



Climate scientists debate a flaw in the Paris climate agreement

Ultimately the only thing that matters: we need to cut carbon pollution as much as possible, as fast as possible

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In September 2017, a team led by the University of Exeter's Richard Millar published a paper in *Nature Geoscience*, which was widely reported as suggesting that the Paris climate agreement's aspirational goal of limiting global warming to 1.5°C above pre-industrial temperatures is still technically within our reach. Many other climate scientists were skeptical of this result, and the journal recently published a critique from a team led by the University of Edinburgh's Andrew Schurer.

The debate lies in exactly how the Paris climate target is defined and measured, which has not been precisely established. Millar's team used the UK Met Office and Hadley Centre global surface temperature dataset called HadCRUT4, which begins in 1850 and estimates global surface temperatures have warmed about 0.9°C since that time. The team thus calculated the remaining carbon budget that will lead to an additional 0.6°C warming.

The three issues underlying the vague Paris target

But HadCRUT4 has some significant flaws. First, it only covers 84% of Earth's surface. There are large gaps in its coverage, mainly in the Arctic, Antarctica, and Africa, where temperature monitoring stations are relatively scarce. And the Arctic is the fastest-warming part of the planet, which means that HadCRUT4 somewhat underestimates global warming.

A second issue is that over the oceans, HadCRUT4 uses sea surface temperatures, which haven't warmed quite as fast as air temperatures directly above the ocean surface. There's also a third issue - what's the start date from which we want to stay below 1.5 or 2°C warming? The starting point in HadCRUT4 is 1850, but another recent study led by Schurer found that starting even earlier would add up to 0.2°C to the warming we've already caused, and thus shrink the remaining carbon budget.

Taken all together, these three issues could mean that we've already warmed 0.2-0.3°C more than estimated in the Millar study, which would mean a significantly smaller carbon budget. Each additional 0.1°C warming shrinks the remaining 2°C carbon budget by about 20%, so in that sense even one-tenth of a degree is important in answering this question about our chances of meeting the Paris targets.

On the other hand, it's not that important

Ultimately, climate scientists are asking for a more specific definition of the Paris climate target. The agreement says we want to limit global warming to no more than 2°C above pre-industrial levels (preferably closer to 1.5°C), but when is the post-industrial start date, and which temperature measurement is the target based on?

However, the 2°C target itself is somewhat arbitrary. It's based on two factors: science and politics. On the scientific side, we can probably accept and adapt to the adverse climate change consequences at that degree of climate change. On the political side, transitioning away from a fossil fuel-based global economy is a tremendous undertaking. From a practical standpoint, it will take everything we've got just to stay below 2°C. That's why the 1.5°C target in the Paris agreement is 'aspirational.' The latest IPCC report considered 116 potential scenarios for staying below 2°C, and 101 of those scenarios (87%) included negative emissions in the form of carbon capture and storage. In other words, it's difficult to envision meeting the Paris target by cutting carbon pollution alone.

The 2°C target is simply a nice round number that represents what the international community considers an acceptable amount of climate change risk and is also a practically achievable (although daunting) goal.

It's simple: cut carbon pollution as much and as fast as possible

Tackling climate change boils down to risk management. Global temperatures are likely already hotter than at any time in the history of human civilization, and warming at a rate 20 to 50 times faster than Earth's fastest natural climate changes. Climate contrarians like Trump's EPA administrator Scott Pruitt often ask what's Earth's ideal temperature - the answer is that an ideal climate is a stable one. Rapid climate changes like the one humans are currently causing create problems that are difficult for species to adapt to. We need to shift away from dangerously rapid climate change to a stable climate as soon as possible.

The ideal Paris target would thus have simply been "cut carbon pollution as much as

possible, as fast as possible.” However, governments need a concrete target on which to base their climate policies. “As much and as fast as possible” is vague and subjective, while “an 80% carbon pollution cut by 2050” is concrete, specific, and translates into policy.

The scientific debate over these few tenths of a degree of warming is in some ways important and in other ways unimportant. It’s unimportant because climate scientists are trying to assess our chances of meeting the Paris targets, but the 2°C itself is somewhat arbitrary. However, the Paris targets are important because they provide a concrete goal that governments and policies can aim for. And each additional tenth of a degree represents a greater risk that we’ll trigger a dangerous climate feedback, like a large release of methane from beneath the permafrost or oceans, or the collapse of a major ice shelf.

The one point to take away from this debate is that no matter who’s right, we still need to cut carbon pollution as much as possible, as fast as possible. Using the choices in the Millar paper would suggest that we have a better chance of successfully meeting the Paris target, but even if the international community decides they like those choices best, it will still take everything we’ve got to stay below that definition of 2°C warming.

If governments decide that based on the Millar paper they have a larger carbon budget and can thus afford to act less quickly, that would be an incorrect and dangerous interpretation. Climate policies need to keep progressing and improving at full steam ahead.

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