RESEARCH REVIEW JOURNALS
Volume-03
Issue-11
November -2018

ISSN: 2455-3085 (Online)
RESEARCH REVIEW International Journal of Multidisciplinary
www.rrjournals.com [UGC Listed Journal]

Changing Climatic Patterns: Causes and Our Responsibility

Seema Agrawal

Associate Professor, H.O.D Chemical Science Department, Shri Jain Diwakar Mahavidyalaya, Indore (India)

ARTICLE DETAILS

Article History
Published Online: 10 November 2018

Keywords
Climate change, Climate science, Carbon dioxide, Fossil fuels

ABSTRACT

Climate change is a change in the typical or average weather of a region or city. This could be a change in a region's average annual rainfall or it could be a change in a city's average temperature for a given month or season. Some causes of climate change are natural like Earth's orbit and the amount of energy coming from the sun. Ocean changes and volcanic eruption. But, during the past century, as a result of the Industrial Revolution, which has had enormous benefits for humans, the effects of human activities have become the main driver for climate change. Most scientists say it's very likely that most of the warming since the mid-1900s is due to the burning of coal, oil and gas. Burning these fuels is how we produce most of the energy that we use every day. This burning adds heat-trapping gases, such as carbon dioxide, into the air.

1. Introduction

Earth's climate is always changing. In the past, Earth's climate has gone through warmer and cooler periods, each lasting thousands of years. Observations show that Earth's climate has been warming. Its average temperature has risen a little more than one degree Fahrenheit during the past 100 years or so. Most scientists think that recent warming can't be explained by nature alone. Most of the warming since the mid-1900s is due to the burning of coal, oil and gas. Burning these fuels is how we produce most of the energy that we use every day. This burning adds heat-trapping gases, such as carbon dioxide, into the air. The increase of atmospheric carbon dioxide caused by burning fossil fuels for energy to power the revolution causes an energy imbalance between incoming solar radiation and outgoing planetary emission. The imbalance is warming the planet and causing the atmosphere and oceans to warm, ice to melt, sea level to rise, and weather extremes to increase. In addition, dissolution of part of the carbon dioxide in the oceans is causing them to acidify, with possible negative effects on marine biota.

2. Cause

Climate change is caused by factors such as biotic processes, variations in solar radiation received by Earth, plate tectonics, and volcanic eruptions and certain human activities.

The burning of fossil fuels is the main source of human-caused greenhouse gas emissions. If emissions continue to rise, we'll be locked in to devastating rises in temperature.

Massive amounts of carbon are stored in tropical forests. When we destroy these areas to clear land for ranches or farms, that carbon gets released into the atmosphere and accelerates climate change. Studies show that deforestation accounts for 11% of all human-caused greenhouse gas emissions.

The Earth's atmosphere is essential for maintaining a livable environment. Radiant energy from the sun, mainly in the visible region of the spectrum, where atmospheric gases are transparent, is absorbed by the Earth's surface and warms it. The warmed surface radiates energy back into space, mainly in the infrared region of the spectrum. The balance between the incoming solar energy and the outgoing infrared energy determines the temperature of the planet.

Infrared absorption and emission by carbon dioxide are the major control mechanism for the atmospheric greenhouse effect. The increasing concentration of carbon dioxide increases the greenhouse effect, so the Earth retains more energy. Fig. 1 shows where this energy has gone over about the last half century more than 90% into the oceans, which are an enormous, high heat capacity reservoir, with smaller amounts into melting ice (in glaciers and the polar regions), and warming the land and atmosphere.

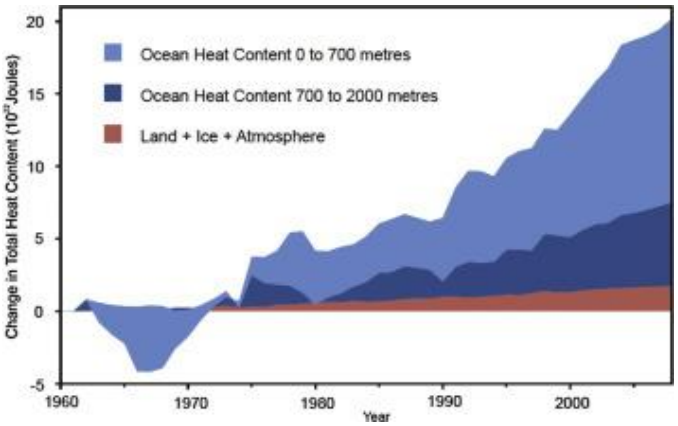

Figure 1. Distribution of the Earth's annual thermal energy content change due to the increased greenhouse effect during the past half century. (Nuccitelli et al., 2012).

The observed environmental changes include increasing sea level as the oceans warm and expand and more water is added from melting land ice, increasing loss of Arctic sea ice affecting the atmospheric jet stream and northern hemisphere weather patterns, and increasing average temperature of the Earth's surface – usually characterized as "global warming." This surface warming is shown on the upper plot in Fig. 2 while the lower plot shows the Earth's imbalance in retention of solar

energy in terms of climate forcing, the amount of the energy imbalance at the top of the atmosphere. (American Chemical Society Climate Science Toolkit) Note that the forcing and temperature had a modest downward trend for the first 800 years of the past millennium, but both started an upward trajectory that became ever steeper during the 200 years following the Industrial Revolution as atmospheric carbon dioxide from fossil fuel burning increased, As fossil fuels continue to be burned, both these curves are very likely to continue their upward climb producing an ever-warmer Earth and its consequences for the environment.

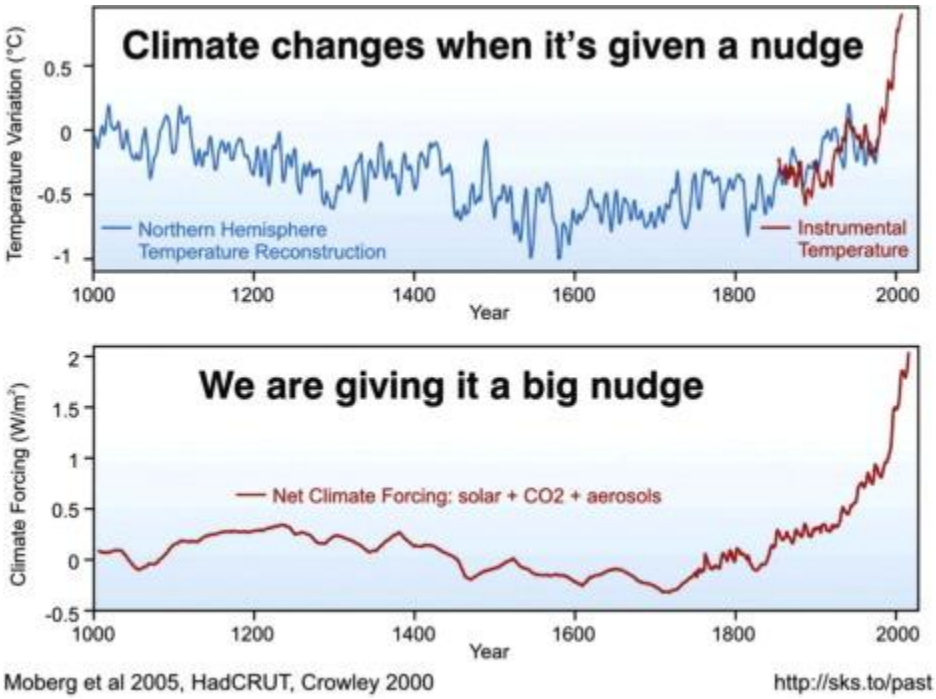

Figure 2.

Upper graph: Surface temperature variations from proxy data (sea and lake sediments and tree rings) in blue and the instrumental record in red. Lower graph: Top-of-atmosphere radiative energy forcing (imbalance) taking account of variations in solar input and atmospheric carbon dioxide and aerosols. (Moberg et al., 2005).

In addition to its primary role in greenhouse warming, the chemistry of carbon dioxide also has a large environmental impact. As fossil fuels are burned, a substantial fraction of the carbon dioxide produced dissolves in the Earth's oceans. The upper plot in Fig. 2 shows the increase in dissolved carbon dioxide that accompanies the increase in its atmospheric concentration.

3. Our Responsibility

When there is so much we don't know? Here are a few simple rules we must follow to be responsible caretakers.

All our waste products must have short lifetimes in the biosphere. **We must minimize the use of raw materials by recycling for remanufacture**. **We must maximize the efficiency with which we use energy and fresh water**.

The Earth changes slowly — but it is more powerful, resilient and in many ways smarter than we are. **It is up to us to understand and adapt to the real world**. For our societies, it may mean changing our fossil bureaucracies to a more adaptive, earth-conscious system of government. For many this means stepping out of our computerized, air-conditioned bubbles and reconnecting emotionally, spiritually and with humility to the natural world in all its beauty and complexity.

This is a societal issue and a global challenge, but each of us has our **personal responsibility** in this.

References

1. The American Chemical Society Climate Science Toolkit American Chemical Society Climate Science Toolkit, www.acs.org/climatescience.
2. Scripps Institute of Oceanography Scripps Institute of Oceanography, University of California-San Diego: http://keelingcurve.ucsd.edu/.
3. Bates et al., 2012 N.R. Bates, M.H.P. Best, K. Neely, R. Garley, A.G. Dickson, R.J. Johnson
4. Detecting anthropogenic carbon dioxide uptake and ocean acidification in the North Atlantic Ocean
5. Biogeosciences, 9 (2012), pp. 2509–252
6. Nuccitelli et al., 2012 D. Nuccitelli, R. Way, R. Painting, J. Church, J. Cook Comment on Ocean heat content and Earth's radiation imbalance II Relation to climate shifts
7. Phys Lett A, 376 (45) (2012), pp. 3466–3468 Figure available at www.skepticalscience.com/graphics.php

8. Hansen, 2009 J. Hansen Storms of My Grandchildren: The Truth About the Coming Climate Catastrophe and Our Last Chance to Save Humanity Bloomsbury Press, New York (2009)
9. Mann, 2012 M. Mann The Hockey Stick and the Climate Wars: Dispatches from the Front Lines Columbia University Press, New York (2012)
10. Climate science from climate scientists RealClimate: Climate science from climate scientists, www.realclimate.org/.

