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Global Warming Is Irreversible

By <u>William D. Fletcher</u>, <u>Craig B. Smith</u> April 15, 2025

The earth's temperature is rising steadily. This global warming can be ignored, perhaps for a long time. However, it cannot be avoided. Eventually, rising temperatures, sea level rise and weather changes may force the world to do something. By that time, global temperatures will be a lot higher.

Global warming is irreversible. Greenhouse gas emissions, mainly carbon dioxide (CO₂), cause the earth to heat up. These emissions stay in the atmosphere a very long time. If we stop these emissions someday, the earth's temperature will not go down. It will stabilize at a temperature consistent with the greenhouse gas concentrations in the atmosphere. It will take a very long time for <u>excess</u> greenhouse gases to be dissipated by natural means.

There are not any inexpensive or quick fixes for this problem. It is unlikely that it will ever be <u>cost-</u> <u>effective to remove CO_2 </u> and other greenhouse gases from the atmosphere on a large enough scale to make a difference. How do we know global warming is real? The evidence presented in this article is not based on computer models or forecasts, but on hard data. There is ample physical evidence of what is happening.

First, greenhouse gas concentrations in the atmosphere are easily measured. From preindustrial levels, a maximum of about 300 ppm (parts per million), the concentration of carbon dioxide in the atmosphere has risen <u>steadily to 428 ppm.</u> CO₂ is about 75% of total greenhouse gas emissions and is produced by <u>using fossil fuels</u>, for heat and as raw materials.

Second, according to <u>Berkeley Earth's Global Temperature Report for 2024</u>, the earth's average temperature is now about 1.6 degrees Celsius (°C) or 2.9 degrees Fahrenheit (°F) above its preindustrial baseline. The earth's temperature is monitored by satellites and thousands of earth-bound sensors. It is increasing steadily in proportion to greenhouse gases in the atmosphere.

The land average temperature increase is about 2.3° C (4.1° F) and the ocean average temperature increase is about (2.1° F). The oceans are a giant heat sink and absorb about 90% of the extra heat added to the atmosphere.



Source: Berkeley Earth Global Temperature Report for 2024

Third, <u>sea levels are rising</u>. This is due to a combination of two effects: thermal expansion of warmer ocean waters, and increased meltwater from glaciers and ice caps. The <u>average rise so far</u> is 21 to 24 cm (8 to 9 inches) since 1880, but can be higher or lower at specific locations. <u>The rate of sea level</u> rise is increasing.

Fourth, <u>the Arctic</u> is <u>heating up more than twice as fast</u> as the global average due to Arctic or polar amplification largely driven by the loss of sea ice and snow cover in the Arctic. Snow and ice reflect most of the incoming radiation from the sun. The exposed land and sea are much darker and absorb

more of the sun's radiation. The resulting temperature increase is resulting in <u>weather changes in the</u> northern hemisphere.

Fifth, due to higher temperatures, permafrost in the Arctic is melting and <u>releasing additional carbon</u> <u>dioxide</u> as well as methane into the atmosphere.

Sixth, the massive ice caps in <u>Greenland</u> and <u>Antarctica are melting</u>. In the past, these ice caps lost ice during the summer months but replaced these losses with new snow and ice in the winter. Today, summer losses are not being fully offset.

The IPCC's (International Panel on Climate Change) goal is to hold the increase in the global average temperature to well <u>below 2°C (3.6°F)</u> above pre-industrial levels and pursue efforts to limit the temperature <u>increase to 1.5°C (2.7°F)</u> above pre-industrial levels. The 2°C (3.6°F) limit is a best estimate of the maximum <u>temperature rise beyond which the effects of global warming are unpredictable</u>. It is a judgement call. The IPCC's 1.5°C (2.7°F) goal was <u>exceeded for the first time in 2024</u>.

The current forecast is for the earth's average temperature increase to be about 3.0°C (5.4°F) by the end of this century.

It may be possible to stop global warming. The technology and economics of renewable energy are favorable and improving. This is not happening fast enough to offset the effects of increasing emissions due to a growing global economy and rising living standards that increase energy use. It will take a lot longer to eliminate greenhouse gas emissions and the earth's temperature will continue to increase along with sea level rise and related climate changes.

It is possible that we may never eliminate human-caused greenhouse gas emissions.

Craig Smith and William Fletcher are co-authors of "The Global Climate Crisis: What To Do About It," published by Elsevier in 2024.

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