# Albedo can reduce climate benefit of tree planting: New tool identifies locations with high climate-cooling potential

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As efforts to restore tree cover accelerate to help avoid runaway climate change, a new study highlights how restoring tree cover can, in some

locations, heat up the Earth rather than cool it by affecting how much sunlight the surface reflects (i.e. "the albedo").

This new study by researchers at Clark University in the United States alongside scientists from The Nature Conservancy (TNC) and ETH-Zurich, published today in the journal *Nature Communications*, provides a global analysis of where restoration of tree cover is most effective at cooling the global climate system, considering not just the cooling from carbon storage but also the warming from decreased albedo.

The researchers provide a tool practitioners and land managers can use to determine just how much of a problem albedo is for any reforestation or afforestation project on the globe. The authors use these new maps to show that previously published 'carbon-only' estimates of the global climate mitigation potential of restoring trees worldwide provided significant overestimation, being anywhere from 20 to 81% too high.

Because comprehensive maps of the consequences of albedo change were not previously available, these carbon-only estimates tend to identify too many options in landscapes—particularly semi-arid settings and snowy, boreal regions—where changes in albedo would significantly offset, or even negate, the carbon-removing benefits provided by these trees.

"The balance of carbon storage versus albedo change that comes from restoring tree cover varies from place to place, but until now we didn't have the tools to tell the good climate solutions from the bad," says lead author Natalia Hasler, a research scientist at the George Perkins Marsh Institute at Clark University in Worcester, Massachusetts.

"Our study aims to change that, providing the maps needed to empower smarter decisions while also ensuring that limited finance is directed at those locations where restoring tree cover can make the most positive

difference as a natural climate solution."

On the positive, the study also identifies locations within every biome on Earth where the climate mitigation benefits of tree-planting can be achieved. Better still, it also finds that most of the thousands of on-the-ground projects underway globally to restore tree cover are concentrated in these zones of greatest opportunity. Even in these locations, however, albedo changes are likely to offset the net climate benefit by at least 20 percent in around two-thirds of cases.

Elaborating further on the team's findings, senior co-author Susan Cook-Patton—senior forest restoration scientist at TNC—explained, "We've addressed a significant research gap and gained a much more complete picture of how restoring tree cover can impact our global climate—both positively and also sometimes negatively.

"However, it's important to remember that there are many other sound reasons to restore tree cover, even in locations where the climate benefits aren't stellar: clean water, resilient food production, wildlife habitat, the list goes on... We're simply calling on governments and land managers to more carefully integrate albedo in their environmental decision-making and are open-sourcing this robust new set of tools to help them do so."

**More information:** Hasler N., Accounting for albedo change to identify climate positive tree cover restoration., *Nature Communications* (2024). DOI: 10.1038/s41467-024-46577-1 , www.nature.com/articles/s41467-024-46577-1

To read more about efforts to restore tree cover and to chart the full potential of nature to mitigate climate change, visit naturebase.org to learn more.