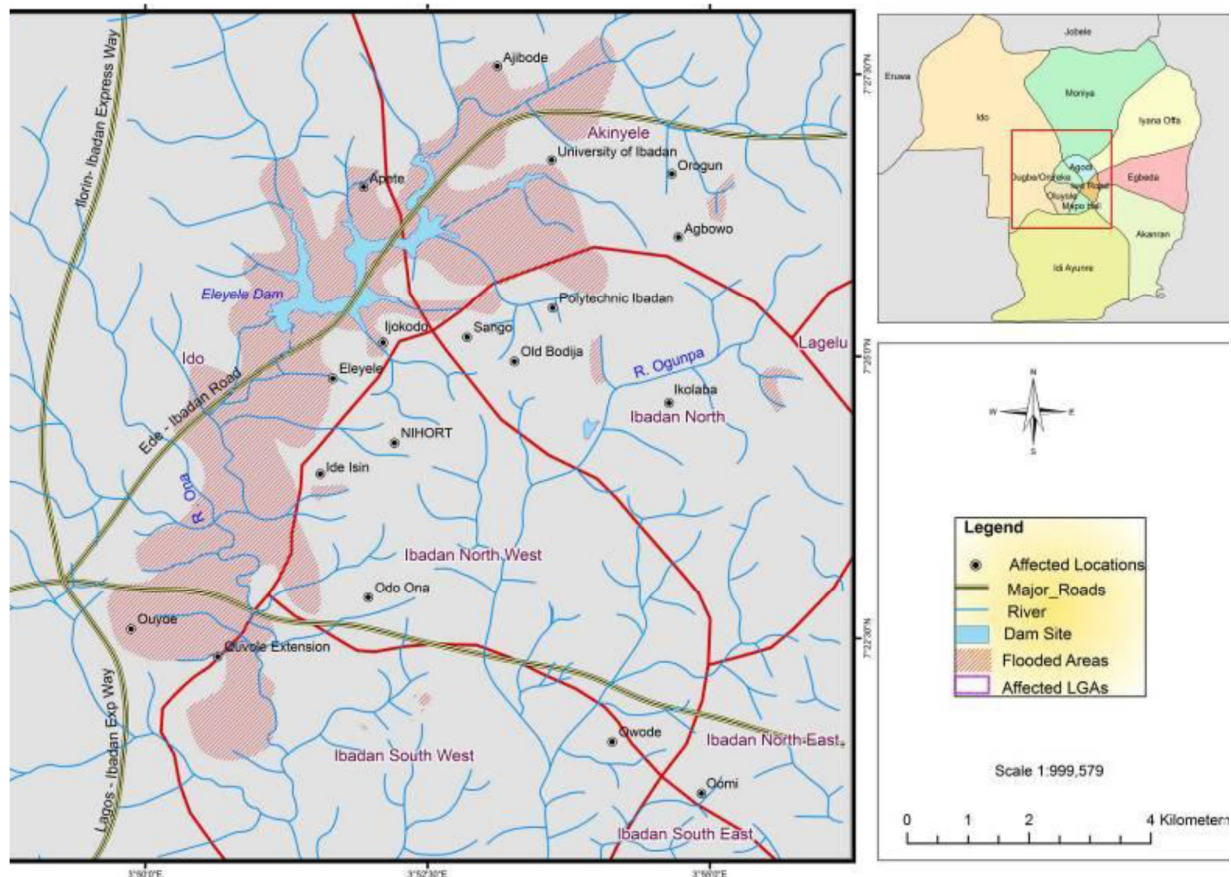
Fig.1.1: Map Showing Rivers and their Tributaries in Ibadan Metropolis

metropolis was 38.85sq/km in 1935, 46.40sq/km in 1965, 77.70sq/km in 1995, 82.80sq/km in 2000 and 214sq/km in 2010.The city is characterized by inadequate provision and management of environmental infrastructure such as insufficient waste management services, illegal dumping of refuse, blocked drains, and unplanned buildings (Popoola, 2012).These are worsened by settlement in flood plain and caused a lot of havoc to residents in the flood prone areas. For instance, the August 2011 flood, which earned Ibadan a national disaster zone status, swept away buildings stall and vehicles together with human and material contents. The material losses were estimated at # 190 million while the number of lives lost was put at 506 people (Popoola, 2012b).

3.0   Data source, collection procedure and analyses

Primary data were derived from fieldwork involving observation, investigation and administration of questionnaires. As a way of investigation, the researchers were involved in rescue team and synergizing for the period of (August-September) 2013 in flood prone areas of Ibadan metropolis. Questionnaires were administered on the residents within the flood prone areas after the flood incidence. Systematic random sampling technique was adopted for this study. Identified Housing within 45 meters to stream/ rivers were selected for survey. The choice of this was anchored on the fact that developers are expected to maintain a set-back of not less than 50m to a stream before constructing a building. However it has been observed that most houses are built within this flood prone area thereby increase their exposure to over flow water. In each of this respective stratum there were a total of 327, 211 and 189 residential buildings. The first stratum consists of buildings within fifteen meter to the river; the second stratum consists of buildings within fifteen-thirty meter; while third stratum is between thirty- forty-five meters to the stream. For questionnaire administration, twenty percent (20%) of the buildings were selected for survey. Sample was drawn using systematic sampling technique. In this case, one out of every five buildings was selected from each stratum. The first building to be sampled was chosen randomly while subsequent unit of investigation was the fifth residential buildings. Where the sampled buildings were not residential, the next residential building was chosen for questionnaire administration. Details of questionnaires administer in each stratum as presented in Table 1

Table i: Residential strata and number of buildings in each stratum

L G A	>15 (m)	16-30 (m)	31-45 (m)	TOTAL	Sampled (20%)	Recovered
Ibadan Northeast	147	97	108	352	70	70
Ibadan Southeast	180	122	81	383	77	77
Total	**327**	**219**	**189**	**735**	**147**	**147**

Source: Authors field Survey, 2015.

4.0 FINDINGS AND CONCLUSION

Presented in this section is the discussion of research findings under the various subsections. Unless otherwise stated, all the tables emanated from the survey carried out by the authors.

4.1   SOCIO-ECONOMIC DISTRIBUTION OF THE RESIDENTS

A total of 82.5% of the 147 residents that indicated their education status had one form of formal education or the other. Residents in Ibadan metropolis without formal educational background were predominant in the first stratum than the other two strata (see table ii).The implication of this was that there was a direct variation between the educational status of residents and increase in distance from the stream towards the third stratum. Out of 72 residents in the first stratum only 11% had tertiary education. This was confirm to be significant through Chi-square test computed (x =47.137 and p= 0.000). Investigation into the education status of respondents' established that residents had spent different number of years in pursuit of formal education. Thus; from our own view, it is expected that those residents with formal education residing in flood prone areas would engage in environmental cleanliness behavior than residents with no formal education. Occupational distribution of residents is summarized in (Table iii). It was discovered that 11% of residents in the first stratum were traders. Only 7% were employed in the public sector. it has being confirmed that traders generate waste more than others. And the quantity of waste generated increase as the distance increases from the stream. In the first and third residential stratum only 5.4% each of residents were into private business. Therefore, educational status is a crucial determinant of the type of occupation the resident does.

Closely related to resident's occupational status is their income which is presented in table iv. To determined residents income status, monthly earnings were classified into three. Those who earned below #20.000 were classified as low income earners. Within #21.000-40.000 were the middle income earners. The high income earners were those earning above #40.000.Thus classification was arrived at using the state civil service salary scale. It was evident that 41.4% of residents earned below #20.000 while 34.0% of residents earned within #21-40.000. In addition, 24.2% of residents earned above #41.000.Majority of the residents lived in the first stratum of the study areas were low income earners. Those that could be termed low and high income earners were 15.4% and 9.0% of the residents reside in the first and third stratum respectively. The proportion of respondents in the low income group showed that there was increase in resident income as distance increased from the first towards the third stratum. Result of one way ANOVA computed (F= value of 147.213, significant at 0.000) also revealed that income varied significantly in the three residential areas of Ibadan metropolis. With variation in the monthly income of residents, factors responsible for flood in Ibadan metropolis may also differ. Indeed, studies have shown that those who have high income are ready to contribute their quota towards ensuring flood free environment than those with low income group.

Table ii: Educational status of respondents

Attributes	<15 (m)	16-30m	31-45m	Total
Primary Secondary	21(14.0)	12(8.0)	10(6.8)	43(29.3)
Tertiary	16(11.0)	10(6.3)	7(5.4)	33(22.2))
No formal education	12(8.0)	7(5.4)	6(4.2)	25(17.0)
Total	23(15.4)	14(9.4)	9(6.2)	46(31.0)
	72(48.3)	44(29.1)	33(22.1)	147(100.0)

 Source: Authors field survey, 2015.

Table iii: Occupational distribution of respondent

Attributes	< 15 (m)	16-30(m)	31-45 (m)	Total
Civil-Servant	10(7.0)	17(11.4)	27(18.4)	54(36.7)
Trader,	16(11.0)	12(8.0)	9(6.0)	37(25.0)
Artisans	11(7.4)	7(5.0)	9(6.04)	27(18.1)
Business	8(5.4)	13(9.0)	8(5.4)	29(20.0)
Total	45(30.2)	49(33.0)	53(35.9)	147(100.)

Source: Authors field survey, 2015.

Table iv: Average monthly income of the residents

Attributes	<15 (m)	16-30(m)	31-45(m)	Total
<#20,000	23(15.4)	22(15.0)	16(10.8)	61(41.4)
#21-40,000	17(11.4)	16(11.0)	17(11.4)	50(34.0)
Above41,000	11(7.4)	12(8.1)	13(9.0)	36(24.2)
Total	51(34.2)	50(34.0)	46(32.2)	147(100.0)

Source: Author field survey, 2015.

B: CAUSES OF FLOODING

Summary in Table v revealed the various causes of flood in Ibadan metropolis. It was shown clearly that the major cause of flood is indiscriminate dumping of waste having accounted for 32% of causes of flooding in the study area. Next to this was poor channelization (29%). While Flood plain encroachment contributed about 19% of flooding in Ibadan metropolis, the contribution of pave surface and excessive rainfall to flooding in this area were 13% and 5% respectively.

Table v: Identified Causes of flood by the residents

Attribute	<15 (m)	16-30(m)	31-45(m)	Total
Poor-chalization.	17(14.0)	15(10.3)	11(7.2)	43(29.4)
Indiscr. dumping	21(15.0)	17(11.4)	11(7.3)	47(32.0)
Flood plain encrhmt.	11(7.0)	9(6.0)	9(6.0)	29(19.2)
Pave surface	9(6.0)	5(3.4)	6(4.0)	20(13.2)
Excessive rainfall.	4(3.0)	2(1.3)	2(1.3)	8(5.3)
Total	62(42.0)	48(32.0)	39(26.2)	147(100.0)

Source: Authors field Survey, 2015.

4.2   METHOD OF DISPOSING WASTE

The residents' methods of disposing waste were presented in the table below. It was revealed that 24.0% of residents disposing their waste in open space, 36% disposing in stream, and uncompleted buildings were 17% while 13% of residents use Incinerator. Only 12% of residents make use of others means of waste disposal methods. Out of 47 respondents sampled disposing their waste in the stream, 18.1% of residents reside in the first stratum while 9% each of residents use uncompleted buildings and incinerator respectively. Only 5% of residents use other methods available. Deductively the percentage of residents that disposed their waste into the stream increase as the distance increase from the stream toward the third stratum. The use of these two methods among the residents of Ibadan metropolis results into blocked drains, gutters, and water ways which subsequently result to flood.

Table vi: Methods of waste disposal

Attribute	<15 (m)	15-30(m)	31-45(m)	Total
Open-space	15(10.2)	11(7.3)	9(6.0)	35(24.0)
Stream	27(18.1)	13(9.0)	7(5.0)	47(36.0)
Uncompleted Bld.	13(9.0)	6(4.0)	7(5.0)	26(17.0)
Incinerator	13(9.0)	3(2.0)	5(3.4)	21(13.0)
Others means	7(5.0)	4(3.0)	7(5.0)	18(12.0)
Total	77(52.0)	37(25.0)	35(23.4)	147(100.0)

Source: Authors field survey, 2015.

4.3: FREQUENCY OF FLOOD OCCURRENCE

The summary of residents' frequency of flood occurrence was analyzed in table vii. It was indicated in the table that 37% of residents had experienced flood at least three times in a year, while 29% experienced flood in their area at least four to six times per annum. And 23% of residents experienced flood more than seven times in a year. The table further revealed that 15% of residents in the first stratum experienced flood at least three times per annum, while 15.4% of residents experienced flood at least four to six times a year. Deductively, this study revealed that the proportion of residents who had experienced flood at least three times decreases as distance increases from the stream.

Table vii: Frequency distribution of flood occurrence

Attribute	<15(m)	15-30(m)	31-45(m)	Total
1-3times	22(15.0)	19(13.0)	13(9.0)	54(37.0)
4-6times	23(15.4)	13(9.0)	8(5.4)	44(29.0)
7-9times	19(13.0)	11(7.4)	4(3.0)	34(23.0)
Others	7(5.0)	3(2.0)	5(3.4)	15(11.0)
Total	71(49.0)	46(31.0)	30(20.1)	147(100.0)

Source: Authors field Survey, 2015.

4.4: THE ROLE OF RESIDENTS IN COMBATING FLOOD MENACE

Information on the roles of residents toward flood reduction in the study area is presented in Table viii below. Clearing of drainage took account of 36.4% of all residents' responses to flooding in Ibadan metropolis while 26% of residents involved in public enlightenment and 22.3% of residents combating flood occurrence in the area through channelization, only 15% of residents involved in improper farming along the stream to ensure free flowing of river each time it rains.

Table viii: The Roles of Residents

Roles	Frequency	Percentage (%)
Public Enlighten	102	26
Clearing of Drainage	139	36.4
Channelization	85	22.3
Improper Farming	56	15
Total	**382****	**100**

**Higher than total survey because of Multiple Response

The devastating effect of floods was not limited to physical structures. Our interaction with the inhabitants also indicates that flooding events are usually accompanied with prevalence of diarrhea and other water-borne diseases as most sources of water are polluted. Other effects include increased poverty arising from destruction of farmlands and disruption of essential services. Based on the information received from Oyo state ministries of physical planning and urban development and from the study it is evident that the level of development control in this area is very low while its physical development is on the increase.

In addition, the study area does not have a Master plan guiding its physical development. It is clear that the State government has not found permanent solution to the problem of flooding in the area but always shows concern any time there is flood in the area. Some of the inhabitants affected are relocated to other communities within the state even though such areas are far from the main city. Invariably most people that are rehabilitated after the flood events moved back to their previous places of abode irrespective of their precariousness thereby recycling this teething problem. At the moment government has resumed frantic effort at rehabilitating and re-construction of town roads and other inter-community roads within the local government. This is part of the efforts of the government at eradicating the menace and devastating effect of flood in the area.

5.0   CONCLUSION AND RECOMMENDATIONS

The findings have revealed that the man-induced factors which of course experiences in the study area are mainly indiscriminate dumping, poor channelization and flood plain encroachment have combined with excessive rainfall responsible for incessant occurrence of flood in Ibadan metropolis. No doubt, the rate at which rural migrants flock into the cities encourages illegal buildings which result in virtual breakdown of physical planning laws which must have been a major cause of floods in the city. Based on the foregoing, the following recommendations if properly implemented by policy makers and authorities concerned would ameliorate the problems. There is an urgent need for a collaborative effort of both government and stakeholders to support town planning, engineering and other professional agencies to combat flooding in the area to avoid its long-range consequences.

Urban and Regional Planning Board and ministry of Environment should enforce strict development order especially along the river courses. There should also be no further construction or removal of sand within a specified set-back to the river. Development control regulations need to be strictly enforced. Three Departments are presently in charge of refuse collection in the city. Unfortunately, none of these is yet performing the task expected. These are the Local Government, the state Environmental Protection Agency and the State Refuse Management Board. There is need for a clear definition of functions in order to really identify the authority in charge to ensure a proper management of refuse along the river courses. It should be made mandatory that households should have their own refuse bins while the authority ensures regular collection. There is a need for a wide publicity not only to restrain further settlement of population around the course of the river, but also to educate the existing population in the areas of the need to protect their environment. It is also worth mentioning that many of the roads are not tarred. There is need for the local government to ensure good management of these roads and to ensure that there is adequate provision of drainages, Professionals such as Town Planners, Physical Scientists, Economist, and Disaster risk Consultants should be consulted in planning of the environment while personnel should be well-trained in effective Environmental Planning Management."The environment remains our most valued possession and legacy which we must all strive to protect. Let us all join hands in protecting our common interest".

REFERENCES

Adebayo, R.O (2006): The metropolitan area of Ibadan: "Its growth and structure": in Ibadan region, M.O. Filani, ed. *Department of geography, University of Ibadan, Nigeria. 2006.*

Adeaga, O. (2008): "Adoption of Global Navigation Satellite System (GNSS) Technology in Flood Disaster

Management and Response; *a case study of Lagos mega City," A paper Delivered at International Symposium on GNSS.*

Adeyinka, S.A (2012): "A Review of physical Planning Law in Nigeria*" Adekunle et al (eds) being a paper Delivered at 11th annual national Conference on Environmental Sustainability in a Democratic Government Held at Federal University of Akure (FUTA).*

Askwe P.T (2007): natural hazard risk assessment and public policy: *anticipating the unexpected, Springer-Veriag, NewYork.*

UNESCO (2009): Project on Environment and Development in coastal Regions and in small islands.

United Nation (1998): Guidelines for Flood Loss, Prevention and Management of Developing Countries Natural Resources Water Series, *No.5, UN, New York, 1986.*

Edward, J.O. (2006): Tropical Hydrology and Eater Resources London: *Macmillan Publisher Ltd.*

Egunjobi, L. (2007): Perception of Urban Environment Problems: *A Pilot Study Center in the City of Ibadan, Nigeria. African Urban Quarterly. Vol. 1 and 2, Pp.23-29.*

.Fadairo, G. and Olarewaju, D.O.(2009): A Study of Flood Threat to Akure Urban Spine*: Ala River as a Case Study.*

Nwaubani G.S (2010): "Anthropogenic activities and Flood Inducement in Urban environment: *The case study of Kwara state Nigeria" in Ojo, S.O and Ukeje, J.E (Eds) African proceedings of Sustainable African Vol. 5 Pp 1-4 Nigeria Met Society.*

Onokerhoraye, A.G. (2008):"|Urbanization in Environment in Nigeria": *Implication for Sustainable Development, by The Benin Social Science Series for African University of Benin, Benin City, Nigeria. Pp 69-70.*

Olaniran, (2003): Regulating Flood Plain Development in Lagos State Government Press.

Oriola, E.O.(2000): "Strategies for Combating Urban Flooding in a Developing Nation: *A case Study of Ondo, Nigeria", The Environmental, Vol. 14 No 157, Pp. 62-70.*

Okereke.R.A. (2007): Incidence of Flooding in Southern Nigeria, International *Journal of Environmental issue Vol. 5(1-2).*

Oyebade, L. (1990) "Aspect of Urban Hydrology and the Challenges for African Urban Environment*", African Urban Quarterly, Vol. 5 No. 1/2, Pp. 39-63.*

Popoola, A.S. (2013): "Spatial Variation in Housing Conditions and Residents Health in Flood Prone areas of Ibadan Metropolis'': *Unpublished M.Sc. thesis submitted to Department of Urban and Regional Planning, Obafemi Awolowo University ile-ife, Nigeria.*

Popoola A.S. (2015): Urbanization Processes: Environmental and Health Effects in Ibadan Metropolis Nigeria*, Journal of Research on Humanities and Social Science Vol. 5 No. 14, 2015.*

Popoola A.S. (2015): An Assessment and Empirical Survey of Housing Infrastructural Provision in a selected public Housing: *A case study of Bashorun Housing Estate, Akobo Ibadan Oyo State, Nigeria.Organise by faculty of science the polytechnic Ibadan Oyo State.*

Rashid, K. (1982): Erosion Hazard Assessment in the savanna: The Hadejia- Jama'are River Basin, in Mortimore, M.Olofin, E.A. Clinecole, R.A and Abdulkadir A. (eds), *Perspective on land Administration and Development in Northern Nigeria, Proceedings of the Workshop on Land Resources, Department of Geography Bayero University, Kano Pp 234-236.*

Kabiru J.E. (2009): Monitoring the Effect of Dams on Fadama Cultivation in the Jakara River Basin, using Remote Sensing Technique in Olofin E. A. and Patric S. (eds), Land Administration and Development in Northern Nigeria: *A Case Studies Proceedings of the second Workshop on Land Administration and Development in Northern Nigeria, Department of geography, Bayero University Kano Pp141- 143.*