

ANTHROPOGENIC-INDUCED URBAN FLOODING: EVIDENCE FROM ILORIN WEST LOCAL GOVERNMENT AREA OF KWARA STATE

¹ISSA, Shehu Oladimeji and YAHAYA, Olanrewaju Yusuf ^{2*}

¹Department of Geography, Kwara State Polytechnic, Ilorin, Nigeria.

²Department of Geography and Regional Planning, Federal University, Dutsin-ma, Katsina state, Nigeria.

ABSTRACT

The principles of sustainable and healthy urban environment are characterized by the recognition of the pivotal role of urban dwellers activities. Based on this, this research examines the impact of human activities (anthropogenic factors) on urban flooding in Ilorin west local government area of Kwara state. Systematic random sampling techniques was used in selecting 120 respondents based on the 12 geographic units susceptible to flooding in the local government of study. One household head out of every ten (10) houses identified and located in each vulnerable area was selected and administered with a questionnaire to give a total of 120 respondents. The questionnaire was designed to specifically capture the socio-cultural attitudes of individuals, specifically ordinary citizens in the destruction of modesty and threatening of urban productivity in some parts of Ilorin city. Primary data were collected on how the inhabitants dispose their waste generation, the building pattern, major flooding incidents as well as people's attitude to environmental regulation. The result of the findings showed that there are poor waste management practices among the residents while poor governance coupled with lack of proper environmental planning lies on the part of government. These however, make environmental sanity unachievable in the study area. The research therefore suggests that everyone must cultivate the habit of cleanliness. It is specifically imperative that the national monthly environmental sanitation exercise is enforced and sustained. It also recommends that there is need to reinvent Nigerian cities through good governance in order to achieve improved and conducive urban environment in Nigeria

Keywords: *Anthropogenic factors, flooding, urban, waste disposal, Ilorin west.*

INTRODUCTION

Urban flooding poses a serious challenge to development and the lives of people, particularly the residents of the rapidly expanding towns and cities in developing countries. It has being described as the most common and widespread of all natural disasters throughout countries (Aderogba, et al., 2012). According to UN-Water (2011), floods including urban flooding are seen to have caused about half of disasters worldwide, and 84% of deaths in the world were attributed to flooding. The phenomenon of flooding results when a stream runs out of its confines and submerges surrounding areas (Stephen, 2011). Flood is also seen as natural consequences of stream flow in a continually

changing environment (Nelson, 2001). Flood is generally said to occur in any geographical region when a body of water moves over and above an area of land which is not naturally submerged. However, the case of urban flooding is as a result of heavy rainfall coupled with bad human activities in relation to the environment and inadequacy of proper drainage infrastructure in most urban centers (Adeoti et al, 2010). The activities of increasing human population particularly in cities of developing nations had contributed much more in urban flooding. For instance, flood risk has strongly increased in Lusaka, the capital of Zambia because of the fast growth of the city in flood prone areas. The same thing can be

said of Alexandria in Egypt, Dakar (Senegal) and Ouagadougou (Burkina Faso) strongly affected by the 2009 flooding, as well as Ibadan in Nigeria which experienced great damage in 2012 flood (Klein et al., 2003; Nchito, 2007 and Aderogba, 2012c).

Flooding is a major environmental challenge that has continued to threaten human health and urban productivity in most Nigerian cities. Flooding is a product of rapid urbanization which has drastically altered the physical development in most Nigerian urban centers. According to Aderogba (2012b), Nigerian cities have experienced great physical development without any appreciable infrastructures such as drainages, roads, and canals to support them. Urban development is happening all over the world at a rate that is unprecedented in the world's history. Statistics show that by the year 2030 two thirds of the population of the world will be living in urban areas (World Bank, 2013). Today, 52% of the world's population resides in urban centers, yet these urban centers occupy only 2% of the world's land (World Bank, 2013). The bulk of this population expansion is expected to be mostly in medium (population between 1–5 million) and small cities (population < 500,000) (World Population Prospects, 2011). As a result, urban populations, particularly in developing City of Sub-Saharan Africa cities, form one of the most deprived groups (World Bank, 1997, in Osinubi, 2003). In addition, construction patterns in cities often result in clearing of large parcels of land for development which aids degradation of natural protection and so absorption of precipitation is reduced. This is catalytic to flooding. Urban areas that are low-lying or located close to water bodies are usually more vulnerable as spatial development on the usually cheaper lands of the floodplains hinders natural drainage courses. This obstruction causes a buildup of water with increased precipitation which then

results in flooding (Adebayo and Jegede, 2010). Unplanned urbanization has drastically altered the drainage characteristics of natural catchments, or drainage areas, by increasing the volume and rate of surface run-off. Urban flooding occur in towns located on flat or low lying terrain especially where little or no provision has been made for surface drainage, or where existing drainages has been blocked with municipal waste, refuse and eroded soil sediments. Flooding is one of the water related environmental problems the magnitude of which is very much dependent on land use practices in the watershed of each river. Riverine floods occur when the amount of run-off originating in a watershed exceeds the carrying capacity of natural constructed drainage system (Khalequzzama, 1999).

Flooding is becoming an increasingly severe and more frequent problem in Nigeria. Extensive urban flooding is a phenomenon of every rainy season in Lagos, Maiduguri, Aba, Warri, Benin and Ibadan (Angela, 2011). The frequency of this phenomenon in Nigeria, especially in most urban areas calls for concern because it is leading to colossal loss of properties and lives. For example, the 1978 through 1985 to 2011 flood in Oyo, Oyo state affected about 50,000 people with several properties destroyed; Lagos flood of 1970s and 2011 recorded 300,000 casualties; Bayelsa flood of 1999 and 2001 affected two-third of the population; 2001 Adamawa flood destroyed houses and farmlands; Delta flood affected half of the population in 1999 and 2001; and Kano flood of 1988 to 2001 destroyed many schools, houses, farmlands, animals and about 300,000 people were equally affected (Etuonovbe, 2011). Flood is usually caused by intense or prolonged rainfall making flood hazard to be natural. However, human modification and alteration of nature's right of way can accentuate the problem, while the disastrous consequences are dependent on the degree of human activities

(anthropogenic factors) and occupancy in vulnerable areas (Ogba, 2008). To buttress this point, Michael and Oyewale, (2013) affirmed that man induced factors contributed more to facilitate flooding than climatic factors. Anthropogenic activities in urban areas is therefore synonymous with construction of buildings; commercial and industrial units, concentration of solid and liquid waste without any formal disposal systems; obstructed drainage systems; intensive economic activities; high value of infrastructure and properties; informal settlements; housing without any health and hygiene standards; and changes in regions around cities.

Ilorin recorded cases of flood in 1973, 1974 and 1976 (Jimoh, 2000). For instance, in the flood event of 1976 at Ilorin, 24 houses were submerged. The flood water also washed away vegetable and sugar cane farmlands, while many roads in the city were rendered impassable for some time. Since then, the town had been afflicted with devastating flood incidents where several houses on Asa river bank were drowned and many properties destroyed. Ilorin is particularly vulnerable to flooding due to inadequate drainage structures; changes to ecosystem through the replacement of natural and absorptive soil cover with concrete; and deforestation of hillsides, which has the effect of increasing the quantity and rate of runoff, and through soil erosion and the silting up of drainage channels. Consequent upon this, the efficiency and effective interplay of different factors in Ilorin city determine to a great extent the level of attractiveness in the shape and form of the city environment. Ompad et al. (2006) buttressed this point by explaining that the physical and social environments that define the urban context are shaped by multiple factors and players at different levels. Thus, sustainability of urban is not just an ecological or environmental issue, but equally captures

economic and social issue. This research therefore examines the socio-cultural attitudes of individuals, specifically ordinary citizens in the destruction or restoration of modesty in Ilorin west local government area of the city center of Kwara State.

THEORETICAL FRAMEWORK

Urban Sustainability for Healthy Growth

The principles of sustainable and healthy urban are characterized by the recognition of the pivotal role of urban dweller activities. The efficiency and effective interplay of different sectors in urban centers determines to a great extent the attractiveness and level of competitiveness in urban areas. Ompad et al. (2006) buttressed this point by explaining that the physical and social environments that define the urban context are shaped by multiple factors and players at different levels. Thus, sustainability of urban is not just an ecological or environmental issue, but equally captures economic and social issue. The theory of urban sustainability as described by Siemen (2010) rests on four pillars: (i) Competitiveness (ii) environment (iii) Quality of life and, (iv) good governance. For cities to attract investments opportunities and to be competitive they need modern and abundant skilled labour, efficient infrastructure, improved information and communication technologies, access to quality housing, transport, education, water and electricity supply among others. It should be noted that the bedrock of sustainable urban lies within the concept of sustainable development. It has been a leading theme of international conferences for over two decades. It is generally constructed around environmental, economic, social and cultural dimensions that target the preservation of the overall environment (Gbadegesin, 2005). The concept has become a catchword for discussion and action among scholars, professionals and policy makers. This stemmed on the fact that,

it captures a widespread feeling that “the state of the earth is somewhat precarious” (Pugh, 1996). Sustainable development is commonly understood through the definition given by the World Commission on Environment and Development (WCED, 1987). Sustainable development seeks to meet the needs and aspirations of the present generation without compromising the ability to meet the needs of the future generation. It is a process in which the exploitation of resources, the direction of investment, the orientation of technological development and institutional changes are all in harmony and enhance both current and future potential to meet human needs and aspirations (WCED, Ottawa 1986.) It entails the alleviation of poverty and the maintenance of environmental and ecological equilibrium in the process of exploiting resources for the provision of jobs, income, food and social services that promote the quality of human dignity, for the present and future generations (Segynola, 2005). Sustainable urban approach unveils the notion of developmental activities that is environmentally, socially and economically friendly.

To attain a sustainable urban it requires an overhauling of environmental, economic and social justices that uphold the necessity of adequate and managed infrastructural facilities for city dwellers, particularly the vulnerable groups (UNEP, 1992) To actualize this, both behavioral and structural changes that guarantee social equities between and within urban needs to be pursued. It should be noted that, the concept recognizes that, economic growth is intricately linked to the environment; and development in any given country as well as growth must be geared towards proper management of natural and human resources. Sustainable development is a positive socio-economic change that does not undermine ecological and social systems

upon which city’s developmental activities depends.

It is imperative to note that achievement of sustainable cities requires concerted efforts of integrating planning and developmental policy into different human activities. This is important particularly in Nigeria and other developing countries because of the persistent rate of deforestation, loss of biodiversity, destruction of ozone layer and accelerating rate of waste generation and improper management. Above all, a sustainable city can partly be assessed by the level of wealth created within a given period, and how much income opportunities accrue to cities inhabitants. Dunford and Greco (2006) emphasized that development, wealth and income of an area depends on the interaction of a four sets of factors that include:

- (i) Natural and created resource endowments (natural resources, infrastructures, population, skills, degree of development of the forces of production, etc) which determines the activities in which its inhabitants specialize and their role in wider divisions of labour
- (ii) The degree and effectiveness with which resources and an area’s human potential are mobilized. (Technologies and skills, institutional and social relations, capacities and performance)
- (iii) The extent to which inhabitants can command and control resources of others based on the degree of unequal exchange and extent of wealth transfers and,
- (iv) Recognition of the fact that, resources are created, conserved, and reproduced through development.

THE STUDY AREA

Ilorin West Local Government Area has its headquarter at Oja-Oba (now located at Wara Osin) and is customarily the social and

administrative center of Ilorin emirate. The local government lies on geographical coordinates between longitude $04^{\circ} 28' 37''$ to $04^{\circ} 36' 01''$ N and latitude $08^{\circ} 23' 52''$ to $08^{\circ} 34' 32''$ E (Figure 1). The Local Government Area is situated between deciduous woodland of the south and savanna to the North. It is bounded to the eastern part by Ilorin East and Ilorin South, Asa Local Government Area to the South, Oyo state to the west and Moro Local Government to the North (figure1). The census of 2006 put the population of the Local government at 364,556 people as the most densely populated LGA of all the 16 Local Government Area in Kwara State. It occupies a total land mass of about $542,700\text{m}^2$. The Local Government Area is drained by many rivers and streams. Some of this river and streams are seasonal. Among them are Odo-Okun, Odota, Amule, Foma and Asa River. Both river Asa and Foma are the major rivers, the direction of flow of which shows the general pattern of the terrain. These rivers often overflow their banks during raining season destroying lives and properties (Olaniran, 1983). The vegetation is greener and thicker along the river valley.

The climate of Ilorin West is humid type characterized by dry and wet seasons (Jimoh, 1997). The season is controlled by two surfaces opposing winds i.e the south east

maritime and the north east continental wind. During the raining season, Ilorin is under the influence of south east maritime characterized by continental wind. The wet season begins towards the end of March and ends in October (Oyegun, 1983a). The dry season begins in November and ends in February. The month of December and January are usually harmattan period accompanied by dry and cold wind as a result of climatic influence from the North (Oyegun, 1983). The average annual rainfall is about 1500mm and the temperature range between $30-35^{\circ}\text{C}$ as reported by Oyegun, (1983).

The average land height in Ilorin West is about 300m above sea level. This shows that the landscape area is characterized by undulating surface with low trend and highland. The highlands are separated by valley through which major stream flows (Adeleke, 2009).

Historically, Ilorin West Local Government area comprises of Yoruba and Fulani as the major ethnic group. The habitats are predominantly farmers and traders. The trading activities are on grains, pottery (product of clay soil), and weaved clothes, (Aso-Oke), among others. It is popularly regarded as a transitory zone between north and the south.

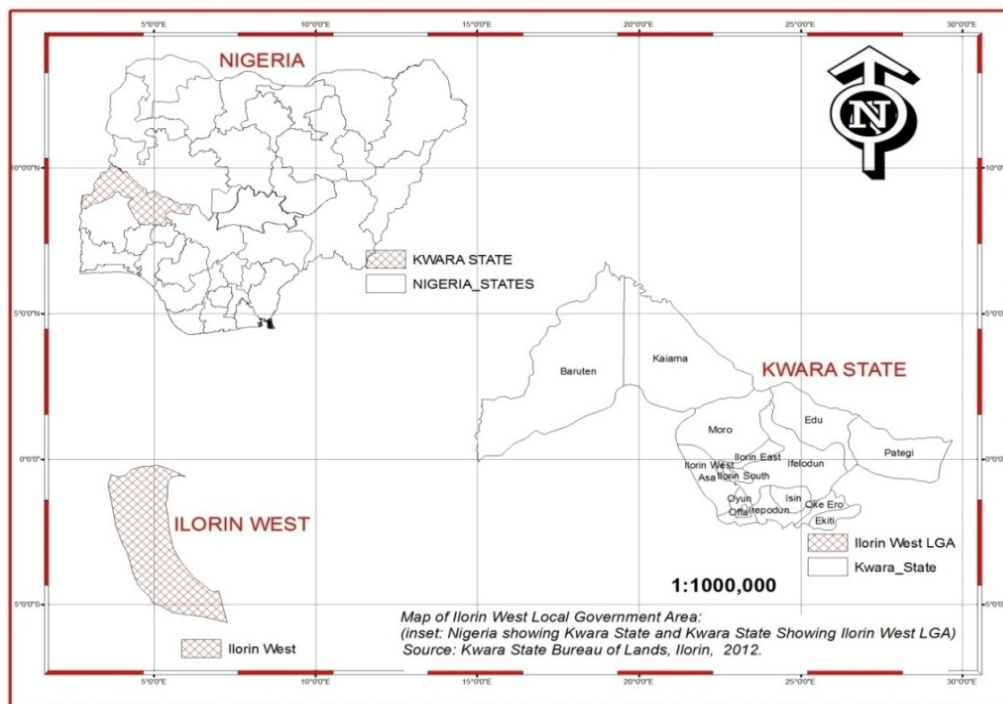


FIGURE 1: MAMFigure 1: Map of Ilorin West Local Government Area.

MATERIAL AND METHODS

Data used in this paper was derived from primary sources and content analysis of different research findings (Okewole, 1999). The required information was gathered directly from field observation, interview and the use of well-structured questionnaire, consisting of close and open ended questions. Data was collected on demographic characteristics of the respondents, methods of waste disposal, average distance of building to the river banks, length of stay in the place as well as damages incurred as result of flooding from respondents. *Systematic random sampling techniques was used in selecting 120 respondents based on the 12 geographic units susceptible to flooding in the local government of study. One household head out of every ten (10) houses identified and located in each*

vulnerable area was selected and administered with a questionnaire to give a total of 120 respondents. Other information obtained from secondary data sources are gathered from Kwara State Emergency Management Agency on the recorded cases of flood incidents in Ilorin with associated effects and remedies. Descriptive statistics such as chart mean and percentage were used to analyze some of the data which were presented in graphical and tabular form for easy understanding.

RESULTS AND DISCUSSION

Presented in Table 1 is the analysis of the methods of waste disposal among the residents of the river banks where flood has occurred within the city. As shown in the table, use of waterways accounted for 63.3% of the method employed by respondents in

disposing their refuse. A sizeable percentage (20%) of the respondents also make use of the waste collection bin that provide by the government and placed at different locations within the city. Burying of waste (2.5%) happens to be the least adopted method of waste disposal in the area and this could be attributed to non-availability of adequate land

space in the city center. It is however surprising that despite the fact that government provide waste collection bin, majority of people still prefer to dump their refuse into waterways or drainage channels especially when rain is falling. This may be attributed to lack of strong enforcement of sanitation on the part of government.

Table 1: Method of Waste Disposal

METHODS OF WASTE DISPOSAL	FREQUENCY	PERCENTAGE
Backyard disposal	06	5
Household Dustbin	04	3.3
Burying	03	2.5
Burning	07	5.8
Waterways disposal	76	63.3
Government waste collection bin	24	20
TOTAL	120	100

Source: Author's Field Work, 2014.

Average Distance of Building to the River Side

Figure 2 contains the analysis of average distance of respondents' building to the river side or banks. As shown in figure 2, only 20 (16.7%) and 12 (10%) comply with building regulation of 50-70m and above 100m respectively. According to the town planning regulation, building should be sited 70 meters away from the river side. Some researchers are of the opinion of 100 meters away in case of the heavy rainfall which increases the velocity and the volume within the drainage channel. This implies that while only 26.7% of the respondents comply with town planning

regulation in building their houses at approved distance from river banks, 73.3% which represent the majority do not comply. This could be as a result of lack of enforcement on the part of Town Planning Authority in the State. By implication, larger proportions of the inhabitant in the study area disobey building regulation in accordance with town planning law. The result of the study further reveal that larger proportion of the inhabitant build directly on the water ways during dry season, and they are deviant of the fact that water will naturally claim its way during raining season.

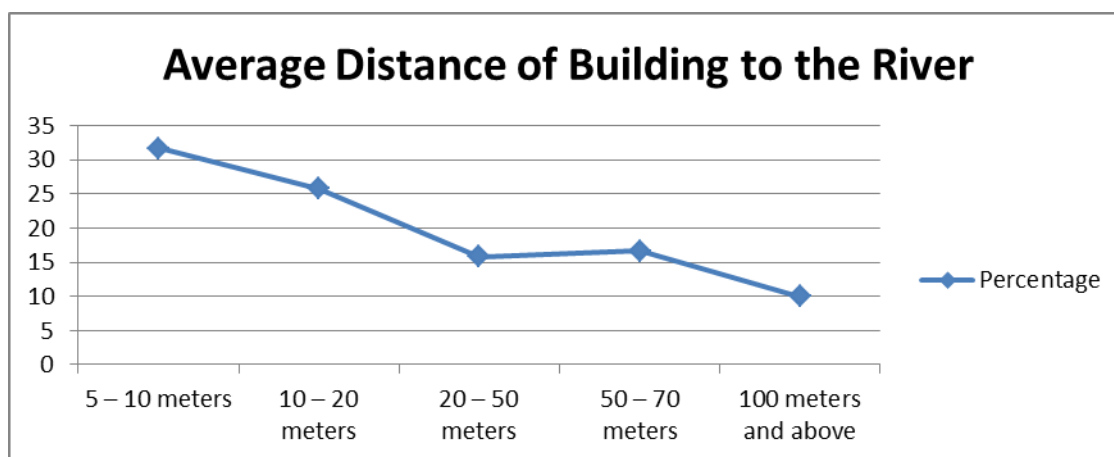


Figure 2: Linear Graph of Average Distance of Building to River Side
Source: Author's Field Work, 2014.

In order to know the frequency of flood occurrence in the study area, data was also collected from Kwara State Emergency Management Agency on the severity and the induced factors. It is as presented in table 3.

Table 3: Flooding Incident in Ilorin (2002- 2012)

Year	Severity	Induced factors
2002	Severe	Hydro Climatology/Anthropogenic
2003	Moderate	Anthropogenic
2004	Moderate	Anthropogenic
2005	Severe	Hydro Climatology/Anthropogenic
2006	Severe	Hydro Climatology/Anthropogenic
2007	Severe	Hydro Climatology/Anthropogenic
2008	Moderate	Anthropogenic
2009	Moderate	Anthropogenic
2010	Moderate	Anthropogenic
2011	Moderate	Anthropogenic
2012	Severe	Hydro Climatology/Anthropogenic

Source: Kwara State Emergency Management Agency's records 2013.

Hydro Climatology induced factors are as a result fluctuation in rainfall intensity and duration, over flows of river bank due to high torrential rainfall while Anthropogenic-induced factors are caused by human activities among which are river side development, dumping of refuse into drainage channels and obstruction of water ways. During these flood

incidents, several properties were destroyed, houses were submerged and many families were displaced. Those that involved destruction of little household properties such as furniture, rugs, carpets, and electronics are regarded as moderate while when houses were submerged, people badly affected and displaced are considered severe in nature.

Table 4: Flood Victims and Associated Remedy in Ilorin West.

Year	Victims	Area Flooded	Associated Remedy
2007	1095 Households with 3045 victims.	Coca cola/Unity Area, Isale koko, Abata Asunkere.	₦20 Million Worth of Relief Materials
2008	204 Households with several properties destroyed.	Coca cola/Unity Area, Isale koko, Abata Asunkere.	₦19 million Worth of Relief materials
2009	100 families rendered homeless	Unity Area and Isale koko	₦13 Million Worth of Relief Materials
2010	17 houses submerged with 68 people affected.	Coca-cola Area and Isale koko	₦15 Million Worth of Relief Materials
2011	65Households affected.	Unity Area, and Abata Asunkere.	₦8 Million Worth of Relief Materials
2012	12 Households were displaced.	Unity Area, Isale koko,	₦3 million Worth of Relief materials

Source: Kwara State Emergency Management Agency's records 2013

Following the reported cases of flood recorded in Ilorin between 2002-2012, scenes from the flooded areas were shown on plates 1, 2, and 3. Plate 1 shows excavator working on the extension of Asa River along Emir's road to remove wastes that have blocked the drainage channels. Plate 2 and 3 show vacated building

along Oja-lya area and flooded Coca-Cola/Unity axis of the city center. In the events, houses and vehicles were submerged, properties destroyed and traffic was interrupted. The flooded streets obstructed source of livelihood and leads to destruction of socio-economic activities in the area.



Plate 1: During Excavation of Waste along Emir's road drainage channel
Source: Author's Field Work, 2014.



Plate 2: Vacated Building along Waterways at Oja Iya area, Ilorin.
Source: Author's Field Work, 2014.



Plate 3: Flooded Coca cola/Unity Axis of Ilorin city center.
Source: Author's Field Work, 2014.

CONCLUSION AND RECOMMENDATION

Flood occurrences in Ilorin West Local Government Area may certainly not have been as enormous as it were if the drainage channels were not blocked by waste discharge and other related human activities such as river side development, dumping of refuse into drainage channels and obstruction of water ways. Drainage channels have been blocked or narrowed by physical buildings, constructions and or by various activities of the city dwellers. It has not been recognized by all that what affect drainage in any street or along any roads will eventually affects the city environment as a whole. The factors of urbanization and the development of the modern commercial/industrial economy as well as the multipliers effects of this has produce a typically dynamic population within the city. However there has not been any serious appreciable increase in infrastructural

facilities, such as drainage, roads and canal to support them. Flood can be traumatic, which can have long lasting psychological effects, the impact of flooding is endless which further includes damages to property, destruction and reduction of agricultural product, loss of livestock and the deterioration of health conditions owing to water borne diseases, and some economic activities can be brought to standstill. The city is always affected by flooding annually because of the lack of environmental consciousness on the part of the public, weak and lenient government legislation, poor governance, lack of proper environmental planning and management, location of buildings on flood prone areas and indiscriminate waste disposal among the residents. The question is therefore not whether flooding is happening, rather it is what to do about it. Interestingly, the current

uprising of flood being experienced in recent time in Ilorin West can be avoided, if a holistic approach is adopted. It is therefore recommended that concerted efforts must be geared towards adequate city planning, policy formulation, enhanced public enlightenment programmes, sensitization on environmental sanitation and management. There should be adequate sensitization of people who are often affected by flood menace towards adopting environmental best practices. Town planning laws should be properly enforced and strictly adhered to as this will go a long way to

curbing the menace of floods. Similarly, all roads should be constructed with adequate drainage facilities provided and the drainage systems should be regularly cleaned, inspected and monitored. Government should set up strict legislative measure for Ilorin city center to be free of bad environmental management practices causing flood which is largely created by human factors. It is imperative that the national monthly environmental sanitation exercise is enforced and sustained.

REFERENCES

- Adebayo, W.O. and Jegede, A.O. (2010). "The Environmental Impact of Flooding on Transportation Landuse in Benin City, Nigeria. *African Research Review*, Pp 390-400.
- Adeleke, D. A. (2009). The Yoruba Fool Insignia: Beyond the Shakespearean Tradition. *Journal of Social Sciences*, Volume 21, No. 2, pp. 104-115
- Adeoti, A., Olayide, O., & Coster, A. (2010). Flooding and Welfare of Fisher's Household in Lagos State, Nigeria. *Journal of Human Ecology*, 32(3), 161-167.
- Aderogba, K., Oredipe, M., Oderinde, S., and Afelumo, T. (2012). Challenges of Poor Drainage Systems and Floods in Lagos Metropolis, Nigeria. *International Journal of Social Sciences and Education*. Vol.2 No. 1 pp 413 - 43
- Aderogba, K. (2012b). Qualitative Studies of Recent Floods and Sustainable Growth and Development of Cities and Towns in Nigeria. *An International Journal of Academic Research in Economics and Management Sciences*, Vol. 1 No.3.
- Aderogba, K. (2012c). Substantive Causes and Effects of Floods in South Western Nigeria and Sustainable Development of the Cities and Towns. *Journal of Emerging Trends in Educational Research and Policy Studies (JETERAPS)* 3(4): 551-560.
- Angela, K. E. (2011). The Devastating Effect of Flooding in Nigeria. *AnGene Surveys and Consultants*. TS06J- Hydrography and Environment.
- Dunford, M. and Greco, L. (2006). *After the Three Italies: Wealth, Inequality and Industrial Change*, Blackwell. Ras- IBG. Book Series, Oxford. ISBN: 140512 5217.
- Etuonovbe, A. (2011). The Devastating Effect of Flooding in Nigeria. *Paper presented at the FIG Working Week*. Marrakech, Morocco, 18th-22nd May.
- Gbadegesin, A. (2005). Minimizing Risk and Sustaining the Environment. The Role of Sustainability Science. Faculty Lecture, Tai Solarin University of Education Ijagun, Dec. 2005.
- Jimoh. H.I, (1997). Drainage Problems in a Tropical Environment: Perspective on Urban Quality, Department of Geography University of Ilorin, Nigeria.
- Jimoh .H. I, (2000). Effects of River Erosion on Houses: A Case study of Asa River Catchment in Ilorin, Kwara State, Nigeria. *Ilorin Journal of Business and Social Science*, 8(1&2):136-143.
- Khalequzzaman .M. D. (1999). " Environmental Philosophy Control in the Context of Bangladesh" weekly holiday Data July 30.
- Klein, R., Nicholls, J., & Thomalla, F. (2003). The Resilience of Coastal Megacities to Weather Related Hazards in Building Safer Cities: The Future of Disaster Risk. Edited by A. Kreimer, M., Arnold, & Carlin, A. The World Bank, Washington, D. C. pp. 101-120,
- Kolawole .O.M. (2011) Managing flood in Nigerian cities: Risk analysis and Adaptation options. Ilorin city as a case study. *Infectious Diseases and Environmental Health Laboratory, Scholars Research Library Archives of Applied Science Research*, 3 (1):17-24
- Michael, A. and Oyewale, O. (2013). Evaluation of the Causes and Effects of Flood in Apete, Ido Local Government Area of Oyo state, Nigeria. *Civil and Environmental Research*. 3(7): 19-26.
- Nchito, W. (2007). Flood Risk in Unplanned Settlements in Lusaka, Environ. Urban., 19(2), 539
- Pilgrim, D., & Cordery, F. (1993). Flood Runoff' in D. R. Maidment. *Handbook of Hydrology*. New York: McGraw-Hill Inc. pp 9.1 -9.42.
- Nelson, S. (2001). River systems and causes of flooding. Geology 204 Tulane University. Retrieved October 23, 2011, from www.tulane.edu/sanelson/geo/204/subsidence.pdf
- Ogba U (2008). Integrated Approach to Urban Flood Adaptation in the Niger Delta Coast of Nigeria, Integrating Generations, FIG working week 2008, Stockholm, Sweden 14-19 June, 2008. Available at http://www.fig.net/pub/fig2008/papers/ts08e/ts08e_02_ogba_utang_2_736.pdf.
- Okewole, E.A. (1999). Feline Infectious Anemia: Clinical and Epidemiological Appraisal in

- Ibadan and its environs. Nigerian Veterinary Journal 20 (1): 67-69.
- Olaniran, O.J. (1983). Flood Generating Mechanism in Ilorin, Nigeria Geographical Journal 7:267-285
- Ompad, D.C., Galea, S., and Vlahov, D. (2006) Distribution of influenza vaccine to high-risk groups. Epidemiology Review;28:54–70.
- Osinubi, T.S (2003). Urban Poverty in Nigeria: A Case Study of Agege Area of Lagos State, Nigeria.
- Oyegun, R. A. (1983a). Water Resources in Kwara State. Matanmi and Sons Printing and Publishing Co. Ltd. Ilorin, Pp.113
- Oyegun, R.A. (1983). The Use and Waste Water in a Third War World City” Geojournal, Raidel Publishing Company. 10(12), 205-210
- Pugh, C. (1996). Sustainability, the Environment and Urbanization, London, Earthscan
- Segynola, A. (2005). Promoting Food Security in Nigeria through Sustainable Development. In Onokerhoraye, A. and Omuta, G. (eds.) Perspectives on Development. CPED; Benin City.
- SIEMEN, (2010). Sustainable Cities: Sustainable Development for Urban Infrastructure. Siemen AG, Munich.
- Stephen, A. (2011). River Systems & Causes of Flooding. Tulane University, EENS 2040
- UNEP, (1992). United Nation Environmental Programme, UN Conference on Environment and Development (Earth Summit) publishes Agenda 21. A blueprint for sustainable Development.
- UN-Water. (2011). Cities coping with water uncertainties. Media Brief, UN-Water Decade Programme on Advocacy and Communication.
- WCED, (1987). World Commission on Environment and Development. Bruthland Report on our Common Future. Oxford University Press.
- World Population Prospects (2011) The 2011 Revision, Highlights. United Nations Publications, ESA/P/WP/224). <http://esa.un.org/unup/pdf/WUP2011>.
- World Bank (2013) Urban Development Sector Results Profile: Harnessing Urbanization for Growth and Poverty Alleviation. Accessed May 2013 at <http://www.worldbank.org/en/results/2013/04/14/urban-development-results-profile>