



# An assessment of public perception of flooding in Akure, Nigeria

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## Abstract

Lives and properties are annually threatened by perennial flooding as a result of climate change and anthropogenic activities all over the world. This paper has assessed of the public perception flooding in Akure, Nigeria. The study utilized both primary and secondary data. Secondary data were sourced from the literatures on flooding while the primary data were sourced through structured questionnaires which were administered to household heads randomly selected from people living in the flood prone areas chosen (Odo-Ikoyi, Isolo, Ala, Oshinle, Isikan, Ijoka and Danjuma). A total of 163 questionnaires were administered to the household heads residing in the flood expose areas without bias; 23 questionnaires were administered to the targeted respondents in each of the areas selected for this study systematically at the interval of 10 building. The study revealed that indiscriminate refuse dumping, poor town planning practices, poor drainage system, building too close to the river bank, high rainfall, blocked drainages and overpopulation are causes of flooding in the study area. The study recommends environmental enlightenment programmes, proper land use planning, accurate weather forecast, appropriate environmental law preventing indiscriminate refuse disposal as the sustainable measures that could prevent flood disaster in Akure.

**Keywords:** Flooding; Natural Disaster; Urbanization; Sustainability; Environment

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## 1. Introduction

There is no doubt that the world is under a tough menace from the environment: From China to Mexico, Indonesia, United States of America and United Kingdom, analysts have argued that the environment was only responding to the mismanagement heaped on it by man's activities (Christopherson, 1997). The concern is that the world may be getting close to extinction through natural tragedy unless proximate actions are taken; and the signs are just too noticeable to be ignored (Christopherson, 1997 and Oyegbile, 2008). Specifically, in May 2008, floods triggered by torrential rains killed dozens of people across China, while thousands of others were victims of landslides caused by the downpours. China is not alone. In the United States of America, the Mississippi River caused damages put at several millions of dollars when it over flew its banks, flooding some cities, towns, farmlands and major industrial installations over a distance of about 250km and ravaging lower before it heaped downstream. Apart from the Mississippi-Missouri River Systems of 1993, and that of 1995, world records of flood have it that severe floods were experienced in Norway, China, Bangladesh, Ghana, The Netherlands and South Florida, (Christopherson, 1997).

In February 2000, a cyclone swept across Mozambique which left some 950,000 people homeless as floods devastated large areas of low-lying lands. Roads, homes, bridges and crops were destroyed (Aderogba, 2012). Aderogba (2012) opined that behaviours averting the annual tragedy of floods often occasioned by torrential rains and living habits of the inhabitants, government at all level must step up renovation activities that would secure main roads and drainage channels across the cities and towns free of encumbrances and serviceable.

Epa (2011) gave a remark of the incident that happened in Ghana in August, 2007, where floods involved about 350,000 people with 49 casualties in the Northern parts of the country alone causing an estimated wreckage of over \$130 million, not including long term losses. Even though, the Government of Ghana inaugurated statutory supervisory agencies such: as Ministry of Works and Housing, City Engineers of Accra Metropolitan Assembly and Lands Department and commissioned consultants to see to the reduction effects of flood on human lives and properties (Adinku, 1994; Netherlands Engineering Consultant (NEDECO) 1962 and Report on Road and Drainage Rehabilitation on Accra (RRDRA) 1991). Yet, the methods employed by the aforementioned agencies such as; identifying watermarks on structures, media reports and aerial photographic interpretations are not enough to solve or mitigate flood hazards as new areas periodically experience flood (Kuma, 1996). According to Asumadu-Sarkodie, Owusu, and Rufangura, (2015), to adopt a sustainable approach for flood risk management, practitioners in Ghana needs to consider a mixture of measures for managing flood risk and plan these measures across the whole catchments. They stressed that increasing resilience to flood risk is a significant component of sustainable flood management. They submitted that resilience to flooding can be increased through varieties of measures including flood warning, flood defenses, natural management and quick and effective responses to flooding (Abolade, Muili and Ikotun, 2013).

In Nigeria, record shows that more than 200 people have lost their lives to flooding while hundreds of thousands have been displaced and properties worth millions of Naira have been razed by devastating floods across the country (Oluduro, 1988). Askew (1999) as cited by Etsienovbe (2011), opines that floods cause

about one-third of all deaths; one-third of all injuries and one-third of all damage from natural disasters. Flooding in various parts of Nigeria has forced millions of people from their homes, destroyed businesses, polluted water resources and increased the risk of diseases (Baiye, 1988; Akinyemi, 1990; Nwabani, 1991; Edward, 1997). Adeniyi and Omole, (2015) noted that flooding effect which are always negative may either be mild or heavy in the structural and erosional damage, loss of lives (human and livestock), a great disruption of socio-economic activities, destruction of agricultural land, contamination of water and environment in general, as well as displacement of humans. They stressed that, the effects of devastating floods, which have especially been witnessed in Sokoto, Kebbi, Niger, Kogi, Nassarawa, Taraba, Benue, Oyo, Ondo and other states have left one to wonder what consequences of this natural disaster could be in the event of recurrence in the near future. Oyinloye, Olamiju and Babalola (2013) reported that the major causes of flood in Akure, the capital city of Ondo State were as a result of building too close to river banks, lack of drainage facilities and block drains. Another prominent issue is the high rate of urbanization manifested in form of high population and overcrowding. The population is greater than what the existing facilities can cope with. Consequently, municipal services like waste disposal machineries are lacking, forcing urban residents to dump their wastes in drainage channels.

A lot of paper has been written on flooding in Nigeria and Akure in particular but only few focused on the sustainable measures that could be taken to curb future recurrence of this disaster which has claimed many lives, renders many people homeless, destroyed infrastructures and as well carted away properties. Flooding is an annual disaster, if this year passes by and nothing is done to curb or reduce this menace, subsequent ones might be more disastrous. This paper examined public perception of flooding in Akure, Nigeria and the sustainable measures to curb future recurrence.

## **2. Literature review**

Sustainability concept is the concept that is pertinent to the study of this nature. Sustainability is a large term that considers the environmental, social, and economic aspects of challenges and their respective solutions. Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland, 1987). Physical, economic and social patterns of human development can affect sustainability at local, national and global level. Land use planning can play a role in improving the sustainability of communities, due to planning being related to how, where, and when anthropogenic development occurs.

The phenomenon of flood hazards, according to Ward (1978), comprises several aspects including structural damage, erosion damage, loss of lives and properties, disruption of social-economic activities, including transport, communication and the damage of agricultural land. Any development process that ignores sustainability would hardly make any positive and enduring influence that could stand the test of time. Since the aim of sustainable development is to ensure that the needs and aspirations of the present are met without compromising the ability of the future generation to meet their own needs, therefore, it will go a long way in solving urban flood challenges in the study area.

However, lives and properties are annually threatened by seasonal flooding as resulting from climate change and human activities all over the world. Ward (1978) reported that the November 1970 flood in the Bay of Bengal drowned 600 people and rendered thousands homeless and that the 1973 Mexico flood damaged the city and rendered 200,000 people displaced within a short time. Flooding can be attributed to hydro-meteorological conditions such as excessive rainfall, climate change causing ice melting and natural disasters like Tsunamis of 26 December, 2004 that destroyed lives and properties in many countries of Southeast Asia, Sri Lanka, Kenya, Somalia and the India subcontinent. Asumadu-Sarkodie et al. (2015) reported the flood disaster that occurred in Cumbria in 2005 and 2009 and the widespread flooding across England in summer 2007, which resulted to loss of lives and major influence on the health and well-being of people living and working in the areas affected. The cost of the summer 2007 floods amounted to more than £3.2 billion (Epa, 2011), with the floods in Cumbria in 2005 causing damage of £450 million (Morris, Penning-Rowell, and Chatterton, 2010). But according to Gillisen, Alexander, Matezak, Petterson and Bruzzone (2016) there has been a sustainable approach to flood disaster in England through effectiveness of flood emergency management system (FEMS). Flood emergency management has served as a important strategy for minimizing the consequences of flood events. Dedicated policy for flood emergency management is seen, with multi-agency flood plans as a standard component of common practice. Moreover, formal legal mechanisms underpin effective integrated working between emergency responders (e.g. duties to cooperate and formation of Local Resilience Forums) and certain responders are actively involved in activities to enhance community preparedness for floods (Wohl, 2000).

Flooding is a disaster and disaster can either be natural or Man-induced. Appearing to occur without a direct human involvement, natural disasters are sometimes called an act of God. Examples of Natural tragedies include Flooding, Tsunami, Hurricane, Landslide, Earthquake among others. Natural accidents become natural disasters when people's lives and livelihoods are damaged. Human and material losses caused by natural disasters are a major obstacle to sustainable development. By issuing accurate forecasts and warnings in a form that is readily understood and by educating people how to be ready against such hazards before they become disasters, lives and properties can be protected (World Metrological Organisation, 2013). Disasters having an element of human intent, negligence, error or involving a failure of a system are called man-induced disasters. Examples of man-induced disasters are power outage, terrorism, war among others. According to Ojo (2013), man-induced disasters like power or telecommunication outages may be caused by thunderstorms, tornados or earthquakes though the root cause is a natural phenomenon, they are considered to be man-induced disasters.

One of the factors identified as contributing to the routine natural disaster is climate change. Several Nigeria cities including Lagos, Ibadan, Jos, Port Harcourt, Sokoto, Kaduna, Owerri, Yenagoa, Calabar and Ado-Ekiti currently face high risk from climate change impacts (Wahab, 2015). He further stressed that vulnerabilities are heightened by the poor quality of housing, infrastructure, drainage and sea defenses. The realities of climate change are much more evident in several Nigerian coastal areas and occurring in location previously not at risk. The coastal communities in Lagos, Ondo, Bayelsa and Rivers States are highly vulnerable to climate-induced risks such as sea level rise, storm surges and flooding while the inland cities are equally exposed to temperature increase, flooding and storms.

Adeleke (1978) noted that the basic cause of urban flooding is man's modification of the basic network and channels characteristics during the process of settlement on the particular flood plain. He stressed that natural surfaces are replaced by more impermeable roads and concrete, which have very low infiltration capacity. The hydrological consequences of this is that water, which should normally infiltrate into the ground or be intercepted by vegetation and then defer for some time before running, would be immediately available for runoff. This considerably decreases the lag time between rainfall and storm water and increase the runoff with concomitant increase in peak discharge and total volume runoff. Almost all cities in Nigeria were heavily affected by flooding recently including, Delta, Anambra, Makurdi, Kogi, Yobe, Ekiti, Osun, Lagos and Akure the Study Area. Oyinloye et al. (2013) reported that the major causes of flood in Akure were as a result of building too close to river banks, lack of drainage facilities and block drains. Another prominent issue is the high rate of urbanization manifested in form of high population and overcrowding. The population is greater than what the existing facilities can cope with. Consequently, municipal services like waste disposal machineries are lacking, forcing urban residents to dump their wastes in drainage channels

According to Bakare and Anjorin, (2016) suggested that the best practice approaches in combatting vulnerability to flood disaster risk in Ala-River noted that flooding in Ala community had been wrecking bane since 2010 on the residents of the affected areas and their materials. They stressed that most house owners in Ala Community do not have legal titles of the existing properties as they build on the buffer zone, hence making it difficult for government at the state and local level to provide needed infrastructure. In addition to the findings of these authors, neither the state government nor the local government has done anything against the recurrence of the flood disaster in Ala community as the problem resurfaces every year. Since people built houses on the setbacks to Ala River which is illegal, government should order the residents to transfer and wrecking of their illegal structures should follow; this action will reduce/eradicate flooding in Ala community and as well send signal to everyone that built structures along flood plains in every part of Ondo State and Nigeria in general that their structures could be demolished one day by the government. Apart from Ala Community, some other areas like Odo-Ikoyi, Isolo, Isikan, Danjuma, Oshinle, Ijoka, Sijuwade, etc, usually experience heavy annual flooding with varying causes ranging from blocked drainages, lack of drainage systems, indiscriminate dumping of refuse, building of Structures along water ways/flood plains among others. Flooding is a natural occurring in every part of the world. Different measures are being taken in curbing this life threatening disaster as revealed by literatures cited.

However, flood perception, among people who believe that it is not natural, may vary for people living along different rivers or for people along the same river over decades or centuries (Wohl 2000). Schumm (1994) has noted that inappropriate responses to fluvial processes may arise from a perception of stability (which leads to the conclusion that any change is not natural), from a perception of instability (which implies that change will not cease), or from a perception of excessive response (which suggests that changes will always be major). For instance, in some cases, low levels of awareness of the risk, has encouraged complacency. A study of inhabitants of Polish regions struck by the disastrous floods of 1997 and 1998 revealed that their perception of the risk was low and the majority (70%) of participants in the study admitted that they did nothing to minimize the danger of floods or to protect themselves (Kruszewski and Madej, 2000).

Also, a majority of residents of the southwest shore of Lake Superior (USA) believe that flooding is induced primarily by the authorities manipulation of lake levels. Respondents perceived that lake levels were primarily dependent upon human regulation systems despite data demonstrating that higher than average precipitation, coupled with lower evaporation rates, were the main cause of the increased lake level (Rashid and Hufferd, 1989). Wilson (1990) conceives perception in terms of transforming input (e.g., flood warning) to output (e.g., mitigation response) while Slovic (2000) sees risk perception as the intuitive judgment of individuals and groups, Raaijmakers, Krywkow and van der Veen (2008) defines risk in terms of relationship of three key factors, namely: awareness, worry and preparedness. He notes that in an event of increase in any of the factor or a combination of these factors raises the perception of risk and this contributes to enhanced flood resilience which will lead to decrease of worry and awareness over time. Researchers in Nigeria and Ondo State in particular have tried their best in proffering solution to this menace of flooding there is need for a sustainable approach hence the relevance of this study.

### 3. Study area

Akure is the capital city of Ondo State, in south-western part of Nigeria; located in latitude 7° 15'N and 7° 28'N of the equator and longitude 5° 06'E and 5° 21'E East of the Greenwich meridian, the total land area is approximately 41.2 km<sup>2</sup> Fadairo, (2013).

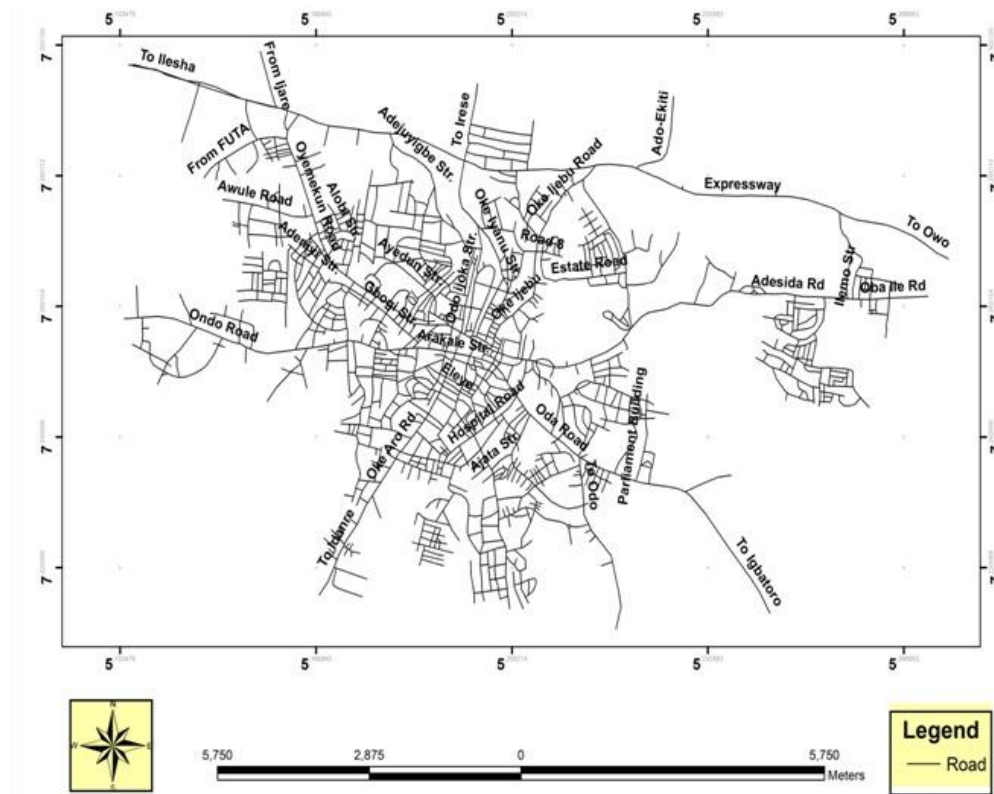


Figure 1. Map of the Study Area

The rate of urbanization in Akure has been on the increase because of the dual roles it plays as the State capital and local government headquarter, hence the population has been on the rise, with the concentration of government administrative activities at both the local and state levels, coupled with other commercial and few industrial activities in the city, where the last official population figure of Akure stands at 353,211 (NPC, 2006) (Figure 1).

#### 4. Methodology

The study utilized both primary and secondary data. Secondary data were sourced from literatures while primary data were collected on site using personal observation and structured questionnaires which were administered to household heads randomly selected from people residing in the flood prone areas selected for this study: Odo-ikoyi, Isolo, Ala, Oshinle, Isikan, Ijoka and Danjuma. The sample size was drawn from the total number of building that falls within flood prone areas. The total number of building is 817 (Table 1). 20% of the total number of buildings was taken to form the sample size which amounted to 163. Therefore, 163 questionnaires were administered to the household heads in the flood prone areas without bias. However, 23 questionnaires were administered to the targeted respondents in each of the zones selected for this study systematically at the interval of 10 building.

**Table 1.** Number of buildings in the flood prone areas

S/n	Flood prone areas	Number of buildings
1	Ala	157
2	Ijoka	166
3	Oshinle	75
4	Danjuma	100
5	Isikan	102
6	Odo-Ikoyi	112
7	Isolo	105
	<b>Total</b>	<b>817</b>

*Source: Field survey, 2017*

### 5. Findings and discussion

Findings showed that 9.2% of the respondents stated that flood occurrence is every year, 12.9% of the respondents stated that flood occurrence is once in two years, 63.8% of the respondents revealed that they experience flood every wet season while 14.1% of the respondents stated that they experience flood just twice in a year. This suggested that the problem of flooding in the study area occurred every wet season thereby posing threats to lives and properties of the people in the study area (Figure 2).

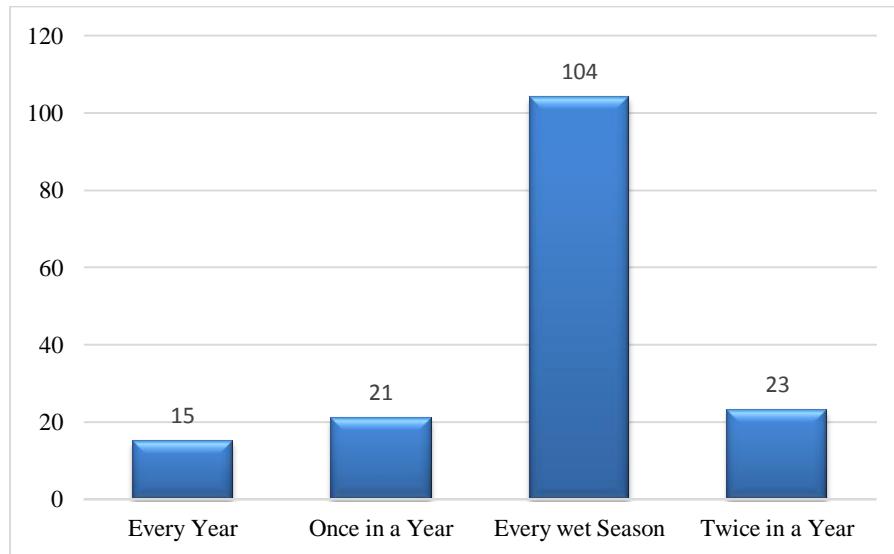


Figure 2. Public Perception of flood occurrence in the study area

#### 5.1. Public perception of the causes of flooding in the study area

This section analyses and interprets data collected on the perception of residents’ on flooding in the study area. The variables used to assess the perception of residents’ involved the subjection of the feelings of the residents in the study area to a 5-point Likert scale in which the feelings of the people were rated as 1= Strongly Agreed; 2= Disagreed; 3=Neutral, 4= Agreed and 5=Strongly Agreed to measure their perception on flooding in the study area. The findings are as presented in the following tables and discussed accordingly. Perception as discussed in this section is related to attitude.

In order to obtain the aggregate Public Perception Index (PPI) of each project, a weight value of 5, 4, 3, 2 and 1 is respectively assigned to each rating above. The summation of weight value (SWV) for each service is obtained from the addition of the product of weight value of each rating and the number of responses to each rating (Afon, Abolade and Okanlawon, 2006). The RPI is finally obtained by dividing MWV by the total respondents that rated each project.

$$PPI_{i,j} = \frac{MWV_{ij}}{N_{ij}}$$



Where:

PPI<sub>ij</sub> = Public Perception Index i-j

MWV<sub>ij</sub> = Mean Weight Value of facility i-j

N<sub>ij</sub> = Respondents' rating each projects i-j

Presented in Table 2 is the aggregate respondents view on how agreed of the each identified variables in the study area. The nearer the PPI to 5, the more significant are such variable to public perception of flooding (Table 2).

**Table 2.** Public Perception Index (PPI)

Variables	Strongly Disagreed (%)	Disagreed (%)	Neutral (%)	Agreed (%)	Strongly Agreed (%)	SW V	MWV
Heavy rainfall	-	-	-	63(38.7)	100(61.3)	752	4.61
Indiscriminate dumps of waste into water channels	2(1.2)	6(3.6)	32(19.6)	38(23.3)	85(52.1)	687	4.21
Lack of pre-flooding warnings	-	-	50(30.6)	53(32.5)	60(36.9)	662	4.06
Dam spills	20(12.2)	30(18)	35(21.8)	38(23.3)	40(24.5)	537	3.30
Ocean tides	6(3.6)	14(8.5)	25(15.3)	43(26.3)	75(46.0)	656	4.02
Overflow of water bodies	-	5(3.0)	20(12.2)	60(36.9)	78(47.8)	700	4.30
Damaged pipe-borne water	12(7.3)	24(14.7)	36(22.0)	48(29.4)	43(26.3)	575	3.53
Rapid snow melts	-	-	31(19.1)	33(20.2)	99(60.7)	720	4.42
Blockage of flood channels	-	12(7.3)	19(11.7)	29(17.8)	103(63.2)	712	4.37
Increase in development	-	-	-	99(60.7)	64(39.3)	716	4.39
Weak institution capacity /emergency readiness	3(1.9)	14(8.6)	17(10.4)	86(52.8)	43(26.3)	641	3.93
Non-functional drainage	5(3.0)	10(3.0)	35(21.8)	43(26.3)	70(43.0)	652	4.00
Total							49.14

Source: Field Survey, 2017

The average PPI denoted by

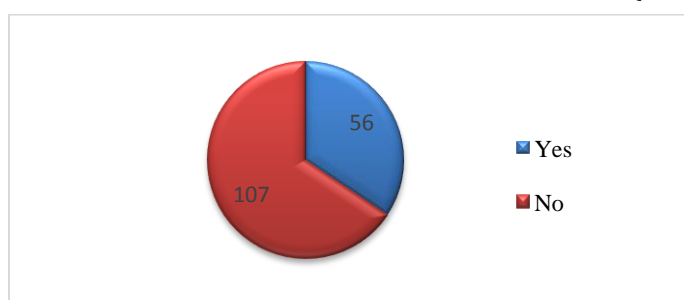
$$PPI = \frac{\sum PPI}{n}$$

Where n = the number of identified variables.

Therefore, the PPI for the study area is 49.14/12 = 4.1. This implication of this is that most of the variables lies between agreed and strongly agreed. Furthermore, of the twelve identified variables, heavy rainfall is rank highest (4.42) while dam spills is rank lowest (3.3) in the study area. Corroborating the studies of Onwuka, Ikekpeazu and Onuoha (2015), Ajaero, Okoro and Ajaero (2016) and Onwumele (2018), rainfall intensity increased over the years due to climate change thereby causing flood events in different parts of the world.

However, from the reconnaissance survey, most of the building in the study area did not conform to planning standards that stipulates a set-back of 30m from rivers while some people did not have approved plan for their building. Findings revealed that majority (65.9%) of the respondents in the study area did not have approved plan for their building while (34.1%) had building plan approval. It is evident that Town Planning officials were not contacted while putting up these unapproved structures (Figure 3).

Floods never occur in an area without leaving a scar on its victims. The victims of flood disaster incur different forms of loss. Findings established that majority (51.1%) of the respondents losses their property during flooding while 20.9% of the respondents agreed that the nature of their loss is outbreak of diseases that afflict them. Findings also revealed that 14.1% and 3.1% revealed that the nature of the loss is the death of their livestock and collapse building respectively in the study area. A small (1.8%) proportion of the respondents classifies their loss to be the loss of the relatives and loved ones (Table 3).



**Figure 3.** Building Plan approval before construction

**Table 3.** Nature of Loss

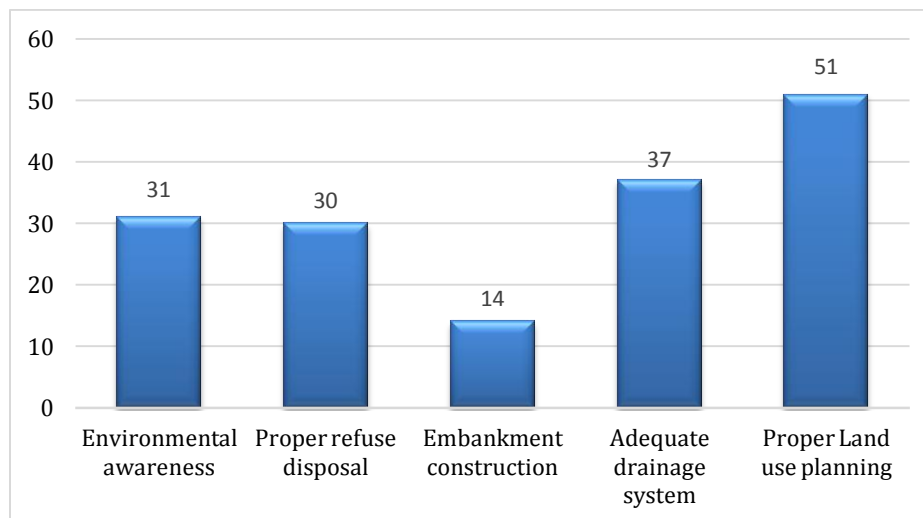
Causes	Frequency	Percentage (%)
Loss of property	84	51.5
Damaged vehicles	5	3.1
Loss of lives	3	1.8
Outbreak of diseases	34	20.9
Collapse building	14	8.6
Death of lives stocks	23	14.1
Total	163	100.0

Source Field Survey, 2017

Findings revealed possible control or sustainable measures that could be taken to curb flood disaster in the study area. It was discovered that 19.0% of the respondents believed that the possible control measure to curb flooding in the study area is the creation of environmental awareness on the danger of flooding through Radio/Television stations and social media whenever wet season draws near informing residents that they should not build house on the flood plains, drop refuse indiscriminately, blocked drainages should be opened for free flow of runoff waters and environmental enforcement agencies should always be moving round to apprehend violators and charge them to court and there should also be public enlightenments by meteorologists and the Ministry of environment.

Findings established that 18.4%of the respondents noted that proper refuse disposal is a possible flood control measure in the study area. They asserted that waste bin should be provided for every household and

environmental management agency should be moving round with their waste van to evacuate refuse generated. Findings revealed that 8.6% of the respondents stated that embankments should be constructed. Findings established that 22.7% of the respondents noted that provision of adequate drainage system is a possible flood control measure in the study area. Findings showed that 31.3% of the respondents constituting the majority believed that proper land use planning will go a long way in controlling flood in the study area (Figure 4).



**Figure 4.** Possible flood control measures in the study area

## 6. Conclusion and recommendations

Flooding is a natural disaster that affects virtually all areas in the world with similar causes. There is no city in Nigeria that is free of flooding. This paper has examined public perception of the flooding in Akure, Nigeria. The study discovered that causes of flooding in the study area are indiscriminate refuse disposal, Building too close to the river banks/ flood plains, poor drainage systems, blocked drainages, Poor town Planning Practices and Urbanization in form of high population and overcrowding. The population is greater than what the existing facilities can cope with. Amphibian caterpillars to remove debris/wastes blocking the river courses in some part of the State by the last administration must be maintained and improved on by the incumbent administration. Intervention of ecological funds to channel river courses; construction of embankments along river courses; enlightening and educating the residents on how to manage and dispose their wastes and to keep their environment clean are what the State government needs to do to reduce flooding in the study area under the monitoring of the Waste Management Authority and Environmental department of the local government. The study submitted that proper land use planning is one of the sustainable measures that could be employed in curbing the recurrence of flood disaster in the study area. The following recommendations will serve as a useful tool in enhancing sustainable flood measures in the study area:

- Environmental enlightenment programmes on Radio stations, Television stations, Newspapers and Social media should be organized periodically or whenever rainy season draws near for educating and enlightening the inhabitants of the study area, on the causes, problems and possible preventive measures of flooding.
- Most of our outdated Environmental and Town planning laws must be reviewed. Also, environmental laws should be enforced to prevent indiscriminate dumping of refuse in drainage channels and monthly environmental sanitation exercise must be enforced and sustained. Also, waste bin should be provided for every household as this will discourage inhabitants from disposing refuse indiscriminately.
- Making available all required equipment (e.g. vehicle) for environment staff to be able to perform effectively. Also, training and retraining through short course workshops, seminars, further and higher degrees for staff members.
- Drainages blocked with sand should be opened and there should be provision for adequate drainage systems. Also, buildings constructed along flood plains or river channels should be demolished. Regular monitoring of developments within and outside the study areas.
- Meteorologists should be more proactive to weather forecasts and enlighten the public on flood disaster and controls. Areas liable to experience immense flood should be stated earlier and all hands must be on deck to avoid the disaster.

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