



Risk and Impact of Global Warming: A Review

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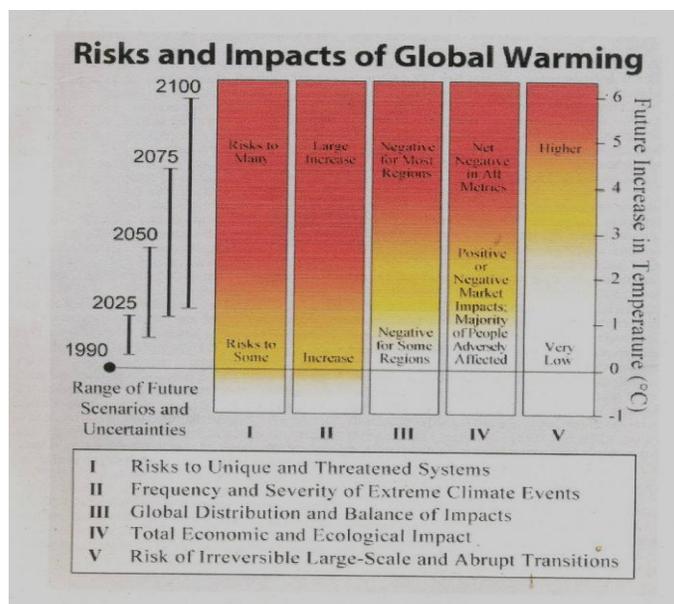
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ABSTRACT

According to the new graph, risks to "unique and threatened systems" such as coral reefs and risks of extreme weather events become likely when temperatures rise by as little as 1.8 degrees F from 1990 levels, which is on course to occur by mid-century given the current concentrations of atmospheric greenhouse gases. Global warming is already having significant and costly effects on our communities, our health, and our climate. Unless we take immediate action to reduce global warming emissions, these impacts will continue to intensify, grow ever costlier and damaging, and increasingly affect the entire planet — including you, your community, and your family.

Graphical Abstract



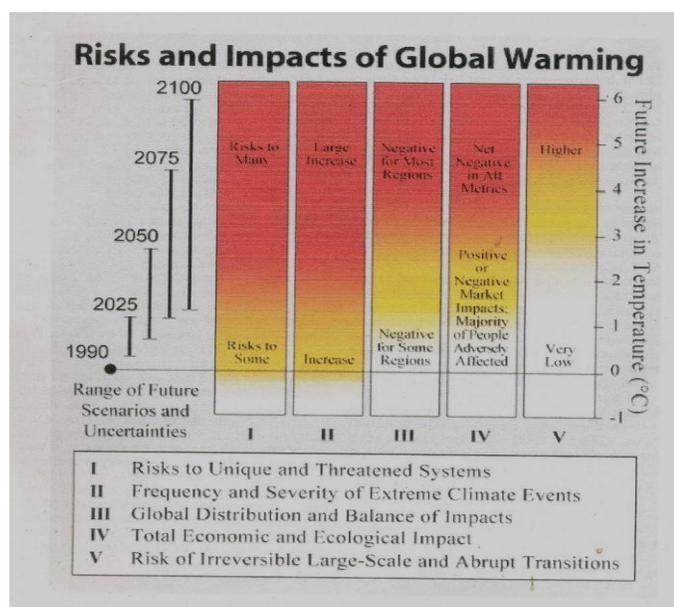
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INTRODUCTION

The gaseous mantle around our globe allows a considerable portion of solar radiations to enter right up to the surface of earth which absorbs it and radiates back as infra-red and heat waves. This heat is transferred to layers above, as warm layer rises and is in turn passed on to higher and higher layers. Finally much of the solar radiations are radiated back to space as infra-red and heat waves [1,2].

Thus, under normal conditions, the temperature at the surface of the earth is maintained by the energy balance of sun rays that strike the planet and heat that is radiated back into space. The thick CO₂ layers functions like the glass panels of a greenhouse, allowing the sunlight to filter through but preventing the heat from being re-radiated in outer space.

Thus, the atmosphere of the Earth gets heated up due to its insulation. Hence giving rise to global warming. Besides, the five emerging environment issues new Technologies, red tides, diesel pollution, acid fog and threats to Antarctica, that the UNEP has been able to identify, the one that has proved the most vexation, and disquieting is the Green House effect or Global warming [3]. It is caused by the build up in the atmosphere of CO₂ and other toxic gases discharged by industry and agriculture. If unchecked, it could alter temperatures, rainfall and sea levels of the earth. The UNEP has appropriately chosen the slogan “**Global Warming: Global Warming**” to alert the people on World Environment Day, June 5, 1989.



Very slow, almost imperceptible rise of about 4-5°C in the Global temperature has occurred in the past 20,000 years. However, a rise of about 0.3-0.7°C was recorded during the last century alone, which is remarkably faster as compared to change that occurred in the past.

This acceleration in the pace of global warming coincides with a rise in the concentration of green house gases in the atmosphere [4]. The insulation of earth's surface from the outer space caused by green house gases tends to become more and more effective as the concentration of these gases rises. More heat and infra-red radiations are trapped by gaseous mantle around the globe which accelerates the pace of global warming. Rise means global temperatures and concentrations of Green House gases in the atmosphere.

There are a number of gases present in the atmosphere which are capable of absorbing effectively heat waves and infra-red rays while being transparent to radiations of lower wavelengths. Carbon dioxide,

methane, oxides of Nitrogen, Sulphur dioxide, ozone, chlorofluorocarbons and water vapors are some of the gaseous constituents of troposphere which came in the category [5].

From the point of Global warming, however, only those gases are important which maintain an effective concentration in the troposphere, i.e. the region of atmosphere immediately covering earth's surface. There are five such gases rising concentration of which has been implicated in causing noticeable rise in the mean global temperature. These are carbon dioxide, methane, chlorofluorocarbons, nitrogen oxide and water vapors. Other gases like sulphur dioxide, ozone is not able to contribute much as they are quickly cleared from the atmosphere.

(A) Carbon Dioxide: It is one of the most important green house gases of which about 18 billion tons are being introduced into the atmosphere annually. A rise of about 26% has already been recorded in a period of 200 years only. Between the years 1980-89, carbon dioxide has been estimated to be responsible for at least about 55% of global rise in temperature.

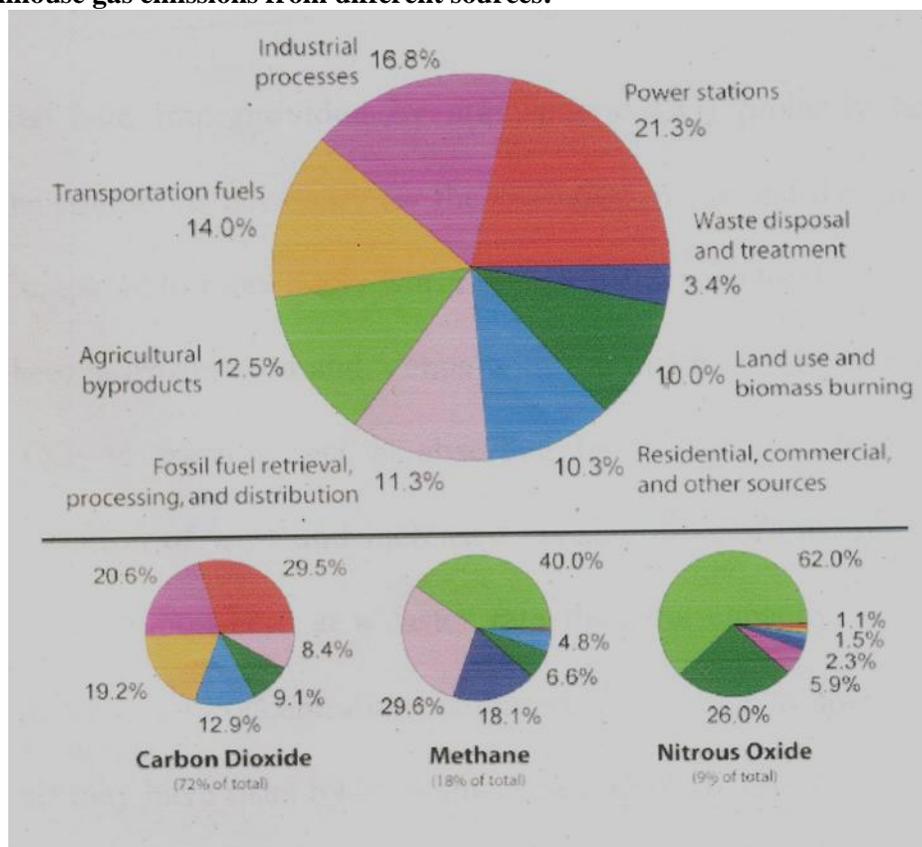
(B) Methane: Methane is another greenhouse gas which is produced when organic matter decays under anaerobic conditions. In 1050 its concentration was about 1.1 PPM while in the year 1985 it was estimated to be 1.7 ppm. The concentration of this gas is rising at a rate of about 1% per year. Between the years 1980-90 about 15% of the total warming has been attributed to this gas alone. In the methane atmosphere, undergoes oxidation to carbon dioxide and water both of which tend to accentuate the green house effect.

(C) Nitrous Oxide: Nitrous oxide is another troublesome gas. Other oxides of Nitrogen are reacted upon or cleared rapidly while nitrous oxide undergoes decomposition very slowly and hence it tends to accumulate in the atmosphere. In 1950 its concentration was about 280 ppb while in 1985 it had reached 380 ppb. Between the years 1980-90, nitrous oxide accounted for at least 6% of the total global warming. The concentration of this gas is still rising at a rate of about 0.5% per year.

(D) Water Vapors: About 70% of earth's surface is covered with water wherefrom an enormous quantity of water evaporates. Likewise, the process of transpiration introduces a substantially large amount of water vapours into the atmosphere precipitation brings down about 496×10^9 cubic kms. of water to earth's surface whereas vapour equivalent to 14,000 cubic kms. of water stay back. Permanently in the atmosphere, water vapor like any other green house gases contributes significantly to the global warming. With an overall rise in temperatures the rate of global transpiration and evaporation shall also go up which shall introduce more water vapors into the atmosphere and could in turn influence the pattern of global warming.

(E) Chlorofluorocarbons: Chlorofluorocarbons represent a group of man-made, colorless, odorless, easily liquefiable chemicals which have more potential for global warming than any other greenhouse molecules. They are very stable compounds which may persist in the atmosphere for periods as long as 80-100 years. Though first introduced only in fifties, chlorofluorocarbons have rapidly attained such levels that between the years 1986-90, they were responsible for 24% of global warming. Till 1985, about 15 million tons of these compounds had been released in the atmosphere. In spite of much international efforts to check the use of these chemicals. CFCs are still rising at a rate of about 5% per year.

Apart from contributing substantially to global warming the persistent nature of chlorofluorocarbons enables them to accumulate and rise at random to reach the stratosphere. Strong ultra-violet radiations present in the stratosphere decompose these compounds to yield chlorine atoms which catalytically destroy the vital ozone shield.

Annual greenhouse gas emissions from different sources:

The increasing CO₂ levels tend to warm the air in the lower layers of atmosphere on a global scale. Nearly 100 years ago, the CO₂ level was 275 ppm. Today it is 350 ppm and by the year 2035 and 2040 it is expected to reach 450 ppm. Imagine the earth's temperature CO₂ increases the earth temperature by 50% while CFCs are responsible for another 20% increase. These are enough CFCs up thereto last 120 years. What will be if we do not stop CFC release.

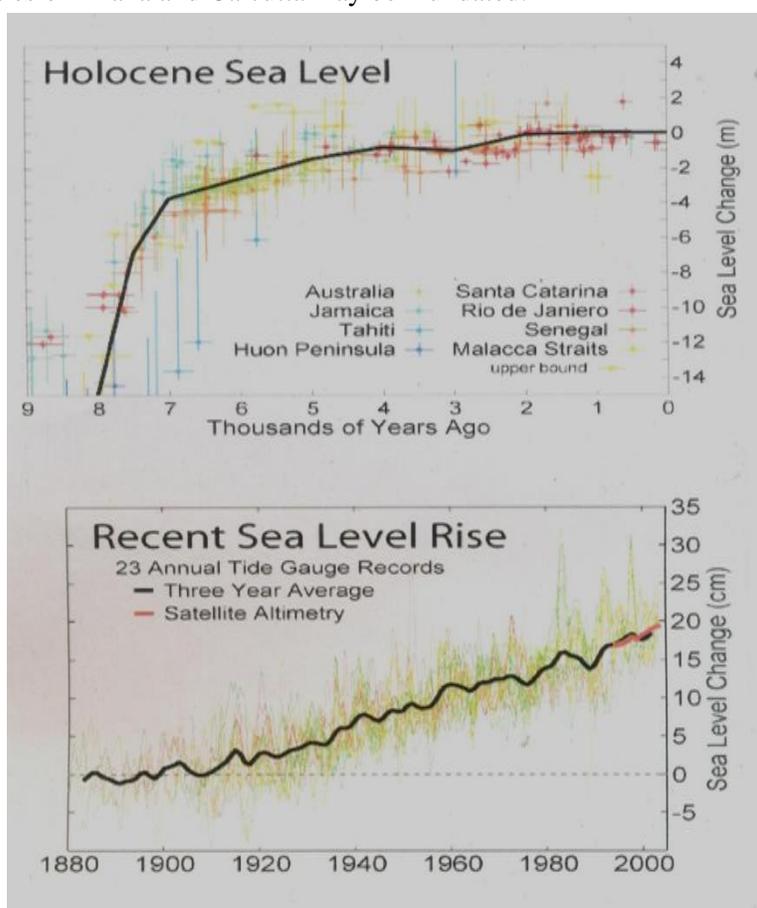
The heat trap provided by atmospheric CO₂ probably helped to create the conditions necessary for the evolution of life and the greening of earth. Compared to moderately warm planet, mars, with too little CO₂ in its atmosphere is frozen cold and Venus with too much is a dry furnace. The excess CO₂ to some extent is absorbed by the oceans. But with the industrialization of west and increased consumption of energy, CO₂ was released into atmosphere at a faster rate than the capacity of oceans to absorb it. Thus, its concentration increased. According to some estimates CO₂ in air may have risen by 25% since the middle of 19th Century. It may even be doubled by 2030 A.D.

These are some differences of opinion, however, about the extent of rise in earth's temperature due to increasing CO₂ levels. According to some computerized models, doubling the CO₂ level will increase the global mean temperature (15°C) by two degrees. There are other gases also which contribute to greenhouse effect. These are SO₂, NO, CFCs discharged by industry and agriculture. Even a change of two degrees may disrupt the earth's heat budget, causing catastrophic consequences.

Some analysts believe that changes in the earth's mean temperature will be apparent by 2050, when the temperature would increase by 1.5 to 4.5°C. According to one projection, changes will be the least in the tropics and the most at the poles. So, Greenland, Iceland, Norway, Sweden, Finland, Siberia and Alaska will be among the most affected. The polar icecaps would melt. The floating Western Antarctica ice sheet

could begin to melt. A rise of five degrees would raise the sea level by five meters, within a few decades, threatening all the densely populated coastal cities from Shanghai to San Francisco. It is suggested that North America would be warmer and drier. The U.S. would produce less grains. On the other hand, North and East Africa, the middle East, India, West Australia and Mexico would be warmer and wetter, enabling them to produce more grain. Rice-growing season as well as area. Under rice cultivation could increase. However, this may not happen as higher temperature will increase the evaporation of water, thus reducing grain yield. According to U.S. scientist, George Woodwell, India's annual monsoon rains may even cease altogether.

According to an estimate, if all the ice on the earth should melt 200 feet of water would be added to surface of all oceans, and low lying coastal cities as Bangkok and Venice would be inundated. A rise in sea level of 50- 100 cm caused by ocean warming would flood low-lying lands in Bangladesh and West Bengal due to green house effect, there may occur more hurricanes and cyclones and early snow melts in mountains causing more floods during monsoon. According to some, within next 25 years or so, there will be rise in sea level by 1.5 to 3.5 meters and in Bangladesh alone 15 million people will have to move or drown. Low-lying cities of Dhaka and Calcutta may be inundated.



Green House Effect and Stratospheric Ozone Depletion



In the troposphere greenhouse gases provide an effective thermal insulation while in the stratosphere many of these gases are responsible for causing ozone depletion. In spite of the discontinuity caused by mutually opposite thermal gradient which prevents a free exchange of materials between the troposphere and the stratosphere, some transfer of gaseous material does take place between the two layers. Because of a greater build up of greenhouse gases and longer life span in the troposphere, these molecules rise at random and reach the stratosphere where they undergo dissociation yielding chlorine atoms, hydroxyl ions and nitric oxide which react with ozone to degrade it to Oxygen.

A significant amount of nitric oxide is produced in the stratosphere by nitrous oxide derived from the troposphere below. More chlorine atoms are derived from the disintegration of chlorofluorocarbon than from any other source. Hydroxyl ions are produced in plenty when water molecules dissociate under influence of ultra-violet radiations in the stratosphere. Though there are other sources as well it is mainly the pollution of the troposphere which contributes significantly to the ozone-depleting constituents of the stratosphere.

During the last two or three decades there has been a slow thinning out of the vital shield and the overall reduction in ozone content is now estimated to be about 8%. An inevitable consequence of this will be an increase in the intensity of solar radiations containing harmful ultraviolet rays. Apart from other damages this will further enhance the heating effect caused by Sun's rays. However, a diminution in the ozone content of the stratosphere shall also reduce the heat retaining capacity of the gaseous mantle around the globe and it has also been suggested that this could neutralize some of the warming effect caused by higher concentration of greenhouse gases.

Consequence of G.W. on flora and fauna: Due to rise in the Global mean temperature, as the climate belts shift away from equator towards poles, vegetation shall have to shift in the same direction to stay in favorable climatic conditions. Those species which are unable to do so, shall die. There will be losses of genetic resources on large scale. Hardy and resistant forms shall come up and survive. An altogether changed biotic spectrum shall replace the earlier ones and all important biomes shall be affected. As temperature changes will affect wind and precipitation patterns also water could play an important part in altering the biotic communities. It has been suggested that some rise in precipitation, however, shall be balanced by an enhanced evapotranspiration and this could lead to water deficit and moisture stress in many regions of the world. (Mother and Peddamma, 1986). Insects and Pests may increase as warmer conditions could be more favorable to their growth and coupled with higher humidity pathogenic diseases shall multiply. Cycling of minerals nutrients may be affected and with it leaching and desertification may follow in many areas. The effect of global warming on agriculture will be of a varied type in different parts of the world. Wheat and maize crops may suffer from moisture stress. Most fertilizers shall have to be used to sustain productivity. In places where temperature conditions are already near the upper tolerance levels even a rise of 1-2°C may be quite harmful.

Alterations in cropping patterns shall occur and post resistant varieties more suitable to warmer conditions shall have to be developed. In short green house warming shall bring with it an entirely new environment in which life though not impossible yet its existence shall be tougher to maintain [6].

Costliest U.S. Atlantic hurricanes

Total estimated property damage, adjusted for wealth normalization

Rank	Hurricane	Season	Cost (2005 USD)
1	"Miami"	<u>1926</u>	\$ 157 billion
2	"Galveston"	<u>1900</u>	\$ 99.4 billion
3	Katrina	<u>2005</u>	\$ 81.0 billion
4	"Galveston"	<u>1915</u>	\$ 68.0 billion
5	Andrew	<u>1992</u>	\$ 55.8 billion
6	"New England"	<u>1938</u>	\$ 39.2 billion
7	"Pinar del Rio"	<u>1944</u>	\$ 38.7 billion
8	"Okeechobee"	<u>1928</u>	\$ 33.6 billion
9	Donna	<u>1960</u>	\$ 26.8 billion
10	Camille	<u>1969</u>	\$ 21.2 billion

Main article: List of costliest Atlantic hurricanes

Government act and summit comments: Unfortunately, no country considers global warming as a potential threat to mankind. However, the U.N.O. has taken the matter seriously and proposed certain preventive measures: In 1979, the first International Climate Summit was held, in which all the nations were appealed to check all such drastic changes.

In the year 1988, the IPCC (Inter-governmental Panel on Climatic Change) was established.

- In 1990, IPCC submitted its 1st report, in which scientists admitted that drastic climatic changes were taking place.
- In 1992, the earth summit was held 154 nations and EEC signed on the convention issued by U.N.O. This convention named Agenda-21, state that the levels of Emissions have to be first stabilized to the 1990 level and then brought down to safe levels after the year 2000.
- In 1997, a Conference of the Representative of nations was held at Kyoto (Japan). In which it was agreed to legalize the internationally decided levels of production of green house gases.
- According to the Kyoto Agreement, by 2008-2018 the levels of emission of green house gases had to be brought down by at least 5% of the 1990 level. 178 nations agreed, but America refused to agree on this agreement.
- In the Kyoto Agreement, Nations producing 55% of the total green house gases were asked to give an acceptance, however, America refused in this also.
- In 2001, I.P.C.C. submitted its Third Report.

Solution for global warming: Scientists consider global warming, the biggest threat to mankind in the near future. In spite of this, no nation is serious about seeking a solution to this problem. They are aware that reducing Global Warming, would be at the cost of their progress. In this situation, use of new pollution-free technology seems to be the only solution. This technology should help to reduce or completely stop emission of green house gases. Some of the technological solutions proposed are as:

1. Use of electrical appliances should be increased.
2. Alternative source for petroleum fuel should be discovered and adopted for use.
3. Use of solar energy, operated battery, energy produced from windmills, battery-operated cars, etc. should be promoted.
4. Use of plant energy (liquid hydrocarbons) should be developed.

5. Non-conventional sources of energy should be developed.
6. Alternative source for CFC should be discovered.
7. Such technology should be developed in which fossil and biological fuels on combustion do not emit CO₂ in the atmosphere.

CONCLUSIONS

Global warming is considered as the biggest threat to mankind in the near future by the scientists. It is believed that global warming will have significant impact on climate changes. Climatic changes will have important effect on agriculture, forestry and live stocks. There would be remarkable decline in regional productivity particularly in Brazil, Peru, Central North America, North America, South Africa, South East Asia etc. Forests may also be adversely affected with changing climate. With the increase in temperature and changes in rainfall pattern, climatic zones could shift several hundred kilometers towards the poles in the next 50 years. An increase in sea level due to global warming (as believed 30-50 cm by 2050) will threaten low islands and Coastal Zones. One meter rise in water level will make several islands and countries Uninhabitable and displace millions of people. Thus, Global Warming will give rise to drought, causing famine and death to thousands of people. Therefore, it is necessary for every-person in the world to be aware of this problem and take necessary precaution in order to save our environment and habitats present on this earth.

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