

How to slow climate change: Three wide-scale efforts could make the difference

October 2 2023, by Brendan Bane



In a new commentary paper, researchers point to three major efforts that could help cap global warming at 1.5°C. Ramping up carbon dioxide removal and better addressing other emissions, like methane and fluorinated gases, are among the most worthwhile efforts they recommend. Credit: Peggychoicair | Pixabay

With the 2023 United Nations Climate Change Conference just nine weeks away, countries will soon take stock of their progress in the worldwide effort to slow and adapt to global warming. Better known as COP28, the conference offers the chance for countries to meet and coordinate their climate-mitigating pledges, like achieving carbon neutrality by 2050 or peak emissions by 2030.

Past research suggests that, if current pledges are upheld, the world is roughly enroute to keep warming below 2°C. But the original goal of the Paris Agreement—the 2015 [climate change treaty](#) in which 196 countries aspired to cap [global warming](#) at 1.5° by the end of this century—remains stubbornly out of reach.

"There's the bad news," said Haewon McJeon, visiting professor at the Korea Advanced Institute of Science & Technology, whose research often focuses on assessing climate pledges. "We took stock of the current climate pledges around the world, and it all falls far short of the 1.5° goal. It's not enough."

What can countries do to bring the goal back within reach? In a [new commentary](#) published in the journal *One Earth*, researchers highlight that the biggest climate mitigation gains stand to be realized through three global efforts: reining in non-CO₂ emissions like methane and fluorinated gases, ramping up [carbon dioxide removal](#), and halting deforestation. Make sufficient progress in these areas, the authors said, and the 1.5° goal may inch back within our crosshairs.

"Mitigating emissions from all sources will be critical to limiting warming to less than 1.5°C," said Gokul Iyer, lead author on the commentary and an Earth scientist at the Department of Energy's Pacific Northwest National Laboratory. "While most efforts to date have focused on [carbon dioxide emissions](#) in the energy sector, those three areas present opportunities for further ratcheting of ambition."

An opportunity to adjust course is fast approaching. The Paris Agreement holds a built-in "ratcheting" mechanism, a course-correcting process where countries can regularly revise their climate pledges in five-year increments.

Its purpose is to bring about more bold and ambitious action within the push to curb warming. COP28 marks the first time participating countries will undergo this "progress review," known as the Global Stocktake, which stands to shape the adjusted pledges.

Ratchet up ambition to dial down emissions: Beyond carbon dioxide

Carbon dioxide is the most well-known greenhouse gas, yet it is one of several. Though less prevalent, other gases like methane and nitrous oxide can trap even more heat. The latter can linger in Earth's troposphere for well over a century before moving to the stratosphere where it chips away at the ozone layer.

Dialing down nitrous oxide and other non-CO₂ emissions sooner rather than later, the authors said, could help curb peak warming this century.

"Doing so could 'flatten the curve' of a temperature overshoot, where global temperatures exceed 1.5° and eventually cool back down," said Yang Ou, a co-author on the study and researcher at the College of Environmental Sciences and Engineering at Peking University.

Some progress here has already been made, notably the Global Methane Pledge, in which over 150 countries voluntarily pledged to reduce methane emissions. Yet more detailed actions are needed, the authors said.

Fortunately, many of the technologies needed to reduce non-CO₂ emissions already exist. Substituting climate-friendly cooling agents, detecting and repairing natural gas leaks, and recovering refrigerants when disposing of air conditioning or refrigeration equipment all could help in diminishing those emissions. Widespread dietary changes, like eating less meat, could also help dial down emissions within the agricultural sector.

Still, the authors said, more progress is needed. Countries could address a wider range of non-CO₂ emissions. Currently, methane takes a large focus, whereas [nitrous oxide](#) and fluorinated gases are equally if not more important, according to the new work.

And as new mitigation measures around these long-unaddressed emissions come into existence, countries could benefit from considering all sectors and sources from which they flow, from livestock to energy production.

Ramping up carbon dioxide removal

Removing carbon dioxide from Earth's atmosphere is essential, the authors said. They highlight an important gap between the amount of carbon dioxide countries have pledged to remove versus the amount that must be removed to meet the goals of the Paris Agreement.

Current pledges are insufficient, according to the authors; we must pull an additional 1–3 gigatons of carbon dioxide from Earth's atmosphere annually by 2030, and 2–7 gigatons annually by 2050. Otherwise, the 1.5° goal will likely remain out of reach.

Many carbon dioxide removal technologies remain nascent and expensive. Yet, to meet the warming goal, they must be made cost effective and deployed at wide scales. The next decade, the authors said,

is key.

They call for incentives to drum up research, development, demonstration, and the deployment of novel and alternative carbon dioxide removal methods. A wide-ranging approach to carbon removal offers the surest course, from afforestation and reforestation to the use of biofuels paired with carbon capture and storage.

The authors note some progress: investments in carbon dioxide removal technology have swelled in recent years, totaling \$4 billion in publicly funded research. Yet only a few countries have made such investments, which have mostly focused on a limited number of removal methods.

"More widespread participation could ultimately drive down costs," said McJeon, also a co-author of the new commentary. "And it could demonstrate an important point: that carbon dioxide removal can be carried out around the world in a variety of ways, as each region is better suited for some removal methods over others."

Halting deforestation

The authors of the new commentary point to 4.1 million hectares of tropical forest lost to deforestation in 2022 alone. A significant chunk of global emissions—16%—flowed from deforestation and other forms of land use change between 2012 and 2021. In some regions, forests that were once [carbon](#) sinks have turned into sources. What could greater ambition in this area look like?

The authors suggest several courses of action. Putting caps on climbing deforestation rates could help. Ceasing or reducing consumption of products like palm oil or soy, too, could protect forests in important regions like South America.

Better monitoring of illegal mining and hunting, creating new incentives to protect fire-prone forests from severe wildfire, and financing commitments to protect forests are all examples of worthwhile efforts, the authors said.

The team pays kudos to the European Union, the United Kingdom and Brazil, whose governments recently reported significant declines in deforestation rates since July 2022. The Forests and Climate Leaders' Partnership—a joint declaration to halt and reverse forest loss and land degradation by 2030—was signed by more than 100 [countries](#) at COP27. If we are to meet the warming goal, however, similar progress must be made at a wider scale, according to the authors.

"While the upcoming global stocktake process will likely focus on assessing climate actions and progress made to date," said Iyer, "it will be important to focus negotiations and discussions on initiatives to ratchet ambition in hitherto ignored areas. Progress in those areas could greatly shape the trajectory of global emissions in the coming decades and improve our chances of staying below 1.5°C."

This work stems from the Joint Global Change Research Institute, a partnership between the Center for Global Sustainability at the University of Maryland and Pacific Northwest National Laboratory. There, researchers from a wide range of disciplines collaborate to model human and Earth systems, from those that harness and deliver energy into our homes to those that govern extreme weather. Their findings help policymakers make informed decisions about the wide range of potential consequences that flow from societal action.

More information: Gokul Iyer et al, Taking stock of nationally determined contributions: Continued ratcheting of ambition is critical to limit global warming to 1.5°C, *One Earth* (2023). [DOI: 10.1016/j.oneear.2023.08.019](https://doi.org/10.1016/j.oneear.2023.08.019)

Provided by Pacific Northwest National Laboratory

Citation: How to slow climate change: Three wide-scale efforts could make the difference (2023, October 2) retrieved 29 April 2024 from <https://phys.org/news/2023-10-climate-wide-scale-efforts-difference.html>

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