Global Warming: Policy Formulations to Regulate

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Global warming is a serious problem faced by the world today as an after effect of Industrial Revolution. Due to the concentration of green-house gases such as carbon dioxide, methane, nitrous oxide which has been injected into the lower atmosphere; warming of earth’s surface and rising near surface air temperature have been caused. It has resulted into climatic variation, geological change and as such is impacting the human, animal and aquatic lives considerably. Changes in weather patterns have led to change in winds, ocean currents and precipitation patterns. Such changes have impacted the agriculture, flora and fauna. If not checked in time, global warming shall lead to serious disasters. It would lead to the change in solar radiation and the insolation pattern ultimately affecting the geometry of earth’s orbit around the Sun. Earth’s axis may tilt due to direct rays of the Sun wiping out the life on earth. Environmental degradation poses a great danger to man’s own survival. Climatologists believe that the rising of global average temperatures would result into significant ecological, societal and economic damage. Human influence on environment has increased manifold due to the rapid population growth and fast development in technology. The increasing amount of burning of fossil fuels in industries, the vehicular emission, burning of coal or leaves for residential purposes have increased the Greenhouse effect. If fossil fuels are being burnt at current rate, they may concentrate at the level of 560 ppm in lower atmosphere by mid-21st century. The flooding of atmosphere with carbon dioxide would melt the glaciers and the intensity of hurricanes may increase. Consequently many species shall extinct affecting the death and birth rates. It should be realized that conservation of environment is vital for the survival and well-being of mankind. Hence public policy needs to be formulated to regulate the carbon concentrations in air. It is high time to understand the alarming situations and make laws at national and international levels so as to keep the global warming under check and control environmental degradation. UNFCC,

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JOURNAL OF NATIONAL DEVELOPMENT, Vol. 31, No. 1 (Summer), 2018
Kyoto Protocol, Paris Agreement are certain major international treaties to check global warming. Efforts at national level are also being taken in this regard. 

[Keywords: Global climate change, Greenhouse effect, Global warming, UNFCC, Kyoto Protocol]

1. **Introduction**

   Global Climate Change is a serious problem being faced by our earth. Climate is being defined as the long term average of weather gathered over many years. When a particular type of weather becomes more regular in some area, it is recognized as a change in climate. Global warming has become a regular feature of the planet leading to extreme cold or extreme hot conditions. Consequently, extreme weather conditions like heat waves, droughts, rainstorms keep on occurring with greater intensity. The climate models of the scientists forecast that in coming years the climate pattern would face significant changes due to global warming that would be visible in seasonal temperature variations wind, patterns and annual rainfall. As per the report of Environmental Protection Agency, climate change has caused increased annual rainfall in North Eastern United States while in Pacific Northwest we find that the summer rainfall is decreasing to a great extent.

   Before 1850, the climatologists did not have the techniques to measure the exact temperature. Only the proxy measurements were used to get the temperature readings in certain areas. After 1850s, the scientists started measuring the temperature through thermometers at enough places so as to know the global average temperature. By 20th century, major temperature variations were witnessed. From 1920 to 1940, the global temperature was warmer whereas from 1940-1970, the temperature got a bit cool. From 1970 onwards there has been a rise in temperature. The average temperature of the world has increased by about ±0.6 to 0.2°C. The slow and steady rise in temperature has led to global warming of earth’s surface. Temperatures today have increased to 0.74°C (1.33°F) higher than it was 150 years ago and as such a 6 degree Celsius rise in global temperature is expected in the next 100-200 years.

   From 1880 to 2012, the global average surface temperature has seen an alarming increase of 0.85°C. From 1906-2005, the average surface temperature rose by 0.74 ± 0.18°C.¹ The rate of warming just doubled during that period. Since 1997, the average temperature has been increasing by 0.13°C and 0.22°C. Such a fast pace of global warming has resulted in melting of glaciers leading to an overall rise in the sea level. Ocean temperatures have been increasing at a slower rate than land temperature due to the large heat capacity of oceans and also that oceans lose more heat by evaporation.² Arctic temperatures have been increasing at almost twice the rate of the rest of the world in past hundred years.³
2. **Greenhouse Effect**

It is a phenomenon that acts as a boon for planet earth. The prime greenhouse gases in atmosphere are carbon dioxide, water vapor, methane, nitrous oxide, ozone etc. Greenhouse gases absorb the heat and emit radiation within thermal infrared range.\(^4\) The process as such is called greenhouse effect. Without it, earth’s average temperature would have been -18°C where it would have been impossible to sustain life as is the case with other planets due to lack of atmosphere. Earth’s average temperature is 15°C (59°F).\(^5\) The balance between the source of emission of gas due to natural system or human activity and the sinks i.e. the removal of gas from the atmosphere through its conversion to a different chemical compound, keeps protecting the atmosphere.

3. **Global Warming and its Causes**

The gradual heating of Earth’s atmosphere, its surface and oceans is termed as global warming. The rise in the average temperature of earth by 1.4 degrees Fahrenheit (0.8 degree Celsius) since 1800s and the projected rise of 2-11.5 degrees Fahrenheit (1.133-6.42 degrees Celsius) in temperature over the next 100 years, prove that global warming of our planet at this rate shall lead to total devastation. Global warming is caused by the greenhouse effect due to the interaction between radiation from Sun rays reaching the earth’s surface and earth’s atmosphere. Solar radiation while passing through the atmosphere towards the surface of the earth gets absorbed and is radiated back as heat. Though this process is favorable for sustaining a warm and life-supporting environment but indefinite and non-uniform rise in amount of heat can lead to an overall global climatic change. These Greenhouse gases are considered to be the major causes of global warming.

The major atmospheric gases such as oxygen (O\(_2\)), nitrogen (N\(_2\)) and argon contain two atoms of the same element and hence they do not undergo any change in their charge distribution while they vibrate. So they remain totally unaffected by infrared radiation. On the other hand gases like carbon dioxide, carbon monoxide, water vapor etc containing two atoms of different elements absorb infrared radiation. In case of carbon monoxide, hydrogen chloride etc., although they absorb infrared radiation but their molecules are short-lived in the atmosphere due to their solubility so they do not contribute much to the greenhouse effect. Carbon dioxide is the major greenhouse gas and is abundant in the atmosphere due to large-scale burning of fossil fuels such as coal, oil and natural gas, deforestation, burning forests so as to create pastures and plantations. CO\(_2\) absorbs infrared radiation, the heat trapping effects of which get compounded over the time. Thus there is a need to control and regulate CO\(_2\) emission levels, especially by the largest emitters such as the United States. Since the year 2000, fifteen of the warmest years have occurred.\(^6\) Though the press has not been giving proper attention to the warmest years, the records are really shaking. Gavin
Schmidt said, “The long-term trends or the expected sequence of records are far more important than whether any single year is a record or not.” The Press Conference convened jointly by NASA, NOAA and NCDC announced that the year 2014 had been the warmest year. The monthly global concentrations of CO₂ exceeded 400 ppm in March 2015 for the first time in the last millions of years. NASA scientists reported on 12th November that human-made carbon dioxide continues to increase above levels not seen in hundreds of thousands of years. Half of the carbon dioxide released in the atmosphere due to burning of fossil fuels does not get absorbed by the vegetation or the oceans, rather it continues to accumulate in the atmosphere.

4. Effects of Global Warming

From North Pole to South Pole, the planet has been warming up at a scale whose effects are now becoming more prominent and if not checked in time, the effects may be disastrous. The heat being accumulated has not only melted the glaciers and sea ice but it has also led to shifting of precipitation patterns. Mountain glaciers and ice sheets that cover Greenland, Arctic Sea and West Antarctica have started melting. This in turn has led to an overall rise in the sea-level, which is expected to rise between 7-23 inches by the end of the century. Rain and snowfall have been observed to be getting more erratic than usual leading to prevalence of floods and droughts. In Ethiopia, that is already suffering from droughts, rainfall may further decrease by 10% over the coming 50 years. Hurricanes and storms shall become stronger with repeated occurrence.

Global warming shall have a deep impact on plantation and the species. The timing of spring season has started to get preponed due to which the plants bloom much earlier before their pollinating insects become active. It would bring a decline in natural plantation. Species that depend upon one another mutually may go out of sync. Certain foxes, alpine plants, butterflies etc. have started moving already to farther north or to higher cooler areas. In Antarctica, there has been a decline of the Adelie penguins. There number has decreased from 32,000 pairs to 11,000 in the last 30 years. According to the research done by wildlife research scientists Martyn Obbard, since the 1980s, the polar bears are getting skinnier due to loss of habitat and food. In Hudson Bay, similar pattern regarding polar bears have been found. It is a great fear among wildlife researchers that if the sea ice disappears, the polar bears and other polar flora and fauna may get extinct.

Due to global warming, the future generations may face lack of fresh water. The scientists fear that if the Quelccaya ice cap in Peru keeps on melting at current rate, it would completely vanish by the next century and the thousands of people relying on it for electricity and drinking water shall be left in dark. Entire ecosystem can get altered due to this imbalance. Diseases like dengue, malaria shall become more prevalent due to increased mosquitoes. Due to warm summers
in Alaska, the insects have chewed up a large number of spruce trees. Therefore, signs of ecosystem changes are evident all over the planet.

5. International Treaties to Regulate the Climate Change

Due to the alarming pace of global warming, the developed nations as well as the developing ones realized the need of regulating the global temperature so as to save the ecosystem from degeneration by stabilizing the gas emissions.

5.1 The United Nations Framework Convention in Climate Change

UNFCC, an international environment treaty negotiated on 14th June 1992 which came into force on 21 March 1994, has a foremost objective to “stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.”10 Though the Treaty did not set any binding limits on greenhouse gas emissions for the countries and even did not contain any enforcement mechanisms, but it developed a tradition to set an understanding and awareness amongst the nations to take up the responsibility themselves to limit the greenhouse gas emissions. An Intergovernmental Negotiating Committee was established to coordinate amongst the nations for implementation of the provisions of treaty and for the signatures to be done on the day of the treaty. By December 2015, 197 members signed, proving thereby that the convention enjoys broad legitimacy.11

Since 1995, parties to the convention have been meeting annually in the ‘Conference of Parties’ so as to assess the progress relating to reduction in greenhouse emissions. The major task assigned to the signatory nations by this convention was to establish the National Greenhouse Gas Inventories so that the greenhouse emission could be measured regularly at different places and checked or removed thereby. The updated inventories were to be regularly submitted to the working group of Inter-Government Committee of UNFCCC. Those who are not signatories to the convention could also participate in Protocol related meetings or in the conferences as observers.

5.2 Kyoto Protocol & Doha Amendments

The Kyoto Protocol was adopted on 11th December 1997 in Kyoto, Japan and came into force on 16th February 2008 with 192 parties. Kyoto Protocol is an extension of UNFCCC to fight the global warming by reducing greenhouse gas concentrations. The Protocol believes that the obligation of reducing the greenhouse gas emissions is more upon the developed nations. Under the Protocol, countries were supposed to meet their targets of greenhouse gas reduction through three Kyoto mechanisms : 1) To stimulate the green investment and meet the emission targets in a cost-effective way; 2) Actual emissions to be monitored and the records to be kept. 3) Registry system of track and record transactions by the Parties under Kyoto mechanism and finally reporting to be done by the parties at
regular intervals. A compliance system would ensure that the parties are meeting their commitments.

First target commitment period was from 2008 to 2012. The second commitment period started in 2012 known as Doha amendment to the Protocol whereby 37 countries were given binding targets viz. Australia, 28 members of European Union, Belarus, Kazakhstan and Ukraine. But some of the countries stated that they may withdraw from the Protocol or not put into legal force the amendments with second round targets.\textsuperscript{12} USA did not participate in the targets as the White House could not ratify the protocol and Canada too stayed away from Kyoto Protocol. Hence Doha amendment could not come into force as of July 2016, only 66 states had accepted it whereas entry into force required the acceptance of 144 states. Negotiations were held within the framework of the annual UNFCCC Climate Change Conference on how to continue with the second commitment period that has to be ended by 2020. Conference in Paris was convened in 2015 for the purpose that resulted in Paris Agreement, an entirely separate one under the UNFCCC rather than an amendment of the Kyoto Protocol.

Kyoto Protocol was designed to assist the nations in adapting to the deployment of technologies so as to increase the resilience to the impacts of climate change. Though it could not come in force, it can be seen as the first important step towards the global emission reduction regime that would channelize the nations, stabilize their GHG emissions and could provide an architectural base for the future agreements on climate control.

5.3 Paris Agreement

The Paris Agreement, drafted on 30th December 2015 and signed on 22nd April 2016, is yet another major step towards World Climate Control. It was signed by 195 nations and ratified by 193 members by November 2016, by which the agreement came into effect by 4th November 2016. The agreement dealing with greenhouse gas emissions mitigation is an ambitious and balanced plan that if adopted properly would be a historic turning point in the goal of reducing global warming.\textsuperscript{13} Article 6 of the agreement contains the key provisions of Paris Agreement that outlines the cooperative approaches that parties can take in achieving their nationally determined carbon emission reductions. By doing so it would turn the framework into a global carbon market.\textsuperscript{14} It governs the International transfer of mitigation outcomes (ITMOs) that would link various carbon emissions trading systems into a global linkage under the auspices of UNFCCC. Hence the agreement puts a pressure upon the signatories to adopt emissions management systems that may be cost-effective suiting their economies.

Para 6.4-6.7 establish the Sustainable Development mechanism that would contribute to the mitigation of greenhouse gases and support sustainable development.\textsuperscript{15} The SDM is the successor of clean development mechanism that was adopted under Kyoto Protocol whereby parties take up emission reductions for
their Nationally Determined Contributions. The SDMs would contribute to a great extent to the global GHG emissions reduction and as such would enhance sustainable development. Paris Climate Change agreement could be termed as world’s greatest diplomatic success with a global attempt to resolve the climate change. This agreement is hailed as historic, ambitious and durable whereby developed as well as developing nations are required to limit their GHG emissions to safe levels of 1.5C. Poor nations may be provided with the finance to run the project of controlling GHG in their respective nations. As the agreement has come into force, world is hopeful of protecting the climate of the Earth in the near future.

6. **Steps taken in India towards Environmental Protection**

   Environmental sensitivity in India has been growing through a major public awareness. Green movements have grown out of small local initiatives to become major players in advocating environmental protection. Through several tools in electronic media, various programmes have been taken up by different agencies from time to time. India has prepared a comprehensive pollution abatement strategy. Pollution Control Boards have been established for the purpose. In addition to that six Environmental authorities including National Environment Appellate Authority have been constituted under Environment Act 1986. Various policies have been framed so as to protect the environment such as National Conservation Strategy and Policy statement on Environment and Development, 1992; Policy statement on abatement of Pollution, 1992, National Environment Policy 2006, National Environment Tribunal Act. Pro-environmental issues are major concerns of India’s policy makers today.

7. **Conclusion**

   Global Warming, if not checked in time can lead to a great disaster in future. The climate scientists agree to the fact that the rate at which global warming is increasing is not due to a natural occurrence, but as a result of human activity. The Intergovernmental Panel Report on climate change indicated the same. Hence there is a dire need to get alert in time and save the planet. Development of clean energy such as solar, wind or geothermal energy, reducing the burning of fossil fuels that cause the release of more and more CO2 in the atmosphere, more sustainable transportation options as alternate fuel vehicles and mass transit may also reduce greenhouse gases in atmosphere. Individual efforts such as lowering the use of thermostats in winter and also the use of energy efficient light bulbs could help addressing global warming issues. But large-scale International policies, cooperation amongst the nations and the compliance to international convention is also required to reduce the greenhouse gas emissions and make the planet safer for future generations.
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