October 2025

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SRM & the Amazon

The Amazon is under threat from climate change and deforestation. What are the impacts, and how might emerging approaches to cool the planet affect it?

Key messages

Facing threats

The Amazon is a vital ecosystem that has been significantly damaged by deforestation and climate change, which pose serious threats to its future.

Weighing risks

Compared to climate change, stratospheric aerosol injection (SAI) could benefit the Amazon overall, but many uncertainties, risks, and governance challenges remain.

Improving understanding

Further research is needed to better understand how the Amazon will be affected by climate change and how it may be impacted by SAI.

A farm tractor travels in a deforested section of the Amazon rainforest (Mario Tama/Getty Images)

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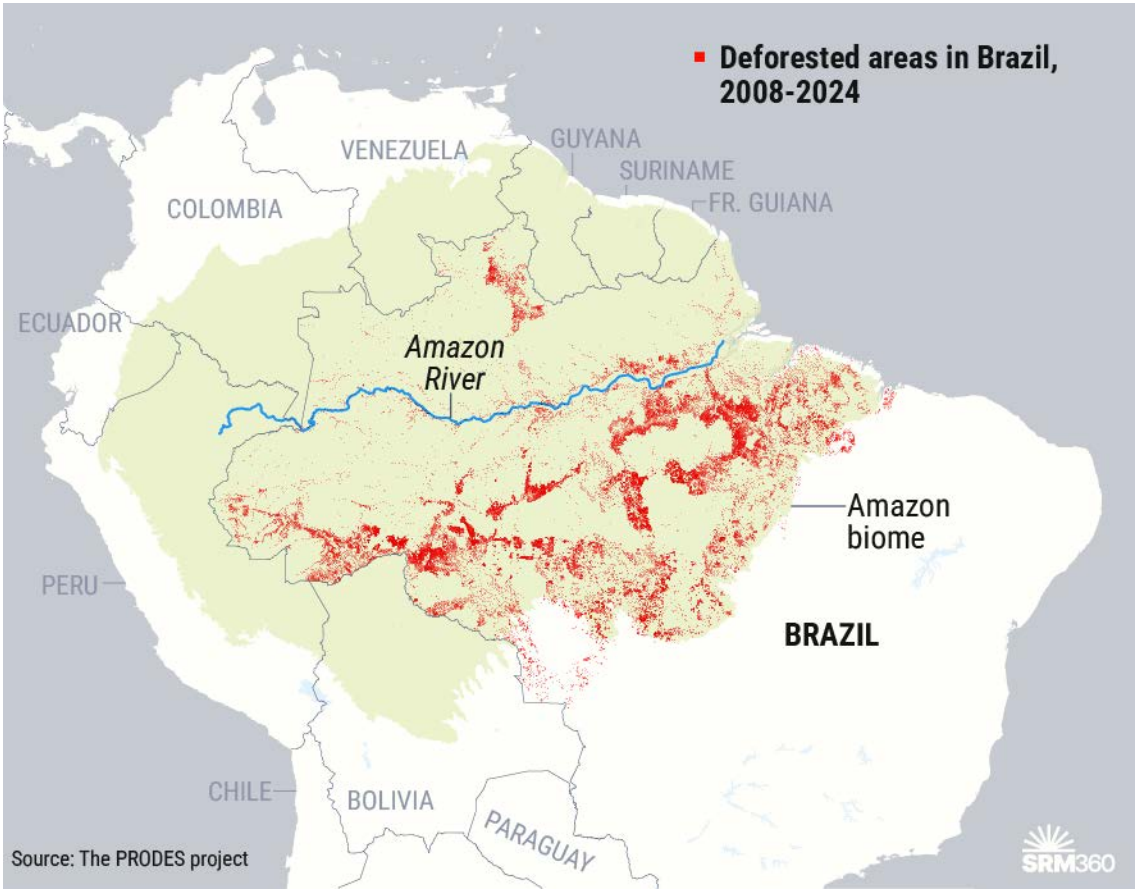
The Amazon is the world's largest rainforest and is one of the most biodiverse places on Earth.[1] It plays a key role in regulating the global climate by absorbing and storing carbon dioxide, currently holding hundreds of billions of tonnes of carbon, though it may release more than it takes in as climate change and degradation continue.[2] The Amazon is also home to tens of millions of people, including over two million Indigenous people, who rely on it for their livelihoods.[3]

Since the 1970s, about 15% of the Amazon rainforest has been lost, mainly due to deforestation for farming.[4] It is also under increasing threat from climate change as extreme heat, water scarcity, and exacerbated wildfires continue to worsen.[5] These stresses are pushing the ecosystem towards a potential collapse, which would lead to the permanent loss of parts of the rainforest.[6]



Emissions cuts, carbon dioxide removal, and adaptation are the main strategies to limit the impacts of climate change around the world. However, given the growing risks and limited progress, there is increasing interest in a set of potential technologies known as sunlight reflection methods (SRM), also called solar geoengineering. If deployed, SRM would reflect a small portion of sunlight back to space to cool the planet.

The most researched approach is stratospheric aerosol injection (SAI), which would use high-flying jets to create a global layer of tiny reflective particles.[7] While this seems technologically feasible and effective at cooling,[8] it would have several side effects, bring new risks,[9] and pose significant governance challenges.[10]

What would SAI mean for the Amazon, compared to the effects of climate change?

How might SAI affect the Amazon?

This table outlines how four key areas could be affected by SAI compared to future climate change.

	 How might climate change affect the Amazon?	 How might SAI affect the Amazon?
Heat stress	Climate models indicate that maximum temperatures in the Amazon will increase 2–4°C above current levels by 2050.[5] Increasing heat stress limits trees' ability to grow and store carbon, and damages their leaves.[5]	Carefully deployed SAI could reduce temperatures around the world.[11] One study finds that SAI's cooling would increase the ability of trees in the Amazon to grow and store carbon.[12*]
Water stress	Climate change is increasing the frequency, duration, and intensity of droughts in the Amazon.[13] Increasing water stress degrades the forest and can kill trees.[16]	Studies suggest SAI may not reverse and may even slightly worsen reductions in rainfall and water availability in the Amazon, though this is uncertain.[14,15] Despite this drying effect,[14] a study suggests the forest would benefit from SAI overall due to its cooling effect.[12*]
Wildfires	Intensified dry seasons in the Amazon increase both the risk and intensity of wildfires.[13] Exacerbated wildfires lead to greater forest loss and can destabilise the remaining forest cover.[13]	SAI's combined cooling and drying effects lead to uncertain impacts on wildfires.[17] One study finds SAI would have little overall effect on western Amazon wildfires and could reduce fire risk in the eastern Amazon.[17]
Collapse	Much of the rain that maintains the Amazon is recycled by the forest itself. Deforestation and climate stresses are degrading the forest's ability to maintain this cycle, which could lead to large losses and tip parts or all of the Amazon into a permanently deforested state.[5,16]	Research on the impact of SAI on tipping points in the Amazon is limited, and the potential effects remain uncertain.[18] SAI may reduce the risk of collapse, as the benefits of its cooling could outweigh its drying impacts.[12*]

**Preprint, currently under review*

Appendix

Learn more about sunlight reflection methods at SRM360.org.

Check out our introductory guides to SRM here.

Endnotes

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About SRM360

SRM360 is a non-profit knowledge broker dedicated to informing people about sunlight reflection methods – or solar geoengineering – so they can contribute to critical decisions about its research, development, and governance.