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Monographic issue

Disaster Risk Profile of Nigeria

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Letter from the editors

The Emergency and Disaster Reports is a journal edited by the Unit for Research in Emergency and Disaster of the Department of Medicine of the University of Oviedo aimed to introduce research papers, monographic reviews and technical reports related to the fields of Medicine and Public Health in the contexts of emergency and disaster. Both situations are events that can deeply affect the health, the economy, the environment and the development of the affected populations.

The topics covered by the journal include a wide range of issues related to the different dimensions of the phenomena of emergency and disaster, ranging from the study of the risk factors, patterns of frequency and distribution, characteristics, impacts, prevention, preparedness, mitigation, response, humanitarian aid, standards of intervention, operative research, recovery, rehabilitation, resilience and policies, strategies and actions to address these phenomena from a risk reduction approach. In the last thirty years has been substantial progress in the above-mentioned areas in part thanks to a better scientific knowledge of the subject. The aim of the journal is to contribute to this progress facilitating the dissemination of the results of research in this field.

This monographic issue is about disaster risk profile of Nigeria.
Disaster risk profile of Nigeria is more or less complex because of the diverse disaster and crisis happening in the country and the resulting increased mortality. The country smolders some vulnerabilities to natural and technological hazards and to conflicts.

This risk profile report gives a glimpse on the hazards and vulnerabilities and the subjacent risk for disasters in Nigeria.

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"The starting point for reducing disaster risk ... lies in the knowledge of the hazards and the physical, social, economic and environmental vulnerabilities ... and of the ways in which hazards and vulnerabilities are changing in the short and long term, followed by action taken on the basis of that knowledge."

– Hyogo Framework for Action 2005-2015

CONTENTS

OVERVIEW

Globally, the impacts of disasters have risen rapidly in recent decades affecting almost all sectors of the affected countries/Nation.

Annually, several hundred millions of people are affected and as of 2011, the losses have reached a record US$ 371 billion[1]. During the first semester of 2015, EM-DAT preliminary data shows that 138 disasters occurred in 68 countries. The impact of which resulted in 15,143 deaths, affected more than 15 million people and caused more than US$13.2 billion[2].

A figure that might underreport the true losses by 50% or more[2,4] and does not include knock on impacts across economies and relative economic impacts on individual and particularly poor families are also underestimated.

A **disaster** can be referred to a serious disruption of the normal functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community/society to cope using its own resources. But in some areas of world, frequent smaller-scale and unreported events are a major source of aggregate loss, especially in developing countries and poor communities[5].

Disaster is a function of the risk process, and results from the combination of hazards, conditions of vulnerability and insufficient capacity or measures or even interest to reduce the potential negative consequences of risk, and exposure. Understanding the interaction between hazards, exposure and vulnerability is crucial to effective disaster prevention.

The UNDP defines **risk** as the probability of harmful consequences — casualties, damaged property, lost livelihoods, disrupted economic activity, and damage to the environment — resulting from interactions between natural or human-induced hazards and vulnerable conditions[6]. It further described **Risk assessment** as a process to determine the nature and extent of such risk, by analysing hazards

and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend[6].

A comprehensive risk assessment not only evaluates the magnitude and likelihood of potential losses but also provides full understanding of the causes and impact of those losses[6]. And therefore an integral part of decision and policy-making processes and requires close collaboration among various parts of society.

As part of meeting the UNDP's work on disaster risk reduction (DRR) and recovery risk assessments are therefore essential and thus, the need for developing a Disaster Risk profiling for a Nigeria.

This risk profile is aimed at finding the optimal level of risk of disasters in Nigeria considering the risk required, its risk capacity and risk tolerance.

NIGERIA IN CONTEXT

Nigeria according to the National Bureau of Statistic has a population of 177.5 million with an annual population growth of 6.3%[7] and far more than 140,431,790 from the 2006 population census[8] and an estimate of 182,202,000 by the United Nation World Population Prospects (comprising 92, 789 males, 89, 413 females and a sex ration of 104 males per 100 females).[9]

Nigeria has a population area of 923,768 sq km (356,669 sq miles)[11] (about 3% of Africa's landscape) with 1.4% of its area covered by water. It is bordered by some African countries such as Chad at the Northeast, Niger at the north, Burkina Faso Northwest, Benin at the Western part and Cameroon at the east.

After the Colonial reign under the British, Nigeria gained its independence in 1960 and became a republic in 1963. Barely four seven years after independence, a separatist movement formed the Republic of Biafra in 1967, which lead to the Nigerian Civil War that lasted for 3 years. Nigeria

later became a republic once again with a new constitution written in 1979. After the military juntas, Nigeria became a democratic nation in 1999.

Nigeria is divided roughly in half between Christians, who live mostly in the southern and central parts of the country, and Muslims in the northern and southwestern regions. A minority of the population practise religions indigenous to Nigeria.

Figure 1: Map of Nigeria

According to the World Bank, Nigeria's GDP (US$) is placed at $568.5 billion in 2014[7] and Nigeria is classified as a mixed economy emerging market, and has already reached lower middle income status according to the World Bank[11].

Although the GDP has grown over time since 1965 (the start period of this profile), Nigerian has faced some economic problems with affected the economy negatively with the annual GDP growth dropping from 6.2% in 2014 to 4.55 in 2015[7]. It has a fatality rate of 5.6 and an average age of 18.5 year. Poverty

rate in Nigeria is put at 62.65 as of 2012 with per capita income of $1280 and a human development index of 0.47[12]and a GDP per capita (current US$) of $3,203.3 in the previous year[7].

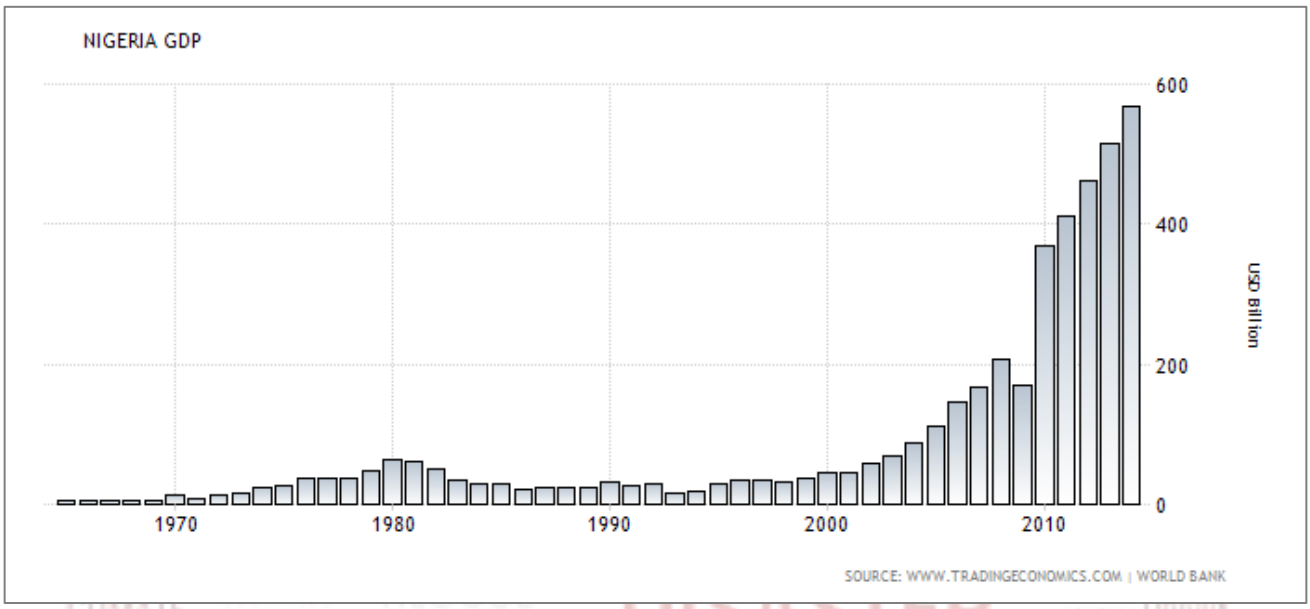


Figure 2: Nigeria GDP – source: World Bank

Nigeria is often referred to as the "Giant of Africa", owing to its large population and economy with its abundant supply of natural resources, well-developed financial, legal, communications, transport sectors and stock exchange (the Nigerian Stock Exchange) and as of 2010, about 30% of Nigerians are employed in agriculture[13] and petroleum accounting for 40% of GDP and 80% of Government earnings[14].

DISASTER IN NIGERIA: An Introduction

Disaster is an inevitable event when it occurs naturally but some or more may result from human activities which are prevented.

According to the United Nations International Strategy for Disaster Reduction (UNISDR), Disaster is a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources[15]. It further defined Disaster risk as a serious

disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources[15].

The International Federation of Red Cross and Red Crescent Societies (IFRC) as well as others such as EM-DAT CRED and International Strategy for Disaster Reduction (ISDR) classified disaster into two major types, natural and technological but other school of taught divided it into 2 basic groups: natural and man-made[16]. Among the natural disasters are earthquakes, volcanoes, hurricanes, floods, and fires. Among the man-made disasters are war, pollution, nuclear explosions, fires, hazardous materials exposures, explosions, and transportation accidents. The man-made disaster also include complex emergencies[17] (Complex emergencies are situations of disrupted livelihoods and threats to life produced by warfare, civil disturbance and large-scale movements of people, in which any emergency response has to be conducted in a difficult political and security environment).

Estimates from 1990-2000 shows that the burden cost of natural disasters constituted between 2 to 15 percent of an exposed country's annual GDP[18]. In 2003, there were approximately 700 natural disasters, which killed an estimated 75,000 people and caused about US $65 billion worth of damage, according to a 2004 report by Munich Re, an international insurance company[18, 19]. Of this insured losses accounted for only US$15.8 billion[18].

Globally, increase in occurrence of disasters has resulted in great loss and damage to health, social, and economic conditions. According to the World Health organisation (WHO), exposure of civilian populations to chemical, biological and radiological agents is an increasing hazard, and may result in fatalities that pose an ongoing threat[20, 21, 22].

According to the information from INFORM, Nigeria's risk index is at 6.5 higher than neighbouring countries like Cameroun and Benin but lower than Chad and Central African Republic (See figure 3&4).

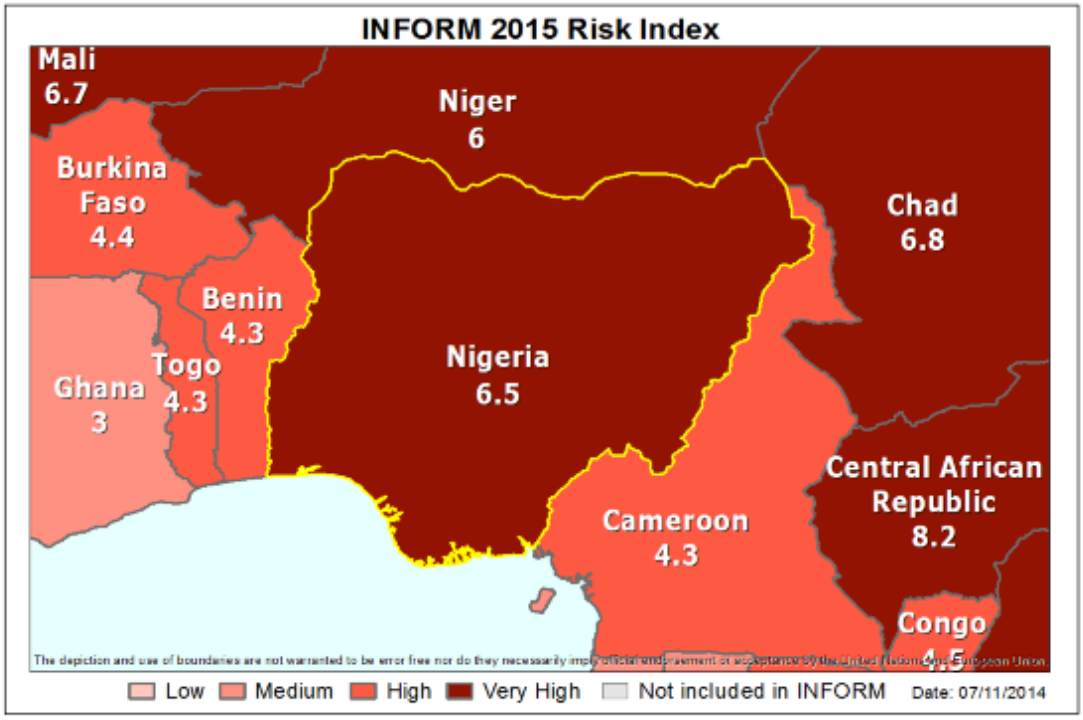


Figure 3: INFORM Country risk profile from

	Value	*Rank*	*Trend (3 years)*
INFORM Risk	**6.5**	**13**	↑
Hazard & Exposure	**6.8**	**19**	→
Vulnerability	**5.9**	**26**	↑
Lack of Coping Capacity	**6.8**	**42**	→

Figure 4: Hazard, Vulnerability and Capacity of Nigeria. Source: INFORM database

Although hazard and exposure seem to normalize, vulnerability of the country to risk has increased with more or less a stabilized rather than increasing coping capacity requiring external intervention and assistance (Figure 4).

Disaster risk profile of Nigeria is more or less complex because of the diverse disaster and crisis happening in the country in resulting in increased mortality and the facts that some disasters are either over reported for political reasons or underreport to protect the image of the country. Never the less, this risk profile will include information and data from National Emergency Management Agency of Nigeria.

Natural disasters

Table 1: List and number of 10 top events of Natural disaster in Nigeria (1965-2015)

Disaster type	Disaster subtype	Events count	Total deaths	Total affected	Total damage ('000 US$)
Drought	Drought	1	0	3000000	71103
Epidemic	Viral disease	17	6715	143281	0
Epidemic	Bacterial disease	25	17263	161155	0
Extreme temperature	Heat wave	1	60	0	0
Extreme temperature	Cold wave	1	18	0	0
Flood	Flash flood	6	330	109165	7805
Flood	Riverine flood	26	1039	10162644	611717
Landslide	Landslide	3	32	1800	0
Storm	--	27	1163	26007	1900
Storm	Convective storm	2	26	15012	1000

Source: EM-DAT; the OFDA-CRED International Disaster Database

According to the EM-DAT and the OFDA-CRED International Disaster Database, during the period of 1965-2015, a total of 111 natural disasters have occurred in Nigeria. Although this might be an underestimation of those falling below the limit of the reporting criteria of EM-DAT, its impact on the health, population and environment cannot be overestimated especially with more occurrence of epidemics, storms and flooding. The ten (10) top is provided on table 1 above.

Figure 5 and 6 present the summary of occurrence and deaths from natural disaster by type. The charts represent the extracted from EM-DAT database and limited to CRED Criteria[23] for entering information into its database which entails that for a disaster to be entered into the database at least one of the following criteria must be fulfilled:

- Ten (10) or more people reported killed.
- Hundred (100) or more people reported affected.
- Declaration of a state of emergency.
- Call for international assistance.

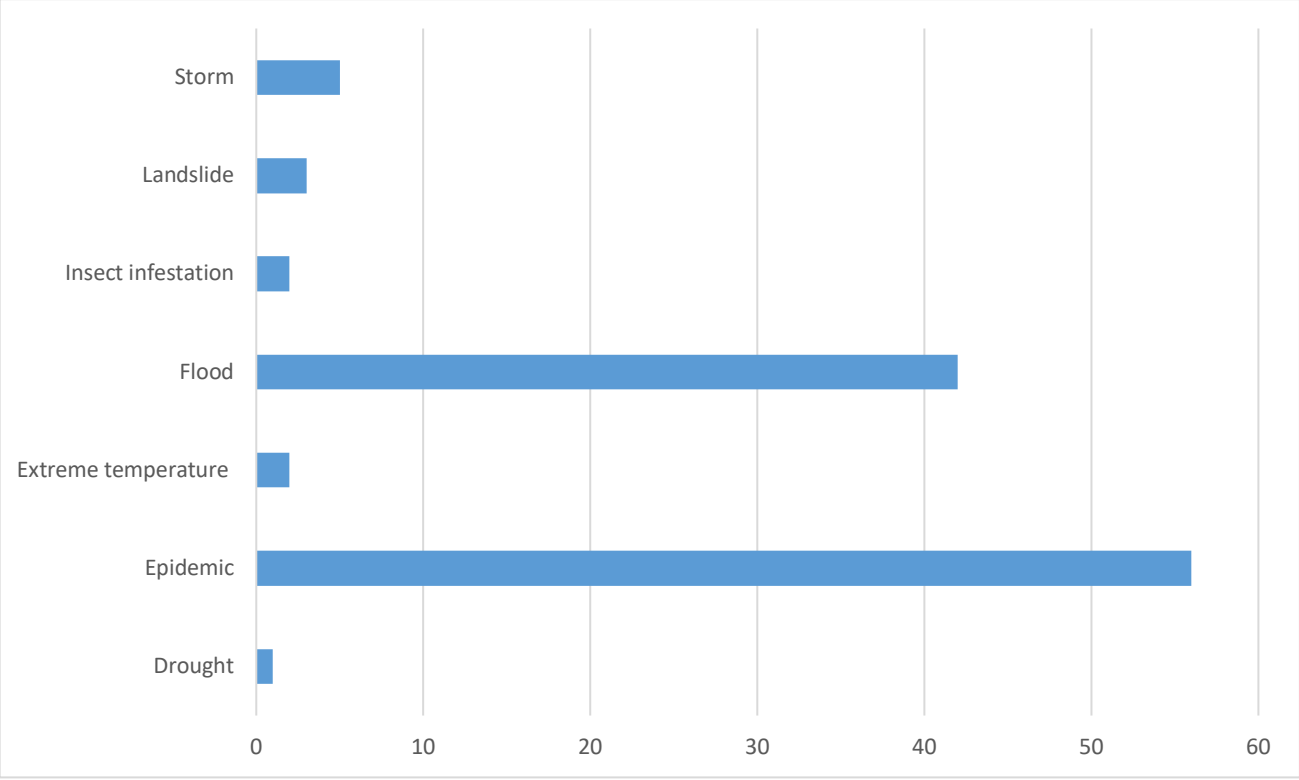


Figure 5: Summary of occurrences of Natural disaster by type

Although drought has occurred less frequently, the immense effect of drought is due to its protracted and slow nature and the fact that it is occurring in a highly populated northern and poor population of mostly farmers.

Flood on the other hand has occurred more frequently and with inadequate drainage system and poor waste management system, the impact of flood lingers and appear to expected with poor community resilience.

In spite the great impact of drought on the population, it account for less deaths as compared to epidemics which account for greater portion of deaths followed by storms and flooding.

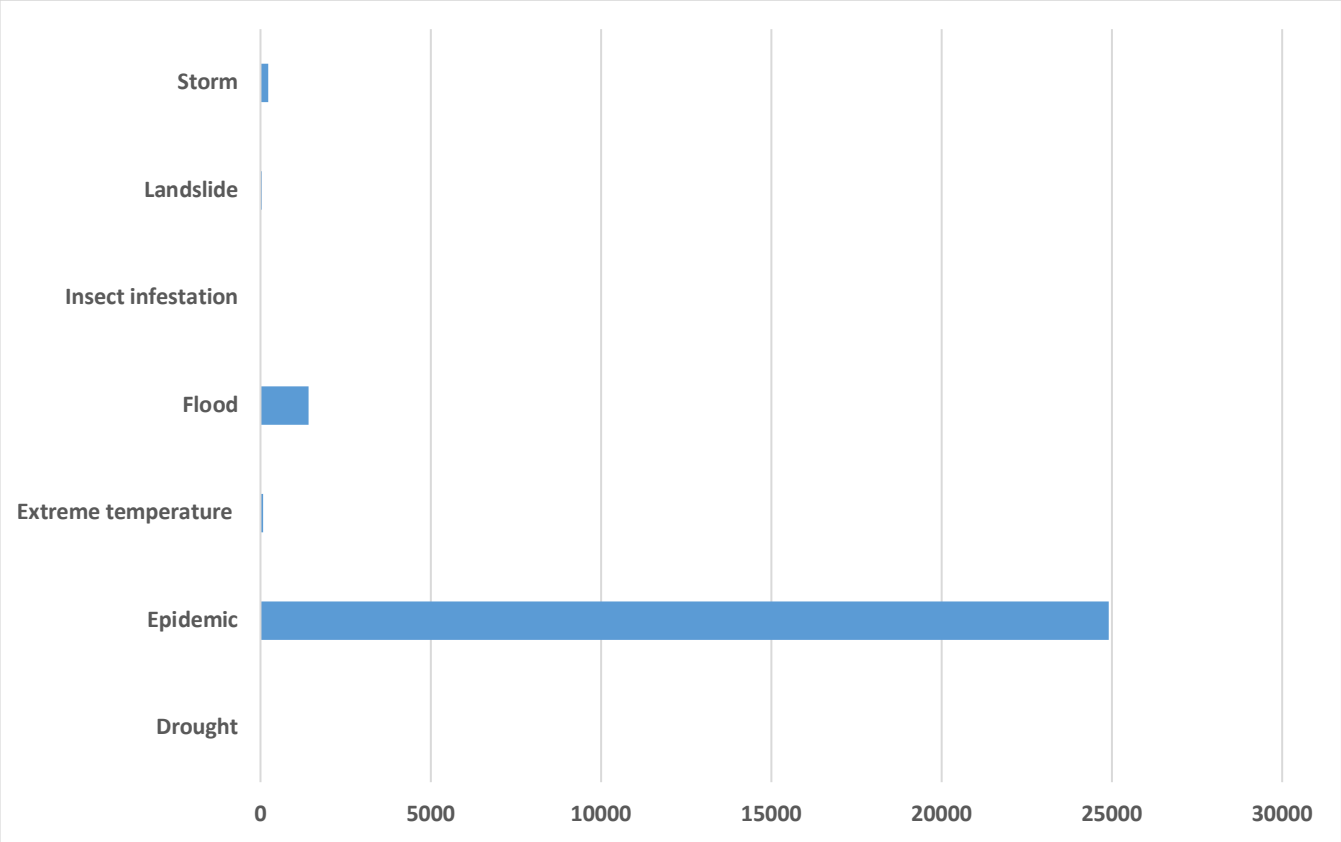


Figure 6: Summary of Deaths by Natural disaster by type

Technological disasters

According to the EM-DAT and the OFDA-CRED International Disaster Database, during the period of 1965-2015, a total of 329 technological disasters have occurred in Nigeria. Although this might be an underestimation of those falling below the limit of the reporting criteria of EM-DAT, its impact is enormous especially road accidents. The ten (10) top is provided on table 2 below.

And figure 6 indicated the summary of impact of Technological disasters by type. Transport accident account for greater number of deaths and injuries with less affected or rendered homeless as compared to industrial accident or the miscellaneous accidents as indicated on the CRED EM-DAT database.

Also to be included the profile are complex emergencies not on CRED EM-DAT database but rather appeared on OCHA publications as well as newsletters, archives and journal publication.

Table 2: List and number of top 10 events of Technological disaster in Nigeria (1965-2015)

Disaster type	Disaster subtype	Events count	Total deaths	Total affected	Total damage ('000 US$)
Industrial accident	Explosion	32	3640	21411	0
Industrial accident	Poisoning	2	309	18000	0
Industrial accident	Chemical spill	1	0	1000	0
Miscellaneous accident	Collapse	13	406	261	0
Miscellaneous accident	Fire	9	200	21190	0
Miscellaneous accident	Other	3	52	66	0
Transport accident	Air	15	1241	64	2000
Transport accident	Rail	2	62	0	0
Transport accident	Road	208	5322	1305	0
Transport accident	Water	44	3111	320	0

Source: EM-DAT; the OFDA-CRED International Disaster Database

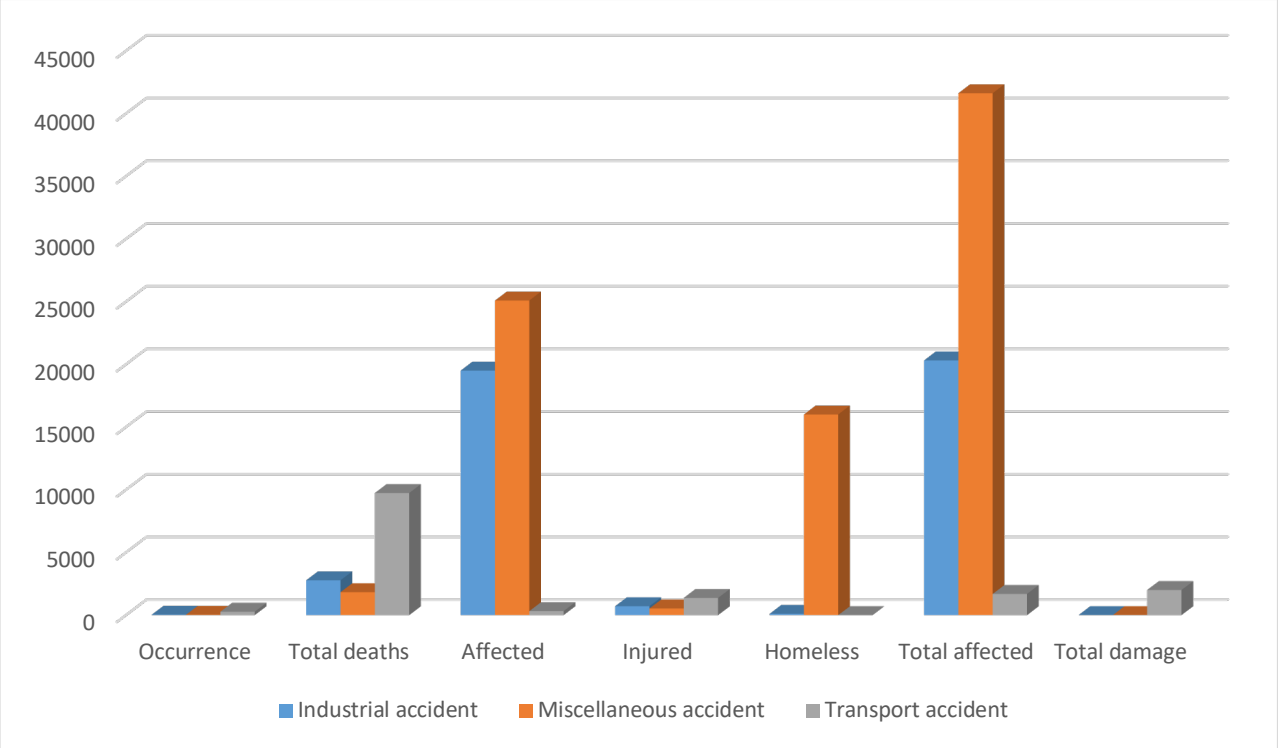


Figure 6: Summary of impact of Technological disasters by type

METHODOLOGY

This report/research employed a qualitative retrospective approach to gather information about different disasters occurring in Nigeria. It focuses information on risk, vulnerability and impact of disasters (Natural and Technological) on population, environment and an economy of the most populous nation in Africa and resident to more than 170,000 people.

Data were collected from different database including EMDAT-CRED, Prevention web, Relief Web, INFO, World Bank Database, Global Terrorism Database, insurance companies like Munich RE.. Although Nigeria has the National Emergency Management Agency (NEMA), based on the information on global risk information platform, Nigeria has no disaster database. So data were also systematically collected from relevant publications related to different disasters within the scope and context of the risk profile.

Ethical considerations were ensured and data needed for relevant discussions were systematically collected from countries sharing similar risk characteristics and quantitatively analysed using IBM SPSS version 20 to foster comparisons, understanding and explaining events for possible and informed decisions and recommendation for Disaster risk reduction and recovery.

DISASTERS RISK PROFILES

A. NATURAL DISASTER: Risk, Vulnerability, Impacts and Prevention Strategies

1. Flooding

According to Zibulewsky, floods account for 50% of disasters and deaths related to disasters[24] with the worst natural disaster in recorded history being the flood of the Yellow River in China in 1887 which left 900,000 people died, and displaced 2 million people and the number of major flood disasters has risen relentlessly over recent time[25].

In spite of the fact that its event can be destroying, it is likewise seen as an essential component in the regular cycle. As per Maher, occasional flooding fortify expanded oceanic creation in full scale spineless creatures and result in solid conceptive year classes for fish species that utilization floodplain territory for scrounge or generating[26]. At the point when the occasions is amazing, it gives solid regular aggravations prepared to do basically resetting oceanic and floodplain groups[27,28].

Events of surges in the urban areas and towns of Nigeria as of late have made an incredible concern and test to the nation[29, 30, 31]. Aderogba recognized the vicinity of what he called journalistic and non-quantitative reports of surge for a few sections of Nigeria including Lagos however needs headings for experts and arrangement producers[32].

History of flooding in Nigeria includes that which happened in Akure in 1980 (20 houses collapsed, 3 people killed), Ibadan, 1982 (3 people killed), Ibadan, 1984 (5 people killed

and millions of naira worth of property destroyed), Port Harcourt, 1984 (Thousands of people rendered homeless and properties worth millions of naira destroyed), Sokoko, 1987 (Loss of farm produce worth N14 million and destruction of 85,000 hectares of land) Borno, 1987 (13 people killed and 68 rendered homeless) Kaduna, Kano and Ibadan, 1988 (4 lives lost and thousands naira worth of properties destroyed, 55 people died, 80,000 homes washed away and Millions of naira worth of properties destroyed respectively), Minna, 1990 (Thousands of naira worth of properties destroyed), Jos, 1992 (Thousands rendered homeless), Borno, 1995 (Over 200 lives lost and properties damaged), Bauchi, 1994 (Over 3,500 hectares of farmland destroyed), Ikot Epene, 1994 (3 lives lost and thousands of naira worth of properties destroyed), Kaduna and Sokoto, 2003 (22 villages submerged, several people killed and thousand rendered homeless and Houses submerged and million naira worth of properties destroyed respectively), Obbe-lle, 2006 (20 lives lost and several areas of farmland destroyed), Minna, 2008 (7 people killed, houses submerged), and Benin, 2008 (8 lives lost and millions naira worth of properties destroyed)[33].

A flooding that happened in August 2008 tossed the inhabitants of Makurdi out of their homes and farmlands left devastated following two days of overwhelming storm of precipitation. Taiwo depicted it as extremely heart-breaking[34]. It was likewise reported in Thisday daily paper of August eighteenth around 500 individuals were dislodged from their home and properties worth a few a large number of Naira crushed when a surge, occasioned by heavy precipitation attacked Babura town in Jigawa State and went on for 2days[32].

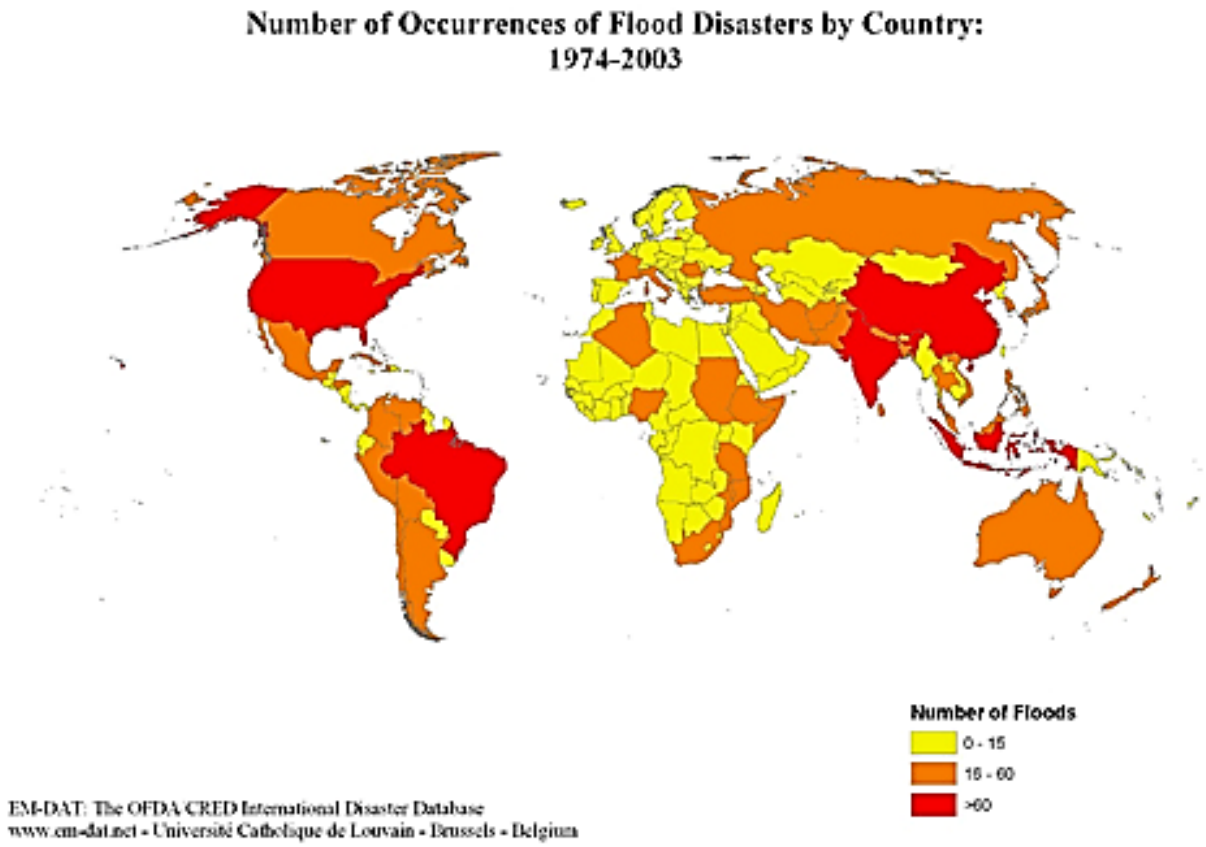


Figure 7: CRED EMDAT – Number of occurrence of flood disaster by country 1974-2003

A publication by Akani and Bilesanmi on the Lagos surge seventh and eighth of July 2011 which uprooted Lagosian with little learning of the impact of the staggering heavy rain[35]. The overwhelming deluge of downpour came about even in a more unfortunate surges in Lagos Metropolis in the next week 10-14 July[36, 37, 38]. The storm was said to have begun in regards to 5 a.m. in the early hours of 10 July, 2011 and enduring 17 hours, prompted gigantic flooding.

By the eleventh of July 2011, media reports demonstrated that 20 persons had lost their lives while open foundation like streets, scaffolds and schools were harmed. A huge number of persons were influenced by the surges with numerous uprooted from their homes which were submerged by surge water wrecking property including vehicles[38].

Taking into account the report of Nigeria Red Cross on 27-28 Aug, surges slaughtered no less than 98 individuals in the southwest Nigerian city of Ibadan, around 120km (75 miles) north of the business capital Lagos[39].

The 2012 blustery season in Nigeria has been more regrettable than before years, and overwhelming downpours toward the end of August and the start of September prompted genuine surges in many parts of the nation. The starting overabundance keep running off was contained through possibility measures, yet amid the most recent week of September water repositories have overflown and powers were obliged to open dams to remember weight in both Nigeria and neighbouring Cameroon and Niger, prompting obliterated waterway banks and foundation, loss of property and domesticated animals and blaze surges in numerous territories[40]. Given that 75% of the Niger Delta Region is wetland with a yearly precipitation of 2000-3000mm, flooding might happen because of over the top precipitation, human control of wetland, surge fields specifically and exorbitant arrival of water from Rivers Niger and Benue[41, 42].

The impact of the arrival of the dam was devastating to the point that by 29 Sep, the surges had influenced 134,371 individuals, uprooted 64,473, harmed 202 and murdered 148 people[40] and the Niger Delta Region was likewise influenced.

As toward the end of October, more than 7.7 million individuals had been influenced by the surges, and more than 2.1 had enrolled as IDPs. 363 individuals were accounted for dead, just about 600,000 houses had been harmed or wrecked. Out of Nigeria's 36 states, 32 have been influenced by the surges[43]. The waterways were back at their standard water levels as at January 2013 and as indicated by IFRC, further flooding was not expected in the short term[44].

Regardless of flooding was not expected in the short term, substantial rains and surges was additionally recorded in mid-July 2013 influencing more than 81,500 individuals crosswise over Nigeria. Just about 8,000 individuals were dislodged and more than 6,500 homes were harmed[45]. What's more, starting 11

Sep 2013, 19 passing had been recorded the nation over and no less than 2,217 farmlands were decimated by flooding with Zamfara, Kogi, and Bauchi state generally influenced[45].

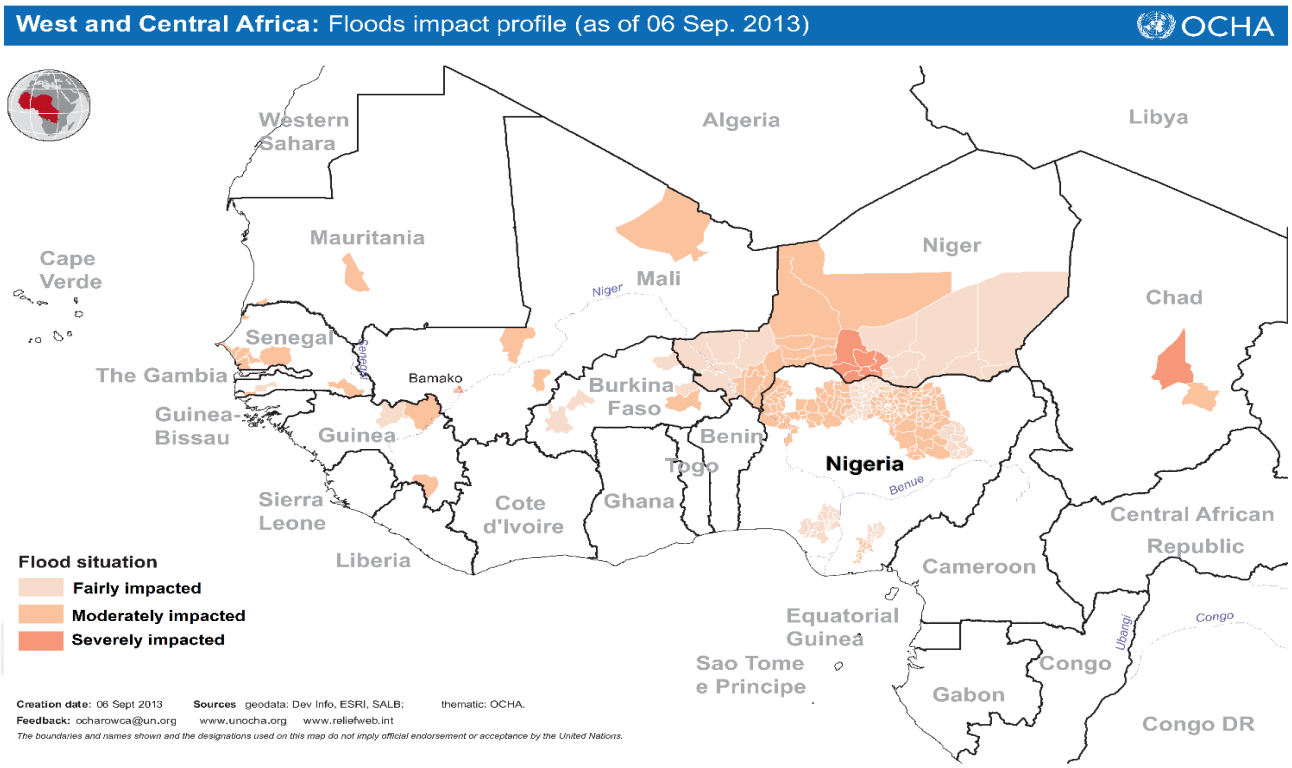


Figure 8: Flood Impact profile- source: OCHA

Factors increasing vulnerability

i. Heavy Rainfall: Heavy rainfall is experienced in some parts of the world especially in the tropical regions.

ii. Soil Nature: the nature of the soil through which rain water flows or percolates, determines to a great extent the rate of infiltration and the volume of water that will be generated as run-off.

iii. Deforestation: large scale deforestation in the forest and vegetation of the world has helped to increase the flood occurrence.

iv. Climate Change: change in our climates has also increased the occurrence of floods in the world.

v. Poor Waste Disposal: poor waste disposal especially in our urban centres cause blockage of drainage channels.

vi. Poor Land Use Policy Planning and Management: Poor land use policy planning and management constitute a major problem to urban flooding in the world especially in the developing countries of the world.

vii. The level of predictability: This affects the timing, accuracy and communication of warnings given before a flood.

viii. The rate of onset of the flood: How quickly the water arrives and the speed at which it rises will govern the opportunity for people to prepare and respond effectively for a flood.

ix. The speed and depth of the water: This dictates the level of exposure of people and property to a flood.

x. The duration of the flood: This is another important factor in determining the extent of its impact, particularly on individuals and affected communities.

Impact of flooding on the Population, Environment and Economy

Although floods can be extensive, only 0.2% to 2% of people involved in a flood require medical care[24]. Impacts will included;

- Exposure to unsafe food
- Exposure to contaminated drinking and washing water and poor sanitation
- Prolonged rainfall and floods provide new breeding grounds – wet areas and stagnant pools for mosquitoes and animals
- Excessive exposure to molds and mildews can cause flood victims – especially those with allergies and asthma – to contract upper respiratory diseases and to trigger cold-like symptoms,
- Carbon monoxide poisoning

Picture 1. A flooded community in Ibadan- Source[46]

The impact of flooding in Nigeria is evidence in the amount of destruction of properties, farmlands and lives which at time are under reported especially for those occurring in rural and not easily-reached areas with devastating effect and no insurance for life or properties.

Flood can have momentous effects on long – term economic growth of the affected region; Indirect and secondary effect on the local and national economy may lead to a decrease in the family income, which would ultimately result to the increase in spending, trying to repair the damage houses and household gadgets like electronics, rug and more[47].

It also create conditions that stimulate secondary treats of waterborne and vector borne diseases as in respiratory diseases[47].

Risk reduction strategies

Some risk reduction method suggested by Bariweni and colleagues[48] include but not limited to the following;

i. Flood Risk mapping determines the area at risk and should be the basis for all flood damage reduction program and subsequent action.

- Increase public awareness of the areas at risk of flooding

- Provide information of areas at risk by defining flood risk zone to give input to spatial planning.

- Perform spatial planning and land management which provide various tool to prevent natural hazards.

ii. Planting vegetation to retain extra water

iii. Terracing hillsides to slow flow down hills

iv. Construction of flood ways (man-made channels to divert floodwater)

v. Other techniques include the construction of levees, dikes, dams, reservoirs or retention ponds to hold extra water during times of flooding

2. **Epidemics**

a. Cholera outbreak

Cholera remains a major public health problem in the WHO African Region. In early 2010, Nigeria saw its worst cholera outbreak, with 2010 epidemic being the largest with 41,787 cases including 1,716 deaths in 18 of the 37 States of the country[49]. The number of cases were nearly three times the total for all of last year and 7 times that of 2008[50].

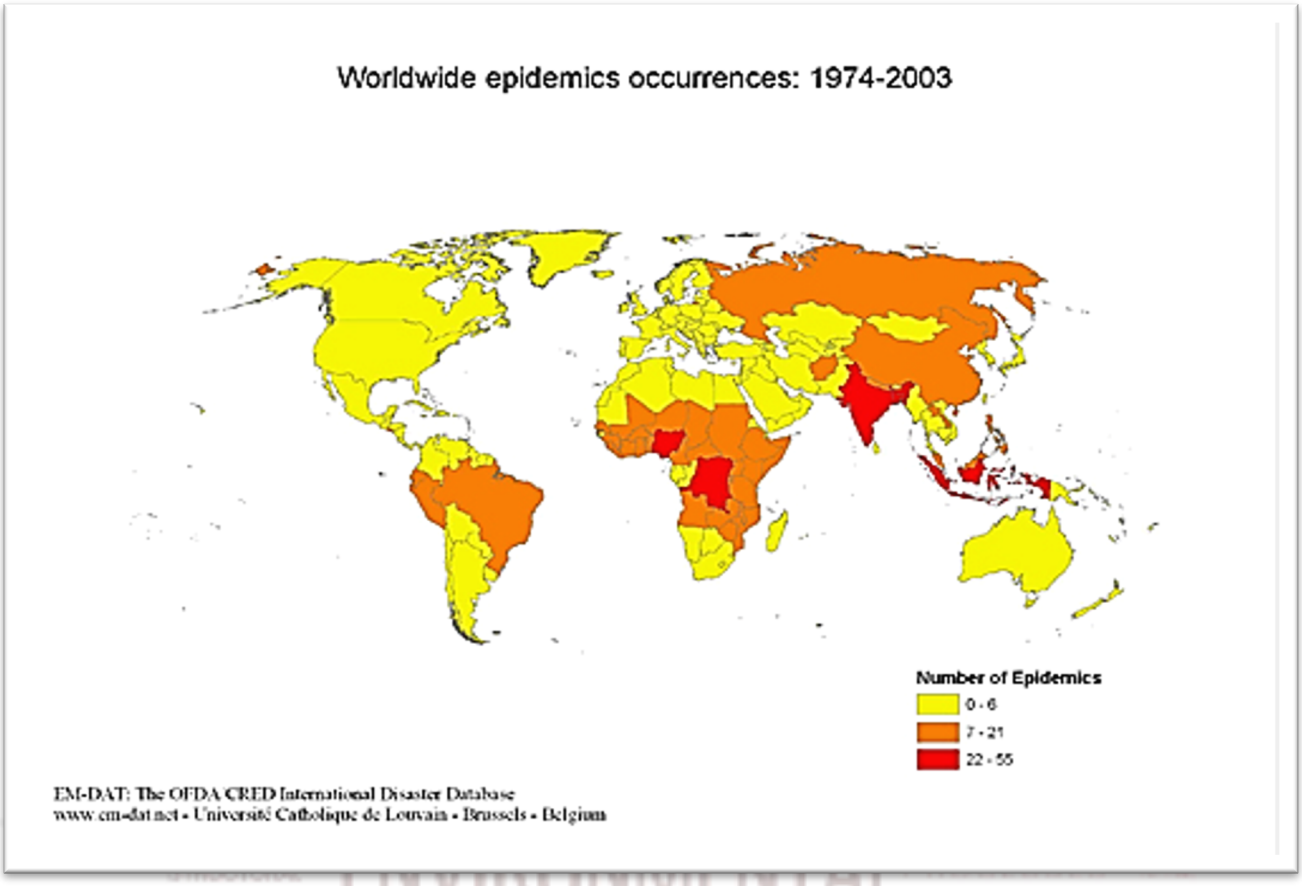


Figure 9: World epidemic 1974-2003; CRED EM-DAT

Between 01 January and 11 November 2013, a total of 39,898 cholera cases including 862 deaths (CFR: 2.2%) were reported from 21 countries with Nigeria accounting for 10%[51] and between 01 January and 11 November 2012, a total of 4,220 suspected cholera cases including 145 deaths (CFR 3.5%) were reported from 51 LGAs in 16 states. 43 cases had laboratory confirmation as cholera.

By the end of March 2014, 12,223 cases with 178 deaths in 13 states had been reported[52]. By 11 May, 19,160 suspected cholera cases including 244 deaths had been reported from 15 states[53]. By mid-June, the number of suspected cases had increased to 23,324 and the number of deaths to 301[54]. As at December, more than 35,700 cases, including 753 deaths, had been reported and the number of new cases continued to drop and stood at 50 in week 47[55].

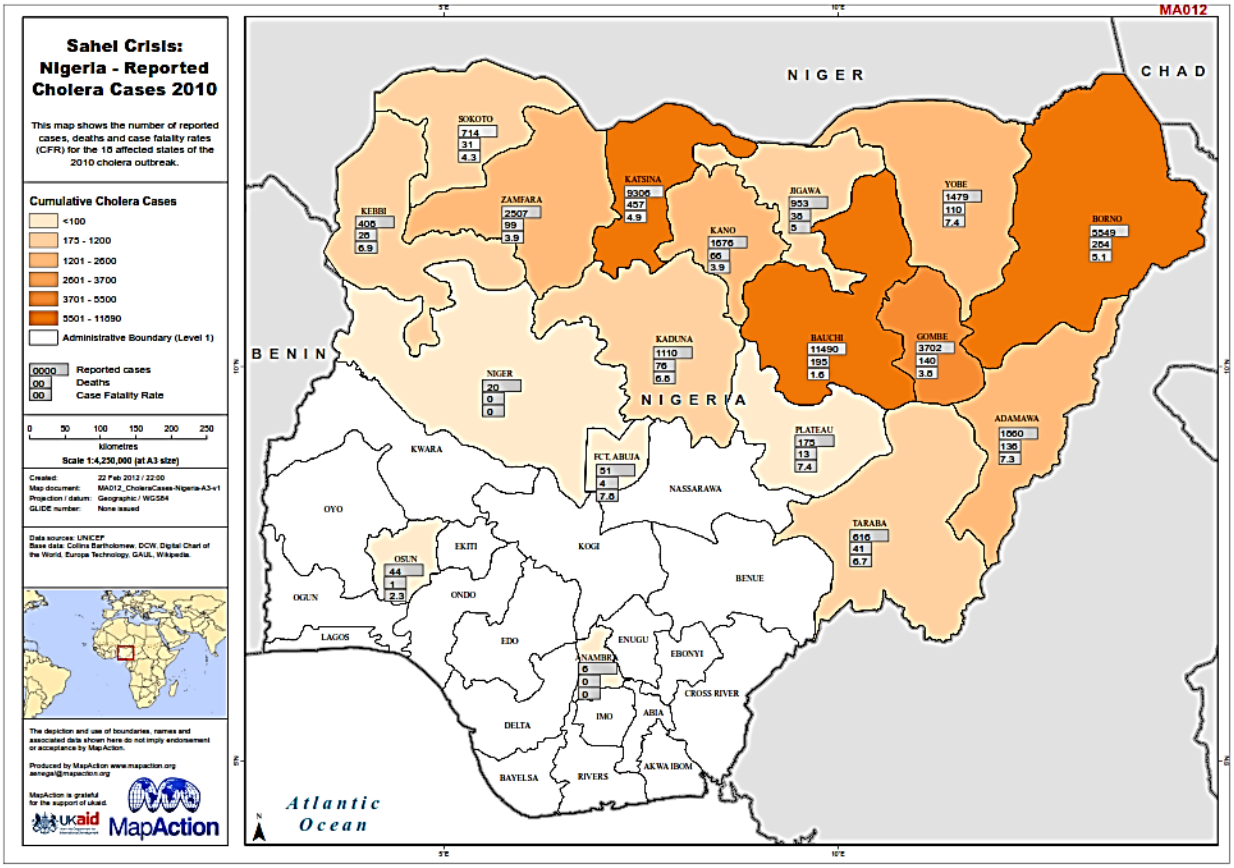


Figure 10: Map of Nigeria showing distribution cases of cholera in 2010

According to the information provided on relief web, outbreaks occurs almost every year in Nigeria and the IFRC[49] stated that the surge of the cholera outbreak in 2014 largely resulted from limited access to safe drinking water (both the quality and quantity is poor), insufficient hygiene conditions, and poor sanitation but this coincided with an increased number of IDPs in the affected regions or states like Maiduguri. The intervention summary published on relief web on 12 Mar 2015 added that with 350,000 IDPs in multiple camps, comes with perfect scenario for the occurrence of a more catastrophic crisis to develop. The IDPs include majority of vulnerable groups (eg young married girls, elderly, disabled, children under 5).

Similarly, a report of the Médecins Sans Frontières/Doctors without Borders (MSF) of 17 September 2015 published on relief web confirmed that people fleeing Boko Haram violence in Maiduguri were hit by cholera[56]. A crisis which has forced more than 1.65 million Maiduguri resident out of their home

and several more in affected States[57]. In response, the MSF set up 100-beds cholera treatment centre not enough to contain 187 patients as of 15 September 2015 including 50 admitted on 13 September alone and a recorded 16 deaths on 16 September[56].

In contrast to the MSF report, the UNICEF Humanitarian Situation Report as of 1st October, 2015 reported a total cases of 554 with 15 deaths and a CFR of 2.7% since the report of the outbreak on 7th September in 4 IDPS and surrounding communities[57].

Factors contributing to vulnerability

i. Poor Sanitation: Poor sanitation costs Nigeria 455 billion Naira each year, equivalent to US$3 billion (Water and Sanitation Program [WSP], 2012). This sum is the equivalent of US$20 per person in Nigeria per year or 1.3% of the national GDP.
ii. Massive displacement of IDPs or refugees to overcrowded settings due to Crisis: A report of the Médecins Sans Frontières/Doctors without Borders (MSF) of 17 September 2015 published on relief web confirmed that people fleeing Boko Haram violence in Maiduguri were hit by cholera[56].
iii. Lack of access to safe drinking water and poor hygiene practice

Risk reduction strategies

i. Good sanitation and personal hygiene practice promotion
ii. Reduction in overcrowding especially among IDPs or refugees
iii. Periodic purification of water via chlorination to enhance access to clean and safe drinking water
iv. Increase access to safe drinking water at least 3-5 litre/person/day in acute cases or more (15-20 litres/person/day) in protracted outbreaks/displacements
v. Cholera alert

vi. Colour coding of vomit and faecal collection containers as applied by MSF to allow proper disposal

vii. Periodic spaying the Cholera Treatment Centres (CTC) with disinfectants

viii. Safe burial of dead bodies

ix. Effective and accurate surveillance and monitoring of outbreak and as well as coordination of adequate intervention measures to control spread

b. Lassa fever outbreak

Lassa infection is asymptomatic in about 80% of cases, but causes an acute illness in the rest. Fever and general weakness are followed by headache, chest pain, vomiting, diarrhoea, cough, pleural effusion, bleeding from orifices, and in the late stages sometimes disorientation and coma[58]. The overall case fatality rate is around 1%, rising to 15% of hospitalized cases[59].

It is endemic in parts of west Africa including Sierra Leone, Guinea Liberia and Nigeria[60, 61, 62, 63, 64]; however, other neighbouring countries are also at risk, as the animal vector for Lassa virus, the "multimammate rat" (*Mastomys natalensis*) is distributed throughout the region.

The number of Lassa virus infections per year in West Africa is estimated at 100,000 to 300,000, with approximately 5,000 deaths. Unfortunately, such estimates are crude, because surveillance for cases of the disease is not uniformly performed[65].

The pattern of Lassa fever outbreaks in Nigeria over the years shows a worrying trend where outbreaks are increasingly becoming more frequent with widening geographical spread. Data from the Nigerian Federal Ministry of Health, Epidemiology Division reveal that Lassa fever has been reported in more than 23 of the 36 states of Nigeria. Ebonyi, Edo, Nassarawa and Plateau States are the most frequently affected.

According to a publication[66], after the historical start at the Lassa Village near Maiduguri, Borno State (1969), the same outbreak had a nosocomial spread to Jos, Plateau State (1969-1970). Thereafter, Lassa

fever outbreaks occurred in Zonkwa, Kaduna State and Onitsha, Anambra State(1974), Pankshin, Plateau State (1976), Ekpoma, Aboh Mbaise, and Aba (1989), Ekpoma (endemic for Lassa)(1989 till date), Lafia (December 1993 to February 1994) Northern part of Edo State, including Ekpoma, Igarra,and Ibilo (2001 and 2004), Ebonyi and Ogun States (2005) Edo, Plateau, Kogi, Benue, Ondo, Nasarawa,Ebonyi (2007/2008), Edo, Nasarawa, Gombe, Kaduna,Plateau, Ondo,Lagos States and FCT(2009), Kaduna,Kebbi, Plateau, Taraba, Edo, Kogi, Ondo (2010)[66].

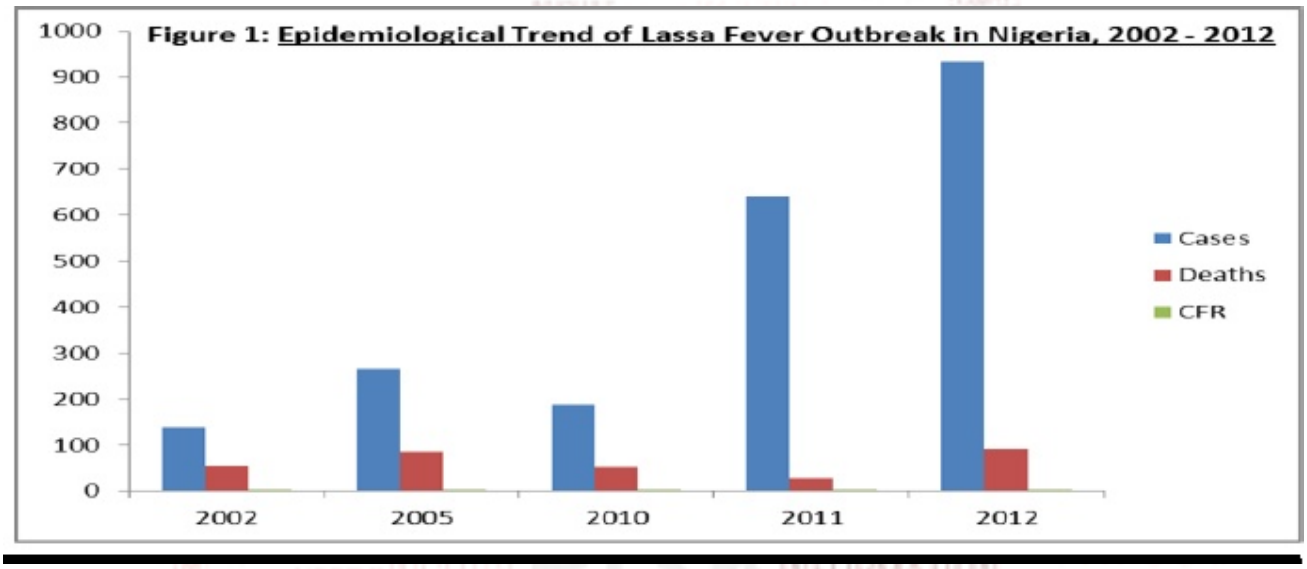


Figure 11: Trend of Lassa fever 2002-2012[66]

At the beginning of 2012, WHO was notified by the Federal Ministry of Health in Nigeria of an outbreak of Lassa fever. As of March 22, 2012, 623 suspected cases, including 70 deaths have been recorded from 19 of the 36 States since the beginning of the year[67]. Laboratory analysis undertaken at the Irrua Specialist Teaching Hospital, Irrua Edo State has confirmed the presence of Lassa virus infection in 108 patients. Three doctors and four nurses were reported to be among the fatalities. This information is provisional and subject to change when laboratory results for Lassa fever in suspected cases become available.

The IFRC final report of 31st August, 2012 recorded number of cases of Lassa fever in Nigeria this year was greater than in the previous years, with 933 cases and 93 deaths reported by late June[68]. But in contrary, another report revealed that 937 cases and 95 deaths were recorded, with a Case Fatality Rate (CFR) of 10.14% and out of the 937 cases 148 (15.7%) were laboratory confirmed[66].

Factors increasing vulnerability

i. Rodents which invade houses in search of food remains especially grains
ii. Sun-drying of food stuff: Sun-drying provides ample opportunity for rodents to run over the food item, depositing their waste as they do so. Not only that, viral ridden dust particles rest on the food, rendering them unsuitable for consumption[69].
iii. Storage of kitchen utensils close or open to the reach of rodents
iv. Bushy surrounding and unclean environment encouraging the breeding of rodents
v. Inadequate disposal of refuse/garbage especial close to residential areas

Risk reduction strategies

i. Key to the control of infection in human populations is an understanding of the dynamics of disease transmission and effective communication for behavioural change[70].
ii. Trapping is known to reduce rodent populations and viral transmission can be reduced as much as five-fold when Mastomys population is reduced by >90%[71, 72].
iii. Health education should advocate safer storage of utensils.
iv. Keeping food and water covered to prevent contamination by rats
v. Keeping the compound clean and clearing of bushes around houses to prevent rats from entering.
vi. Dispose garbage correctly and away from the house
vii. Maintaining effective personal hygiene; gloves, face masks, laboratory coats, and goggles are advised while in contact with an infected person.

c. Polio cases

The RI program, begun in 1979, includes 4 doses of Oral Polio Vaccine (OPV) given at birth and at 6, 10, and 14 weeks of age. National average coverage for ≥3 OPV doses (OPV3) rose above 20% in 1986, increased to 55% in 1990, then decreased to ∼20% in 1999[73].

Through 1996–1998, the Government of Nigerian via the Ministry of Health in collaboration with the World Health Organization (WHO) instituted an Acid Flaccid Paralysis surveillance system to detect paralytic poliomyelitis[74]. But despite the Global Polio Eradication Initiative effort on immunization of children with multiple doses of oral poliovirus vaccine (OPV), thorough routine immunization and supplementary immunization activities[75], the Northern Nigeria had remained a major reservoir for WPV1 and WPV3[76, 77], leading to extensive international spread of WPV1 in 2003–2006[78] and 2008–2009[79, 80] and limited WPV3 international spread in 2008–2009[81, 82].

And as of 2012, Nigeria accounted for more than half of all polio cases worldwide. This resulted in a resolution by all levels of government, civil society, religious leaders and tens of thousands of dedicated health workers in Nigeria to stopping polio[83]

Unfortunately, as of 04 November 2013, almost half of the cases occurred in security compromised states of Borno and Yobe, and other cases are genetically linked to these states[84]. And after then, Nigeria has not reported any case of wild poliovirus since 24 July 2014

Factors increasing vulnerability

i. Poor coverage of the routine immunization and supplementary immunization activities
ii. Cultural perception and rumoured risks associated with the vaccine, such as infection with the human immunodeficiency virus and steroid contamination leading to infertility.
iii. Failure to complete immunization schedule by some mothers due to ignorance or distance from health care/immunization centres
iv. Poor reporting of Acid flaccid paralysis to heath care facilities and providers

v. Deficiencies and localized vaccination.

vi. The immunity gap in northern Nigeria is the bequest of a interruption of poliovirus immunization activities in 2003 and 2004

Risk reduction strategies

i. Complete immunization of children with OPV according to the immunization schedule

ii. Early reporting of cases of Acid flaccid paralysis

iii. Increased and effective surveillance and monitoring system

iv. Increased coverage of routine immunization and supplementary immunization activities

Recent Development

Recently, on the 25 SEPTEMBER 2015, the WHO Geneva/New York announced that polio is no longer endemic in Nigeria. This was seen as the first time Nigeria has interrupted transmission of wild poliovirus, bringing the country and the African region closer than ever to being certified polio-free[85].

d. **Ebola outbreak**

Ebola virus disease (EVD) was first discovered in 1976 in 2 simultaneous outbreaks, one in Nzara, Sudan, and the other in Yambuku, Democratic Republic of Congo[86]. The virus family Filoviridae includes three genera: Cuevavirus, Marburgvirus, and Ebolavirus and transmitted to people from wild animals and spreads in the human population through human-to-human transmission with an average case fatality rate of around 50% and case fatality rates have varied from 25% to 90% in past outbreaks[87].

On March 23, 2014, the World Health Organization (WHO) was notified of an outbreak of Ebola virus disease (EVD) in Guinea. On August 8, the WHO declared the epidemic to be a "public health emergency of international concern[88]." This was regarded as the largest and most complex Ebola outbreak since the Ebola virus was first discovered in 1976.

By September 14, 2014, a total of 4507 probable and confirmed cases, including 2296 deaths from EVD (Zaire species) had been reported from five countries in West Africa — Guinea, Liberia, Nigeria, Senegal, and Sierra Leone. We analysed a detailed subset of data on 3343 confirmed and 667 probable Ebola cases collected in Guinea, Liberia, Nigeria, and Sierra Leone as of September 14[89].

The laboratory confirmation of the Nigeria's first Ebola case, in Lagos- a busy city in Nigeria characterized by a large population living in crowded and unsanitary conditions in many slums, was announced on 23 July, the news shocked public health communities all around the world[90].

Nigeria is Africa's most populous country and its newest economic powerhouse. The city of Lagos has population of around 21 million – almost as large as the populations of Guinea, Liberia and Sierra Leone combined.

Although cases and contacts where quarantine, the 1st of August, witnessed another report in Port Harcourt of a close contact of the index case that flew Lagos there seeking care from a private physician who eventually contacted the infection and developed symptoms on 10 August and died of Ebola on 23 August. Laboratory tests confirmed the city's first case on 27 August[91].

In the end, Nigeria confirmed a total of 19 cases, of whom 7 died and 12 survived, giving the country an enviable case fatality rate of 40% – much lower than the 70% and higher seen elsewhere.

Factors increasing vulnerability

i. Fear of dying of the infection even without contact
ii. Characterized increased population in areas affected
iii. Virulence nature of the diseases with average case fatality rate of around 50% and varying case fatality rates of 25% to 90% in past outbreaks.
iv. Poor hygiene practice and unclean environment
v. Ritualized safe burial of the dead

vi. Non adherence with standard precaution by health care providers enhancing exposure and contamination of other patients; among others

Risk reduction strategy

i. Reducing the risk of wildlife-to-human transmission from contact with infected fruit bats or monkeys/apes and the consumption of their raw meat. Reducing the risk of human-to-human transmission from direct or close contact with people with Ebola symptoms, particularly with their bodily fluids.

ii. Reducing the risk of possible sexual transmission, because the risk of sexual transmission cannot be ruled out, men and women who have recovered from Ebola should abstain from all types of sex (including anal- and oral sex) for at least three months after onset of symptoms

iii. Outbreak containment measures, including prompt and safe burial of the dead, identifying people who may have been in contact with someone infected with Ebola.

iv. Good hygiene and maintaining a clean environment.

v. Application of standard precautions by health-care workers caring for patients, regardless of their presumed diagnosis.

Recent development

On the 20 October 2014, Nigeria was officially declared free of Ebola by the World Health Organization (WHO) after six weeks with no new cases. According to the WHO representative Rui Gama Vaz, speaking in the capital Abuja, it was a "spectacular success story" showing that the virus can be contained[92].

Health, environmental and economic impacts of Epidemic outbreak

Faecal contamination of the environment is the root cause of an annual average of 5,400 cases of cholera affecting Nigeria. According to the WHO Global Health Atlas, the cost of the necessary WASH response is estimated to be US$3.5 million each year[93]. This is not only applicable to cholera

but also disease outbreak with indication of faecal or oral-faecal transmission or contamination of the water body and the environment.

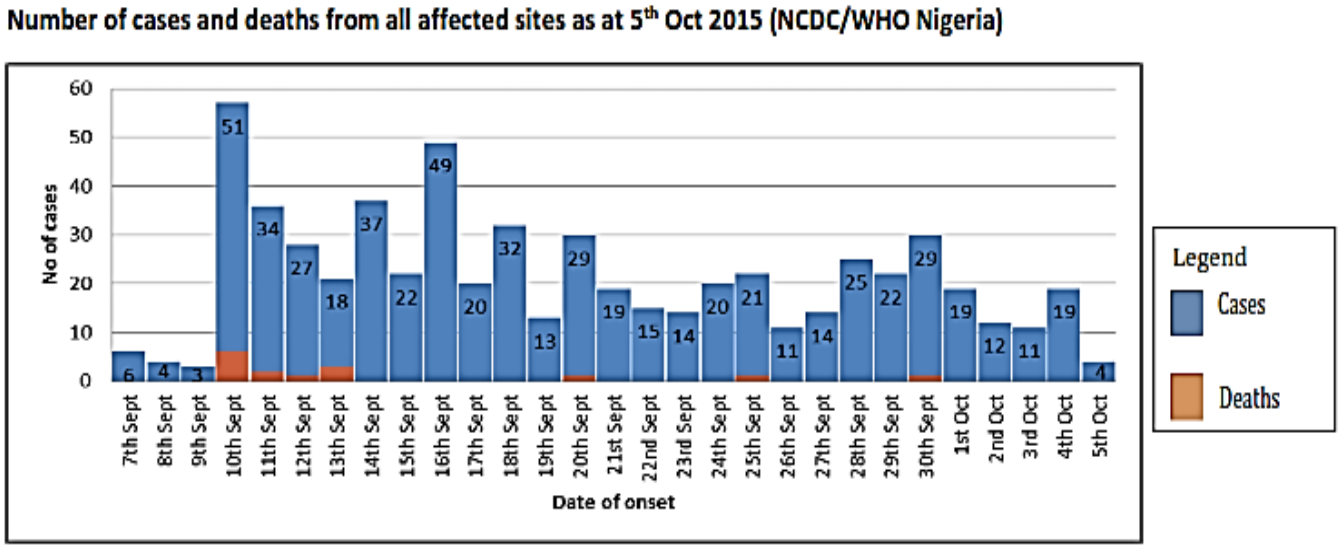


Figure 12: Cases and deaths from Cholera – Source; NCDC/WHO

The economic implications of a cholera outbreak however, go beyond the immediate health system response – there are also costs related to productivity loss and premature death, diverting expenditures from other essential items and losses in trade and tourism revenue[94].

In Nigeria, the Federal and State Ministry of Health, with support of international organizations such as UNICEF, Médecins Sans Frontières and Nigeria Red Cross undertook a prevention and response activities related to water chlorination, hygiene promotion, cholera treatment centres and outreach activities especially during the cholera surge of April, 2014[49].

According to Smalley et al[95], using a mathematical modelling have shown that despite the efficacy of improved sanitation, hygiene, and better access to safe water in control of cholera, oral cholera vaccines can help to control the spread of cholera in the short term. The publication however lamented on the lack of any current systematic method for determining way of allocating the vaccines to minimize disease incidence in a population where the disease is endemic and resources are limited.

It also added that distributing vaccines to groups based on disease incidence (from greatest to least) is the most life and cost-saving strategy and a detailed surveillance data is critical in determining the most at risk groups.

Similarly, other epidemics and outbreaks that have occurred in Nigeria has left the country with huge implication for health, economy and environment. According to the World Bank, the projection of the economic impact of the outbreak of Ebola show a possible $32.6 billion loss to West Africa over the next two years[96]. It added that the emergence of Ebola in Nigeria has led to fewer customers for shops and commercial businesses and the government has to spent significant resources to successfully contain the disease and, like Cote d'Ivoire and Senegal, placed some travel restrictions on its citizens during the period affecting trade and economic activities.

The health impact of the outbreak can be visualised and assessed by the increase in mortality and morbidity reported with increased fatality in cases with high case fatality rate depending on the virulence and strength of the health care system.

3. **Drought**

Drought is an inherent characteristics in Africa[97] and Nigeria with several of its states (around 11 states) laying within the Sudan and Sahel belt is not left out from the effect of this slow devastating coastline natural event.

According to the information on the EM-DAT database regarding drought in Nigeria on table 1, the country has only faced one drought as recorded in June, 1983 affecting some 3 million people and causing damages worth $71103 (See table 1).

Contrary to the information as stated above, several studies have investigated and reported several drought occurring within the Sudano-Sahelian ecological zone[98-106,] (James, 1973; Mortimore, 1973; Khalil, 1974; Oguntoyinbo and Richards, 1977; Adefolalu, 1986; Oladipo, 1993a&b; Aremu, 2011; Abaje et al, 2011).

According to the Federal Government of Nigeria[107], the area has suffered a decrease in rainfall ranging between 3-4 % per decade since the beginning of the 19th century. Although the studies of Oladipo[103, 104] gave a higher percentage, several other investigation[105, 106] has followed using the temporal and spatial occurrences of drought.

A study using the Normalized Rainfall Index, characterized drought in the Sudano-Sahelian zone as severe since the early 1968 through the 70s with more severe cases in the 80s and a more or less decrease between late 90s and 2000s[97]. The characterization was based on the extent and degree of severity of droughts.

Although the study failed to quantify the number of people affected, the mean absolute probability of mild drought, moderate and severe drought in the zone was put at 0.13 (reoccurrence interval of 7.7 years), 0.11 (reoccurrence interval of 9.1 years) and 0.08 (reoccurrence interval of 12.5 years) respectively[97]. And this zone is a home to 43 million people (2004 projection) occupying about 3997,222 sqkm of mostly small-scale farmers who are dependent on agriculture (plant and animal production) for livelihood[97].

According to the federal Ministry of Environment, Nigeria loses about 350,000 hectares of land every year to desert encroachment which has led to displacement in the affected areas. The encroachment and drought amount to $5 million loses every year[108].

Nigeria witnessed the longest drought episode in its history between 1981 and 1997 characterized by absolute dryness with exception of 1988 and 1994 which experienced a weather with a more or less higher standard precipitation index value.

Aremu and colleague using the Bhalme and Morley drought Index (BMDI) to depict the intensity period of drought in the Sudano-Sahelian region showed that various intensity occurred for 232 years i.e. 50.3% between 1941 and 2010[109]. The intensity presented in the publication is shown on table 3 below;

Table 3. Drought intensities years for stations, zones and region.

Sudan zone	Invisible	Mild	Moderate	Severe	Extreme	Out of total for station (70yrs)
Bauchi	18	14	3	1	0	36
Bida	11	12	5	2	0	30
Kaduna	17	12	6	1	0	36
Zone total	46	38	14	4	0	102
Sahel zone						
Kano	10	17	7	2	1	37
Maiduguri	16	8	7	1	1	33
Sokoto	22	8	4	3	0	37
Nguru	19	9	8	2	0	38
Katsina	14	12	7	1	1	35
Zone total	81	54	33	9	3	180
Regional total	127	92	47	13	3	282

Sources: Aremu and Olatunde[109]

The study concluded that low intensity drought (invisible, mild and moderate) are predominant in the studied Sudano-Sahelian regions than higher intensities (severe and extreme) [109].

Characteristics that determine severity of drought

- Duration of the drought
- Its persistency
- Intensity in term of the degree of severity of the drought
- Return period i.e. the percentage reoccurrence rate
- Termination time of the event

Factors increasing vulnerability to drought

The exposure to drought depends on several factors such as population, technology, policy, social behaviour, land use patterns, water use, economic development, and diversity of economic base and cultural composition[110, 111]. And with a decreased rainfall ranging between 3-4% per decade within the Sudano-Sahelian region[107], the regions are the most vulnerable areas to drought and desertification processes.

Impact of drought on the economy

i. Agricultural production is reduced in periods of drought, majority of the populations in the drought prone areas are peasant farmers, living on marginal lands in rural areas and practicing rain fed agriculture.

ii. Another important effects of drought is the depletion of biodiversity. Existing fauna and flora that are not resistant to drought are likely to go extinct.

iii. The impacts of drought and desertification on the energy sector are felt primarily through losses in hydropower potential for electricity generation.

iv. There is resultant decrease in inflow of money due to poor agricultural outputs affecting both the transport and the banking sectors.

v. Other activities and sector are also affected indirectly with great losses and effected on the GDP especially from agriculture.

vi. Loss of livestock: The Drought situation resulted in poor establishment of pastures in the rangelands leading to acute fodder shortage. The result was high loss of livestock due to malnutrition and infestation by flies and liver flukes.

vii. Low fish production**:** Due to the early drying up of the water bodies in the state, fishing activities were grossly hampered.

Short Term risk reduction measures for Drought

- Emergency relief materials were dispatched to affected communities in form of food stuff, medication and tents.
- Provision of feed supplement for livestock
- Provision of irrigation and water pumps
- Rehabilitation of degraded Oases in some local government areas
- Establishment of rangeland e.g National Strategic Grain Reserve
- Survey and demarcation of drought rehabilitation centre to manage refugees

Drought Alleviating Practices.

Responses embarked by government of Nigeria include the following[1];

i. Institutional Arrangements leading to the creation of Federal Ministry of Environment and the Drought and Desertification Amelioration Department.

ii. Management of Water Resources by the establishment of River Basin Development Authorities to promote sustainable utilization of water resources in the dry land.

iii. Use of Drought tolerant (hybrids) crop varieties in the drought prone regions by farmers.

iv. Production of National Action Plan(NAP) as part of the National Economic and Environmental Protection plan and making the NAP Coherent with other environmental strategy and planning framework

v. Linking the NAP with National, intra-Regional and local approaches. Measures taken within the framework of NAP include adequate Diagnosis of past experience

vi. New projects/strategies initiated as part of implementation process since the last NAP report in 2002 includes: Sand dune fixation, Rangeland establishment, Oasis inventory and rehabilitation, Drought forecasting, Formulation of drought and desertification policies, Development of National drought preparedness plan, Development of Drought and Desertification policy, Rainwater harvesting, The Great Green Wall program to halt desert encroachment, Preparation and implementation of the National Biodiversity Strategy and Action Plan (NBSAP) to halt the loss of biodiversity[112].

[1] UN-Water Activity Information System (UNW-AIS). UN-Water Activity Information System (UNW-AIS). http://www.ais.unwater.org/ais/pluginfile.php/629/mod_page/content/6/Nigeria_EN.pdf (accessed 27 November 2015).

4. **Earthquake in Nigeria**

Although Nigeria is not located within the major seismic zones of the world; over the years, several minor earthquakes have been experienced in some parts of the country. The first widely reported occurrence of an Earth tremor in Nigeria was in 1933[113]. Other events were reported in 1939, 1964, 1984, 1990, 1994, 1997, 2000 and 2006. The intensities of these events ranged from III to VI based on the Modified Mercalli Intensity Scale[113]. Of these events, only the 1984, 1990, 1994 and 2000 events were instrumentally recorded. They had body wave magnitudes ranging from 4.3 to 4.5, local magnitudes between 3.7 and 4.2, and surface wave magnitudes of 3.7 to 3.9[113]

Figure 13: Map of Nigeria showing the areas where some earth tremors were felt (diameter of the solid dot denotes intensity of the events[2]

[2] Akpan O.U., Yakubu T.A., A review of earthquake occurrences and observations in Nigeria, Earthquake Science. 2010; 23(3):289-294.

When these events occurred, there were no functional seismological observatories in Nigeria. However, that has now changed with the establishment of a seismographic network managed by the Centre for Geodesy and Geodynamics (CGG), Toro, Nigeria. Presently, the network has four operational stations equipped with 24-bit 4-channel recorders and broadband 30-second seismometers[114].

Table 4: Historical earthquake that occurred and tremors that were felt in Nigeria[3]

Year-month-day	Origin time	Felt areas	Intensity	Magnitude	Probable epicenter
1933	–	Warri	–	–	–
1939-06-22	19:19:26	Lagos, Ibadan and Ile-Ife	–	6.5(Mr), 0.3(Ms)	Akwapin fault in Ghana
1963-12-21	18:30	Ijebu-Ode	V	–	Close to Ijebu-Ode
1982-10-16	–	Jalingo and Gembu	III		Close to Cameroun volcanic line
1984-07-28	12:10	Ijebu-Ode, Ibadan, Shagamu and Abeokuta	VI	–	Close to Ijebu-Ode
1984-08-02	10:20	Ijebu-Ode, Ibadan, Shagamu and Abeokuta	V	–	Close to Ijebu-Ode
1984-12-08	–	Yola	–	–	Close to Cameroun volcanic line
1985-06-18	21:00	Kombani Yaya	IV	–	Kombani Yaya
1990-06-27	–	Ibadan	–	3.7(ML)	Close to Ijebu-Ode
1994-11-07	05:07:51	–	–	4.2(ML)	Dan Gulbi
1997	–	Okitipupa	IV	–	Close to Okitipupa
2000-03-07	15:53:54	Ibadan, Akure, Abeokuta, Ijebu-Ode and Oyo	–	4.5(mb), 0.9(Ms)	Close to Okitipupa
2000-05-07	11:00	Akure	IV	–	Close to Okitipupa
2005-03	–	Yola	III	–	–
2006-03-25	11:20	Lupma	III	–	Close to Cameroun volcanic line

[3] Shiwua, A. J. Seismicity in Nigeria: the need for earthquake-resistant structures. *Zeszyty Naukowe Politechniki Częstochowskiej. Budownictwo* 2013; 19(169): 171-178.

Factors increasing vulnerability

i. Closeness to the epicentre (seismic area) of probable earthquakes

ii. Lack of information on earthquake risks

iii. Non earthquake-resistant buildings/structures

Risk Reduction Strategies

Potential risks to humans and damage potential to structures can be minimized by

i. Designing earthquake--resistant structures using records of ground motion from previous earthquake occurrences which makes it possible for proper understanding of seismic sources and properties of seismic waves.

ii. Improve and support researches on seismicity

iii. Provide information on earthquake risk in areas most vulnerable

Impacts of earthquake

The unpredictable nature of earthquakes some or the intensity and the anticipated devastating mark of huge human and infrastructural damage it leaves on the affected population, makes it an important disaster requiring adequate risk reduction strategies. Nigeria has not experience any devastating earthquake per say but even with the prediction of future occurrence of one (Magnitude ≥5)[115], most structures in Nigeria are designed without recourse to seismic load and introduction into the design process parameters of ductility and energy degeneracy mechanisms making them not earthquake-resistant. The implication is that critical facilities in towns and cities in event of an earthquake will result to massive human, material and environmental destruction.

5. **Landslides in Nigeria**

Although records of severe and damaging landslide activities do not exist in Nigeria, accounts are abounding with environmental problems resulting from recurrent small-scale mass-movements, particularly in the gully erosion-prone Nanka Formation in Anambra Basin[116, 117, 118] and along the banks of Cross and Calabar Rivers[119].

Landslides which occurred in Umuchiani community of Anambra state led to the displacement of about 250 families in December 2005[120].

The Obot Ekpo Landslide disaster occurred in July, 2007 and an estimated area of about 9000 m^2 with an average slope of 28° was affected[121]. Another event of landslide which occurred in Bayelsa community in September 2011 and two persons were killed[120]. A month after, twenty communities in Awgu and Oji-River Local Government Areas of Enugu State were thrown into serious difficulties by landslides which cut off a portion of the Awgu-AchiOji River road[120].

Factors increasing vulnerability

i. Small-scale mass-movements, particularly in the gully erosion-prone
ii. Human activities such as clear cut timber harvesting, vegetation, previous use of land, poverty, timber harvesting operations, blasts, vibrations from machinery or traffic and water,
iii. Building on weak foundations, choatic planning, infrastructural inadequacies, bad governance, lack of understanding of landslide hazards, lack of warning systems and blocking of drainage by artificial fills.

Risk reduction strategies

i. Education and awareness will play a major role in the prevention, control of human contributory factors to landslides.

ii. Practice of soil conservation processes such as planting of trees, building terraces, no till farming, contour ploughing, crop rotation and planting of indigenous crops should be encouraged

Impacts of landslides

- Continuous saturation of soil with water
- Changes in groundwater level and anthropogenic activities such as slope excavation and increased surface runoff from channelled water in urban areas
- Loss of human lives thereby increasing mortality rate.
- Other health hazards include displacement of families, homelessness with associated hardships, damage to natural environment, loss of facilities, damage to farm lands, houses and roads.

6. **Extreme Temperature (Heatwaves and cold waves)**

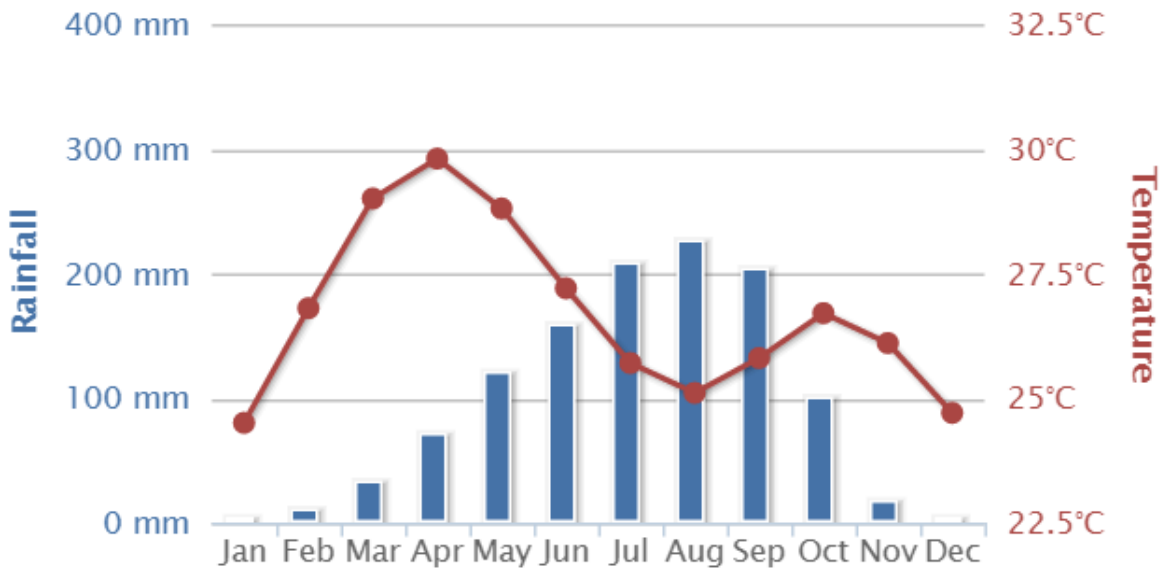


Figure 13: Average Monthly temperature and rainfall for Nigeria from 1900-2002[4]

[4] World Bank Group http://sdwebx.worldbank.org/climateportal/index.cfm?page=country_historical_climate&ThisRegion=Africa&ThisCCode=NGA (accessed 29 November 2015).

Climate change has increased globally with mean temperature increasing by 7^{o}C and differs in different regions[122].

According to the Annual Climate Review Bulletin of 2012, the climate of Nigeria has shown considerable temporal and spatial shifts in its variability and change with re- occurring extreme climate and weather events[123].

The spatial and temporal patterns of trends in the indices indicates statistically significant increase in the frequency of hot extreme and decrease in cold extreme events[124]. Related studies in Nigeria have similarly shown different periods of change in temprenture[125, 126].

The EM-DAT database reveals that one event of heatwave and cold wave has occurred in Nigeria causing 60 and 18 deaths respectively. Extreme temperature events, through the occurrence of prolonged hot or cold spells, can have serious impacts on our environment and society. But despite the threats extreme events poses to population health, cases of extreme weather events are only reported by the media[127] – such as the report by BBC Africa in 2002 where many people lost their lives in Maiduguri when the temperature rose above 50° Celsius[127]. Thus, paucity of quantitative research that studied the frequency and magnitude of these extreme events.

Indicators of vulnerability to heat and cold that have been investigated include:

• Age and disease profile
• Socioeconomic status
• Housing conditions
• Prevalence of air conditioning
• Behaviour (e.g. clothing).

Risk reduction Strategies

The following steps can help to prevent cold extremes and their consequences[128]:

- Wear proper cold-weather gear.

- Avoid severe cold.
- Find alternate shelter if the home or residence has lost its heat.
- Use safe indoor heating sources.

Take steps to prepare in advance; know what to do to reduce the effects of extreme heat[128]:

- Make plans for home cooling or alternate shelters in the event of a heat wave.
- Never leave children in unattended vehicles.
- Ensure adequate access to water and periods of rest.

Impact of Extreme Temperature

Precipitation extremes may bring about genuine consequences for human populace. History has demonstrated that catastrophes like starvations and illnesses episodes are brought on by dry seasons and flooding separately[127].

Flooding brought on by overwhelming precipitation may affect water related disease like cholera and typhoid with serious effects to populace well-being[127].

Extreme heat events have a significant impact on human health both directly through dehydration, and indirectly through a number of other health conditions including cardiovascular collapse and respiratory distress[129].

Prolonged exposure to high temperature can cause heat-related illness, including heat cramps, heat syncope, heat exhaustion, heat stroke and death[130]. Heat events can result in increased deaths and emergency hospital admissions, especially among vulnerable groups such as elderly people, young children and patients with chronic diseases. Elevated temperatures also have major consequences on livestock, and terrestrial biota generally[131, 132].

7. **Insect infestation**

In Nigeria majority of Agricultural product and crops are associated with one or more insect infestation but in some season or period, excess of the infestation could be alarming and have devastating effect on crop production. Some could also hamper the normal day-to-day activity of humans.

In 1989-1990 there appeared to be a sudden increase in the abundance of *Paederus sabaeus*, a vesicating beetle, in and around Choba, a rural community approximately 10km north of Port Harcourt, Nigeria[133]. The total area affected by the epidemic spread 80 km from Choba and included Port Harcourt to the south and the rural communities of Bori to the south-east (lowland rain forest), Kaiama to the west (freshwater swamp-forest), Omuku to the north-west (freshwater swamp-forest), Degama to the south-west (saltwater swamp-forest) and Opubu to the south-east (saltwater swamp-forest)[133].

This is among several others this paper might not be able to cover.

Factors increasing Vulnerability

- Increased rainfall and relative humidity
- Damp environment encouraging breading
- Poor solid waste management and disposal

Risk Reduction Strategies

i. Use of Insecticides/fungicides recommended for the control of the particular pest
ii. Calendar spraying versus pest monitoring and use of economic threshold
iii. Use of biological method by introducing its predators

Impact of pest infestation

Approximately 30 species of *Paederus* are known to cause dermatitis and ophthalmic lesions in man and other mammals[134]. When crops are the economic implement runs in damages worth millions of Naira with resultant poor crop production and significant reduction in nutritional quality of food.

TECHNOLOGICAL DISASTER

According to EM-DAT, a total of 269 transport accident has occurred in Nigeria including 2 rail accident, 15 air accident, 208 road accident and 44 water accident (See table 2). Although many unreported cases exist, this might account for the miscellaneous cases reported on the database such as the Saque Comprehensive College which collapsed at Port Harcourt on the 16 June 1990, killing 100 people and the Synagogue Church Building collapsed at Lagos State, Nigeria on 12 September 2014 which killed 115 people among several others.

Air accident in Nigeria

Nigeria had its first commercial flight in 1935 and since then, the industry has experienced swift growth in the industry but this did not occur without accompanying challenges in air accidents[135]. Table 5 shows a list of air accident that occurred in Nigeria between 1965 and 2015.

Train/Rail accident

Train in Nigeria since its introduction in Nigeria has remain a source for carrying of bulky goods for businesses across the nation states. Despite effect to keep the system in working condition, poor management of the system has put the life of passengers at risk in many occasion although only few accidents were recorded including the collation of two rains that happened between Gwada and Guni, Niger State in 1994 claiming several lives with multiples injured. Also, on the 10 of August, 2015 a train crashed with a trailer at 8.45pm in Lagos claiming 2 lives and absence of signal officer was blamed for the incident[136].

Factors increasing vulnerability of air and rail accident

i. High cost of operation and maintenance
ii. Inadequate Funding and Huge Operating Losses
iii. Corruption and Weak Management

iv. Stagnation and Poor Response to Emerging Rail and Air Transport Needs

v. Other factors will include poor visibility and bad weather

Table 5: List of Air accident 1965-2015 in Nigeria

Date	**Airline/Location**	**Number death**	**Injured**	**Total**
6th Dec., 1985.	ALOUETTE III Helicopter Registered 5N-ALD at MEREN 24 Off-Shore Landing Pad (Jacket)	0	1	4
8th Sep., 1987	Airbus A-310 - Vicinity of the threshold area of runway 21 at Port-Harcourt Airport.	0	8	109
7th Sep., 1989.	Okada Air BAC 1-11- Port-Harcourt International Airport	0	0	92
1st Apr. 1990	Concord Airlines Fairchild FH 227B Aircraft-Runway Murtala Muhammed Airport, Lagos	0	0	45
24th Feb. 1991	Bristow Helicopters (Nig) LTD- sea off Eket, Akwa Ibom State	9	4	13
20th Jan. 1992	Nigeria Police Force (Bell 412 helicopter)	0	2	4
26th Feb. 1992	THE PMAS DO-228-201 Aircraft Registered 5N ARI- end of the runway Eket Airstrip, Akwa Ibom State	0	0	12
18th Aug. 1994	ADC Airlines (LIBERIA) 5N-BBE-DC-9-31 at James Spriggs Payne Airfield	0	3	85
19th December, 1994	Nigeria Airways Ltd Boeing 707 - 320C at Kiri Kasama, Hadeija Local Government Area	3	2	-
5th Sep. 1995	Dassault Avion Falcon 20F	0	0	-
13th Nov. 1995	Boeing 737 Aircraft Registered 5N-AUA - New Kaduna Airport	11	74	85
22nd Nov. 1998	Chanchangi Airlines's Boeing 737-200 - Kaduna Airport	0	0	24
25th Nov. 1998	Cessna Citation 501 Aircraft- Warri Airstrip	0	0	2
17th Mar. 2000	Express Airways Aircraft Bandeirante EMB 110 Registered 5N-AXM on final approach to Kaduna Airport	0	3	6
21st May 2002	LET410-UVP Aircraft Registered 9Q-CGX on the approach to Calabar Airport	5	0	5
10th Dec. 2005	Sosoliso Airlines DC 9-32 Aircraft	108	2	110
7th Sep. 2006	DHL, Registration ZS-DPF, at Murtala Muhammed International Airport, Ikeja, Lagos. Nigeria	-	-	-
22nd Oct. 2005	Bellview Airlines Ltd B737-200 Reg. 5N-BFN at Lisa Village, Ogun State, Nigeria	117	0	117
10th Oct. 2006	TAMPICO Club 9 Aircraft, Reg. 5N-CBF at Zaria, Kaduna State, Nigeria	0	0	
29th Oct. 2006	ADC Airlines, Boeing 737-2B7 Registration 5N-BFK at Tungar Madaki, Abuja	96	9	105

10th Nov. 2006.	OAS, Registration 5N - BHU, Along the road to Delta Steel Company, Ovwian, Aladja, (Near Osubi Airstrip), Warri, Delta State	2	2	4
3rd Aug. 2007	Bristow Helicopters Accident Bell 412 EP Registration 5N-BIQ at Qua Iboe Terminal Akwa Ibom state, Nigeria	1	0	-
15th Jan. 2008	Serious Incident involving A BAGGAGE TRACTOR (DOUGLAS) Towing Tug NO. 55/2 and parked Aircraft B737-200 at D-43 Avio-bridge on the Ramp at Murtala Muhammed International Airport, Ikeja, Lagos, Nigeria	0	Plus 1	-
15th Mar. 2008	Beechcraft 1900D Accident-Bushi Village in Obanlinku Local Government Area of Cross River state	3		3
24th Mar. 2008	Aero Contractor Nigeria Limited AS 365 N2 Registration 5N-BJF at Bonny Airstrip, Bayelsa State, Nigeria	0	2	-
21st Aug. 2010.	Aero Contractors Nigeria Limited Boeing 737-500 Registration 5N-BLE at Runway 28 Yakubu Gowon Airport, Jos, Plateau State, Nigeria	0	92	92
14th Jul. 2011	Bristow Helicopters, Registration 5N-BMM at Port Harcourt International Airport, River State.	0	6	-
3rd Jun. 2012	Dana Air 0992, 5N-RAM crash in Lagos	159	0	153
3rd Oct. 2013	Airlines EMB 120, Registration 5N-BJY crash	16	4	20
07th Jul. 2015	Emirates, HAK Air in Ground Collision At Lagos Airport	-	-	-
12th Aug. 2015	SIKORSKY S-76C+ Helicopter Belonging to BRISTOW Helicopters Nigeria Limited with Registration 5N-BGD which occurred at Oworonshoki area of Lagos	6	6	12

Source: Accident Investigation Bureau, Nigeria. *Reports & Publications. http://www.aib.gov.ng/publication.php (accessed 3 December 2015).*

Risk reduction strategies for air accident

- Accident Investigation Bureau (AIB) conducts quality and timely investigations into aircraft accidents and serious incidents with a view to determine cause of such occurrence(s) and make safety recommendations to prevent future reoccurrence of similar incidents.
- Risk reduction recommendation also include; improve manpower and manpower training, tackling corruption and effective management, improved private sector partnership and enhanced funding.
- Also is the establishment of the National Airspace Management Agency (NAMA).

- For rail transport accident, the Nigerian railway cooperation needs to improve in the implementation of its regulation in collaboration with the Government but poor political will in this sector has remained a setback.

Road traffic accidents

In 2008, road traffic accidents triggered approximately 158,000 deaths and were the 13th ranked cause of fatalities, accounting for 2.3% of all deaths on the Africa[137].

According to their report, one in every four road accident deaths in Africa occurs in Nigeria. The WHO survey and the FRSC report of 5,693 fatal road accidents in 2009[138].

Between 2006 and 2013, the FRSC (Federal Road Safety Corps) recorded 41,118 deaths from road accidents (i.e. 74% of accidents resulted in fatalities), while Nigeria Watch recorded 14,300 (26%)[138]. Despite these differences and a more restricted data set, Nigeria Watch helps to monitor the trends and patterns of reported fatal road accidents because it gives more details than the official statistics of the FRSC on each accident recorded[138].

Factors increasing vulnerability

i. Human factors include visual acuteness, driver fatigue, poor knowledge of road signs and regulations, illiteracy, health problems, excessive speeding, drug abuse, and over-confidence while at the steering wheel. This contributes to majority of the causes of road accident.
ii. Among the mechanical factors that lead to fatal car accidents are poor vehicle maintenance, tyre blowouts, poor lights, un-roadworthy vehicles, and broken-down vehicles on the road without adequate warning.
iii. The environmental factors are include heavy rainfall, harmattan winds, sun reflection, heavy wind, pot holes, and un-tarred roads.

Risk reduction strategies

Decree 45 of 1988 provides for the establishment of Federal Road Safety Commission (the Governing Council) and Federal Road Safety Corps (the operational/enforcement Agency) for road traffic administration and road safety management in the country[139].

The following risk reduction strategies applies for road traffic accident;

i. Curbing menace of tankers and articulated vehicles
ii. Provision of pedestrian safety training
iii. Laying penalties on sets of road traffic offences such as use of mobile phones while driving, driving without licence, drinking and driving etc.
iv. Establishment of the National Road Traffic Regulations, 2012; to give effect in Nigeria to the Geneva Convention on Road Traffic of September 19, 1949 and the Vienna Convention on Road Signs and Signals of November 8, 1968. And to provide operational requirements, rules and regulations among others.

Water accidents

There are more marine accidents happening more in August because of strong water waves outflow from Chad, Cameroon and other countries which uproots trees by the river banks and submerged other types of wrecks into the navigable ways1[140].

Over 15 people died in one major accident in Lokoja in 2006 as result of overload. Similar accident occurred in 2005 by the bridge along Numan – Biu road on River Gongola because of strong wind that resulted in collision of two boats. Six boats sank in Jimeta all at once in 2006 where neither the goods nor the boats were recovered but there was no loss of life[140].

Boat mishap involving modern ships started as far back as 1977/78 in Donga. Another ship also sank in Donga in 1983 and In July 2011, a boat carrying 20 people capsized at Makurdi while crossing passengers to Nassarawa during which five people died[140].

Water accident risk reduction strategies

i. Establishment of Search and Rescue Volunteer Groups in all marine communities and carrying out regular awareness campaign about modern safety measures by NIMASA.
ii. Promotion of intervention policies aimed at improving the education and training of the marine communities in different aspects of maritime.

Impacts transport accident on the economy and development

Increase in losses on both human and material resources[141]. The impact also include gross loss to the industry in terms of medical bills payable to the injured and insurance coverage also has a heavy impact in the form of compensation to victims or victims' estates.

A study that developed a cost estimation model for air traffic accident concluded that between 1983 and 2007 that the costs of fatal, serious, and minor accidents amount to ₦1,453,616,775.00, ₦2,547,388.00 and ₦511,928.00, respectively[142].

The burden of deaths due to road traffic accidents can be understood as comprising two main components: indirect costs and the value of mortality. Although the value of mortality is much more difficult to assess, the impact of accident in general goes from human power destruction, cost of repair or replacement, damages on infrastructure and burden on health care cost insurance and increased mortality rate.

NON-TECHNOLOGICAL MAN-MADE DISASTER (Complex Emergencies)

Nigerian Civil War 6th July, 1967-15th January, 1970 (Biafra War)

The 30 months civil war was preceded by pre- and post-independent crises[143]. On the one hand were the Igbos in Eastern part of Nigeria, while their opponent was the Federal Government of Nigeria. It was a means to an end for Nigeria but a fight for independence by the Igbos.

The war attracted a lot of international interest with its devastating impact especially on the eastern part of the nation, humanitarian assistance was greatly required because of lots of atrocities committed during the war.

In October 1967, few months in the war, the massacre by the Nigerian troop resulted in loss of thousands of lives[144]. The war attracted international involvement like Britain, France, USA, Soviet Union, Israel and other countries in oppositions, supports and neutrality.

In 1969, Biafra made a formal complaint of genocide against Igbos to the International Committee on the Investigation of Crimes of Genocide, which concluded that British colonial administrators were complicit in the process of fomenting ethnic hatred and violence, dating back to the Kano riots of 1953. With special reference to the Asaba Massacre, Emma Okocha described the killings as "the first black-on-black genocide"[145]. Millions of lives were lost directly and indirectly by the war.

Impact of the Nigerian Civil war

The war cost the Igbos lives, money and infrastructure. Millions of lives were lost the conflict, mostly from hunger and disease and lack of medical care. Thousands starved to death every day as the war progressed[146]. The International Committee of the Red Cross in September 1968 estimated 8,000–10,000 deaths from starvation each day) [145]. The general impact on the economy can never be over emphasised as it affected every sector of the economy with a drop in GDP (see Figure 14).

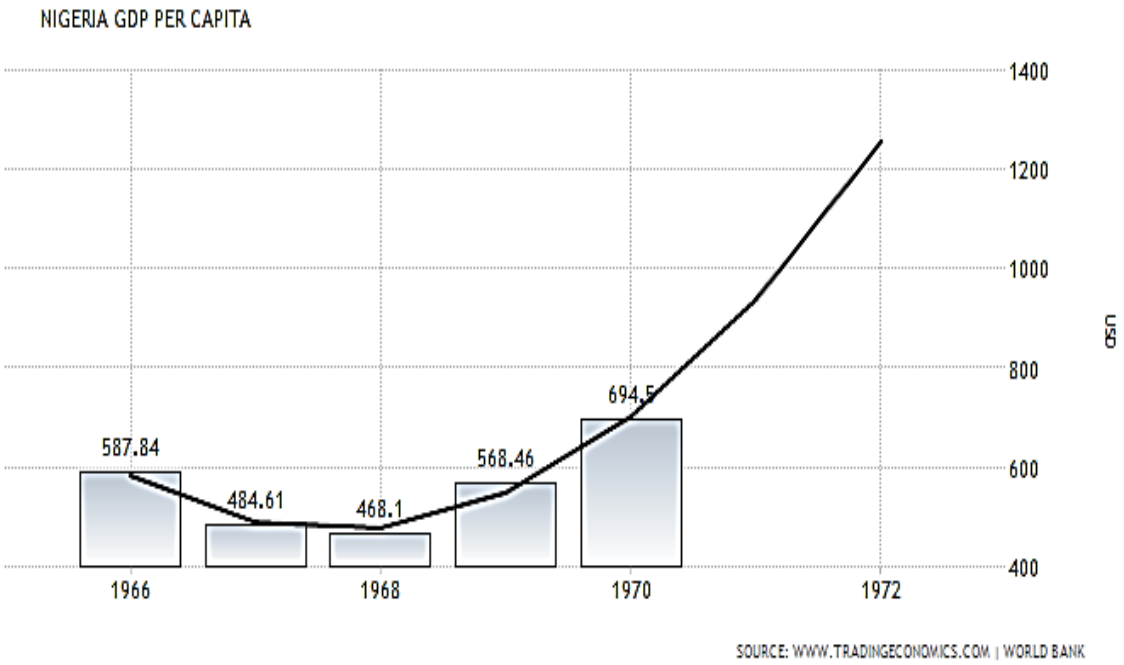


Figure 14: GDP per capita during the Civil war

Other Civil crisis (e.g. communal clashes, Election violence and Religious crisis)

Many other crisis (salient but devastating) has reaped the nation. Majority as a result of intense antagonism between the two major religion, some due to domestic response to external pressure happening elsewhere in the world, the placing of religions consideration in the politics of the country among several other reasons. Table 6 below highlight few but not all of the crisis that has occurred in Nigeria.

Impact on economic development

i. Massive loss of lives and properties accompanying religious and election violence

ii. Stagnates the economy and stultifies growth by scaring foreign investors

iii. Increasing number of internally displace persons with aggravation of poverty

Table 6: Inter-Tribal and Religious Crises in Nigeria

Date	Events	No. of Victims
Sept. '01	Violent clashes between Muslim and Christians in Jos	3, 000 people dead
March'03	Fighting between Itsekiri and Ijaw ethnic group in Niger Delta	200 people killed
Feb. '06	4 days of sectarian violence across Nigeria, particularly in the cities of Onitsha, Maiduguri, Katsina and Bauchi.	150 people killed
July, '07	Violence between Sunni and Shi'a Muslims over the murder of a Sunni cleric in Sokoto	5 people killed
Dec. '07	3 churches burnt in the Northern State of Bauchi	10 people killed
Dec. '08	Violent clashes over disputed election result in Jos	400 people killed
July, '09	2 days battle with radical Islamist in Yobe and Bauchi	150 people killed
Sept.'09	Rioting in the Northern State of Kano	19 people killed
Oct. '10	Bomb blast at the Eagle square in Abuja, during the country's 50th anniversary	19 people killed
April, '11	Bomb blast at the INEC office in Niger state	13 people killed
April, '11	Post election violence in Kaduna, Bauchi, and some states in the northern part of Nigeria.	9 National Youth Services Corp Members killed

Source: Saheed, ZS. Impact of Social Crises on Economic Development: Theoretical Evidence from Nigeria. *American International Journal of Contemporary Research.* 2012; 2(6): 179

Boko Haram Insurgency (2009 till Date)

Boko Haram attacks started in 2006 and today, they have encroached into the neighbouring countries raining attacks and treats.

According to the Global terrorism index report, 78% of all deaths and 57% of all attacks occurred in just five countries: Afghanistan, Iraq, Nigeria, Pakistan and Syria and Boko Haram and ISIL were jointly responsible for 51% of all claimed global fatalities in 2014[147].

It added that Nigeria experienced the largest increase in terrorist activity with 7,512 deaths in 2014, an increase of over 300% since 2013.

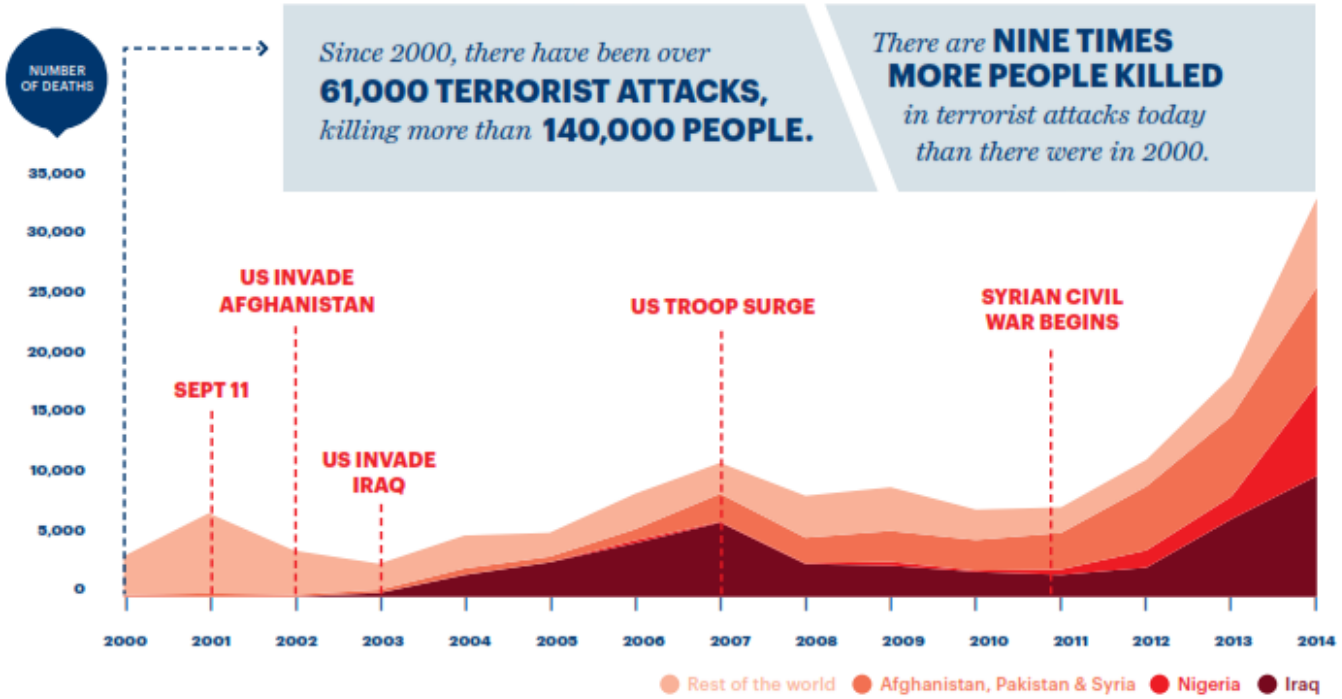


Figure 14: Death from Terrorist attacks[147]

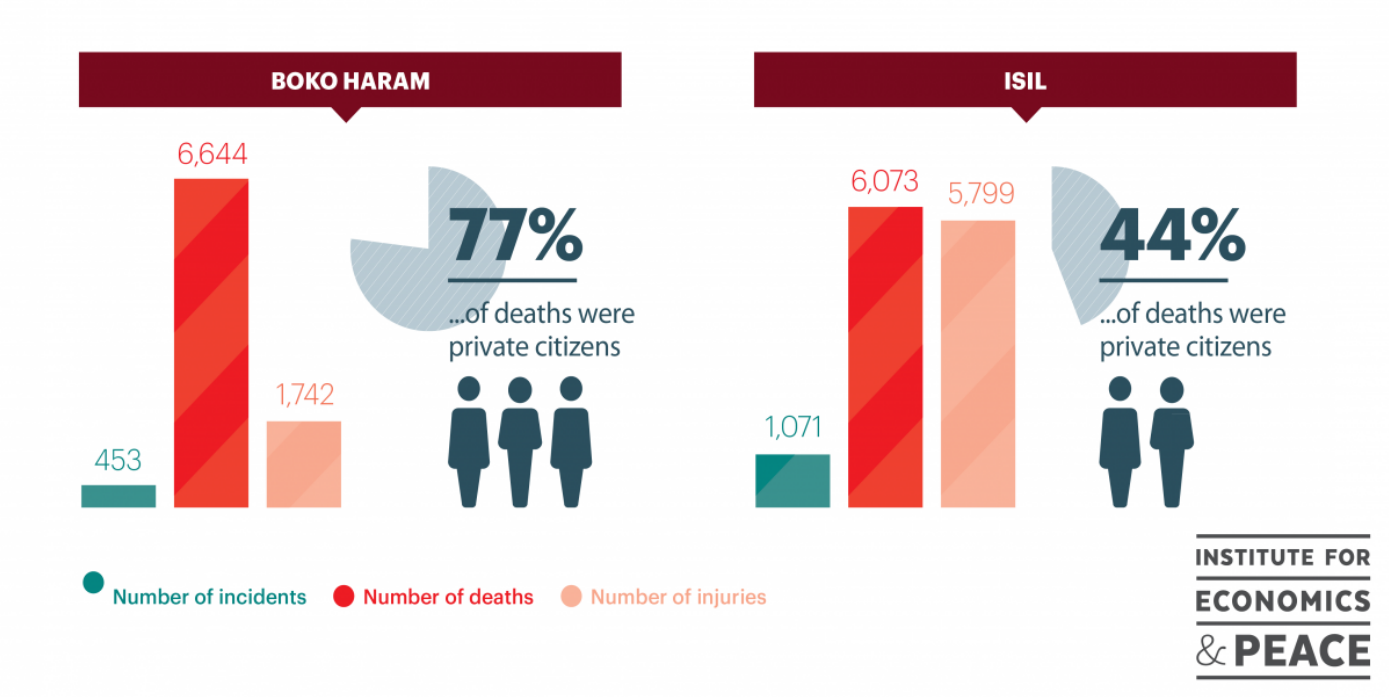


Figure 15: comparison of Boko haram and ISIL[147]

Today Nigeria is ranked 3rd out of 162 on the Global terrorism index (GTI). The GTI measures the impact of terrorism in 162 countries. To account for the lasting effects of terrorism, each country is

given a score that represents a five year weighted average[146]. Unfortunately it is 151st out of 162 on the Global Peace Index.

The insurgency in north-east Nigeria impelled by the Islamist extremist group known as Boko Haram has led to pervasive displacement, violations of international humanitarian and human rights law, protection risks and a growing humanitarian crisis[148].

Thousands of death has been record in the history of the insurgency more than 7000 in 2014 and recent, November 19th attack recorded 19 death in Kano, on 23rd another blast in Maiduguri killed nine person. Subsequent attack on the 29th of November in Bam village of Borno State killed seven person and today 4th December, One bomb blast is reported to have taken place in Kimba area of the Biu Local Government Area (LGA) and the other in Sabon-Ngeri, both located in Borno State, Death Toll are yet Unknown[148].

According to the result of the 5th Displacement Tracking Matrix (DTM), conducted in July and August 2015, it has been revealed that there are more than 2.1 million internally displaced persons (IDPs)[149] majority of which are children and women adding to the vulnerabilities of the affected population.

An estimated 24.5 million people are living in the states under the insurgency and as of August 2015, 2.2 million people has been displaced with 4.6 million estimated needing humanitarian aid of which only 2.8 million was target in 2015[150].

Concurrently, 164,715 Nigerian refugees are harboured in the neighbouring countries including Chad (9%), Cameroon (34%) and Niger (57%). This countries are neither safe or have enough for themselves; for instance, 3 in 4 families in Diffa, Niger are at risk of going hungry yet, the host 150,000 displaced by Boko Haram[150].

With reported recent attacks and the countries commitment to ending the insurgency, it only to hope that things get better.

Factors increasing vulnerability to attack

The two factors most closely associated with terrorism are the levels of political violence and conflict. Ninety-two per cent of all terrorist attacks between 1989 and 2014 occurred in countries where political violence by the government was widespread, while 88% of all terrorist attacks between 1989 and 2014 occurred in countries that were experiencing or involved in violent conflicts[147].

Impacts on Population, Environment and Economy

Boko Haram conflict has resulted in thousands of deaths (over 7000 in 2014) and has strongly affect food security (4.6 million) with 2.2 million people displaced. Many rural, resident households and IDPs will continue to face difficulty meeting their minimal food needs (1.5 million)[151]. IDPs and households less directly impacted by the conflict in some area still experience restrictions to their normal livelihoods. Conflict is also contributing to reduce market activity and millions of men, women and children facing physical and psychological trauma related to the insurgency. Educated is drastically hampered and access to basic amenities affected. There is also increase cases of epidemics and massive cost on the economy to fight the insurgency.

Parameter of the responses

- Shift in needs: the far reaching UN nation group (UNCT) interagency appraisal mission, directed in May 2014 in six states influenced by insurrection and between mutual roughness, recognized key needs as: (i) struggle in the North-East, (ii) between shared brutality in the Middle Belt (North-Central), and (iii) scourges, particularly cholera, in North-Central.
- Focused on populace: the HNO directed in November 2014 discovered near 15.5 million individuals in Nigeria were living in territories influenced by strife, sustenance unreliability, lack of healthy sustenance and pestilences.

- Hindrances to reaction: philanthropic access in strife influenced territories is obliged, especially in Borno state and parts of Adamawa and Yobe states. Philanthropic access to different parts of the North-East and the Middle Belt (North-Central) is by and large conceivable, yet with intermittent limitations because of frailty.

NATIONAL POLICY ON ENVIRONMENTAL DISASTER MANAGEMENT IN NIGERIA

The National Policy on the Environment, 1999 is quite explicit and detailed on the issue of "disasters". It did not treat it as mere matters arising, rather, as the very first listed crosscutting issue. It identified disasters – natural and manmade suggested action for the strengthening of our emergency preparedness to reduce our peoples' vulnerability and cushion the impact of disasters on our settlements, economy and environment. The following strategies are required to mitigate the negative impacts of natural and man-made disasters on the lives of the people.

A) Prepare comprehensive hazard maps and vulnerability analysis for the country by:
    a. Compiling historical data of disaster occurrence.
    b. Analysis of meteorological, seismological, agricultural and environmental records.
    c. Employing satellite imagery and the GIS system to plot the hazard maps.

B) Establish very effective early warning systems for meteorological, geophysical, biological, social and industrial hazards by;
    a. Enhancing the meteorological services.
    b. Effective monitoring of pests and disease epidemics.
    c. Resuscitation of seismographic stations and the existing seismological centres.
    d. Development of reliable biological indicators.
    e. Building of a viable network for early warning information dissemination.

C) Develop and maintain prompt emergency response mechanism and contingency plans by:

a. Making an inventory of all existing resources for emergency response for easy marshalling at times of disasters.

b. Establishing a body to coordinate emergency response to reduce duplication of efforts and enhance accountability.

c. Formulating a national emergency policy and emergency plan.

D) Mount a sustained public awareness and education programme on hazard preparedness by:

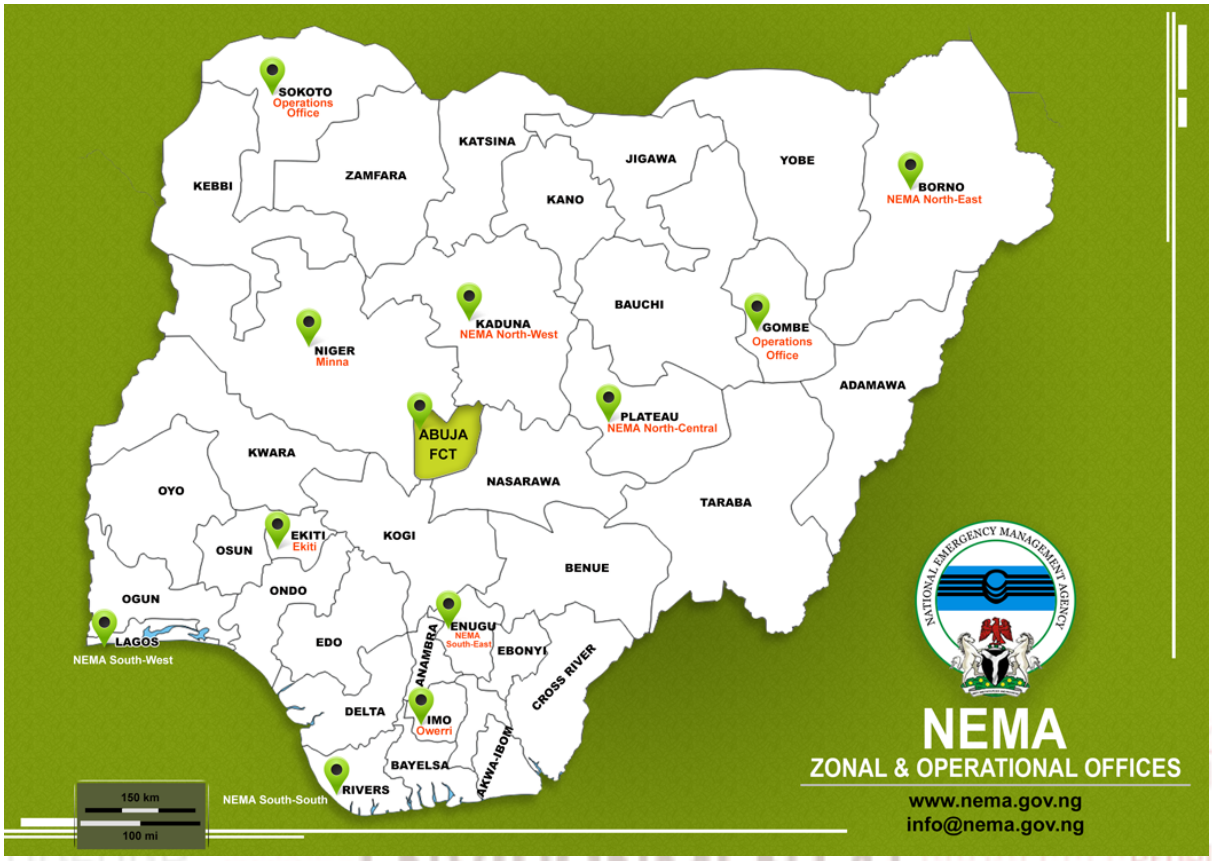
a. Engaging military and para military forces as well as voluntary organizations in drills on emergency response including search and rescue.

b. Preparing curriculum and integrating emergency preparedness into school."

National Disaster Management Framework (NDMF)

The establishment of the National Emergency Management Agency (NEMA) was one major step towards a holistic approach in addressing issues relating to disasters and emergencies in the country.

The target is the mainstreaming of disaster risk reduction (DRR) into sustainable development in the country. This is in line with the Hyogo Framework for Action 2005-2015 which stressed that efforts to reduce disaster risk reduction must be systematically integrated into policies, plans and programmes for sustainable development and poverty reduction.



NEMA established an in-house committee to develop a "zero document" that is holistic in nature and reflects global best practices in disaster management.

This draft document served as baseline for inputs from stakeholders across the country, to ensure participation, ownership and sustainability.

In finding answers to these questions, NEMA organised roundtable discussions in each of the 6 geo-political zones and at the National level to consider the zero document. And participants were drawn from the three tiers of government; Federal, State and Local Government, MDAs; Military, Police and Para-military; CSOs; International NGOs; development partners and the private sector. The roundtable discussions generated fresh ideas, observations and recommendations that were incorporated into the NDMF[152].

It has eight thematic area:

1. Institutional Capacity
2. Coordination
3. Disaster Risk Assessment
4. Disaster Risk Reduction
5. Disaster Prevention, Preparedness and Mitigation
6. Disaster Response
7. Disaster Recovery
8. Facilitators and Enablers

Another major step taken by NEMA, in disaster management in Nigeria, is the mainstreaming of DRR into the University education for the purpose of capacity building, public education and awareness raising. The Agency, collaborated and signed an MOU with six Universities (one in each of the six geopolitical zones of the country) on the 12th November, 2009.

- University of Maiduguri, Maiduguri North - East zone;
- Ahmadu Bello University, Zaria - North West zone;
- University of Nigeria, Nnsuka – South East zone;
- Federal University of Technology, Minna - North Central zone;
- University of Port-Harcourt - South South zone; and
- University of Ibadan, South - West zone

Summary of Existing Disaster Response Plans and Agreements

- National Disaster Response plan (NDRP) – 2001
- The Integrated National Avian and pandemic Influenza Response Plan – 2007
- Search and Rescue and Epidemic Evacuation plan (SAREEP) – 2009
- National Contingency Plan on Infrastructural resuscitation (NCPIR) – 2010
- National Disaster Management Framework (NDMF) – 2011
- National Contingency Plan (NCP) – 2012

- National Emergency Management Agency Standard Operating Procedures – 2012
- Guidelines for use of Military assets and personnel during disasters – 2012
- Memorandum of understanding between National Orientation agency (NOA), National Environmental Standards and Regulations Enforcement Agency (NESREA) and NEMA – 2013

PROGRESS IN THE IMPLEMENTATION OF HFA 2005-2015[153]

Priority for Action 1

Core indicator 1: Nigeria has put in place relevant plans, procedure, guidelines, strategies, structures and laws such as the Environmental Impact Assessment (EIA), Climate Change Adaptation (CCA) Policy, DRR Action Plan, National Contingency Plan, Erosion Control Law etc and institution established at all levels for managing disaster risks.

Core indicator 2: One percent of the national budget is allocated to risk reduction, relief and reconstruction. The sectoral budget of the MDAs makes contribution to activities that relate to DRR, relief and reconstruction.

Core indicator 3: NEMA Act 50 of 1999 provides for establishment of Local Government Emergency Management Committees at Local Government level, but not many have done so.

Core indicator 4: There is a National Platform for Disaster Risk Reduction in Nigeria.

Priority for Action 2

Core indicator 1: The Vulnerability and Capacity Assessment (VCA), a state based assessment was carried out in seven pilot states, baseline studies conducted in six other states and the PDNA after the 2012 flood.

Core indicator 2: The establishment of situation room in NEMA to monitor, record, update and generate report/disseminate for planning purposes

Core indicator 3: There is an Early Warning system in place, with some agencies responsible for forecasting and prediction such as Nigerian Meteorological Agency (NIMET), Nigerian Hydrological Services Agency (NIHSA) etc.

Core indicator 4: Nigeria is participating in Regional DRR programme coordinated by ECOWAS. Nigeria participated in flood Trans-boundary study expert meetings and development of DRR Action Plan for the West African countries.

DRR Frameworks and strategies for West Africa region had also been developed and approved.

Nigeria received trans-boundary information on Early Warning System from ACMAD and also a member of West African Disaster Management Agencies

Priority for Action 3

Core indicator 1: The National Emergency Management (NEMA) worked with the Federal Ministry of Information, National Orientation Agency (NOA), Media (Print & Electronic, Social Media) to effectively disseminate information. An MoU was signed with NOA to ensure effective dissemination of information

Core indicator 2: NEMA is collaboration with Nigerian Educational Research and Development Council (NERDC) has mainstreamed DRR/CCA into basic and Post basic curriculum. NEMA National Progress Report - 2013-2015 16/41 is also collaborating with six Nigerian Universities for PGD and MSc in DRM. DRR has also been incorporated into professional programme such as Police Armed Force, Civil Defence, Town Planning and Architects.

Core indicator 3: The National Institute for Socio-Economic Research (NISER) carries out research programmes and projects in various areas which includes DRR, Economic cost and benefits of DRR, Child Labour, Oil Exploration, and the Manifestation of Street Children (Causes and consequences),

the consequence of Oil Spillage and Gully Erosion in the southern part of the country etc. The Centres of Disaster Risk Management and Development Studies also conduct researches in DRR.

Core indicator 4: The National Emergency Management Agency with other stakeholders such as Federal Ministry of Information, Ministry of Education etc have been widely engaged in public education , Training of staff and stakeholders (State and Local government, NGO's, FBO's, Volunteers and the communities) for effective DRR. There are publications by NEMA on DRR practice.

Priority for Action 4

Core indicator 1: The Federal Ministry of Environment has legislation in place for the protection of Forest Reserves, also legislation for the conduct of Environmental Impact Assessment for major development projects. The ongoing Great Green Wall project to conserve and afforestate the desert prone belt. Other projects include the REDD project (Reducing Emission from Deforestation National Progress Report - 2013-2015 20/41 and Degradation), the wetland initiative in the southern part of the country.

Core indicator 2: The following are put in place:

- National Progress Report - 2013-2015 21/41
- Agricultural Insurance cooperation; - Subsidy reinsurance and
- Tandatory insurance for certain categories of assets,
- Temporary employment guarantee scheme.

There are programmes in place for crop and property insurance, conditional and unconditional cash transfers, micro finance, micro insurance such as SURE – P, Niger Delta Amnesty Programme, Small and Medium Scale Enterprises Development Agency (SMEDAN), National Poverty Eradication Programme (NAPEP), National Directorate of Employment (NDE) and the United Nations System for Cash Transfer during emergencies etc.

Core indicator 3: The Tertiary Education Trust Fund (TETFUND) was introduced to receive some percentage of profits from Business Concerns as Education Tax. The fund is being used to retrofit and renovate schools at all levels. Millennium Development Goals (MDG) is a programme meant to carry out projects at all levels so as to increase the resilience of the people. The conduct of EIA is a way of mainstreaming DRR into developmental projects.

Core indicator 4: Large scale urban flood management projects in major urban centers are being carried out. The Ecological programmes are being done to reduce erosion in the South East region. There is also the provision of low income houses in many of the urban centers in Nigeria. Provision of low income houses and serviced plots and relocation of vulnerable communities from flood prone areas. There are regulations and building codes for the development of real estate. The land use act regulates land titling by government.

Core indicator 5: The Post Disaster Needs Assessment explicitly incorporate DRR for resilience recovery, however, there is limited funding for the implementation of the recovery projects and programme. The recovery plan incorporated the issue of gender.

Core indicator 6: All sectors are involved in the reconstruction and recovery processes. There is an existing law for Environmental Impact Assessment (EIA) which is expected to assess the impacts of disaster risk that can be created by major development projects.

Priority for Action 5

Core indicator 1: There exist policies and programmes that are put in place in preparations to contingency planning and response as mentioned earlier under Summary of Existing Disaster Response Plans and Agreements.

Core indicator 2:

- Contingency Plans at the national level has been developed and NEMA is equally encouraging the State Emergency Management Agencies to develop contingency plans for different scenarios.
- NEMA acquired Air Ambulance and Search & Rescue helicopter for emergency response.
- There are relief stockpiles in warehouses.
- NEMA also has a functional Simulation Unit under the department of Training for drills and simulations to test contingency and preparedness at the national and state levels
- Establishment of Emergency Call Centre and Situation Room
- Stockpile in all the NEMA regional and state offices

Core indicator 3:

- Federal Government allocates 1% of the National Budget for ecological problems and 20% of that goes to disaster management in the country.
- Insurance facilities for major infrastructure and insurance are compulsory for some properties.

Core indicator 4:

- Under the umbrella of Global Facility for Disaster Risk Reduction (GFDRR) and the World Bank, the country has benefitted in capacity building programmes such as the Damages and Losses assessment and Post-Disaster Needs Assessment trainings. The training provided an agreed method and procedure to be adopted to assess damage, loss and needs when disasters occur.
- Experts were identified at National and sub-national level and trained on PDNA using standardized DaLA methods.

It identified the following as drivers of HFA Progress;

- Multi-hazard integrated approach to disaster risk reduction and development
- Gender perspectives on risk reduction and recovery adopted and institutionalized
- Capacities for risk reduction and recovery identified and strengthened

- Human security and social equity approaches integrated into disaster risk reduction and recovery activities
- Engagement and partnerships with nongovernmental actors; civil society, private sector, amongst others, have been fostered at all levels

TOWARDS THE SENDAI FRAMEWORK FOR DISASTER RISK REDUCTION 2015-2030

Its plans towards integrating into the Sendai framework include[151]

1. The more effective integration of disaster risk considerations into sustainable development policies, planning and programming at all levels, with a special emphasis on disaster prevention, mitigation, preparedness and vulnerability reduction.

Likely Challenges

i. Weak Legislative and institutional framework at sub-national and local level
ii. Weak capacity at all level to implements the plans
iii. Insufficient funding
iv. Weak regional and international cooperation

2. The development and strengthening of institutions, mechanisms and capacities at all levels, in particular at the community level, that can systematically contribute to building resilience to hazards.

Likely Challenges

i. Weak institutions, mechanism and capacities in some of the states and the local government.
ii. Inadequate resources for capacity development in DRR.
iii. Ineffective collaboration among stakeholders especially at the state and local government levels.

iv. Inadequate political support to develop and strengthen institutions and capacities especially at state and local government levels.

3. The systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery programmes in the reconstruction of affected communities.

Likely Challenges

i. Resources allocated to disaster response are inadequate to mitigate disaster occurrences in the country i.e to respond to emergencies and recovery programmes as well as preparedness.

ii. Weak capacity at all levels.

iii. Non availability of Contingency Plan for various hazards.

DISCUSSIONS

Salient natural disasters has befallen the Nation Nigeria since 1965 starting from a fast spreading epidemics to slow tormenting drought in the Sudan-Sahel zone.

From the flood in Akure 1990 that killed 3 people and destroyed 20 houses to that of 2012 that resulted in 363 deaths. According to the National Orientation Agency (NOA), a total of 53 people died100, 420 people have been displaced by floods in 11 states across Nigeria, following heavy rains[151]. Flood accounts for 83.3% of disaster frequency with 84.4% mortality and 99.8% economic issues[154].

Although the Ebola case which stared in July 2014 accounted for only 19 cases and 7 death, sustainability of the system applied by the country is necessary so also readdressing of the international health regulation of 2005.

Nigeria is ranked 3rd out of 162 on the Global terrorism index (GTI)[146]. And despite international humanitarian intervention and effort by the Government it stands 151st out of 162 on the Global Peace Index[146].

According the UNHCR Regional Update, there are an estimated 2,233,506 million IDPs as a result of the insurgency of Boko haram with 216, 937 Nigerian refuges in neighbouring countries including Chad, Niger and Cameroun (Countries facing similar insecurity, food insecurity, malnutrition and increased child and maternal mortality)[151]. This has also resulted in cholera outbreak which as of 5th November, a total of 949 cases with 17 deaths and a case fatality rate (CFR) of 1. 8% was recorded since the 7th October[155].

It suffice to say that out of the USD 100 million SRP required, only 51% was funded as of 1st November, 2015[151].

The vulnerability of Nigerians to hazards is a function of several factors including level of poverty; population growth and distribution, condition of human settlements and their infrastructure, level of environmental degradation, level of public awareness as well as the dynamics of public policy and environment on disaster management[152].

CONCLUSION

Despite the progress of the country in the implementation of HFA 2005-2015, it deems it necessary to ensure dedicated fund for DRR activities at all levels for disaster preparedness, response and recovery; and also ensure that DRR is incorporated into policies, plans and programmes in disaster preparedness, response and recovery in order to address disaster risk reduction and the building of resilience2 to disasters with a renewed sense of urgency within the context of sustainable development and poverty eradication.

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