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COMBATING THE EFFECTS OF FLOODING THROUGH INDIGENOUS ADAPTIVE STRATEGIES IN NIGERIA

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Abstract: **This paper examined the adaptation challenges posed by the 2012 flood disaster to Orashi province of Rivers State, Nigeria and the indigenous knowledge, skills and strategies provided by the people to mitigate the flood and achieve rapid recovery from the effects of the flood. Anchored on the Resilience theory, the study relied on the Focus Group Discussion conducted in impacted rural communities, interview with the victims and transects observation from communities in Ahoada-East and Ahoada-West Local Government Area. The paper revealed that existing modern flood mitigating infrastructures like drainage system, fish ponds and shoreline embankment were combined with indigenous knowledge and adaptation skills and strategies such as canoe touring, fabrication of wood rafts, etc, to mitigate the flood. The study recommends among others an intensive community based flood education initiative and provision of modern critical flood infrastructure that will help the people cultivate a culture of prevention, preparedness and so enhance their ability to combat flood and other disasters.**

Keywords: **Combating, Effect, Flooding, Adaptive Strategy.**

1. INTRODUCTION

Flooding phenomenon as an aspect of contemporary global environmental change is no longer questionable. Flooding hazard turned out to be a recurrent and most commonly occurring natural hazard accounting for about one-third of all geo-physical hazards negatively impacting on more of the citizenry more than any other natural disaster. (Obeta, 2014). Available reports indicate that several Nigerian states like Lagos, Cross Rivers, Adamawa, Plateau, Rivers, Bayelsa, Kebbi, Zamfara, to mention few, have recorded towering flood inundation levels. (Obeta, 2014; Famous, 2013.) The impacts of these floods are usually far reaching with physical, psychological, socioeconomic and cultural dimensions. These events are accompanied by destruction of residential accommodations, means of livelihood, transportation routes, farms, and animals, Public utility installations, Markets, and loss of human lives which further inflict socioeconomic and cultural hardships. (Vanguard October 03, 2012; upi.com Aug. 28, 2012). According to Inter Governmental panel on Climate Change (IPCC) 2007 report, the increase in flooding and other extreme weather events is increase in global average temperature. Over the years, scientists recording global temperatures have noticed an almost imperceptible steady rise in the average worldwide temperature. (IPCC, 2007; Harvey, 2008.) The worldwide temperature increase result in warmer oceans, melting glaciers, and rise in sea levels Gulledge, 2012; Ogbanga, 2015; all of which predisposes communities to flooding especially those located on the coasts of the sea, rivers and creeks as is the case in the Niger delta area where the Orashi is located. (Obot, 2008; Stephen and Marcus, 2014). Human activities such as waste disposal, construction of dams, burning of fossil fuel, deforestation, and building on running water ways, among others, contribute to the occurrence of and vulnerability to flood. Flood as observed by Asthana and Asthana (2013) can be local, affecting on neighborhood or community, or international, affecting entire river basins and multiple states or countries as witnessed

during the 2012 flood events in Nigeria. Whatever dimension it takes, flood can be mitigated through controlled human behavior.

The 2012 flood event in Nigeria was described by experts as Nigeria's share of the extreme weather events resulting from global warming and climate change phenomena - NIMET seasonal Rainfall prediction Feb, 2012 (Vanguard on October 03, 2012; Rose Jia, NTA Weekend files 01/09/12). As predicted by NIMET, the rains came down heavily on Nigerian territory ravaging the entire nation. Njoku Jude, Vanguard on October 03, 2012; Rose Jia, NTA Weekend files 01/09/12 reported that the rain took center stage and constituted a dominant focus of discussion and concern. From East to West, North to South and indeed all parts of the country, flood brought unspeakable adversity on millions of Nigeria. According to Alhaji Mohammad Sani-Sidi, the Director General, National Emergency Management Agency (NEMA), by middle of october, 2012 when the flood had ravaged the entire nation 7.7 million people had been affected, more than 500,000 houses destroyed, 363 persons lost their lives, and the country lost N2.6 trillion to the disaster ((Premiumtimes, December 5, 2013; *Odeyemi, Dailly Trust, 20 Sept. 2013*, earthobservatory.nasa.govOctober 13, 2013). The level of human casualty and the property damage in addition to the colossal financial loss that accompanied the 2012 flood disaster make a case for urgent stock-taking of our communities' adaptive ability and their level of preparedness against flood and other disasters. The knowledge and practice of indigenous strategies for combating flooding disaster will therefore translate to a more resilient, more adaptive individuals, communities and by extension a nation aptly prepared to combat the challenges and effects of climate change such as flooding.

2. THEORETICAL FRAMEWORK

This paper is anchored on the Resilience theory. Many scholars agree that the Resilience theory originated between 1970s and 1980s in the field of engineering and is it is concerned with perturbation that jeopardizes the functional stability of (engineering) systems and the ability of the system to bounce back when the disturbance is relieved (Liao, 2012; Pisano, 2012, Cosens, 2012). Resilience is conceptualized as a system's ability to absorb disturbances and still persist. This is contrary to the conservative ecological paradigm of equilibrium that presumes a predetermined stable state for every ecosystem, to which it eventually returns after a disturbance.

Resilience theory therefore is concerned with the ability of a system [human or natural] to persist, absorb, and recover from hazardous event or the effects of danger in a timely and efficient manner, preserving or restoring its essential basic structures, functions and identity. The choice of resilience theory for this study is built on the fact that it provides explanation for the stability that humans and ecosystems undergo as a result of crisis from natural or manmade processes. Variation in weather and the negative consequences that affects the bio-diversity of a place has a direct influence on the people whose lives in such places depend on their environment. The resilience of such system is reflected by how much of adversity its social as well as its ecological components together can withstand without collapsing. With increasing frequency and severity of extreme weather events like floods, the individual, community, and the nation at large have the urgent need to acquire, develop and improve its resilience, adaptive strategies and culture of survival so as to function optimally in the face of increasing flooding disaster. Pisano, 2012, Cosens, 2012.

3. THE CONCEPT OF FLOODING

Flood from layman's point of view is seen as any spillover of excess water from river bank or when the earth surface is inundated by water. Asthana and Asthana (2013) perceives it as an outcome of accumulation of large volumes of water flowing through river channels spilling over the banks and causing extensive damage to human lives and property. Similarly IPCC (2007) describes flooding as the 'overflowing of the normal confines of a stream or other body of water or the accumulation of water over areas that are not normally submerged' causing or threatening damage in the event. Floods naturally occur with prolonged rainfall over several days, extreme rainfall within short space of time (flash flood) or when an ice or debris jam causes a river, water bodies, dam or stream to overflow its surrounding areas. Manmade floods are generated by human behavior and activities that adversely affect the environment such as deforestation, poor farming method, overgrazing, over-cultivation, increase population, levees or dams failure and development activities. Okonkwo (2013) simply observed flood as too much water in the 'wrong' place! To him, flood is a hazard with no exception to any community- rural or urban, developed and underdeveloped. He further enumerated some of the rather destructive floods that occurred worldwide, including the China floods of 1887 and 1931 that claimed 3.7 million and 2million people

respectively; the Morvi Dam incident of 1979 in India that claimed over 4,500 lives and the Landslide in Huascaran (Peru) 1962 with the loss of more than 4,000 lives (Okonkwo, 2013). Famous (2013) similarly documented the 1530 St. Felix flood storm surge Netherlands with death toll of 100,000 and the Indian Ocean Tsunami Indonesia with death toll of 230,000. He further averred that in 2004, the Haiti spring flooding destroyed more than 3,000 persons while the Pakistani flood of 2010 suffocated about 2,000 human lives. He also pointed out that the Rio de Janeiro floods of January 2011 put to death 800 people. These constitute quite a few of the fatal floods that impacted the world.

Obeta (2014) in addition affirms that Nigeria, akin to other nations world over, do experience unpleasant flood incidents. In 2001, for instance, Abia state, Adamawa state and Akwa-Ibom State experienced intense rain and rainstorm which impacted on 5,000 of the populace. Similarly in that particular year, 12,300 persons relocated from their residence due to the torrential rain that came with destruction of farm lands, damage to property and inundated living houses in Zamfara State (Obeta, 2014). He further says that in 1988 and 2007, Kano State played host to windstorm and floods which disorganized 300,000 lives while in 2011 flood wreaked extensive havoc on Lagos state and Ibadan. The story is similar to that in 1999 and 2001 when Bayelsa and Delta State suffered heavy floods, displacing many and rendering them homeless (Obeta, 2014). Famous (2013) observes that in 2005, Taraba State experienced massive flood that put over 50,000 people out of home. Regionally, flood also took heavy toll on certain West Africa countries due to heavy rains resulting from ruthless flooding in West African region of Nigeria, Ghana, Burkina Faso, Mali, Kenya, and Togo with heavy carnage of 353 persons and distressing over 600,000 others (Famous, 2013). This shows that flood hazard is not a new phenomenon in Nigeria, but what is perhaps strange is the indifference and seemingly lack of learning and ineptitude which flood warnings evoke in Nigeria and the casual manner with which mitigation efforts are undertaken.

Flood events in coastal areas of Nigeria such as Rivers State cannot be totally avoided due to its environment predisposition. However the governments can minimize its negative effects on lives, property and the environment when proactive measures of mitigating these effects become a strong priority for governments. According to Okonkwo (2013), some countries in the Sub Saharan Africa including Nigeria are yet to demonstrate full preparedness in tackling the problems associated with flooding. The other problem associated with flooding in Nigeria is the negative environmental stance of majority of the populace. There is gross lack of awareness and non-sustainable attitude as people deliberately block drains and destroy the surroundings which otherwise would have acted as natural receptacle, reservoir, and containment for flood waters during heavy rains and river overflow.

4. TYPES OF FLOODING

Okonkwo (2013) identifies the following types of flooding:

(a) **Areal or Surface Water Runoff**: This is the type of floods that happen on flat or low-lying areas when the ground is saturated with water which cannot run off or cannot run off quickly to stop accumulating and therefore results to flooding.

(b) **Riverine Flooding**: This type of flooding occur when river flow or rise above the level expected at different rates, from a few minutes to several weeks, depending on the type of river and its source. The cause can result from localized convective precipitation (intense thunderstorms) or sudden release from an upstream impoundment created behind a dam, landslide, or glacier. Dam-building beavers can also cause flooding in low-lying urban and rural areas occasionally and as well result to damages.

(c) **Estuarine and Coastal:** these types commonly happen as a combination of sea tidal surges caused by winds and low barometric pressure, and are exacerbated by high upstream river flow. Coastal areas are flooded by water storm from the sea, resulting in waves over-topping defenses or in severe cases by tsunami or tropical cyclones.

(d) **Tidal Flooding or Storm Surge**: This type of flooding according to Bassey (2012) is the type that increases water in earth surface elevation above the normal tide levels due primarily to low barometric pressure; and the piling up of waters in coastal areas as a result of wind action over a long stretch of open water. This can happen along the coast, storm surge is often the greatest threat to life and property from a tropical cyclone. Hurricane Katrina in 2005 is a prime example of the damage and devastation that can be caused by storm surge in which at least 1500 people lost their lives.

(e) **Urban Flooding:** This type is referred to as inundation of land or property in a built environment, particularly in more densely populated areas. It is caused by rainfall that overwhelms the capacity of drainage system.

Other types of flooding consist of Ground failures, catastrophic flooding, inland flooding, flash flooding, Ground water flooding, pluvial flooding, fluvial flooding and alluvial.

5. EFFECTS OF FLOODING

Flood disaster undoubtedly impacts directly or indirectly on lives, infrastructures and the environment. The effects of floods can be classified as primary and secondary effects (Bariweni et al, 2012); the detail of which are outline below:

(a) **Primary Effects:** This type of effect refers to the immediate impacts of flood **as** manifested in the loss of life, damage to buildings and other structures, including bridges, sewage systems and roadways. Bariweni et al (2012) also enlists frequent damage of power transmission facilitates and generating equipment by flooding affecting the power generation, distribution and supply in affected an area. Flooding disrupt normal drainage systems the community making sewage spills a common occurrence; this also results in serious health hazard alongside with standing water and wet materials in homes

(b) **Secondary or long-term effects** refers to situations such as economic hardship due to a temporary decline in tourism, rebuilding costs, or food shortages leading to price increases is a common after-effect or secondary effects of serious flooding. The effects on those affected victim can cause psychological problems and post traumatic disorders to them, especially where deaths, serious injuries and loss of property occurred.

(c) **Benefits of Flooding:** Flood waters flow along with sand, silt and debris during the flood and these become deposited on the flood plan and adjourning areas. Post flood, these deposits enriches the land making it richer and more fertile for higher agricultural yields. (Bariweni et al, 2012). Flood recharges ground waters, lakes, and increases biomass of these bodies of water which will increase fisheries yields. Floods irrigate the dry and semi- arid regions thus increasing their agricultural yields and preserve ecosystems in river corridor. Flood increases the functioning capacity of hydropower stations.

Resilience tenets as mechanisms for combating flood

The concepts of adaptive capacity, self organization and redundancy which are tenets of resilience theory can be translated into key mechanisms for community resilience to flood (Liao, 2012.)

Timely adjustments after every flood: The adaptive capacity contributing to increasing community ability to combat floods is associated with the ability to learn from each flood and act wisely because every flood brings about something new (Liao, 2012.) Such learning manifests in the community implementing timely behavioral, physical, and institutional adjustments to be better equipped for the subsequent flood. By so doing, the community increasingly become resilient and adjusts better and rapidly to future flood disasters. It is a learning-by-doing process, where novelty is involved in the adjustment to evade repeating the previous unpleasant experience (Walker et al. 2004; Liao, 2012).

Localized flood-response capacity: Self-organizing communities, where each citizen and public manager could act promptly to avoid damage, are more responsive in coping with flooding and are thus more resilient and apt to combat flooding than those that rely on centralized mechanisms such as flood-control infrastructure. Such a community, if disrupted, can swiftly rearrange its component structures due to the internal universal ability and cohesion to clean up and fix damages without waiting for external help which will always delay.

Redundancy in subsystems: Here, redundancy is more than duplication of the same element in an engineering sense, for instance, the freeboard added on top of the levee height required for confining a certain flow. It entails diversity and functional replication across scales (Peterson et al, 1998; Liao, 2012). For example, a water delivery network with redundancy would integrate both regional and localized systems and make use of different water sources.

Indigenous adaptive strategies for combating effects of flooding in Orashi area of Nigeria

As revealed by the focus group discussants certain local indigenous strategies were utilized to combat the 2012 flood in Orashi province of Rivers state, Nigeria. In a post flood study involving Focus group discussion conducted in impacted rural communities, interview with the victims and transects observation at Ahoada 2015, comprising 6 communities, participants revealed that certain indigenous adaptive strategies were called into operation by the Orashi people to combat the 2012 flood menace. The question of what indigenous local adaptive strategies and skills were utilized by your

community (Orashi people) to combat the 2012 flood disaster? - was raised. In response to the question the under listed strategies were enumerated:

According to the Focus Group Discussion (FGD), local technologies and manufacturing expertise were developed and employed during the flood. They fabricated canoe and wood raft and used them as a means of transportation to convey humans and personal belongings to safety were called into operation. Again, purification of water from local sources through filtration, boiling and decontamination using charcoal provided alternative source of drinking water for especially victims who refused to evacuate. It was revealed through the FGD that enhancement, utilization and safeguard of the fish stock in the fishing ponds dotting the Orashi wet land forests, were reasonably achieved during the 2012 flood by local technology. The ponds served as reservoirs and containment for flood water while fulfilling its primary function as fish farm. Local fish nets were used to protect the aquatic lives contained in these ponds thus preventing fish and other sea foods from being carried away by the flood water. The use of forests and the abundant vegetation in the area as water-shed to contain or store some quantity of the flood water was another adaptive measure the people of Orashi took advantage of. This was accomplished by clearing the existing drainages of debris, digging of trenches to divert and channel flood water away from residential building into the forests that absorbed the water.

Agriculturally the FGD also revealed innovative potentials of the indigenous people of Orashi. Early harvesting of inundated farm produce like cassava, Yam, plantain, etc, were carried out in advance of their natural harvesting period to prevent the crops from being damaged by the flood water. This provided sustenance and a source of income (if produce were sold) for affected households for the period the flood lasted. Similarly adoption of late cultivation options and growing of flood resistant crops, floods friendly crops helped to bridge the gap in food production occasioned by the flood. Humanitarian intervention and aids came from governments, good spirited individuals, and NGOs, Social and Religious organizations. They provided food, materials and medicines that helped to cushion the food shortages caused by the flood disaster.

Economically, the people ventured into new areas of business areas like trading, at least temporarily, to supplement individuals' and household's disarticulated sources of income. The FGD revealed that the people adopted selling of personal asserts and property such as household items, jewelries, rappers and the likes to raise fund needed to finance or argument family up keep expenses. The perturbation compelled people to adjustment their spending pattern, reducing their expenditure on socials and not-too pressing issues but channeled spending towards sustenance, mitigating flood effects and recovery. Another economic adaptive stratagem used by member of the community is the communal credit initiative in which people borrow money or food stuffs from one another without interest. A measure of Garri for instance, could be borrowed by a neighbor who currently does not have, but the same measure would be returned to the lender on a later date when the borrower has gotten that particular borrowed stuff and then returns same measure as he borrowed.

Furthermore, the self organization prowess of the communities to muster social action during flood was a social asset well utilized by the people during the 2012 flood. As revealed by the FGD, this was exemplified in formation of local Flood Emergency management Committees that undertook the task of mopping-up the local inundated areas to identify vulnerable, trapped, and incapacitated persons; and provided assistant to bring them to safety. The people equally learnt and understood the importance of cooperation and working mutually as a team. The predisposition to team spirit as revealed by the FGD, featured prominent during evacuation when local rescue committees were constituted to rally round each other and particularly the weak and feeble amongst them. For many, the 2012 flood event was the initial time in their life to experience intimidating volume of flood flow; and because they lacked pre-flood awareness, it became a shocking and devastating experience. But at the same time, the experience constituted a learning incident for them. The younger generation for instance learnt the science and art of fabricating wood raft, canoe and canoeing. Canoe touring and wood raft became modes of transportation to ferry people and personal belongings across the flood to safe grounds.

The FGD further revealed that the flood event provided opportunities for improvement of community members and even for the community itself. This was a factor in their rapid recovery and constitutes a resilient factor to future flood events. One innovative and developmental stride aftermath of the flood experience was that majority of those whose mud houses caved in to flood, reverted to building flood resilient houses with blocks and cement during the reconstruction period.

Through contacts made during the flood events, many of the community members established face to face interaction with members of other communities from the state, country, and the world. This in itself became a mode of education as they

became acquainted socially with people of other culture. The flood, for the government, was an opportunity to relocate those who may have built and were residing on flood channels and plains. It presented a time for the powers of government to reappraise and rethink the conventional community development style that do not take into account the actual needs impinging on the people; and switch over to a needs/people oriented community development initiative with community need as the focus for developmental projects. The FGD exposed the embarrassing fact that in the entire Orashi region and indeed in Rivers State, no Internally Displaced People's (IDPs) camp existed during the 2012 flood. What subsisted were make-shift camps established in school buildings, public buildings, and other sub-standard structures. This meant further exposure to hash environmental elements and increase in the hardship experienced by the victims who were already subjected to adverse conditions and are left at the mercies of nature and reptiles. The flood therefore represents an opportunity for the different sheds of government to build camps for those displaced by disaster to guard against future disaster. The problem remains that governments did not utilize these opportunity to improve on the lots of the prople.

6. CONCLUSION

Many communities in Nigeria especially those at the coast like the Orashi people of Rivers State, are potentially exposed to flooding resulting from extreme weather events such as heavy/ prolonged rainfall, coastal flooding and wind storm. This spells the urgent need for communities to engage in efforts aimed at combating the effects of flooding through the enhancement of community resilience and adopting local strategies to combat the flood. The adaptive strategies enumerated in this paper as revealed by post flood Focus Group Discussion in Orashi province, helped in some ways to cushion the effects of the 2012 flood and so maintain an acceptable level of function and structure in the communities. This paper, to a large extent revealed that high level of resilience to adversity determines the persistence of relationships among communities during the period of flooding disturbances and by extension the local government areas, states and the nation at large would be a safer place. It brought to limelight how indigenous adaptive strategies were employed in combating flood disaster in Nigeria enabling the flood-affected communities to contain the disturbances and bounce back to normal pattern of their socio economic activities. This paper concludes that the collective action of the people as manifested in cooperative response to perturbation exemplified in evacuation pattern, formation of flood disaster committee, and indigenous local skills and strategies, etc, represent the bedrock of combating flood disturbances, and raising community resilience to difficulties impinging on the community. These skills and strategies include traditional fabrication of canoe and wooden raft used for transportation, Cooperative and team work experience, Volunteerism of the community hazard control committees, Interaction with people of others and the popularization of the region to the outside world, digging and clearing of gutters and drainage channeling flood away from residential building to forest through dug tunnels and excavation of ponds that operated as water-sheds and fish ponds. These skills and strategies, if carried out, developed and sustained at community levels will strengthen community ability to adapt to flood, increase community based resilience, reduce the human casualties and the socio economic impact of flood and other disasters.

Recommendations

Based on the findings of this paper, the following recommendations were made:

1) The government should build a culture of prevention, preparedness, and effective response amongst the people through intensive community flood education initiative to strengthening their ability to combat flood. A virile community-based capacity to combat flood constitutes the bases for effective national preparedness and response culture against flood and other natural disasters.

2 The indigenous adaptive strategies exemplified by the flood affected communities of Orashi province should be developed and expanded by government into viable industries that would benefit the people. For example the clusters of fish ponds could be developed and upgraded to reputable fish farms that will improve the socioeconomic life of the locals while at the same time would serve the primary water containment function during future floods. Similarly, the innovative fabrication of floatable canoe and wood rafts by the indigenous people though rudimentary, can be developed and expanded by government into a viable economic venture. Again, the Local community flood management committees set up during the 2012 flood in the various communities of Orashi can be upgraded through appropriate training to local community NEMA to help in times of emergencies.

3 Government should urgently provide basic modern critical flood infrastructure and lifeline through people/needs oriented community development initiative especially in flood-prone communities. The ravaging effects of the 2012 floods emanated from the fact of lack of pre-flood awareness, absence of preparedness resulting from absence of NEMA activity in one hand and poor critical flood infrastructures like communication and transportation system in the affected communities on the other hand. Infrastructures like climate monitoring equipments, roads, communication, drainage system and emergency medical services, etc are lacking or in a state of disrepair. These infrastructures are important as they guarantee access in case of evacuation, medical emergencies and delivery of basic materials to trapped flood or disaster victims.

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