

Basics of Climate Change and Global Warming

Pulakesh Mondalⁱ

The climate is changing. The earth is warming up, and there is now overwhelming scientific consensus that it is happening, and human-induced. With global warming on the increase and species and their habitats on the decrease, chances for ecosystems to adapt naturally are diminishing. Many are agreed that climate change may be one of the greatest threats facing the planet. Recent years show increasing temperatures in various regions, and/or increasing extremities in weather patterns. In addition to the direct impact on human communities are the impacts on ecosystems with an estimated 15-40% of species potentially facing extinction after only 2°C of warming. Further major irreversible impacts on marine ecosystems are likely because of acidification of ocean water as a direct effect of rising carbon dioxide levels.

Global warming and climate change refer to an increase in average global temperatures. Natural events and human activities are believed to be contributing to an increase in average global temperatures. This is caused primarily by increases in “greenhouse” gases such as Carbon Dioxide (CO₂). A warming planet thus leads to a change in climate which can affect weather in various ways.

Climate Change:

Climate change refers to any distinct change in measures of climate lasting for a long period of time. In other words, “climate change” means major changes in temperature, rainfall, snow, or wind patterns lasting for decades or longer. Climate change may result from:

- Natural factors, such as changes in the Sun’s energy or slow changes in the Earth’s orbit around the Sun;
- Natural processes within the climate system (e.g., changes in ocean circulation);
- Human activities that change the atmosphere’s make-up (e.g., burning fossil fuels) and the land surface (e.g., cutting down forests, planting trees, building developments in cities and suburbs, etc.).

Greenhouse Effect:

The term *greenhouse* is used in conjunction with the phenomenon known as the *greenhouse effect*. Energy from the sun drives the earth’s weather and climate, and heats the earth’s surface. In turn, the earth radiates energy back into space and some atmospheric gases (water vapor, carbon dioxide, and other gases) trap some of the outgoing energy, retaining heat somewhat like the glass panels of a greenhouse. These gases are therefore known as greenhouse gases. Eventually, the greenhouse effect is the rise in temperature on Earth as certain gases in the atmosphere trap energy.

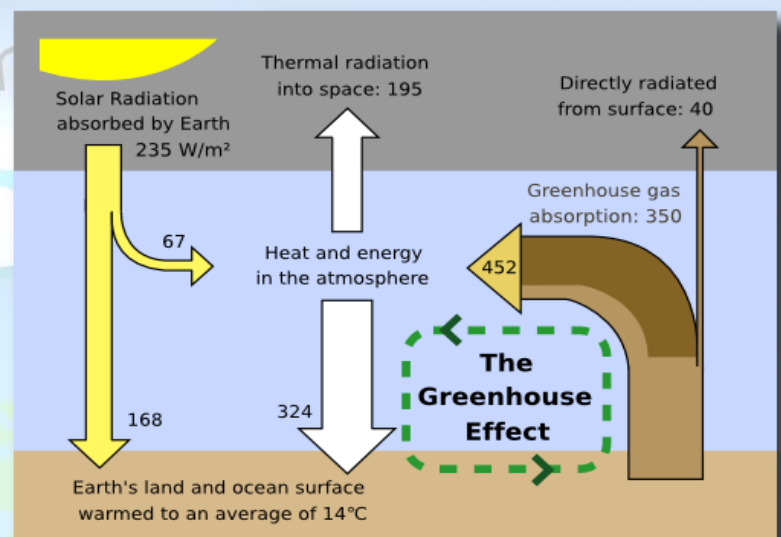


Image source: Greenhouse Effect, Wikipedia

Global warming and its indicators:

Global warming is an average increase in temperatures near the Earth's surface and in the lowest layer of the atmosphere. Increases in temperatures in our Earth's atmosphere can contribute to changes in global climate patterns. Global warming can be considered part of climate change along with changes in precipitation, sea level, etc. As explained by the US agency, the National Oceanic and Atmospheric Administration (NOAA), there are 7 indicators that would be expected to increase in a warming world and 3 indicators would be expected to decrease. **Humidity, temperature over ocean, sea surface temperature, sea level, ocean heat content, tropospheric temperature and temperature over land are the indicators for increasing global warming.** **Sea ice, glaciers and snow coverage are the indicators for decreasing global warming.**

Impact of Climate Change

Negative impact of climate changes:

Sea level rise: Some of the most obvious impacts will be due to the rise in sea level that occurs mainly because ocean water expands as it is heated. Melting of ice on glaciers and polar ice caps adds to the rise. The projected total rise is estimated to be up to one meter this century and the rise will continue for many centuries – to warm the deep oceans as well as the surface waters takes a long time. This will cause large problems for human communities living in low lying regions.

Unusual precipitation: Water is becoming an increasingly important resource. A warmer world will lead to more evaporation of water from the surface, more water vapour in the atmosphere and more precipitation on average. Of greater importance is the fact that the increased condensation of water vapour in cloud formation leads to increased latent heat of condensation being released. Since this latent heat release is the largest source of energy driving the atmosphere's circulation, the hydrological cycle will become more intense. This means a tendency to more intense rainfall events and also less rainfall in some semi-arid area.

Tropical cyclones (hurricanes or typhoons): How will they be affected by global warming? There is no evidence that tropical cyclones will increase in number with increased greenhouse gases. However, the intensity of storms is connected with the ocean surface temperature in the region where the storms develop, not surprisingly so because the main energy source for such storms comes from the water is not only cold but salty, hence of higher density than the surrounding water. It therefore tends to sink and provides the source for a slow circulation at low levels that connects all the oceans together.

Positive impact of Climate Change:

There are some positive impacts. For instance, in Siberia and other areas at high northern latitudes, winters will be less cold and growing seasons longer. Also, increased concentrations of carbon dioxide have a fertilizing effect on some plants and crops which, providing there are adequate supplies of water and nutrients, will lead to increased crop yields in some places, probably most notably in northern mid latitudes. However, careful studies demonstrate that adverse impacts will far outweigh positive effects, the more so as temperatures rise more than 1 or 2 °C (2 to 3.5 °F) above their preindustrial level.

Source: <https://www3.epa.gov/climatechange/bas>; <http://www.globalissues.org/print/article/233>

ⁱ Pulakesh Mondal, Senior Programme Officer (Regional), South Asia Co-operative Environment Programme (SACEP), 69/4, Maya Avenue, Colombor-6, Sri Lanka. Web: www.sacep.org