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Mitigation and Management of the Effects of Weather-Induced Hazards/Disasters in the Arid and Semi-Arid Zones of Nigeria

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Abstract. Weather-induced hazards such as drought, flooding, hailstorm, windstorm and heavy rainstorm among others have become common in arid and semi-arid areas of Nigeria. This paper reviews the occurrences of the hazards and the uncoordinated manner in which the effects of these hazards have been mitigated and managed. A modern and up to date approach is also proposed for the mitigation and management of the effects of the hazards on the people, environment and the society at large.
Keywords: Disasters, Hazards, Mitigation, Management, Weather, Semi-Arid

1. Introduction

Weather-induced disasters are hazards events that have occurred as a result of extreme weather. These events are also known as meteorological hazards. Some of these hazards are heavy rainstorm, flooding, windstorm, wildfire, hailstorm among others. Some of these hazards like drought and flooding are well known and reoccur regularly in the study region (NEST, 1991; Oladipo, 1993b), while the occurrence of others like hailstorm and dust storm are not regular (Suleiman, 2011). The increasing rates of reoccurrence of these hazards have had and continue to have devastating effects on the study region (Olatunde, 2011a&b). There occurrences in the study region have been blamed for the following problems; social conflicts, for example between farmers and cattle herders over grazing rights and farmlands, the existence of internally displaced people, entrenchment of poverty, migration of able body men to urban centres with the

attendant social vices like armed robberies and prostitution(Oladipo,1993b). There occurrences have also devastated the agricultural sub-sector of the economy of the region through the destruction of farmlands and reduction in farmhands as a result of the migration of young and able men to towns and cities. The already very bad infrastructure of the region are not spared as roads, bridges are destroyed cutting off the rural agricultural producing areas from the urban market centres(Oladipo,1991&1993). All these collectively have continue to perpetuate poverty in the study region making it almost impossible to attain the Millennium Development Goals (MDG's) as enumerated by the United Nations (UN).This paper therefore, examines our current effort at mitigation and management of the effects of these hazards. It argues that despite the seriousness and increasing severity of their effects, the approach of the country to the mitigation and management of the hazards and their effects have been uncoordinated. This has resulted in very little been achieved. In this paper therefore, the need to put in place a comprehensive approach and plan to mitigate and manage the effects of these hazards is emphasized. Also, a national plan for the country is proposed in this paper. The comprehensive proposal made herein therefore can also be adopted by other countries in the West Africa sub-region with similar arid and semi-arid zones.

2. Study Area

The semi-arid region of Nigeria lies within latitudes 10^0 N to 14^0 N and between longitudes 4^0N and 14^0 N. This zone lies between the humid zone to the south and the arid Sahara desert in the north. The study area therefore covers this zone (Oladipo, 1993; Abaje, 2012) (Fig 1.0).The dominant climatic types in the study region are; Tropical Hinterland (Tropical Wet) climate in the Sudan zone and Tropical Continental (Tropical Dry) climate in the Sahel zone. The vegetation of the study area has been grouped into the Sudan Savanna and Sahel Savanna (Abaje,2012). The North-Central highland can be found in the study area. It is made up of basement complex and volcanic rocks that rises between 750 and 1800

metres above sea level (Iloeje, 2004). Rivers that have their sources here include Kaduna, Ikara among others. The Sokoto plain is located in the North Western part of the study area. It is a flat plain drained by rivers Rima and Zamfara. The Chad plain can also be found here, it is low and varies between 45metres and 60metres below sea level. Rivers in this plain include Komadugu, Yobe and Gana among others. The study region is a very significant part/area of the grain basket of Nigeria. Therefore, it provides grains such as maize, millet, guinea corn in large proportions for the consumption of people of the area and other areas in Nigeria. The region is known to be very prone to some of the hazards mentioned above especially drought. Other meteorological hazards such as hailstorm, flood have been occurring at more frequent rates than in years and decades gone by (Suleiman, 2011). The high rate of return of these hazards have been attributed of recent to climate change and also partly as a result of human activities that include bush burning, intense animal grazing and population pressure on marginal lands (Oladipo, 1993). As a result of the increase in their rate of reoccurrences, mitigation of the effects of these hazards have become of utmost importance.

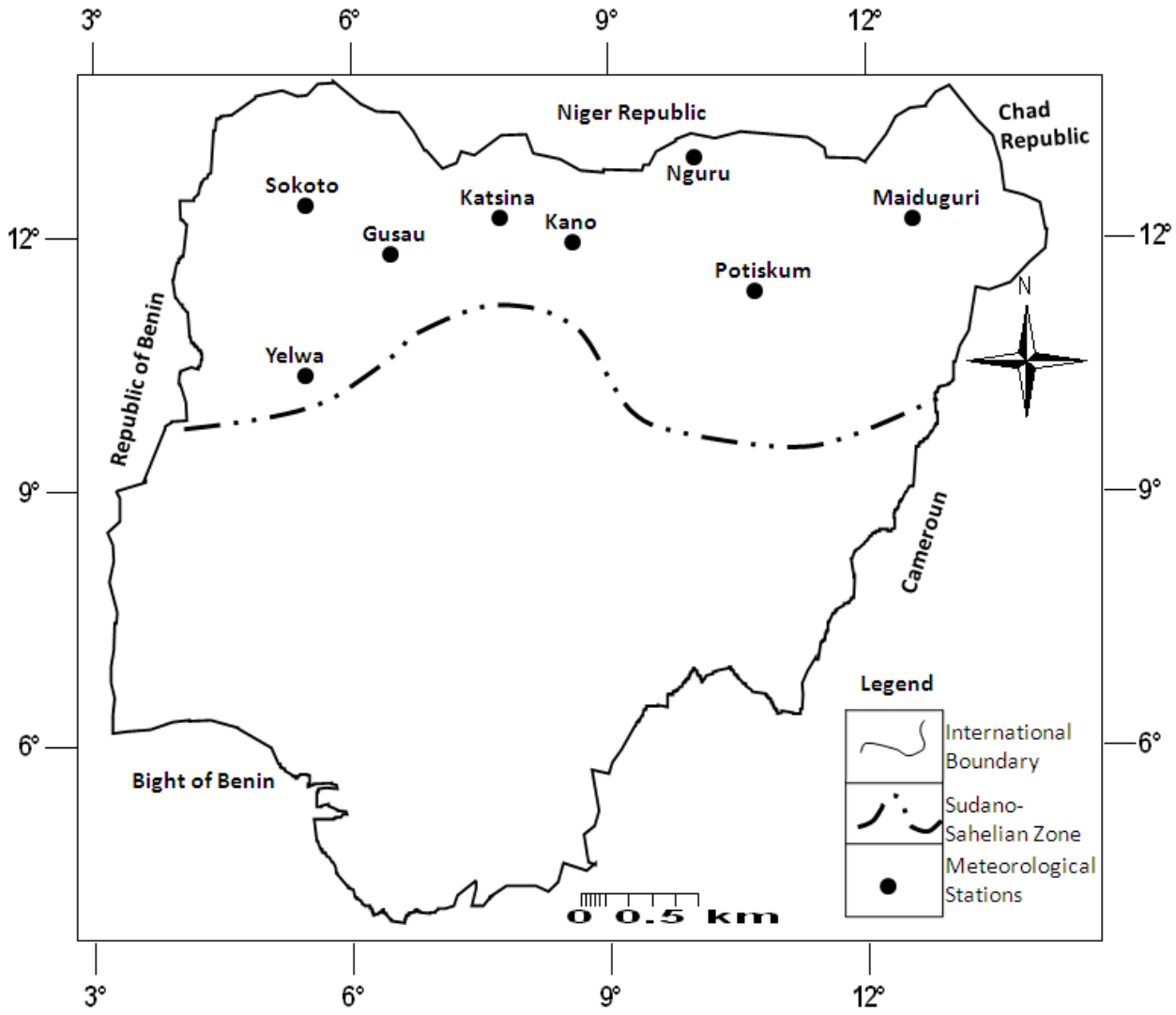


Fig 1.0: Map Showing the Sudano-Sahelian Zone of Nigeria (Study Zone)

Source: Abaje*et al,* 2012

3. The Extent and Consequences of Weather-induced Hazards in the Arid and Semi-Arid Zone of Nigeria.

Disaster management plans can be effective when the extent, rate and damage caused by hazards to the environment, people and society at large are known. Apart from drought and to a lesser extent flooding that their effects have been written on extensively in the study zone. Other weather-induced hazards such as hailstorm, windstorm, wildfire and sandstorm have very rudimentary information on their effects (Suleiman, 2011).Droughts of various durations and intensities have been reported in this zone (James, 1973; Landsberg, 1975;

Oguntoyinbo and Richard, 1977; Gregory, 1982; Adefolalu, 1986; Sale, 1988; Druyans, 1989; Oladipo, 1986, 1993a; Shuaibu and Oladipo, 1993; Olatunde, 2011a&b) for years and decades. The recent pattern of its occurrence is that its rate of return has considerably increased. These Droughts resulted in the depletion of soil and groundwater, as they come mainly from rain and overland flow. This depletion of soil and groundwater have caused soil surfaces to crack, sink and damages to buildings, roads and pipelines (Worldbook, 2001). Rivers (Kaduna, Rima, Yobe and Hadejia) and Lake Chad in the study area have their volume reduced, thereby drastically affecting areas/settlements down stream (Oladipo, 1991; Worldbook, 2001; The Ecofinance, 2009). This affects the quantity and quality of water supply to settlements as most portable water supplied to this area by the various water boards are from the rivers (Kaduna, Sokoto, Hadejia and Rima, among others). Thus, domestic activities of cooking, washing and bathing are seriously affected in this zone. Water for industrial uses is affected in addition to fishing activities. This is because most of the rivers are at this period are dry. This receding water in the rivers leads to the death of the fish and renders the fishermen jobless. The overall effects of all these are that of food scarcity and famine, as well as inflation since production of food and other crops will decline drastically. As a result of the large inter-annual variability of rainfall in the Arid and Semi-Arid zones of Nigeria, the zones are subjected to frequent floods and droughts. Records have shown that severe flooding have become an almost annual occurrences in this zone (Abaje&Giwa, 2010). In 1988 for example, severe flooding in Kano State resulted in the loss of 146 lives, destruction of 180,000 houses, washing away of 14,000 farms, displacement of 200,000 people and damage to residences and infrastructure worth 560 million naira (NEST, 1991). Also, in August 1988, 142 people died, 18,000 houses destroyed while 14,000 farms were swept away due to heavy rainfall and collapse of Baugauda dam. Similarly, the September 6, 2010 flood in Sokoto-Kagara near Goronyo town in Sokoto State as a result of inundation of Rima River and destruction of Goronyo dam resulted in the submerged of houses in over 50

communities, washing away of thousands of farmlands, loss of over 40 lives and hundreds of livestock, nineteen bridges and the collapse of th bridge linking UsmanuDanfodiyo University with the metropolis on the 9th September, 2010. Other areas affected by the floods are Isa, Sokoto-north, Sokoto-south, Rabah, Binji and Shagari local governments (Abdulsalami, 2010). Also flooding in the months of July and August 2012 has created considerable havoc resulting in loss of lives, properties and infrastructure (roads, bridges and farmlands) in the study region and all over Nigeria (Nigerian Newspapers). Flooding therefore have forced millions of people from their houses in the region, destroyed businesses, polluted various sources of water supply and increases the risk of diseases in the zone (Baye, 1988; Akinyemi, 1990; Etuonovbe,2011). The rate of occurrence and reoccurrences of hailstorm in this zone has increased drastically resulting in damages to properties and injuries to people in the zone especially Katsina area. For example 162 car windscreens were damaged and several people injured by the hailstorm that happened in Katsina on 15th July 2010 (Suleiman, 2011).

4.Mitigation and Management of Weather-Induced Disasters

Mitigation can be defined as activities /measures that can be put in place/or already in place to alleviate the effects /impacts of the hazards/disasters. Mitigation of disasters involves four stages. These are:

(i) Prediction, which entails the forecasting of the occurrence and reoccurrence of the specific hazard/disaster.

(ii) Monitoring, that involves periodic checking of the area/region (in this case Arid and Semi-Arid Zones of Nigeria) for signs/evidences of the presence of the hazard/disaster.

(iii) Impact Assessment, this entails the examination and compilation of the effects of the hazard/disaster on the environment, people and the society.

(iv) Response, this involves the mobilization of the necessary people, services and first responders in a disaster zone. It may include emergency providers like fire fighters and disaster management officials. This phase may start with getting to

find the people affected, but it is dominated by fulfilling humanitarian needs of the affected people.

Management in this instance entails putting in place institutions at various levels that will organize, implement and control the programmes and measures that are required to ameliorate the effects of the disaster.

5. Responses to the Effects of Weather-Induced Hazards/Disasters.

The mitigation and management of the effects of weather-induced hazards/disasters as out lined above involve the putting aside of huge amount of money in other to be able to successfully ameliorate the effects of the hazards/disasters. Apart from this, there are many technical measures that can be used to ameliorate the impacts of these disasters. Some of the measures are short term and include providing relief materials, for instance, providing shelter for those that lost their homes. Other measures are long term and involve measures that will take longer periods and are continuous. For instance, enlightening the people about the hazard/disaster and how to prepare for its return, it also involves the development of early warning system for monitoring the hazard/disaster.

In Nigeria as well as the study region, the government and people have responded in various ways to these hazards/disasters in order to reduce their impacts. The governmental bodies responsible for the mitigation and management of these disasters in Nigeria (study region inclusive) are the National Emergency Management Authority (NEMA) at the federal level and the State Emergency Management (SEMA). Also at the local government level, there is usually a committee responsible for it. The people of the study region over the years have evolved various adaptive measures to cushion the effects of these hazards/disasters. Most of their responses are temporary stop-gap measures. They include:

(i) liquidating their accumulated asserts such as livestock.

(ii) mobilizing social networks by which wealth is distributed from the rich (Masu-Dan hali) to the common people (Talakawas).

(iii) collective sustenance.

(iv) hunting and utilization of edible leaves, roots and fruits of various plants.

(v) migration of people into cities, areas further south and neighboring countries (Gashua, 1991; Mortimore, 1989; NEST, 1991; Oladipo, 1993).

However, the responses above from the governments and people are inadequate and of limited effects. As said earlier, the responses of the people are just stop gap measures. On the other hand the governmental responses to disaster have tended to be slow, inconsistent, limited in scope and largely of remedial efforts and to some extent misdirected. The bodies mentioned earlier as being responsible for the mitigation (NEMA and SEMA's) are not able to cope and carry out their responsibilities due to several reasons. Among these reasons are:

(i) the top-bottom down approach instead of bottom-up approach of the institutions.

(ii) increase in the frequency of occurrences of the hazards/disasters.

(iii) the complicated and complex nature of the hazards/disasters with each requiring various specialists.

(iv) the institutions are overwhelmed with the magnitude and scope of the task of being responsible for both man-made and natural disasters mitigation.

(v) the ignoring of the traditional coping strategies by governments and the institutions.

(vi) the funding of these institutions have left much to be desired. Also their budgeted fund are not released as at when due.

(vii) the sometime overlapping efforts of NEMA and SEMA's in the mitigation of these disasters.

The combinations of the above problems have tended to dissipate the efforts of these bodies. There is also improper allocation of resources resulting in mitigation efforts/measures not getting to the rural areas/people during the occurrence of some of the hazards/disasters (Suleiman, 2011)

6. Towards a Comprehensive Coping Mechanism

In order to ensure proper allocation of resources and at the same time adopt an adequate coping mechanism against the effects of these hazards/disasters. Also in order to ensure bottom-up approach in the mitigation effort, a six-tier institutional approach that includes the federal government and/or its agencies, the state governments and/ or their agencies, the local governments, districts/ward communities, villages and other stake holders is proposed.

Attempt to improve the country's capacity to cope and mitigate the effects of these hazards/disasters require the establishment of another body known as "Weather-Induced Disasters Mitigation and Management Agency (WIDMMA). This body should be a parastatal of the Federal Ministry of Environment. It should be a multi-discipline body, so that it will be able to take into consideration the multi-disciplinary and multi-faceted nature of these hazards/disasters. It is recommended that the country be divided into 10 zones with 6 zones in the north and 4 zones in the south to take cognizance of the spatial extent and the higher degree of reoccurrence of some of these hazards/disasters (drought, heat waves) in the north (Fig.2.0) (Oladipo, 1993). Corresponding and similar agencies are to be established at the state, local, district/ward and village levels.

The WIMMA at the federal and zonal levels should have special offices that will be coordinating the relief efforts of non-governmental bodies, industries and other stake-holders. This is very important as it will relieve government of some of the financial burden of mitigating the disasters. It will also facilitate rapid response to hazard/disaster occurrence as these bodies (NGO'S, industries) are not incapacitated like governments by bureaucracy and slow decision making. Also such office will be able to interact and impress it on insurance companies of the need to put in place policies that can be assessed by members of the public to ameliorate the effects of disasters. The offices may also be able to persuade industries to take disaster mitigation as an essential part of their corporate social responsibility.

The bottom-up approach of the proposed institution will ensure proper enlightenment of the people on the mitigation efforts and what their roles are through the cooperation of the body with NGO's, associations, industries and individuals. This will also ensure the integration and incorporation of the traditional relief measures into the mitigation programme.

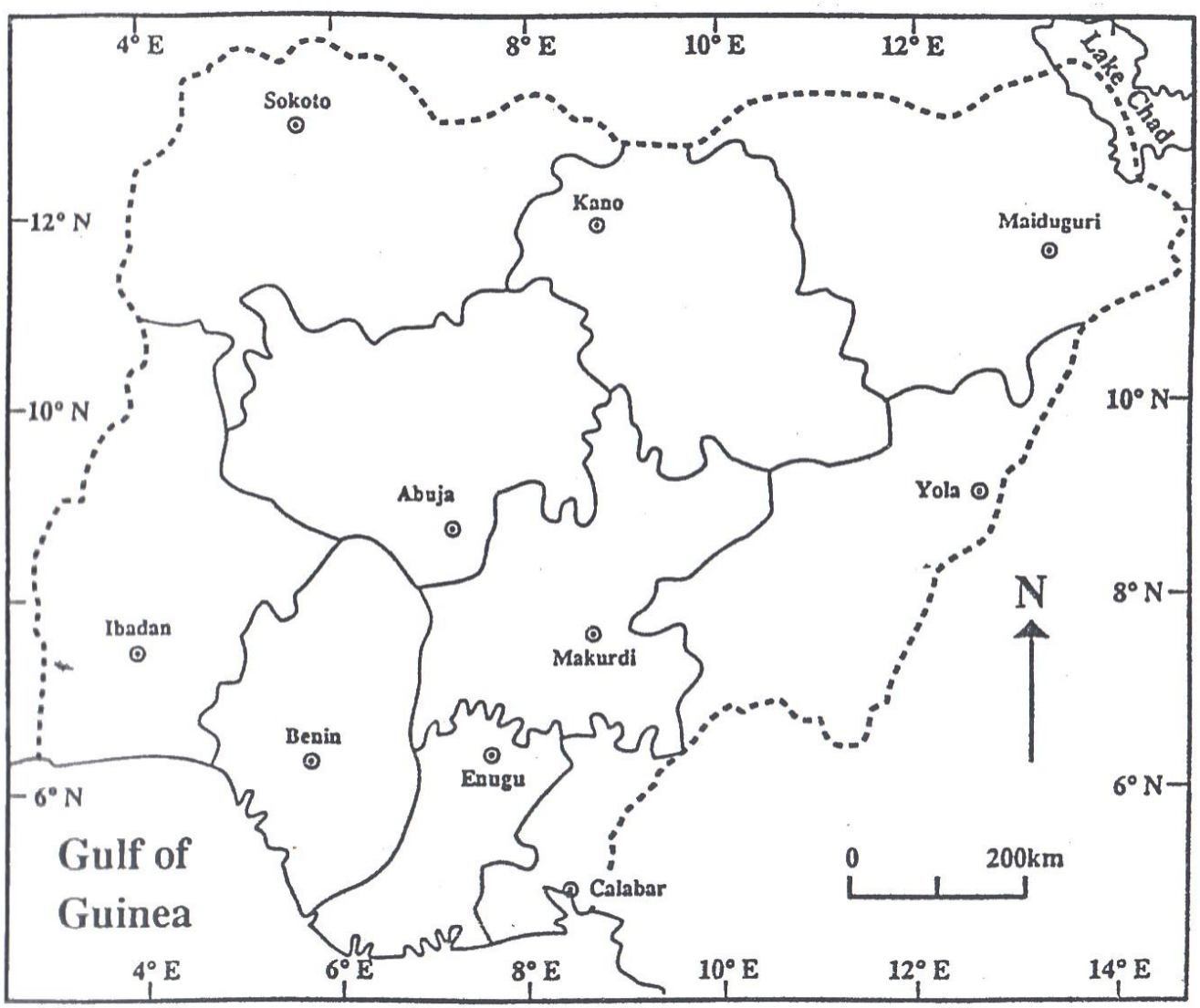
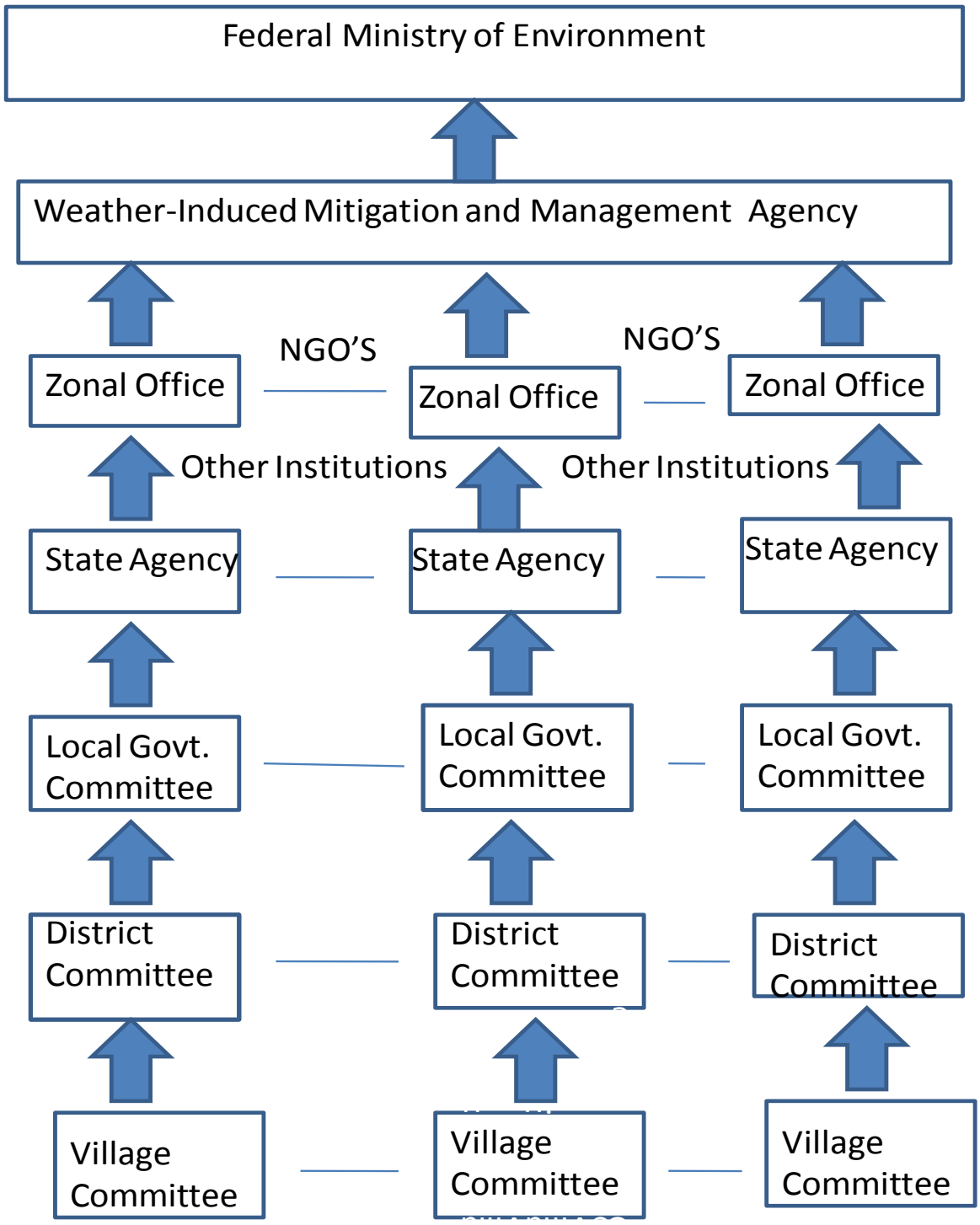


Fig 2.0: Proposed Geographical Units for Monitoring and Mitigation of Weather-Induced Hazards/Disaters.

Adapted from: Oladipo, 1993.



Source: Fieldwork, 2012

7. Conclusion

Some of the weather –induced hazards in this region are not of recent origins. They include drought and windstorm. Others like hailstorm have not being experienced in the zone for a very long time. In this scenario therefore, drought and windstorm are likely to continue to reoccur in this zone for sometime, while the reoccurrence rate of hailstorm cannot be easily predicted. This situation therefore highlights the need for a comprehensive implementable plan for the mitigation and management of weather-induced hazards especially the hazards that reoccur regularly.

In this region of Nigeria where poverty rate is very high as well as the rate of population growth, there is the need to put in place implementable solutions that will alleviate the effects of these hazards. This is more so because governmental responses have tended to be ad hoc and palliative in nature. This being the main reason why in this paper a plan to mitigate the effects of these hazards in this arid and semi-arid region of Nigeria has being discussed. This proposed structure should be able to enhance preparation and response time to weather-induced disasters in this zone by linking the different levels in the society starting from the village level upward.

The role of the local people is emphasized in this paper because they are the ones directly affected by the hazards and disasters. As a result of this, they have developed strategies over the years that can be modified by other levels to cope with the effects of the hazards/disasters. The strategies proposed in this paper, if properly implemented will result in better coordination and cooperation within and among the different levels of society. It also allow governments to respond rapidly as at when due and the society to take full advantage of the private sector through the mobilization of funds for disaster mitigation. It will also allow policies by insurance companies that are specifically targeted at these types of hazards and disasters to be put in place. The proposed strategies can be adopted by other countries in the West Africa sub-continent with similar situations.

The barriers to the implementation of the above proposed plan are political

considerations, unprecedented growth rate of population and shortage of funds. Therefore, governments at all levels need to look critically at these likely impediments and remove them, in order to make the plan to work. There is also the fear of bureaucratic bottleneck. This should not prevent the implementation of this plan as refinement of administrative instruments (as done in Botswana and Gujarat in Indian) (Morgan, 1988; Hubbard, 1988) has reduced the vulnerability of the people to some of these disasters. Finally, a comprehensive formulation and implementation of weather-induced disaster policy is required to reduce human sufferings and to enhance the welfare of the people in this region and other regions like it in Africa.

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