IMPACT OF CLIMATE CHANGE ON AFRICA

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Abstract
One of the greatest problems facing mankind is that of climate change. This ecological problem is of great concern to human beings because it has adverse effects ranging from effects on human contents to effects on non-human contents in the environment. Climate change refers to some alterations in the climate system and this is caused mainly by the activities of human beings. Global warming is a term that is closely related to climate change and it refers to the gradual increase in the average temperature of earth's atmosphere and its oceans and this change is permanently changing earth's climate forever.[1] The effects and impacts of this phenomenon is seen, noticed and felt in all countries and continents of the world including Africa. An example of this is seen in the southern part of Nigeria where gulley erosion has devastated many settlement areas and farmlands, leading to poverty among the local populations. This work therefore, is geared towards exposing the impacts of climate change on Africa with particular focus on Nigeria.
Keywords: Global warming, Environment, Climate Change, Ecology

Introduction

The human race from earliest times has suffered from a lot of existential problems. One of the greatest problems facing mankind is that of climate change. This ecological problem is of great concern to human beings because it has adverse effects ranging from effects on human contents to effects on non-human

[1] A.A. Idowu, S.O Ayoola, A. I Opele, N.B Ikenweiwe, "Impact of Climate Change in Nigeria", *Iranica Journal of Energy & Environment 2* (2011) p.145

contents in the environment. Climate change refers to some alterations in the climate system and this is caused mainly by the activities of human beings. Global warming is a term that is closely related to climate change and it refers to the gradual increase in the average temperature of earth's atmosphere and its oceans and this change is permanently changing earth's climate forever.[2] The effects and impacts of this phenomenon is seen, noticed and felt in all countries and continents of the world including Africa. An example of this is seen in the southern part of Nigeria where gulley erosion has devastated many settlement areas and farmlands, leading to poverty among the local populations. This work therefore, is geared towards exposing the impacts of climate change on Africa with particular focus on Nigeria.

The Notion Of Climate Change

Climate refers to the weather conditions prevailing in an area in general or over a long period. Climate means the usual condition of the temperature, humidity, atmospheric pressure, wind, rainfall, and other meteorological elements in area of the earth's surface for a long time.[3] It is pertinent to note that climate is not the same thing as weather. Whereas weather is the condition of the atmosphere of a particular place over a short period of time, climate is the weather pattern, using statistical data, of a place over a long enough period to yield meaningful averages.[4] Change in weather may not be harmful but change in climate is very harmful.

The most general definition of climate change is a change in the statistical properties of the climate system when considered over long periods of time, regardless of cause. Climate change is a rise in average surface temperatures on earth. It is a change in the statistical distribution of weather patterns when that change lasts for an extended period of time (i.e., decades to millions of years). The Environmental Protection Agency (EPA) defines climate change as "any significant change in the measures of climate lasting for an extended period of time."[5] The term 'climate change' is often used to refer specifically to anthropogenic climate change. Anthropogenic climate change is caused by human activity as opposed to the ones caused by natural processes. Finally,

[2] A.A. Idowu, S.O Ayoola, A. I Opele, N.B Ikenweiwe, "Impact of Climate Change in Nigeria", *Iranica Journal of Energy & Environment 2* (2011) p.145

[3] Wikipedia, "Climate", https://simple.m.wikipedia.org/wiki/climate, (Accessed: 27.11.2019)

[4] Wikipedia, "Weather and Climate", https://en.m.wikipedia.org/wiki/Weather and climate , (Accessed: 27.11.2019)

[5] EPA, "Climate Change: Basic Information", https://www.epa.gov., (Accessed: 27.11.2019.)

climate change is now used as both a technical description of the process, as well as the noun used to describe the problem.[6]

Causes Of Climate Change

It has been argued that human beings are undoubtedly the major causes of climate change. Other natural factors like volcanoes, variations in sun's energy, decay of organic matter etc. also contribute to climate change. Therefore, in this subsection, we shall take a look at the causes of climate change under two major subheadings: human and non-human causes.

Human Causes

Below are some of the causes of climate change that can be attributed to the human person:

1. **Industrialisation:** In its Fifth Assessment Report, the Intergovernmental Panel on Climate Change, a group of 1,300 independent scientific experts from countries all over the world under the auspices of the United Nations, concluded that there is a more than 95 percent probability that human activities over the past 50 years have warmed our planet. The industrial activities that our modern civilization depends upon have raised atmospheric carbon dioxide levels from 280 parts per million to 400 parts per million in the last 150 years.[7] Since the industrial revolution in 1700, the level of carbon dioxide on earth has increased by 34%. This is a clear indication of the negative effects of industrialisation on our ecology.

   The major source of energy for most factories and machines is the burning or combustion of fossil fuels which release potential greenhouse gases like methane (CH_4), CO_2, etc. Fossil fuels are natural fuels like gas formed in the geological past from living organisms. Pollution whether it is vehicular, electrical or industrial is a main contributor to global warming. Everyday billions of vehicles release various gases into the atmosphere. Electricity also causes pollution in many ways. Over 75% of the electricity worldwide is produced by burning of fossil fuels like coal. Coal is the major fuel that is burnt to produce power. Coal produces around 1.7 times as much carbon dioxide per unit of energy when flamed as does natural gas and 1.25 times as much as oil. Other fossil fuels burnt to provide

[6] M. Hulme, *Concept of climate change, (*USA: Blackwell,2016) p.34
[7] Nasa, "Causes of climate change", https://climate.nasa.gov/causes/, (Accessed: 27.11.2019)

power for machines, plants and cars include: fuel, kerosene, gasoline etc. Also, mineral exploration processes like mining and oil drilling are included here. As these compounds burn they release greenhouse gases like methane which contribute in a great manner to the warming up of our planet. They not only increase greenhouse gases but are also responsible for large scale deaths due to asthma and other respiratory diseases.

2. **Deforestation**: Deforestation particularly man-made is the cutting down of trees and forest vegetation, for economic, residential, industrial or agricultural purposes. Plants play an important role in regulating the climate because they absorb carbon dioxide from the air and release oxygen back into it. However, it is sad that people clear vast areas of vegetation around the world for farming, urban and infrastructure development or to sell tree products like timber and palm oil. When vegetation is removed or burnt, the stored carbon is released back into the atmosphere as CO2, contributing to climate change. Up to one-fifth of global greenhouse gas pollution comes from deforestation and forest degradation.

3. **Population Influence:** Another cause of climate change is the influence of over population. Since carbon dioxide contributes to climate change, the increase in population makes the problem worse because we breathe out more carbon dioxide in the atmosphere. More people means more demand for food, more carbon dioxide in the atmosphere, more demand for cars and more demand for homes. More demand for food will lead to more transportation since movement of goods and services is done by transportation sector. More demand for cars means more pollution in the air and more traffic on the roads which means longer waiting time on the traffic lights and that will result in burning of more fuel. More demand for homes means cutting down of plants and trees to make way for homes, schools and colleges. This factor is in congruence with the philosophy of Paul Ehrlich as portrayed in his work *Population Bomb* where he conveyed his fear that the population growth of humanity is threatening life support system.

4. **WAR**: During war situations a lot of combustive bombs are detonated. Long range missiles and ICBM (inter-continental ballistic missile) are dispatched. Again the locations where these bombs are detonated go up in flames burning houses, buildings, forests etc. the smoke from all these put

together contain carbon dioxide which is a greenhouse gas. In such a manner, wars contribute its own quota to the problem of climate change.

5. **AGRICULTURE VIS-À-VIS ANIMAL REARING:** Animals particularly livestock like sheep and cattle, produce methane, a greenhouse gas. When livestock are grazed at a large scale, as in Australia, the amount of methane produced is a big contributor to climate change. Some fertilisers that farmers use also release nitrous oxide, which is another greenhouse gas. Nitrous oxide (N_2O) is 300 times more dangerous than carbon dioxide. The EPA (Environmental Protection Agency) strongly warns that the farming industry's use of fertilizer is one of the leading causes of global warming[8].

Non-Human Causes

There are some non-human causes of climate change as outlined below:

1. **Volcanic Eruption:** A volcano is a naturally occurring opening in the surface of the earth through which molten, gaseous and solid minerals are ejected. Volcanoes are usually cone shaped mountains or hills. The principle is that as a result of the pressure and heat in the crust of the earth,magma (i.e. molten rock) rises through cracks or weaknesses in the earth's crust. When this pressure is released, e.g. as a result of plate movement, magma explodes to the surface causing a volcanic eruption. The lava from the eruption then cools to form new crust. Over time, after several eruptions, the rock builds up and a volcano forms. However, what concerns us here is not the rock formed but the gases emitted during the eruption. Volcanic eruptions inject enormous quantities of dust and gases into the upper atmosphere. Large amounts of sulphur dioxide are included which through photochemical reactions using the sun's energy are transformed to sulphuric acid and particles.[9] Typically, these particles remain in the atmosphere forming part of the greenhouse gases which eventually cause global warming For example, two major volcanic eruptions, El Chichon in 1982 and Pinatubo in 1991, pumped sulphur dioxide gas high into the atmosphere. The gas was converted into tiny particles that lingered for more than a year, reflecting sunlight and

[8] EPA, "Causes of Global warming", https://www.conserve-energy-future.com/GlobalWarmingCauses.php, (Accessed: 27.11.2019)

[9] J. Houghton, *Global Warming: The Complete Briefing*, (Cambridge University Press: Cambridge, 2001), pp 5-6

shading Earth's surface. Temperatures across the globe dipped for two to three years.[10]

2. **Position of the Earth Vis-A-Vis Earth's Orbit and Axis:** This refers to the changes in the position of the earth as it rotates on its axis and revolves around the sun. This in turn goes on to determine when and where sunlight falls on the earth's surface. These fluctuations in the earth's orbit around the sun are known as the Milankovitch cycles**.** The principle is that it determines the amount of solar energy reaching the earth from the sun, thus having an adverse effect on climate by changing the seasonal and latitudinal distribution of incoming solar energy at Earth's surface. During the last few thousand years, this phenomenon contributed to a slow cooling trend at high latitudes of the Northern Hemisphere during summer, a trend that was reversed by greenhouse-gas-induced warming during the 20th century.[11]Again, another effect of this positioning of the earth is that some regions receive more sunlight than the others for example the regions in the equator. This makes the region hotter, increasing the chances of warming in that area. It worsens if these areas are sites of heavy industrialisation, for the effects of ozone layer depletion will be highly felt, thereby increasing the greenhouse effect in these areas.

3. **Variation in the Sun's Energy Output:** Variations in the energy produced in the sun itself have alternately increased and decreased the amount of solar energy reaching the earth. The rate at which energy from the Sun reaches the top of Earth's atmosphere is called "total solar irradiance" (or TSI). TSI fluctuates slightly from day to day and week to week.[12] In addition to these rapid, short-term fluctuations, there is an 11-year cycle in TSI measurements related to **"**sunspots**"** (a part of the Sun's surface that is temporarily cooler and darker than its neighbouring regions). When the sun is at its peak, it is known as solar maxima, and when it is at its average, it is known as solar minima. Direct measurements of solar irradiance, or solar output, have been available from satellites only since the late 1970s. These measurements show a very small peak-to-peak variation in solar irradiance (roughly 0.1 percent of the 1,366 watts per

[10]Nasa, "Global warming", https://earthobservatory.nasa.gov/Features/GlobalWarming/page4.php, (Accessed: 27.11.2019)
[11]Wikipedia, "Global warming:, https://en.wikipedia.org/wiki/Global_warming, (Accessed:27.11.2019)
[12] "Impacts of Global warming", http://www.ucsusa.org/global-warming/science-and-impacts/science/effect-of-sun-on-climate-faq.html#bf-toc-1(Accessed: 27.11.2019)

square metre received at the top of the atmosphere, for approximately 0.12 watt per square metre). However, indirect measures of solar activity are available from historical sunspot measurements dating back through the early 17th century. However, the effect of the amount of energy produced by the sun on global warming is so pronounced that a decrease in solar activity is thought to have triggered the Little Ice Age between approximately 1650 and 1850, when Greenland was largely cut off by ice from 1410 to the 1720s and glaciers advanced in the Alps.[13]

4. **Decay of Organic Matter and Waste Products from Respiration of Animals**: The gradual decomposition of organic matter brings about the presence of greenhouse gases in the atmosphere for during this process, they release as CO_2, the carbon they stored during their lifetime. Animals on the other hand are to take in oxygen while giving out CO_2 during respiration. Worthy of note is the fact that nature balances the effects of minor causes of greenhouse gases such as these through sets of physical, chemical, or biological processes, called "sinks," that removes CO_2 from the atmosphere.

5. **Water Cycle Process:** The effect of this process is that it contributes to the presence of water vapor in the atmosphere which is the most abundant greenhouse gas in the atmosphere. When the earth heats up, vapor from the oceans and seas rise up to the atmosphere thus acting as greenhouse gases.

It is important to note here that although these natural causes are still in play today, their influence is too small and they occur too slowly to explain the rapid warming seen in recent decades.

Impacts Of Climate Change On Africa: The Nigerian Experience

Climate change is an existential problem and its effect is felt and seen in all parts of the world including Nigeria. Nigeria, as a developing country with population of more than 200 million has been adversely impacted by climate change due to its vulnerability and low coping capability.[14] Evidences have shown that climate change impacts on Nigeria arise from various climate change- related causes

[13]Nasa, *O*p. Cit.,

[14] Ruth During, "Impact of Climate change on Health in Nigeria", https://allafrica.com/stories/, (Accessed: 28.11.2019)

such as increase in temperature, rainfall, sea level rise, extreme weather events, flooding etc.[15]Its negative effects are seen on humans, on the environment and on the economy.

On Human Beings

There are some negative impacts of climate change on humans being. These changes, especially as observed in Nigeria, threaten human life by affecting the food we eat, the water we drink, the air we breathe, and the weather we experience.

1. **Heat Wave:** It is a prolonged period of abnormally hot weather. Increased warming of the earth brings about heat waves among the population on the earth. Exposure to extreme heat can lead to heat stroke and dehydration, as well as cardiovascular, respiratory, and cerebrovascular disease. Excessive heat is more likely to affect populations in northern latitudes where people are less prepared to cope with excessive temperatures. Heat waves are also often accompanied by periods of stagnant air, leading to increases in air pollution and associated health effects. This is the case in the northern parts of Nigeria.

2. **Physical and Mental Health:** Another impact of climate change on human health is the increased spreading of diseases in a warmer world. Many insect carriers of disease thrive better in warmer and wetter conditions. For instance, epidemics of diseases such as viral encephalitides carried by mosquitoes are known to be associated with unusually wet conditions which occur in the Australian, American and African continents associated with different phases of the El-Nino cycle. Some diseases currently largely confined to tropical regions can spread into the mid-latitudes under warm conditions. Malaria is an example of such disease which is spread by mosquitoes optimally under warm conditions. This disease - malaria – is the most common disease in Nigeria. Also, any change in a person's physical health or immediate environment can also have serious impacts on the individual's mental health. In particular, experiencing an extreme weather event can cause stress and other mental health consequences, particularly when a person loses loved ones or their home. Individuals with mental illness are especially vulnerable to extreme heat; studies have found that having a pre-existing mental illness tripled the risk of death

[15] Ibid.,

during heat waves. People taking medication for mental illness that makes it difficult to regulate their body temperature are particularly at risk. Even the perceived threat of climate change (for example from reading or watching news reports about climate change) can influence stress responses and mental health.

A report by OGADEP (Ogun state agricultural development program) shows the attendant impact of climate change on the public health of the Nigeria's citizens' farming communities. The report is as follows:

- Respiratory diseases due to increases in the level of pollutants.
- Malaria in more widespread levels within the population (70% annually)
- Skin ailments (45% annually)
- Heat stroke (4% annually)
- Loss of productivity (40% annually)
- Possible water shortages due to floods or salt water intrusion (60% annually)[16]

3. **Increase in Ozone:** Scientists project that warmer temperatures from climate change will increase the frequency of days with unhealthy levels of ground-level ozone, a harmful air pollutant, and a component in smog. People exposed to higher levels of ground-level ozone are at greater risk of dying prematurely or being admitted to the hospital for respiratory problems. Ground-level ozone can damage lung tissue, reduce lung function, and inflame airways. This can aggravate asthma or other lung diseases. Children, older adults, outdoor workers, and those with asthma and other chronic lung diseases in Nigeria are particularly at risk.[17]

4. **Population Displacements:** Climate change impacts on the farming communities can lead to farm abandonment and hence farm occupation decline. Because of increased drought, Fulani herdsmen do not find enough grass in the north for their cows to graze on; this in turn leads them to the southern part of the Nigeria. The danger of this is that most times there are clashes between the herdsmen and the farmers. The

[16] OGADEP, "Report of the National Fish Frame Catch Assessment Survey in Ogun State (2004-2008)", Ogun State Agricultural Development Programme (OGADEP), Abeokuta, Nigeria as cited in A.A Idowu et al., *op.cit.*

[17] Environmental Protection Agency, "Impacts of climate change", https://epa.gov/climate-impacts/climate-impacts-human-health/, (Accessed: 29.11.2019)

resultant effect is that farmers are now afraid to go to farm because of the fear of the herdsmen.

On Environment

It is pertinent to note also that there are some negative effects of climate change on the environment. These effects are discussed briefly below:

1. **Frequent Wild Fires:** As a result of increased temperatures, the tendency for uncontrolled fires to spark upon basin forests is highly aggravated. Although wildfires are a natural occurrence, with the added carbon dioxide in the air, and hotter weather conditions, the evidence speaks for itself. More frequent wildfires continue to surface in vast amounts each year. The rate at which they burn is longer than the last, and with the release of carbon dioxide into the air, not only are people's lives in danger, but wildlife severely suffers. Each time a wildfire burns, the less oxygen there is to combat the dangerous amounts of carbon dioxide being released into the atmosphere. In most villages in Nigeria, this is seen during the harmattan and dry season when fires set nearby are carried by the wind to the forest and this often leads to great loss of food and properties.

2. **Droughts:** Climate change affects evapotranspiration — the movement of water into the atmosphere from land and water surfaces and plants due to evaporation and transpiration — which is expected to lead to increased drought in dry areas. In drier regions, evapotranspiration may produce periods of drought — defined as below-normal levels of rivers, lakes, and groundwater, and lack of enough soil moisture in agricultural areas. Precipitation has declined in the tropics and subtropics since 1970. Southern Africa, the Sahel region of Africa, southern Asia, the Mediterranean, and the U.S. Southwest, for example, are getting drier. Even areas that remain relatively wet can experience long, dry conditions between extreme precipitation events.

Also, the Sahara Desert is observed to be expanding in all directions trying to engulf the Sahelian region of Africa with annual expansion of 1-10km. Also, Nigerian north is under severe threat of desert encroachment and sand dunes. This is seen in states like Yobe, Borno, Sokoto, Jigawa and Katsina. The sand dunes have buried large portions of arable lands, thus

reducing agricultural productions.[18] This also leads to migration and migration can result to increasing spate of communal clashes among herdsmen and farmers and one of such clash in 1998 resulted in the death of 186 people in six northern states of Nigeria.[19]

3. **Flood and Ocean Surges:** Flood and ocean surges occur because of sea transgressions and because of periodic spilling and plunging sea waves extremes that rapidly inundate the seashores. This causes road tracks inundation, house losses, public health hazards, erosion, farmland, landslides (250-750 m/year), mud-accumulation, livestock mortalities and damage to general soil fertility.[20] It is pertinent to note that the coastal inundations and erosion with their resultant population displacement are currently major environmental problems in Nembe, Eket, and other coastal settlements in Bayelsa, some parts of Anambra, Delta, Cross River, Rivers, and Lagos states of Nigeria. It is also estimated that a metre rise in sea level will displace about 14 million people from the coastal regions of Nigeria.[21]

4. **Energy:** Hydroelectric power generation which is the source of our energy can be affected by climate change. This energy source is sensitive to the amount, timing and geographical pattern of precipitation as well as temperature.[22] For example, high temperatures and low rainfall reduce its transmission capabilities and excessive drought leads to high evapo-transpiration which in turn affects water volume and the reduction in hydroelectric power generating capacities[23] and this will in turn lead to low energy distribution across the nation.

On economy:

The negative effects of climate change are not felt directly on the human person and his environment but also on the economic development of the particular nation or geographical area.

[18] P. Akpodiogaga and A Ovuyovwiroye Odjugo, *General Overview of the Climate Change Impacts in Nigeria*, (department of geography and regional planning, University of Benin),
[19] *Ibid.,*
[20] A.A Idowu, *op.cit.*, p.148
[21] P. Akpodiogaga, *op.cit,*
[22] *Ibid.*,p.150
[23] *Ibid.*,

1. **Agriculture:** Climate change affects agriculture and food security negatively especially in tropical and subtropical regions because greenhouse gas emissions would increase the risk of hunger by 80 million people by 20280 in Africa and southern Asia[24]. A study by Odjugo shows that climate change has led to a change in the type of crops cultivated in Northern Nigeria. For example, in 1978, the preferred crops by farmers were guinea corn followed by groundnut and maize, but due to the increasing temperature and decreasing rainfall amount and duration occasioned by climate change, the farmers as a means of adaptation in 2007 shifted to the production of millet followed by maize and beans.[25] Environmental disasters caused as a result of climate change like flood and drought destroy crops and eventually lead to a low income yield. The resultant effect is that there is scarcity of food items leading to fluctuations in the price of food items.

2. **Industrialisation**: When the effects of climate change have become so obvious and drastic, the resultant effect is that there will be universal clamour to shut down industries whose manufacturing processes lead to the release of greenhouse gases which in the long run cause climate change. The reduction of industrial activities reduces the productions, which affects the economy of a given state.

3. **Unemployment:** This is a consequent result of reduction of industrial activities. In order for the few available industries to manage their affairs well, there will be need to retrench some workers, thus contributing to unemployment problem.

Concluding Reflections: Towards Combating The Impacts Of Climate Change

So far, we have taken a look at the notion of climate change, causes of climate change and also its effects. The pertinent question now is: What do we do to either eradicate or minimize the negative effects of climate change on Africa in general and Nigeria in particular? Against this backdrop, the following recommendations are presented:

[24] *Ibid.*,
[25] *Ibid*,

- **Afforestation and Reforestation**: Afforestation is the establishment of a forest or stand of trees in areas where there was no previous tree cover or the conversion of bare land into forests. Reforestation on the other hand is the planting of trees where they existed before but for one reason or the other had been cut down. The planting of these trees serve as a form of natural sink for absorbing excess carbon dioxide in the atmosphere. This is because the trees take in carbon dioxide for their respiration and give out oxygen which is beneficial to man.

- **Ban On Deforestation:** The government of Nigeria should make laws banning deforestation as an unlawful act so as to deter people from the indiscriminate burning and cutting down of trees. This is because trees are very necessary for the control of excess carbon dioxide in the atmosphere.

- **Enlightenment Campaigns and Creation Of Awareness**: One of the reasons why people do things that contribute to climate change is that they are unaware of the messy situation at hand. Government, religious institutions, NGO's should embark on massive enlightenment campaigns so as to educate people on the state of affairs as regards global warming, enlighten them on some of their actions that can contribute to global warming and then teach them some ways of curbing this ugly menace.

- **Inclusion in Curriculum:** According to Francis Bacon, knowledge is power. The issue of climate change should be inserted into school curriculum beginning from the primary level to at least the secondary level. Better results will be achieved if from childhood, humans are well skilled in the intricacies of climate change. It will make us more at home with it and better equipped to fight it or manage climate change.

- **Green Transportation**: The transportation sector's emissions have increased at a faster rate than any other energy-using sector over the past decade. A variety of solutions are at hand, including improving efficiency (miles per gallon) in all modes of transport, switching to low-carbon fuels, and reducing vehicle miles travelled through smart growth and more efficient mass transportation systems. In recent times we have seen countries like France and Germany planning to phase out petrol or gasoline automobiles by the year 2040, and to start making use of

rechargeable electrical cars. Nigerian government should imitate them and begin to think in that same direction.

- **Phasing out Fossil Fuel Electricity and Revving Renewable Sources of Energy**: Generating energy through the burning of fossil fuels is one of the greatest contributors to the menace of climate change. Dramatically reducing our use of fossil fuels—especially carbon-intensive coal—is essential to tackling climate change. There are many ways to begin this process. Key action steps include: not building any new coal-burning power plants, initiating a phased shutdown of coal plants starting with the oldest and dirtiest, and capturing and storing carbon emissions from power plants. While it may sound like science fiction, the technology exists to store carbon emissions underground. The technology has not been deployed on a large scale or proven to be safe and permanent, but it has been demonstrated in other contexts such as oil and natural gas recovery. Demonstration projects to test the viability and costs of this technology for power plant emissions are worth pursuing. Renewable energy sources such as solar, wind, geothermal and bioenergy are available around the world. Multiple studies have shown that renewable energy has the technical potential to meet the vast majority of our energy needs. Renewable technologies can be deployed quickly, are increasingly cost-effective, and create jobs while reducing pollution.

- **Scientific Efforts**: Technology should not only be a contributor to this ugly trend but it should be developed and channelled into solving the problem too. In recent times there have been improvements in this regards example the development of the process of carbon sequestration which is capturing the carbon dioxide emitted from fossil fuels and storing it underground. Thus in the same manner, scientific researches should go on exploring and finding new and better ways of ameliorating the problem of global warming.

- **Government Control of Pollution:** As one of the ways of reducing climate change, government should place limits on amount of carbon that polluters are allowed to emit and offenders should be strictly punished.

- **Common Action:** Since climate change is a universal threat. International organisations such as the United Nations, should come together and enact decrees binding on member nations, and aimed at controlling human

activities which contribute to climate change. Strict sanctions should also be put in place for member nations who will fail to adhere to the directives of the accord.

- **Installation of Green Roofs**: A green roof or living roof is a roof of a building that is partially or completely covered with vegetation and a growing medium, planted over a waterproofing membrane. It may also include additional layers such as a root barrier and drainage and irrigation systems. This is a new trend gradually gaining grounds in the western world. Just as reforestation, it is also a wonderful of reducing greenhouse gases by absorbing excess carbon dioxide in the atmosphere. Nigerians should imitate this good trend and construct this green roofs in their own houses. Government should also encourage this.

Finally, the issue of climate change is a source of great concern to human beings all over the world. Its effects cut across all nations of Africa including Nigeria. The probing question is whether this existential phenomenon can be tackled? The answer is in the affirmative if the solutions presented in this study are adhered to and properly executed. This study finally submits that there is urgent need for a change of attitude in the way we handle nature. Nature should be respected and loved and not only exploited. If we all put our hands in this fight, this threat will be combated.