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Lessons in Resilience: A Rural Community's Adaption to an Extreme Flood Event in Northern Rivers State of Nigeria

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Abstract

The study applied the RRA technique in studying the adaptation of the Ndoni people of Rivers State to flooding in Nigeria. The study examined the impact of the 2012 flood disaster in the area. The research is based on survey method, and data collected was through House-To-House Interviewing, Focus Group Discussion (FGD) and Key Persons Interview (KPI). Simple random sampling technique was used to select ten (10) out of fifteen (15) disaster affected villages in the district and thirty five (35) households selected from each of the villages. Data collected was analyzed using descriptive statistics, presented in figures and percentages. The findings reveal that personal preparedness for the 2012 flooding which occurred in October was low, as majority (90.32%) of the respondents had no early warning signs before the flood struck and therefore could only make few adjustments to withstand its impacts. As a result, personal properties such as individual homes/houses, fish and crop farms, other businesses and houses contents as well as government infrastructure including health facilities, roads, and schools were adversely affected. Therefore, the people chose to relocate to safe areas, raising household items above the flood level as immediate response measure. After the flooding, the people considered building resilience as only alternative to live with the flooding in the area since its vulnerability remains high due to its proximity to the River Niger. The adaptive strategies to enhance their resilience include following warning advice on radios and television; dredging of Rivers, modification of building designs by raising the foundations above flood levels and the community cohesion among other traditional methods.

Keywords : Flood Disaster; Resilience; Adaptation

Abbreviations : DRR: Disaster Risk Reduction; LGA: Local Government Area; NPC: National Population Commission; FGD: Focus Group Discussion; KPI: Key Persons Interview; NEMA: National Emergency Management Agency

Introduction

According to the National Climate Change Adaptation Research Facility 2013, understanding how floods impact communities provides insights on policies aimed at reducing the impact of future flood events. It further argued that climate change scenarios suggest an increase in extreme rainfall events, contributing to a greater frequency of riverine and flash floods, and concluded that the experiences of psychological, financial and social stress within the communities preparing for, dealing with, and recovering from the floods provides information to planners and emergency managers. This is as having pre-disaster plans ahead of catastrophic events such as flooding shortens the immediate recovery process [1]. When the most devastating flood disaster in relevant memory ever witnessed in Nigeria struck in Sept-Oct. 2012, many communities were affected with about three hundred and sixty-three (363) deaths recorded and over two million, one hundred thousand (2,100,000) people displaced and almost six hundred thousand (600,000) houses destroyed (OCHA, 2012). The worse affected states by the disaster include Adamawa, Taraba, Plateau, Benue, Bayelsa, Kogi, Niger, Lagos and Rivers among others [2]. Revealed that the flood disaster in Ogba/Egbema/Ndoni LGA of Rivers State occurred in October, 2012 after the main rainy season (August- September) [3]. The study posited that since the flooding, occupants of the area have continued to count their losses as schools, family homes, personal properties including farmlands and crops/livestock suffered various farms of flood damage with distorted the livelihood means of the community, whose residents are mainly poor farmers. However, two years after the disaster, Nwaogu and Ezekwe [4] in their study revealed that the Ndoni community is vulnerable to flooding because it is surrounded by River Niger. The study conducted in USA on human impacts of floods, revealed that the risk of catastrophic losses due to flooding was on the increase owing to increasing proximity of large populations to coastal areas, river basins and

lakeshores [5]. This is because rising sea levels are the main driver for increasing flood risk [6].

A study by the International Flood Initiative suggests that floods are the most taxing of water related natural disasters to human, material assets as well as to cultural and ecological resources affecting people and their livelihoods and claiming thousands of lives annually worldwide. Apart from the direct deaths caused by floods, disease outbreak is common especially in less developed countries with malaria and typhoid being the most common in tropical countries. In India and Bangladesh alone, 300 million people live in areas that are affected by floods, with the physical damage to property being one of the major causes for tangible loss in floods. These include the cost of damage to goods and possessions, loss of income or services in the flood aftermath and clean-up costs. It further argues that some impacts of floods are intangible and are hard to place a monetary value because on most intangible goods such as levels of physical emotional and psychological health problems suffered by flood- affected people are difficult to be quantified [7].

The United Nations publications titled ''Know Risk'' observed that studies undertaken showed that the economic impact of natural disasters shows a marked upward trend over the last several decades. It suggests that the hazards tend to hit communities in developing countries especially the least developed countries, increasing their vulnerability and setting back their economic and social growth, sometimes by decades. According to the United Nations Secretary General, Ban Ki - Moon, poorer nations bear the brunt of deaths from natural disasters than rich nations [8]. It continued that an analysis of more than 7000 disasters over the past decades, in which 1.35 million people died, showed 90% of those deaths occurred in low and middle income countries because of poverty. Ban called it "a damning indictment of inequality". Shantosh and Ananata [9] in their study in Nepal affirmed that the majority of flood disaster victims are poor people because they live in flood plain. In Vietnam, in a study by Dang and Pham [10] on living with floods in the Mekong River Delta, the government adopted the provision of low cost loans to households for construction of flood proof houses and raising of houses on piles above the expected flood water level as a traditional coping technique. This helps to build the capacities of the downtrodden and reduce their vulnerability to the disaster. The strategy of living with floods is due to the Non-preventive nature of flooding in Mekong River Delta whose vulnerability remains high as a result of the proximity of the River to the area and high poverty level.

According to Dewan [11], two South Asian countries, Bangladesh and Nepal, due to their susceptibility to severe floods caused by high level of poverty have implemented a number of flood mitigation measures to cope with flood inundation in the areas. In Bangladesh, there are flood shelters, flood protection embankments, drainage channels, sluice gates and regulators on different rivers and canals while in Nepal, there are early warning awareness programs, rescue operation strategies, relief and post-flood rehabilitation programs among others by the government. Beside these contemporary approaches to flood adaptations in the areas, residents of both countries are still relying on traditional/indigenous knowledge and other local adaptation practices to cope with the hazard. In general, the prevalence of flooding has led to loss of human life, destruction of social and economic infrastructure and degradation of already fragile ecosystems across the globe, thereby threatening human existence.

The concept of Disaster Risk Reduction (DRR) in this study is to emphasize the need for adaptive measures and practices that will minimize the vulnerability of the residents to future flood disasters. This is because, the magnitude of disasters depends on the intensity of the causative natural events that the population and structures are exposed to, and the effectiveness of pre- and post events mitigation actions to protect people and property. Because, the Ndoni district is prone to flooding by virtue of its position, it becomes imperative to undertake actions that can build the resilience of its residents either by way of adaptation or increasing their capability. Therefore, improvements are to be made through recovery programs to ensure adaptation and avoid a repeat of the destruction [12]. By this, resilience is achieved. According to Alison and Kimberley [13] resilience is the capacity of a person/community to anticipate, cope with, resist and recover from the impact of a flood. Resilience enables communities to rebound from disasters and reduce long term vulnerability [14]. This study therefore is an attempt to study the community's adaptive and coping strategies to extreme flood event.

Methods and Materials

The study was conducted in Ndoni district of Ogba/Egbema/Ndoni Local Government Area (LGA) of Rivers State. The LGA is one of the largest reservoirs of crude oil in Nigeria and has experienced oil exploration and production activities for many decades. According to the 2006 National Population Census, the area habours 73,883 people out of the total of 284,010 people in the whole LGA. According to National Population Commission (NPC), the growth rate of the Nigeria population is 2.3% per annum. With this, the population of the Ndoni district was be projected at 84,618 in 2012.

The LGA has a landmass of 969km2 and is situated in the Riverline area. It is inhabited by three tribes of Ogba, Egbema and Ndoni with its administrative headquarters at Omoku. The Ndoni tribe is bounded by Balyelsa State to the South, Anambra State to the North, Delta State to the West and Imo State to the East. The Ndoni district selected for this study carried out in February, 2015, is made up of fifteen (15) villages. The ten (10) villages selected for this study are Inwegwe, Ogbe-Ukwu,

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Umuolodu, Ugbebi and Umuokeya. Others are Umuonyema, Umuawor-Achi, Iseala, Onuiku and Abadaukwu. These villages are grouped into three (3) major settlements according to their positions for convenience in this study as follows: Inwegwe settlement comprising of Ugbebi,Inwegwe and Umuawo-Achi villages; Umuojia settlement comprising Umuolodu,Umuonyema and Umuokeya villages; and Ogbe-Ukwu settlement which comprisesIseala,Onuiku,Ogbe-Ukwu and Abadaukwu villages. The population for the study includes youth, women and men selected from the communities in the area grouped into (3) settlements. A sample of three hundred and ninety (390) respondents which included the thirty five (35) households randomly selected from each of the ten (10) of the fifteen (15) villages of the district plus a total of twenty (20) participants in Focus Group-Discussion (FGR) and twenty (20) stakeholders in the district who were purposively selected and engaged in Key Persons Interview (KPI) were used for this study. A descriptive analysis presented in percentages and tables were used to analyze research findings (Figure 1).

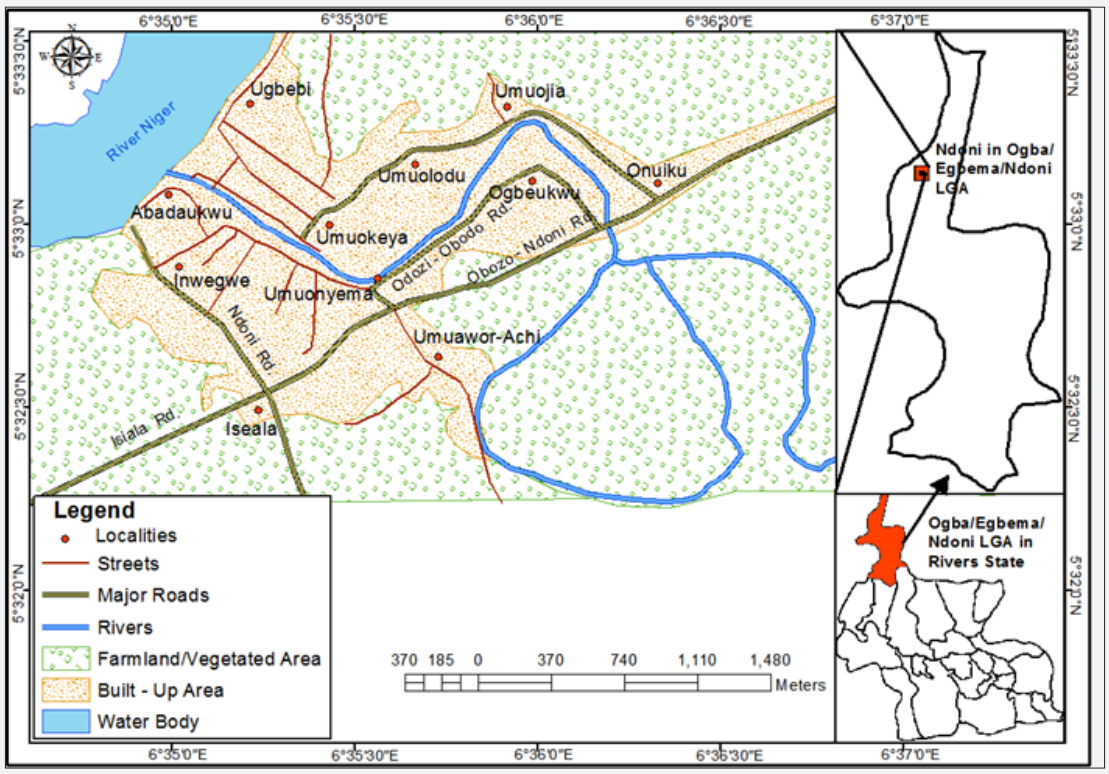

Figure 1.

Results and Discussions

Flood Impact on Households in the Study Area

From Table 1, most of the respondents indicated that their household effects were damaged by the flood. Furthermore, 98.38% and 96.13% of the respondents respectively had their farms and homes damaged by the flood. While as large as 68.06% of the respondents had their other businesses than agricultural businesses affected by the flood, only 3.84% were left homeless by the flood. Of the 96.13% of the respondents whose houses/ homes were damaged, about 60.32% of them have completed effecting repairs on their building while 23.46% noted that their repairs are ongoing and 16.22% are yet to commence theirs. On interaction, majority of those who were left homeless by the flood and have rebuilt their houses did so singlehandedly while few are still contending with the devastation due to financial constraints two years after the disaster suggesting that poverty is a source of concern to flooding victims. Notwithstanding, Ezekwe and Nwaogu [4] described the general recovery of the people as good and rapid, a feat achieved without a supportive intervention from the government which ordinarily would have undermined their resilience.

The rapid recovery of the people would have reduced the flood impact. This is because Alison and Kimberley [13] in their study on the experience of flooding in UK identified some ancillary factors such as increased time taken to return to normal (recovery) and the ineffectiveness of actions and help received during an extreme flood event as factors that worsen flooding impact especially the psychological health impact. Therefore, it is suggestive that the impact of flood is both influenced by, and results in, other impacts within an individual's daily life. It is therefore concluded that the impact of the flood in Ndoni district was high.

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Table 1: Percentage of respondents that were negatively impacted by the flood.

Flood Impact	Settlements						Total	
	Inwegwe		Umuojia		Ogbaukwu			
	Yes	No	Yes	No	Yes	No	Yes	No
Other business affected	23.22	10.0	20.97	12.26	23.87	9.68	98.06	31.94
Fish/crop farming business affected	32.90	0.32	32.58	0.65	32.90	0.65	98.38	1.62
Homes/houses sustained damages	30.97	2.26	31.94	1.29	33.22	0.32	96.13	3.87
Left homeless	2.26	30.97	1.29	31.94	0.32	33.22	3.87	96.13
House contents damaged	33.23	-	32.90	0.32	33.23	0.32	99.36	0.64

Flood Damages in the Study Area

From Table 2, a reasonable proportion of respondents believed that their own farms (58.46%) were completely destroyed while their house contents (64.19%) suffered major impacts even as their building structures (55.70%) were moderately impacted by the flood. Only 23.87% of the respondents in the district where 56.45% of them are farmers had their other businesses such as hairdressing saloon, supermarkets, and fashion designing, as well as provision and chemist stores among others completely destroyed. Interaction with the respondents revealed that more than 50% of them had their buildings inundated to a height not less than 2.5m above the ground. All these indicate that the impact of the flood on personal property was high. Both the elderly and the young were seriously affected. According to Dewan [11] the aftermath of floods are water pollution, water borne disease, loss of human life and livestock, escalation of prices, social insecurity and costs of rebuilding infrastructure during recovery.

Table 2: Percentage Perception of degree of personal impact.

Item	Not Impacted	Minor Impacts	Moderate Impacts	Major Impacts	Completely Destroyed	Undecided
Other business	28.86	13.24	14.19	16.94	23.87	2.90
Our farmers	1.54	4.60	11.30	24.10	58.46	-
Building structure/property	-	0.63	55.60	39.87	3.80	-
House contents	0.63	6.40	22.35	64.19	6.43	-

In total, 78.06% of the respondents relocated from their homes to neighbouring houses where there are storey buildings and other safe areas within and outside the district especially at Omoku, the local government headquarters, while all the respondents indicated that they raised household items up off floor since they are leaving in bungalows. The case study revealed that of those who refused to relocate 42.37% of them were elderly people aged above 70 years. Their reason was that it is a taboo for them to vacate their fathers' compounds as their tradition forbids them from doing so. They maintained that they prefer to die in their fathers' compounds than to run away from home. Fear over the safety of their properties may have influenced this belief. But the belief scattered populations, causing separations in many families as some relocated while others stayed behind. Mc Kenna [15] noted that fears over leaving their property unattended may force families to be separated. No matter what the reasons of the Ndoni people would be for not relocating, the fact remains that ignorance and tradition had immediate intangible and significant impact on the people's vulnerability to the flooding.

Meanwhile, the time taken to rebuild the peoples' losses especially in the absence of government assistance was a major concern for them both for practical and emotional reasons as they believe it was going to take too long. Surprisingly, reasonable recovery was achieved within two years. Notwithstanding, some challenges still persist with more than 50% of the respondents noting that there was food shortage and that prices of food items which rose beyond 200% immediately after the flood were yet to return to normal. Government should consider provision of improved seedlings and farm incentives as well as making fertilizer available to farmers in the early farming season as a way of cushioning the food insecurity in the area. Also, credit facilities and insurance coverage should be made accessible to farmers. According to Glanzer [16], crop insurance coverage protects farmer's investment and gives them peace of mind throughout every harvest season and makes them more competitive in the market.

Table 3 below shows the percentage perception of degree (extent) of flood general impacts on infrastructure in the study area. A large proportion of respondents indicated that their health facilities (42.34%), schools/public buildings (43.28%), roads (60.32%), water systems/ properties (46.43%) as well as worship places (69.77%) and community town halls (70.28%) suffered major impacts. Indeed, public infrastructures are often affected indirectly by floods (Alison and Kimberley (2013). All the people interviewed in the FGD confirmed that major roads were completely flooded and that people were united in tackling the transportation challenge by providing free boats

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and canoes to facilitate movement and maintain social life. By this, socialization was sustained as people could move from one point to another amidst the floods. According to Gordon [17], in the aftermath of a flood, cohesion within the community can increase with everyone pulling together-often termed "social fusion". However, flood general impact was high in the area. In spite of the above, about 83.87% of respondents indicated that the affected government infrastructures had been rehabilitated by the state government. Some noted that the school walls were repainted and health centers reactivated, while the villagers were left to their fate [18,19].

Table 3: Percentage perception of degree of general impact.

Item	Not Impacted	Minor Impacts	Moderate Impacts	Major Impacts	Completely Destroyed	Undecided
Heath facilities	0.97	30.12	25.60	42.34	-	0.97
Schools/public building	0.65	15.74	40.98	43.28	-	0.96
Roads	-	-	39.68	60.32	-	-
Water systems/properties	0.32	-	20.53	46.43	30.46	2.26
Worship places	-	6.91	21.38	69.77	-	1.94
Community town halls	-	-	26.14	70.28	2.29	1.29

Coping/Adaptive Strategies to the Flood Disaster in the Area

Table 4 below shows the adaptive strategies used by the people to cope with the disaster. Coping/adaptive strategies employed by the people during the 2012 flood disaster include relocation to safe locations (78.06%), design of evacuation plan (95.48%) which was mainly the use of canoes and joined woods to lift people out of the waters. This was done collectively by the people. There was unity and togetherness among community members in evacuating the people. According to Home Office, 2011, community cohesion plays pivotal role in building resilience. Nzegwu [20] also in his study, cited social support and togetherness among community members as weapon of resilience. This was demonstrated by the Ndoni people. There was building of flood barriers with blocks (64.19%) which played key role in protecting the buildings [21]. The people may have adopted this approach to build their resilience following their past experiences on flood [22].

Table 4: Coping/Adaptive Strategies employed by the respondents during the flooding.

Adaptive strategy	Settlements			Respondents (%)
	Inwegwe	Umuojia	Ogbe-Ukwu	
Relocated to safe locations	20.65	26.45	30.96	78.06
Modified House and property	7.09	5.81	3.87	16.77
Devised an evacuation plan	30.97	31.61	32.90	95.48
Built flood barriers	20.65	19.02	24.52	64.19
Sandbagged houses	16.13	17.74	17.10	50.97
Cleared drainage debris	5.81	6.77	7.10	19.68
Raised household items up off floor	32.26	32.58	32.26	97.10
Followed warning advice on phones, radio/television etc	19.35	19.03	27.10	65.48

For instance, Graham A [23] recognized past experience is contributing factor to building resilience. This is because findings have suggested clear positive association between previous experience and taking action to prepare. Also, other common adaptive measures were sandbagging of houses (50.97%), rising of household to the roofs and following warning advice on phones from friends, radios and televisions. Most people were reluctant to clear their drainages (80.32%) while markedly majority (83.23%) could not modify their houses due to lack of funds and prior information about the flooding. Group discussions indicated that almost every household opened their ceilings and safeguarded their properties/items in the building roofs as the flood inundation in their rooms was high reaching the armpit of a man of average height. Those who relocated to safe areas took refuge in individual storey buildings converted as shelters for the displaced. Some of the buildings were provided by prominent politicians such as the former Governor of Rivers State, Peter Odili. Others who could not be accommodated in the buildings due to space were harboured in sand filled areas of high elevation, provided and designated as shelters by the community while some fled to nearby cities like Port Harcourt, Owerri and Yenagoa to stay with their family relations/friends.

According to Akiyuki et al. [24], adaptive strategies employ by government of Myanmar to cope with flooding in Bago Region

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include building of dams, canals and adequate sharing of flood warning information as well as strengthening of the overall disaster risk reduction plans. As a result, the residents did not consider relocation from their communities as best option to flood management but relied on structural and non-structural flood mitigation methods. In Vietnam, Flood Safety Training is provided for children in schools thereby building their capacity [10]. Therefore, it can be concluded that the adaptive strategies of the Ndoni people to cope with floods in the area is effective, a lesson to be learnt.

Table 5 below shows the current adaptive strategies adopted by the people to adapt and reduce their vulnerability to flood disasters. From this study, the adaptive strategies to mitigate flooding in the area are clearing of drainage systems, following early warning signals issued by government, dredging of Community Rivers and sand filling of some areas to raise their heights above flood level, and improvement/modification of houses by raising the height of their foundations, to a reasonable height above the ground. Notwithstanding, more still need to be done, especially in installing flood doors and barriers to windows to effectively fortify the houses and build flood defense.

Table 5: Current Adaptive strategies to floods in the area.

Respondents (%)	Settlements			Respondents (%)
	Inwegwe	Umuojia	Ogba-Ukwu	
Planning to modify houses/property	17.42	15.16	19.68	52.26
Dredging of River	26.77	26.45	31.67	84.84
Following warning advice on radio/television	31.94	30.97	32.57	95.48
Clearing drainage systems	32.26	32.58	32.26	97.10

Lessons from Ndoni Community

Housing: The community has started erecting houses with the integration of disaster risk reduction measures. Most houses in the area since after the 2012 flood disaster are modified by raising them above flood levels, using higher foundations. Some are placing sandbags around old building to strengthen their resistance to flood whole others are constructing flood barriers using concrete walls in front of houses to prevent flood from surging into the rooms.

Following Warming Advice in Radio/Television: Although most people were reluctant to heed to any advise encouraging them to leave their houses prior to the disaster, but aftermath of the disaster they appreciated the need to utilize flood management information provided them by government through the radios/televisions.

Dredging of Local Rivers: There has been dredging of rivers around the community to help retain more waters in case of overflow of River Niger.

Living with the Floods: Knowledge of the high vulnerability of the area to flooding has helped them grow resilience. They therefore prefer to live with floods to evacuating/relocating from the area.

Social Cohesion/Capital: The mobilization of collective human resources within the community was a major driving power for rapid recovery. The unity of purpose and marked togetherness of the residents in galvanizing their social capital commonly known as social fusion increased their capacity to live with the floods. This reliable feet is an marked contrasts to what obtains in some other areas. According to social support and togetherness among community members is a weapon of resilience.

Building of Flood Barriers: The concrete walls constructed around buildings/ and the sandbagging of houses by most households provided defense for the houses against the flood. This practice offered interesting buffer for buildings even in flooded compounds thereby making them able to withstand the floods. It can be deduced that the community was able to adopt this measure due to their past flood experiences. Graham A [23] identified past experience as key factor to building resilience.

Design of Evacuation Plan: During the flooding, the community never waited for government to mobilize helicopters and boats to rescue its residents rather designed local boats known as canoes and wooden ladders as well as ropes to leverage the evacuation of those trapped in the flood. This sheer innovation was an invaluable capacity deployed to reduce flood human impact and was responsible for the fewer number of deaths resulting from drowning.

Sand Filled Areas: The community already sand filled some areas and raised them high above flood levels. These elevated sites provided handy platform for state government to construct temporary shelters for the displaced victims. The opportunity offered by the high-raise ground reduced the cost and risk of moving people to a long distance during emergency. By this, the displaced persons were quartered within the community, a development that made it look as if they are still in their homes as some could sight their houses from the distance.

These practices strengthened the community's capacity to live with the floods and increased their resilience against flood disasters. With such, any future flooding event in the area will have minimum impact on households. Therefore, replicating them in other communities with high vulnerability to flood disasters will go a long way in enhancing their resilience and reduce potential flood losses. It is a lesson to be learned.

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Summary

This study analysis the adaptation of the Ndoni community, a rural community in Northern Rivers State with high vulnerability to flooding, especially aftermath of the 2012 flood disaster in Nigeria. The study reveals that the area is vulnerable to floods because it is near to River Niger, a major River that traverses most parts of Nigeria. While there is absolute lack of flood prevention technologies and post-flood rehabilitation programs in the area contrary to the practice in most developing countries like Nepal, Myanmar and Vietnam, the people strengthened their own capacity to enhance their resilience.

The research showed that the community was impacted hugely by the disaster with 98.38% and 96.13% of respondents, indicating that their farms and household effects were badly damaged. Obviously, this destruction had negative effects on the livelihoods of the people with grave implication on their financial and health status. However, the people are not deterred as majority of those interviewed declined to vacate/relocate from the area after the 2012 flood disaster despite the high vulnerability of the area to floods.

However, the understanding of the vulnerability of the area to flooding was instrumental in the peoples' choice to live with the floods, and by extension the need to grow resilience. This manifested in the few number of deaths recorded during the disaster as only two deaths were recorded. In the community, flood is no longer approached as a preventable issue but as a something to be lived through. This approach is adapted in Bangladesh and some parts of India and Vietnam. Because it is belief of the Ndoni people that their tradition forbids them from relocating from the area, any flood warning issued by government for relocation prior to flooding may not be heeded by the people. Therefore, it became preferential to grow their resilience to live with floods.

As a consequence, the people adopted to follow early warning signals on radio/television, dredging of Community Rivers, modification of houses to make them flood proof, clearing of drainage systems, community cohesion and social capital together with building trusted community networks to help disadvantaged families improve their capacity. These are marked transferrable key lessons for other flood vulnerable communities in Nigeria, because in the future, the frequency and impact of floods on human populations is expected to rise as population growth, urbanization, land use change and more rainfall increases exposure to extreme rainfall events.

Recommendation

A key finding of this study is that taking action to prepare for flood involves communities appreciating the level of risk and giving flood preparation messages sufficient attention. By this residents can galvanize their strengths, and resources to mitigate flood impacts. But this cannot be the only ways to guarantee maximum resilience.

In this study, there was total lack of government supportive role and absence of community relationship with external disaster response organizations such as the National Emergency Management Agency (NEMA). Therefore, the key recommendations are:

a) Communities should be engaged in disaster preparedness and response work.

b) Government should support communities either by each compensation, incentives and or provision of soft loans to help build their resilience.

c) There should be enhancement of community relations with disaster response organizations in order to increase their resilience.

d) Communities should see togetherness and unity as strong social capital towards disaster recovery resilience.

e) There should be sustainable flood awareness campaigns/programs even in periods without flooding to continuously entrench the culture of resilience on the communities.

f) Communities should be encouraged to live with floods by regular training to build their capacity rather than encouraging them to flee from their home. Apart from those living in flood plains, due to increasing human activities nowhere is excluded from being affected by flooding but improving resilience can make areas safer.

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