

**Global Warming and Climate Change: Challenges, Causes and Solutions**

**Olayinka O.O1, Adebesin A.A2**

1Department of Computer Engineering, Federal Polytechnic, Ilaro, Ogun State, Nigeria

2Department of Mechanical Engineering, Federal Polytechnic, Ilaro, Ogun State, Nigeria

|  |  |  |
| --- | --- | --- |
| **ARTICLE INFORMATION** |  | **ABSTRACT** |
| *Article history*:  Received 04 October 201X  Revised 02 January 201X  Accepted 09 January 201X  Available online 20 February 201X |  | *Researchers, environmentalists and engineers all around the globe expresses deep concerns on the climate change and the global warming of the planet. The combustion of fossil fuels churning out gases like carbon dioxide, methane and nitrous oxides which leads to climate change. Warmer temperatures can also be attributed to deforestation. Global environmental hazards are resultant largely from the serious problems of climate change. There is a lot of ignorance about the effect of global warming and climate change consequences, some of its impacts, and the consequence will grievously affect ecological diversity and balance. This study discusses the challenges, causes and impacts of global warming and climate changes and provides some remedies in resolving some these issues. Adapting to risk reduction can be used to handle climate change and climate change problems. The United Nations Development Programme (UNDP) has proposed a three step technique to manage the problem on Carbon finance, involves abolishment of hurdles to climate friendly technologies, setting up systematic course of action for clean development mechanism (CDM) and expand projects through millennium development goal (MDG) carbon facility. An Integrated Territorial Climate Plan (ITCP) was created for regional governments to outline their operations inclusive of financing climate change relocation procedure.* |
| *Keywords*:  *Climate, fossil fuels, Deforestation, Global warming, Alternative energy sources* |  |

**1. Introduction**

The geometric growth in surface climate condition of the earth and the rise in sea levels over the years has become a significant feature of global warming that has fascinated both researchers and policy makers in contemporary times. The earth’s atmosphere generates instinctive greenhouse effect such that the surface of the earth is kept warmer contrarily to it natural condition. An essential part of the ecological system is Life where all other creatures are impact on the make-up of greenhouse gases in the a atmosphere by “inhaling” and “exhaling” of oxygen and carbon dioxide through that preserving the chemical equilibrium in the atmosphere. Diverse human interests centered mostly on the combustion of fossil fuels, industrial activities, deforestation for both urbanization and agricultural activities, can considerably soar the accumulation of greenhouse gases into the atmosphere, inevitably altering the chemical balance. The specific complexity of our climatic structure are not adequately investigated that entitle us to anticipate the compelling repercussion based on the incremental rate of greenhouse gases on universal temperature particularly climate change. The propensity for man to exactly determine effect of climate change is consequently narrowed: but the anticipated indicators are notwithstanding becoming visible from the clamor of changeability of the natural climate coupled with unpredictability. These noticeable change encompasses extensive patterns of lengthy natural variations and time-evolving patterns and the reactions to variations in the accumulations of greenhouse gases, contaminant (aerosols), and land surface changes as well. Nevertheless, there is disparity of opinions based on the rising surface temperature of the earth and factual existence of global warming majorly attributed to human activities. Therefore, some scholars have disagreed with the impact of climate change, thus critics of global warming do not necessarily see the need to put adequate measures in place to counter the trend of climate change and global warming. The steps put in place to curtail these menace are seen too premature not cost effective. The United Nation Framework Convention on Climate Change (UNFCCC) drafted an international environmental treaty known as the Kyoto Protocol directed governments of industrial countries put adequate measures in place that will manage and maintain global warming the hence minimize the greenhouse gas emissions to a magnitude that will check the precarious anthropogenic intrusion with climate system. The Kyoto accord which was embraced in Kyoto Japan on December 11, 1997, and enforced on February 16, 2005 was opposed mainly. The growing challenges in both energy needs and the population relative to the improvements in the standard of living and economic growth in the developing nations, the insufficiency of political will and the establishment weakness to formulate and enact suitable environmental strategies, moreover, the unavailability of comprehensive information and misinformation are the crucial components that have tend to prevent measures to decline the effects of greenhouse gases emission and reduce the effects of climate change (Aizebeokhai,2009).

2. **Literature Review**

Global warming and climate change alludes towards the rising in global average temperature on account of the growing effect of greenhouse gases. Natural occurrences including, volcanic eruptions, wild forest fires, the melting of permafrost discharging methane on the ocean floor and that released from cattle, combustion exhaust from anthropogenic sources, greenhouse gases released due to the activities of industries, cultivated paddy in water logged areas used for agricultural production, deforestation and man-made wet lands. Hence the global warming of the earth mainspring swift variations in previous weather order (Sivakumaran, 2015)

**2.1 Sources of Global Warming and Climate Change**

The sources of global warming can be naturally occurring or as a result of human interference.

**2.1.1 Natural Sources**

**Atmospheric Carbon Dioxide**

Carbon dioxide is frequently known as the greenhouse gas. This gas accounts in regards to 50% of the effects resulting from greenhouse gases and tied to about half the retained atmospheric heat. The propensity Methane (CH4) possess in retaining heat has the equivalence 20 -30 time more functional than that of CO2. Global Warming Potential (GWP) is the intensity for a greenhouse gas expressed as GWP. The highest peak of global warming is recorded in the 20th century which has been found greater than the peaks expressed during the last 1000 years. Records proved that the Northern Hemisphere in the early 1990s hard the warmest decade in the millennia while in 1998 it had the warmest year (Houghton et al., 2001).

**2.2. Volcanic Eruptions**

Sicily volcano at Mount Etna, the location of an active presently moderately quell volcano which has an overwhelming source of carbon dioxide. Each year additional 25million of CO2 is liberated into the atmosphere enriching the surrounding regions with Carbon dioxide (Anjali & Ranjana, 2012).

* + 1. **Physical Sources**
* Humans have been discharging extra greenhouse gases, resulting from the burning of fossil fuels namely gas, wood, coal, oil and solid waste but these releases can linger in the atmosphere for thousands of years thus leading to an increase in the volume of CO2 churn out by man and a sudden rise in temperature from a lower temperature range of 30C to a higher temperature range of 80 C to 100C. The human factor has increase by two-folds the impact of severer heat waves like the heat scorched in Europe between the months of July and August 2013. Substantial proof shows that the summer was the hottest in Europe at the past minimum of 500 years ago (Luterbacher et al., 2004).
* The UHI (Urban Heat Island) is amplified within the urban settlements where pollution intensifies the effect of global warming in cites besides the industrial heat liberated into the atmosphere, household heating, and exhaust emissions from vehicles. As the populations of the cities increases the impact of UHI becomes vigorous thereby generating an unnatural warming.
* CFCs (Chloro Fluoro Carbons) would be assumed to be behind the 24% of the human involvement to greenhouse gases that causes the depletion of the ozone layer in the stratosphere.
* Almost all the perceived increments in global average temperatures considering the middle of the 20th century is vastly expected on account of the noticed augments in anthropogenic GHG (greenhouse gas) accumulations.

It was suggested that humans seem to be giving rise to the earth to heat up and putting at risk mayhem besides allowing such an important influence as regards public impression. The media reportage strengthen the validation of the findings for it in every weather event. Children of schooling age are enlighten about scientific truth. Dr. Gray offer counter-argument about this extensive viewpoint (Gray, 2001).

Mankind can be allowed at best a limited space of time left, possibly a decade, to embark on the extensive procedure of balancing the concentration of greenhouse gas at a proportion that can forestall damaging and unalterable consequences from climate change (Anjali & Ranjana, 2012)

**2.3. Climate Change Challenges**

The expression 'climate change' relates to alterations in terms of the behavior arrangement of the atmosphere over millennia or, more contemporarily, subsequence of natural processes or human activity. Climate is different from weather, defined as the fixed behavior of the climate at a distinct time. Weather is an embodiment of peculiar occasions, for instance, a distinct storm, the rainfall over a specific duration of time, the temperature at a certain time. Climate is concerned with presumptions while weather is with respect to incident and circumstances. 'Climate is based on your expectations, weather is what you get' is often quoted to express the variation linking climate and weather. Both weather and climate could potentially be mentioned in regards to particular places or general areas, but while on the contrary weather is devoted to the definite duration such as dates and times, climate relates to the anticipated situation in general over time periods, by way of illustration, spring or summer, day or night, morning or evening. The uttermost salient factors constituting the climate are temperature, precipitation (rainfall, snow, and hail), wind direction and speed, atmospheric pressure, humidity, the nature and extent of clouds, and hours and intensity of sunlight. There exist, nonetheless, numerous tenable systems by which climate could be expressed. These are typically identified with averages or fluctuations in temperature, precipitation, wind and cloud. The climate differs geographically, as an illustration, contingent to the distance from the equator or the sea, and temporally, for instance, subjected to periodic and everyday alterations (Soas, 2021).

**2.4. Solutions to Global Warming and Climate Change**

The dangers ascribed to global warming are monumental. The extreme usage of fossil fuels namely coal, natural gas and oil takes part also. The use of fossil fuels requires the development and adoption of a new technology known as carbon capture and sequestration which entails trapping of carbon emissions and converting into a re-use though the best notable result that will put a termination to global warming disaster is the usage of renewable sources of energy. It encompasses wind, solar, bio mass, geothermal and hydro. The utmost outstanding point is adopting these sources is their clean nature. They tend not to generate any type of pollutant or toxic gases that be capable of leading into global warming. They are environmentally friendly since the pose no threat to ecological balance. However, their high installation and setup costs may discourage the end user at first instances but in the future they are assuredly favorable for everyone. Notably, as the time changes, the full adoption of renewable or alternate energy sources will be as a result of the depletion of fossil fuel and this may likely put an end to the menace of global warming.

Preventing the medical dangers resulting from global warming, the general public have a duty to be held accountable for their choices based on methods of conserving energy. A stable climate linked with a healthy atmosphere can be guaranteed for the next generations.

Governments should formulate and enact strategies that will galvanize the energy companies and populace in general, to adopt the usage of renewable energy in preference to conventional means. Non-Governmental Organizations (NGOs) should embark of advocacy campaigns to enlighten people by prompting them to utilize alternative sources of energy and deter them from the use of fossil fuels. Also, they should be enlighten about the dangers and implications imposed resulting from the continual use fossil fuel which include the degradation of the ecosystem, health hazards and the depletion of the ozone layer. The adoption of renewable energy by many developed countries like USA, China, UK and Poland have at present result in massive amount of harnessed power, these countries should broaden their strategies to assist the developing countries in tackling the consequence of global warming jointly. Curtaining the rate of gas emission is certain in exploiting the benefits of adopting renewable energy which plays paramount part in global warming.

The three major categories for electricity generation in the US are:

|  |  |  |
| --- | --- | --- |
| **Fossil fuel** | **Nuclear energy** | **Renewable energy** |
| * Coal (9%) * Natural gas (40%) * Petroleum (1%) | Nuclear reactors (20%) | * Solar * Wind 40% |

Table 1: US Electricity Generation by major source

|  |  |  |
| --- | --- | --- |
| **Fossil fuel** | **Biomass & Waste** | **Renewable energy** |
| * Coal (75%) | Biomass and waste (6.1%) | * Solar * Wind 0% |

Table 2: UK and Poland Electricity Generation by major source

**2.5. Other Solutions**

The emissions of toxic is among the crucial sources of global warming, in achieving the complete elimination of such injurious emission, it is imperative to reduce the number of vehicles that run of fossil fuel and replace such with vehicles that runs on clean eco-friendly sources such as electric cars. These has posed a lot of challenges with many car owners relenting to give their old vehicles for eco-friendly ones, even though some people patronize the public transport systems. No doubt, some people have started to use bicycles and public transport, whereas some prefer walking as oppose the vehicles. Nevertheless the number is still minimal. Emission rates and fuel economy are the cardinal factor that influences the choice of cars, the introduction of hybrid cars that possesses upmost energy efficiency with lower carbon footprint when the tires are properly inflated enhance the mileage of cars and air filters ought to be regularly changed to reduce the dangerous emissions. In addition, in order to reduce the number of vehicles plying our roads and minimize the carbon footprint, it is pertinent for people to adapt to sharing a ride with friends and coworker. Also the mainstream media, print houses and social media can play an effective role in curbing the menace. The automobile commercial vehicles can be used as mass mobilization, sensitization and campaign platform for other road users on the need to reduce pollution and to conserve energy using logos, posters and reflective inscription on their cab. These demonstrates the effects that ensued regarding global warming and other helpful ways of cutting down the effect is the process of recycling materials such as using rechargeable batteries instead of disposable ones. Also, local markets should be patronize in a bid to cut down to a sizeable many vehicles commuting our roads. The use of incandescent lamps should greatly be discontinued and replaced with energy saving lamps, also individuals should endeavor to reduce their thermostats during winter seasons. Government policies should restrict the forest degradation and deforestation while motivating the process of reforestation as a measure to encourage tress planting. Another promising solution is the use of Nuclear power as an alternate source of energy that produces hardly little emissions but cautious efforts and safety measure must be ensured as any form of accident or leakage can result in disastrous consequences.

**2.6 Conclusion**

The scientific and environmental community are been in agreement judging by the harsh actuality of global warming and the role human factor plays. Global warming poses a colossal threat and suitable course of action must be put in place to address this urgent issue. This setback is not only peculiar to humans alone but affects all the players that comprises of animal and plants. The pandemonium originating from the thawing of the melting ice cap can be attributed to the devastation of flooding that gives rise to water levels. Consequently, affecting the agricultural and fishing activities. As measures of ameliorating the menace are pondered upon it is necessary to encourage the usage of renewable energy sources and motivate the culture of afforestation which must be timely done.

Human beings had better be prepared to address this dilemma or will be faced with the repercussions associated with global warming and climate change because the nature is unforeseeable. In spite of the accessible scientific data that shows the inclination of global cooling conditions, new research trend should be instituted and encouraged with the tendency of absorbing the neighboring heat wave in a substantial amount for effective cooling. In addition, the aim of this study is an unembellished awareness that tends to bring to the front burner the menace of global warming and the need for countries to take bold actions in frontally remedying the surge without delay. It could be suggested that government and policy makers should chart a way forward through the establishment of a universal and harmonized carbon tax, with perhaps steep pricing on industries that produce greenhouse resulting from the flaring of fossil fuels.

**References**

Augst, T. K. (2008); Institution of Reading Public Libraries, Journal of Library & Information Technology, Massauchusetts Press, Amherst: MA 3 (5), 148- 153.

Aizebeoku, A.P. (2009) Global Warming and Climate Change: Realities, Uncertainties and Measures, Journal of Physical Sciences 4 (13) 868- 879

Anjali, G & Ranjana, B (2012); Causes and Consequences of global warming; Journal of Life Sciences, Bio- Technology & Pharma Research, 2 (4) 168- 174.

Gray, M, Beatlie & Chritine Esssen (2001).The Industrial Effluents: Carbon Dioxide Capture & Sequestration; Journal of Energy and Environment, 237(2) 306-323.

Goodale, C.L., Schimel, D., Field, C.B., (2001) “Consistent Land and Atmosphere: Carbon Sink Estimates” Journal of Sciences, Milan Press Ltd., 6 (4)292- 231.

Houghton, J.T., Ding, D.J, Griggs, M, (2001); Comprehensive Report on “Climate Change Variability 2001”The Scientific Basis. Cambridge University Press, Edinburg Building, Cambridge CB2, 2Ru, United Kindom, http: www.cambridge.org

Luterbacher, J.D., Dietrich, H., Wanner, B, (2004) “European Seasonal and Annual Temperature Variability, Trends and Extremes; Journal of Science, 30 (3) 1499- 1503.

Ray, V.R. (2001); The Causes of Global warming, Journal of Energy and Environment; 1 (1), 613-629

Sivakumaran, S (2015); Global warming and Climate Change: Causes, Impacts and Mitigation, Research Gate

SOAS (2021); Climate Change and Development Challenges. Available on http://www.soas.ac.uk/cedep-demos/000\_CCD\_K