

Ozone Layer Depletion and Climate Change in Nigeria - Problems and Prospects: A Review

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Abstract

Nigerians are facing a serious global environmental problem and there is a widespread concern that the ozone layer which is bringing out terrible deterioration thus contributes to climatic change and global warming. This study made use of relevant already published data of the nature and effect of climate change in Nigeria.

The objective of this paper is to review and examine how ozone layer depletion and climate change acts as a threat to Nigerians and strategies that should be elucidated to reduce this phenomenon. The review established the fact that climate change has adverse effect in Nigeria especially in gas flaring region, Nigeria Delta area. Nigeria generally is known as a highly industrialised country and a recent study reports that Nigeria have over one hundred and twenty three (123) gas flaring sites making her one of the highest emitters greenhouse gases in Africa. The World Bank (2008) [1] revealed that Nigeria accounts for roughly one-sixth of worldwide gas flaring. There are sparse rainfall thereby making food production difficult in Northern part of Nigeria, Uncontrolled logging, people in Niger Delta region are experiencing oil exploration and exploration, deforestation and bush burning in the southern Nigeria leading to acid rain, urbanization with increasing risk of disease and rising cost of extreme weather damage. The impacts of which are already felt all over the country.

Keywords: Ozone layer depletion; Climate change; Global warming; Greenhouse gases; Gas flaring

Abbreviations: ODS: Ozone Depleting Substance; CFCs: Chlorofluorocarbon; BFCs: Bromofluorocarbon; HCFCs: Hydrochlorofluorocarbons; UV: Ultra-Violet; Cl: Chlorine; Br: Bromine; CO₂: Carbon dioxide; CH₄: Methane; N₂O: Nitrous Oxide; H₂O: Water; SO₂: Sulphur dioxide; CO: Carbon monoxide

Received: November 24, 2017; **Accepted:** December 29, 2017; **Published:** January 09, 2018

Introduction

The quest for human survival, improved quality of live and especially affluence has made modern human the culprit of the Earth's degradation due to uncontrolled consumption pattern of natural resources, especially energy and numerous unfavourable environmental behaviours. There are also industrial advancement in Agriculture, Science and Technology, all these unmistakably altered some essential natural processes and systems on the earth. The emissions of greenhouse gases as by-products have been inducing global warming over the centuries and have now resulted to anthropogenic climate change [2].

Ozone depletion and climate change have usually been thought of as environmental issues with little in common other than their global scope. Ozone layer depletion is a serious problem facing the earth surface today and its ravaging effect on climate, lives and physical environment are global.

The Ozone layer has been linked to climate change in several studies but it is a different phenomenon. The Ozone is a layer of gas present in the upper part of the atmosphere (stratosphere) which is about 20-48 km above the sea level. It contains

structurally different forms of oxygen (allotropes of oxygen) constantly reacting in the presence of UV radiation allowing non-harmful UV- radiations to pass. Since this layer contains gases in reaction, these gases are powerfully-anthropogenic in nature and are chemically stable in the atmosphere but become harmful when they drift into the upper stratosphere thereby depleting the ozone layer after emission.

The most obvious linkage between efforts to mitigate ozone depletion and climate change is the fact that certain ODS: (CFCS and HCFCs) are also powerful greenhouse gases that alter some processes in the atmosphere. Once the CFCS were exposed to UV radiation, free Chlorine were liberated, a substance that is very reactive indeed, which enhance both global warming and stratospheric ozone depletion. It is important to know that the global climate system also involves in addition to the atmosphere, the oceans and other surface waters, the world of ice masses, surface soil and vegetation and geographical features of the earth.

Stratospheric cooling is a key factor in the development of ozone hole over the poles. It is clear that efforts to mitigate global warming can have positive effect on ozone depletion and vice versa. However, care must be taken to avoid solutions to one problem that make the other worse.

In fact, Cl act as a catalyst in the decomposition of ozone and since catalyst are not used up in a reaction, the same Cl radical can continue to destroy ozone layer until it react with something else in the atmosphere and is removed.

Climate Change and Global Warming

Climate Change and global warming are often used interchangeably. It is referred to a change which is directly and indirectly attributed to human anthropogenic activities that alters the composition of the global atmosphere and which are in addition to natural climate variably observed over comparable period of time. When there are natural disorders in the ozone layer either due to human or non-human factors, there will definitely be climate change. Over some decades now, the issue of global climate change due to greenhouse effects poses threat to human, natural systems and resources through high temperature, acidic rain, flooding and susceptibility to pests and diseases outbreak hence making life difficult to live.

Anthropogenic activities such as the burning of coal, oil and natural gas as well as deforestation and various industrial practices are altering the composition of the atmosphere and contributing to climate change [3].

Global warming is increase in the average temperature of planet earth's atmosphere. This comes from the release of CO₂ and other greenhouse gases such as CH₄, N₂O, CO and H₂O into the atmosphere. These gases are helpful to man by increasing industrial activities, producing CO agricultural practices, products of aerosols and CFCs, but they hold the potential to be harmful in large amounts by our activities [4]. The release and increase of these gases causes earth warming and keeps the earth warmer than it would otherwise be. Just a few degree Celsius of warming

can cause major problems as rise in sea level, precipitation patterns shift, wind and ocean current, submerging coastal cities and some species go extinct as climate changes faster than they can adapt.

Recent studies have rather indicated that the climate cannot and should not be regarded as constant. The climate is always changing on a variety of time scales. There would be an intending consequence on human if urgent action is not taken against the steady rise in global surface temperature and gradual rise in sea level in Nigeria.

Ozone Layer Depletion

The ozone is a stratospheric layer which plays an important role in the support of human lives for survival. It is a layer of gas present in an upper part of the atmosphere (stratosphere) which is about 20-048 km. Above the sea level. It contains different forms of oxygen (allotropes) constantly reacting in the presence of UV light. Ozone layer protects planet earth from harmful UV radiation allowing non-harmful UV rays to penetrate to the earth surface [4].

Ozone would still be present near the surface and throughout the troposphere and stratosphere because is a natural component of the clean atmosphere [5] but when it is massively affected and reduce in amount, it leads to depletion of ozone layer and subsequently lead to climate change and global warming [6]. The large amount of ODSs released into the atmosphere has led to a significant decrease of the ozone layer. CFCs, HCFCs, BFCs and halocarbons which are artificially synthesized gases consisting of carbon and one or more halogens released in enormous amount thereby responsible for an increased concentration of Cl and Br in the atmosphere.

The studies indicated that the ozone layer is becoming thinner and thinner thereby decreasing in its capability and potency of both acting as a blanket shielding the earth surface from UV radiations as well as acting as a filter to lethal rays from to part of the earth that supports life [7,8]. Ozone layer depletion is majority caused by greenhouse gases like CFCs, volatile organic compounds, SO₂ NO₂ CO₂ CH₄, water vapour etc. These gases are emitted as industrial waste and humans activities. When the ozone layer is depleted, UV and infrared radiation goes directly to the earth surface heating up the lower atmosphere and causing climate change [9].

Nigeria as a Case Study

The Climate Change and sea level rise have significant impacts, regionally and locally creating problems for human resources management and affecting the sustainability of the environment and sea level rise.

Perhaps it is important to mention a few things about the Niger Delta area, the main origin of petroleum resources in which Niger economy substantially depends. As noted by Ojo [10] with rise of one meter in sea level, for example, inundation in the Niger Delta alone may render more than 15,000 km² of land at risk, while soil erosion may claim more than 300 km² with sea level

rise of 0.3 metres, the land loss due to inundation may exceed 7,000 km² while that due to erosion may be up to 120 km² and if this happens about 2-3 million people could be displaced in the Niger Delta State of Nigeria. It has also been estimated that along the coastline of Niger Delta alone about 110 villages with values of 35 billion USD and about 500 villages with values worth of 175 million USD would be impacted with a sea level rise of about 0.2 and 1.0 million respectively.

Indeed, the entire municipality of Port Harcourt (about 70 km²) may be inundated. Other significant localities that may be affected are Warri, Okrika, Nichia, Abua, Bori, Bonny, Degema, Brass and Yenogua, all of which are local government headquarters.

Another likely consequence of the effect of climate change and sea level rise on the water supply-demands system in Lagos State Metropolitan area for example, the impacts of climate change will cause rise in the sea level thereby would include damages and losses due to flood, erosion, inundations, salt level rise on ground H₂O resources in the area. It can also lead to loss of vegetation and possible displacement of people. Another likely consequence of the effect of climate change and sea level rise on water resource systems in the Lagos area is the possible alteration of the characteristics of the hydrological systems with serious consequences on the availability of water resources in the area. Already more than half of the population in the metropolis could be subjected to further stress as a result of the likely negative impacts of climate change and rise in sea level on ground water resources in the area.

Lagos State consists of large areas of lowland vulnerable to rise in sea level. This is particularly so because the State is generally characterized by low lying area mostly below 5 metres. The summary of the study shows that if adequate response measures are not taken, considerable physical, ecological and socio-economic losses would be incurred with the expected rise in sea level between 0.5 metre and 1.0 metre in areas like Eti-osa, Lekki, Lagos island, Shomolu Ojo and Badagry areas will be inundated [10].

Nigeria contributes significantly to the greenhouse emissions especially land use change and forestry sector generated about 40% of gross national emissions into the atmosphere. Also sources of CO₂ emission are gas flaring and transportation which accounts for 20% and 30%, respectively (Figures 1 and 2).

No matter the level of uncertainties in the knowledge of the characteristics and future trends of the climate, climate change and sea level rise have significant impacts creating serious problems for economic development and resources management in the country. Presently there are threats imposed on coastal zones and low lying islands like Lagos metropolis and Niger Delta area in particular; which are already constantly plagued by floods and erosion, many are under serious water stress and other economic activities will be distorted.

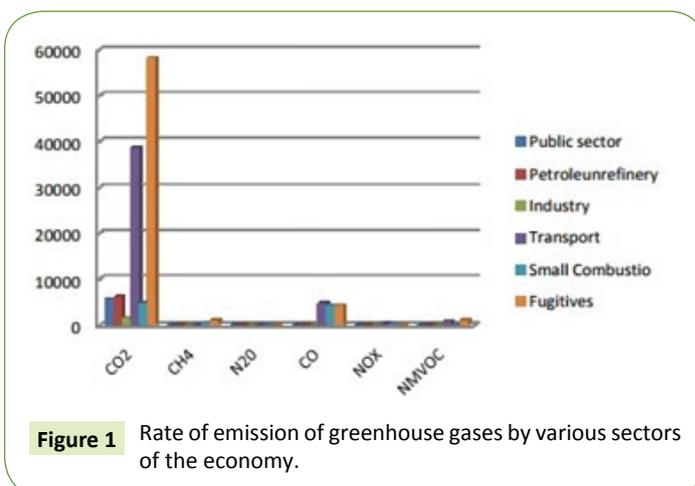


Figure 1 Rate of emission of greenhouse gases by various sectors of the economy.

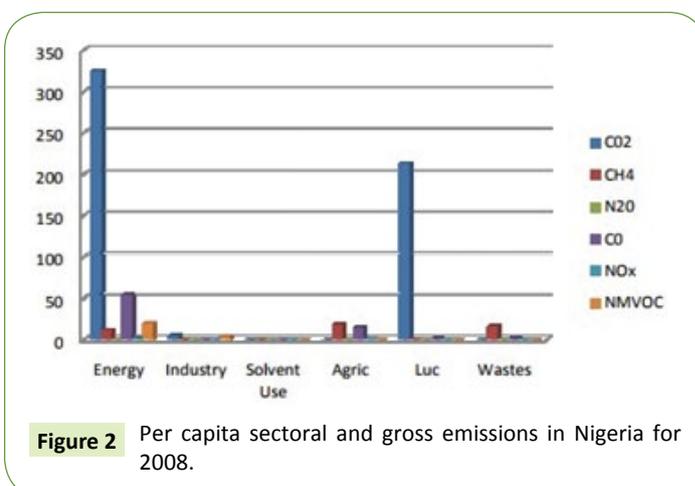


Figure 2 Per capita sectoral and gross emissions in Nigeria for 2008.

Effect or Negative Impact of Climate Change in Nigeria

Some adverse effects of climate change are around the Country which include:

- Decreased in H₂O availability to many region affecting hydro-power generations and agriculture.
- Desertification has moved inland progressively and several kilometers of descant encroachment has been witnessed in the Northern parts of Nigeria in the last 3 decades.
- Increased incidence of flooding and physical habitat destruction due to irregular and storm laden rainfall complicates the poor sanitation infrastructure thereby resulting in high increase of water related diseases like Cholera and Vector-borne diseases like Malaria around the country [11] heat stress mortality.
- High surface temperature resulted in climate-driven heat stress to large populace around the country.
- River Niger which has been the reliable source of Kanji Dam feedstock for electricity generation has witnessed a great level of dryness over the past 15 years.

- Increase in Drought especially the Northern part of Nigeria has caused negative impact on food Production with resultant "Reduction in farm – incomes" thereby results in increased Starvation and Poverty.
- The removal of wood for fuel wood will continue to contribute to the increasing rate of deforestation which diminishes natural forest releasing CO₂ to the atmosphere. Since the trees that converts CO₂ to O₂ are been cut down there would be continual release of CO₂ to the stratosphere and deplete the ozone layer.

The general effect of climate change is global warming and CO₂ (www.wikipedia.com) and these foregoing effect have unquantifiable consequences on human health and livelihood of people in Nigeria.

Remedies to Ozone Layer Depletion/ Climate Change

Efforts have not been efficiently made to involve all and Sundry in the knowledge about activities carried out on that brings about ozone layer depletion. People awareness level about this phenomenon is drastically low.

Local communities and individuals should undergo thorough orientation on the future damage that might occur to our on-coming generation. However, this requires a well-defined concerted effort from the government, professional bodies, Academia and all stakeholders. The process of improving electricity supply through Gas should be accelerated in order to minimize the use of power generators whose exhaust emission also contributes to CO₂ pollution. Weather and climate change to large extent control agricultural practices including plant growing, length of growing season and the productivity of plants and animals. The most critical factors in trend of agricultural production is rainfall presently food production has dropped by over 60% in the northern part of Nigeria [12]. The water resources ministry should revisit the concept of Inter-Basin-Water-Transfer-Schemes in order to efficiently manage water

resources for drought control and Agriculture. Government should design efficient and conducive transportation systems to certain excessive use of personal automobiles to reduce Tail pipe emissions. Natural resource management strategies should be developed to deal with emerging issues such as growing demand for renewable energy. Efforts at rehabilitating rail transport should be intensified. Ministry of Environment in Nigeria needs to be more proactive in its operation by designing policy upgrades. Intensive afforestation and reforestation should be pursued and efficient enforcement should be put in place to ensure compliance with global environmental standards [13]. Ministry of National Planning should provide direction for all planners in the country to upscale design parameters.

Fertilizers and pesticides that contain greenhouse gases should be banned. Biodiversity can support effort to reduce the negative effect of climate change, conserved or restored habitat can remove CO₂ from the atmosphere thus adding to address climate change by storing carbon e.g., reducing emission from forest degradation [14].

Conclusion

Since humanity is altering the concentration of these greenhouse gases and aerosols, both of which influence, and are influenced by climate, it has become very significant to balance the forces that determine the earth climate making it a home for humanity. The environmental problems that have arisen in Nigeria need a preliminary measure to prevent future damages to Ozone layer. All stakeholder needs to have high level of awareness on the adverse impact of climate change on all facet of our living.

However, it will be beneficial if Nigerians focuses more attention on environmental friendly chemicals for industrialization and household uses like refrigerant, aerosol etc. that will reduce the problem of ozone layer depletion and safe the future of planet earth and mankind. Since, climate change is a product of greenhouse gases unlike CFCs (Ozone depleting substances) and most of them are not synthetic.

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