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Asymmetry in CO2 emissions and removals could skew climate targets

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Source: Simon Fraser University

Summary: Changes in climate resulting from carbon dioxide emissions into the Earth's atmosphere are not equal to the climate changes from deliberate carbon dioxide removals -- and assuming such a balance could lead to different climate outcomes that may skew climate targets, according to new research.

FULL STORY

Changes in climate resulting from carbon dioxide (CO_2) emissions into the Earth's atmosphere are not equal to the climate changes from deliberate CO_2 removals -- and assuming such a balance could lead to different climate outcomes that may skew climate targets, according to new Simon Fraser University-led research.

"Because of the complexity of the Earth's system, things are not as simple as "one ton of CO_2 in, equals one ton of CO_2 out," says Kirsten Zickfeld, a distinguished professor of climate science in SFU's Department of Geography, and lead author of a new paper published this week in the journal *Nature Climate Change*. "CO_2 emissions are more effective at raising atmospheric CO_2 concentration than CO_2 removals are at lowering it."

According to Zickfeld, this "asymmetry" implies that a larger amount of CO_2 removal is required to compensate for a given amount of CO_2 emissions if the atmospheric CO_2 concentration is to remain unchanged.

Researchers used a series of climate model simulations to test whether the change in climate resulting from CO_2 emissions and removals is asymmetric. Their results showed that the rise in the atmospheric CO_2 concentration following an emission is larger than the decline following a removal of the same magnitude.

Findings of the study infer that balancing a given amount of CO_2 emissions with an equal amount of CO_2 removals could lead to a different climate outcome than avoiding the CO_2 emissions.

"Our study suggests that assuming exact balance between CO_2 emissions and an equal amount of CO_2 removals in a net-zero framework risks blowing climate targets," she says.

While Zickfeld says that balancing emissions with CO_2 removals of the same magnitude could lead to different climate outcomes, further study is needed to learn more about the extent of this effect.

Story Source:

Materials provided by **Simon Fraser University**. *Note: Content may be edited for style and length.*

Journal Reference:

1. Kirsten Zickfeld, Deven Azevedo, Sabine Mathesius, H. Damon Matthews. **Asymmetry in the climate–carbon cycle response to positive and negative CO2 emissions**. *Nature Climate Change*, 2021; DOI: 10.1038/s41558-021-01061-2

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