

Negative emissions no silver bullet for climate change mitigation

Paper in *Nature Climate Change*: There is no fall-back option to reducing CO₂ now

Berlin, 12/7/2015. There are significant constraints to large-scale deployment of negative emissions technologies in the future to reach climate change targets, according to a new study including research of the Mercator Research Institute on Global Commons and Climate Change (MCC). Published today in *Nature Climate Change*, it demonstrates the potential environmental, economic, and energy impacts of negative emission technologies for addressing climate change. The study comes at a time when UN climate negotiators currently meet in Paris at the world climate summit COP21 and emphasizes that greenhouse gas emissions must be reduced aggressively and immediately.

Negative emission technologies aim to remove carbon dioxide (CO₂), a major driver of climate change, from the atmosphere. They include relatively simple options like planting more trees to lock up CO₂ as they grow, or crushing rocks that naturally absorb CO₂ and spreading them on soils so that they remove CO₂ more rapidly. Other higher-tech options include using chemicals to absorb CO₂ from the air, or burning plants for energy and capturing the CO₂ that would otherwise be released, then storing it permanently deep below the ground, called bioenergy with carbon capture and storage (BECCS).

The study confirms and warns that future use of negative emissions should not be interpreted as a fall-back option. This would be risky, as continuing to cumulate emissions would entail lower chances of stabilizing climate change at less than two degrees Celsius. "Plan A" must be to reduce greenhouse gas emissions aggressively now. A failure to initiate such aggressive emissions cuts may leave us with no "Plan B" to stabilize the climate within

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the two degree target, as the deployment of these technologies will likely be limited due to any combination of the environmental, economic or energy constraints examined in the study.

“Negotiators at the climate summit in Paris must realize that betting on negative emissions doesn’t release us from cutting down on carbon now,” says co-author Sabine Fuss, a researcher at the Mercator Research Institute on Global Commons and Climate Change (MCC), who also serves on the Global Carbon Project (GCP) scientific steering committee.

“Our research shows that there are limits to the different negative emissions technologies – some demanding vast areas of land, some being energy-intensive. Therefore, future research should look not only on BECCS, but continue to explore all carbon dioxide removal options: we will probably be dependent on the full deck of cards, even if we don’t end up playing all of them.”

The work was carried out by a team of 40 collaborators on behalf of the GCP, including three MCC researchers. Among other things, they focused especially on the synthesis of the current literature on the biophysical limits to bioenergy and afforestation, and contributed to the analysis of BECCS deployment in the scenarios for the latest IPCC report. Some 85 percent of the 2-degree-scenarios examined by the IPCC assume the use of technologies such as BECCS.

It is still realistic to limit the increase global mean temperature to two-degree. Indeed, this requires negative emissions – but they’re also necessary to manage a three-degree-target,” MCC director Ottmar Edenhofer says. “Putting a price on carbon would be a very effective way to cut rising emissions quickly and aggressively. It would push the development of technology in the right direction and make us less dependent on negative emissions that bear large uncertainties.”

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The new research considers the impacts of negative emission technologies on land use, greenhouse gas emissions, water use, earth's reflectivity, and soil nutrient depletion, as well as the energy and cost requirements for each technology. The study shows that there are many such impacts that vary across technologies. These impacts need to be satisfactorily addressed if negative emission technologies are to play a significant role in achieving climate change goals.

About the MCC

The MCC explores sustainable management and the use of common goods such as global environmental systems and social infrastructures in the context of climate change. Seven working groups conduct research on the topics of economic growth and development, resources and international trade, cities and infrastructure, governance and scientific policy advice. The MCC was jointly founded by the Mercator Foundation and the Potsdam Institute for Climate Impact Research (PIK).

Reference of the cited article:

Pete Smith (et al.) (2015): Biophysical and economic limits to negative CO₂ emissions. Nature Climate Change. DOI: 10.1038/nclimate2870

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