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HEALTH AND ENVIRONMENTAL IMPLICATIONS OF FLOODING PREVALENCE ON THE PEOPLE OF KHANA LOCAL GOVERNMENT AREA, RIVERS STATE

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Abstract
Flooding had a far-reaching implication on mankind causing extensive damage affecting human settlement and infrastructure. It is one of the common natural disasters that has serious impairment on the environment and health of the people. This study investigated the prevalence of flooding and its health and environmental implications on the people of Khana Local Government Area of Rivers State. The study adopted a descriptive survey research design and the population of the study consisted of the people of Khana Local Government Area of Rivers State. Stratified and simple random sampling techniques were used to select 250 participants for the study. Data was collected using a self-developed and structured questionnaire titled 'Health and Environmental implication of flooding questionnaire with a reliability coefficient of 0.94. Data were analyzed using frequencies and percentages for socio-demographic data and research questions while a t-test was used for testing the hypotheses at a 0.05 level of significance. The findings of the study showed that the prevalence of flooding in the area was moderate (40.7%) The findings of the study also showed that the health implications of flooding are enormous as the majority (89.0%) of the respondents indicated that flooding contributes to loss of human and animal lives; Also, (83.7%) of the population attested to the fact that flooding contributes to the spread of diseases while (82.1%) of the respondents indicated that flooding leads to drowning. The result also showed that flooding comes with many environmental implications especially the destruction of farmlands and properties. There was a significant difference in the perceived implications of flooding based on gender and location respectively. The study recommended among others that community stakeholders and youth leaders should embark on health and environmental awareness campaigns on the dangers of flooding in an area.

Keywords: Environment, Flooding, Health, Implication, and Prevalence

Introduction

The rain and the soil water are very important to agriculture and farmers as it enhances and facilitates farming and crop production. However, when this rain and soil water becomes excess in our environment, it results in flooding. Flooding is a common natural disaster that has deep, far-reaching consequences. It impairs human health and disorganizes the environment and communities. According to Aderogba (2012), flooding can cause physical trauma, heart attack, electrocution, carbon monoxide (CO) poisoning, and fire as it has far-reaching implications on mankind causing extensive damage to human settlement and infrastructure. World Health Organization WHO (,2010) reported that the magnitude of the physical and human cost of such events had become a serious public health concern as flooding is becoming too frequent and threatens the sustainable human development and settlement

However, developed countries (European Region) such as Germany and Russia which has experienced in recent years some of the largest flooding events in their history. The effects of flooding on health are extensive, ranging

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from morbidity, injuries, and mortality (Ben-Noun, 2022). Similarly, Bariwerri et al. (2012) reported that in recent times, flooding had been the most common of all environmental hazards and it regularly claims 20,000 lives yearly and adversely affects around 75 million people worldwide. Flooding is common in wetlands of the world and the reason is the general rise in sea level globally, due to global warnings as well as the saturated nature of the wetlands in Nigeria (Bariwerri et al., 2012).

Nevertheless, in Nigeria periodic floods occur as many Rivers rise to overflow for reasons such as excess rainfall, blocking of waterways, global warming, and climate change. The flooding that occurred in some parts of Nigeria in 2012 is the worst in the country and remains indelible in the country's living memory (Social Action, 2012). Flooding is among the most devastating natural disaster in the world, Nigeria inclusive. It claims more lives and causes more property damage than any other natural phenomenon.in Nigeria, though not leading in terms of claiming lives. Flood adversely affects human lives, displaces people, and causes damage to properties. At least 20 percent of the world population is at risk of one form of flooding or the other (Abowei & Sikoki, 2014). In Nigeria, the Niger Delta is the worst devastated area in terms of flooding, Rivers State inclusive due to their topography and geographical location.

However, flooding disasters had been perilous in Rivers State. In the case of Khana Local Government Area, the situation is not different. Just like any other Local Government Areas in Rivers State, it does experience heavy rainfall from April through July, with a low intensity within August (August break), and experience more severe downpour in September. July and September months are worst for the natural downpour. Consequently, houses in low-land environments of the local government area become flooded and people do evacuate themselves and their properties to relatives and neighbours where houses are on the high lands (The Guardian, 2012). This is so because flooding is often experienced within these months and human lives including properties are at risk of being adversely affected especially those who live around the Kaa waterside and the Rivers that link Andoni Local Government Area of Rivers State (The Guardian, 2012). This however motivated the researcher to carry out this study to ascertain the prevalence of flooding and its health and environmental implication on the people of Khana Local Government Area of Rivers State.

Flooding

The Almighty God at creation separated the water from the dry land. So, when water either through heavy rainfall or overflow of river banks, occupies the usually dry land is said that flooding has occurred. A flood is an overflow of water that covers land that is usually dry The World Health Organization (2010) defined a flood as a covering by water of land not normally covered by water. Glickman and Zenk (2000) was of the view that in the sense of "flowing water", the word may also be applied to the inflow of the tide. Jonkman and Kelman (2005) defined flooding as the presence of water in areas that are usually dry. The Center for Research on the Epidemiology of Disasters (2009) also defined a flood as a significant rise in water level in a stream, lake, reservoir, or coastal region. A situation that results when part of the earth's surface that is usually dry is covered with water due to a high amount of rainfall or the overflowing of a water body.

Furthermore, flooding was explained by Mohamed, et al. (2015) as an overflow of water from water bodies, such as a river, lake, or ocean, in which the water overtops or breaks levees, resulting in some of that escaping its usual boundaries or it may occur due to an accumulation of rainfall on saturated ground in an area flood. Werner, et al (2006) was of the view that floods can also occur in rivers when the flow rate exceeds the capacity of the river channel, particularly at bends or meanders in the waterway. Floods often cause damage to homes and businesses if they are in the natural flood plains of rivers. While riverine flood damage can be eliminated by moving away from rivers and other bodies of water, people have traditionally lived and worked by rivers because the land is usually flat and fertile and because rivers provide easy travel and access to commerce and industry. Some floods can develop in

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just a few minutes and without visible signs of rain. Additionally, floods can be local, impacting a neighbourhood or community, or very large, affecting entire river basins (Jones, 2000).

Prevalence of Flooding

Several incidences of flooding have been occurring in different parts of Nigeria in which morbidity and mortality rates have been minimal. National Emergency Management Agency (2012) reported that the worst floods in Nigeria occurred in 2012 and killed 363 people and displaced over 2.1 million people and 30 percent of Nigerians in 36 states were affected by the floods. The floods were termed the worst in 40 years and affected an estimated total of seven million people, the estimated damages and losses caused by the floods were worth N2.6 trillion (Namdi, et al. 2012).

Similarly, many Nigerian coastal regions and inland cities experienced heavy rainfall, and residents of Lagos, Rivers, Delta, and Akwa Ibom always suffer untold hardship due to the flooding. Also, these floods form roadblocks on major roads causing people to cancel or postpone journeys and appointments. Ajayi (2012) reported that thousands of stranded commuters had to pay increased fares for the few bus drivers who were willing to take the risk of traveling on the flooded roads.

The Guardian (2012) reported that in mid-July 2012, flooding in the Ibadan metropolis caused some residents at Challenge, Oke-Ayo, and Eleyele to flee from their residences and save their lives. Ajayi (2012) reported that flooding killed about 33 people in central Plateau state in Nigeria in which homes were destroyed while roads and bridges were washed away which obstructed relief efforts National Emergency Management Agency. However, the author added that over 12,000 people were affected by the flooding in six districts of the state while hundreds were rendered homeless.

Delta State was not left out of the scenario. According to The Guardians (2012), the worst flood incidence happened and spread to Delta state and rendered about 12,000 people homeless in which several temporary displacement sites set up were also flooded forcing people to flee for their dear life. In Delta State, among the buildings destroyed by the floods were 20 health centres, five hospitals, many schools, churches, and government buildings. Schools were either closed or occupied by internally displaced persons. The floods also spread across Benue state where a local river overflowed causing the displacement of over 25,000 people and in Yenegoa and other parts of Rivers State, 3,000 people who were displaced by the flooding were sleeping at the sports complex, Ovom, Bayelsa State (Guardians, 2012). The incidence of flooding as one natural disaster is accompanied by several health implications

Health Implications of Flooding

It is on record that there are health problems of both physical, mental, and psychosocial impacts which are attributed to flood events. This suggests that they can have a significant impact on people's well-being. However, other psychosocial impacts of flooding include: anxiety, depression, and stress and those affected by floods admitted that their health had been adversely affected by a range of conditions such as dermatitis, worsening asthma, arthritis, and chest infections (Lin, el al, 2015).

The impacts of flooding on health vary between populations for reasons relating to population vulnerability and the type of flood event. In flood conditions, there is a likelihood of an increased outbreak of infectious diseases, especially in areas where the population does not have access to clean water and sanitation. In a follow-up study on severe cholera outbreaks immediately after floods. it was reported that post-flood increased the outbreak of cholera among the study population. Similarly, in an outbreak investigation by Kondo et al. (2002) on post-flood-infectious diseases, the prevalence of nonspecific diarrhea among respondents was reported. Furthermore, a survey of households affected by tropical storms found that diarrhea was significantly associated with residing in a flooded

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home and flooding caused an increase in the outbreak of typhoid and paratyphoid infections among respondents (Wade et al., 2014; Lin et al., 2015).

Studies have revealed that flooding is also associated with gastrointestinal illness. Wade et al. (2004) carried out a study on the incidence of gastrointestinal symptoms caused by a flood. There was a comparison of reported gastrointestinal and other illnesses in flooded and non-flooded households which showed an increase in self-reported gastroenteritis among participants in the flooded area.

The relationship between flooding and vector-borne disease is complex. Many important infections are transmitted by mosquitoes, which breed in or close to stagnant or slow-moving water. According to Sly (2005), the collection of stagnant water due to the blocking of drainages by floods can be associated with increases in mosquito-borne transmission. Kondo, et al. (2002) in their post-flood-infectious diseases study, it was indicated that floods appeared to increase the number of malaria cases in the study area by a factor of 1.5-2 by comparison with 1999 and 2001.

Environmental Implications of Flooding

The environment is very essential to mankind because anything happening to the environment will affect humans either positively or negatively. The case is not different from the effect of flooding on the environment. Akuro, et al (2013) argued that despite many disruptive effects of flooding on humans, his properties, environment besides economic activities, flooding can also ring the bell of many benefits. The negative effects of flooding are outlined below.

Negative Effects of Flooding

The harmful and damaging effects of this phenomenon (flooding) are felt by the environment. The negative effects of flooding are enormous as it affects plants, animals, and mankind. According to Kazmierezak and Cavan (2011), from the early experience of flooding by ancient people and contemporary humans, flooding has caused so many pains, loss of lives or deaths, and the dis-balance in the ecosystem of both the fauna and flora. However, Agbonkheso et al. (2013) and Haitham and Jayant (2014) highlighted the negative effects of flooding on the environment such as destroying human lives, about 363 people were killed in Nigeria's flooding in 2012, properties such as houses, food crops, market, stores, electronics, vehicles were lost and damaged, more money was spent on rehabilitation and curing of diseases arising from flooding, it causes the depletion of soil nutrients thereby hindering effective plant growth, development and fruits/seeds and tuber production cripples economic growth and development besides social activities of the people, hinders the free movement of the people, animals, and stampedes social interaction, restricts movement of animals and displaces them from their natural homes besides human beings and unconscious people use funds meant for alleviating victims for personal aggrandizement.

Positive Implications of Flooding

Conversely, despite the enormous negative impacts of flooding on the environment enumerated above, there are still some beneficial elements of flooding to the environment. Akuro el al. (2013) documented the following as the positive implication of flooding to the environment; fresh water flooding, particularly play an essential role in maintaining ecosystem in river corridor and are key factors in maintaining flood plain biodiversity, water provide much needed resources, especially in semi-arid regions where precipitation events can be very unevenly distributed throughout the year, re-charges ground water content and chemistry, makes soil more fertile and provides nutrients, adds a lot of nutrients to lakes and rivers which leads to an improved fisheries for a new year, also because of suitability of a flood plain for spawning (little predation and a lot of nutrients), fishes make use of flooding to reach new habitants besides other aquatic lives, together with fish boom, binds profit from the boost in production caused by the flooding, periodic flooding was essential to the well-being of ancient communities along the Tigris-Euphrates rivers, the Nile river, the induce river, the granges and yellow river among others, as they create viability for hydrological based renewable resources of energy thus giving positive effect on thin

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businesses and other occupations such as agriculture and irrigation, fish-catch during flooding increases which gives more body proteins to consumers and animals are usually chased by the flooding and they try to relocate to dry land, this increases the hunters catch during this period.

However, several studies have been carried out on flooding in Rivers State but none have been carried out in specific Local Government Areas like Khana. It was given the above that the study sought to establish the prevalence of flooding, identify the health and environmental implication of flooding on the people of Khana Local Government Area of Rivers State.

Purpose of the study

This study investigated the prevalence of flooding and its health and environmental implications on the people of Khana Local Government Area of Rivers State. The specific objectives were to:

1. Determine the prevalence of flooding in Khana Local Government Area of Rivers State
2. Find out the health implications of flooding in Khana Local Government Area of Rivers State
3. Determine the environmental implications of flooding in Khana Local Government Area of Rivers State

Research questions

The following research questions were used to guide the study;

1. What is the prevalence of flooding in Khana Local Government Area of Rivers State?
2. What are the health implications of flooding in Khana Local Government Area of Rivers State?
3. What are the environmental implications of flooding in Khana Local Government Area of Rivers State?

Hypotheses

The following null hypotheses were formulated and tested for the study;

H_{01}: There is no significant difference in the perceived implications of flooding in Khana Local Government Area of Rivers State based on gender.

H_{02}: There is no significant difference in the perceived implications of flooding in Khana Local Government Area of Rivers State based on location.

Materials and Methods

This study was conducted in the Khana Local Government Area of Rivers State. The local government area was created in 1992 with its headquarters located at Bori. It forms part of the Greater Port Harcourt metropolitan area and it is located east of Port Harcourt. It covers an area of 560 km^2 with a population of 294, 217 (National Population Commission of Nigeria, 2011). It comprises 45 villages that make up the four districts of the local government namely; Babbe, Bori Central, Nyo Khana, and Ken-Khana districts. It is bounded by Oyigbo in the North, Imo River and Akwa-Ibom in the East, Andoni and Opobo/Nkoro in the South, and Tai and GoKhana Local Government Area in the West. It is one of the largest Local Government Areas in Rivers State. The descriptive survey design was adopted to carry out the study. According to Kerlinger, (2006) and Nworgu, (2015), descriptive survey design is the type of research design that involves a collection of data on an issue or event, analysis of data, and making generalizations after findings hence, this design was considered appropriate for the study. The population of the study consisted of all the youths and adults in Khana Local Government Area with a population of about one hundred and forty-seven thousand, and forty-six (147, 046) (Independent National Electoral Commission, 2015). Stratified random sampling techniques were used to select 10 communities for the study while a simple random sampling technique was used to select 25 respondents from each of the above communities selected for the study. Data was collected using a self-developed and structured questionnaire titled Health and Environmental Implication of flooding Questionnaire. (HEIFQ) The questionnaire was made up of three sections: A, B, and C. Section A comprise the socio-demographic data of the respondents. Section B comprises items on the health implication of flooding while section C emphasized items on environmental implications of flooding. The

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questionnaire was designed to obtain responses using an alternative response pattern of Yes or No. To obtain data for the test of hypotheses the responses were rated (Yes=2 & No=1).

The reliability of the instrument was established using the test re-test method since getting in touch with the same respondent in the second test will not be difficult. A reliability coefficient of 0.94 was obtained using Pearson Product Moment Correlation. The data were analyzed using frequencies and percentages for socio-demographic data and research questions while a t-test was used for testing the hypotheses at a 0.05 level of significance.

Results

Table 1: Analysis of the Prevalence of Flooding in Khana Local Government Area

Items	Frequency (F)	Percentage (%)
Have you experienced flooding in your community before		
Yes	100	40.7
No	146	59.3
Total	**246**	**100.0**
Does flooding occur regularly in your community		
Yes	81	32.9
No	165	67.1
Total	**246**	**100.0**
Does flooding occur mostly in the rainy season		
Yes	206	83.7
No	40	16.3
Total	246	100.0
Is it true that flood does not occur in some part of the local government areas		
Yes	205	83.3
No	41	16.7
Total	**246**	**100.0**
Does flood occurs all year round		
Yes	77	31.3
No	169	68.7
Total	**246**	**100.0**

Table 1, revealed the prevalence of flooding. (40.7%) of the respondents indicated that they have experienced flooding in their community before. Some (32.9%) of the population indicated that flooding occurs regularly in their community. The majority (83.7%) of the respondents confirmed that flooding occurs mostly in the rainy season, (16.7%) of the respondents indicated that it occurs in some parts of the local government area. The results also showed that (31.3%) of the respondents indicated that flooding occurs all year round. Thus, the prevalence of flooding was 31.3%.

Table 2, revealed the health implication of flooding. The majority (89.0%) representing 219 respondents indicated that flooding contributes to the loss of human and animal lives, (83.7%) of the population attested to the fact that flooding contributes to the spread of diseases, and (82.1%) respondents indicated that flooding leads to drowning. The study also showed that the majority (84.1%) of respondents agreed that flooding contributes to surface water pollution, (95.5%) of the population indicated that flooding destroys agricultural produce, (66.3%) of the population indicated that flooding contributes to psychological problems, (90.2%) respondents agreed that those who live in flood areas are always at risk of communicable diseases while (85.8%) confirmed that flood helps in carrying faecal matters and other waste products around the environment

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Table 2: Health Implication of Flooding on the People of Khana Local Government Area

Items	Frequency (F)	Percentage (%)
does flooding contribute to the loss of human and animal lives		
Yes	219	89.0
No	27	11.0
Total	**246**	**100.0**
Does flooding contribute to the spread of diseases		
Yes	206	83.7
No	44	16.3
Total	**246**	**100.0**
Is it true that flooding leads to drowning		
Yes	202	82.1
No	44	17.9
Total	**246**	**100.0**
Does flooding contribute to surface water pollution		
Yes	207	84.1
No	39	15.9
Total	**246**	**100.0**
Does flooding destroy agricultural produce (food) meant for human consumption		
Yes	235	95.5
No	11	4.5
Total	**246**	**100.0**
Does flooding contribute to psychological problems		
Yes	163	66.3
No	83	33.7
Total	**246**	**100.0**
Is it true that those who live in flood areas are always at risk of communicable diseases		
Yes	222	90.2
No	24	9.8
Total	**246**	**100.0**
Is it true that flood helps in carrying faecal matters and other waste products round the environment		
Yes	211	85.8
No	35	14.2
Total	**246**	**100.0**

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Table 3: Environmental Implication of Flooding on the People of Khana Local Government Area

Items	Frequency (F)	Percentage (%)
Does flooding destroy houses		
Yes	228	92.7
No	18	7.3
Total	**246**	**100.0**
Can flooding stop daily businesses		
Yes	185	75.2
No	61	24.8
Total	**246**	**100.0**
Does flooding destroy farmlands		
Yes	229	93.1
No	17	6.9
Total	**246**	**100.0**
Does flooding contribute to erosion		
Yes	198	80.5
No	48	19.5
Total	**246**	**100.0**
Does flood water result in the spread of chemicals		
Yes	206	83.7
No	40	16.3
Total	**246**	**100.0**
Does flooding contribute to the wetting of dry land		
Yes	217	88.2
No	29	11.8
Total	**246**	**100.0**
Is it true that floods contribute to the falling of electric poles		
Yes	220	89.4
No	26	10.6
Total	**246**	**100.0**

Table 3, revealed the environmental implication of flooding. The majority (92.7%) representing 228 respondents indicated that flooding destroys houses, (75.2%) of the respondents confirmed that flooding hinders daily businesses, (93.1%) of the population representing 229 of the respondents indicated that flooding destroys farmlands while (80.5%) of the respondents indicated that flooding contributes to erosion. The study also showed that (83.7%) of the respondents indicated that floodwater results in the spread of chemicals, a majority (88.2%) representing 217 of the population indicated that flooding contributes to the wetting of drylands while (89.4%) of the respondents indicated that flood contributes to the falling of electric poles.

Testing of Hypotheses

Table 4: t-test summary of significant differences in the perceived implications of flooding based on gender

Group	N	Mean	SD	df	t-cal	p-value	Decision
Female	206	1.61	0.49	244	0.96	0.019	Rejected
Male	40	1.53	0.51				

*p<0.05Significant

Table 4 shows that the p-value is lesser than 0.05 (p<0.05). The null hypothesis that stated that there is no significant difference in the perceived health and environmental implications of flooding in the Khana local government area based on gender is therefore rejected.

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Table 5: t-test summary of significance difference in the perceived implications of flooding based on location

Group	N	Mean	SD	df	t-cal	p-value	Decision
Rural	198	1.61	0.48	244	1.141	0.025	Rejected
Urban	48	1.52	0.50				

*p<0.05 Significant

Table 5 showed that the p-value is lesser than 0.05 (p<0.05). The null hypothesis that stated that there is no significant difference in health and environmental implication of flooding in Khana local government area based on location is therefore rejected.

Discussion

The result in Table 1 showed that (40.7%) of the respondents indicated that they have experienced flooding in their communities before which means that there is a moderate prevalence of flooding in the area. This finding is in line with that of (Kazmierczk & Cavan 2011) who observed that flooding is been experienced yearly in some communities and is usually frequent. The findings are also consistent with that of Agonkhese et al. (2013) whose results reported frequent flooding in the study area, especially during the rainy season. The similarities between these studies and the present study may be due to the location and topography of the area.

The findings of the study in Table 2 revealed that (90.2%) of the respondents agreed that those who live in flood areas are always at risk of communicable diseases which means that there is health implication of flooding in the area. This finding is in agreement with that of Wade et al. (2014) whose studies indicated that flooding is associated with disease outbreaks, psychological problems, loss of lives, and shortage of agricultural produce. However, the finding of the study is not in line with the study of Haithan and Jayant (2014) who revealed that only (30%) of respondents were at risk of communicable diseases. The similarities in the findings may be due to the instrument used for data collection and the population of the study while the differences in the study may be due to the sample size used in both studies and the area both studies were carried out.

The findings in Table 3 revealed that the majority (92.7%) representing 228 respondents indicated that flooding destroys houses, and farmlands and contributes to erosion which means that there is the environmental implication of flooding. This finding is in line with the findings of Abowei and Sikoki (2014) who reported that floodwaters spread toxic chemicals around the environment. The finding of the study also supports that of Bariweni, et al (2012) who reported that flooding is associated with landslide and erosion, destruction of farmlands, houses, and other human activities and that it has several negative consequences compared to the positive effects. However, the similarities in findings may be attributed to the similarities in the study area.

The findings in Table 4 revealed that the p-value = 0.019. The null hypothesis that stated that there is no significant difference in health and environmental implication of flooding in Khana local government area based on gender is therefore rejected indicating that the prevalence of flooding in Khana Local Government Area comes with serious health and environmental consequences which affect both male and female. This finding is in agreement with that of Jones and Becha (2014) who reported a significant relationship between flooding and its health implications. However, the similarities in the findings could be attributed to similarities in the study population.

The findings in Table 5 indicated that the p-value = 0.025. The null hypothesis that stated that there is no significant difference in the perceived health and environmental implications of flooding in Khana local government area based on location is therefore rejected indicating that the prevalence of flooding in Khana Local Government Area comes with serious health and environmental consequences and affect both the urban and rural areas. This finding is consistent with the study of Bariweni, et al. (2012) who reported a significant relationship between flooding and its environmental implications and affect both the urban and rural areas.

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Conclusion

Given the above, it was concluded that the prevalence of flooding in Khana was moderate and there are serious health and environmental implications of flooding on the people of Khana Local Government Area of Rivers State.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. Government should through the National Assembly enact laws to protect natural water ways from being used for any other activities such as buildings, constructions and parks in order to avoid high prevalence of flooding and its implications
2. The National Environmental Protection Agency should carry out Environmental Impact Assessment (EIA) of the environment where flooding occurs frequently
3. Members of the community should discourage indiscriminate dumping of refuse especially along drain lines, small creeks and streams.
4. Community stakeholders and youth leaders should embark on health and environmental awareness campaigns on the health and environmental dangers of flooding in an area.
5. Government should moderate streams or river flow by constructing flood stations and good channels.
6. Health educators should carryout awareness and sensitization programmes to educate the communities in Khana LGA on the impact of flooding on the health of the people and how to avoid it.

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