



Review Article

CAUSES AND CONSEQUENCES OF GLOBAL WARMING

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Global warming is melting glaciers in every region of the world, putting millions of people at risk from floods, droughts and lack of drinking water. It is a complex issue full of uncertainties and controversies. This article discusses amongst cause of global warming and consequences of global warming on the environment.

Keywords: Global warming, Greenhouse gas, Global environment, Atmosphere.

INTRODUCTION

Global warming is a very large area of scientific uncertainty. There are literally thousands of scientists working around the world. What will the climate be like in 50 or 100 years time? No one can know for certain. However, there are real fears that rapid climate change will have a dramatic impact on life on earth. Over the last 10,000 years the earth has experienced a very stable climate and life has adapted to it. Recently, however, the earth has seen an increase in temperature change and many scientists now believe that there is a direct link between this warming and emissions of greenhouse gases such as carbon dioxide (CO₂) and nitrogen oxides (NO_x) caused by human activities. In the past the greenhouse gases were in balance. It is feared that, at the present rate of increase of greenhouse gases,

the natural balance will be upset. It takes millions of years for fossil fuels to form but only a few minutes for them to burn, releasing large quantities of CO₂ into the air. In the past fluctuations in CO₂ levels have been explained by natural causes such as volcanic eruptions and the number of phytoplankton in the sea. There are currently several other theories about global warming such as positive and negative feedback systems of ocean currents and the position of the Earth in space.

The real problem for the scientist is that climate change is very difficult to predict. The environmental community rightly recognizes global warming as one of the greatest threats to the planet. Global temperatures are already higher than they have ever been in at least the past millennium, and the increase is accelerating even

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faster than scientists had predicted. The expected consequences include coastal flooding, increases in extreme weather, spreading disease, and mass extinctions.

Global warming poses one of the most serious threats to the global environment ever faced in human history. Global warming will not only be felt many decades from now—it is already happening and its impacts are clearly visible. The Chemistry of the atmosphere is changing due to emission of carbon monoxide, nitrogen oxides, and volatile organic compounds, among other species, in addition to the changes in the greenhouse gases (Climate Change; and Noam Mohr, 2005).

CAUSES OF GLOBAL WARMING

The causes of global warming may be natural or may be caused by human interference.

Natural Causes

Atmospheric Carbon Dioxide

Carbon dioxide is commonly known as the greenhouse gas. It is responsible for about half of the atmospheric heat retained by trace gases and also for 50% of the greenhouse effect. Methane (CH_4) is 20-30 times more effective than CO_2 in trapping heat. The potential of a greenhouse gas to cause greenhouse warming is expressed by “*Global Warming Potential*” (GWP). The rate and duration of the warming of the 20th century is larger than any other time during the last 1,000 years. The 1990s are likely to have been the warmest decade of the millennium in the Northern Hemisphere, and 1998 is likely to have been the warmest year (Houghton *et al.*, 2001).

Volcanic Eruptions

Mount Etna, an active but at present a relatively subdued volcano in Sicily, is a case in point. It is

one of the most potent natural sources of carbon-dioxide. Every year it adds about 25 million tons of carbon dioxide to the atmosphere. The entire region around the volcano is, therefore, enriched in carbon dioxide (Rajni Johar Chhatwal, 2009).

ARE HUMANS CAUSING IT?

Humans have been emitting extra greenhouse gases, which are the result of burning fossil fuels (like coal, oil and gas). In the next 100 years, CO_2 produced by man will cause a lot more warming, from as low as three degrees C to as high as 8 or 10 degrees C.

- Human-caused global warming may have already doubled the chance of “killer” heat waves like the one that scorched Europe in July–August 2003. Strong evidence indicates that the summer was the hottest in Europe in at least the past 500 years (Luterbacher *et al.*, 2004).
- The UHI (Urban Heat Island) is enhanced by human activities within the urban environment. Pollution has a warming effect on a city, in addition to the heat released by industrial processes, household heating and car use. As cities grow, the UHI effect becomes stronger, creating an artificial warming.
- CFCs (Chloro Fluoro Carbons) are believed to be responsible for 24% of the human contribution to greenhouse gases. They also deplete ozone in the stratosphere.
- Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG (green house gas) concentrations.
- The idea that humans are causing the world to heat up and risking disaster by doing so has a powerful hold on the public perception. It is

reinforced by media reporting which finds verification for it in every weather event. It is being taught to school children as scientific truth. Dr. Gray offers a rebuttal to this widespread perception (Vincent Gray, 2001).

- Humanity may have only a narrow window of time left, perhaps a decade or so, to begin the long process of stabilizing greenhouse gas concentrations at a level that can avert devastating and irreversible impacts from climate change.

WHAT ARE THE REALISTIC CURRENT ESTIMATES OF FUTURE WARMING?

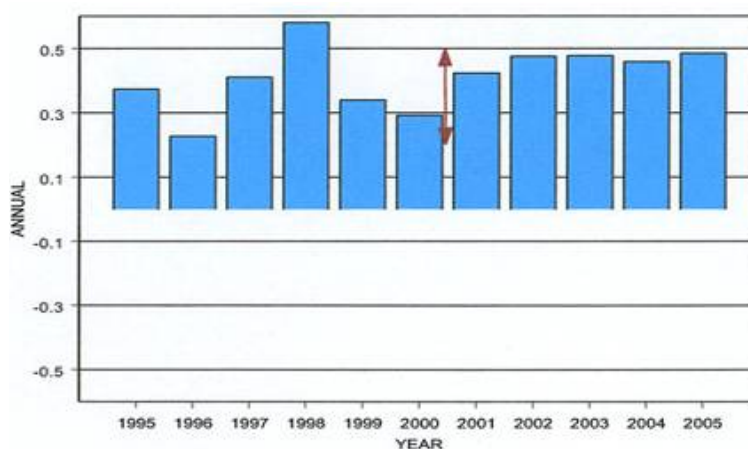
Figure 1 shows variation in the temperature from 1995 to 2005. James Hansen of NASA (the father of greenhouse theory) and Richard Lindzen of MIT (the most renowned climatologist in the world) agree that, even if nothing is done to restrict greenhouse gases, the world will only see a global temperature increase of about 1 °C in the next 50-100 years. Hansen and his colleagues “predicted additional warming in the next 50 years of 0.5 ± 0.2 °C, a warming rate of 0.1 ± 0.04 °C

per decade (Sun and Hansen, 2003).

CONSEQUENCES OF GLOBAL WARMING

- The effects of global warming have taken its role on people, animals, birds and habitat. In fact no continent has been spared.
- At Antarctica, shrinking sea ice has reduced the population of the Adelie penguin by 33% in 25 years.
- In Canadian Arctic, the Peary caribou population has decreased due to heavy rainfall from 24,000 in 1961 to 1100 in 1997.
- Developing countries are twice as at risk to climate change as industrialized countries, and small islands states are thrice as at risk, according to a group of UN scientists. U.S is the fourth country in the world responsible for CO₂ emission.
- Estimates drawn from reports by the Intergovernmental Panel on Climate Changes (IPCC) projects increase in average global temperatures ranging from 1.4 0C to 5.8 0C by the year 2100.

Figure 1: Variations in the Temperature from 1995 to 2005



Source: UK Metrological office
Global mean annual surface Temperature per year from 1995 through 2005

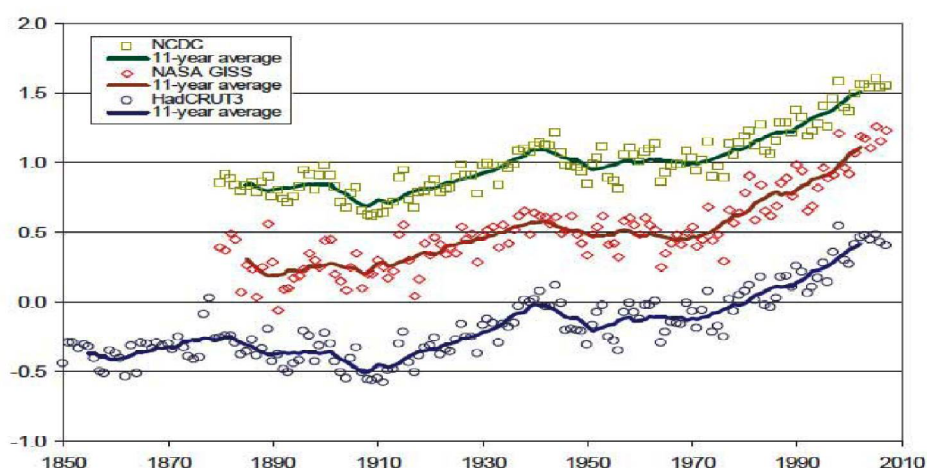
- A slight rise in temperature even by 1 °C, can have adverse effect on the Sea levels. This sea level rise would threaten coastal cities (Calcutta, Mumbai, Chennai, etc.) and some 60-odd island nations such as Maldives, Bangladesh, etc. Anil Kumar De and Arnab Kumar De (2008)
- Global warming increases the desert. It increases temperature in North America, South Africa, Mexico, India and other countries. Changes of hurricanes, cyclones and floods will be more which will damage the lagoons, estuaries and coral reefs. Global warming may cause extinction of more than one million species of animals and plants by 2050 AD.
- Change in climate can also bring several other problems, such as Drying of surface water bodies, fall in ground water table, serious water

shortage, desertification of vast areas which were hitherto fertile and productive lands, crop pattern change and reduced agricultural yields- shortage of food, growth in micro-organisms and spread of diseases, etc.

- In the United States, Chicago experienced one of the worst weather-related disasters in Illinois history when a heat wave resulted in 525 deaths during a 5-day period in July of 1995 (Kunkel *et al.*, 1996).

The two American data sets (red and green in Figure 2) have 2005 as their warmest year. While 2006 and 2007 were cooler than 2005 in all three data sets, two such cooler years is much too short a time to conclude that the clear warming trend over the second half of the 20th Century has stopped or reversed. Figure 2 shows many sets of three consecutive years with a short-lived cooling trend that is reversed soon afterwards.

Figure 2: Three time series of globally-averaged annual mean temperature anomalies in degrees Celsius, together with their 11-year unweighted moving averages



Note:

- The blue (circles) data (1850-2007) from the Hadley Centre (British) are calculated with respect to the 1961-1990 base period.
- The red (diamonds) data (1880-2007) from NASA GISS are calculated with respect to the 1951-1980 base period.
- The green (squares) data (1880-2007) from NOAA NCDC are calculated with respect to the 1901-2000 base period.
- The latter two sets of data have been offset in the vertical direction by increments of 0.5 °C for visual clarity. An averaging period of about 10 years or more is necessary in these time series to remove most of the year-to-year variation in the annual data.

The British data set has 1998 as its warmest year (blue in Figure 2). Is the ten years from 1998 to 2007 long enough to establish a cooling trend? We have noted that ten years is about the minimum averaging time to remove the year-to-year variations in these global temperature data sets, so ten years might be just enough to reveal any downturn in the underlying trend. However, there hasn't actually been a cooling over the decade 1998-2007 (see Figure 2). In all three data sets, the linear trend over 1998-2007 is upward (i.e., one of warming), even if the warming is weaker in the British data set than in the American data sets (Fawcett Robert and Jones David, 2008).

CONCLUSION

Besides all the scientific data available with us showing the trend of global cooling, we must understand that the nature is unpredictable in its behavior and can come before us in a random manner violating the depicted trend, so the human being should be ever ready to tackle this problem or to face the consequences. Thus a new research trend should be initiated and promoted which can absorb the surrounding heat in a large amount to cause cooling. Further, the message of this study is a simple one: Global warming is a serious problem that will not solve itself. Countries should take cooperative steps to slow global warming. There is no case for delay. The most fruitful and effective approach is for countries to put a harmonized price, perhaps a steep price, on greenhouse gas emissions, primarily those of carbon dioxide resulting from the combustion of fossil fuels. While other measures might usefully support this policy, placing a near-universal and harmonized price or tax on carbon is a necessary, and perhaps a sufficient condition, for reducing the future threat of global warming. But it does draw our attention to the fact that nature takes its own course. Somewhere in our

arrogance and in our desire to play god, we might have forgotten that there is a universal force governing all life, including us.

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