ASSESSMENT OF FACTORS CONTRIBUTING TO FLOOD DISASTER IN IBADAN METROPOLIS: IMPLICATION FOR ENVIRONMENTAL HEALTH EDUCATION

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ABSTRACT

Climate change has brought with it some forms of extreme weather events. One of such is heavy rainfall which often leads to flood. In recent times, flood disaster has been a regular occurrence destroying lives and property. This study was carried out to identify and assess contributing factors to flood disaster in Ibadan metropolis. The study investigated the contributions of variables such as heavy rainfall, drainage system, waste disposal arrangement, the dumping of refuse inside waterways, the role of environmental health officers and level of adherence to the city master plan. Expost facto research design was adopted for the study. The population comprised all residents of Ibadan metropolis. The sample consisted of seven hundred and fifty (750) respondents. Respondents were sampled from flood affected areas in five Local Government Areas of Oyo State, Nigeria. The instrument used was self-constructed questionnaire with 0.78 reliability co-efficient. The data obtained were analyzed using frequency counts, percentages and inferential statistics of regression. The findings revealed that dumping of refuse inside waterways, attitude of environmental health officers, heavy rainfall, drainage system and poor adherence to city master-plan contributed to flood disaster in Ibadan metropolis. Among the factors that contributed significantly are heavy rain and dumping of refuse inside waterways. It is implied from the findings that there is urgent need for environmental health education for the population in order to encourage proper disposal of waste among residents of Ibadan metropolis.

Keywords: Assessment, contributing factors, flood disaster, dumping inside waterways, environmental health education.

INTRODUCTION

Weather is the atmospheric condition of a place at a time. It includes sunshine, temperature, hotness, coldness, wind, humidity and rain. Climate is average state of weather overtime ranging from hundreds to millions of years. The variables of weather include precipitation, wind, humidity as well as wet and dry seasons. Climate is important as it plays fundamental role in structuring natural ecosystem. An ecosystem is the functioning system of plants, animals and microorganism in an interdependent manner. Ecosystem provides natural, cultural, recreational and aesthetic resource environment for human beings to live comfortably on the planet earth. Human health, agricultural practices, water resources and ecosystem are all sensitive to climate. Undisrupted climate stabilizes ecosystem. However, in the recent times climate continues to change with disruptive impacts on ecosystem. Climate change is a change in climate that is attributed directly or indirectly to human activity which alter the composition of the global atmosphere and in addition to natural climate variability observed over comparable time periods (WHO, 2004). The underlying cause of climate change is global warming. Increase in the earth's average temperature is as a result of build up of greenhouse gases such as carbon dioxide, methane and nitrous oxide.

Climate change encompasses the effect associated with changes in the earth's temperature, which cause global warming and changes in weather pattern (Washington State Department of Ecology, 2012). According to Preparation for a Changing Climate report, rising level of carbon dioxide and other heat-trapping gases in the atmosphere have warmed the earth and are causing wide-ranging impacts including rising sea levels; melting snow and ice; more extreme heat events, fire and drought; and more extreme storms, rainfall and floods. (Washington state Department of Ecology, 2012). In this way, climate change has brought extreme weather condition typical of heavy rainfall. The Union of Concerned Scientist (2011) described how climate change contributed to heavy rainfall and flood as follows:

"carbondioxide from burning fossil fuels and destroyed tropical forests accumulates in the atmosphere trapping heat that would otherwise escape into space; this trapped heat raises the planet's average temperature; some of the extra heat evaporates water from the ocean and soil into the atmosphere; additionally, growing plants transfer water vapour into the atmosphere; as average global temperature rises, the warmer atmosphere can hold more moisture about 4 percent more per degree Fahrenheit temperature increase; thus, when storms occur, there is more water vapour available in the atmosphere to fall as rain, snow or hail''. Floods are associated with continuous heavy rainfall.

Flood is an overflow of water that submerges land which is usually dry. Flood becomes a disaster when it occurs in large unexpected scale and with excessive frequency thereby causing damage to life and property and the entire environment. United Nation International Strategy for Disaster Reduction (2003) defined disaster as a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources. In the recent times, pattern of occurrence of floods have remained unpredictable, more intense and devastating. Thus, flood continue to pose challenges to human being.

Globally, the occurrence of flood disaster has become an issue of a great concern. International Federation of Red Cross and Red Crescent societies (2005) noted with concern that flood disaster affected more people across the globe (14 million per year or average) than all the other natural or technological disasters put together. According to Ogunyemi (2002) floods are the most common natural disaster in the developed and developing nations of the world, the occurrence of which usually have a devastating impact on the people as well as deteriorates the ecosystem as a whole. The devastating impacts of flood disaster on the people may include sudden death, injury, loss of personal belongings, loss of one's source of livelihood and psychological trauma of losing loved ones. In the recent times, flood disaster has become one of the most frequent and wide-spread of all environmental hazards. Flood disaster has occurred in various parts of Nigeria including Calabar, Sokoto, Lagos, Kogi, Port-Harcourt causing destruction of lives and disruption of infrastructures, business activities and health facilities.

The history of disaster in Ibadan dated back to 1955 when Ogunpa river got flooded and swept many people including properties away. In 1960, Ogunpa flood disaster destroyed 400 houses and killed many people, also in 1963 and 1978 the river overflowed its banks and properties worth several millions of naira were destroyed at Old Gbagi Market, Ogunpa Oyo, Omitowoju and Molete (Tomori, 1979). In 1980, another Ogunpa flood disaster that occurred killed many people and destroyed properties. In the 2011 flood disaster, another monumental loss was recorded when over one hundred and two people were swept away (Nigeria Red Cross, 2011). The flood disaster of August 26, 2011 and July 14, 2012 that occurred in Ibadan killed many people and destroyed properties worth huge amount.

The occurrence of flood disaster can be traced to human actions and inactions. This is because human induced climate change influences to a large extent some natural factors that trigger rainfall consequent upon the occurrence of flood. Also, flood most especially, the one that usually occur in the urban towns are as a result of little or no provision for drainage or the ones provided have been blocked with wastes. Meanwhile the practices of indiscriminate refuse dumping into water ways is as a result of poor attitude to environmental management that stemmed from inadequate knowledge of its consequences.

The area of the study that helps to improve knowledge, attitudes and practice regarding health issues is health education. The report of United Nations Conference on Environment held in Rio de Jainero, Brazil in June 1992 laid emphasis on education as the reliable means of empowering the people to understand and manage the environment (Ayotunde, 2008). Moronkola (1999) described environmental health education as the one directed at individual and communities and at making the environment to be safe for living. He went further to say that issues usually addressed in environmental health education include waste disposal, vectors

control, provision of good water supply, good housing, and good food supply, prevention of communicable diseases, pollution of (air, water and noise and radiation). Therefore, prevention of flood disaster has great implication for environmental health education.

Concept of flood

Flood occurs when river level exceeds its natural bank and water overflows. Flood involves the inundation or overflow of water to cover land that is not normally submerged (Ward and Smith, 2008). Normal naturally occurring flood can be beneficial to ecology but floods that exceed normal flows and people's capacities can be damaging and have devastating consequences on human health and the environment. Flooding occurs as a result of one or a combination of events such as rainfall, filling rivers, streams and ditches, coastal storms resulting in overtopping and breaching of costal flood defences, blocked or overloaded drainage ditches, drains and sewers, heavy rain resulting in run-off flowing overland, or rain soaking into the ground thereby raising ground water levels (MET Office, 2003). Flood can be explained to be the accumulation of water within a water body and the flow of excess water on to adjacent plains.

Types of flood

Flood can be classified according to its location, intensity and potential impacts. Major classes include the following:

(i) Flash floods: Flash floods are influenced by high intensity rainfall which turns river into destructive torrents. The National Weather Service (2006) defined a flash flood as a rapid and extreme flow of high water into a normally dry area or a rapid rise in a stream or creek above a predetermined flood level beginning within six hours of the causative event (e.g intense rainfall, dam failure, ice jam). Flash flood can occur where land terrain is steep allowing for high rates of surface run-off water.

(ii) Riverrine Floods: Surface water run-off when introduced in large amount exceeding the carrying capacity of channel whether natural or constructed causing water to overflow its bank results into riverrine floods. Surface water run-offs finding their way into existing river occur as a result of rainfall intensity exceeding evaporation rate and infiltration capacity of the soil. Features of urbanization such as roadways and larger paved areas can contribute to the imperviousness of soil.

(iii) Coastal Floods: Coastal floods usually occur off land beside or near the sea or ocean. Ocean water can be driven onto coastal area through the action of strong winds which can increase the surface elevation above normal level.

(iv) Urban Flooding: During heavy rainfall, large amount of water that cannot be infiltrated into the ground often find their way into channels. In most urban towns in Nigeria, drainages are not provided or the existing ones have been blocked by waste. Urban flooding is a regular occurrence during raining season in most parts of the country.

Flood Disaster and its Negative Impacts

Flood disaster is destructive in nature causing tremendous loses to lives and property, Adikari and Yoshifani (2009) corroborated the assertion when they reported that among all observed natural and anthropogenic adversities, water-related disasters are undoubtedly the most recurrent and pose major impediments to the achievement of human security and sustainable socio-economic development. Some of the identified impacts of flood disaster are the following:

(i) Loss of lives and property: Flood disasters have been known to cause damage to property and destruction of crops and livestocks. Animals can be trapped causing them to drown. Adikari and Yoshitani (2009) reported that during the period 2000 to 2006, a total of 2,163 water-related disasters were reported globally in the Emergency Disaster Database (Em-Dat), killing more than 290,000 people, affecting more than 1.5 billion, and inflicting more than US$422 billion of damage.

(ii) Pollution and Spread of Disease: Floods present to the environment pollution. Waste of various types which are contaminants are washed away by flood and spread into the environment. Contamination of the environment often results into disease infection. Center for Disease Control and Prevention (1989) found that increased rates of Diarrhoea (including Cholera and Dysentary), respiratory infections, Hepatitis-A and E, Typhoid Fever, Leptespirosis and diseases borne by insect occurred after floods in developing countries.

(iii) Psychological health effects: The long term effects of flood on the psycho-social health of the victims and their families can be traumatic. The loss of relation including, the loved ones are bad experiences that will be remembered for long. Displacement from home, loss of personal belongings and destruction of business activities including social affairs can trigger mental ill-health. Long after the water has receded, the victims continue to have emotional trauma. Also, clearing up and making repair of damaged property can be stressful

Environmental Health Education

Flood disasters are common and consistent occurrence during rainy season in Nigeria causing enormous destruction of lives and property, some of which could have been protected through appropriate education. United Nations Framework Convention on Climate Change (UNFCC) (2007) recommended education, training and awareness creation on global warming and its impacts as a matter of urgency through co-ordinated educational interventions. This is against the backdrop of the fact that most people lack adequate knowledge of climate change. Okali (2008) said that if humanity is to respond to the challenge posed by global warming, then education has a key role to play in promoting understanding and helping individuals, society and governments to make informed choices; not only about simply giving information, but also ensuring that education is mobilized to re-orient the society towards sustainable practice. UNESCO/UNEP (2008) affirmed that education is an essential element of the global response to climate change. Environmental health is the branch of public health that is concerned with all aspects of the natural and built environment that may affect human health. (Wikipedia, 2013). Environmental Health Education teaches basic environmental health knowledge. It is inculcating good health habits that benefit the environment. The recipients of environmental health education will have improved and properly cultivated idea about health and by extension benefit the society at large.

Statement of the problem

Floods disaster is the most destructive natural hazards causing damage of great magnitude to built and natural environment. Trends in flood disaster showed sporadic increase with its attendant lives and economic losses. In Nigeria there is an increasing rate of occurrence of flood disaster affecting large population, emotionally and economically. Recent dramatic rise in the frequency and magnitude of flood disaster affecting large population in Nigeria called for concern. For instance, Ibadan city faced the echoes of flood disaster in 2011 which claimed many lives and destroyed properties worth several billions of Naira in Oyo State (Adeloye, 2012). In the same vein, on July 14, 2012 there was heavy rainfall in Ibadan which resulted in flood disaster. Lives were lost and valued properties wasted. As a result of the flood, 14 bridges collapsed and were washed away. Also bridges were over-flown while motorists were cut-off from passing through Odo-OnaElewe Road, Orita Challenge, Apete, Awotan, Secretariat Road, New Garage, Eleyele, Agbowo, Amukoko and Rhema Road along Mobil area of Ibadan metropolis. These challenges brought many debates on the factors that contributed to the flood disaster in Ibadan with a view to ending the occurence. It is on this premise that the study sought to assess the contributing factors to flood disaster in Ibadan Metropolis.

Objectives of the Study

The objectives of the study are to:

1. Assess factors contributing to flood disaster in Ibadan Metropolis
2. Determine the implication of the factors assessed on environmental Health Education.
3. Proffer health education approach solution to the problem of flood disaster in Ibadan

Hypotheses

The following hypotheses were tested in the study.

Hypothesis 1: There will be no significant joint effect of variables (refuse disposal system, dumping of refuse inside waterways, attitude of environmental health officers, heavy rainfall, drainage system, city master plan) on flood disaster in Ibadan.

Hypothesis 2: The respective variables (refuse disposal system, dumping of refuse inside waterways, attitude of environmental health officers, heavy rainfall, drainage system and the city master plan) will not significantly contribute to flood disaster in Ibadan Metropolis.

METHODOLOGY

Expost facto research design was used for the study. The population comprised residents of Ibadan Metropolis; while sample was made up of 750 respondents randomly selected from five local Government Areas in Ibadan Metropolis as shown in the sampling table below.

Table 1: Respondents Distribution by Local Government Areas,

Local Government and Areas Affected	Number of Respondents	Percentage Contribution
Ibadan North (Major Salawu- Agbowo, Carpenter-Agbowo, Kogi Area, University of Ibadan, Polythenics Area)	200	26.7%
Ibadan North-East (Oluyoro Area, Green Spring Area, Onipepeye Area, Agugu Area, Mufutaulanihun Area)	190	25.3%
Ibadan North-West (Eleyele Area, Vertinary)	80	10.7%
Ibadan South-East (Mapo Area, New Garage, Oke Ayo Area)	120	16.0%
Ibadan South-West (Odo-Ona Elewe, Apata Area, Mobil Area, Rhema Road)	160	21.3%
Total	**750**	**100**

A self developed questionnaire was used to collect data. The instrument was a modified 4-point Likert Scale type with various value assigned as follows strongly agree=4; agree=3; disagree=2 and strongly disagree=1. The pre-test to ascertain the reliability of questionnaire item produced correlation co-efficient of 0.78 on the Cronbach alpha scale. Data were collected with the help of 5 research assistants. Descriptive statistics of frequency counts and percentages were used to analyse demographic data, while inferential statistics of Regression Analysis was employed to test the hypotheses at 0.05 alpha level.

RESULTS

The results obtained revealed the following (i) frequency distribution of respondents by sex include male 392 (52.3%) and female 358 (47.7%) (ii) 326 (43.5%) of respondents were within the age category of 21-30 years, while 248 (33.1%) of respondents were within the age bracket of 31-49 years. 164 respondents representing 21.9% were within the age group of 41-50 years and only 12 respondents representing 1.6% were 51 years and above. (iii) Married respondents have the highest frequency 383 (51.1%) followed by single 357 (47.6%) while a total of 10 respondents representing 1.3% are separated. (iv) frequency distribution of respondents by ethnicity showed that 611 (81.5%) are Yoruba, 121 (97.6%) are igbos, while others are 18 in

number representing 2.4%. (v) Out of 750 respondents 69 respondents representing 9.2% possessed SSCE/WAEC as their highest academic qualification, 329 (43.9%) and 310 (41.3%) of the respondents obtained OND/NCE and HND/B.SC/B.A respectively while 12 and 30 respondents representing 1.6% are 4.0% were M.Ed/M.Sc/M.A and M.Phil/Ph.D holders respectively (vi) 129 and 358 respondents representing 17.2% and 47.7% were self-employed and civil servants respectively while 245 respondents representing 32.7% were students and 18 (2.4%) respondents were unemployed.

Table 2: Analysis of Variance (ANOVA) showing the joint effect of the independent variables on the dependent variable

Model	Sum of square	Df	Mean square	F.cal	F.crit	Sig
Regression	5.084	6	.847			
Residual	182.031	743	.245	3.458	2.11	.002
Total	187.115	749				

(F=3.458, df=6/743, p<.05)

(a) Predictors: (Constant), refuse disposal system/dumping location, dumping refuse inside waterways, attitude of environment health officer, heavy rainfall, drainage system and master plan.

(b) Dependent variable; Flood disaster.

Table 2 presented the Analysis of Variance of significant effect of the respective variables (i.e refuse disposal system, dumping of refuse inside waterways, attitude of environmental health officers, heavy rainfall, drainage system and city master plan) on flood disaster in Ibadan. The result showed that the sum of squares is 5.084 with 6 degree of freedom and a mean square of 0.847. For within the groups, the sum of squares is 182.031 and 743 degrees of freedom as well as a mean square of 0.245. The computed F (3.458) is greater than the table value of F (2.11), which is statistically significant at 0.05. Therefore, the null hypothesis one that states there will be no significant joint effect of variables (dumping location, dumping of refuse inside waterways, attitude of environmental health officers, heavy rainfall, drainage system and master plan) on flood disaster in Ibadan metropolis", is rejected ($F_{(6,743)}$=3.458, P<.05).

Table 3: Relative effect of independent variables on dependent variable

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	β		
(Constant)	1.793	.658		2.726	.000
Refuse disposal system\dumping location	.006	.030	.033	.183	.140
Dumping refuse inside waterways	.790	.190	.291	4.165	.000
Attitude of environmental health Officer	.049	.046	.195	1.083	.053
Heavy rainfall	.415	.150	.170	2.761	.003
Drainage system	.002	.027	.010	.093	.193
Master Plan	.070	.059	.202	1.188	.093

(R^2= .027, P<.05)

Table 3 showed the estimated regression of contributing factors (i.e refuse disposal system/dumping location, dumping refuse inside waterways, attitude of environment health officer, heavy rainfall, drainage system and master plan) on flood disaster in Ibadan. The results revealed that dumping refuse inside waterways (β=.291, P<.05) and heavy rainfall (β=.170, P<.05) have significant contribution to flood disaster while refuse disposal system/dumping location (β=.033, P>.05), attitude of environment health officer (β= .195, P>.05), drainage system (β= .010, P>.05) and master plan (β= .202, P>.05) have no significant contribution to flood disaster in Ibadan metropolis.

DISCUSSION OF FINDINGS

This study revealed that the respective variables of refuse disposal system, dumping of refuse inside waterways, attitude of environmental health officer, heavy rainfall, and drainage system and city master plan when taken together had significant contribution to flood disaster in Ibadan. The finding of this study is in agreement with Adebayo and Jegede (2010) who in a study that found that flood disaster results from excessive rainfall, blockage of natural drainage channel, and the overflow of riverbank ways. Specifically, this study found that dumping of refuse inside waterways and heavy rainfall had significant contributions to flood disaster in Ibadan metropolis. The finding supported Brook (2003) who found that the occurrence of potentially damaging flood events are caused by dumping of refuse and improper channelization of drainage system.

In this study, dumping of refuse inside waterways contributed significantly to flood disaster. This is because waste dumped inside water ways hinders the free flow of water down streams. Blockages of river beds and drainage channels with solid waste result into occurrence of flooding. Ajala (2003) noted that one of the greatest threats to man's health is inefficient disposal of waste. Nwankwo (2004) corroborated this when she said improper disposal of waste constitutes serious threat to human health and to the achievement of sound environmental sanitation.

Conclusion

It was concluded as follows:

I. That refuse disposal system, attitude of environment health officers, drainage system and city master plan contributed to flood disaster, though not significant.
II. Dumping of refuse inside waterways and heavy rainfall stand out as significantly contributing to the flood disaster.

Implication of the study

The findings of this study have some important implications for environmental health education intervention on environmental practice of residents of the flood affected areas in Ibadan Metropolis. Heavy rainfall and dumping of refuse inside waterways contributed significantly to flood disaster in the study. Human induced climate change is inextricably linked to heavy rainfall which eventually leads to flood disaster. People continue to embrace the unhygienic methods of waste disposal such as open dumping and stream dumping as a result of inadequate health knowledge and poor attitude to environmental management. The needed attitudinal change for eventual practice of good management of solid waste can be achieved through environmental health education that is Nigerian focused and culturally responsive.

Recommendations

The identified factors of dumping of refuse inside water ways, attitude of environmental health officers, heavy rainfall, drainage system and master plan which have continued to contribute to flood disaster have to be addressed. This is with a view to stemming the tide of flood disaster in Ibadan metropolis. It is along this line that the following measures are suggested.

1. In this study, dumping of waste inside waterways largely contributed to flood disaster, there is therefore the need to provide adequate waste disposal bins in strategic areas in Ibadan metropolis to discourage indiscriminate refuse dumping.
2. Government must take a bold step towards solving the problem of indiscriminate dumping of waste by providing funds. This is because availability of sufficient funds will encourage provision of more facilities and employment of adequate sanitary inspectors.
3. Inculcation of good environmental management habit should be embarked upon by government at all levels through public advertisement and campaign on radio, television, newspapers and magazines.
4. Proper disposal of waste can be encouraged through the promotion of environmental health education by print and electronic media, theatre groups and advertising industries.
5. Community Development Associations along with Landlord Associations should monitor the drainages provided in their areas to ensure that refuse is not dumped inside waterways to allow for free flow of water.
6. Environmental Health officers must be alive to their responsibilities by ensuring strict compliance of the people with enacted law on environmental sanitation.
7. Ministries of Lands and Housing along with town planners must ensure re-organization of overcrowded areas and ensure that house are not built on waterway.
8. Environmental health education must be entrenched in schools curricular at all levels of education in Nigeria.

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