

## **Global warming**

Global warming is a long-term rise in the average temperature of the Earth's climate system, an aspect of climate change shown by temperature measurements and by multiple effects of the warming. Though earlier geological periods also experienced episodes of warming, the term commonly refers to the observed and continuing increase in average air and ocean temperatures since 1900 caused mainly by emissions of greenhouse gasses in the modern industrial economy. In the modern context the terms global warming and climate change are commonly used interchangeably, but climate change includes both global warming and its effects, such as changes to precipitation and impacts that differ by region. Many of the observed warming changes since the 1950s are unprecedented in the instrumental temperature record, and in historical and paleoclimate proxy records of climate change over thousands to millions of years.

In 2013, the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report concluded, "It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century." The largest human influence has been the emission of greenhouse gases such as carbon dioxide, methane, and nitrous oxide. Climate model projections summarized in the report indicated that during the 21st century, the global surface temperature is likely to rise a further 0.3 to 1.7 °C (0.5 to 3.1 °F) to 2.6 to 4.8 °C (4.7 to 8.6 °F) depending on the rate of greenhouse gas emissions and on climate feedback effects. These findings have been recognized by the national science academies of the major industrialized nations and are not disputed by any scientific body of national or international standing.

## **Climate change**

Climate change occurs when changes in Earth's climate system result in new weather patterns that last for at least a few decades, and maybe for millions of years. The climate system is comprised of five interacting parts, the atmosphere (air), hydrosphere (water), cryosphere (ice and permafrost), biosphere (living things), and lithosphere (earth's crust and upper mantle). The climate system receives nearly all of its energy from the sun, with a relatively tiny amount from earth's interior. The climate system also gives off energy to outer space. The balance of incoming

and outgoing energy, and the passage of the energy through the climate system, determines Earth's energy budget. When the incoming energy is greater than the outgoing energy, earth's energy budget is positive and the climate system is warming. If more energy goes out, the energy budget is negative and earth experiences cooling.

As this energy moves through Earth's climate system, it creates Earth's weather and long-term averages of weather are called "climate". Changes in the long term average are called "climate change". Such changes can be the result of "internal variability", when natural processes inherent to the various parts of the climate system alter Earth's energy budget. Climate change can also result from "external forcing", when events outside of the climate systems five parts nonetheless produce changes within the system. Examples include changes in solar output and volcanism.

Human activities can also change earth's climate, and are presently driving climate change through global warming. There is no general agreement in scientific, media or policy documents as to the precise term to be used to refer to anthropogenic forced change; either "global warming" or "climate change" may be used.

### **Greenhouse Effect**

The greenhouse effect is the process by which radiation from a planet's atmosphere warms the planet's surface to a temperature above what it would be without its atmosphere.

If a planet's atmosphere contains radiatively active gases (i.e., greenhouse gases) they will radiate energy in all directions. Part of this radiation is directed towards the surface, warming it. The intensity of the downward radiation – that is, the strength of the greenhouse effect – will depend on the atmosphere's temperature and on the amount of greenhouse gases that the atmosphere contains.

Earth's natural greenhouse effect is critical to supporting life. Human activities, mainly the burning of fossil fuels and clearing of forests, have strengthened the greenhouse effect and caused global warming.