



The Menaces of Ozone Layer Depletion and Global Warming in Nigeria

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Abstract: Global warming has remained a universal problem, topic of discussion and a controversial issue among different nations and the scientific community at large. Thus, it is the most severe problem the public is facing today: more serious than the danger of terrorism. The study examines the menaces of ozone layer depletion and global warming in Nigeria. Secondary sources of data were used and the study is guided by the Anthropogenic Global Warming (AGW) Theory. The study discovered that Nigeria is not exempted from the environmental disasters of global warming. The study found that Nigeria generates about 40% of gross national emissions into the atmosphere. The study discovered that aside cancer, exposure to high concentrations of ozone is associated with increased hospital admissions for pneumonia, chronic obstructive pulmonary disease, asthma, allergic rhinitis, and other respiratory diseases, and with premature mortality. The findings of the study revealed that Nigeria, through the land use change and forestry sector generates about 40% of gross national emissions into the atmosphere. The study concludes that Nigeria is going green with the assistance from the United Nation Development Programmes (UNDP) through a project managed by the Ozone Programmes and Management Implementation Unit (OPIAMU), in the Ministry of Environment. The study recommends that climate scientists should advise Nigeria through the Ministry of Environment on how to reduce greenhouse emissions.

Keywords: anthropogenic; climate change; depletion; global warming; greenhouse gas; ozone layer

1. Introduction

Ever since its emergence in the early nineteenth century, global warming has remained a universal problem, the topic of discussion, and a controversial issue among different nations and the scientific community at large (Pasquini & Shearing, 2014).^[1] In addition, climate change, synonymous with global warming (Bashir, 2009; Hulme, 2005)^[2,3] is the most controversial environmental problem facing the world (Huang et al. 2012)^[4] and gains top precedence on international political agendas at the present (EUROBAROMETER, 2008).^[5] Hulme (2005)^[3] illustrates that climate change is the most severe problem the public is facing today: more serious than the danger of terrorism. The special EUROBAROMETER (2008)^[5] report adds that the most somber problems facing the world at present include global warming, poverty, and international terrorism. However, most Europeans agreed that global warming is posing a more serious challenge than any other threat factor. Research reports like Dantas-Torres (2015)^[6] and Addisu et al. (2015)^[7] stated that global warming is undeniable and nearly all experts in the field have reached a consensus that the Earth's climate has changed, is changing, and will continue to change despite any adaptation and mitigation measures. This finding is supported by the works of

Herath (2011)^[8] which says about 83% of the world's scientists believe that the Earth is undergoing global warming. Furthermore, IPCC (2007)^[9] reports that the risks and severity of global warming are even greater than previously realized.

The expedition for human survival, improved standard of living and especially material comfort has made modern humans the perpetrator of the Earth's degradation due to uncontrolled consumption patterns of natural resources, especially energy, and numerous unfavorable environmental behaviors. The industrial advancement in Agriculture, Science, and Technology; all altered some essential natural processes and systems on the earth. The emissions of greenhouse gases as by-products have been inducing the depletion of the ozone layer and global warming over the centuries, which has currently resulted in anthropogenic climate change (World Bank, 2008,^[10] Horton et al., 2018).^[11] Ozone layer depletion is a serious problem facing the earth's surface today and its devastating effect on climate, lives (both plants and animals) and physical environment is global.

Ozone depletion has always been a serious topic of interest for scientists. The ozone layer serves as a protective covering to humans, animals, crops, and aquatic lives. It protects life on earth from absorbing excessive ultraviolet rays. Thinning or reduction of this

layer can lead to excessive absorption of ultraviolet radiation (UV) that could destroy organic matter. Plants and planktons may not survive to play an important role in providing food to man and sea animals. In humans, it can cause skin cancer and eye diseases including cataracts (CEF, 2010).^[12]

The activities of a man like industrial processes and man-made compounds are depleting the ozone layer excessively. These substances are CFCs (chlorofluorocarbons), halons, CH_3CCl_3 (Methyl chloroform), CCl_4 (Carbon tetrachloride), HCFCs (hydrochlorofluorocarbons), hydro Bromo fluorocarbons and methyl bromide (NOAA, 2008).^[13] These gases remain there for a long time and are not washed back by the rain and transferred to the stratosphere where chlorine and bromine are released in the presence of UV radiations. Eventually, chlorine and bromine react with ozone molecules and break them, which results in depletion. Scientists have concluded that these substances would play an active role in destroying the ozone layer for many decades in the future (David, 2010).^[14]

The first time the ozone layer and its consequences were acknowledged was in 1977. Since then, thirty-two countries have participated in Washington D.C. with UNEP (United Nations Environmental Program) (ICF, 2010).^[15] It was noticed that human activities were playing a major role in this depletion and by effect, making the world environmentally dangerous especially for man and for plants and animals. Within this context, this paper seeks to evaluate the menaces of ozone layer depletion and global warming in Nigeria.

To achieve the purpose of this study, the following objectives are set: 1) To assess the environmental menaces of ozone layer depletion and global warming in Nigeria, 2) To ascertain the health implications of ozone layer depletion and global warming in Nigeria, 3) To examine ways Nigeria is contributing to the ozone layer depletion and global warming in the world, and 4) To assess the possible programmes or solutions that Nigeria has engaged in to minimize ozone layer depletion and global warming.

The present study was guided by the following research questions: 1) what are the environmental menaces of ozone layer depletion and global warming in Nigeria? 2) What are the health implications of ozone layer depletion and global warming in Nigeria? 3) In what ways is Nigeria contributing to ozone layer depletion and global warming? and 4) what are the possible programmes or solutions that Nigeria has engaged in to minimize ozone layer depletion and global warming?

2. Literature Review

The ozone layer is a layer in Earth's atmosphere, which contains comparatively high concentrations of ozone (O_3). This layer absorbs 93-99% of the sun's high-frequency ultraviolet light, which is capable of damaging life on earth (Canan & Reichman, 2017).^[16] More than 91% of the ozone in Earth's atmosphere is present here (Canan & Reichman, 2017).^[16] It is mostly located in the lower segment of the stratosphere from approximately 10 km to 50 km above the Earth, even though the thickness varies seasonally and geographically (Hoffmann, 2012).^[17] The ozone layer was discovered in 1913 by the French physicists; Charles Fabry and Henri Buisson. Its properties

were explored in detail by the British meteorologist G. M. B. Dobson, who developed a simple spectrophotometer (the Dobson meter) that could be used to quantify stratospheric ozone from the ground. Between 1928 and 1958, Dobson established a worldwide network of ozone monitoring stations which continues to operate today. The "Dobson unit", is used to measure the total amount of ozone in a column and the unit is named in his honor.

The ozone is a gas made up of three oxygen atoms (O_3), instead of the normal oxygen atom which is two (O_2). Ozone is formed by the action of sunlight on oxygen high in the stratosphere where the air pressure is very low and sunlight very strong. Lower down in the stratosphere, ozone is naturally destroyed in reactions with other atmospheric gases and the ozone layer is a result of the creation and destruction processes. About 300 million tons per day of ozone are involved in this cycle (Fitzka et al, 2012).^[18]

The ozone layer is not a layer in the real sense but has become known as such because most ozone particles are speckled between 19 and 30 kilometers (12 to 30 miles) up in the Earth's atmosphere and in a region called the stratosphere. The concentration of ozone in the ozone layer is usually below 10 parts ozone per million (Safran, 2003).^[19] Without the existence of the ozone layer, a lot of ultraviolet (UV) radiation from the Sun would not be stopped reaching the Earth's surface, causing indescribable damage to most living things (plants and animals). In the 1970s, scientists revealed that chlorofluorocarbons (CFCs) could obliterate ozone in the stratosphere. Ozone is formed in the stratosphere when UV radiation from the Sun strikes molecules of oxygen (O_2) and causes the two oxygen atoms to split apart. If a freed atom bumps into another O_2 , it joins up, forming ozone (O_3). This process is called photolysis. Ozone is also physically broken down in the stratosphere by sunlight and by a chemical reaction with various compounds containing nitrogen, hydrogen, and chlorine. These chemicals all occur naturally in the atmosphere in very minute amounts. In an uncontaminated atmosphere, there is equilibrium between the amount of ozone being produced and the amount of ozone being destroyed. As a result, the total concentration of ozone in the stratosphere remains rather constant. At different temperatures and pressures (i.e. unstable altitudes within the stratosphere), there are different formation and destruction rates. Thus, the amount of ozone within the stratosphere varies according to altitude. The ozone concentrations are highest between 19 and 23 km (Elliot, 2004).^[20]

The ozone layer plays an important role in the support of human lives for continued existence. It is a layer of gas present in an upper part of the atmosphere (stratosphere) which is about 20-48 km above sea level. It contains different forms of oxygen (allotropes) constantly reacting in the presence of UV light. The ozone layer protects planet earth from harmful UV radiation, allowing non-harmful UV rays to the face of the Earth (Bello et al, 2012).^[21] Ozone would still be present near the surface and throughout the troposphere and stratosphere because is a natural component of the pure or uncontaminated atmosphere (Fahey, 2006)^[22] but when it is massively affected and reduced in amount, it leads to depletion of the ozone layer and afterward lead to global warming (Seinfeld & Pandis, 1998).^[23]

Global warming is an increase in the normal temperature of planet earth's atmosphere. This is a result of the release of CO_2 and

other greenhouse gases such as methane, nitrogen oxide, carbon (ii) oxide, and water (CH₄, N₂O₂, 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 are capable of causing harm in large amounts by mans' activities (Bello et al, n.d).^[21] The release and increase of these gases cause earth warming and keep the earth warmer than it would otherwise be. Just a few degrees Celsius of warming can cause major problems as a rise in sea level, precipitation patterns shift, wind and ocean current, submerging coastal cities, and some living things going extinct as climate changes as a result of the difficulty in adaptation.

Studies by Seinfeld and Pandis (1998)^[23] and IPCC (2007)^[9] indicated that the ozone layer is becoming thinner and thinner thus decreasing in its potential and potency of both acting as a blanket shielding the earth's surface from UV radiations as well as acting as a filter to dangerous rays. Ozone layer depletion is mainly caused by greenhouse gases like chlorofluorocarbons (CFCs), volatile organic compounds, sulphur (iv) oxide, nitrogen (iv) oxide, carbon (iv), methane, water vapour, etc. These gases are usually emitted as industrial wastes and human activities. When the ozone layer is depleted, UV and infrared radiation go directly to the earth's surface heating the lower atmosphere and causing global warming (Agbogidi, 2011).^[24]

The ozone layer is depleting and UV radiation is increasing, which is playing an active role to cause severe health problems. These radiations have acute and chronic health effects e.g. skin redness, tanning, and peeling while on the other hand, it causes photokeratitis, photo conjunctivitis, and Chemosis in the eyes which are simply known as swelling. These radiations cause non-melanoma cancers in the light-skinned population. It has been proven that these radiations are also playing a major role in causing melanoma skin cancers and the rate of these cancers has been increasing radically over the last twenty years. Exposed areas especially the head, neck, arms, and hands are more prone to have it. Non-melanoma skin cancers including basal cell and squamous cell carcinomas are most common in the United States (Norval, 2007).^[25] Anthropogenic activities like the burning of coal, oil, and natural gas, deforestation, and various industrial practices are changing the composition of the atmosphere and contributing to global warming (Nsikakabasi, 2008).^[26]

3. Global Warming in Nigeria

Accessible evidence shows that global warming will be universal, likewise its impacts, but the raw effects will be felt more by the developing countries, especially those in Africa, due to their low level of coping abilities (Nwafor, 2007; Jagtap, 2007).^[27,28] Nigeria is one such developing country. Researchers have shown that Nigeria is already being overwhelmed with assorted ecological problems, which have been directly linked to the current global warming (Chindu & Nyelong, 2004; Mshelia, 2005; Ayuba et.al, 2007),^[29-31] while Odjugo (2001,2005)^[32,33] observed erratic pattern of weather elements in Nigeria. Odjugo and Ikhuria (2003)^[34] also show that global warming is seriously impacting and devastating the Northeastern part of Nigeria.

Global warming and decreasing precipitation in most parts of the world are the greatest impacts of climate change. These bring about either negative or positive environmental impacts in different parts of the world. The increasing global warming has led to increased land-based ice instability and its melting. The thawing of the arctic, cool and cold temperature ice, the increased rainfall in some parts of the world, and spreading out of the oceans as the water warms has started impacting on sea level, coastal deluge, and erosion. The current global estimate of sea-level rise is 0.2m and it is projected to increase to 1m by 2100 (Bush et al., 2002; Hengeveld & Whitewood, 2005).^[35,36] The implication is that the present 0.2m sea level rise has inundated 3,400 km² of the coastal region of Nigeria, and if the sea level rise attains the projected 1m on or before 2100 then 18,400 km² of the coastal region may be flooded (NEST, 2003).^[37] Some of the coastal regions in Nigeria like Bonny, Forcados, Lagos, Port Harcourt, Warri, and Calabar among others that are less than 10m above the sea level would be seriously threatened by a meter rise in sea level. It is expected that a meter rise in sea level will displace about 14 million people from the coastal areas of Nigeria (Abu, 2007).^[38]

The increase in temperature as a result of the depletion of the ozone layer has impacted Nigeria's climate as well as the health of its populace. Water resources are extremely vulnerable. Incidences of meningitis have been on the increase in Nigeria for the past ten years as a result of excessive heat (global warming) (Akingbade, 2010).^[39] In 2011, it was unbearably hot in Nigeria and countries in sub-Saharan Africa. In Nigeria, the eleven frontier states in the north that have suffered from desert encroachment have been suffering from heat-related ailments. Investigation revealed that more than 200 people were killed by meningitis in Nigeria in one week in the year 2010. There was a record of an outbreak of meningitis and in 76 areas; there were 25,000 suspected cases and 1,500 deaths in the first quarter of 2009. Apart from heat rashes that had been noticed amongst the population within the period of intense heat, there has been a rise in Tuberculosis (TB) in the past (Macaulay, 2010).^[40]

4. Empirical Review

Studies such as Mann (2009)^[41] and Villar and Krosnick (2011)^[42] found out that global warming and climate change are not synonymous although they are often used interchangeably. As a result, the subjects of global warming and climate change have become parts of both the popular word list and the public discussion (Mann, 2009).^[41] Climate change appeared in the scientific writing before the term global warming and it was used for more than forty years while global warming was not used until the 1970s (Mann, 2009; Villar & Krosnick, 2011).^[41,42] According to Maibach (2014),^[43] climate change can be seen as consisting of two components, one of which is anthropogenic and the other which is natural and plays a role in past and present climate fluctuations. Global warming on the other hand refers to the anthropogenic component of climate change alone and only the surface warming associated with it. Global warming refers to the increase in the Earth's average surface temperature since the Industrial Revolution is primarily due to the emission of greenhouse gases from the burning of fossil fuels and land-use change. Climate change, on the other hand, refers to the

continuing change of the Earth's climate including changes in temperature, precipitation, and wind patterns over several decades or longer (Maibach, 2014).^[43] Villar and Krosnick (2011)^[42] pointed out that global warming is a more serious problem than climate change. According to them, global warming was rated more important and of greater concern than climate change. Climate change is less terrifying and sounds like a more controllable challenge than global warming.

In the 1980s, greenhouse gas was the dominant topic and in the mid-1990s, it was replaced by a more specific term climate change, which soon becomes global warming at present. Sufficient scientific research works (Berry et al., 2016;^[44] Brönnimann, 2002;^[45] IPCC, 2007;^[9] Oreskes & Conway, 2008;^[46] The Royal Society, 2014)^[47] dispute that the theory of anthropogenic warming began with the Industrial Revolution in the late 18th century, with gradual increases in greenhouse gas emissions. Similarly, IPCC (2007)^[9] claims that it is very likely, probably greater than 90% confidence that the issue of global warming vis-à-vis climate change emerged from the 1950s onwards and is associated with the Industrial Revolution.

The same report concludes that the atmospheric concentrations of carbon (iv) oxide, CO₂, and methane, CH₄ in 2005 surpasses by far the natural range over the last 650,000 years and there is high certainty that the global average net effect of human activities increased because of the Industrial Revolution. The Royal Society (2014)^[47] stated that Earth's average air temperature has increased since 1880; with much of this increase taking place since the mid-1970s when global energy consumption increased due to the Industrial Revolution.

In an indisputable scientific agreement on global warming, Miller (2000)^[48] comments that the earth's global average temperature has been rising over the past century and much of this increase has been ascribed to human activities, primarily the burning of fossil fuels during the era of industrializations. Since then, the theory of global warming is now generally used to refer to the increase in the average surface temperature of the earth as a result of human activities and in particular, the concentration of greenhouse gases (carbon dioxide, methane, and nitrous oxide) in the atmosphere (Khandekar et al., 2005).^[49] Hence, anthropogenic global warming holds that greenhouse gases, primarily carbon dioxide is mainly human in origin (Weber & Stern, 2011; Muhammad, 2013).^[50,51] It is now more certain than ever, based on many lines of evidence that humans are changing the earth's climate through global warming (Lupo, 2008; The National Academy of Sciences, 2009).^[52,53] Also, Doran and Zimmerman cited in Whitmarsh (2011)^[54] validated that 97% of climate scientists collectively agreed that human activities tremendously contribute to global warming.

5. Theoretical Framework

This study is guided by the Anthropogenic Global Warming (AGW) Theory. The Anthropogenic Global Theory was propounded by the English steam engineer and inventor, Guy Stewart Callendar (1898-1964) (Mann, 2018).^[55] When he developed the theory, he connected the rising carbon dioxide concentrations in the atmosphere to global temperature. He was the first person that demonstrates that the Earth's land temperature over the previous 50

years (Jones et al., 2013).^[56] The theory proposes that human emissions of greenhouse gases, particularly carbon dioxide (CO₂), methane and nitrous oxide, are causing a dangerous rise in global temperatures. How this happens is called the enhanced greenhouse effect. This theory is called "anthropogenic global warming (AGW). The energy of the solar system travels through space and reaches Earth. Earth's atmosphere is mostly transparent to the arriving sunlight, allowing it to reach the planet's surface where some of it is absorbed and some are reflected as heat out into the atmosphere (Bast, 2010).^[57] Certain gases in the atmosphere, called "greenhouse gases," absorb the outgoing reflected or internal heat radiation, resulting in Earth's atmosphere becoming warmer than it should be in the normal circumstance.

Water vapour is considered as the major greenhouse gas, responsible for about 36 to 90 percent of the greenhouse effects, followed by CO₂ (<1 to 26 percent), methane (4 to 9 percent), and ozone (3 to 7 percent) (IPCC, 2007).^[9] During the past century, human activities such as burning wood, fossil fuels, and cutting down or burning forests are considered to have increased the concentration of CO₂ in the atmosphere by approximately 50 percent. The Continual burning of fossil fuels and deforestation could double the amount of CO₂ in the atmosphere in the next 100 years if natural "sinks" don't grow at pace with emissions (Menon et al., 2007).^[58]

The Earth's climate also responds to numerous types of external influences, such as a discrepancy in solar radiation and the planet's orbit, but these "forcings," according to the proponents of AGW, cannot explain the rise in Earth's temperature over the past 30 years. The forcing caused directly by man-made greenhouse gases is also small, but the AGW theory states that positive feedbacks increase the effects of these gases between two- and four-folds (Algere, 2006).^[59] A small increase in temperature causes more evaporation, which places more water vapour in the atmosphere, thereby causing more warming. Global warming may also lead to less ice and snow cover, which would lead to more exposed ground and open water, which on average are less reflective than snow and ice and thus absorb more solar radiation, which would cause more warming. Warming also might activate the release of methane from frozen peat bogs and CO₂ from the oceans (IPCC, 2007).^[9]

Supporters of the AGW theory challenge the ~0.7°C warming of the past century-and-a-half and ~0.5°C of the past 30 years, saying that it is mostly attributable to man-made greenhouse gases. They dispute the claims that some or perhaps the entire rise could be as a result of Earth's continuing recovery from the Little Ice Age (1400-1800). They use computer models based on physical principles, theories, and assumptions to envisage that a doubling of CO₂ in the atmosphere would cause Earth's temperature to rise an additional 3.0°C (5.4°F) by 2100 (Bast, 2010).^[57] When these climate models are run "backward" they tend to predict more warming than has occurred, but this, the theory's supporters argued that it is due to the cooling effects of aerosols and soot which are also products of fossil fuel combustion. Proponents of the AGW theory believe manmade CO₂ is responsible for occurrences like floods, droughts, severe weather, crop failures, species extinctions, the spread of diseases, ocean coral bleaching, famines, and hundreds of other catastrophes. According to them, all these disasters will become

more frequent and severe as temperatures continue to rise. Therefore, only rapid and huge reductions in human emissions will save the planet from these disastrous events. Thus, the theory is considered in this study.

6. Methodology

The study is conducted based on information derived from secondary sources such as significant texts, journals, newspapers, official publications, historical documents, and the Internet. However, the research was strictly limited to available or recorded information about ozone, ozone layer depletion, and effects of ozone layer depletion, global warming, and its effects that can be found in scholarly journals, books, the internet, and libraries. The method was used to appraise findings with other existing findings on the subject matter under consideration. The study also adopts content analysis as its method of analysis. The method here is to sift the findings in the works available for this research, check the consistency of the opinions of the authors in the different kinds of literature, and evaluate such findings or opinions with other existing findings in other literature. Through these methods, the study draws inferences from the data generated in the course of the study.

6.1. Findings and Discussions

Based on the stated research objectives, the findings and discussions are purely based on the study objectives. The following objectives in the study are discussed as follows:

6.1.1. The environmental menaces of ozone layer depletion and global warming in Nigeria:

Just as global warming has become a catastrophic phenomenon in the universe, Nigeria is not exempted from its environmental disasters. Below are some of the negative environmental impacts of ozone layer depletion and global warming in the country.

- The diminution in the edge size arid depth levels of significant lakes like Lake Chad and the decline in river water through-put in some of the rivers shows that inland water bodies in Nigeria are drying up progressively which has a high negative impact on domestic usage of water (Ladan, 2014).^[60]
- An increase in drought-like conditions especially in the extreme Northern parts has created a harmful impact on food and agricultural production with consequential depletion of income which in turn results in increased poverty, hunger, and starvation.
- Ojo (2000)^[61] states that with the rise of one meter in sea level of Niger Delta area, the main origin of petroleum resources in which Nigeria economy largely depend will render more than 15,000 km² of land at risk, while soil erosion may claim more than 300 km² with a sea-level rise of 0.3 meters. The land loss due to deluge may exceed 7,000 km² while that due to erosion may be up to 120 km² which could lead to the displacement of about 2-3 million people in the Niger Delta State of Nigeria if it occurred. It has also been appraised that along the coastline of Niger

Delta alone about 110 villages with values of 35 billion USD and about 500 villages with values worth 175 million USD would be impacted with a sea-level rise of about 0.2 and 1.0 million respectively.

- River Niger which has been the dependable resource of Kanji Dam raw material for electricity generation has experienced a great level of dryness over the past 15 years.
- The indiscriminate removal of trees for fuel wood will continue to contribute to the increasing rate of deforestation. Since the trees that convert CO₂ to O₂ are been cut down there would be the continual release of CO₂ to the stratosphere and this will lead to continuous depletion of the ozone layer.
- Increased incidence of flooding and habitat devastation due to irregular and storm burdened rainfall complicates the poor sanitation infrastructure thereby resulting in a high increase of water-borne- diseases like Cholera and Vector-borne diseases like malaria in the country (Ancha et al, 2008).^[62]

A study by Ojo (2000)^[61] shows that due to the characteristics nature of Lagos State (mainly lowland below 5 metres), if adequate response measures are not taken, considerable physical, ecological and socio-economic losses would be incurred with the estimated 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 flooded.

- To ascertain the health implications of ozone layer depletion and global warming in Nigeria.
- A decline in the concentration of stratospheric ozone enhances the solar ultraviolet (UV) radiation, which is detrimental to the growth of the plant and various other metabolic processes of the organisms and might cause changes in pigments concentrations, nucleic acids, and proteins (Bornman et al, 2015).^[63] Moreover, exposure to high concentrations of ozone is associated with increased hospital admissions for pneumonia, chronic obstructive pulmonary disease, asthma, allergic rhinitis, and other respiratory diseases, and with premature mortality (Vinikoor-Imler et al, 2014; Kahle et al, 2015).^[64,65]

The two effects of ozone on the temperature balance of the earth are the absorption of solar UV radiations and the infrared radiations emitted by the earth's surface. UV rays are of different kinds due to their different strength and penetrating ability which ranges from 400nm to 100nm. Major types are ultraviolet A (UVA), ultraviolet B (UVB), and ultraviolet C (UVC). UVA and UVB are more powerful because they can penetrate the skin, damage it, and can lead to skin cancer. Furthermore, UVC does not get through our atmosphere and sunlight so there is no proof against them of causing any health illness (American Cancer Society, 2015).^[66]

The depletion of the stratospheric ozone is increasingly causing serious health problems like skin redness, tanning, and peeling while on the other hand, it causes photokeratitis, photo conjunctivitis, and Chemosis in the eyes which are simply recognized as swelling. The increase in UV radiations causes non-melanoma cancers in the light-skinned population. It has been proofed that these radiations are also playing a key role in causing melanoma skin cancers. Exposed areas particularly the head, neck, arms, and hands are more prone to

have it. Non-melanoma skin cancers including basal cell and squamous cell carcinomas are most frequent in the United States (Norval, 2007).^[25] Similarly, for eyes, long-term exposure to UV rays lead to cataract (clouding of the eye's lens) of the posterior and subscapular forms. UV-B radiation at 280-320 nm is a risk factor for cortical cataracts. Other eye effects are squamous cell cancer of the cornea and conjunctiva. Experiments have shown that UV radiations reduce the immunity towards skin cancer, infectious agents, and other antigens (Sivasakthivel & Reddy, 2011).^[67]

To examine ways Nigeria is contributing to the ozone layer depletion and global warming in the world:

Nigeria is contributing significantly to greenhouse emissions. Particularly, land-use change and the forestry sector generate about 40% of gross national emissions into the atmosphere. Also, sources of CO₂ emission are gas flaring and transportation which account for 20% and 30% respectively. 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 global warming (Nsikakabasi et al, 2008).^[26] In addition, removing trees by burning is a common practice in developing countries like Nigeria. This releases CO₂ into the atmosphere and prevents forests from impounding carbon in the future. The pasture or cropland that replaces the forest lacks the shade created by a forest canopy and tends to be warmer. The IPCC has estimated that between one-quarter and one-third of anthropogenic CO₂ emissions are due to deforestation and not necessarily the burning of fossil fuels (IPCC, 2007).^[9] It also stated that the anthropogenic cause of climate change involves human activities that either discharge huge amounts of greenhouse gasses into the atmosphere that depletes the ozone layer or activities that decrease the number of carbons absorbed from the atmosphere. The human factors that emit great amounts of greenhouse gasses include industrialization, burning of fossil fuel, gas flaring, urbanization, and agriculture.

Research conducted by Onwubiko et al, (2014),^[68] assesses the preference of consumers for ozone-friendly products and the extent to which the products have gained acceptance in the marketplace. The findings showed that the consumers preferred the ozone-depleting substances to the ozone-friendly products. This proves that green products have not gained much market acceptance when compared with conventional (ozone-depleting substances) products. The implication is that consumers would likely utilize the ozone-depleting substances or products if available in the market which may affect the ozone layer and contribute to global warming. Anthropogenic challenges are caused mainly by human interference with the environment. Miller and Spoolman (2011)^[69] identified growth in population, wasteful and indefensible resource use, poverty, as well as insufficient knowledge of how nature works as the major causes of global warming. Also, Ofomata and Phil-Eze (2007)^[70] identified the poor application of the principles of environmental management as a major cause of some of the environmental challenges and global warming in Nigeria.

To assess the possible programmes or solutions that Nigeria has engaged in to minimize ozone layer depletion and global warming:

The increasing concern or fear for the causes and effects of ozone depletion led to the signing of the Montréal Protocol in 1987. The Protocol calls on nations around the world to take solid actions to protect the ozone layer by reducing and eliminating the production and utilization of ozone-depleting substances. Nigeria agreed to both the Montreal Protocol on substances that deplete the ozone layer and the Vienna Convention for the protection of the ozone layer on 31st October 1989 (Bayero, 2003). The international policy response to this environmental threat of ozone layer depletion led to the declaration of 15th September of every year as the ozone layer protection day.

Nigeria is not an exemption from the global management for environmental protection of the ozone layer. One of the topical environmental establishments in the country is the National Environmental Standards and Regulation Enforcement Agency Act, 2007. The Act authorizes the Minister of Environment to make a set of laws for the general purpose of carrying out or giving effect to environmental protection in Nigeria. With a view to ozone layer depletion, the Minister has made a bylaw contained in the National Environmental (Ozone Layer Protection) Regulations, 2009 which provided for the phasing out of the use of destructive substances.

Ozone-depleting substances legislation was enacted in Nigeria to hamper trade in ozone-depleting substances, ban the importation of refrigerators and air conditioners using CFC, refill and use of fire extinguishers with halon, disallow CFC -II and XII as blowing agent or refrigerant, and declaring of controlled substances, provision of storage facility and disposal of the controlled substances. There was a placement of ban on importation of used refrigerators, air conditioners, and cars older than eight years. This is because evidence abounds that all second-hand refrigerators, cars, and air conditioners imported into the country contained gases that damage the ozone layer. The collaboration of the Federal Government of Nigeria (FGN) with the United Nations Development Programme (UNDP) and the United Nations Industrial ozone harmful substances has also been sensitized and their factories restructured with adequate technological tools for ozone friendly materials. Members of the branches of the Nigerian Association of Refrigeration and Air Conditioning Practitioners from 17 of the 36 States of Nigeria and the Federal Capital Territory were trained on how to convert CFC-based domestic refrigerators to non-ozone harmful ones (UNDP, 2011).^[71] Development Organization (UNIDO) facilitated the programme of phasing out about 3075.71 metric tons of ozone-depleting substances in the Foam, Refrigeration/Air-Conditioning, Halon Aerosol, and Solvent firms in Nigeria (Bayero, 2003).

Nigeria is going green with assistance from the United Nations Development Programme (UNDP) through a project managed by the Ozone Programme and Management Implementation Unit (OPIAMU), in the Ministry of Environment. The drive of the project is to get both the refrigerator manufacturers and the various associations of second-hand fridges and air conditioners traders to change from the CFCs to a more ozone-friendly substance.

7. Conclusions

Global warming has remained a universal problem, the topic of discussion, and a controversial issue among different nations and the

scientific community at large. It is, therefore, the most severe problem the public is facing today: more serious than the danger of terrorism. Thus, the study found that Nigeria is not exempted from the environmental disasters of global warming. The finding of the study also revealed that an increase in drought-like conditions, especially in the extreme Northern parts, has created a harmful impact on food and agricultural production, resulting in increased poverty, hunger, and starvation. The study discovered that aside from cancer, exposure to high concentrations of ozone is associated with increased hospital admissions for pneumonia, chronic obstructive pulmonary disease, asthma, allergic rhinitis, and other respiratory diseases, and premature mortality. The study also discovered that Nigeria, through the land-use change and forestry sector generates about 40% of gross national emissions into the atmosphere. The findings of the study revealed that Nigeria agreed to both the Montreal Protocol on substances that deplete the ozone layer and the Vienna Convention for the protection of the ozone layer on 31st October 1989. The study concludes that Nigeria is going green with assistance from the United Nations Development Programme (UNDP) through a project managed by the Ozone Programme and Management Implementation Unit (OPIAMU), in the Ministry of Environment.

Recommendations

Based on the findings, the following recommendations are put forward:

1. The study recommends that the Ozone Programme and Management Implementation Unit (OPIAMU), in the Ministry of Environment should see to it proper implementation of its bylaws on indiscriminate felling of trees.
2. Since the study discovered that Nigeria, through the land-use change and forestry sector generates about 40% of gross national emissions into the atmosphere, the study recommends that climate scientists should advise Nigeria through the Ministry of Environment on how to reduce greenhouse emissions.
3. The study also recommends that the Federal Government, through the Ministry of Food and Agriculture and the Ministry of Humanitarian Affairs, Disaster Management, and Social Development should liaise to boost the production of food in the country to alleviate hunger, starvation, and poverty.
4. Finally, the study recommends that the Nigeria Hydrological Services Agency (NIHA) should put proactive measures in place to prevent flooding in the Niger Delta areas and coastal state like Lagos.

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Authors Contribution

Conceptualization and empirical review was conducted by Aonover Eric Msughter. Theoretical and methodology was established by Aruaye Afeye Obada as well as Data analysis. Also, writing original draft preparation and review the article was done by Alhaji Musa Liman.

Conflicts of Interest

The authors declare no conflict of interest.

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