How planting trees in some areas could actually increase atmospheric warming

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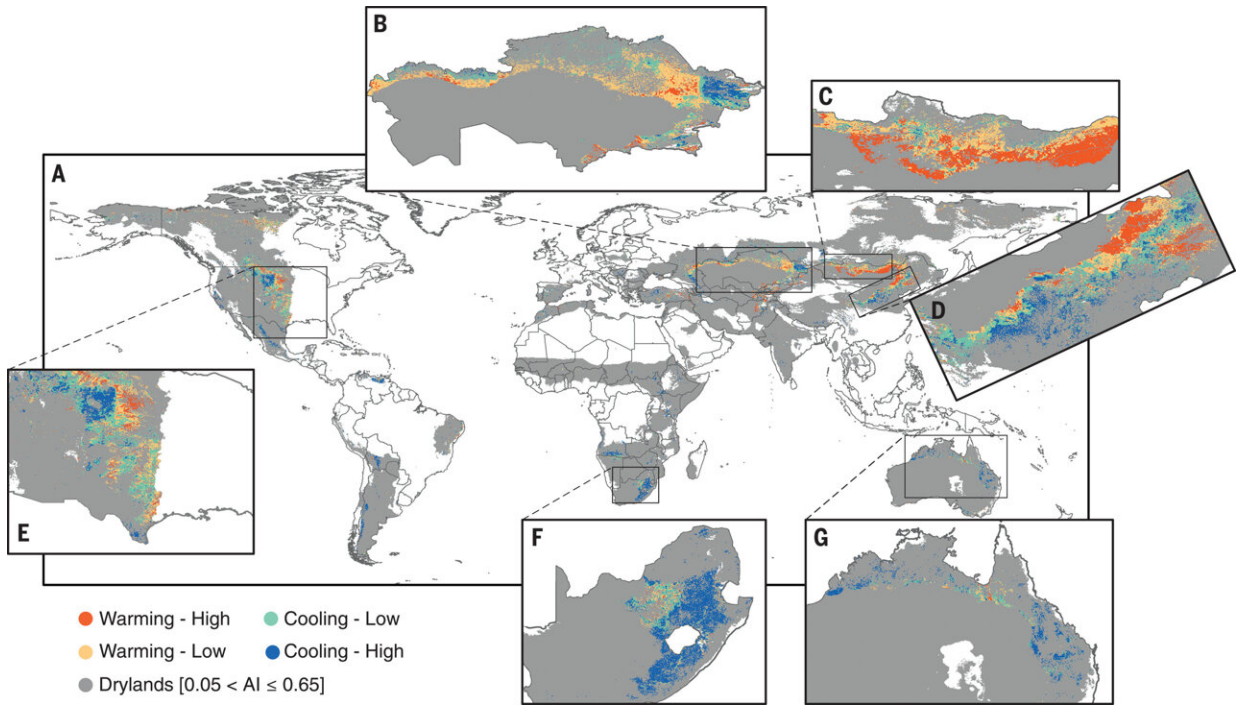

Net equivalent carbon stock change obtainable from the afforestation of suitable nonforested drylands.(**A** to **G**) NESC outcomes calculated as the net difference between the carbon sequestration potential (ΔSP) and the emissions equivalent of shortwave forcing (EESF) arising from forestation-induced changes in albedo. Colors represent the NESC effect range, where NESC was calculated in units of tons of carbon per hectare over a forest lifetime of 80 years (2020–2100): high warming, NESC ≤ −50; low warming −50 50 (represents the largest potential climate cooling effect). The dark gray background indicates the full extent of global drylands [defined as semiarid and dry-subhumid lands within the aridity index (AI) range of 0.05

A combined team of researchers from The Technion–Israel Institute of Technology and Weizmann Institute of Science, both in Israel, has found that in some instances planting forests in dry regions can lead to more atmospheric warming. In their paper published in the journal *Science*, the group describes how they used high-resolution spatial analysis to study dry parts of the planet and what they learned by doing so.

As the planet continues to grow warmer due to emissions of human produced greenhouse gases, scientists and government officials around the world continue to look for ways to slow or stop the warming. One such approach has involved planting trees—they pull carbon dioxide from the air and store it. Converting barren areas to forests, logic suggests, would be a great way to slow global warming.

But it seems there is a problem even with this approach. Because trees generally have green leaves, they absorb heat. And if trees are planted in areas that are barren, such as dry wastelands, the result could be an increase in temperatures. This is because deserts and wastelands tend to be very light in color, which means they reflect heat rather than absorb it.

In this new effort, the team in Israel looked at wasteland areas across the globe and calculated the net gain or loss of heat if such areas were to be converted to forests. They did this by conducting high-resolution spatial analysis of such areas that were in places where it would be possible for forests to survive if they were planted. In all, they found 448 million hectares that could be forested.

As they did so, they noted that many of the places they found were already included in tree-planting projects. They then used data from prior efforts that showed how much carbon is stored in various types of trees and in the forests where they grow—and data from other projects that had included measurements of how much heat is stored by the different types of trees. Then they applied what they had found to the sites they had identified.

In looking at their work, the researchers found that if all the wasteland they had identified were planted with trees, the net result would be the sequestering of 32.3 billion tons of carbon. But they found that approximately two-thirds of that amount would be needed to cancel out the warming that would result from heat

absorption. And that, they found, meant that foresting all of the possible wasteland available would offset just 1% of greenhouse gas emissions.

More information: Shani Rohatyn et al, Limited climate change mitigation potential through forestation of the vast dryland regions, *Science* (2022). DOI: 10.1126/science.abm9684