

Climate Change and Disaster Risk Management for Sustainability in Nigeria

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Abstract

Changes have always been part of human history, and man's progress from pre-civilization era has largely depended upon the ability of human societies to adapt to such changes. However, unprecedented rapid changes in the earth's climate / environment have been witnessed since the post-Second World War. Demographic pressure/ technological progress, more than the natural changes, have either aggravated the natural changes or led entirely new dimensions of climate/environmental change. Global warming, Ozone depletion, desertification and general environmental degradation are some of the issues causing widespread alarm and constitute the most topical issue at the onset of the 21st century CE. This paper, therefore, discusses the possible causes and evidences of climate change. It examines the impacts of climate variation on human society especially developing nations. The paper, also, vividly describes vulnerability concepts and some adaptation measures to climate/ environmental change.

Keywords: Climate change, Vulnerability, Climate variability, Green House Gases (GHGs) and Ozone depletion

Background to the Study

The earth is home not only to humankind but also other living and non-living things, which together made life possible. For instance humans depend on animals and plants for their food and survival. The oxygen needed for respiration was produced by plants during the process of photosynthesis, as were the food and fiber; the food we eat was once an animal as were the shoes and our clothes.

The environment is the "gamut" (sum) of the features and conditions surrounding an organism that may influence it, (Ekpoh, 2002). Put in another way, it is a set of surrounding conditions that act on a place or person and gives it a certain character. Environment can be divided into physical, biological, chemical and social. The physical environment encompasses rocks, soil, air, water as well as such factors as light and temperature. These sets of conditions permit life to exist on the earth, they are numerous, complicated and interrelated.

Every human being lives within an ecological complex, such that whenever the balance is disrupted, disaster sets in, and it may be minor with slight impacts or major with widespread devastation. Generally natural systems tend toward a balance or equilibrium among opposing factors or forces. When one factor changes, compensating changes occur in response if the disruption of the system is relatively small and temporary, however, the system may, in time

return to its original conditions. But permanent changes can also occur in a natural system. Human activities can cause or accelerate permanent changes in natural systems, which depend proportionally to the size of the population and level of development, (Raven, et. al., 1993). Thus, rapid demographic increase in the dry areas of wet- Africa may likely have a damaging consequence on the environmental balance and vice-versa.

Changes in modern climates are not new in the earth's history over thousands of years, but changes today appear to be largely the results of human activities. These activities include carbon dioxide emissions from fuel combustion, release of aerosol matter in the atmosphere, land use, ozone depletion, animal agriculture and deforestation. However, a close examination of the issue of climate change indicates that the basic causes is emission of Greenhouse gases by the industrialized nations of Europe, North America and the Asian nation of Japan also, the emerging industrial nations of Asia (China & India), South America (Brazil and Argentina). The continent of Africa contributes least to climate change; despite this there are widespread fears that Africa will be the worst hit than other continents.

The Changing Global Climate

The deteriorating conditions of the physical environment are presently a major global concern more especially on dry areas of developing countries including Nigeria. The IPCC's Fourth Assessment highlighted the likely increase in the frequency and intensity of extreme weather events related to temperature extremes and wind and rain, consequent to global climate change (Parry, 2007). He further stressed that the occurrence of more extreme weather events, together with the increased social vulnerability of societies, has been largely responsible for the increasing global incidences of natural disasters.

The concept of vulnerability as applied to social systems has been interpreted as “a set of conditions and processes resulting from physical, social, economic and environmental factors, which increase the susceptibility of a community to the impacts of hazards” (UN- ISDR, 2002). Thus, the significance of vulnerability with respect to effective planning for and response to hazards and other extreme weather events was highlighted by Sarewity, et al, (2003). He noted that the vulnerabilities associated with specific social and decision processes need to be well understood along with an understanding of the processes and probabilities of risk, in order for proper judgments to be made regarding effective management.

Accordingly, risk perception is an important determinant of vulnerability, as it is associated significantly with disaster preparedness. Hence, if the risk of a damaging event is perceived to be relatively high, there is a greater probability of investment in loss reduction or prevention measures, (Kunreuther, 1997).

The earth's surface is endowed with numerous forces which are complicated, delicate and dependent systems. A change in any of these promotes changes in a number of others, (Jeje and Adesina, 2002). This implies that the equilibrium positions of climate change (i.e. regular changes) are shifting according to the degree of interference of human activities within it. However, whether we like it or not climate has undergone tremendous changes in the past, it is

still changing and will continue to change. These changes affect not only the quality of life of human population but also the survival of human race. For instance, in urban areas of Africa (Nigeria inclusive) characterized by rapid and unplanned growth, poor environmental management and often worsening socio- economic conditions, alterations in the frequency and intensity of extreme weather are likely to have devastating effects on humans, buildings and infrastructure. Thus, unplanned urbanization modifies the physical environment and provides the conditions in which natural events such as floods and severe winds to occur.

Therefore, with growing urbanization and climate change, the interplay between urban planning and disaster risk is becoming increasingly important. This is crucial for Nigeria, where the Geographies of the social vulnerability of urban populations to global environmental change and climate risks are a function of the interplay of many factors, including the rapidly changing urban forms of cities and the institutional context for climate change mitigation and adaptation at the city level.

Evidence of Climate Change

The most useful index for describing the state of global climate is the average surface air temperature of the planet. Estimates of surface air temperature have been compiled from various stations around the world right from 1860. The records show that global temperature has increased by about 0.6^oc due to greenhouse gas concentration since the beginning of the twentieth century, with about 0.4^oc of this warming occurring since the 1970s.

Globally, much attention has been given to major extreme weather events such as droughts, floods and tropical storms. In sub-Saharan Africa, droughts and floods alone accounts for 80 percent of loss of life and 70 percent of economic losses linked to natural hazards, (ACCES, 2010).

Other evidences of climate change include an increase in night-time temperatures over many land areas at about twice the rate of day time temperatures increases, an increase in the length of freeze- free season in the Northern Hemisphere mid- to high- latitudes regions, a worldwide decrease in mountain glacier extent and ice mass, a decrease in sea- ice amounts in Northern Hemisphere and a substantial thinning of Arctic sea-ice in summer. As noted by intergovernmental panel on climate change (IPCC) (1995), global sea level has risen by between 10 and 25cm over the past century and much of the rise may be related to the increase in global mean temperature. Evidence is the persistence of the warm-phase of Elnino Southern oscillation of 1990 to mid-1995, which was usual in the context of the last 120 years (IPCC, 1995). This has been suggested as the cause of droughts in many dry environments.

However, as noted by the Department for Environment, Food and Rural Affairs (DEFRA), Hadley- center, (2001), different regions of the planet will undergo climate change at different rates. For instance, the land will warm at a faster rate than the ocean. Also significantly longer heat-waves have occurred in Alaska, Eastern and Central Europe, while the effect of dry spell has shown a reduction over most part of the globe. But in some other areas such as West and South Africa, Canada and eastern Asia climate is becoming drier.

Fluctuations and variability has always been part of weather and climate. However, during the period from 1969 to the present, the magnitude and frequency of these variations has intensified to a near Crises point. As noted by (Parry, 1985) that in 1982 and 1983 there occurred the most pronounced El Nino event ever recorded. This led to a wide spread droughts and floods in many parts of the globe. As a result, about 84% of gross agricultural product of Northern Brazil failed. In the same year, 1983 there were extensive floods in Ecuador and Peru and a persistent drought in Africa and in north-central India. Still in the same year, the United States Corn Belt received unusually low rainfall, which reduced the average US maize yields by 29%. Thus, globally, climate changes are everywhere as it affects all aspects of human life such as health, food, clothing, human settlements, and ecosystem and movement pattern of people.

Nigeria is highly vulnerable to climate change impacts due to its geography, climate, vegetation, soils, economic structure, population and settlement, energy demands and agricultural activities. The location and size of, and the characteristics relief in Nigeria give rise to a variety of climates ranging from tropical maritime climate to the tropical hinterland climate in the north eastern section of the country. Moreover, rainfall, an important variable of climate has been changing globally over the years and these changes have different implications for water and management particularly in the rural areas of Nigeria which are already known for poor access to water.

It was therefore found out that climate changes have effects on water availability, food security, extreme weather events, biodiversity, human health and sea level rise. This clearly shows that climate change is an eminent threat to the sustainable growth and development of any nation of the world.

Factors of Climate Change

As noted, the observed changes in global climate are due to a combination of both natural and human causes. The earth's climate varies naturally as a result of interactions between the ocean and the atmosphere, changes in earth's orbit, fluctuations in energy received from the sun and volcanic eruptions (IPCC, 1990).

The main human influence on global climate is through increasing emission of green-house gases and land use changes. Changes in land surface processes and properties interact with and cause changes in both regional and global climate. These land surface processes and properties include surface radiation fluxes, control of water vapour and carbon-dioxide fluxes by vegetation, type of land cover, leaf area index, roughness length and albedo. In the opinion of (IPCC, 1990), atmosphere concentrations of the greenhouse gases such as carbon-dioxide (CO_2), methane (CH_4), sulphur dioxide (SO_2) Chlorofluorocarbon and nitrous oxides (N_2O), have grown significantly since about 1750 AD. For instance, CO_2 has increased from about 280 to almost 360PPM, CH_4 from 700 to 1720PPM and N_2O from about 275 PPM to 310 PPM. These trends can be attributed largely to human activities particularly fossil fuel burning and deforestation. The increase in greenhouse gas (GHG) concentrations accentuates the warming process of the atmosphere and the earth's surface. The effect of those greenhouse gases is to trap the outgoing heat from the earth's surface and cause the temperature of the earth's surface to increase.

While many greenhouse gases remain in the atmosphere and affect climate for a long time. Aerosols, reaching the Troposphere from combustion of fossil fuels, biomass burning and other human activities constitute additional anthropogenic cause of climate change, (Jeje and Adesina, 2002).

Another factor of climate change is the human transport sector which contributed significantly to the emissions of toxic substances in to the atmosphere. About 24 percent of global greenhouse gases are emissions resulting from the burning of fossil fuel by automobiles. The consequences of the increase in emission of greenhouse gases in to the atmosphere have ultimately led to global warming, concentration of lead in the blood stream of the population and have made the effect of cancer disease become more apparent worldwide.

Climate Variation

Climate fluctuations or variation are in three main kinds: climate noise, climatic variability and climatic change (Ekpoh, 2002).

Climatic noise may be defined as that part of the variance of climate attributed to short-term weather changes. Leith (1975), confines the term climate noise to the chance location of the start and end of the averaging periods with respect to short-term variation, which may produce small statistical differences between successive periods. Climate variability is best thought of as the manner of variation of the climate parameters within the typical averaging period. Measures of variability include such parameters as the standard deviation of continuous elements such as temperature and pressure and the frequency spectrum of the observed variations. This gives such useful measures as return-period, or the probability of successive anomalous months or years, (Kates, 1985, Hare, 1985, Ekpoh, 1991). Statistical measures associated with climate variability include the means, totals, standard deviation as well as coefficient of variability. On the temporal climatic scale, climatic variability can be examined for period, ranging from one day, one month, and one year to a few years. The regular northward and southward “passage of the sun” is the strongest driving force for variability in the climate system. As a result the annual cycle of seasonal conditions and the equality familiar diurnal cycle of day and night become the strongest regulators of all living behavior.

Climate change is defined as the difference between long-term mean values of a climatic parameter or statistic, where the mean is taken on a specified interval of time, usually a number of decades, (Ekpoh, 2002). That it is said to occur when the difference between successive averaging periods exceed what noise can account for, that when a distinct signal exists that is visible above the noise (Hare, 1985). The term climatic change refers to long term variation extending over long period or centuries such as the little ice age and the mid-Holocene desiccation of much of the sub-tropical world (i.e. the Sahara desert).

We thus, have three types of climatic fluctuation, (Climatic noise which represent the observed year to year differences in climatic variations, to which economic and social systems generally adjust; climatic variability which includes the extremes and differences of monthly and annual values from the climatically expected value (temporal mean) to which society probably needs to adapt in order to avoid undesirable impact from the climatic anomalies; and climatic change

which occur on time scales too large to be considered significant for planning needs of most countries.

The Nexus between Climate Change and Socio-Economic Impact

The manner of the impact of climate change in a particular region is solely depend on the nature of the climate fluctuation, environmental conditions, socio-economic status and other infrastructural factors. These factors can cause significant differences in the vulnerability of different regions to given climatic variations.

Distinctive climate variations may likely affect the followings:

- i. Human health and capacity to work
- ii. Housing and settlement
- iii. Agricultural activities
- iv. Development and management of water resources
- v. Energy production and consumption
- vi. Transportation and communication activities, and
- vii. Public services of various kinds.

All of these may provide plausible explanation of series of connection between climatic variations and human society, (Hare, 1985).

Basically, variations in climate will affect settlements especially in low lying coastal regions and Islands, subsistence farmers, populations in Semi-arid grasslands and urban poor. Perhaps the gravest effects of climatic variations on human settlements will be out-migration, as people affected and displaced by sea-level rise, shore line erosion, coastal flooding, droughts, desertification and will move in search of alternative habitats. As such disruption of economic activities, insufficient amenities and possibility of epidemics and cultural change will automatically face the new inhabitants.

Developing countries such as Nigeria depend significantly on hydropower as its source of energy. Changes in the water resources availability due to climate change (Variation in precipitation pattern, cloud cover, and wind circulation intensity) may render some present hydroelectric power obsolete and future energy planning more gloomy.

The destruction of stratospheric to ozone will lead to an increased ultraviolet radiation reaching the earth, thereby raising the incidence of blurred vision, accelerated aging; a reduced immune response making the body more susceptible to infectious diseases; interference with photosynthesis resulting in lower crop yield; and affecting the growth of phytoplankton the mainstay of the ocean food change, (Michael, 1992).

Responding to Climate Change Impacts

Basically, necessity is still the mother of inventions. Societies experience perturbations, an equilibrium shift that stresses the system(s). How the society responds to perturbation or to this shift is determined by its vulnerability. Vulnerability is defined as the capacity to suffer harm or to react adversely (Karen et al, 2005). Most recently, researchers now recognize that the

vulnerability of a community is a function of its exposure to climatic conditions and its adaptive capacity to deal with those exposures. Exposure depends on the frequency, magnitude and the extent of climate-related risks in a hazardous environment. (www.tiempocyberclimate.org).

Adaptive capacity refers to the ability of a community to prepare for, and cope with or recover from, exposure to climate-related risks. Adaptive capacity is determined by community characteristics such as wealth, equalities, political and social stability, and access to infrastructure, institutional support and social capital, all of which can facilitate to deal with climate-related risks (Karen et al, 2005).

Communities need to improve their capacity to deal with a change, be it natural or man-made, and to adapt, where ever possible making the best of new conditions even if it means changes in lifestyle. Priority actions ought to propose to build the resilience of the poorest and most vulnerable. Various priorities are listed below:

- i. Commitment to mitigation
- ii. Information access
- iii. Effective participation of the rural community acted
- iv. Meeting resource needs; and
- v. Supporting bottom-up approaches

Moreover, it is imperative to improve the prospects of sustainable growth and development to address the menace of climate change impacts. This can be best achieved by conserving existing resources of the environment, and by ensuring that the development pathways are viable and environment friendly, (IPCC, 1991).

Environmental protection and sustainable development should underlie the major constituents of a country's central economic programmes. This can be achieved through capacity development.

Insurance is also acknowledge as an important climate risk management tool for reducing present and future social vulnerability linked to climate change and aids short- term recovery, (Kunreuther, 1997). Therefore, for low- income countries that are highly vulnerable to the impacts of climate hazards due to their low adaptive capacity, climate insurance is especially important, (DFID, 2004). However, access to insurance markets for climate- related risks is very low or non-existent in many developing countries; unlike in more developed societies where insurance is viable mitigating measure for enhancing adaptive capacity against the impacts of climate change, (Arnold, 2008).

African urban centers are considered to be especially vulnerable to natural hazards and extreme weather agents because of the low adaptive capacity of their populations and the deficits in infrastructure, (World Bank IEG, 2007). However, in most recent, urban planning is considered to be one of the key entry points for climate change mitigation and adaptive in cities, (Parry, 2007).

However, various projection and models of global climate change have being made. These models have nevertheless been faced with serious limitations in projecting the pace and the magnitude of global climate change. As such, it is essential to fashion response strategies and evaluate available options after examining the economic and environment sustainability of each options and such evaluations may include:

- i. Improvement of information and knowledge base on all types of environment problems.
- ii. Compilation of information on resource use and management practices under variety of environmental change situation.
- iii. Inventory of resources such as land, water, flora and fauna.
- iv. Estimation of the sensitivities of different economic activities to climate change, and
- v. Research, development and promotion for more efficient agriculture, forestry, animal husbandry, fisheries, etc. through the use of modern technology e.g. improved soil and water conservation, development of more resistant crop varieties and the conservation of forests. (Michael, 1992).

Conclusion

Purposive action is the distinctive characteristics of human behavior. Almost all climatic hazards evoke some individual and collective human, response intended to prevent, reduce or mitigate unwanted impacts or to enhance desired outcomes. To ensure that the effects of climate change for that matter, is kept at the barest minimum, a cooperative international programme of long term monitoring of climatic hazards, should be serious planning to detect potential future impacts.

There is considerable optimism among many that adaptation to climate change is feasible, since human beings and other living things adapted successfully to varying temperatures, precipitation, droughts, floods and storms. Due to economic and technological advancement the ability of the modern man to cope with climatic hazards and to adapt to new circumstance has improved. It is therefore recommended that the authorities in the developing countries should take urgent steps to protect its environment and societies to demand for finances, technology and capacity building for adaptation and risk management on the effects of climate change.

There is need to develop appropriate strategies in mitigating the impacts of these changes in Nigeria. Some of these strategies include environmental planning and design that saves energy and reduce emission of greenhouse gases as well as provision of adequate drainage and proper waste disposal management systems within our cities. Hence, managing climate risk and adapting to climate change in a vulnerable country as Nigeria requires people to understand how they can best protect themselves, their property and their livelihood.

Finally, the basic condition that every society will require for proper adaptation includes: awareness, knowledge, technology, availability of resources and institutional capabilities. Decision to be taken will depend on the societies, after examining the economic and environmental suitability of each option.

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