

STRATEGIES FOR PREVENTIVE MAINTENANCE AGAINST FLOODING IN BIRNIN KEBBI

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ABSTRACT

Flooding is an unpleasant situation, which has affected the lives of people, animals, and natural endowments. It could cause so many negative things, which among them are encroaching the area meant for farmlands, erosion that may lead to earthquake, inability to access good water, and sometimes affect land quality. This research work was aimed at investigating the general strategies for preventive maintenance against flooding in a built environment. The objectives were to identify and rank the various types of flood in a built environment and their related causes to know the various effects of flooding in a built environment. The study adopted a structured questionnaire survey. Respondents were selected using purposive and random sampling technique. The size of the study was 100 respondents made up of five professionals in building construction. Relative Importance Index (RII) was used to analyze both the causes and effects of flooding. The study revealed that flooding is caused by rain, river overflowing, dam breakage, blockage of public drain channels, ice and snow-melt, deforestation, development, poverty among others. It was found out that the effects of flooding are more pronounced on people, animals, environment, and economy among, other things. The study recommended that dumping of refuse at the drainage areas must be avoided, regular inspection, and clearing of drainage system should be embraced among other things.

Keywords: Strategies, Preventive Maintenance, Flooding, Built Environment

INTRODUCTION

Flooding is a lot more than that. Flooding is extremely dangerous and has the potential to wipe away the entire city, coastline, or area, which causes an extensive damage to life and property. It also has great erosive power and can be extremely destructive, even if it is a foot high. It is a natural event or occurrence where a piece of land or area that is usually dry land, suddenly gets submerged under water (Aliyu, 2012). This means low-lying areas may flood quickly before it begins to get to higher ground. In Nigeria, the incidents of floods are becoming a reoccurring decimal in the most area leading to colossal loss of lives and properties. Floods in low-lying coastal areas, such as Lagos, Port Harcourt, Warri, Sapele, and Yenegoa, as well as the hinterland and arid semi-arid places like Ondo, Ilorin, Makurdi, Kaduna, Minna, Borno, Sokoto, Gombe have formed Nigeria Newspaper headlines. Concern over the incidents of floods, especially in urban areas, have attracted several studies focusing on different aspects (Ayado, 2015). Floods can also occur in rivers, when the flow exceeds the capacity of the river channel, particularly at bends or meanders. Floods often cause damage to homes and businesses if they are placed in natural flood plains of rivers. While flood damage can be virtually eliminated by moving away from rivers and other

bodies of water, since time out of mind, people have lived and worked by the water to seek sustenance and capitalize on the gains of cheap and easy travel and commerce by being near water. That humans continue to inhabit areas threatened by flood damage is evidence that the perceived value of living near the water exceeds the cost of repeated periodic flooding (David, 2018).

According to Etuonovbe, (2011) floods are the most devastating natural disasters in the world, claiming more lives and causing damage to properties than any other natural phenomena. In Nigeria, though not leading in terms of claiming lives, flood affects and displaces more people than any other disaster. It also causes more damage to properties and at least 20% of the population is at risk of one form of flooding or the other.

Jimoh, (2000) stated that alternative management concepts have emerged, emphasizing the integration between land and water management and of structural and nonstructural measures; a flood is an overflow of water that submerges land which, is usually dry. (Gersonius 2007). The European Union (EU) Floods Directive defined a flood as a covering by water of land not normally covered by water. In the sense of "flowing water," the word may also be applied to the inflow of the tide. Flooding may occur 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 water escaping its usual boundaries, or it may occur due to an accumulation of rainwater on saturated ground in a real flood. While the size of a lake or other body of water will vary with seasonal changes in precipitation and snow melt, these changes in size are unlikely to be considered significant unless they flood property or drown domestic animals. 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 develop slowly, while others such as flash floods, can develop in just a few minutes and without visible signs of rain. Additionally, floods can be local, impacting a neighborhood or community, or very large, affecting entire river basins.

Flooding is a disaster and should be curbed to avoid being inimical to lives (Aliyu, 2012). The flood could cause so many negative things, which among them are encroaching the area meant for farmlands. It could also cause erosion which may lead to earth-quake, inability to access good water, and sometimes it may affect land quality. Flooding is an unpleasant situation which has affected the lives of people and natural endowments. In some communities, flooding is one of the natural disasters faces as a challenge, and as increased the cost of access to safe water as people have no option than to boil it whenever it is needed,(David, 2018).The precautions that can be taken by individuals to protect against ground water flooding are limited. Ground water flooding is often more difficult to prevent than surface water flooding; it's not as simple as building flood defense to prevent river water spilling over its banks. There are some areas where ground water flooding has been dealt with by installing pumps to remove ground water and so lower the water table, but these only have a localized effect, and there is still the problem of having somewhere to

discharge the water so that the communities will live happily. However Birnin Kebbi Metropolis like other towns of the country has been facing an unprecedented the flood disaster is resulting in loss of lives and properties running into billions of Naira, (Aliyu, 2012).

Types of Flooding

Ward, (2009) mentioned the followings as some of the types of flooding in a built environment:

Tidal Flooding: both Sea and river defenses may be overtopped or breached by a combination of low pressure weather systems and peak high tides. Storms with high wind speeds cause tall and powerful waves and low pressure fronts cause sea levels to rise above normal levels.

Fluvial Flooding: Flooding occurs in the floodplains of rivers when the capacity of water courses is exceeded as a result of rainfall or snow and ice melts within catchment areas further upstream. Blockages of water courses and flood channels or tide locking may also lead to ponding and rising water levels. River defenses may then be overtopped due to increased water levels, or breached by large objects of debris carried at high water velocities.

Flash Flooding: Flash flooding can occur in steep catchments and is far more immediate. Flooding from rivers, particularly, in recognized floodplains, can usually be predicted with good accuracy. However flash floods from sudden downpours such as those in Carlisle continue to challenge the capability of detection and forecasting systems. Water over about 250 mm in depth may carry debris particularly in urban locations and can also be very cold. Even travelling at low speeds this can make it extremely hazardous to people caught in it.

Rapid on-set floods: Similar to flash floods, this type takes slightly longer to develop and the flood can last for a day or two only. It is also very destructive, but does not usually surprise people like Flash floods. With rapid on-set floods, people can quickly put a few things right and escape before it gets very bad.

Slow on-set floods: This kind is usually as a result of water bodies over flooding their banks. They tend to develop slowly and can last for days and weeks. They usually spread over many kilometers and occur more in flood plains (fields prone to floods in low-lying areas). The effect of this kind of floods on people is more likely to be due to disease, malnutrition or snakebites.

Causes of Flooding

According to Oriola, (2000) floods are caused by many factors (or a combination of any of these): heavy rainfall, highly accelerated snowmelt, severe winds over water, unusual high tides, tsunamis, or failure of dams, levees, retention ponds, or other structures that retained the water. Flooding can be exacerbated by increased amounts of impervious surface or by other natural hazards such as wildfires, which reduce the supply of vegetation that can absorb rainfall.

He further expressed that the periodic floods occur on many rivers, forming a surrounding region known as the flood plain. During times of rain, some of the water is retained in ponds or soil, some is absorbed by grass and vegetation, some evaporates, and the rest travels over the land as surface runoff. Floods occur when ponds, lakes, riverbeds, soil, and vegetation cannot absorb all the water. Water then runs off the land in quantities that cannot be carried within stream

channels or retained in natural ponds, lakes, and man-made reservoirs. About 30 percent of all precipitation becomes runoff and that amount might be increased by water from melting snow. River flooding is often caused by heavy rain, sometimes increased by melting snow. A flood that rises rapidly, with little or no warning, is called a flash flood. Flash floods usually result from intense rainfall over a relatively small area.

Modalities for prevention against flooding in a built environment

Thomas, (2003). Observed that, preventing homes from flooding is extremely important, water damage can be expensive to repair and cause harmful mold. The first thing to do relating to flood prevention is to understand where and in what ways your home is vulnerable to flooding. Proper maintenance and regular checks are important tools in flood prevention. He added that, fallen leaves, snow and ice blockages and debris in street gutters and catch basins could be a major cause of flooding during rainfall and winter. Should be regular inspections of culvert trash racks and storm sewer systems to make sure they are functioning efficiently in order to reduce flooding potential. People can assist in reducing the likelihood of flooding near their properties. He further suggested that, clear the gutters and catch basins of leaves and debris. During heavy rains, water running off the street will carry more leaves and debris into the gutter, please do not rake leaves from your property or the boulevard onto the streets or into open ditches. You can collect the leaves and either put by the curbside in bags for the next pick-up or compost them on site. However, ensure any debris collected in driveway culverts or open ditches in front of your property is cleared before it starts raining as they can cause blockages and Snow or ice blockages should also be cleared from gutters and all catch basins to minimize flooding. Make a clear path to the catch basin for runoff water.

Bryant, (2001) explained that human cannot stop the rain from falling or stop flowing surface water from bursting its banks. These are natural events, but we can do something to prevent them from having great impact. Here are a few methods: Sea / Coastal Defense Walls, Retaining walls, Town planning, Vegetation and Education

OBJECTIVES OF THE STUDY

- i. To identify the various types of flood
- ii. To know the causes of floods in the study area
- iii. To identify the various effects of floods in the study area
- iv. To find out the Preventive Measures against Flooding in the study area

RESEARCH QUESTIONS

- v. What are the various types of flood?
- vi. What are the causes of floods in the study area?
- vii. What are the various effects of floods in the study area?
- viii. What are the Preventive Measures against Flooding in the study area?

RESEARCH METHODOLOGY

The research design here provides a comprehensive plan for the final research product and includes variety of procedures for extensive approaches to data collection and instrument development. The data used for the study was generated from both primary and secondary sources of data, Data was collected with a structured questionnaires developed and administered to the respondents within the area of the study. The population of this study was the totality of all the targeted professionals representing various building construction industries in Birnin Kebbi Metropolis. Analysis of the data was done using descriptive analysis of tables, percentages. The 5 -point scale of 1- strongly Agree 2- Agree, 1- Disagree, 4- Strongly Disagree 3- Undecided were adopted.

RESULTS

Table 1 Types of flooding in the study area.

TYPES OF FLOODING	1	2	3	4	5	RII	RANK
pluvial Flooding	2	5	8	31	29	0.813	1 st
Tidal Flooding	8	2	12	20	33	0.781	2 nd
Rapid on-set Flooding	1	17	10	20	27	0.746	3 rd
Flash Flooding	7	14	4	28	22	0.717	4 th
Slow on-set Flooding	8	17	5	20	25	0.698	5 th
Ground Water Flooding	14	21	0	25	15	0.616	6 th
Flooding from Sewers	15	17	5	25	13	0.610	7 th
Flooding from man-made infrastructure	13	23	3	25	11	0.594	8 th

Source: Field Survey, 2019

The table 1 shows the results of the survey analysis of the various types of flooding in a built environment from the professional perspectives. The types were identified and ranked based on their relative importance indexes (RIIs).

Table 2: Causes of Flooding in the study area

CAUSES OF FLOODING	1	2	3	4	5	RII	RANK
Rain	2	10	1	39	23	0.789	1 st
River Overflow	2	10	0	44	19	0.781	2 nd
Dam Breaking	10	6	3	40	16	0.722	3 rd
Blockage of Public Drain Channels	6	8	9	40	12	0.717	4 th
Ice and Snow-Melts	5	22	5	25	18	0.677	5 th
Deforestation	5	25	0	35	10	0.653	6 th
Development	11	17	2	40	5	0.629	7 th
Poverty	6	27	2	20	20	0.602	8 th

Source: Field Survey, 2019

The table 2 shows the results of the survey analysis of the causes of flooding in a built environment from the professional perspectives. The causes were identified and ranked based on their relative importance indexes (RIIs).

Table 3: Effects of Flooding in the study area

EFFECTS OF FLOODING	1	2	3	4	5	RII	RANK
Primary Effect	2	10	0	40	23	0.792	1 st
Secondary Effect	2	10	1	50	12	0.760	2 nd
Environmental Effect	6	8	9	25	27	0.757	3 rd
Economic effect	10	6	3	30	26	0.749	4 th
People and Animal Effects	10	3	0	40	9	0.589	5 th

Source: Field Survey, 2019

The table 3 above shows the results of the survey analysis of the causes of flooding in a built environment from the professional perspectives. The effects were identified and ranked based on their relative importance indexes (RIIs).

Table 4: Preventive Measures against Flooding in the study area

PREVENTIVE MEASURES	1	2	3	4	5	RII	RANK
Education	1	7	1	40	26	0.821	1 st
Town Planning	2	0	0	60	13	0.818	2 nd
Retaining Walls	0	5	0	69	1	0.776	3 rd
Sea / Coastal Defense Walls	5	8	10	40	12	0.722	4 th
Vegetation	0	20	10	40	5	0.680	5 th
Detention Basin	10	3	0	35	10	0.549	6 th

Source: Field Survey, 2019

The table above shows the results of the survey analysis of are the preventive measures against flooding in a built environment from the professional perspectives. The measures were identified and ranked based on their relative importance indexes (RIIs).

SUMMARY OF MAJOR FINDINGS

- 1 Pluvial flooding was identified and ranked number one type of flooding. Tidal Flooding was also ranked second major type of flooding in a built environment with a relative importance index of (0.813). Rapid on-set and ground water floods were ranked third positions with a relative importance index of (0.746) each. Flooding from sewers and man-made infrastructures were also ranked 7th and 8th with the same relative importance indexes.
- 2 Rain is number one major cause of water flooding in a built environment with relative importance index of 0.789, ice and snow melt, deforestation, development, and poverty with the least relative importance index (RII) of (0.602).



- 3 On the effects of water flooding in a built environment by ranking the effects in ascending order of importance with relative importance index of 0.789 as the higher, and the major effect and 0.65 as the lowest according to the result.
- 4 Education, Town Planning, Retaining Walls, Sea / Coastal Defense Walls, Sea / Coastal Defense Walls and Vegetation are the preventive measures against flooding. The measures were identified and ranked based on their relative importance indexes (RIIs).

CONCLUSION

Based on the major findings from the study, it was revealed that the most common cause of flooding in Birnin Kebbi Metropolis is rain followed by river overflowing, dam breaking, ice and snowmelt, deforestation, development, and poverty. Economy, environment, human and animals were found to be the victims of the effects of flooding. The preventive measures were also identified as retaining walls, sea and coastal defense walls, vegetation, enlightenment campaigns, and detention basin.

RECOMMENDATIONS

1. Prevention against flooding is extremely important because water damage can be expensive to repair and cause harmful mold. For the prevention against flooding, the study recommends that: the occupants of the buildings should understand where and in what ways their buildings are vulnerable to flooding and to ensure proper maintenance and regular checks of the area. Regular inspections of culvert trash racks and storm sewer systems to make sure they are functioning efficiently.
2. Furthermore, the clients and occupants should ensure that drainages are adequately provided. The building professionals and other relevant agencies should ensure proper location and selection of a site for the prevention against flooding in their environments. Structural engineers must ensure good structural design and specifications by considering all the environmental aspects that include soil (Geotechnical) investigations that will enable them to come up with a proper design of the foundation.
3. Dumping of refuse at the drainage areas must be avoided to prevent flood incidence in the area. The serving drainage system should be wide enough to allow easy flow of rain water. And lastly, regular inspection and clearing of drainage system should be embraced among other things.

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Picture Results of Findings



Figure 1: Incident of flooding at RafinAtiku Area, BirninKebbi



Figure 2: Incident of flooding at Bayan Kara Area, BirninKebbi