Stratospheric Aerosol Injection

What is S.A.I

Stratospheric Aerosol Injection (S.A.I.) is a proposed geoengineering technique aimed at reducing global warming by introducing reflective particles into the stratosphere. These particles, such as sulphates or other aerosols, would reflect a portion of incoming solar radiation back into space, theoretically lowering global temperatures. S.A.I. is considered a form of solar radiation management and does not address the root cause of climate change, namely greenhouse gas emissions.

Scientific Basis

The method is modelled on natural phenomena, such as volcanic eruptions, which release large amounts of aerosols into the stratosphere and cause temporary global cooling. S.A.I. involves dispersing fine particles using aircraft or other high-altitude delivery systems. Climate models suggest it could reduce surface temperatures, but effects on precipitation patterns, ozone depletion and regional climates remain uncertain.

Potential Benefits

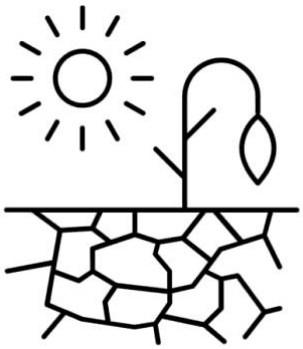
S.A.I. could temporarily reduce global temperatures and mitigate heatwaves or extreme weather, offering a possible short-term buffer against the worst effects of climate change. By cooling the planet, it may reduce the severity of droughts, forest fires and other climate-related disasters. It also provides time for societies to implement comprehensive greenhouse gas emission reductions while limiting immediate climate damage. In addition, it could protect sensitive ecosystems and vulnerable human populations, particularly in regions prone to rapid warming and potentially reduce economic losses linked to climate extremes.

Potential Risks

S.A.I. carries significant scientific, environmental and political risks. Regional impacts on rainfall, monsoon systems and agriculture are uncertain, potentially causing droughts in some areas while reducing rainfall in others. Long-term changes in stratospheric chemistry, including ozone depletion, remain a major concern. The technique may create a ‘moral hazard’, reducing the urgency for greenhouse gas emission reductions. Once implemented at scale, S.A.I. is difficult to reverse and sudden cessation could trigger rapid global warming. Geopolitical risks exist, as unilateral deployment could create conflicts over unequal benefits or harms. Social and ethical concerns also arise regarding consent, environmental justice and unforeseen ecological consequences

International Laws and Agreements

No specific international treaty directly regulates S.A.I. Relevant frameworks include the UN Convention on Biological Diversity, which has issued non-binding guidance on geoengineering activities and general principles of international environmental law. Any deployment would likely require coordination to avoid cross-border environmental impacts.



Ethics and Policies

Implementation of S.A.I. raises questions of intergenerational responsibility, equity and consent, as decisions may affect populations far into the future. Decision-making could involve significant power imbalances between nations or regions, potentially allowing wealthier countries to dominate the process or gain disproportionate benefits. Ethical debates also concern environmental justice, as the consequences may impact some communities more than others and the lack of full scientific certainty complicates decision-making. Public perception and acceptability are key factors, influencing both political feasibility and potential social resistance. Transparency, international consultation and accountability are central to ensuring that any deployment respects ethical and policy principles.

In the News

Several small-scale studies and computer simulations have explored the feasibility and potential consequences of S.A.I. Research indicates possible short-term temperature reduction but highlights high uncertainty in ecological and atmospheric impacts. Media coverage emphasises both potential as a climate emergency tool and concerns over "technological fixes" overshadowing emission reductions. Some experimental proposals have received international attention, though no large-scale deployment has occurred.

Questions to Consider

Should S.A.I. be considered a temporary emergency measure or a long-term climate strategy ?

How should risks and benefits be weighed across different regions and populations ?

What governance or regulatory mechanisms would be necessary to control deployment ?

Can S.A.I. coexist with aggressive emission reduction policies ?

Sources & Further Reading

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