

Science You Can Use

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Dear Science: I heard that climate change might not be as bad as the 2021 Intergovernmental Panel on Climate Change (IPCC) report predicted. Is this true? -- Buck R.

Dear Buck: The short answer to your question is that there is some hope, *if* the promises made at the 2021 United Nations climate change meeting (“COP26”) in Glasgow, UK, are kept. Here are some details.

The IPCC is an internationally renowned panel of climate scientists who periodically review the best climate-change science we have and assess the implications of that science for human welfare. On 9 August 2021, the IPCC published a report (“IPCC 2021”; for the full reference, see the last paragraph of this column) that describes what is happening to climate now and what is likely to happen in the climate future. Briefly put, the report says that if we want to avoid profoundly degrading human welfare because of human-induced climate change, we will have to limit the rise in average global temperature to less than 2 degrees Celsius (°C) above the pre-industrial age average global temperature. (For the sake of brevity, let’s call a 2-degree Celsius rise in average global temperature with respect to the average global temperature of the pre-industrial age a “2 °C rise”.)

In outline, here’s what IPCC 2021 says about our chance of meeting this goal.

What does IPCC 2021 say is happening to climate now? Climate change is here. More specifically:

1. Large-scale, human-induced climate change is already happening.
2. Taken as a whole, the climate changes are larger and longer than any since the last ice age (about 10,000 years ago).
3. Severe weather caused by human activity is happening more frequently, and in more places, across the planet than at any time since the last ice age.

What does IPCC 2021 say about our climate future? To assess what we can expect for climate change in the future, the report considers five scenarios, ranging from “business-as-usual” to aggressive reduction of greenhouse gases, especially carbon dioxide (CO₂) and methane. Based on these scenarios, the IPCC concludes that:

- a. *Global surface temperature will continue to increase until at least the mid-century under all emissions scenarios considered. Global temperature rises of 1.5 °C and 2 °C will be exceeded during the 21st century unless deep reductions in CO₂ and other greenhouse gas (GHG) emissions occur in the coming two decades. A global 1.0 °C rise has already occurred.*
- b. Floods, monsoons, and droughts will become more common and more severe.
- c. Even if we drastically reduce GHG emissions now, the emissions to date will have effects far into the future. If we don’t act now to sharply reduce GHG emissions, the results will be even worse.

Is the IPCC 2021 prediction for our climate future fated? In a recent paper, Malte Meinshausen and colleagues compellingly argue that *if* the pledges made by the countries participating in COP26 are kept, we have a chance of keeping the rise in average global temperature to just below 2 °C (M. Meinshausen et al., “Realization of Paris Agreement Pledges May Limit Warming Just Below 2 Degrees Celsius”, *Nature* 604 (14 April 2022), pages 304-309). Meinshausen et al. note that:

- i. Growth in carbon dioxide (CO₂) emissions has significantly slowed over the past decade, and CO₂ emissions are projected to plateau under current policies and commitments. The high-emission scenarios predicted by IPCC 2021 assumed that energy production in the 21st century would be dominated by coal. Coal usage, however, has not increased since 2013. The International Energy Agency, furthermore, estimates that coal use is likely to decline over the rest of the century.
- ii. Clean energy has become inexpensive: solar-power and battery-storage costs have fallen to about 10% of their 2010 value.
- iii. Most participants in COP26 published concrete plans to try to meet the 2 °C goal.

That said, it is easy to set ambitious climate targets, but difficult to enact policies today that make energy systems sustainable in the future. Long-term goals that are not supported by concrete near-term plans are particularly suspect. Meinshausen et al. estimate that current policies will lead a 2.6 °C rise; short-term commitments, they calculate, will lead to a 2.4 °C rise.

There is no guarantee that countries will meet their COP26 pledges. A recently published estimate suggests, for example, that most of the G7 group (the world’s seven largest economies) – and most importantly, the US, China, and India -- will fall short of achieving their 2030 climate-change goals.

In short, our best climate science says that the climate-control promises published at COP26 will have to be redeemed if we are to have a reasonable chance of sustaining even today’s level of human welfare.

For more information, see *Summary for Policymakers*. In: *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [Masson-Delmotte, V., P. Zhai, A. Pirani, et al. (eds.)], https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf.

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