Climate targets should be set on warming potential not emissions

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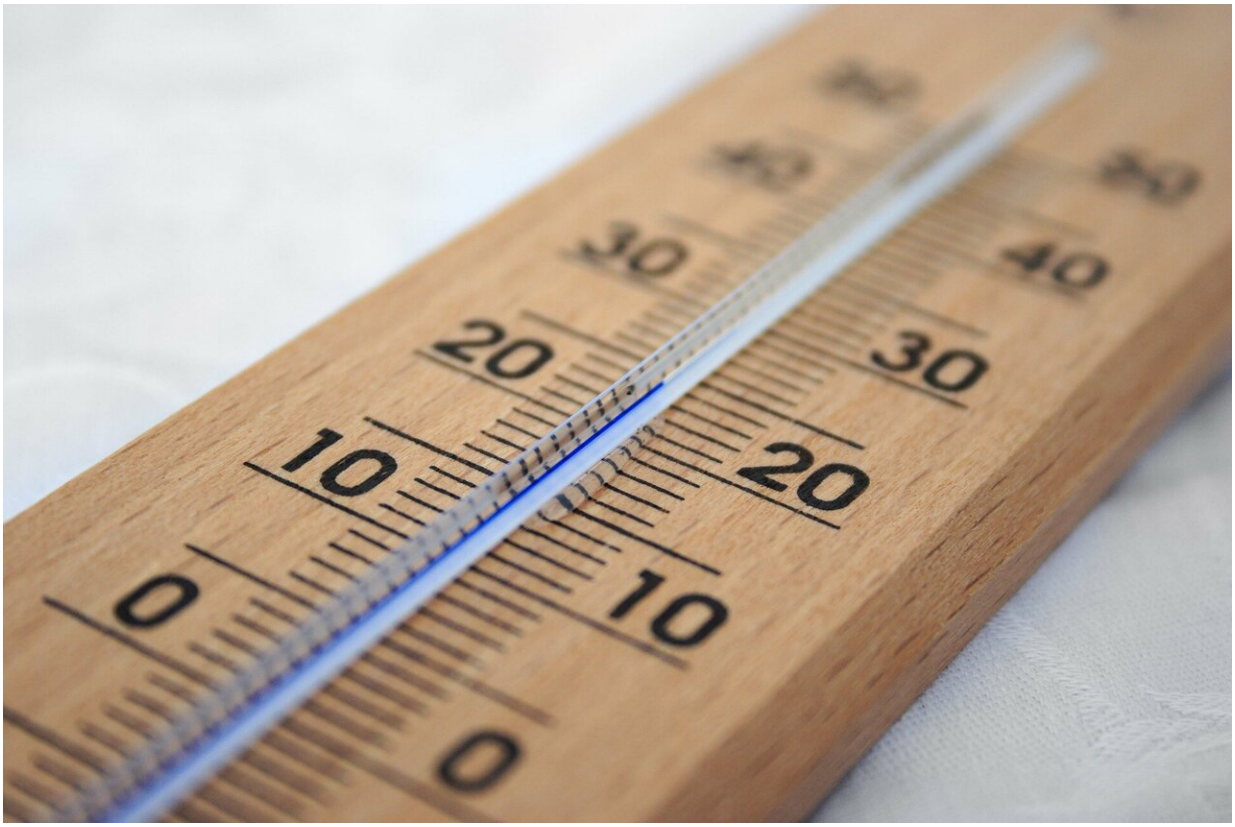

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Climate researchers at the University of Oxford say a new metric that demonstrates how different greenhouse gases warm the Earth's atmosphere over time will enable countries to create accurate emissions

budgets, and meet the Paris Agreement goal of keeping global warming below 2°C.

A "CO_2-warming-equivalence (CO_2-we)" metric should replace the current "CO_2-equivalence (CO_2-e)," recommend the researchers in a study published today in the journal *NPJ Climate and Atmospheric Sciences*.

"The headline goal of the Paris Agreement is to keep global warming well below 2°C, and to strive to stay below 1.5°C," said Dr. Michelle Cain of the Oxford Martin Programme on Climate Pollutants, who led the study. "These are clear temperature-based targets. It therefore makes sense to set emissions reductions targets based on how much warming they will cause or avoid. We can do this using CO_2-warming-equivalence."

Currently, emissions of greenhouse gases other than carbon dioxide (CO_2) are measured by their CO_2-equivalence. However, this is a false equivalence for greenhouse gases that do not accumulate in the atmosphere over time in the way that CO_2 does, and has led to an incorrect assumption that all emissions must reach net zero to reach the Paris goals. Methane, for example, is a more powerful greenhouse gas per kilogram than CO_2, but only about half of 2009's methane emissions remain in the atmosphere today and continue to contribute warming. In contrast, almost all the CO_2 from that year remains—and the CO_2 will remain and continue to cause warming for a century or more.

The proposed metric unambiguously links greenhouse gas emissions with their warming outcomes, no matter their lifespan. This means the warming impact of all greenhouse gases can be calculated directly from reported emissions, allowing short-lived gases like methane be effectively budgeted. Countries' contributions under the Paris Agreement could also be assessed against the Paris goals easily and

transparently using this metric, both individually and collectively.

"Setting targets in terms of temperature—not emissions—is what is so important," explains Dr. Cain, "because we can get to net-zero warming without net-zero emissions of every greenhouse gas. Short-lived gases decay quickly, so as long as emissions are declining, warming from those sources is declining too. On the other hand, because CO_2 lasts for centuries, even millennia, every tonne continues to add to warming, even as emissions decline.

"Understanding this we can see more clearly where we need to target efforts to mitigate climate change. Reducing methane emissions provides an immediate, but short term, benefit. Whereas to truly tackle the long-term damage we are doing to the climate, the focus needs to be on CO_2 and other long-lived pollutants. Widespread use of this metric to set targets could ultimately be a game-changer in keeping keep global warming well below 2°C."

"Currently used climate metrics cannot give the full picture of how agricultural greenhouse gas emissions contribute to global warming, or the impacts of changing what we eat or how we farm," added Dr. John Lynch, a co-author on the paper with the Livestock, Environment and People (LEAP) project, part of the Oxford Martin Programme on the Future of Food. "Our new means of reporting warming-equivalent emissions provides a more reliable way of linking emissions and global temperature."

This method builds on previous work and is based on the direct relationship between methane emissions and the warming those emissions generate. This method, called GWP, produces a far better agreement between CO_2-we emissions and resultant warming than CO_2-e does. It provides a simple calculation to work out CO_2-we emissions and is designed to be useful for informing policies that specifically aim to

limit global warming, as is required under the Paris Agreement.

The paper, "Improved calculation of warming-equivalent emissions for short lived climate pollutants" published in *NPJ Climate and Atmospheric Science* demonstrates the method for methane, although it can be applied to any short-lived climate pollutant.

More information: Michelle Cain et al. Improved calculation of warming-equivalent emissions for short-lived climate pollutants, *NPJ Climate and Atmospheric Science* (2019). DOI: 10.1038/s41612-019-0086-4

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