

Countries must work together on carbon dioxide removal to avoid dangerous climate change

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The Paris Agreement lays out national quotas on CO₂ emissions but not removal, and that must be urgently addressed, say the authors of a new

study.

The Paris Agreement aims to keep global temperature rise this century well below 2°C above pre-industrial levels and to pursue efforts to limit it to 1.5°C. Reaching these targets will require mitigation—lowering the carbon dioxide (CO₂) emitted through changes such as increased use of renewable energy sources, and removal of CO₂ from the atmosphere through measures such as reforestation and [carbon capture](#) and storage.

However, while countries signed up to the Paris Agreement have individual quotas they need to meet in terms of mitigation and have individual plans for doing so, there are no agreed national quotas for CO₂ removal.

Now, in a paper published today in *Nature Climate Change*, an international group of researchers have argued that to meet the Paris Agreement's targets, CO₂ removal quotas cannot be allocated in such a way that any one country can fulfill its obligations alone.

Cross-border cooperation

The team, from Imperial College London, the University of Girona, ETH Zürich and the University of Cambridge, say countries need to start working together now to make sure enough CO₂ is removed in a fair and equitable way. This should involve deciding how quotas might be allocated fairly and devising a system where countries that cannot fulfill their obligations alone can trade with countries with greater capacity to remove CO₂.

Co-author Dr. Niall Mac Dowell, from the Centre for Environmental Policy and the Centre for Process Systems Engineering at Imperial, said: "Carbon dioxide removal is necessary to meet climate targets, since we have so far not done enough to mitigate our emissions. Both will be

necessary going forward, but the longer we wait to start removing CO₂ on a large scale, the more we will have to do.

"It is imperative that nations have these conversations now, to determine how quotas could be allocated fairly and how countries could meet those quotas via cross-border cooperation. It will work best if we all work together."

Co-author Dr. David Reiner, from Judge Business School at the University of Cambridge, added: "Countries such as the UK and France have begun to adopt binding 'net-zero targets' and whereas there has been extensive focus on greenhouse gas emissions and emissions reductions, meeting these targets will require greater attention to the negative emissions or [carbon dioxide](#) removal side of the equation."

Allocating quotas

A critical element in any negotiations will be to determine the fairest way to allocate quotas to different nations. Different methods have been used for determining previous quotas, such as the ability of a country to pay and its historic culpability (how much CO₂ it has emitted), with a blend of methods often used implicitly or explicitly in any final agreement.

The team modeled several of these different methods and applied them to countries across Europe. While the quotas varied significantly, they found that only a handful of countries could meet any of the quotas using only their own resources.

Co-lead author Dr. Ángel Galán-Martín, from ETH Zürich, said: "The exercise of allocating CO₂ removal quotas may help to break the current impasse, by incentivising countries to align their future national pledges with the expectations emerging from the fairness principles."

Carbon dioxide removal can be achieved in several ways. Reforestation uses trees as natural absorbers of atmospheric CO₂ but takes time to reach its full potential as the trees grow. Carbon capture and storage (CCS) takes CO₂ out of the atmosphere and stores it in underground geological formations.

CCS is usually coupled with a fossil fuel power station to take the CO₂ out of the emissions before they reach the atmosphere. However, it can also be coupled to bioenergy—growing crops to burn for fuel. These systems have the double benefit of the crops removing CO₂ from the atmosphere, and the CCS capturing any CO₂ from the power station before it is released.

Beginning the process

However, different countries have varying abilities to deploy these CO₂ removal strategies. For example, small but rich countries like Luxembourg might incur a heavy CO₂ removal burden but not have the geological capacity to implement large-scale CCS or have the space to plant enough trees or bioenergy crops.

The authors therefore suggest, after quotas have been determined, that a system of trading quotas could be established. For example, the UK has abundant space for CCS thanks to favorable geological formations in the North Sea, so could sell some of its capacity to other countries.

This system would take a while to set up, so the authors urge nations to begin the process now. Co-lead author Dr. Carlos Pozo from the University of Girona, said: "By 2050, the world needs to be carbon neutral—taking out of the atmosphere as much CO₂ as it puts in. To this end, a CO₂ removal industry needs to be rapidly scaled up, and that begins now, with countries looking at their responsibilities and their capacity to meet any quotas.

"There are technological solutions ready to be deployed. Now it is time for international agreements to get the ball rolling so we can start making serious progress towards our climate goals."

More information: Equity in allocating carbon dioxide removal quotas, *Nature Climate Change* (2020). [DOI: 10.1038/s41558-020-0802-4](https://doi.org/10.1038/s41558-020-0802-4) , www.nature.com/articles/s41558-020-0802-4

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