

## **Potential Challenges of Climate Change to the Nigerian Economy**

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**Abstract:** *Nigeria is likely to be one of the most negatively impacted countries in the world as a result of climate change. Nigeria is plagued with many ecological problems of varying magnitude. Whilst the people living in the southern part of the country are being ravaged by flood and gully erosion, their counterparts in the north are contending with the menace of desertification, deforestation and drought, among others. These environmental challenges have direct and indirect effects on the social and economic activities of the societies. The paper review the potential impact of the challenges of climate change on the Nigerian economy by identifying the impact according to sectors and the potential impacts on the future GDP of Nigeria. Secondary data were used and content analysis was adopted. The findings indicates that many sectors of the Nigerian economy appears to be directly vulnerable to the impacts of climate change such as manufacturing, insurance, transportation, offshore oil and gas exploitation, and thermal and hydro power generation and transmission. Other vulnerable sectors are those dependent on climate-sensitive resources like agriculture, fishing, forestry, renewable energy and eco-tourism. These cumulative effects will impact the GDP negatively. On the basis of the findings, the following were recommended; there should be policies toward mitigation and toward developing technology that can improve productivity and are environmentally friendly, irrigation should be encouraged, NIMET should be well equip to enable it function effectively, government agencies and NGO should sensitize the people about the danger and hoh to work to work towards a sustainable environment.*

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### **I. Introduction**

Climate change is one of the most serious environmental threats facing mankind world wide due to its multi-faceted nature. The issue of climate change has become more threatening, not only to the sustainable development of socio-economic and agricultural activities of any nation, but to the totality of human existence. Climate change has been defined by the Intergovernmental Panel on Climate Change (IPCC) as statistically significant variations that persist for extended period, typically decades or longer. It included shifts in frequency and magnitude of sporadic weather events as well as the slow continuous rise in global mean surface temperature. This includes climate weather variations on all temporal and spatial scales, ranging from short-lived severe storms to decades of droughts and century shifts in temperature, rainfall and ice-cover (IPCC, 2007).

Nordhour (1993) is of the opinion that the earth's climate system has been demonstrated to change on global and regional scales since the pre industrial era, with some of these changes attributed to human activities. Emissions of greenhouse gases (GHGs) due to human activities continue to alter the atmosphere in a way that is expected to affect the climate. He also added that Greenhouse gases are gases that trap heat in the atmosphere, the principal greenhouse gases are carbon dioxide (CO<sub>2</sub>), Methane (CH<sub>4</sub>), Nitrous Oxide (N<sub>2</sub>O) and Fluorinated gases which trap heat in the atmosphere and thereby warm the surface of the earth.

The greenhouse gases enters the atmosphere basically through fossil fuel energy use, (oil, natural gas and coal), solid waste, trees and wood products, and also as a result of chemical reactions (such as cement production) is responsible for 60% of energy-related human-induced CO<sub>2</sub> emission as identified by Akin,(2008). In a study conducted by McGrory and Kneating (1998) they outline two major causes of climate change, merely, natural factors and induced human factors. They further states that; Scientists are becoming more concerned that human activities, primarily the burning of fossils fuels such as coal, oil, and natural gases and land use practice, particularly deforestation, are changing the atmospheric concentrations of greenhouse gases. Consistent with the above, IPCC (2007) find that Human activities have increased the levels of carbon dioxide in the atmosphere by more than 30% since the beginning of the industrial revolution in the mid 18<sup>th</sup> century and are still increasing at the rate of 0.4% per year” As these gases build up in the atmosphere, they trap more heat near the earth's surface, causing the earth's climate to become warmer. In fact, global average temperature has increased since 1861. Over the 20<sup>th</sup> century, the global temperature has increased by 0.6 0.2 °C. The climate is projected to warm up by another 1-3.5°C over the next century due projected increases in atmospheric concentration of greenhouse gases.

Nigeria is plagued with many ecological problems of varying magnitude. Whilst the people living in the southern part of the country are being ravaged by flood and gully erosion, their counterparts in the north are

contending with the menace of desertification, deforestation and drought, among others (Mendelsohn 2000 in Boko, et al., 2007). These environmental challenges have direct and indirect effects on the social and economic activities of the societies, this serve as the basis for this study

## **II. Statement Of The Research Problem**

Nigeria is likely to be one of the most negatively impacted countries in the world as a result of climate change. Its risks are particularly high due to its low lying coastline that is highly populated with a heavy concentration of GDP generating industry and infrastructure in Lagos, Ibadan and Port Hacourt. In addition, the north of the country forms part of the Sahel which is at risk of further desertification and droughts. Flooding, water shortages, increase diseases and associated social disruption could well give rise to a vicious cycle of economic degradation and social conflict.

Based on IPCC climate change assumptions, latest research findings relating to sea level rise, and results of a consultation exercise in Nigeria, a preliminary Integrated Assessment Model adapted for that study predict that climate change could result in a loss in GDP of between 6% and 30% by 2050, worth an estimated US\$ 100 to 460 billion dollars. By 2020, if no adaptation is implemented, between 2-11% of GDP could potentially be lost. That serves as a basis for this study. Therefore, the objectives of the study are to outline the potential impacts of climate change on the Nigerian economy by examining the effects of such change on the various sectors of the economy. And also, to make a review the estimated effects of climate change on the future Gross Domestic Product (GDP) of Nigeria.

## **III. Research Methodology**

The data for this work is literature based, and content analysis approach was adopted. Reports and presentations from Intergovernmental Panel on Climate Change (IPCC), Ministry of Environment (MOEFRN), and Department for International Development (DFID), National Climate Change Commission (NCCC), Nigerian Environmental Study Team (NEST) and Nigerian Metrological Agency (NIMET) etc, were used for review in this study.

## **IV. Potential Implications Of Climate Change On The Nigerian Economy**

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, M. et al., 2007, p3). Below indicates the key areas at risk from climate change in Africa, revealing that Nigeria faces potentially serious risks both on the south coast and in the north of the country. The remainder of this section identifies key reasons why Nigeria is vulnerable to climate change and key impacts likely to occur. It then provides two summary tables that highlight how the three main economic sectors and the three main regions of Nigeria are likely to be affected.

### **4.1 Impacts of Climate Change on Sectors of the Nigerian Economy**

Many sectors of the Nigerian economy appears to be 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 Adejuwon, (2006). Nokomo, (2006) add that other vulnerable sectors are those dependent on climate-sensitive resources like agriculture, fishing, forestry, renewable energy and eco-tourism.

#### **4.1.1 Agriculture**

Climate change has the potential to affect African agriculture in a range of ways leading to an overall reduction of between 2 and 7% of GDP by 2100 in the Sahara and 2 to 4% in Western Africa (Mendelsohn 2000 in Boko, et al., 2007). Firstly, desertification and the decline of Lake Chad as a major source of irrigation water is likely to decrease food production in the northern Sahel region, which today accounts for 26.6% of Nigeria's land area as identified by Boko, et al., (2007).

Agriculture in southern Nigeria will also be affected by climate change. Indeed, Southern Nigeria's low elevation means that it is prone to salt-water intrusion as sea levels rise. Even upland water is already showing evidence of increased salinization which is supported by MOEFRN, (2003), which will ultimately make agriculture no longer viable and will force populations to relocate.

#### **Crop Production**

Crops occupy nearly 94% of the agricultural sector in Nigeria and some areas are already experiencing a loss in length of growing days by 20%. Growth rates of maize, guinea corn, millet and rice are depressed by rises in temperature. Warming trends also make the storage of root crops and vegetables more difficult for those without access to refrigeration. Agriculture in Nigeria will be adversely impacted by increased variability in the

timing and amount of rainfall. Water deficits may also depress crop and livestock production and hence, food supply, necessitating imports (Scoones, et al., 2005). During the worst of the drought in the 1970's and 1980's, harvest failure was significant which had significant repercussions for animal husbandry (Nkomo, et al., 2006).

According to CGIAR, (2008) Food security is dependant on the age-long ability of farmers to predict when to plant their crops. Increasing unpredictability of when the rainfall start and stabilizes in the last 30 years has led farmers to plant crops early and being damaged by an unexpected dry spell. This combined with the late arrival of rains results in harvest failures, forcing farmers to plant afresh. Furthermore, extreme weather events like storms, heavy winds and floods may devastate farmlands and lead to crop failure. NEST (2008c) added that Pests and crop diseases are also migrating in response to climate variations. The changing distribution of pests may also hamper food storage.

### **Livestock**

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. During the worst of the drought in the 1970's and 1980's, close to one million livestock were lost, affecting meat and dairy supply throughout the country (Nkomo, et al., 2006).

### **Fisheries**

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. The viability of inland fisheries is threatened by increased salinity, and shrinking rivers and lakes (Okoli, 2004). Also, Gwary in his work indicates that what is left of Lake Chad is not more than 36% of which mostly was attributed to climate (lower rainfall and drought).

### **Forestry**

Climate change will potentially increase the incidence of pests and diseases that decimate forest trees. This in turn can lead to species extinction in the various ecosystems of Nigeria, as it has already been the case for Iroko and oil bean in the southeast; various mahogany species in southwest; the baobab and the locust bean in the northwest and gum Arabic in the northeast (NEST, 2008b).

#### **4.1.2 Mining and Quarrying**

Increase in precipitation in the south combined with irregular rainfall events will trigger flooding which will adversely effects the mining operations located in that region. Also extreme weather events around the coastal region will threaten off-shore drilling. About \$13 billion is at risk of loss from sea level rise in the Niger delta (MOEFRN, 2003).

#### **4.1.3 Manufacturing Sector**

This sector will suffer losses from reduced potentials to produce output requiring agricultural produce as inputs. Sea level rise may lead to flooding which can destroy transportation and other infrastructure as well plants and industrial layouts, that can hamper productivity and efficiency in the sector (DFID, 2009).

#### **4.1.4 Wholesale and Retail Trade**

Infrastructure is at direct risk due to sea level rise and extreme weather events which consequently damage the infrastructure which affects the supply and distribution of their products thus challenging wholesale retail trade business (NEST, 2008b).

#### **4.1.4 Other Sectors**

All sectors will be affected by the extreme weather pattern due to change in climate that may lead to sea level rise, drought, floods, and etc. Transport, insurance, tourism and utility will be among the worst hit as they are directly affected.

**Transport and Tourism:** Roads, bridges, airports terminal and rail line will be destroyed due to floods and erosions caused by excess rainfall or sea level rise. Tourism especially the beach-based tourism will negatively affected, the beaches and lagoons will be taken over by water due to sea level rise as in the case of Lagos bar beach and Lekki Island (DFID, 2009) Increase in the occurrences of natural disaster such as flooding, drought, land slide and windstorm may cause a lot of damages to business facilities and activities; this may cause a lot of cost to the insurance companies in compensating its clients. (Gwary, 2009 and NEST, 2008b).

**Utility and Energy:** this sector will be affected by decrease in output of hydroelectricity generation plant due low rainfall as in the case of Kainji dam and Shiroro (MOEFRN, 2003). Water supply will affected also due to shrinking amount of water as a result of low rainfall or due to intrusion of flood water salt water from the sea.

**Government Expenditure:** The Federal Government has disbursed N3bn from the Ecological Fund in the last two years. A breakdown of the figures indicated that about N765m was disbursed for the provision of incinerators for six teaching hospitals and three Federal Medical Centres, while about N2.3bn was disbursed for erosion, flood and pollution control (Emeka, 2010). Huge amount of funds are spent by government in the treatment and resettlement of victims of increasing environmental disaster.

**V. Implication Of Climate Change On The Future Gross Domestic Product (Gdp) Of Nigeria**

The data is based upon up to date national economic data and forecasts along with most recent peer reviewed scientific studies of the potential impacts of climate change upon Nigeria, including IPCC’s 2007 4<sup>th</sup> assessment report.

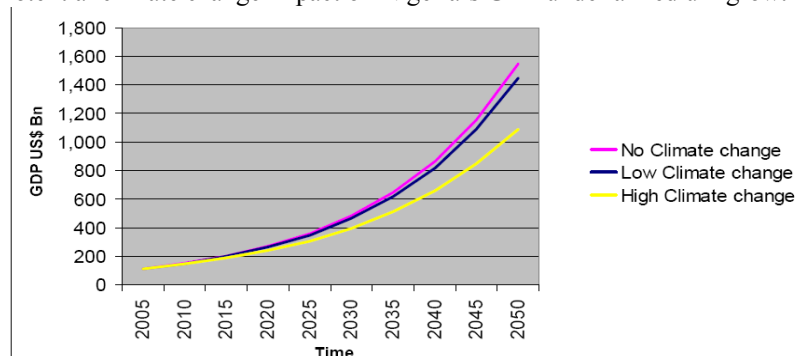
It is important to note that the climate change impact scenario is based on potential impact accounts, but it is thus possible that climate change impacts in Nigeria could be more extreme moderate or milder than is assumed or estimated.

**Table 1: Percentage Loss of GDP from Climate Change in Different Years.**

Climate change (cc)	2010	2020	2050
Low cc	0.7%	2.2%	6.4%
High cc	3.9%	11.1%	29.5%

Source: DFID, (2009)

**Table 2: Potential climate change impact on Nigeria’s GDP under a medium growth scenario.**



Source : DFID, (2009)

**Table 3: Percentage Loss of Sectoral GDP from Climate Change in 2050**

Sector	Low Scenario	High Scenario
Agriculture	8%	36%
Mining	4%	21%
Wholesale & Retail	5%	27%
Others	5%	27%
Overall	6.4%	29.5%

Source: DFID, (2009)

**Table 4: Percentage Loss of GDP through Climate Change by 2050 according to Regions**

Regions	Agric	Mining	Retail	Others	All
North	8-33%	16%	7-27%	5-23%	8-30%
SE/SS	3-38%	5-22%	2-10%	5-26%	2-25%
SW/Lagos	8-42%	5-25%	7-34%	5-29%	7-34%

Source: DFID, (2009)

In terms of benchmarking these figures against other studies, in 2000, Mendelsohn et al estimated a potential loss of GDP of 11% by 2060 based on a 2°C rise for Nigeria. Stern (2006) indicated that poorer countries could lose in excess of 10% of their GDP based on 5-6°C warming by 2100. Currently, each wet year in the Sahel causes a loss of around 1.25% of GDP and 3.5% for a dry year

(Ludwig and Kabat, 2007). Between 1997 and 2006, natural disasters have caused damage valued up to 22% of an exposed country's GDP, although most impacts of 6% or more relate to island economies (Harmeling, 2008).

## **VI. Conclusion**

Nigeria hopes to be in the world's top 20 biggest economies by 2020. In order for Nigeria to reach this goal, the strengthening of non-oil growth is essential. However, global climate change is one of the largest threats to Nigeria's development and economy. Particular threats are posed to Nigeria's competitiveness in agriculture from changes to rainfall patterns in the north resulting in increased desertification and flooding, and to economic activity in Lagos, Nigeria's commercial hub, which has recently been identified among the 21 cities most likely to be affected by rising sea levels (IPCC, 2007).

Other threats include effects on power generation and distribution due to the effects of river levels on major dams, on transport infrastructure vital for trading, and possibly on oil and gas production and investment. Despite the recognition of the serious threats posed by climate change to the Nigerian economy, the need to address this issue is not incorporated into national policy or regulation. At present addressing climate change is the responsibility of the Federal Ministry of the Environment, and focuses largely on individual projects. Such an approach is unlikely to enable appropriate and cost-effective adaptation to climate change for the country as a whole.

There is therefore a strong need for policy to address climate change at the Federal, State and local area levels, and to ensure that the private sector adequately factor the risks posed by climate change into risk assessment, investment planning and project execution.

## **VII. Recommendations**

In consideration of the findings of the study which shows that climate change has the potentials of impacting the nation's economy negatively, the following suggestions were made as follows;

- The effect of climate change can be minimized if policies toward mitigation are geared toward developing technology that can improve productivity and are environmentally friendly.
- Agricultural production can increase and sustained through irrigation as a source of constant water supply, which will have positive impact on the environment. Hence, efforts and policies should be focus towards encouraging and providing effective irrigation facilities
- Also agricultural innovation that increase soil nutrient and do not contribute to change in climate should be encouraged.
- Governments, non-governmental organizations, community based organizations should work together to raise and increase awareness among the communities and people on the impact of climate change and how to cope with such changes when they occur.
- Seasonal climate forecasting should be encouraged, farmers can adapt to current year-to-year variability through the use of advanced information, and also communities will be in the position to adapt to longer-term climate change. The Nigerian Metrological Agency (NIMET) has an important role to play here.
- Afforestation and re-forestation programme should be reactivated and strengthened for the protection of the environment. Forest provides a good protection for soil and improves both the structure and nutrients status.
- Government should equip and update the equipment of the Nigerian Metrological Agency (NIMET) to collect appropriate weather data necessary for developing drought early warning system for the country.

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