

Paris Climate Agreement goal still within reach, suggests new study

February 11 2022



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The Paris Climate Agreement goal to limit global warming this century to 3.6 degrees Fahrenheit (2 degrees Celsius) over pre-industrial temperatures is still within reach, while apocalyptic, worst-case scenarios are no longer plausible, suggests a new CU Boulder analysis.

Out today in *Environmental Research Letters*, the new study finds that a subset of climate scenarios from the Intergovernmental Panel on Climate Change (IPCC) most in line with recent data and International Energy Agency (IEA) forecasts to 2050 project between 3.6 and 5.4 degrees F

(2 and 3 C) of warming by 2100, with a median of 3.96 F (2.2 C) degrees. In comparison, some implausible, worst-case scenarios have projected as much as 7.2 or 9 F (4 or 5 C) degrees of warming by the end of the century.

"This is cautiously optimistic good news with respect to where the world is today, compared to where we thought we might be," said lead author Roger Pielke Jr., professor of environmental studies. "The two-degree target from Paris remains within reach."

In order to explore and plan for possible futures, the climate research community uses scenarios: forecasts of how the future might evolve based on factors such as projected [greenhouse gas emissions](#) and different possible climate policies.

The most commonly used scenarios, called the Representative Concentration Pathways (RCPs), were developed by the IPCC starting in 2005. The Shared Socioeconomic Pathways (SSPs) that followed, starting in 2010, were meant as an update. Together, the two sets of scenarios inform the IPCC's Fifth and forthcoming Sixth Assessment Reports.

For their study, Pielke Jr. and his co-authors started with a total of 1,311 climate scenarios from which the climate research community selected the 11 RCPs and SSPs. Pielke and colleagues compared the scenarios to the projected 2005-2050 fossil fuel and industry carbon dioxide emissions growth rates most consistent with real-life observations from 2005-2020, and IEA projections to 2050. The number of scenarios which most closely matched up to data from the past 15 years and subsequent emissions projections ranged from less than 100 to almost 500, depending upon the method applied. These scenarios represent what futures are plausible if current trends continue and countries adopt the climate policies they have already announced to reduce carbon

emissions.

Additional, more optimistic or pessimistic futures could also exist, the authors said.

"Because we haven't updated our [IPCC] scenarios [for many years], there are also some futures which are plausible but haven't yet been envisioned," said Pielke Jr.

Pathways and plausibility

The analysis joins a growing consensus of independent groups around the world whose work finds that the most extreme climate scenarios are unlikely to occur this century, and mid-range scenarios are more likely. A report from the IPCC Sixth Assessment Report (AR6) released in 2021 also notes that the likelihood of high emissions scenarios is considered low.

Why are these worst-case scenarios now less plausible? Mainly, they were all developed more than a decade ago, and a lot has happened since.

For example, renewable energy has become more affordable and, thus, more common faster than expected, said Matthew Burgess, co-author and fellow in the Cooperative Institute for Research in Environmental Sciences (CIRES) at CU Boulder.

These fast-moving changes are captured in the scenarios drafted by the IEA, a Paris-based intergovernmental organization, which provides updates each year.

Climate scenarios also tend to overestimate economic growth, especially in poorer countries, according to Burgess, assistant professor of

environmental studies.

In addition, while the 2010 scenarios were supposed to serve as updates to the socio-economic assumptions of the initial RCPs, the RCPs have continued to be used heavily by scientists. And the commonly used "worst-case" scenario, RCP8.5 (named for 8.5 watts per meter squared, a measure of solar irradiance) projects an increase of 7.2 to 9 F (4 to 5 C) by 2100.

"It's hard to overstate how much the [climate] research has focused on the four- and five- degree scenarios, RCP 8.5 being one of them. And those are looking less and less plausible by the year," said Burgess.

Relying on not only outdated scenarios, but scenarios which are no longer plausible, for research and policy has big implications for how we think about, act and spend money on [climate](#) change issues, the authors said.

"There's a need for these scenarios to be updated more frequently. Researchers may be using a 2005 scenario, but we need a 2022 perspective," said Pielke Jr. "You're going to have better policies if you have a more accurate understanding of the problem, whatever the political implications are for one side or the other."

The authors stress that 3.6 degrees F (2 C) of warming will still take a dramatic toll on the planet, and this is no time for complacency.

"We're getting close to our two-degree target, but we definitely have a lot more work to do if we're going to get to 1.5," said Burgess.

Justin Ritchie at the Institute for Resources, Environment and Sustainability, University of British Columbia is a co-author on this publication.

More information: Roger Pielke Jr et al, Plausible 2005–2050 emissions scenarios project between 2 °C and 3 °C of warming by 2100, *Environmental Research Letters* (2022). [DOI: 10.1088/1748-9326/ac4ebf](https://doi.org/10.1088/1748-9326/ac4ebf)

Provided by University of Colorado at Boulder

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