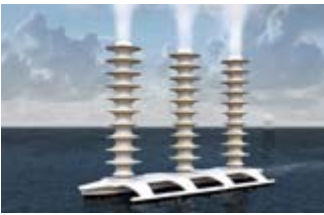




Climate Change : Climate Solutions

Manipulating Nature for a Cooler Planet

With greenhouse gas emissions still rising sharply, some scientists say it's time to think about "last resort" options to stop and reverse global warming. But most geoengineering proposals have risks of their own.



One geoengineering proposal involves deploying thousands of wind-powered yachts that would spray seawater droplets into the air to produce more sun-reflecting clouds (Image courtesy: John MacNeill)

A typical late summer afternoon in southern California in the year 2020: empty beaches, a cold breeze, and the ocean cloaked in perpetual fog and topped by a thick layer of algae. What happened?

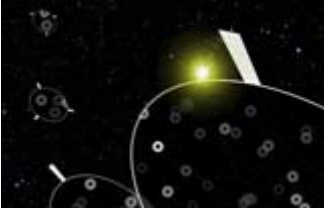
If stopping climate change - not getting a tan - becomes a paramount concern, this could be the modern form of California dreamin'. Scientists in a field called geoengineering have come up with ways to reverse global warming. But instead of hybrid cars and efficient lightbulbs, geoengineers talk about things like sulfate injections, iron fertilization, and cloud seeding - methods that could cool global temperatures, but with possible impacts on life as we know it.

Some geoengineering proposals - like sending trillions of small sun-reflecting shades into space - can sound outlandish and exorbitantly expensive. But researchers say the time has come to start thinking about a "climate emergency system," a way to halt runaway global warming if humanity is unable to reduce its greenhouse gas emissions. Since mankind has been unable to do that so far, scientists say we should start discussing some "last resort" options to cool the Earth quickly.

"What we need is not just a few oddballs like me thinking about this; we need a broader debate," said Canadian climate scientist David Keith at a recent TED lecture about geoengineering. "We should move this out of the shadows and talk about this seriously, because sooner or later, we will be confronted with decisions about this."

Celestial sunglasses

One of the geoengineering ideas on the table is increasing the amount of sulfates in the Earth's atmosphere, which would more efficiently reflect sunlight back into space. This concept gained ground following the 1991 eruption of a Philippine volcano, Mount Pinatubo, which belched 20 megatons of sulfur dioxide into the atmosphere and noticeably cooled temperatures around the world.



Geoengineering Picture Gallery (click on image to begin)

A closer look at seven of the "geoengineering" solutions scientists and engineers have proposed to halt global warming

Pinatubo's aftermath also sent scientists looking for ways to replicate the effect. Initial proposals included sulfuric additives to jetliner fuels, sending sulfates up in stratospheric balloons, or even using naval artillery to fire sulfate shells into the atmosphere. The problem with sulfates, however, is that they also damage the ozone layer and cause acid rain that destroys forests and depletes soils.

Scientists like Alan Robock of Rutgers University thus warn that the potential side-effects are still not fully understood. In a paper entitled "20 Reasons Why Geoengineering May Be a Bad Idea," Robock raises even more questions: Which countries get to decide to inject aerosols and when? Will it whiten our blue skies?

Similar concerns loom over the other geoengineering concepts that have been bandied about conferences and academic journals in recent years. The scariest unknowns are usually the unintended consequences - a recurrent theme in the history of man's intervention with nature.

Fertilizing oceans with iron, another geoengineering proposal, would trigger algae blooms to absorb more carbon dioxide from the atmosphere. But biologists still don't know all of the broader effects on marine ecosystems. The meteorological impacts of another idea - spraying seawater into the air to "seed" the formation of reflective stratocumulus clouds over oceans - is also not yet fully understood.

"The Earth system is notoriously complex," said Stanford University scientist Ken Caldeira in a lecture earlier this year. "And we can assume that tinkering with it on a global scale will produce unanticipated outcomes."

Like David Keith and Alan Robock, Caldeira also warns against having too much confidence in geoengineering. Having an "emergency system" might prevent the actions and policies that would keep us from needing such a system in the first place - namely, switching to a cleaner and more efficient energy system.

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"If the cost of energy system transformation is thought to be in the high hundreds of billions of dollars," says Caldeira. "It looks a lot cheaper just to geoengineer the planet than to reduce carbon dioxide emissions. Of course, it's far riskier."

Solving a problem by creating another does not seem like a viable solution, especially if you like hanging out at the beach.

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