

The Impact of Climate Change in Nigeria.

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Abstract

It is often argued that Africa need not care about climate change because in global dimensions Africa produces negligible greenhouse gases. Climate change is primarily caused by the developed countries, so they should be the ones dealing with it. However, it is the bitter irony of destiny that Africa contributes least of all the continents to the climate change, but will probably suffer most from its consequences. Third World countries, particularly Africa are threatened by the predicted change in climate because of their economic dependence on agriculture for survival. Intergovernmental Panel on Climate Change (IPCC) describe Africa as one of the most vulnerable continents to climate change and climate variability and within Africa, Nigeria is one of the countries expected to be worst affected.

The present study evaluates Nigeria as likely to be one of the most negatively impacted countries in the world as a result of climate change. Nigeria has a tropical climate with variable rainy and dry seasons, depending on the location. In the southeast part of the country it is hot and wet most of the year, but it is dry in the southwest and farther inland. In the north and west, a savannah climate with marked wet and dry seasons prevails, while a stepped climate with little precipitation is found in the far north. Its risks are particularly high due to its low lying coastline that is highly populated with a heavy concentration of Gross Domestic Product (GDP) generating industry and infrastructure. In addition, the north of the country forms part of the Sahel which is at risk of further desertification and droughts. Flooding, water shortages, increased diseases and associated social disruption could well give rise to a vicious cycle of economic degradation and social conflict.

Keywords: Climate Change, greenhouse, Carbon dioxide, Coastline.

INTRODUCTION

Climate Change

Climate change is defined as fluctuations in the patterns of climate over long periods. The United Nations Framework Convention on Climate Change (UNFCCC) of 1992 defines climate change as a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere (UNFCCC, article 1.2, 1999). While the Intergovernmental Panel on Climate Change (IPCC, 2001) defines climate change as a change due to natural internal processes or external forcing, or to persistent anthropogenic changes in the composition of the atmosphere or in land use. Scientists have been predicting the consequences of climate change since in the 1980s (Ford, 1982). In addition (Nkemdirim, 2003) observed the current signs of global climate change to have resulted from an average increase in the world temperature of just 0.7 degrees centigrade since 1900. Climate change affects the whole world though the poorest people who contribute least to the change are the ones who suffer the most. Scientific evidence shows that the net climate resulting from the change will largely be driven by atmospheric greenhouse gases (Nkemdirim 2003). Greenhouse gases cause warming because these gas molecules absorb outgoing longwave radiation and therefore less radiation is lost to space. Some green house gases occur naturally, while others result from human activity. The natural greenhouse gases like water vapor, carbon dioxide, nitrous oxide, ozone and methane prevent heat from escaping, thus allowing vegetables and flowers to grow even in cold weather. Carbon dioxide, methane and nitrous oxide levels in the atmosphere are added by human activities through industry, transport, agriculture, organic and solid waste combustion. Very powerful green house gases that are not naturally occurring include hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride

(SF₆), which are generated in a variety of industrial processes. (Carter, 2007) predicted that the change in climate will put over 100 million people at risk of hunger by 2080 with 80% of them being in Africa.

African climate is driven by three major processes: the tropical convection, the alternation of the monsoons and the El Niño-Southern Oscillation of the Pacific Ocean. The tropical convection and the alternation of the monsoons determine the regional and seasonal patterns of temperature and rainfall while the El Niño-Southern Oscillation of the Pacific Ocean influences the year to year rainfall and temperature patterns in Africa. Our ignorance is nevertheless, poor understanding of the drivers of the African climate and lack of local weather data for analysis. The lack of knowledge makes it difficult to validate climate models and hence predict with any degree of accuracy what will happen as a result of climate change in a country or even sub-regional level in Africa. Africa's climate is highly diverse and variable because it encompasses the extreme aridity of the Saharan deserts at one end of the range and the extreme humidity of the Congo rainforest at the other. Africa produces less than 4% of greenhouse gas emissions, it is considered the world's most vulnerable region with regard to the effects of climate change due to the fragility of its economies. It is estimated that over 50% of the annual carbon released from burning of forests and savannas comes from Africa. The burning of biomass and wind-borne dust produce large quantities of aerosols. Some of these aerosols reflect incoming radiation so cooling the planet but others trap the heat and add to the greenhouse effect. Dust can either reduce or stimulate rainfall. In low clouds, water attaches to dust particles and prevents droplets from becoming heavy enough to fall but in high clouds, dust particles over wetter regions may provide surfaces for ice crystals to form around them resulting in greater rainfall (Mahowald and Kiehl., 2003). The most significant change to Africa's climate has been a long-term reduction in rainfall in the semi-arid regions of West Africa.

In the Nigerian Sahel region, there has been a 25% decrease in precipitation on average in the last 30 years (Nkomo et al., 2006). However, the reduction in precipitation has been more moderate in other parts of Africa. During the last decades ecological conditions in West Africa have dramatically changed. Very evident is the climate change, which has resulted in a southward shift of the climate zones, e.g. a spread of the desert (Sahara) into the Sahelian zone. Especially in climate sensitive regions, where rained and irrigated agriculture is the main source of food security and income, concerns about the variability in rainfall, its temporal and spatial distribution, must be taken very seriously. This seems to be particularly true of West Africa where significant alterations in precipitation during the great Sahelian drought of the early 1970s and 1980s affected great parts of West Africa in terms of ecological, economic, and societal aspects. After this drought period, livestock density increased resulting in an intensification of grazing pressure. This anthropogenous phenomenon leads to similar landscape changes as those caused by the climate. Like all other regions, West Africa must take-up this challenge – essentially that of vulnerability and uncertainty. The IPCC describe Africa as one of the most vulnerable continents to climate change and climate variability and within Africa, Nigeria is one of the countries expected to be worst affected (Boko, et al., 2007).

STUDY SITE

Nigeria is one of African's greatest countries in West Africa. It is situated between 4°N and 14°N and between 3°E and 15°E with 6 major vegetation zones reflecting highly variable climate throughout the country. Its sub-Saharan location is one of the hot spots of climate change likely to experience the most severe impacts due to the fragile nature of the existing ecosystems. With an estimated population of over 150 million people, Nigeria is blessed with a vast expanse of inland and marine ecosystems. The surface area of marine and brackish water resources covers estimated area of 233, 000 km² (Ita, 1993) and the brackish –marine fishery potential has been estimated at 273, 500 metric tonnes per annum (Amadi, 1991). In terms of climate, Nigeria is classified under three regions: the far south, the far north and the rest of the country. The far south is defined by its tropical rainforest climate with annual rainfall of 2,300 to 3,200mm. The far north that is the Sahel region is defined by its desert-like climate with annual rainfall of less than 800mm. The rest of the country is the savannah with annual rainfall of between 800 mm and 2,300 mm.

RESULTS

The most significant change to Africa's climate has been a long-term reduction in rainfall in the semi-arid regions of West Africa. In Nigerian Sahel region, there has been a 25% decrease in precipitation on average in the last 30 years (Nkomo et al., 2006). However, the reduction in precipitation has been more moderate in other parts of Africa. The regularity of drought periods has been a notable aspect of Nigerian climate in recent years, especially in the drier regions in the north. Well publicized droughts in the 1970s and 1980s significantly affected West Africa in the 20th century and they severely affected large areas of northern Nigeria and the Sahel region. The Nigerian delta has in particular seen a marked increase in flooding in the last few decades (Nkomo et al., 2006). Dust storms which are partly due to changes in land use such as grazing and deforestation in the some parts of the Sahel have also increased, particularly between the 1950s and 1980s (Elasha et al., 2006). The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report explains that during 1961 to 2003, the average sea level rose by 1.8 ± 0.5 mm per year. While sea level rise varies between regions, Nigeria's entire coastline has been affected by this observed rise (IPCC, 2007a). Such a rise will have already led to an increase in coastal erosion and exacerbated flooding damages. The length of rainy season decreases from South to North. In the South the rainy season lasts from March to November while in the far North it lasts from May to September. Nigeria's First National Communication under the United Nations Framework Convention on Climate Change (MOEFRN, 2003) report that 15% of the country's population is affected in some way by climatic variation and sea level rise. The Ministry of Environment's 2003 report also states that this is set to rise to between 50% and 60% with further anticipated climate change and sea level rise, and that between 25%-40% of the national capital stock could be adversely affected. Poverty in Nigeria is multi-dimensional. Poor people are more likely to be living in rural areas; to depend on natural resources for their livelihoods and to be women, young or elderly. (Fischer, Shah, and van Velthuisen 2002) point out that nearly 800 million people in the world are chronically undernourished and poor—a large portion of them children under the age of five. They localize their research to Africa and noticed that in sub-Saharan Africa—one of the regions deemed most vulnerable to climate change—poverty rates reach a staggering 40 percent of the entire population. The majority of the poor live in rural areas where agriculture is the predominant form of economic activity; their fate is thus inextricably interwoven with that of farming.

Most Nigerians live in rural areas, yet urban centres like Lagos grow quickly and welcome a growing number of poor populations. Moreover, poverty rates in the northern regions are substantially higher than in the south (World Bank Group and UK-DFID, 2005). The range of impacts listed is complex, and some are better understood than others. For example, changes in crop yields under a range of climate scenarios are relatively well known, whereas little research has been conducted to date on the impacts of climate change and weather extremes on women compared to men (IPCC, 2007). Many sectors of the Nigerian economy are directly vulnerable to the impacts of climate change such as construction, insurance, communications, transportation, offshore oil and gas exploitation, and thermal and hydro power generation and transmission (Nokomo, 2006). Other vulnerable sectors are those dependent on climate-sensitive resources like agriculture, fishing, forestry, renewable energy and eco-tourism (Adejuwon, 2006). We readily acknowledge that agriculture is not the only means by which climate change can impact on the poor. Potential damage to infrastructure such as roads, public and commercial buildings, and housing due to natural disasters may have localized, adverse impacts for the population as a whole. Likewise, disease, conflicts over scarce natural resources, or ethnic strife exacerbated by migration away from vulnerable, low-lying areas may have a profound and adverse impact on the poor (Barnett 2001; Heltberg, Jorgensen, and Siegel 2008; Raleigh, Jordan, and Salehyan 2008; Reuveny 2007).

Effect of regional climate on Nigeria

Two thirds of Nigeria is already prone to desertification and this will be exacerbated by climate change. The 30-year-long drought in the Sahel is described as the biggest climatic anomaly observed to date by (Lebel, 2005), is the root of conflicts across the Sahel like what we see in Darfur and this is triggering major social changes across the region. The Sahel zone's vulnerability to conflict is heightened by unregulated border crossings between Nigeria and its dry neighbour to the north, Niger. Pastoralists from Niger, whose welfare depends on their livestock, allow their animals to encroach on Nigerian farmland, further decreasing food security in the country. (Boko, M. et al., 2007) observed that the Sahel is expected to experience higher temperatures and extreme peaks and troughs in rainfall resulting in reduced agricultural outputs and disruptive migration as people move around the region searching for water, fertile land and jobs. Wind and strong rains damage the region's soils, leading to erosion and flash flooding. One predicted impact of climate change is a reduction in soil moisture, which will have serious impacts on

agricultural output (Boko, et al., 2007). The longer dry periods between rain storms are also affecting water quality and creating new health risks, in particular cholera outbreaks.

Lake Chad was once the sixth largest lake in the world and the second largest wetland in Africa but persistent droughts and continuous extraction have shrunk it to about one tenth of its former size (UNEP) and its contraction has been increasing in rate in recent years. (Coe and Foley, 2001) observed that the Lake is now 1/20th of its size 35 years ago. Many different communities like fishermen, farmers and herdsman depend upon the lake. This food source is increasingly under threat from climate change, further compounding food insecurity in the region. The monsoon rains that fall in June, July and August is the primary source of water for the Lake but over the last three decades these rains have become increasingly unreliable. Meanwhile, the use of water for irrigation has increased in response to the drier climate. Climate refugees are being created as climate change makes land no longer viable for farming without irrigation and simultaneously reduces the water available for irrigation (Okali, 2004). Nigeria's 800 km coastline is about 3% of the country's entire land surface, this coastal zone which are low lying and prone to erosion and flooding, house most of the economic activities that form the backbone of the nation's economy. Over six million country's population lives in coastal cities. Coastal erosion, flooding, pollution, deforestation, saltwater intrusion and subsidence are already degrading the region and these issues are further worsened by climate change. (Onofeghara, 1990) reports that a 0.2 m rise in sea level will inundate 3,400km² of Nigerian coast-land while a 1.0 m rise will cover 18,400 km² and submerge the Delta's entire oil and gas infrastructure. The Niger Delta is under 6,000 km² and contains the oil and gas producing region and other infrastructure. (Ngaria, 2007) observed the effect of global sea level rise and reports that nearly one third (1/3) of all human beings live within 60km of a coastline and a rise in sea level of half a meter could have devastating effects on settlement patterns causing many people to move and many cities and ports to be submerged. The Ministry of Environment estimate that Nigeria will lose close to \$20 billion as a result of the sea-level rise of 0.5m and US\$ 43 billion from a 1m sea level rise assuming development and economic growth of 5% over 30 years (MOEFRN, 2003). As sea levels rise, beach properties will be destroyed; low lying buildings and roads further inland will be threatened. This eventuality is already happening at Bar Beach, Lagos (NEST, 2008c). It is estimated that about 40% of the mangroves in Nigeria had been lost by 1980 (WRI, 1990). Lagos is the largest city in Nigeria and one of the largest in sub-Saharan Africa. It is located on the high rainfall of West African coast. The city is situated just above sea level and is characterized by poor housing, overcrowding, chronic slums, environmental pollution and traffic congestion. However Lagos remains Nigeria's most prosperous city and much of the nation's wealth and economic activity are still concentrated there. The sheer density and size of the population in Lagos combined with poor infrastructure and building quality, poverty and flood risk means that Lagos is very vulnerable to climate change.

Sectoral impact of climate change in Nigeria

Crops occupy over 90% of the agricultural sector in Nigeria and some areas are already experiencing a loss in length of growing days by 20%. Agriculture in Nigeria will be adversely impacted by increased variability in the timing and amount of rainfall. The timing of rainfall is as vital as the quantity (Boko, et al., 2007). Water deficits may also depress crop and livestock production and hence, food supply, necessitating imports (Scoones, et al., 2005). Food security is dependant on the age-long ability of farmers to predict when to plant their crops. Increasing unpredictability in the onset of rains in the last 30 years (NEST, 2008b) have led to crops planted with the arrival of early rains being damaged by an unexpected dry spell. This combined with the late arrival of rains results in harvest failures, forcing farmers to plant afresh with seeds taken from their reserves or else borrow money to buy seeds.

The current warming trend hinders livestock production by reducing animal weight gain and dairy yield as livestock are subjected to long treks to find water and grass. (Nkomo, et al., 2006) observed that the 1970's and 1980's drought claim close to a million livestock which affected meat and dairy supply throughout the country. In Nigeria, nomadic pastoralism is felt to be most vulnerable due to the insecurities of reliance on open land grazing and natural watering holes and the relative poverty of those currently practising this livelihood. The range of the tsetse fly has already extended its range Northward and will pose a threat to livestock in the drier North.

Coastal regions will be hit as climate change upsets ocean currents and fisheries (Okali, 2004). Major changes to fish spawning patterns have already been observed. In the coastal zone, the loss of mangroves as sea level rises will have serious repercussions for fishing as mangroves act as a sanctuary for young fish to mature (NEST, 2008c). Increases in the severity of storms, will threaten fishing vessels and crew. Scientists calculate that ocean expansion could cause a rise in sea levels of between 20 and 140cm if the average temperature increased by between 1.5 to

4.5oC and this scenario would adversely affect marine fishing (Ngaria, 2007). The viability of inland fisheries is threatened by increased salinity, and shrinking rivers and lakes.

Oil spills affect fishing and upset the balance of marine ecosystems in the country. Industrial pollution damage large areas of the Nigerian coast and further worsen food insecurity, exacerbate already existing social tensions in the Niger delta and create a greater risk of malnutrition. Sea level rise of 1 metre would submerge the entire oil infrastructure in the Delta region which would have a devastating knock on impact to the whole economy due to Nigeria's overreliance on hydrocarbons for foreign exchange and government revenues.

Climate change has significant impacts on the energy sector in Nigeria, as it affects production, transmission, distribution and consumption patterns. The reduced rainfall increases droughts and rise temperatures, particularly in the northern part of the country this will adversely affect the supply of hydroelectric power, upon which most Nigerians rely. Hydropower generation currently accounts for about 40% of the total installed generation capacity in Nigeria (UNIDO Regional Centre for Small Hydro Power, 2005). (Ministry of Environment of FRN, 2003) observed that all types of energy facilities that include electric transmission lines, thermal power plants, wind and oil and gas production facilities, located along the coast could be subject to damage related to sea level rise. The hampered energy production in Nigeria will affect other countries because Nigeria supplies Niger with electricity to stop them from building a dam upstream of the Niger (Nkomo, 2006). If Nigeria is unable to supply these consumers, then it is feasible that her upstream neighbours may decide to dam the river themselves.

The rise in sea level may require costly changes to ports, coastal roads and railways as the current means of communications along the coast may be covered by intruding sea water or washed away by erosion. This will necessitate drainage in our roads and coastal airports. Adverse weather conditions may cause flight delays, cancellations and re-routing; with attendant financial losses to an industry already suffering from high fuel costs. Increasing floods and storms are also likely to hamper trucks and trains transporting merchandise. Any change in prevailing winds and increased dust haze would affect the safety and efficiency of take-off of flights (Ministry of Environment of FRN, 2003).

Conclusion

The main causes of climate change discussed in this write up are anthropogenic in nature. As earlier stated Africa contribute negligibly to the cause of climate change which is the production of greenhouse gases. To this effect, an international environmental treaty- Kyoto Protocol, linked to the United Nation Framework Convention on Climate Change (UNFCCC) mandated the governments of industrialized nations to take appropriate measures that would control and stabilize global warming by reducing greenhouse gas emissions to a level that would prevent dangerous anthropogenic interference with the climate systems. This accord has been largely contested by opponents because of increase in energy demand, the need for economic growth and improved standard of living in the developing countries. This lack of political will and institutional weakness to implement appropriate environmental policies are major factors that have militated against measures to reduce greenhouse gases emissions and mitigate the effects of climate change.

Recommendations

African governments have a responsibility to their citizens to ensure that adequate plans for addressing current and future impacts of climate change are designed and implemented through consultation with all stakeholders. This should include:

- (i) implementing laws, policies and practices to support small-scale producers, and localised biodiverse, agroecological food production.
- (ii) developing adaptation policies that prioritise poor people's needs, actions for poverty reduction and sustainable development. Efforts to address power relations explicitly – such as gender equality, social justice and human rights – and promoting equal and fair access to resources and services must also underpin adaptation strategies.
- (iii) establishing common targets for demands on emissions cuts and adaptation financing.
- (iv) increasing cooperation between countries and across the region, on climate change challenges and resource requirements

- (b) Africa lacks both regional and local climate data. There is an urgent need for improved climate modeling and forecasting on the continent, which can provide a basis for informed decision-making and the implementation of adaptation strategies.
- (c) Production of greenhouse gases through deforestation and fuel burning by Nigerians can be reduced by making use of Geothermal and solar energy which the country is well endowed with instead of cutting trees and burning of wood for fuel wood.
- (d) Massive investment in coastal and short line protection, protection of threatened ecosystem, resettlements and limiting development to flood prone areas should be enhanced in the country
- (e) Climate Change education should be taught in formal and informal sector of our education

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