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ASSESSMENT OF THE COPING CAPACITY FOR URBAN RESILIENCE TO FLOOD IN THE NIGER DELTA, NIGERIA

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Abstract: Global trends have indicated that in the current clime, flood hazards are inevitable hence; "resilience thinking" is the panacea for coping with flood. This study assessed the coping capacity to flood across the state capitals of the Niger Delta by generating capacity indices and comparative analysis across Yenogoa, Port Hacourt, Uyo, Calabar, Benin and Asaba. The survey was conducted among 386 households and key informant interviews were used to explore, define and obtain additional data which were beneficial to the research. Findings revealed that proper waste disposal and street cleaning which are vital services that are required to increase the capacity to cope with flood were mostly unavailable. Also, there is inadequate external support and assistance to tackle flooding across the state capitals of the Niger Delta. These results identify the need for increasing the capacity to cope with flood across the study area. Based on these, this study proffers a practical method for urban communities to cope with flood hazards by applying the Community Based Flood Risk Management Optimization Framework for Action.

Keywords: Urban households, flood, coping capacity, Niger-Delta, Nigeria.

I. Introduction

Natural disasters in diverse forms have had severe impacts in the reduction of the world's population across the globe due to the increasing prevalence. Climate change has led to increase in flooding due to global warming (IPCC, 2001). Extreme weather and climate events have constituted serious threats to global economic growth over the past few years. This statement agrees with the prediction of the World meteorological program on flood management (WMO/AFM, 2009) which stated that global warming would result to several changes in many subsystems of the global hydrologic cycle resulting to an altered rainfall and runoff pattern. The apparent increase in the severity of flooding indicates that there are changes taking place in the earth's climate (IPCC, 2001). Flooding has adverse impact especially on the socio-economy of developing nations.

In Nigeria, severe floods especially, among other extreme weather and climate events have impacted negatively on its socio-economy and many people have been affected physically and psychologically (NIMET, 2010; Etuonovbe, 2011). Flooding is already one of the most widespread of hydro meteorological hazards in present climate regime. NIMET (2013) reported that impact of climate change is threatening almost every sector of the economy and this has already been revealed as NEMA (2012) reported 2.6trillion Naira loss to 2012 flood disaster alone. Several studies have been conducted globally and nationally in attempt to combat climate hazards especially in a changing climate regime witnessed in recent time, nevertheless, climate risks like flood still abound (NIMET, 2013). It is obvious that occurrence of natural disasters associated with severe climate events are now increasing in intensity, taking terrible toll on human lives and socioeconomic development.

The Niger Delta, as an oil rich region attracts urbanization because of the hope for employment. Unfortunately, human intervention through the change of natural systems to artificial systems without proper land-use planning makes the urban areas more vulnerable to the impact of flooding in terms of damages and losses. Thus, to reduce flood vulnerability there should be a paradigm shift to "resilience thinking" which will enable people living in flood prone areas cope and adapt to the flood disaster or incidents. According to Mileti (1999), it has come to the knowledge of spatial planners that more is required than just using physical and infrastructural adjustment to resist disturbances that are not sustainable over time. Thus, an alternative and more effective resilient strategy that

can cover a wide range of approaches and is flexible is required for spatial planning (Lu & Stead, 2013). According to Barocca (2013) the urban planners have key roles in spatial interventions to increase the adaptive capacity to climate change in turn increasing urban flood resilience.

Adaptive capacity can be equated to coping capacity which is generally used in disaster risk management. In this context UN/ISDR (2004) defines coping capacity as the combination of all the strengths, attributes and resources which are available in the area to reduce the level of risk of the disaster effect. It includes all adaptive processes and resources identified from previous experiences, utilized presently to cope with the effects of climate change and other unprecedented events in time to come. Resilience, adaptive capacity and coping capacity are, most time used synonymously in most literature as resilience is stretched beyond its original meaning as seen in IPCC (2012) definition which states that resilience is a system's ability to anticipate, absorb, accommodate or recover from the effect of a hazardous phenomenon in a timely and efficient manner including through ensuring the preservation, restoration or improvement of its essential basic structures and functions. However, this argument agrees with Malone, 2009, who stated that there is reduced vulnerability in a system which is resilient. It is therefore important, for urban planners to come up with relevant urban policies or strategies to improve urban resilience to flooding, but, they require baseline information on the existing coping capacity to serve as a guide. Thus this study aims to assess the coping capacity to flood in the Niger Delta. The outcome of the capacity assessment to flood in the Niger Delta is the development of a Community based flood risk management optimization framework for action which involves participation of the urban residents so as to reduce flood vulnerability by mitigating flood itself where possible and reducing the impact of flood on urban dwellers through capacity building.

II. Material and methods

Study Area

The Niger Delta region of Nigeria (Figure 1) is the largest wetland and maintains the third largest drainage basin in African possessing a flat monotonous low relief interspersed by several wetlands (Abam, 2001; UNDP, 2006). It consists of a population of over 30 million people who majorly inhabit the urban areas (Okhakhu, 2014).

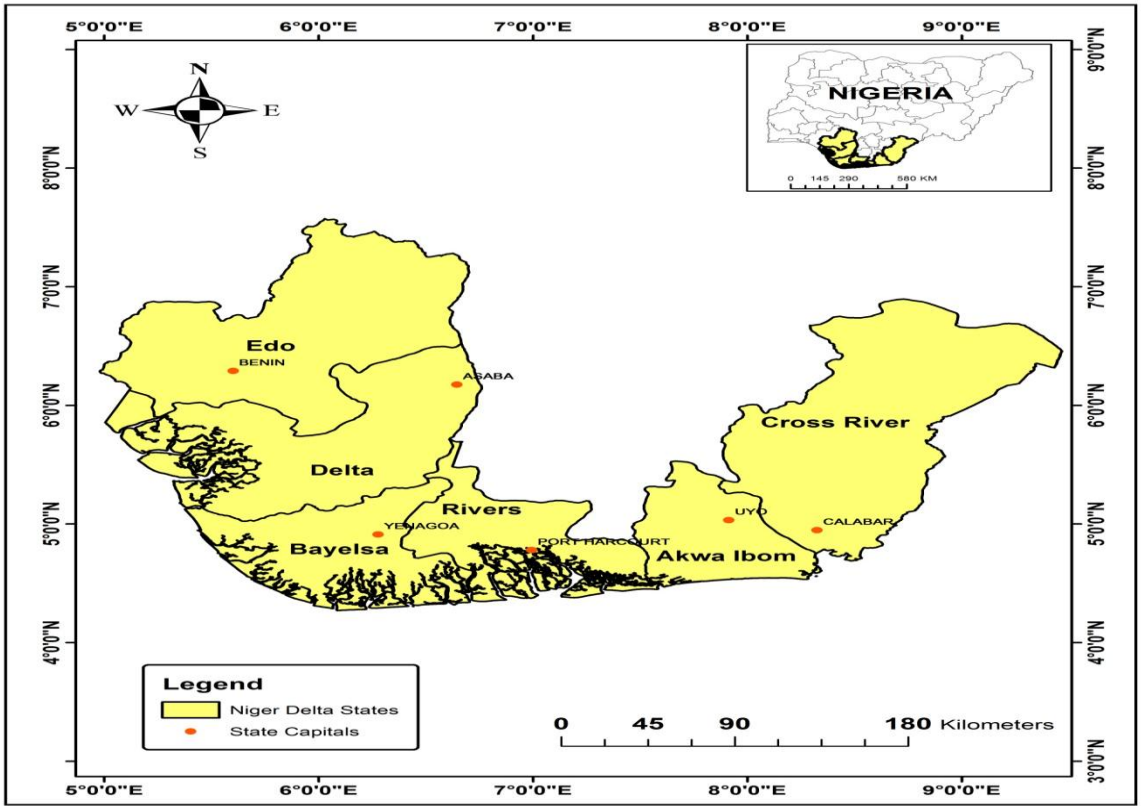

Figure 1: The Niger Delta BRACED States.
(Source: State Boundary Shapefile from Open street map, 2018).

III. Flood Capacity indicators

Flood capacity indicators are used in evaluating all the strengths, qualities and assets used for risk reduction as well as disaster impact mitigation. This involves individuals, households, communities and the national contributions. Capacities may be characterized into various dimensions such as the physical, institutional, economic or social which could be grouped into structural or nonstructural capacity (UNISDR, 2004). However, the indicators selected from existing literature (UNISDR, 2004; Yasmin & Ahmed, 2013) which are basic needs, external support and institutional capacity were used for this study. The questionnaire was used to obtain data for the measurement. Table 1 shows some flood capacity indicators, definition and measurements.

Table 1: Flood Capacity indicators, definition and measurements

Indicator	Definition	Measurement (Proxy)	Relationship
Basic needs	Availability of the basic needs required in an urban area.	Number of required basic needs accessible by household.	The more the basic needs available to household, the higher the capacity.
External support	Availability of support from Disaster Risk Reduction Agencies	Number of agencies that support flood risk reduction activities in the area.	The greater the number of agencies that support flood risk reduction in the area, the higher the capacity.
Institutional capacity	Availability of basic support requirements from the government and NGOs	Number of available institutional capacity drivers.	The higher the number of available institutional capacity drivers the higher the capacity.

Source: Adapted and modified from existing literature (UNISDR, 2004; Yasmin & Ahmed, 2013).

IV. Sampling technique

This study was carried out in six randomly selected local government areas of the state capitals in the Niger delta through the use of a cross-sectional survey research method. The sample was drawn from 400 heads of households across the study area, using the Yamane (1967) formula. Simple random sampling was adopted to pick households for questionnaire administration. From the total household population of each LGA, the Kumar (1976) stratum allocation formula was used to allocate the number of administered in the selected Local Government Areas in the state capitals as represented in Table 2**.** Also, Key informant interviews were used to explore, define and obtain additional data which were beneficial to the research. Participants of the key informant interviews were representatives of the State Emergency Management Agency and the National Emergency Management Agency (south-south zone). The data obtained were analyzed with the aid of the Statistical Package for Social Sciences (SPSS) version 25.0 and were presented in tables and statistical diagrams.

Table 2: Distribution of households for questionnaire administration.

States	LGA Selected	Administered questionnaire	Retrieved questionnaire	Percentage
Bayelsa	Yenogoa	74	68	92
Rivers	Port Harcourt	113	113	100
Akwa Ibom	Uyo	64	61	95
Cross River	Calabar Municipal	39	39	100
Edo	Oredo	79	76	96
Delta	Oshimili South	31	29	94
TOTAL	**Six (6)**	**400**	**386**	**96.5**

Source: Researcher's Computation (2019).

V. Results and Discussion

Basic needs

The study identified the basic needs required in the urban area to include electricity, water, tarred roads, refuse disposal and street cleaning, findings revealed that the residents agreed that water, electricity, tarred roads refuse disposal and street cleaning were available in the following proportion; 89.1%, 87.3%, 72.8%, 45.6% and 21.5% respectively (Figs. 2-6). The result reveals that there is adequate supply of water, electricity and tarred roads which most of the respondents felt were very important to them. However, the level of refuse disposal and street cleaning is very low being that these two services are vital to increase the capacity to cope with floods. Proper refuse disposal reduces health problems, because a poor refuse disposal and management comes with numerous challenges such as becoming impediment in drainage which encourages stagnant water that breeds mosquito which causes malaria. It also causes other health problems through the spread of disease causing vectors such as flies and rats. In addition solid wastes contaminate 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. In the urban areas, lack of drains and dumping waste in the drains are the leading causes of flooding. Thus, it becomes very important to prioritize proper waste disposal and management across the study area. Figure 7 shows that across the state capitals of the Niger Delta, 37.6%,25.9%, 19.2%,14.2% and 3.1%, households of the respondents had available(3,4,2, 5,1) basic needs respectively which are essential to enhance flood resilience. This implies that 77.7% of the households have access to at least three basic needs indicating a high coping capacity to flood.

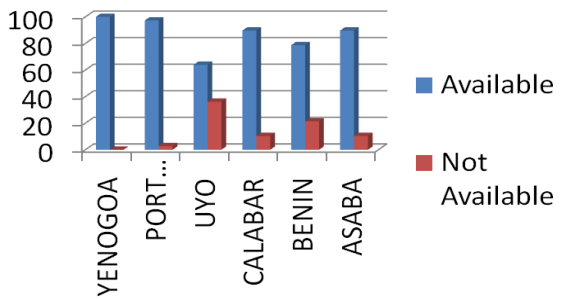

Figure 2:Basic need(water
Source: Researcher's Computation (2019).

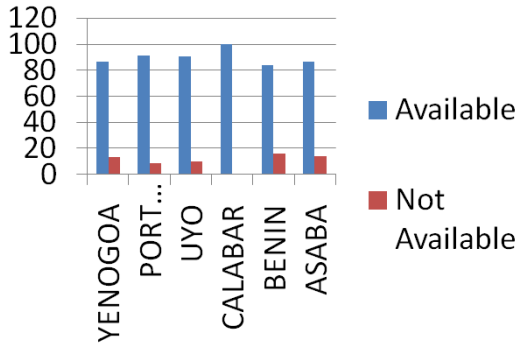

Figure 3 Basic need (electricity)
Source: Researcher's Computation (2019).

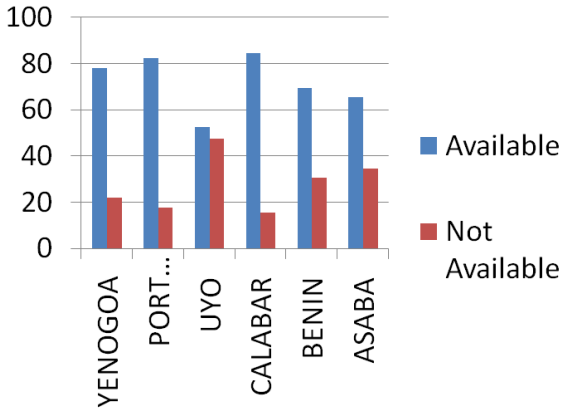

Figure 4:Basic need(Tarred roads)
Source: Researcher's Computation (2019).

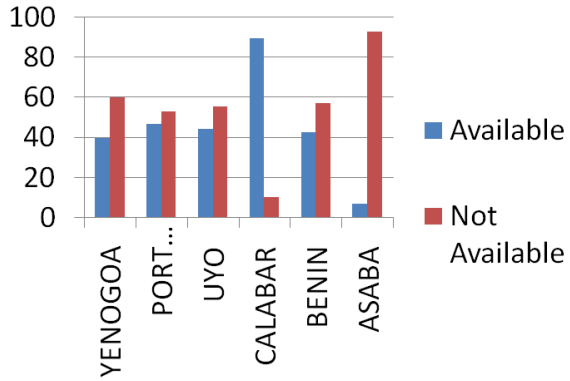

Figure 5 Basic need (Refuse disposal)
Source: Researcher's Computation (2019).

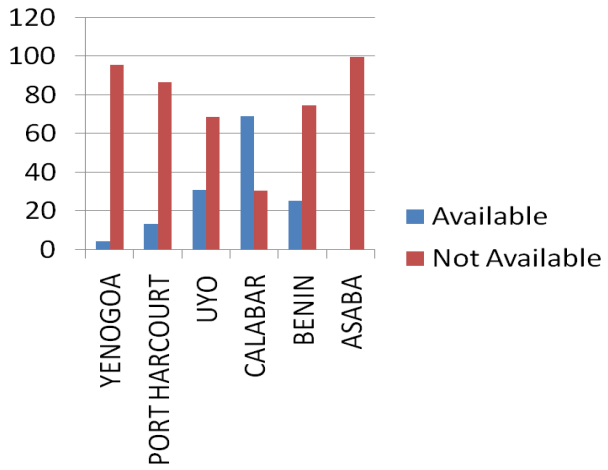

Figure 6: Basic need(Street cleaning)
Source: Researcher's Computation (2019).

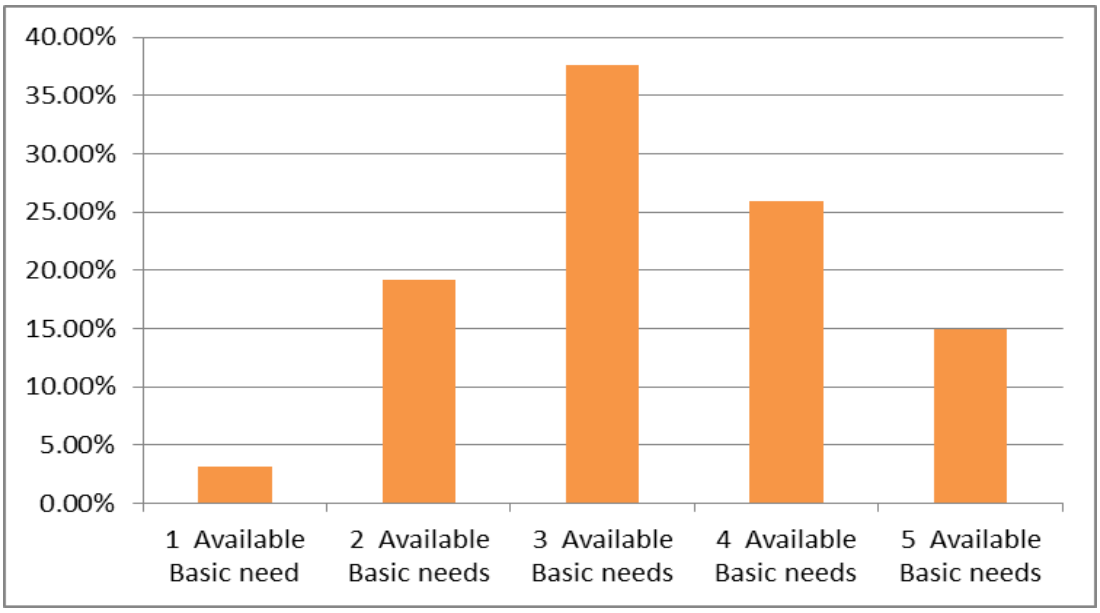

Figure 7: Number of available Basic needs
Source: Researcher's Computation (2019).

b. External support

The results from the findings on external support reveals that only 7.8% of the entire population received support and assistance to tackle flooding and reduce the risk while the remaining 92.2% of the population did not receive any external support (Fig. 8). The assistance received was basically in three (Yenogoa, Calabar and Asaba) out of the six state capitals and they were mainly relief materials from religious groups, state emergency management agencies, ministry of environment, politicians and Shell Petroleum Development Company. Households also indicated receiving assistance from just one Agency across the study area. In the course of the interview, the Coordinator of south-south zone National Emergency Management Agency (NEMA), mentioned that support and assistance is being given to affected communities, but it was observed that most of the areas prioritized were the rural communities. However, across the states, only two states had State Emergency Management Agencies (Cross River and Delta). Thus, it is important to encourage the establishment of more state emergency management agencies and to prioritize support beyond provision of relief materials as well as increase focus of support to the urban areas. As presented in figure 8, 92.8% households of the households indicated that there was no agency that

supported disaster risk reduction while 7.8% indicated that only one agency was available to support disaster risk reduction. This indicates a low capacity for disaster risk reduction across the state capitals in the Niger Delta.

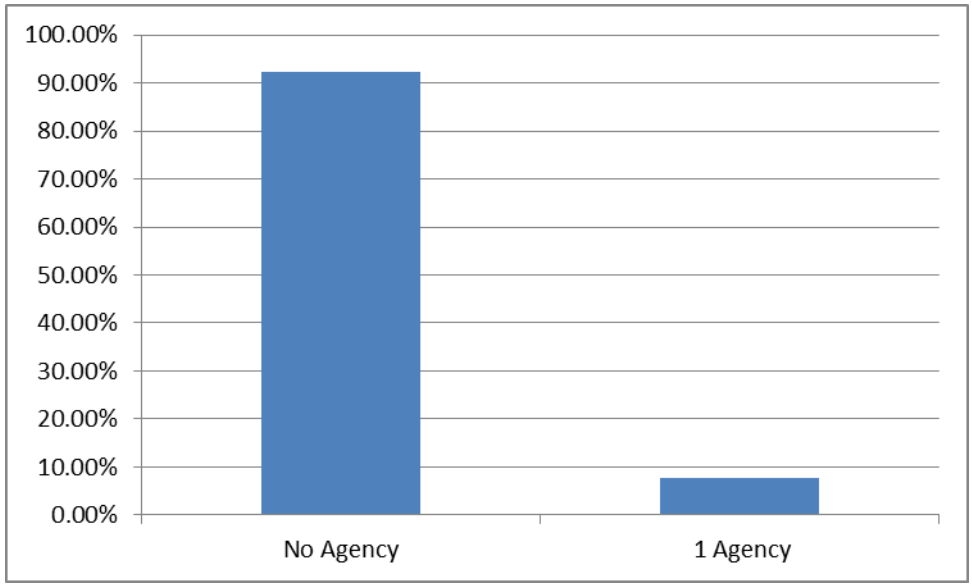

Figure 8: Number of agencies that support DRR
Source: Researcher's Computation (2019).

VI. Institutional capacity

The results from the indicator that assessed the institutional capacity reveal that emergency shelters, public awareness, emergency management plans, flood insurance, early warning systems and development control are available in the following proportions, 0%, 23.6%, 0.3%, 1.6%,1.6%, and 6.5% respectively as shown in Figure9-12 . Judging by the findings it is obvious that the institutional capacity to cope with flood is very low across the state capitals thus increasing their risk to flood. In line with Adelakan's (2011) findings, lack of early warning system was part of the factors responsible for the high risk to flooding. Figure 13 shows the number of available capacity drivers across the state capitals of the Niger delta in increasing order from 0- 5 were 71.8%, 25.1%, 1.3%, 1.3%, 0% and 0.5% respectively. Inadequate availability of these institutional capacity drivers implies that there is no likelihood of institutionalizing flood prevention and mitigation in the urban settlement. Thus it is very important to increase the capacity of urban residents in this aspect.

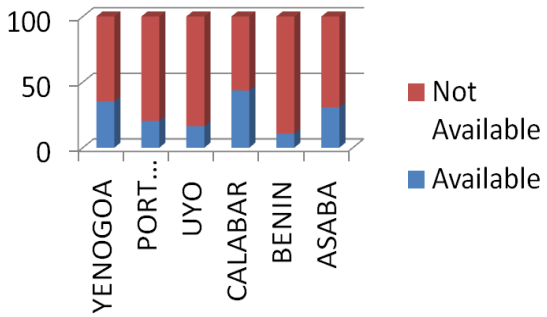

Figure 9: Public awareness and training

Source: Researcher's Computation (2019).

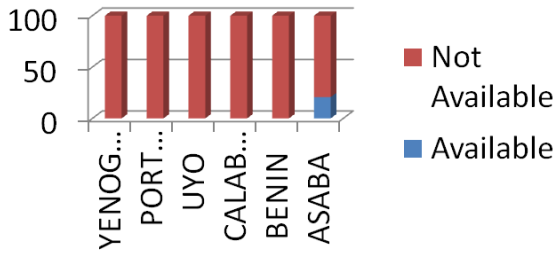

Figure 10: Flood Insurance

Source: Researcher's Computation (2019).

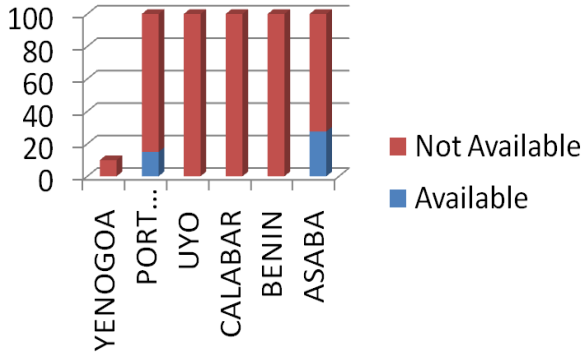

Figure 11: Early warning systems
Source: Researcher's Computation (2019).

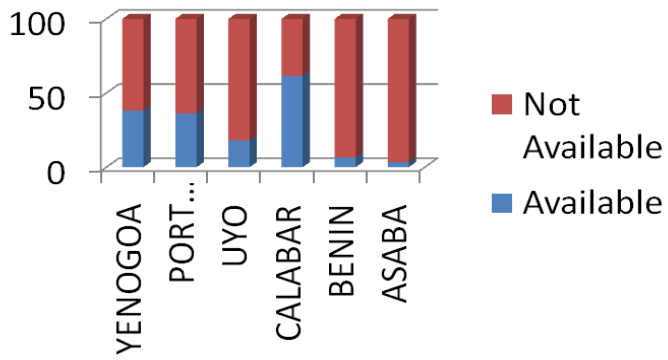

Figure 12: Development control
Source: Researcher's Computation (2019).

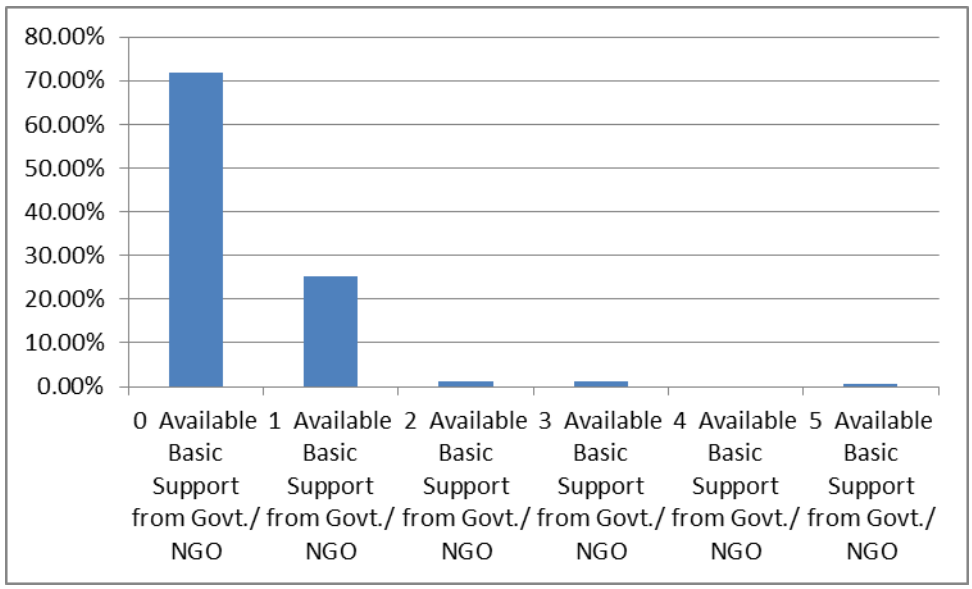

Figure 13: Number of available Institutional capacity drivers.
Source: Researcher's Computation (2019).

VII. Community Based Indigenous knowledge for flood Management

Figure 14 shows that 97% of the respondents across the state capitals of the Niger delta think that the local authorities have not incorporated indigenous knowledge into institutionalized flood management as well as flood risk management practices. However, when asked how they apply their indigenous knowledge to cope with flood, the following coping strategies were the most reoccurring across the state capitals: clearing drains, channeling away flood water, use of sand bags, relocation and pumping out flood water. Sustainable coping strategies identified across the study areas include planting of trees, plantain, banana and flowers. However, as presented in Figure 15, 17 % of the population is of the view that these coping strategies were effective while 83% identify these strategies as being ineffective, but they serve as temporary measures to help them cope with the flood.

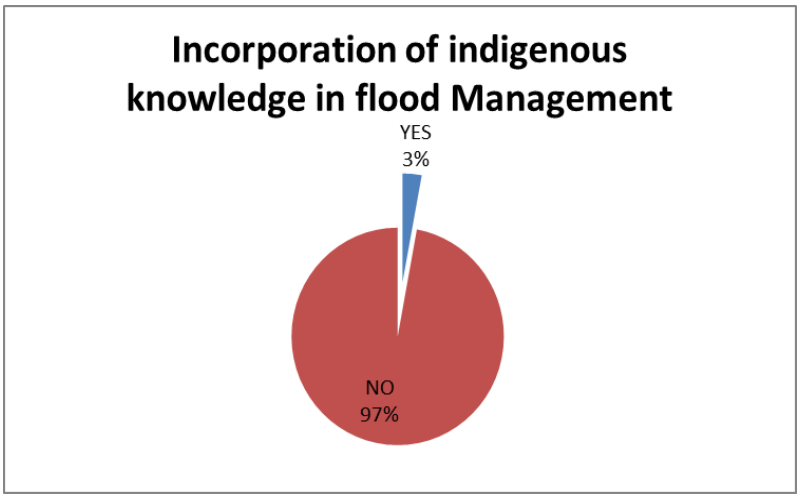

Figure 14: Incorporation of indigenous knowledge in flood management.
Source: Researcher's Computation (2019).

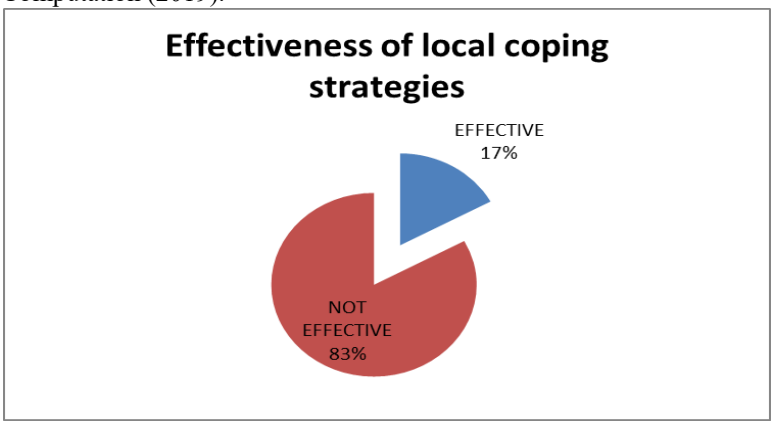

Figure 15: Effectiveness of local coping strategies.
Source: Researcher's Computation (2019).

VIII. Interview Response from Disaster Risk Reduction Agencies.

Table 3 presents the non-verbatim transcription of the interview with the available disaster risk reduction agencies. Across the state capitals of the Niger Delta, only two states which are Cross River and Delta had a state Emergency management Agency. However representative from the National Emergency Management Agencies in the south-south zone were interviewed as well. The results show that they all agreed that flooding across the study area was an annual event during the rainy season. It was also identified that the major conditions that worsened flooding in the area were, inadequate drainages, dumping of waste in the drains and poor urban planning. The major risk reduction strategies adopted by these agencies include sensitization, stakeholders meetings, clearing and maintenance of drainage and sewer systems. The major community based approaches which the agencies identified for flood management across the study area were clearing of drains, building of walls and monthly environmental sanitation. However the agencies pledged their willingness to replicate any sustainable community based flood risk management strategies.

TABLE 3: INTERVIEW RESPONSE FROM DISASTER RISK REDUCTION AGENCIES

INTERVIEW QUESTIONS	NATIONAL EMERGENCY MANAGEMENT AGENCY(SOUTH SOUTH ZONE)	DELTA STATE EMERGENCY MANAGEMENT AGENCY	CROSS RIVER STATE EMERGENCY MANAGEMENT AGENCY
How often does flooding occur in the community/ city?	Annually, during the raining season from May to December.	Annually	Annually between June to September where the rains are very heavy.
What are the conditions and underlying constraints t worsen flood event in the area?	• The terrain of the Niger Delta is low compared to other parts of the country. • The soil contains so much water • Poor drainage • Poor urban planning	• Natural blockage at River mouth. • Infrastructural development along water ways • Indiscriminate dumping of waste/refuse along water courses and drainage channels resulting in blockage at drains and pollution to water source	• Most drainage systems are not frequently desilted. • Some areas have poor drainage problems
What are the risk reduction strategies employed by agencies to mitigate flood impact on the community?	• Sensitization. • Stakeholders meeting with relevant stake holders with respect to town planning.	Flood risk mitigation in Asaba is focused on; • Attitudinal and behavioral change • Legislation • Enforcement and review of environmental laws • Dredging and channelization of River channel • Clearing and proper maintainace of drainage and sewer system.	• Sensitization • Meeting with the community • Creation of flood awareness in flood prone communities.
Are there any community approaches adopted in flo management in the area?	• Cleaning of drainages • Construction of more drainages • It recommends building of new towns	• Monthly cleaning of the environment	• Desilting the drainages • Building walls
Are the Agencies willing to incorporate indigen knowledge which is effective in flood management?	Yes, the agency encourages local adaptation strategies and is willing to replicate it.	Yes	Yes

Source: Researcher's Computation (2019)

IX. Community Based Flood Risk Management Optimization Framework for Action

Predicated on the research, the community based flood risk management optimization frame work for action was created. Enumerated below are the key factors for a sustainable community based flood risk management.

1. Ascertain the participation of community members as well as relevant stake holders prioritized to manage flood risk within urban settlement.
2. Public education and training is required to target flood preparedness and mitigation in the urban area.
3. Resources and amenities are needed to strengthen the capacity to cope with urban flood.
4. Coordination is a necessity to ensure proper management of resources for urban flood capacity building
5. Enhancing sustainability of urban flood risk management through incorporation into periodic planning and budgeting.

X. Conclusion

The study assessed the coping capacity for urban resilience to flood in the Niger Delta. The findings from this study have shown that proper waste disposal and street cleaning which are vital services that are required to increase the capacity to cope with flood were mostly unavailable. Also, there is inadequate external support and assistance to tackle flooding across the state capitals of the Niger Delta. More so, there are very few agencies handling risk reduction activities across the state capitals of the Niger Delta Region. Lastly flood risk management strategies such as provision of emergency shelters, public awareness programmes/training, having emergency management plans, provision of flood insurance schemes, provision of early warning systems and development control that are supposed to be the responsibility of the government are not being implemented except for public awareness and development control which are implemented on a less than 30% scale. These results project the need for adoption and implementation of the Community Based Flood Risk Management Optimization Framework for Action to enhance capacity to flood management across urban areas.

XI. Recommendations

Predicated on the findings, the study recommends establishment of state and local government emergency management agencies and committees in the States where they are not available, existing drains should be kept free from refuse and properly maintained, public education is required to target behavioral change to prevent unsanitary practices, littering and poor infrastructural maintenance.

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