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FLOOD DISASTER:AN EMPIRICAL SURVEY OF CAUSATIVE FACTORS AND PREVENTIVE MEASURES IN KADUNA, NIGERIA

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ABSTRACT: *Flood is a water induced disaster that leads to temporary overflow of dry land and causes serious damage on lives, property, and infrastructures. Flood has created a lot of damaging effect in Nigeria, resulting to the death of people, collapse of buildings, destruction of properties, damage of agricultural produce, loss of land and increased government expenditure. Despite persistent occurrence of this disaster, there is limited research geared at studying the factors that cause flooding and measures to effectively control it. To fill this gap, a random survey was conducted on 40 households, community leaders and agencies responsible for the management of flood in Kaduna State, Nigeria. Relative Important Index (RII) was employed for ranking the factors and the preventive measures. From the result, the common factors that cause flooding were poorly constructed drainage, heavy rainfall and improper waste disposal. Preventive measures for flooding were proper dumping of refuse, awareness of the public on the need to adhere to environmental rules, empowerment of government agencies to monitor residential building construction, implementation of government policies on flood and sanitization of town/city planners. Increased awareness at all levels (community, local, state and federal) of the risk of flooding, appropriate response techniques in mitigating flooding via implementation of flood control policies and flood early warning system to control flooding in Nigeria were also recommended.*

Keywords: Flood, Disaster, Environmental hazard, Causative factors, Preventive measures.

INTRODUCTION

Flooding, for long has been one of the most common forms of natural disaster (Oriole, 1994). It usually occurs when a river spills its excess water and when it goes beyond its capacity. The surplus water overflows the banks and runs into adjoining low-lying lands. Studies conducted by Folorunsho and Awosika (2001); Adebayo (2011) and Yahaya Ahmed and Abdalla (2010) revealed that flood occur mainly in three forms - coastal flooding, river flooding and urban flooding. Coastal flooding occurs in the low-lying belt of mangrove and fresh water swamps along the coast, river flooding occurs in the flood plains of the larger rivers, while short-lived flash floods are associated with rivers in the inland areas and sudden heavy rains that change into a destructive torrent within a short period. Urban flooding on the other hand occurs in towns, on flat or low-lying terrain especially where little or no provision has been made for surface drainage, or where existing drainage has been blocked with municipal waste, refuses and eroded soil sediments.

Flood is caused by construction of buildings along flood plains; large scale road construction; encroachment into flood plains; indiscriminate dumping of refuse and municipal wastes on flood

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plains, inside streams, river channels, surface drains, and along road side (Onifade, Ruth, Adigun, Oguntunji and Ogunboye, 2014).

Globally, flood has been reported to have destroyed properties worth fortunes in different countries of the world (Aljazeera, 2010). Flooding in urban areas is seriously becoming an ecological menace in most countries as several coastal areas along the Atlantic Ocean, surrounding cities and river valleys are affected by flooding on a yearly basis (Jeb and Aggarwal, 2008). In tropical regions, cases of flooding of high magnitude that have resulted in serious consequences have been caused by heavy rain or thunderstorms, hurricanes, snow melt and dam failures (Jeb & Aggarwal, 2008). In some other countries, flood has also caused land degradation due to low-lying coastal areas and river flood plains (Abbas, 2008).

Nigeria as a country is not left out in the menace of flooding. According to Folorunsho and Awosika (2001) and Adebayo (2011), flood is no longer a new phenomenon in Nigeria and its destructive tendencies are sometimes enormous. The country has recorded one of the highest death toll in the West African region, particularly in the northern part of the country where entire villages and huge sparse of agricultural land have been destroyed by flood (African Research Bulletin, 2010).

Flood has therefore caused a lot of problems in the country, resulting to the death of people, collapse of buildings, destruction of properties and agricultural produce. The coastal cities of Lagos, Port Harcourt, Calabar, Uyo, Warri, Lokoja and Kaduna among others have severally experienced incidences that have claimed many lives and properties worth millions of Naira.

Furthermore, each year, the number of deaths from flooding of rivers is more than any other natural disaster. The effects of natural hazards such as flood can be felt at local levels, affecting communities and neighborhood, or at regional and national levels, affecting entire drainage basins and large sparse of land between states (Kwak and Kondoh, 2008).

This research focuses on flooding in Kaduna city, the capital of Kaduna State, Nigeria, because series of cases of flooding that has been recorded in the past decades. The most recent flood happened on the 13th of September, 2012 and it occurred after a torrential rainfall that lasted for days swept away at least 178 homes in Kaduna metropolis. Flooding has destroyed infrastructures within Kaduna Metropolis and its surrounding farmlands.

However, the response of government and relief agencies to floods in Kaduna and other parts of the country has only been in the area of rescue and supply of relief materials to victims of flood.

So far, nothing has been done to ensure that the hazard is prevented and its associated risk is reduced to the barest minimum (Jeb and Aggarwal, 2008).

Moreover, the Asian Disaster Preparedness Center (ADPC) (2005) reviewed that flood is very difficult to deal with and its devastating effects on buildings and its environment can be structural, economic, or health related.

The Associated Programmer on Flood Management (APFM) (2008) is of the opinion that reduction of risk of flooding will depend largely on the amount of information on floods that is

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available and knowledge of the areas that are likely to be affected during a case of flood. Therefore, it is necessary to use modern day techniques in developing measures that will help government and relief agencies in the identification of flood prone areas and in planning against flooding events in the future.

Based on the irreparable damage that has resulted from flooding, there is a dire need to direct urgent attention towards establishing the causative factors and effective measures to combat future occurrence of flood in Kaduna State, Nigeria. Hence, this study intends to critically assess the issue of flood in Kaduna State thereby establishing preventive and sometimes curative measures that will put a permanent end to this evil menace.

Management and Control of Flood in Nigeria

The Government of Nigeria is the primary initiator of measures for the management of flooding in Nigeria. Various institutions, policies and regulations have been set up by government to address issues relating to floods and activities that promote/influence flooding in Nigeria. These agencies are:

National Environmental Standards and Regulations Enforcement Agency (NESREA)

This is an agency of the Federal Ministry of Environment that is saddled with the responsibility of enacting and enforcing regulations that protect the environment from degradation. Examples of some flood-related regulations are:

i) Watershed, Mountainous, Hilly and Catchment Areas Regulations 2009: Aims to check and restrain activities in the above-mentioned areas that are inconsistent with proper land practices (Oladipo, 2010).

ii) Wetlands, River Banks and Lake Shores Regulations, 2009: The objectives of these regulations are management and conservation of water catchments and flood control, conservation and sustainable use of wetlands and pollution control (Oladipo, 2010).

National Emergency Management Agency (NEMA)

The Nigerian government established the National Emergency Management Agency (NEMA) through (Act 12 as amended by Act 50 of 1999), to manage and respond to disaster related activities in Nigeria such as flooding, accidents caused by natural and man-made sources (Adeoye, 2009). NEMA is saddled with the responsibility of formulating policies, assessment of natural and man-made disasters, provision of mitigating measures for disaster related activities, coordinating plans and programmes for offering relief items to victims of such disasters. It is essential to assess the activities of NEMA as it relates to identification of flood risk areas in order to develop prevention/mitigation measures in controlling flooding in the study area.

Since the inception of these agencies, policies and regulations the country's response to flood risk management has still been mainly that of relief management after a flooding incident. Even then, co-ordination of rescue operations has always been slow, exacerbating the damage and loss in the aftermath of the event (NEMA, 2011; Jeb & Aggarwal, 2008). Part of this problem may be due to lack of technical expertise for handling environment issues and insufficient information on flood

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vulnerability of different parts of the country, hence the need to introduce proven strategies to combat this menace.

National Erosion and Flood Control Policy (NEFCP)

This agency was established in 2005 with the goal of protecting the environment from degradation, loss of productive land and negative impacts of flood. They are responsible for ensuring coordinated and systematic measures in the management and control of the hazards of erosion and floods to reduce their impacts on people and the environment (Oladipo, 2010).

The Study Area

Kaduna state is the successor to the old Northern Region of Nigeria, with its capital being Kaduna. On the 27th of May, 1967, it was split into six states. One of which was the North-Central State, whose name was changed to Kaduna State in 1976. This was further divided in 1987 to form part of Katsina State. Kaduna State occupies part of the Central position of the Northern part of Nigeria (with Kaduna as its capital) and shares common borders with Katsina, Zamfara, Kano, Niger, Bauchi and Plateau States. The State also shares border with the Federal Capital Territory Abuja to the South-West. The State is latitude 10º31"N and Longitude 7º26' 25"E. The State occupies an area of approximately 48,473.2 square kilometers and has a population of more than 6 million (Nigeria Census, 2006). The entire land structure of Kaduna State is an undulating Plateau with its major rivers including River Kaduna, River Wonderful in Kafanchan, River Kogom, River Gurara, Aso and Galma River. There are two marked seasons in the State- the Dry season and the Rainy (wet) Seasons. The wet season is usually between April through October with great variations toward the North. On the average, the State enjoys a rainy season of about six (6) months. There is always heavy rainfall in the southern parts of the state like Kafanchan and northern parts like in Zaria with an average rainfall of about 1016mm. The State extends from the tropical grassland known as Guinea Savannah to the Sudan Savannah in the North. The grassland is a vast region covering the Southern part of the State. The prevailing vegetation of tall grasses and big trees are of economic importance during both the wet and dry season. Due to the heavy rainfall experienced during the wet season, the state has suffered from many cases of flooding in the past decade. Presented in Table 1 are some of the past records of flood incidents in the state.

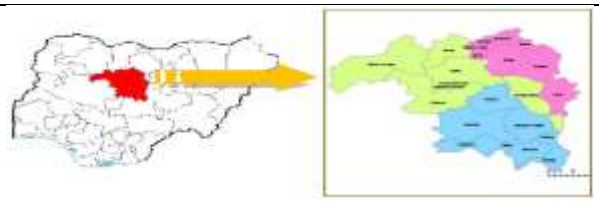	
Map of Nigeria showing Kaduna state. (google.com/image)	**Map of Kaduna metropolis showing major road and stream**

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Table 1: Recorded Cases of Flooding in Kaduna State

Date of occurrence	LGA	Location of disaster	Nature of disaster	Cause of disaster	No .of People Affected	Properties affected
23rd August 2003	Kaduna North/South LGA, Chikun LGA, jaba, soba jemaá kudan, Zaria LGA	Malali, Barnawa, A/Rimi, Kujama road	Flood	Heavy downpour of rain causing Kaduna river to overflow it's banks.	5000	30,000houses damage
12th September 2012	Kaduna North	Rafin Guza	Flood	Heavy downpour causing Kaduna river to overflow it's banks	40	40 houses
12th September 2012	Kaduna North	Haliru Dantoro close	Flood	Heavy downpour causing Kaduna river over flow it's banks	12	12 houses
12th September 2012	Kaduna South	Bashama road	Flood	Protracted downpour and over flow of river banks	22	22 houses
12th September 2012	Kaduna South	Barnawa road Kaduna Garden	Flood	Heavy downpour causing the river to overflow	72 persons	72 farmlands
17th September 2012	Chikun LGA	Romi village, Telvision district chikun LGA	Flood	Heavy downpour	107	107 houses
17th September 2012	Chikun LGA	Nassarawa	Flood	Heavy downpour	147	81 houses 66 farms

Source: (Kaduna State Emergency Management Agency, 2012 & National Emergency Management Agency, 2012).

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METHODOLOGY

The study utilized primary data obtained through questionnaire administration. Information was sought from respondents on the number of times they have experienced flooding; the causes of flooding and measures to mitigate flooding. The target populations for the study were households, community leaders and agencies responsible for the management of flood in Nigeria.

In administering the questionnaire, Kaduna State was stratified into twenty three Local Government Areas; out of which, five were randomly selected and these were: Kaduna North, Kaduna South, Sabo, Jaba and Chikun. One community was selected from the randomly selected Local Government Areas for the purpose of the study. These communities were: A/rimi –Kaduna North, Barnawa- Kaduna South, Romi- Chikun, Kwoi town- Jaba, Maigana town –Soba Local Government Areas. Ten copies of questionnaire were administered to 10 respondents in each of these communities. A total of fifty (50) questionnaire were distributed for the purpose of the study and forty (40) questionnaire were fully completed and retrieved.

The questionnaire covered the following: life span of building, location of building, flood Impact on infrastructure, water, sanitation and housing property. Key informants were also interviewed using a checklist at both district and community levels. The composition of key informants comprised all critical players that have a role to play in the management of floods. Some of the organizations were Kaduna State Emergency Management Agency (SEMA); National Emergency Management Agency (NEMA)**;** Community Leaders and Practitioners.

The key informant and focus group discussions at district and community levels covered the following topics: Main Livelihood pattern, Topography of the place, Types of structure built, Rainfall performance and its effects, Impact of floods on: Infrastructure, Water and Sanitation, Housing and Property, Underlying causes of vulnerability to floods, Coping Strategies and Development options to deal with the problem of floods.

Relative important index, significant index, frequency and percentages were used to rank the descriptive data. Coded broad sheets were thereafter used for extracting data from the returned questionnaires. These data collected were analyzed using SPSS 19 (Statistical Package for Social Science), mean score was used to achieve the stated objectives. Tables, figures, charts and plates were used where applicable to present data gotten from the field.

RESULT AND DISCUSSION OF FINDINGS

From the copies of the questionnaire distributed to respondents residing in the communities highlighted in Table 2, 40 out of 50 respondents constituting 80% of the questionnaire were fully completed and usable for the research analysis.

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Table 2: Details of Questionnaire Administered to the Respondents in Kaduna state

Description	A/Rimi	Barnawa	Romi Village	Kwoi Town	Maigana Town	Total
No. Distributed	10	10	10	10	10	50
No. Retrieved	8	5	8	10	9	40
Percentage %	20%	12.5%	20%	25%	22.5%	80%

Figure 3 displays the type of building, residents of kaduna live and the result indicated that 60% of the respondents live in hollow sandcrete block buildings, 40% live in mud building,while none of them lived in timber structures. Hollow sandcrete blocks are the most common and popular material for walling units used for domestic, industrial or commercial buildings. The statistic, indicated that residents of the selected communities lived in hollow sandcrete and mud buildings that can not withstand flood.

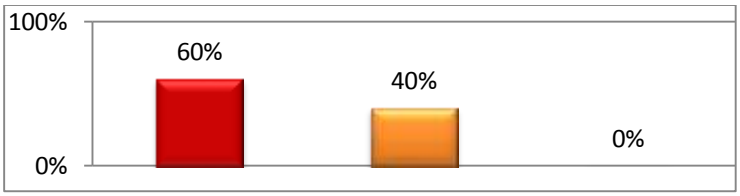

Figure 2: Building Types Occupied by Respondents

Table 3 indicates that 27.5% of the respondents lived in one bedroom apartment. 25% of the respondents lived in a self contained apartment, 15% of the respondents lived in two bedroom bungalow, 12.5% of the respondents lived in one bedroom bungalow and 10% of the respondents lived in three bedroom bungalow. This implies that the respondents are adequate distributed in the types of residential buildings that are liable to be affected by the flooding.

Table 3: Type of Residential Building

Description	Frequency	Percentage %
One bedroom apartment	11	27.5%
Self-contained apartment	10	25%
One bedroom bungalow	5	12.5%
Two bedroom bungalow	6	15%
Three bed room bungalow	4	10%
Two bedroom duplex & above	4	10%
Total	40	100%

Figure 3 indicates that one bedroom apartment had the highest percentage of (39.9%) which implies that it is the building type with the highest units destroyed by flood within the study area, next is the self-contained apartments with 24.9%, this is followed by one bedroom bungalow with 14.9%, two bedroom bungalow with 6%, and Two bedroom duplex and above had 4.3% on the

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estimate of units of buildings destroyed by flooding. Looking at the house distribution in the various communities, all the houses are affected by flood hence, the need for flood control in Kaduna to avert destructions of properties is important.

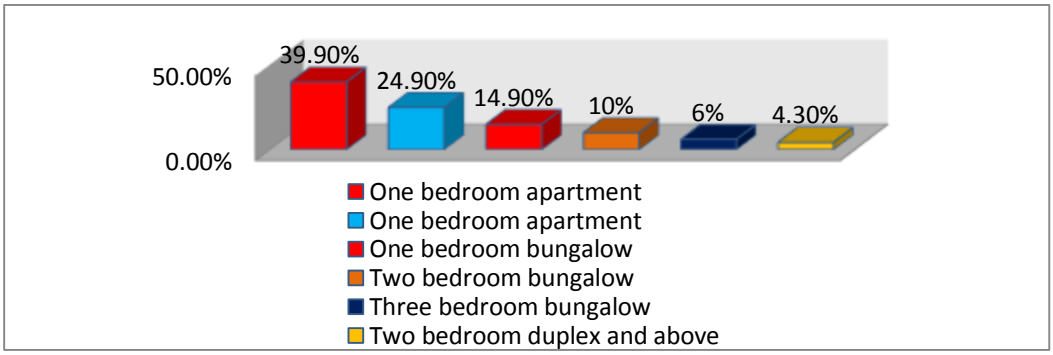

Figure 3: Estimate of Unit of Building Destroyed by Flooding.

Table 4 below indicates that the respondents who have lived for six to ten years accounted for 22.5% and those who have lived for twenty one years and above accounted for 5% of the total number of respondents. This shows that respondents have lived in the area for a period which is sufficient enough to enable them supply relevant information regarding flooding in the selected area.

Table 4: Period of Respondents Stay in Residence

Description	Frequency	Percentage %
0-5 yrs	17	42.5%
6-10yrs	9	22.5%
11-15yrs	10	25%
16-20yrs	2	5%
21yrs & above	2	5%
Total	40	100%

Table 5 indicates the number of times respondents have experienced flooding in the area. The greatest percentage which accounted for 72% have experienced flooding once within the first nine years of their stay and this happened in 12th-13th September, 2012 (SEMA, 2012). 24% of the respondents have so far experienced flooding twice on the 23rd of August, 2003 and 12th September, 2012. This category of respondents were those who had lived in the area for about ten to fifteen years. 4% of the respondents had experienced flooding three times; this were the categories of respondents that have stayed in the area for more than twenty years. From the discussion above it can be inferred that most of the respondents constituting 70% have experienced flooding at least once during their stay in the community. This shows that these respondents are adequately experienced to supply information needed for this study.

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Table 5: Flooding Experience of Respondents.

Description	Frequency	Percentage %
Once	18	72%
Two times	6	24%
Three times	1	4%
Four times	0	0%
Five times & above	0	0%
Total	40	100%

Table 6 shows the extent of damage caused by flooding and the result reveals that damage to roots of crops was ranked first having RII of 4.53. The reason for this is attributed to the fact that roots of crops are usually not more than 3cm deep. This can be easily washed away by flooding. Farmland was ranked second among the extent of flood damage having RII of 4.40; controlling flooding on farmland is not an easy task, but excess run off water can be slowed down and stored on the land to improve absorption, by loosening the soil and creating a rough soil surface after harvest, leaving it for as long as possible to allow water to soak in rather than run off. Residential Building was ranked third under the extent of flood damage having RII of 4.23. Whether the flood resulted from storm surge, riverine flooding, or urban flooding, the physical forces of the flood water which acts on the structure are classified into three load cases. These loads cases are hydrostatic loads, hydrodynamic loads and impact loads. Their load cases can often be exacerbated by the effect of water scouring soil from around and below the foundation. Road was ranked fourth with RII of 2.65 among the extent of flood damage. Most of flooding damage on roads was caused by poor or lack of good drainage system. Having good drainage system will reduce flooding on roads. However, commercial building was ranked seventh among the extent of flood damage with RII of 2.45. Reason being that, flooding mostly results from heavy rainfall that affects soil from around and below the foundation. This weakens the stability of the ground their leads to flooding. Ranked least was loss of lives with RII of 1.45.

Table 6: Ranking of the Extent of Damage Caused by Flooding.

S/N	FACTORS	E.S 5	V.S **4**	S **3**	S.S **2**	N.S **1**	N.R	T.S	RII	S.I	RNK	RMK
1.0	Crops	31	4	1	3	1	40	181	4.53	0.30	1	S
2.0	Farmland	25	9	4	1	1	40	176	4.40	0.29	2	S
3.0	Residential Building	19	15	2	2	2	40	167	4.13	0.28	3	S
4.0	Roads	4	6	9	14	7	40	106	2.65	0.18	4	S
5.0	Industrial Building	3	6	12	10	9	40	104	2.60	0.17	5	S
6.0	Bridges	1	7	12	12	8	40	101	2.53	0.17	6	S
7.0	Commercial Building	0	7	13	11	9	40	98	2.45	0.16	7	S
8.0	Religion building	0	6	10	14	10	40	92	2.30	0.15	8	S
9.0	Loss of lives	0	0	2	14	24	40	58	1.45	0.10	9	NS
	Total							**1083**	**27.0**	**1.80**		
	Mean							**120.33**	**3.00**	**0.20**		
	Std. deviation							**40.81**	**1.01**	**0.063**		

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Key: E.S = Extremely Significant, V.S = Very Significant, S = Significant, S.S = Slightly Significant, N.S =Not Significant N.R = Number of Respondent, T.S = Total Score, R.I.I = Relative Importance Index, S.I = Significance Index RNK = Ranking, RMK = Remark, S = (S.I ≥0.15) Significant, N.S = (S.I ≤ 0.15) Not Significant

Table 7 reveals that, poor drainage with RII of 4.70 was ranked first among the factors that cause flood on crops, farmland and residential buildings. The effect of poor drainage results to cracking of concrete, retaining walls, fences and foundation. When water enters a gap or crack in these parts of a building, it puts intense pressure on them causing unexpected problems. To repair poor drainage, the service of professionals is required to inspect defective foundation, clean and unblock exterior drains yearly, create gutters and downspouts to direct water away from building and foundation. Next in rank among the factors that a cause flooding was heavy rainfall with RII of 4.60. Rainfall in Kaduna metropolis is seasonal, with August and September having the highest frequency of occurrence. Heavy downpour usually affects crops, farmland and residential buildings during this period. Third in the rank is improper waste disposal having an RII of 4.40. Waste is any material that is no longer needed and disposed. Improper waste disposal leads to wearing off of the soil and flooding. Adequate waste disposal system will reduce flooding on any community. Erosion was ranked forth having an RII of 3.95 among these factors. Erosion is a hazard which washes the top soil gradually. Continuous washing off of the top soil weakens the crops, farmland and residential buildings and exposes them to flooding. The seventh factor is poor river channel maintenance having RII of 3.45. Due to the poor river channel, rivers over flows their bank exposing crops, farmland, and building to the effect of flood. Least in rank is deforestation having RII of 2.63. Deforestation is the removal of trees from a natural or man-made area. Deforestation increases flooding, by increasing soil erosion. As a consequence, the land no longer has trees to minimize the effect of water and this cause water to be retained longer than necessary on the surface of the earth. The retained water builds up and drains into river and other water bodies resulting to flooding.

Table 7: Ranking of the Factors that Causes Flooding

S/N	FACTORS	E.S 5	V.S 4	S 3	S.S 3	N.S 1	N.R	T.S	RII	SI	RNK	RMK
1	Poor Drainage	29	10	1	0	0	40	188	4.70	0.31	1	S
2	Heavy Rain	28	9	2	1	0	40	184	4.60	0.31	2	S
3	Improper waste disposal	22	12	6	0	0	40	176	4.40	0.29	3	S
4	Erosion	8	24	6	2	0	40	158	3.95	0.26	4	S
5	Dam failure	5	20	11	4	0	40	146	3.65	0.24	5	S
6	Topography of the soil	6	14	17	3	0	40	143	3.56	0.23	6	S
7	Poor River Channel Maintenance	4	15	17	3	1	40	138	3.45	0.23	7	S
8	Deforestation	3	5	14	10	8	40	105	2.65	0.17	8	S
	Total							**1238**	**30.9**	**2.04**		
	Mean							**154.75**	**3.85**	**0.26**		
	Std Deviation							**21.84**	**0.65**	**0.002**		

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Table 8 shows the result of the measures for mitigating or reducing the occurrence of flooding on residential buildings. Proper dumping of refuse was ranked first having an RII of 4.60, awareness of the public on the need to adhere to environmental rules was ranked second having an RII of 4.45. Next in rank was empowerment of monitoring bodies (NEMA, NESREA/NEECP) which was ranked third having an RII of 4.43. This was followed by implementation of government policies on flood having an RII of 4.40. Building levees to link canals was ranked tenth having an RII of 4.00 and afforestation was ranked least with an RII of 3.93. All these factors will mitigate flooding if properly and adequately implemented within Kaduna metropolis, and will greatly reduce the effect of flooding on crops, farmland and residential building.

Table 8: Measures of Reducing Flooding.

S/N	FACTORS	E.S 5	V.S 4	S 3	S.S 3	N.S 1	N.R	T.S	RII	SI	RNK	RMK
1	Proper Dumping of Refuse	26	12	2	0	0	40	184	4.60	0.31	1	S
2	Awareness of the Public on the Need to Adhere to Environmental. Rules	23	14	2	0	1	40	178	4.45	0.30	2	S
3	Empowerment of monitoring bodies(NEMA/NESREA/NEEECP) to Monitor flooding	22	13	5	0	0	40	177	4.43	0.30	3	S
4	Implementation of Government Policies on Flood	20	17	2	1	0	40	176	4.40	0.29	4	S
5	Town/City Planners Sanitization Should be Carried out	23	10	4	3	0	40	173	4.33	0.29	5	S
6	Stop Building Construction on Flood Plains	19	15	5	0	1	40	171	4.28	0.29	6	S
7	Building Flood Controlling Dam	18	15	4	3	0	40	168	4.20	0.28	7	S
8	Building Canals in the Various Cities	19	15	2	4	3	40	164	4.10	0.27	8	S
9	Prevention of Soil Erosion	16	13	9	2	0	40	163	4.07	0.27	9	S

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10	Building Levees to Link Canals	17	15	2	3	3	40	160	4.00	0.27	10	S
11	Afforestation	14	13	10	2	1	40	157	3.93	0.26	11	S
	Total							**1771**	**46.8**	**3.08**		
	Mean							**170.09**	**4.25**	**0.28**		
	Std. Deviation							**6.31**	**0.20**	**0.02**		

Key: **E.S** = Extremely Significant, **V.S** = Very Significant, **S** = Significant, **S.S** = Slightly Significant, **N.S** =Not Significant, **N.R** = Number of Respondent, **T.S** = Total Score, **R.I.I** = Relative Importance Index, **S.I** = Significance Index**RNK** = Ranking, **RMK** = Remark, **S** = (**S.I** ≥0.15**)** Significant, **N.S** = (**S.I** ≤ 0.15) Not Significant

CONCLUSION AND RECOMMENDATION

An effort was made to evaluate flooding and its causative factors in Kaduna, Nigeria. It was discovered that most of the buildings in the study area were made of sandcrete blocks and mud. The factors that responsible for flooding were highlighted to be poor drainage, dam failure, erosion, heavy rainfall, topography of the soil, improper waste disposal, poor river channel maintenance and deforestation. However, the consensus among respondents was that factors such as proper dumping of refuse, afforestation, building near canals in the various cities, building levees to link canals, stoppage of building construction on flood plains, prevention of soil erosion, building flood control dams, implementation of government policies on flood, empowerment of monitoring bodies (NEMA, NESREA/NEECP) and town/city planners sanitization will reduce flooding. If menace - flooding of communities in Kaduna, Nigeria is continually ignored, the risk of exposure to flooding will be on the increase and more lives and properties will be lost on this cause. Based on this, the following are therefore suggested in order to reduce flooding:

- Increase in awareness at all levels (community, local, state, and national level) on the risk of flooding and appropriate response technique in mitigating flooding.
- Good governance; implementation of flood control policies, flood early warning system.
- Installment of planning agencies with the obligation to ensure compliance with building standards that will enhance construction of good structures.
- Complete detailed design including the site plan and site analysis should be produced to determine the effect of flood on the building before the actual construction on site.
- Communities should be investigated to determine flood risk zones before carrying out construction activities in that region.
- Evaluating data such as drainage, density and rainfall distribution in different metropolis will help minimize the rate of flooding.

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