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Evaluation of Residents Capacities for Flood Risk Management in Selected Communities in Rivers State, Nigeria

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Abstract

This study evaluation of residents' capacities for flood risk management in selected communities in Rivers State, Nigeria. The cross-sectional research design was adopted for the study. Twelve (12) local government areas (Port Harcourt, Obio/Akpor, Okrika, Akuku-Toru, Degema, Emohua, Bonny, Andoni, Opobo/Nkoro, Ogu/bolo, Asari-Toru, and Ahaoda-East) were selected for the study out of the 23 that constitute Rivers State using the purposive sampling procedure. From these 12 LGAs, 33 communities were selected for inclusion in the study also with the purposive sampling procedure. The sample size of 400 was determined with the Taro Yamane (1967) formula and this was the basis for allocation of the study questionnaire to the selected communities based on proportional allocation technique. The questionnaire was randomly administered to the heads of the household in the communities. A total of 398 questionnaire were returned and used for analyses out of the 400 that were allotted. Descriptive statistics (frequency distribution, percentages and means) were used to analyse the data. Findings revealed that mobile phones were the highest information receiving medium of residents (32.16%). Many basic needs/amenities essential for enhancing flood resilience were lacking in the communities; major institutional capacity driver for flood management was awareness programme/training; and majority did not get any organisational support to management flood. The study concludes that residents capacity to manage flood across the sampled communities have different dimensions amid the absence of basic needs and organisational support. It is recommended that there should be periodic environmental assessment of the areas to help boost the capacity of the population to manage flood disasters.

Keywords: *Residents; Capacities, Flood Risk; Management; Rivers State.*

1. Introduction

Floods occur when land that is usually dry is inundated with a surplus flow of water often due to heavy rainfall, fast melting of snow or a storm surge from a tropical cyclone or tsunami in coastal areas (World Health Organisation [WHO], 2023). Flood can come about in virtually any terrestrial zone and basically is the occurrence of excessive water on an area of land which is not normally submerged be it in a single drain or in an inundated part of an area that is unable to be absorbed (Ologunorisa, 2004; Action Aid, 2006). Risk in the sphere of disasters, is defined as the possibility of an event and its damaging outcome put together (UNISDR, 2009). The World Meteorological Organization (WMO) and Global Water Partnership (GWP) (2017)

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defined “flood risk as the expected losses caused by a given flood at a specific period and is based on three elements, namely; the intensity of the flood and the speed of the water rise; the exposure of human activity to the flood; and the vulnerability of the exposed elements”.

The resurgence of floods and many other disasters have become a weighty threat to the quest and realisation of sustainable development. Shockingly, circa one-third of all fatalities, injuries, and damages due to occurrence of natural disasters are credited to floods (Singh & Kumar, 2013). Yet most communities prefer to settle and inhabit flood plains for whatever reasons. However, it is important to note that floods as natural events are not a problem per se, but they become a hazard and can cause a calamity only when people undertake physical development on areas vulnerable to floods (National Research Council of Canada [NRC], 1989). According to a report by the Centre for Research on the Epidemiology of Disasters (CRED) and United Nations Office for Disaster Risk Reduction (UNISDR) (2018), between 1998 and 2017 climate-related and geophysical disasters killed 1.3 million people and left a further 4.4 billion injured, homeless, displaced or in need of emergency assistance.

While the majority of fatalities were due to geophysical events, mostly earthquakes and tsunamis, 91% of all disasters were caused by floods, storms, droughts, heatwaves and other extreme weather events. Amid other risks, the greatest common risks that are linked to flooding is the contamination of drinking-water facilities, and standing water, which can be a breeding grounds for mosquitoes, bring chemical hazards, and cause injuries (World Health Organisation [WHO], 2020). In the Niger Delta region where Rivers State is located, the three predominant types of flood hazard that overspill and immerse landed areas are river overflow, tidal overflow, and meteorological flash floods and together they overflow the river tributaries and thus cause runoff to surpass river channels/banks (Ochege, et al., 2016). These flood hazard

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result to the deaths of many, displace thousands, destroys properties and affected community livelihood of millions of people in the region.

Studies have made attempts to bare concerns of flood risk and populations' capacity to manage the risks. For instance, Mfon et al. (2022) reviewed the causes and effects of flooding in Nigeria using temperature and rainfall data obtained NiMET office in Uyo. Findings from the study showed that rainfall and roads without good drainage channels exact significant influence on flooding in Uyo. Week et al. (2019) assessed communities' resilience to flooding in the flood-prone areas of Bayelsa, Delta and Rivers States, Nigeria and found that major resilience measures to flooding included distribution of relief materials by communities' flood control committees; early flood warning; engagements between NEMA or SEMA; and construction of flood bank, drainage, dams etc. in order to control or manage flood incidents.

Rehman et al. (2019) in their study applied systems thinking to flood disaster management for sustainable development in Pakistan. They found that heavy rainfall in the monsoon season, lack of flood control and inadequate drainage system were the main reason of flooding in Pakistan. Similarly, Anade and Luhunga (2019) also implicated heavy rainfall resulting to overflow as well as blocked drainages, poor infrastructure, and ocean surge as major causes of flooding in their study in Der es Salaam, Tanzania. Ijigah and Akinyemi (2015) in their study in Kaduna, Nigeria discovered that the common factors that caused flooding were poorly constructed drainages, heavy rainfall and improper waste disposal; while major preventive measures were proper dumping of refuse, awareness on adherence to environmental rules, and monitoring of residential building construction.

Nwigwe and Emberga (2014) in their study in south western Nigeria reported that no city or town of the region is absolutely free from flood any year; while the number of occurrences, magnitudes, and impacts have been increasing over the years; and government concerns have

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been unsustainable. This result on government concerns is in variance with the findings of Oruonye (2012a) who reported that in the 2005 flood disaster in Jalingo, government agencies and stakeholders responded promptly. In a study in Oleh, Isoko South Local Government Area of Delta State, Otomofa et al. (2015) reported that flooding had significant relationship with socio-economic activities in Oleh; and that loss of portable water and agricultural products were some negative impacts of flooding in the study area. The above review and many other studies as well concentrated their efforts on causative and preventive factors of flood hazard and the nexus between flooding and socio-economic impacts (Ocheri & Okele, 2012; Odunuga et al., 2012; Olajuyigbe et al., 2012; Duru & Chibo, 2014; Akukwe, 2014; Kwari et al., 2015). The obvious is therefore the fact that studies on residents capacities for flood risk management has not been accorded adequate attention in the literature, as they are limited.

2 Materials and Methods

2.1 The Study Area

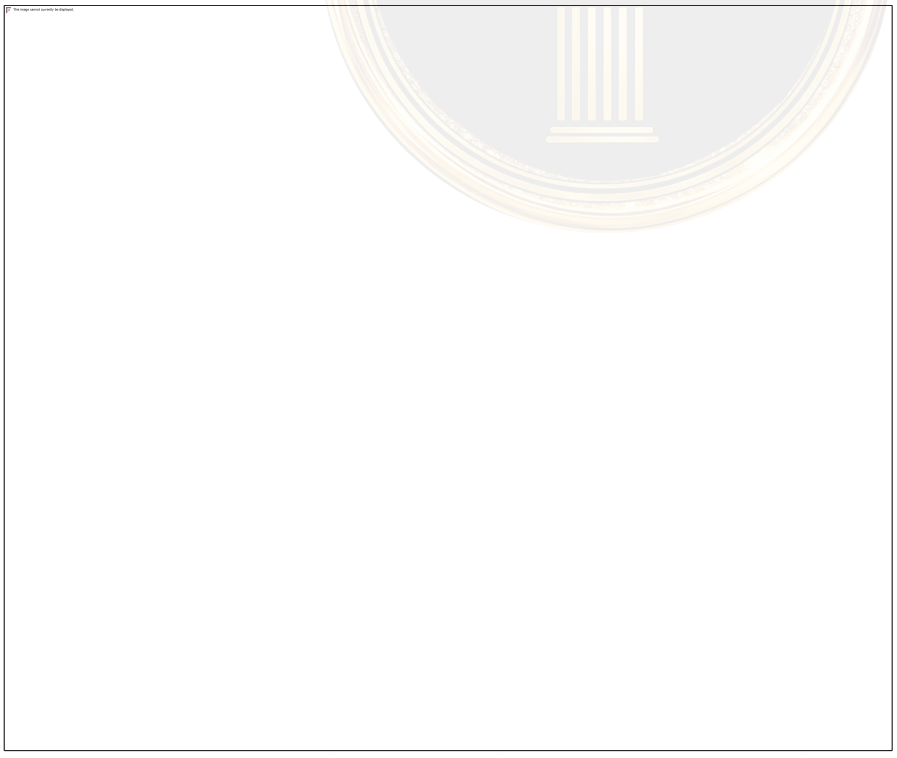


Figure 3.2: Rivers State showing Local Government Areas and Communities

Source: Rivers State Ministry of Lands and Survey

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Rivers State is one of the core states of the Nigerian Niger Delta Region. Rivers State is situated between latitudes 4° 30'N and 5° 40'N and longitudes 6° 25'E and 7° 33'E. The State has belongs to tropical climate and has a mean temperature of 30^0C, copious amount of sunshine, a relative humidity of 80%-100%, and a mean annual rainfall of between 2000mm and 2400mm. It hosts abundant surface water which is a manifestation of the poor drainage of the area (Mmom & Fred-Nwagwu, 2013). Rivers State topography is comparatively flat terrain which is principally due to the varying river channels of the inlets of the River Niger. The composition of this flat terrain is a mix of coastal plains traversed by web of swamps, creeks and water channels representing a somewhat scarcity of strong and wide-ranging land areas (Umeuduji & Auseubeogun, 1999).

The elevation of the area is circa 12m above mean sea level (Mmom & Fred-Nwagwu, 2013). The geological formation of the study area is of the Pleistocenic formation that is underlain by the coastal plain sands (Nwakoala & Warmate, 2014). Sands constitute the foremost type of rock in the area; while gravels and pebbles constitution the last part of the sub-surface rock types and settle at the river channel floors (Joab-Peterside, 2005). There is abundance of booming and composite diversity of Tropical rainforest vegetation in the area domiciled in the inland parts and mangrove swamps towards the coast the Atlantic Ocean (Ojeh, 2011).

2.2 Data

This study selected 12 local government areas (LGAs) out of the 23 LGAs that constitute Rivers State using the purposive sampling method, namely; Port Harcourt, Obio/Akpor, Okrika, Akuku-Toru, Degema, Emohua, Bonny, Andoni, Opobo/Nkoro, Ogu/bolo, Asari-Toru, and Ahaoda-East. From these 12 LGAs, 33 communities were selected for inclusion in the study also with the purposive sampling procedure, for reason that these communities are settled in lowland flood plains that are in contemporary times frequently flooded. Afterwards,

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10,454 households were drawn from these 33 sampled communities and then heads of the different households were selected for the study interrogation. The sample size of 400 was determined with the Taro Yamane (1967) formula and this was the basis for allocation of the study questionnaire to the selected communities based on proportional allocation technique. The questionnaire was randomly administered to the heads of the household in these communities. A total of 398 questionnaire were returned and used for analyses out of the 400 that were allotted. The formula for the Taro Yamane sample determination is given as:

$$n = \frac{N}{1 + N\,(e)^2} \qquad \text{Eqn. 1}$$

Where;
n = sample size
N = total number of Household heads
e = 0.05

Primary and secondary data were used in this study. Questionnaire administration aided data collected. Flood capacity indicators selected from literature for this study are basic needs, external support and institutional capacity (UNISDR, 2004; Yasmin & Ahmed, 2013) (Table 2). Descriptive statistics such as frequency distribution, percentages and means were used to analyse and present the data. The SPSS version 20.0 was used to perform the data analyses.

3 Results

3.1 Socio-economic Characteristics of Respondents

The result shows that males (72.51%) were more in number than females (27.49%). The result on age of respondents reveals that greater proportion of the respondents were between the age bracket of 41 and 50 years (31.16%), while those between 21 and 30 years were 29.15%, those between 61 years and above were 14.07%, those between 51 and 60 years were 11.81%, those between 31 and 40 years were 7.54%, and those below 20 years were 6.28%. Majority of the respondents were married (54.52%), 15.58% were widowed, 15.08% were single, while

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14.82% were divorced/separated. Majority of the households live in their own houses (64.07%), while 26.38% live in rented apartments, and 9.54% were squatter dwellers.

Table 1: Socio-economic Characteristics of Respondents

Variables	Frequency	Percentages
Gender of Respondents		
Male	289	72.51
Female	109	27.49
Total	**398**	**100.0**
Age of Respondents		
Below 20	25	6.28
21-30	116	29.15
31-40	30	7.54
41-50	124	31.16
51-60	47	11.81
61 and above	56	14.07
Total	**398**	**100.0**
Marital Status of Respondents		
Single	60	15.08
Married	217	54.52
Divorced/Separated	59	14.82
Widowed/Widower	62	15.58
Total	**398**	**100.0**
House Ownership Status of Respondents		
Rented	105	26.38
Owner	255	64.07
Squatter	38	9.54
Total	**398**	**100.00**
Educational Qualification of Respondents		
FSLC	20	5.03
SSCE	69	17.34
OND	74	18.59
HND	60	15.08
BSc	123	30.90
PG	52	13.07
Total	**398**	**100.0**
Income per Month of Respondents (Naira = ₦)		
Below 100,000	46	11.56
100,000-300,000	207	52.01
301,000-500,000	74	18.59
501,000 and Above	71	17.84
Total	**398**	**100.0**
Economic Activities of Respondents		
Farming/Agriculture	98	24.62
Fishing	84	21.11
Oil Bunkering	121	30.40
Oil Exploration/Exploitation	56	14.07
Lumbering/Wood Extraction	39	9.80
Total	**398**	**100.0**

Source: Author's Computation (2023)

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Majority of the respondents had Bachelor of Science (BSc) degree (30.90%), 18.59% Ordinary National Diploma (OND), 17.34% Senior School Certificate (SSC), 15.08% Higher National Diploma (HND), 13.07% Post Graduate (PG) degree, while 5.03% had First School Leaving Certificate (FSLC). Greater proportion of the population earn annual income of ₦100,000 - ₦300,000 (52.01%), 18.59% earn ₦301,000 - ₦500,000, 17.84% earn ₦501,000 and above, 11.56% earn below ₦100,000. Oil bunkering activities was prevalent human activity (30.40%), 24.62% was in farming/agriculture, 21.11% in fishing, 14.07% in oil exploration/exploitation, and 9.80% engage in lumbering/wood extraction.

3.2 Capacity of Residents of Sampled Communities to Manage Flood Risk in Rivers State

3.2.1 Flood Hazard Related Information Receiving Tool in Rivers State

Table 2 reveals that majority of the respondents indicated that mobile phones were the highest information receiving tool they had (132.16%); followed in ranking by television (22.11%) and radio (22.11%) respectively; computer with internet (15.57%); and wireless telephone (7.53%). This analysis also corroborates to the level of awareness on early warning information on flood predictions by relevant authorities across the communities in the State and the Nation at large.

3.2.2 Flood Hazard Related Training in Rivers State

Table 2 shows the various age categories that had engaged in one form of training or the other in the sampled communities across the State. The analysis showed that respondents within the age bracket of 41-50 years are the residents that has had the highest number of one form of hazard related training or the other across the sampled communities (52.76%); seconded by age brackets 21-30 years (14.57%); and then 51-69 years (12.56%); 31-40 years (9.54%); 61-70 years (7.54%); and above 70year (5.03%).

3.2.3 Basic Needs Indicators across Communities in Rivers State

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Table 2 evaluated the basic needs essential to enhance resilience to flooding in the study area. The results shows that 33.16% of the respondents had electricity supply; 27.13% of the sampled residents across the communities had water available; 19.34% agreed that they had tarred roads across their communities; while 12.0% had some form of refuse disposal arrangement; and 8.29% agreed that their streets are cleaned especially in the urban areas..

3.2.4 Institutional Capacity Drivers to Flood Disaster Management in Rivers State

Table 2 shows that majority of the respondents indicated that the institutional capacity building for flood disaster management they have experienced is awareness programme/training (22.11%); 19.59 % agreed that the plans of management agencies have not reflected how flood incidents could be averted; 17.58% agreed that early warning signals are given by the agency via the information dissemination tools, but the people are never ready to heed until the flood incidents occurs; 17.08% of the respondent agreed that emergency shelters/camps that were available were not enough to carter for the displaced persons; 15.57% indicated that they are aware of flood insurance schemes; 8.04% agreed that the problem of flooding across the state can be averted by the deployment of development control schemes by the government authority in charge of physical planning in the state.

3.2.5 Availability of Organisational Support to Flood Management in Rivers State

As presented in Table 2, 72.51% of the sampled population was of the view that there are no serious support from organisations to manage flood in their rural and urban settlements; while 27.49% admitted that they had received support and assistance from some agencies in form of relief materials such as Rivers State Ministry of Special Duties, to cushion the effects of flooding, which was just a temporary relief measures.

Table 2: Flood Hazard Related Information Receiving Tool

Variables	Frequency	Percentages

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Information Tool		
Radio	88	22.11
Television	88	22.11
Mobile phones	128	32.16
Computer/internet	62	15.57
Wireless Telephones	30	7.53
Total	**398**	**100**
Flood Hazard Related Training by Age		
Below 20	0	0
21-30	58	14.57
31-40	30	7.54
41-50	210	52.76
51-60	50	12.56
61-70	30	7.54
Above 70	20	5.03
Total	**398**	**100**
Basic Needs Indicators		
Water supply	108	27.13
Electricity	132	33.16
Tarred Roads	77	19.34
Refuse management	48	12.06
Street Cleaning	33	8.29
Total	**398**	**100**
Institutional Capacity Drivers		
Emergency shelter/camps	68	17.08
Awareness programme/Training	88	22.11
Emergency Management Plans	78	19.59
Flood Insurance Schemes	62	15.57
Early warning Signals	70	17.58
Development Control Measures	32	8.04
Total	**398**	**100.00**
Availability of Organisational Support		
No	289	72.51
Yes	109	27.49
Total	**398**	**100.0**

Source: Author's Computation (2023)

3.2.6 Adaptation and Coping Strategies Adopted for Flood Management

From the analysis in Table 3, it is discovered that 75.88% of the respondents strongly agreed on constructing elevated walls and use of sand bags as coping strategies for flood controls; 13.07% merely agreed; 10.05 disagreed; while 1.01% strongly disagreed. Also, majority strongly agreed on adopted regular cleaning of drainages and good sanitation as strategies for flood controls (52.51%); 38.19% agreed; 6.53% disagreed; while 2.76% strongly disagreed.

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Similarly, majority of the population agreed on planting of trees and grasses for flood controls (39.95%); 28.14% strongly agreed; 17.09% strongly disagreed; and 14.32% disagreed.

Majority of the respondents strongly agreed to adopting regular cleaning of water channels to allow easy flow of storm water as mitigation strategies (63.82%); 25.88% agreed; 10.05% disagreed; while 0.25% strongly disagreed. Again, majority of the respondents strongly agreed that they adopted proper waste disposal and no dumping of waste into drainages as flood controls strategies (58.79%); 31.41% agreed; 5.78% disagreed; while 4.02% strongly disagreed. It was yet observed that more than 2/3 of the sample population representing 67.59% agreed on the implementation of laws and policies that will discourage activities that can lead to flooding in the communities; 14.07% agreed; while 12.31% disagreed; and 6.03% strongly disagreed. Also, majority of the respondents strongly agreed to the adoption of periodic evaluation of the environment as key and necessary measure for early warning signals (69.85%); 17.34% disagreed; 10.55% agreed; while 2.26% strongly disagreed.

Once more, majority of the respondents strongly agreed that training of handlers of emergency responders by government agencies and organisations has been viable tool for adaptation and coping strategies for flood controls across their respective communities (54.77%); 26.38% agreed; while 14.32% disagreed; and 4.52% strongly disagreed. Again, greater proportion of the sampled population strongly agreed for adopting adequate channeling of storm waters into flowing streams and rivers as adaptation and coping strategies for flood controls across their respective communities (64.82%); 34.42% of them agreed; 0.50% disagree; while 0.25% strongly disagreed. Lastly, majority of the respondents covering 50.50% strongly agreed that buildings constructed on elevated areas and of high rise type to avert incessant flooding of residences as adaptation and coping strategies for flood controls across their respective communities; 25.88% agreed; 14.57% strongly disagreed; while 9.05% disagreed.

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Table 3: Coping Strategies being adopted for Flood Controls across the Communities

Items	SA	A	D	SD	Total
Building elevated walls and use of sand bags	302 (75.88)	52 (13.07)	40 (10.05)	4 (1.01)	398 (100)
Regular cleaning of drainages and good sanitation	209 (52.51)	152 (38.19)	26 (6.53)	11 (2.76)	398 (100)
Planting of trees and use of flood control grasses	112 (28.14)	159 (39.95)	59 (14.32)	68 (17.09)	398 (100)
Regular cleaning of water channels to allow easy flow of storm water	254 (63.82)	103 (25.88)	40 (10.05)	1 (0.25)	398 (100)
Proper waste disposal and not dumping of waste into drainages/ construction of deep drainages	234 (58.79)	125 (31.41)	23 (5.78)	16 (4.02)	398 (100)
Implementation of laws and policies that will discourage activities that can lead to Flooding	269 (67.59)	56 (14.07)	49 (12.31)	24 (6.03)	398 (100)
Periodic evaluation of the environment is key and necessary for early warning signals	278 (69.85)	42 (10.55)	69 (17.34)	9 (2.26)	398 (100)
Training of handlers of emergency responders by government agency/organisation	218 (54.77)	105 (26.38)	57 (14.32)	18 (4.52)	398 (100)
Adequate channeling of storm waters into flowing streams/ rivers	258 (64.82)	137 (34.42)	2 (0.50)	1 (0.25)	398 (100)
Building on elevated areas and construction of high rise buildings	201 (50.50)	103 (25.88)	36 (9.05)	58 (14.57)	398 (100)

Source: Author's Computation (2023)

4 Discussions

4.1 Socio-economic and Demographic Characteristics

There were more male heads of household (72.51%) than female heads of households (27.49%). The predominant age bracket of 41 years and above (31.16%) suggest some chancy situations for the population especially with regard to emergency relocation exercise. There were more owner-occupiers in the communities than tenants and squatters and scenario has the good of making the house owners' exhibit fervor and commitment in protecting their houses against flood disasters. This situation is supported by the assertions of Steinfuher and Kuhikle (2009) and Twigg (2004). The Bachelor of Science (BSc) degree was found to be the popular educational certificate obtained by majority of the sampled population (30.07%). The implication is that more of the people would be enlightened about flood hazard and its preventive measures. Respondents that earn ₦100,000 - ₦300,000 as annual income were in majority the sampled communities. This circumstance implies that the standard of living of majority of the residents in the sampled communities is low. Meanwhile, the Nigerian national

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minimum wage of is ₦30,000 per month, which translates to ₦360,000 per annum. This goes further to imply that majority of the population will be handicapped in coping with flood events, as most of the measures require huge capital.

4.2 Residents Capacity to Manage Flood across the Sampled Communities in Rivers State

With BSc as dominant educational qualification among the population as earlier reported, the illiteracy ratio was observed to be low, which means that majority of the residents can read and write in English and may also be exposed to other mass media platforms. With this aptitude, it may become easy to reduce flood risk and boost the level of preparedness, resilience, coping and reduction measures. However, access to hazard related information is largely dependent on the number of available information receiving media that residents can acquire. Findings revealed that each household in the study area had an average of three out of the five information receiving media, implying that residents have fair asses to flood related information. However, mobile phones were the highest information media they had and then the television and radio respectively. This is an advantageous stride for the communities just as the contrary would be ominous, because according to the findings reported by Adelekan (2011), the lack of pre-flood information was responsible to the high risk to flood in Abeokuta.

Numerous basic needs like refuse disposal and street cleaning were lacking in the communities. Proper refuse disposal promotes free flow of water along all water courses as it reduces blockage as well as reduces health problems. This is more so because poor refuse disposal comes with numerous challenges such as impediment in drainage flow which encourages stagnant water that breeds mosquito that causes malaria, and other health problems through the spread of disease causing vectors such as flies and rats. In addition solid waste pollutes surface water and the environment generally. In the case of street cleaning, whatever is not removed from the streets will be washed away into the drainages contributing to blockage as well.

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The major institutional capacity drivers to flood disaster management that respondents have experienced were awareness programme/training; early warning signals, though the people are never ready to heed until the flood incidents occurs; emergency shelters/camps though not enough to carter for the displaced persons; and flood insurance schemes though not effectively explored due to official bureaucracies that has hampered the peoples willingness to explore it. It was found that no serious support from organisations had been accorded the residents of the communities to manage or to cushion the effects of flooding in their respective communities. The assistance ever received were mainly paltry relief materials from religious groups, State management agencies, politicians, NEMA and multinational oil companies.

4.3 Adaptation and Coping Strategies Adopted for Flood Management in the Sampled Communities in Rivers State

As found in the agreement continuum, generally, the major adaptation and flood reduction strategies among residents of the sampled communities were building elevated walls and use of sand bags; regular cleaning of drainages and good sanitation; planting of trees and flood control grasses; regular cleaning of water channels to allow easy flow of storm water; proper waste disposal and no dumping of waste into drainages; implementation of laws and policies; periodic evaluation of the environment as key and necessary measure for early warning signals; adequate channeling of storm waters into flowing streams and rivers; and constructing buildings on elevated areas and also high rise type to avert incessant flooding of residences.

5 Conclusion and Recommendations

The study evaluated residents' capacities for flood risk management in selected communities in Rivers State, Nigeria. The study found that residents capacity to manage flood across the sampled communities in Rivers State have different dimensions. Even though from the study findings it has been established that each household across the study area had an average of

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three information receiving tools, implying that residents have fair asses to hazard related information, and thus should increase their flood awareness and early warning; the people are never ready to heed until the flood incidents occurs. Worst still, the residents have not enjoyed any serious support from organisations to manage or cushion the effects of flooding in their communities other than unsustainable paltry relief materials amid absence of basic needs that would enhance resilience to flooding. Thus, this study recommendations as follows:

1. There should be periodic environmental assessment of the areas to help boost the capacity of the population in the flood prone communities to manage flood disasters.

2. Organisational and institutional support base for flood management should be improved to transcend beyond the issuance of "handouts" called relieve materials, and touch other aspects of post flood livelihoods ventures like flood insurance schemes, soft loans, agricultural subsidies, structural rehabilitations, and other life-improving schemes.

3. Authorities should proactively put in place both structural and non-structural flood reduction cum mitigation measures. This will discourage the usual emergency and "fire brigade" approach to flood management and control.

4. The standard of living and income levels of the population at the lower ebb should be raised, in addition to provision of basic socio-economic amenities s that promote wellbeing. These would increase the individual and communal capacities to manage flood disasters.

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