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Greenhouse Gases and Global Warming: Emerging and International Policy Issues and Challenges.

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ABSTRACT

A critical review of issues and challenges of green-house gases and global warming is presented. Inferences were drawn from a wide spectrum of researches and observations to portray the fact that unprecedented warming of the climate system in response to human induced emission of green-house gases and aerosols is unequivocal and is putting the climate system in jeopardy. The mitigation and adaptation measures including the international policy responses to the unprecedented warming have not been prioritized because of non-binding commitments to many international agreements on ground of economic reasons. The paper advocates the need for the international community to chart a more equitable and sustainable development path. This requires the need to redefine and redesign our energy needs with appropriate policies and mechanism to ensure compliance of the provisions and commitments. The challenge is tremendous in a highly polarized and unequal global economy, currently mired in concerns about debt levels and economic recession. The issue is worrisome as the ravaging effects of global warning are felt very acutely in the form of climate and weather changes, droughts, famines, disease epidemics, destruction of wildlife, huge forest fires and devastating floods to mention a few.

KEYWORDS : - Greenhouse Gases, Greenhouse Effect, Global Warming, Issues, Challenges, Review.

1.0INTRODUCTION

The atmosphere plays a complex and extremely important role in the global energy balance. The average surface temperature of the earth (about 288K) is considerably higher than its equivalent blackbody temperature (about 255K) due to the presence of the atmosphere. This is a consequence of the radiative transfer properties of the natural greenhouse gases (water vapour, carbon dioxide and clouds) bringing about the natural greenhouse effect.

Human activity since the industrial revolution has increased the amount of anthropogenic greenhouse gases in the atmosphere, leading to increased radiative forcing from them (USEPA 2007), thereby accelerating the natural greenhouse effect and causing a rise in the average temperature of the earth called global warming. The global warming theory maintains that anthropogenic greenhouse gas emissions are so high that they are warming the planet beyond acceptable levels.

It seems that the scientific community is still divided on whether or not this process is underway. Nevertheless, the global warming trends are recognized by the national science academies of all major industrialized nations. Expectedly, greenhouse effect and global warming have triggered off provocative issues of global concern in the scientific literature and popular media with emphasis on human-derived greenhouse gases, evidence and impact of warming, models explaining the mechanism of the process and human responses to it. These issues are, indeed, critical and are the focal points in this paper, in recognition of the persistent calls by the United Nations for sustainable development and green economy.

The greenhouse effect is a natural process that keeps the planet warm enough to sustain life. Solar energy is the main source of heat to the earth which is transmitted by radiation. When sunlight enters the earth's atmosphere, some of it is converted into heat at the earth's surface. To balance this input of solar radiation, the earth itself emits radiation to space. As this terrestrial radiation tries to escape the atmosphere, some of it is trapped by the greenhouse gases and re-radiated back to the earth, resulting in the warming of the earth's surface. This phenomenon is called the greenhouse effect. Trapping of the terrestrial radiation by naturally occurring greenhouse gases (GHGs) is essential for maintaining the earth's surface temperature well above the freezing point of the oceans. Presently, there is serious concern that anthropogenic GHGs are inducing rapid surface warming of the earth. The naturally occurring GHGs such as carbon dioxide show increases over the last century due to human activities: farming, manufacturing, electric power generation, transportation and domestic cooking etc. Additional GHGs produced by chemical industry have also accumulated in the atmosphere.

The greenhouse effect is an essential physical process mediated primarily by water vapour and carbon dioxide that warm the earth by approximately 33^{0}C (Lashof, 1989), allowing the planet to be habitable and maintain abundant liquid water. By contrast, global warming involves increase in average temperature of the earth, mediated in large part by a few percentage increases in the greenhouse effect. As mentioned in the preceding paragraph, when energy from the sun reaches the earth, the earth absorbs some of this energy and radiates the rest back to space in the infrared. The earth's surface temperature depends on this balance between incoming and outgoing radiation. If this energy balance is shifted, the earth's surface could become noticeably warmer or cooler, leading to a variety of changes in global climate (USEPA, 2010). A variety of natural and man-derived mechanisms can alter the global energy equilibrium and force changes in the earth's climate. GHGs are one such mechanism (USEPA, 2010). Factors that influence earth's energy balance can be quantified in terms of "radiative climate forcing". Positive radiative forcing indicates warming (by increasing incoming radiation or decreasing the amount of radiation that escapes to space), while negative forcing is associated with cooling. Some GHGs can remain in the atmosphere for decades or even centuries, and therefore can affect the earth's energy balance over a long time period (USEPA, 2010). Since the early 20th century, earths mean surface temperature had increased by about 0.8^{0}C with about two-thirds of the increase occurring since 1980 (IPCC, 2007B).

Warming of the climate system is unequivocal, and scientists are very certain that it is primarily caused by increasing concentrations of GHGs and some aerosols produced by human activities such as:

i. Burning fossil fuels and deforestation, including bush burning leading to a high carbon dioxide concentrations in the air (IPCC 2007A);
ii. Live stock enteric fermentation and manure management (Steinfeld *et al,* 2006), paddy rice farming, land use changes, and covered vented landfill emissions, leading to higher atmospheric methane concentrations;
iii. Use of chlorofluorocarbons (CFCs) in refrigeration systems, and use of CFCs and halons in fire suppression systems and manufacturing processes;
iv. The use of fertilizers in agricultural activities that leads to higher nitrous oxide concentrations.

2.0ANTHROPOGENIC AND NATURAL RADIATIVE CLI-

MATE FORCINGS

2.1GREENHOUSE GASES (GHGs).

Greenhouse gases (GHGs) are gases in the atmosphere that absorb and emit radiation within the infrared range. This is the fundamental cause of greenhouse effect (IPCC 2007A). The primary GHGs in the earth's atmosphere in order of most abundant are water vapour, carbon dioxide, methane, nitrous oxide and ozone. GHGs greatly affect the temperature of the earth; without them, earth's surface temperature would average about 33^{0}C colder than required.

However, since the beginning of industrial revolution, the burning of fossil fuels (principally wood, coal, oil and natural gas) has contributed to the increase in carbon dioxide in the atmosphere from 280 ppm to 397 ppm, irrespective of the uptake of a significant portion of the emission through various natural "sinks" involved in the carbon cycle (Lindeburgh, 2006).

Methane and nitrous oxide are emitted from agricultural activities, changes in land use and other sources. Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), Chlorofluoro carbons (CFCs), sulphur hexafluoride (SF_6) are released by industrial processes, while Ozone in the lower atmosphere is generated indirectly by automobile exhaust fumes.

Atmospheric concentrations of GHGs are determined by the balance between sources (emissions of the gases from human activities and natural sources) and sinks (the removal of the gases from the atmosphere by conversion to different chemical compounds (IPCC,2007A).

Water vapour accounts for the largest percentage of the greenhouse effect (Kiehl and Trenberth, 1997). Water vapour concentrations fluctuate regionally, but human activity does not significantly affect water vapour concentrations except at local scales, such as near irrigated fields. The atmospheric concentration of water vapour is highly variable from less than 0.01% in extremely cold regions up to 20% in warm humid regions (Evans, 2005). Water vapour responds to and amplifies effects of the other GHGs. The Clausius – Clapeyron relation establishes that air can hold more water vapour per unit volume when it warms. This and other basic principles indicate that warming associated with increased concentrations of other GHGs will also increase the concentration of water vapour. Because water vapour is a GHG, this results in further warming, and is a positive feedback that amplifies original warming.

Eventually, other natural earth processes offset these positive feedbacks, stabilizing the global temperature at a new equilibrium and preventing the loss of earth's water through a venus-like runaway green house effect (Held and Soden, 2000). Reduced stratospheric ozone has had a slight cooling influence on surface temperatures, while increased tropospheric ozone has had a somewhat larger warming effect (Shindell *et al,* 2006).

2.1.1 IMPACT OF A GIVEN GAS ON THE OVERALL GREENHOUSE EFFECT

The contribution of each gas to the greenhouse effect is affected by the characteristics of each gas, its abundance, and any indirect effect it may cause. IPCC (2007A) reported that on a molecule-for-molecule basis, the direct radiative effects of methane is about 72 times stronger than carbon dioxide over a 20-year time frame, but it is present in much lower concentrations so that the total radiative effect is smaller. On the otherhand, in addition to its direct radiative impact, methane has a large indirect effect because it contributes to ozone formation. Shindell, (2005) argued that the contribution to climate change from methane is at least double the previous estimates as a result of this effect. Kiehl and Trenberth (1997) ranked these greenhouse gases by their direct contribution to the greenhouse effect in order of most important as in table 1.

Table 1: Direct contribution of greenhouse gases to greenhouse effect

GHG	Contribution %
Water vapour	36-72
Carbon dioxide	9-26
Methane	4 – 9
Ozone	3 – 7

Source: *Kiehl and Trenberth, 1997.*

It is not possible to state that a certain gas causes an exact percentage of the greenhouse effect. This is because of overlapping contribution as some of the gases absorb and emit radiation at the same frequencies as others so that the total greenhouse effect is not simply the sum of the influence of each gas. In addition, some gases such as methane are known to have indirect effect that are still being quantified (Isaksen *et al,* 2011).

2.1.2 INTERACTION BETWEEN RADIATION AND GHG MOLECULES

The position and number of absorption bands of GHGs are determined by the chemical properties of the gases present. In the present atmosphere, water vapour is the most significant of these GHGs followed by carbon dioxide and other minor GHGs. As radiation passes through the atmosphere, some is absorbed by the gases with specific absorption bands because these gases experience a net change in their dipole moment when they vibrate or rotate. Molecules containing two atoms of the same element (Such as N_2 and O_2)and monoatomic molecules such as argon have no net change in their electric dipole moment when they vibrate. Hence they are almost totally unaffected by infrared radiation. Even though molecules containing two atoms of different elements such as CO and HCl absorb infrared radiation, these molecules are short-lived in the atmosphere due to their reactivity and solubility. For these, they do not contribute significantly to the greenhouse effect and are usually omitted when discussing GHGs.

Clouds constitute the major non-gas contributor to the earth's greenhouse effect. They also absorb and emit infrared radiation and thus have an effect on radiative properties of the GHGs. (Kiehl and Trenberth, 1997).

2.2PARTICULATES AND SOOT

Global dimming, a gradual reduction in the amount of global direct irradiance at the earth's surface was observed from 1961 until at least 1990 (IPCC, 2007A). The main cause of dimming is particulates produced by volcanoes and human-made pollutants, which exert a cooling effect by increasing the earth's albedo. Radiative forcing due to particulates is temporally limited due to wet deposition which causes them to have an atmospheric life-time of order of a century, and as such, changes in particulates concentrations will only delay climate changes due to carbon dioxide (Ramanathan and Carmichael, 2008).

In addition to their direct effect by scattering and absorbing solar radiation, particulates have indirect effects on the radiation budget (Lohmann and Feichter, 2005). Sulphates act as cloud condensation nuclei (CCN), and therefore, lead to clouds that have more and smaller cloud droplets. These clouds reflect solar radiation more efficiently than clouds with fewer and larger droplets known as Twomey effect (Twomey, 1977). This effect also causes droplets to be of more uniform size, which reduces growth of rain drops and makes the cloud more reflective to incoming solar radiation known as Albrecht effect (Albrecht, 1989).

Soot may cool or warm the surface, depending on whether it is airborne or deposited. Airborne atmospheric soot directly absorbs solar radiation, which heats the atmosphere and cools the surface. In isolated areas with high soot production such as rural India, as much as 50% of surface warming due to GHGs may be masked by atmospheric

brown clouds (Ramanathan et al, 2005). When deposited, especially on glaciers or ice in arctic regions, the lower surface albedo can also directly heat the surface (Ramanathan, and Carmichael, 2008).

2.3SOLAR ACTIVITY

Solar variations causing changes in solar radiation energy reaching the earth have been the cause of past climate changes (NRC, 1994; Martin – Puertas *et al,* 2012). The effect of changes in solar forcing in recent decades is not certain, with some studies showing a slight cooling effect (Lockwood and Frohlich, 2008; Sirocko et al, 2012), while other studies suggest warming (Hansen, 2002; Hansen, 2005).

GHGs and solar forcing affect temperature in different ways. While increase in solar activity and GHGs are expected to warm the troposphere, an increase in solar activity should warm the stratosphere while an increase in GHGs should cool the stratosphere. Radiosonde data show that the stratosphere has cooled over the period since observations started in 1958, although there is greater uncertainty in the early radiosonde record. Satellite observations which have been available since 1979 also show cooling (Randel et al, 2009).

3.0 GLOBAL WARMING FEEDBACK MECHANISMS

Feedback is a process in which changes in one quantity brings change in the second quantity, and the change in the second quantity in turn changes the first. Positive feedback increase the change in the first quantity while negative feedback reduces it.

Feedback is important in global warming because it may amplify or diminish the effect of a particular process. The main positive feedback in the climate system is the water vapour feedback while the main negative feedback is radiative cooling through the Stefan-Boltzmann Law, which increases as the fourth power of temperature.

A wide range of potential feedback processes exist, such as Arctic Methane release and ice – albedo feedback (Lenton *et al,* 2008). Other researchers found that increased emissions of methane could instigate significant feedbacks that amplify the warming attributable to methane alone. Isaksen *et al* (2011) found that a 2.5 fold increase in methane emissions would cause indirect effects that increases the warming 250% above that of methane alone. According to the same study, for a 5.2 fold increase, the indirect effect would be 400% of the warming from methane alone.

4.0OBSERVED EVIDENCES OF GLOBAL WARMING AND ITS IMPACTS

The warming that is evident in the instrumental temperature record is consistent with a wide range of observations, as documented by many independent scientific groups (Kennedy *et al,* 2010). According to Kennedy (2012) such evidences include rising temperature, sea level rise, widespread melting of ice and snow, increased humidity and the earlier timing of spring events such as the flowering of plants. The intense flooding and forest fires ravaging various parts of the world is also worthy of mention here. The American Geo-physical Union (2007) affirmed that many components of the climate system such as temperature, the extent of sea ice and mountain glaciers, the precipitation distribution and the length of seasons are changing at rates and patterns that are not natural. According to the source, these changes are brought about by the increased atmospheric concentration of GHGs and aerosols generated by human activities. The probability that these changes could have occurred by chance is virtually zero.

The environmental effects include: rise in sea levels, change in the amount and pattern of precipitation, probable expansion of tropical deserts, altered pattern of agriculture, occurrence of extreme weather events, including heat waves, droughts and heavy rainfall, ocean acidification and species extinction (loss of biodiversity) due to shifting temperature regimes.

Effects significant to human include the threat to food security from decreasing crop yields (Battisti and Naylor, 2009) and loss of habitat from inundation in coastal areas, river estuaries and low lying areas such as Bangladesh and Nile Delta. Vulnerability of human societies to global warming lies in the effects of extreme weather events (IPCC, 2007A), adverse effects on small islands, adverse effects on indigenous populations in high latitude areas, and small but discernible effects on human health, (IPCC, 2007A). Most economic studies suggest losses of world gross domestic product (GDP), (Stern, 2006).

5.0RESPONSES TO GLOBAL WARMING

5.1MITIGATION AND CARBON SEQUESTRATION

The IPCC defined mitigation as activities that reduce GHG emissions, or enhance the capacity of carbon sinks to absorb GHGs from the atmosphere (IPCC, 2007c). Many developed and developing countries are aiming at using cleaner, less polluting technologies (World Bank, 2010). Use of these technologies could result in significant reductions in anthropogenic GHG emissions. Policies include targets for emissions reductions, increased use of renewable energy and increased energy efficiency. Carbon dioxide, methane, nitrous oxide and three groups of fluorinated gases (Sulphur hexafluoride, SF_6; hydro fluoro–carbons, HFCs; and perfluorocarbons, PFCs) are the major anthropogenic GHGs (Grubb, 2003), and are regulated under the Kyoto Protocol international treaty, which came in force in 2005.

Although Chloro fluorocarbons (CFCs) are GHGs, they are regulated by the Montreal Protocol, which was motivated by the CFC's contribution to ozone depletion rather than their contribution to global warming. Since fossil fuel usage would continue for years to come, even in the most optimistic scenario, mitigation may also involve carbon capture and storage. This is a process that traps carbon dioxide produced by factories and gas or coal power stations and then stores it, usually, underground (Robinson, 2010), which is a process of carbon sequestration. Carbon sequestration is the process of capture and long-term storage of atmospheric carbon dioxide (Sedjo and Sohngen, 2012) and may refer specifically to:

(i) The process of removing carbon from the atmosphere and depositing it in a reservoir; when carried out deliberately, it may be referred to as carbon dioxide removal, which is a form of geo-engineering.
(ii) The process of carbon capture and storage, where carbon dioxide is removed from flue gases such as on power stations, before being stored in underground reservoirs.
(iii) Natural biogeochemical cycling of carbon between the atmosphere and reservoirs, such as by chemical weathering of rocks.

Carbon sequestration describes long-term storage of carbon dioxide or other forms of carbon which has been proposed as a way to slow the atmospheric and marine accumulation of GHGs, which are released by burning fossil fuels. It is worthy to mention that energy related carbon dioxide emissions in 2010 were the highest in history, breaking the prior record set in 2008 (IEA, 2011B).

5.2ADAPTATION

IPCC (2007B) defined adaptation as the adjustment in natural or human systems to a new or changing environment. Adaptive capacity is the ability of humans or natural systems to adjust to climate changes, to moderate potential damages, to take advantage of opportunities, or cope with consequences. Unmitigated climate (i.e future climate change without efforts to limit GHG emissions) could, in the long-term be likely to exceed the capacity of natural, managed and human systems to adapt, drawing inferences from the calamities of floodings recently.

5.3GEOENGINEERING

Geoengineering involves the deliberate modification of the climate. NASA (2007) and Royal society (2009) have investigated geoengineering as a possible response to global warming. Techniques under research generally fall into two categories: solar radiation management and carbon dioxide removal, although, various other schemes have been suggested. Research is generally at its infancy, with no large-scale schemes currently deployed.

6.0POLITICS OF GLOBAL WARMING

Global warming remains an issue of widespread political debate, sometimes split along party political lines, especially in the United states. Many of the largely settled scientific issues such as the human responsibility for global warming, remain the subject of politically motivated attempts to downplay, dismiss or deny them. The energy lobby, oil industry advocates and free market think-tanks, have often been accused of overtly or covertly supporting efforts to undermine or discredit the scientific consensus on global warming.

The framework convention to stabilize atmospheric GHGs concentrations was agreed in 1992, but since then, global emissions have risen (Raupach *et al,* 2007). During negotiations, the G77 (a lobbying group in the United Nations representing 133 developing nations) (Dessai, 2001), pushed for a mandate requiring developed countries to take the lead in reducing emissions (Grubb, 2003). This was justified on the basis that the developed countries emissions had contributed most of the stock of GHGs in the atmosphere; per-capita emissions were still relatively low in developing world; and the emissions of developing world would grow to meet their developmental needs (Liverman, 2008). This mandate was sustained in the Kyoto Protocol to the Framework Convention which entered into legal effect in 2005. In ratifying the Kyoto Protocol, most of the developed countries accepted legally binding commitments to limit their emissions. The then United States president, George W. Bush rejected the treaty on the basis that it exempted 80% of the world, including major population centres such as China and India from compliance, and would cause serious harm to the economy of the United States (Dessai, 2001).

At the 15th United Nations Framework Convention on Climate Change (UNFCCC) conference of parties held in 2009 at Copenhagen, several UNFCCC parties produced the Copenhagen Accord (Muller, 2010). Parties associated with the Accord (140 countries as at November 2010) (UNEP, 2010) aim to limit the future increase in global mean temperature to below 2^0C (UNFCCC, 2010). A preliminary assessment published in November 2010 by the United Nations Environmental Programme (UNEP) suggests a possible emission gap between the voluntary pledges made in the Accord and the emission reduction necessary to have a chance of meeting the 2^0C objective.

7.0UNITED NATIONS CONFERENCES ON SUSTAINABLE DEVELOPMENT

7.1STOCKHOLM CONFERENCE IN 1972

The world first came together to discuss environmental problem in 1972 at the United Nations Conference on the Human Envrionment in Stockholm. The Stockholm conference gave birth to the United Nations Enviornment Programme (UNEP) and a range of multilateral environmental agreements (Stoddart, 2011). These included conventions on trade in endangered species, wetlands, weather warfare, wild-life conservation and air pollution (Munoz and Najam, 2009).

7.2 THE 1987 BRUNDTLAND REPORT

This was convened to research how the deteriorating natural environment affected social and economic development. The Brundtland Commission introduced the concept of intergenerational equity. This concept states that we should leave behind a liveable world when we die. So, people need development without damage to the environment. The Brundtland Report "Our Common Future", defined the concept of sustainable development that we still use today. "development that meets the need of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987).

7.3 RIO DE JANEIRO CONFERENCE IN 1992.

The United Nations Conference on Environment and Development (UNCED), or Earth summit in Rio de Janeiro in 1992 was unique in its size and participation because it attracted more heads of states and governments than any other international conference earlier. For the first time, civil society took part in such an event in a significant way. The conference succeeded in raising public awareness on the need to integrate environment and development, and geared towards addressing urgent problems of environmental protection and socio-economic development. Major outcomes of the summit include, among others:

i. Agenda 21 – a blue print for implementing sustainable development;
ii. Climate Change Convention – a climate change agreement that led to the Kyoto Protocol;
iii. The United Nations Framework Convention on Climate Change (UNFCCC);
iv. Convention on Biodiversity:
This earth summit influenced subsequent UN conferences, set the global green agenda, and led to the reform of the Global Environment Facility.

7.4THE 1997 KYOTO PROTOCOL

The Kyoto Protocol is one of the most prominent international agreements on climate change but it was highly controversial. Some argue that it goes too far or not nearly enough (Darragh, 1998) in restricting the emissions of GHGs. Another area of controversy is the fact that China and India, the world's two most populous countries, both ratified the protocol but are not required to reduce or even limit the growth of carbon emission under the present agreement whereas they have significant emissions of 5.13 and 1.37 tonnes of GHG per capita, and 23.6% and 5.5% of global total emissions respectively (IEA, 2011A). China is presently the world's largest producer of GHG emissions, amounting to 23.6% of global emissions compared to the United States with 17.9% of global emission and 16.9 tonnes of GHG per capita (IEA, 2011A).

By this arrangement, high costs of decreasing emissions in some countries covered under the treaty would cause significant production to move to countries that are not covered under the treaty, such as China and India (Singer, 2000).

7.5GLOBAL WARMING SUMMIT IN BUENOS AIRES IN 1998

The Buenos Aires Plan of Action agreed to set a timetable for discussing by the year 2000 the many issues that needed to be settled. These include: whether to impose penalties on those countries that do not achieve their goals; how to transfer climate – friendly technology to developing nations so that they could reduce pollution and emission of GHGs.

7.6 (WORLD SUMMIT ON SUSTAINABLE DEVELOPMENT (W.S.S.D) IN JOHANNESBURG, SOUTH AFRICA IN 2002.

World Summit on Sustainable Development (WSSD) in South Africa, nicknamed Rio + 10, reviewed progress on Rio 1992 commitments. At Rio + 10, sustainable development was recognised as an overarching goal for institutions at the national, regional and international levels. The need to enhance the integration of sustainable development in the activities of all relevant United Nations agencies, programmes and funds was highlighted. The official outcome of the conference includes the Johannesburg Declaration, and almost 300 international partnership initiatives meant to achieve the Millennium Development Goals.

7.7EARTH SUMMIT ON SUSTAINABLE DEVELOPMENT IN RIO DE JANEIRO, IN 2012

Billed as the biggest UN event ever organized, the Rio + 20 summit was intended to be a high-level international gathering organized to re-direct and renew global political commitment to sustainable development. Rio + 20 sought to secure affirmations for the political commitments made at past earth summits and set the global environmental agenda for the next twenty years by assessing progress towards the goals set forth in Agenda 21 and implementation gaps therein, and discussing new emerging issues. The United Nations wanted Rio + 20 to endorse a UN " green economy roadmap", with environmental goals, targets and deadlines, whereas developing countries preferred establishing new sustainable development goals to better protect the environment, guarantee food and power to the poorest, and alleviate poverty.

The primary result of the summit was the non-binding document "The Future We Want". In it, the heads of state of 192 governments in attendance renewed their political commitment to sustainable development and declared their commitment to the promotion of a sustainable future. Nations agreed to explore alternatives to Gross Domestic Product (GDP) as a measure of wealth that takes environmental and social factors into account in an effort to assess and pay for "environmental services" provided by nature, such as carbon sequestration and habitat protection.

Rio + 20 attracted many protests, and more than 500 parallel events, exhibitions, presentations, fairs, and announcements took attractive stages; as wide range of diverse groups struggled to take advantage of the conference to launch themselves into international attention. This singular episode led to the skeptical conclusion that the green ideology crashed and burnt at the Rio + 20 earth summit. A few key global leaders, mostly G-20 leaders, namely, U.S President, German Prime Minister, and United Kingdom Prime Minister did not attend

the conference and blamed their absence on the then prevailing European sovereign – debt crisis. Their collective absence was seen as a reflection of their administration's failure to make sustainability issues a priority.

8.0CONCLUSION

The problem of global warming is a world-wide problem, crossing national boundaries and calls for determined and combined efforts by all nations of the world. The United Nations and its member nations have been indulging in empty talks, discussions and futile exercises several years down the line. All the United Nations conferences on environment and sustainable developments succeeded in generating much heat, hype and verbosity but no concrete results.

We need to have greater respect for the mother earth and its environment. There is absolute need to chart a more equitable and sustainable development path. It is high time that all the inhabitants of the mother earth realized the gravity of the problem, and the danger it portends, and make determined and combined efforts to reduce global warming appreciably. We need to redefine and redesign our energy need in order to cut GHGs emissions.

Alternative, cleaner fuels should be searched and developed besides creating more efficient automobiles. These use of renewable energy sources should be encouraged and developed on a large scale. Wind power solar power, tidal-power, hydro-power are some of the well-known clean, renewable and abundant energy resources in nature.

The process of establishing a common global approach to regulating and responding to cross-boundary environmental issues will inevitably involve some loss of national sovereignty to global and regional bodies. This will not be easy in a highly polarized and unequal global economy, currently mired in concerns about debt levels and economic recession. In some regions of the world including Nigeria, the effects of global warming are now being felt very acutely in the form of climate and weather changes, droughts, famines, epidermics, destruction of wildlife, huge forest fires, devastating floods, to mention a few. Global problems need global co-operation and solutions. Let us use recent events to chart a new course.

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