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FLOOD RISK MANAGEMENT STRATEGIES OF HOUSEHOLDS IN KATSINA URBAN AREA, KATSINA STATE, NIGERIA

BY
Rufa'i Abdulmajid: Department of Educational Foundations, Isa Kaita College of Education, Dutsin-ma, Katsina State, Nigeria
&
Murtala Mohammed Ruma: Department of Geography, Umaru Musa Yar'adua University Katsina, Nigeria
***Corresponding Author's email: armahuta@gmail.com**

Abstract
This study analysed the Flood Risk Management (FRM) strategies of households in Katsina Urban area, Nigeria. Yamane's formula was used to obtain the sample size in Wakilin Arewa "B" (369) and Wakilin Kudu "III" (353) wards of the study area. Systematic random sampling was conducted in each of the eight flood-prone areas. Structured questionnaires were administered to the most senior person available in each household within the selected areas. Households' data were analyzed using descriptive statistics and Welch's T-test was used to test the stated hypothesis which was run in the analysis ToolPak of Microsoft Excel 2007. The results of the study highlighted that the strategies adopted through clearing of waterway (58.17%), dredging and de-watering (61.50%) and sanitation (42.65%) are the major strategies of households before, during and after flood events respectively in the study area. Also the null hypothesis (Ho) was accepted because the p-value is 0.9 while the alternative hypothesis is rejected. The study recommends the need for a FRM Action Framework for the Area, because effective management is done in a collaborative manner.
Keywords: Flooding, Flood Risk, Management, Household, Strategies

Introduction

The amount of rainfall received in Katsina urban area is much less than that of areas in the southern part of the country, yet flooding occurs almost every year. This is because the rains are mostly torrential and some people build in flood-prone areas. Flooding in the study area has impoverished many of people through displacement from homes and loss of properties. The impacts of flooding in Nigeria include mortality, widespread infections and vector-borne diseases, homelessness, and food insecurity among others (Ogunbodede & Sunmola, 2014). These hazards were generally linked to poor urban planning and climate change which increase frequency and intensity of rainfall (Adeloye & Rustum, 2011). Abaje, *et al.* (2015) showed that most of the flood occurrences in Katsina State own their reasons not only to high torrential rainfall, but also improper physical planning, blockage of drainage channels, deforestation and the erection of structures in areas of high risk. It was also noted that flood disaster triggered vulnerability factor as it left many people and communities in precarious conditions, depriving them of most basic goods. Most poor Nigerian communities are susceptible to floods, thus lacking functional institutions and essential services. These factors, in addition to ignorance and lack of access to external help have amplified the impacts of flood events beyond the resilience of vulnerable Communities to adapt, Rigasa, *et al.* (2015).

Households in Katsina urban area have high perception of the nature, causes and effects of flooding (Asanarimam, *et al.* 2015 & Mashi, *et al.* 2020). Flood Risk Management (FRM) seeks to reduce the risk from flood events to the people who are located in flood-prone areas. While FRM strategies identify and implements measures that reduce the overall risk such that only the residual risk remains (NRC, 2013). FRM is supposed to be done in a collaborative manner, using an integrated approach. However, affected households have to respond before any form of external assistance arrives. This study analyzed the effects of flooding and the strategies used by households to manage flood risks, before, during and after events.

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Hypotheses

The study tested the following null and alternative hypotheses based on the assumption that:
(Ho) - There is no significant difference between the flood risk management strategies of households in Wakilin Arewa "B" and Wakilin Kudu "III" Wards of the study area.
(H_1) - There is significant difference between the flood risk management strategies of households Wakilin Arewa "B" and Wakilin Kudu "III" Wards of the study area.

Methodology

The primary data were obtained from the field survey conducted at the households'. The sample locations in the study area were; *Dabinai*, *Tudun Yanlihidda*, *Lambobi*, *Unguwar Dan Mada* and *Malali* all in Wakilin Arewa "B" *ward. Kofar Kaura, Tudun Matawalle* and *Sabuwar Unguwar* in Wakilin Kudu "III" ward. These locations were obtained from Katsina State Emergency Management Agency (SEMA), and Katsina State Environmental Protection Agency (SEPA), during a reconnaissance survey and were identified as high flood-prone locations where flooding is recorded annually. The total household populations (722) in the study area were obtained from Katsina Local Government Primary Health Care Department master list of settlements (2019). That is 369 in Wakilin Arewa "B" (WA "B") ward and 353 in Wakilin Kudu "III" (WK "III") ward. A total of 722 households were obtained using Yamane's formula; that is 369 in Wakilin Arewa "B" (WA "B") ward and 353 in Wakilin Kudu "III" (WK "III") ward. Yamane's formula is mathematically expressed as; $n = \frac{N}{1+N(e)^2}$

Where; N = Sample Population, n = Corrected Sample Size and e = Margin of error (0.05)

Structured questionnaires were administered to the most senior person available in each household within the selected areas and systematic random sampling was conducted in each sample location. Data from households were analyzed using descriptive statistics, and Welch's t-test was used to test the stated hypothesis which was run in the analysis ToolPak of Microsoft Excel 2007.

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RESULTS AND DISCUSSION

Table 1: Household's Responses on Effects of Flooding in the Study Area

Locations in WA "B" ward	Frequency and Percentage											
	Loss of Life	%	Damage to Buildings	%	Damage to Personal Belongings	%	Spread of Water-borne Diseases	%	Road Blockage by inundated Waters	%	Total	%
Dabinai	--	--	8	28.60	5	18.00	4	14.20	11	39.20	28	100
Tudun Yanlihidda	--	--	27	24.50	18	16.40	4	3.60	61	55.50	110	100
Lambobi	--	--	33	26.20	17	13.50	5	3.96	71	56.34	126	100
Unguwar Danmada	--	--	9	19.56	13	28.26	3	6.53	21	45.65	46	100
Malali	--	--	10	16.95	7	11.86	--	--	42	71.19	59	100
Subtotal	--	--	87 (23.60%)		60 (16.30%)		16 (4.30%)		206 (55.80%)		369	100
Locations in WK "III" ward												
Kofar Kaura	--	--	20	20.20	23	23.23	19	19.19	37	37.38	99	100
Sabuwar Unguwa	--	--	9	12.68	11	15.49	5	7.04	46	64.79	71	100
Tudun Matawalle	--	--	69	38.00	41	22.00	16	9.00	57	31.00	183	100
Subtotal	--	--	98 (27.76%)		75 (21.25%)		40 (11.33%)		140 (39.66%)		353	100
Grand total	--	--	**185 (25.62%)**		**135 (18.70%)**		**56 (7.76%)**		**346 (47.92%)**		**722**	**100**

Source: Fieldwork, 2023

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Poor drainage system and dumping refuse on water ways were the main cause of flooding in the study area, (Abaje, *et al.* 2015; & Mashi, *et al.* 2020). This was attested by what was observed in the study locations during fieldwork (Plate 1). While road blockage by inundated waters and damage to buildings were the main effects of floods, (Plate 2). This leads to the disruption of socio-economic sustainability of the affected people. The effects of flooding in the study area include; road blockage, spread of water-borne diseases, damage to buildings, damage to personal belongings, and loss of life. However, loss of life was not recorded during data collection for this study. From Table 1, road blockage by inundated waters was the main effect of floods in WA "B" with over half of the responses and 39.66% of responses in WK "III" ward. This is followed by damage to buildings with 23.60% of responses in WA "B" and 27.76% for WK "III". The least effect of floods was the spread of diseases with the lowest percentages; 4.30% from WA "B" ward and 11.33% from WK "III" ward (Table 1).

These households' responses on effects of floods corroborate with various studies conducted in Nigeria, Yola metropolis, Kaduna metropolis and Katsina State (such as Magami, *et al*. 2014; Nwigwe, *et al*. 2014; Adebayo and Nwaigwe, 2015; Aliyu and Suleiman, 2016; & Abaje, *et al*. 2015). All found out that the major effects of floods in their study areas were blockage and destruction of road networks, damage to buildings and household properties. These lead to the disruption of socio-economic sustainability and services of the affected people.

Plate 1: Poor Drainage and Refuse Dumped in *Sabuwar Unguwa* area (2022)

Plate 2: Road Blockage by Inundated Waters in Wakilin Arewa Ward (2022)

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Table 2: Flood Management Strategies of Households in Wakilin Arewa "B" and Wakilin Kudu "III"Wards

(Ho) - There is no significant difference between the flood risk management strategies of households in Wakilin Arewa "B" and Wakilin Kudu "III" Wards of the study area

Wards	**STRATEGIES (BEFORE EVENT)**								
	Clearing of Waterways	**%**	**Flood defenses**	**%**	**Moving belongings**	**%**	**Temporary relocation**	**%**	**Total**
WA "B"	231	62.60	69	18.70	60	16.26	9	2.44	**369**
WK "III"	189	54.00	58	16.00	64	18.00	42	12.00	**353**
Subtotal	420 (58.17%)		127(17.60%)		124(17.17%)		51(7.06%)		**722 (100%)**

Wards	**STRATEGIES (DURING FLOOD EVENT)**						
	Evacuation of People	**%**	**Dredging & de-watering**	**%**	**Search and Rescue**	**%**	**Total**
WA "B"	87	23.58	282	76.42	--	--	**369**
WK "III"	167	47.31	162	45.89	24	6.80	**353**
Subtotal	254 (35.18%)		444 (61.50%)		24 (3.32%)		**722 (100%)**

Wards	**STRATEGIES (AFTER FLOOD EVENT)**								
	Sanitation	**%**	**Filling eroded Areas**	**%**	**Rebuilding homes**	**%**	**Raising houses above flood Level**	**%**	**Total**
WA "B"	171	46.34	138	37.40	52	14.10	8	2.16	**369**
WK "III"	137	39.00	100	28.00	80	23.00	36	10.00	**353**
Subtotal	308 (42.65%)		238(32.96%)		132(18.30%)		44(6.09%)		**722 (100%)**

Source: Fieldwork, 2023

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The responses of the strategies before flood events are fairly the same across the two wards. However, the residents of WK "III" ward tend to relocate (12.00%) more than those residing in WA "B" ward (2.44%), (Table 2). The least strategy adopted by the household before flood event in the study area was temporary relocation (7.06%) of responses, and more than half of the households used clearing of waterways as the main strategy before a flood event (Table 1). This corroborates with the study of Asanarimam, *et al*. (2015), which assessed flood hazard responses among the residents of Katsina Metropolis and that of Umar, *et al*. (2017), which assessed the Adaptation Strategies to Flood Hazard in Hayin-Gada, Dutsin-ma Local Government Area. Both studies highlighted that the coping strategies employed by the respondents include clearing of waterways, raising their building above flood level, and building flood defenses.

There seems to be not much done during a flood event in the study area as dredging and de-watering were the main strategies adopted (61.50%) of the households while 35.18% of the responses said that they evacuate to safer areas. Search and rescue was the least method used with 3.32% of responses, showing an increase in preparedness and less catastrophic nature of floods in some areas. About 43% of the entire respondents in the study area did sanitation after a flood event, by removing debris and other dirt brought by floodwaters. The least adopted strategy is raising houses above flood level with 6.09% of the entire responses. A comparison of strategies adopted after flood event between WA "B" and WK "III" wards are; sanitation 46.34% and 39%; filling erode areas 37.40% and 28%; rebuilding damaged homes 14.10% and 23%; and raising houses above flood levels have 2.16% and 10% of responses respectively, (Table 2).

A Welch's t-test was performed to determine if there was a statistically significant difference in FRM strategies (before, during, and after) between WA "B" and WK "III" wards of the study area. The test revealed that the results were not statistically significant because the p-value of about 0.9 in all the three management strategies is much higher than the set alpha 0.05. Therefore, the test fails to reject the null hypothesis, since p-values determine the significance of results on the set hypothesis.

Conclusion

Even if stakeholders play a role in flood risk management, this study clearly showed how affected households mitigate flood risks and adapt to the impending hazard in the study area. Clearing of waterway (58.17%), dredging and de-watering (61.50%) and sanitation (42.65%) are they major strategies of households before, during and after flood event respectively in the study area. The null hypothesis (Ho) was accepted because the p-value is 0.9; hence there is no significant difference between the flood risk management strategies of households in Wakilin Arewa "B" and Wakilin Kudu "III" Wards of the study area. As the threat of flooding increases, there is the need to work together to manage the impacts of flooding, with researchers continuing to offer critical perspectives as the relationship develops.

Recommendations

The study also recommends;

i. The inclusion of community stakeholders in decision-making processes and implementation should be embedded into policy and practice for efficient FRM.
ii. Flood risk Sensitization exercises should be done at the right places, through the right channels, and at the required frequencies.
iii. There should be a unified FRM Guidance Document for Katsina urban area.
iv. The vigorous pursue of poverty reduction measures by the government; this will tremendously change the results of the dismal efforts made on, development control and environmental enforcements.

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