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Atmospheric Geoengineering Experiment to Curb Global Warming

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The research by scientists at Harvard and Yale universities, published in the journal *Environmental Research Letters*, proposed using a technique known as **stratospheric aerosol injection**, which could cut the rate of global warming in half.

- The technique would involve **spraying large amounts of sulfate particles** into the Earth's lower stratosphere at altitudes as high as 12 mile (around 20 kilometre). The sulfates will be delivered with specially designed high-altitude aircraft, balloons or large naval-style guns.
- The idea is to **help shield the Earth from just enough sunlight** to help keep temperatures low, i.e. **increasing the planet's albedo**, or reflective power. This method would **mimic what large volcanoes do**. E.g.:
 - In 1991, **Mount Pinatubo erupted in the Philippines**. It was the second largest eruption of the 20th century. In total, the eruption injected 20 million tons of sulfur dioxide aerosols into the stratosphere which **lowered atmospheric temperature by approximately 1-degree Fahrenheit**. However, it's effect only lasted a couple of years because the sulfates eventually fell to Earth. Moreover, it **affected precipitation** in many parts of the world.
- The report does, however, acknowledge that the technique is **purely hypothetical** and would involve developing a new, purpose built tanker with substantial payload capabilities that may take around 15 years' of time.

Geoengineering

- Geoengineering is the technique designed to **tackle the effects of climate change directly**, usually by **removing carbon dioxide (CO₂) from the air** or **limiting the amount of sunlight reaching** the planet's surface.
- It involves deliberate planet-scale interventions to counteract global warming.

- **Methods to remove CO₂ from the air:** Increasing the **capacity of trees and plants to absorb CO₂** from the air, burning large quantities of wood in power plants with **carbon-capture technology**, making and burying **large amounts of charcoal to lock carbon** into the soils, grazing cattle in a way designed to **turn grasslands into giant carbon sinks**, fertilising the **oceans with iron** to encourage the growth of **algae that can soak up atmospheric carbon dioxide**, etc.
- **Methods to limit amount of sunlight:** Placing **mirrors in space that reflect sunlight** away from the Earth, firing **sulphate aerosols into the stratosphere**, using unmanned ships to increase above-ocean cloud cover by **spraying sea water into the air**, etc.

Concerns

- The technique could result in **reduced precipitation, soil moisture and river flow in many regions**.
- Injection of sulphur compounds into the stratosphere is likely to **increase acid deposition** on the ground and also contribute to **ozone layer depletion**.
- Once the aerosol has been injected into the atmosphere, it **cannot be removed**.
- Stratospheric aerosol injection techniques could jeopardize **crop yields, lead to droughts or cause extreme weather**.
- The proposals also don't address the issue of rising greenhouse gas emissions, which are a leading cause of global warming. Few argue that it's only a **temporary Band-Aid covering** a problem.
- Solar radiation management is still a much worse solution than greenhouse gas emissions: it is **more costly and much more risky over the long run**.
- There are the **ethical and governance issues** that surround geoengineering as well, questions about who should be allowed to do what and when.

Conclusion

- The buildup of greenhouse gases is **already altering the atmosphere and climate in an unprecedented and uncontrolled manner**. Climate researchers should **explore solar geoengineering** to determine whether it would actually work and how safe it would be.
- Along with this political scientists also need to start thinking about how to implement such an unprecedented planetary project. All that will be left then is **for society and governments to face the impossibly difficult task of deciding whether to do it**.