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## Is geo-engineering a real solution for climate?

Henry Chu, Los Angeles Times  
Thursday, November 26, 2009



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**(11-26) 04:00 PST London --**

If there were some kind of panic button to stop global warming, what would it look like?

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How about billions of tiny mirrors, launched into orbit to deflect solar rays away from Earth? Or big, fluffy clouds, artificially whitened so they reflect more sunlight back into space? Or maybe mechanical trees, ugly but effective at sucking carbon dioxide from the air along busy highways?

Outlandish as some of these proposals may seem, scientists and engineers are paying increasing attention to such ideas amid mounting evidence that human-caused climate change is wreaking havoc in some parts of the world.

The proposals belong to a field known as geo-engineering, or manipulation of the environment on a grand scale.

As a solution to global warming, it remains a highly controversial concept, dismissed as a dangerous distraction by critics or embraced as a quick, if temporary, fix by enthusiasts such as the authors of the best-selling book "Freakonomics."

Regardless, decision-makers are beginning to take notice. The U.S. House Committee on Science and Technology held its first hearing on the topic this month.

"It's too soon to think about actually doing any of these things, but it's the right time for some serious research and for some funding from the government," said John Shepherd, a professor of Earth science at the University of Southampton in southern England, who testified at the hearing.

Shepherd is a member of the prestigious Royal Society, a fellowship of scientists that released a highly publicized report in September identifying various geo-engineering solutions and assessing their feasibility.

The ideas usually fall into either of two categories. In one, the goal is to decrease the amount of sunshine hitting and warming Earth - one eye-popping proposal calls for unfurling a space-based gigantic shade made of a super-thin mesh of aluminum threads. A more reasonable and promising alternative, according to the Royal Society, would be to spray sulfate aerosols into clouds to make them brighter, whiter and therefore more reflective.

The other type of idea calls for removing carbon dioxide already in the atmosphere, whether by trapping and storing it via artificial trees or converting it to something else - for example, tapping the ability of the oceans' algae to convert CO<sub>2</sub> into oxygen through photosynthesis.

In general, the "solar radiation management" techniques would offer quick, emergency relief from rising temperatures, a dose of cosmic aspirin to bring down Earth's fever. The carbon-capture methods, although taking longer to be effective, would get at the cause of the infection.

But Shepherd, along with virtually all scientists, engineers and other experts here, emphasizes that none of these solutions is a substitute for the paramount task of getting people, and countries, to slash their carbon emissions.

That's why, at next month's global summit in Denmark on reducing greenhouse gas emissions, he hopes that policymakers don't pay too much attention to a talk he's scheduled to give on geo-engineering ideas.

"Geo-engineering is not a magic bullet, and it's not a viable alternative to carbon reduction," Shepherd said. "I hope that this is not going to be any serious component of the discussions in Copenhagen, because it would be premature for any of it to be taken into account."

Many of the ideas are "still at the back-of-the-envelope stage," he said, and the technologies some would require are years, if not decades, away. For instance, no one knows yet how to catapult 1 million tiny mirrors into space every minute for 30 years.

Critics worry that too much focus on geo-engineering will divert attention and resources from the immediate need to reduce carbon footprints, or could cause people to become complacent.

"A lot of this is just pie-in-the-sky compared to the clear and obvious things and most cost-effective things that we can be doing straightaway," said Doug Parr, a spokesman for the environmental organization Greenpeace.

In addition to the unproven technologies, he said, there are side effects that could be just as harmful to the environment as climate change. One proposal, pouring iron into the ocean to stimulate the growth of CO<sub>2</sub>-gobbling algae, significantly would alter the marine ecosystem. Spraying aerosol into clouds would set back the healing of the ozone layer.

This raises questions of ethics and international governance. Who gets to decide which techniques are used and at what cost? What happens if a U.S.-driven solution creates new problems for people in Asia, or vice versa?

"For example, the sulfate aerosols: The consequence of that would almost certainly be to affect rainfall patterns, and when you affect rainfall patterns, there are going to be winners and losers," Parr said. "How do the losers feel about these experiments?"

The aerosol method also comes saddled with the same problem as other sunlight-repelling proposals: the need for constant maintenance and replenishing. Moreover, if anything went wrong or maintenance stopped for any reason, all the effects of the pent-up greenhouse gases would come barreling back and Earth would heat up quickly, just as a fever returns without aspirin.

"The CO<sub>2</sub> is still in the atmosphere, and you've got to deal with that," said Nem Vaughan, a researcher at the University of East Anglia in eastern England, which has launched an initiative specifically to study and evaluate geo-engineering.

Many experts prefer the carbon-removal idea, which attacks the source of the disease, not just the symptoms.

At its august headquarters just a stone's throw from Big Ben and the Houses of Parliament, Britain's Institution of Mechanical Engineers conducted its own study of various geo-engineering ideas and concluded this summer that artificial trees were the best bet.

Scientists have developed models for mechanical trees that would trap carbon dioxide from the air for removal and storage later, perhaps in hollow seams deep underground.

Although dubbed "trees," suggested models more resemble upright fly swatters or roadside cabins than actual trees.

Tim Fox, head of the institution's environment and climate-change section, estimates that 100,000 "trees," at a cost of \$20,000 each, in theory could scrub Britain clean of a significant portion of its carbon emissions.

"It's very plausible. It just needs financial backing and the will to do it," Fox said.

His organization also recommends using algae on buildings to absorb carbon. Artists' impressions, perhaps rather fancifully, imagine big office towers in London ribbed with long tubes full of algae, giving "green design" a whole new meaning.

Critics of these geo-engineering proposals are unconvinced.

"Why are we speculating about whether we can construct concrete trees that may or may not effectively capture carbon from the atmosphere when we've got people's homes which aren't properly insulated? That's absurd," Parr said.

Fox insists that such measures are feasible. His institution and the Royal Society contend that governments should dedicate a small portion of funding for climate-change research to geo-engineering; at the moment, scientists have been working on such ideas at their universities or "in their spare time," Shepherd said.

Fox emphasizes that geo-engineering proposals form only part of the solution, a way to buy the planet some time while people and nations wrestle their carbon emissions under control, which they so far have not had much success in achieving.

"The reality is we don't have enough time left available to us," he said.

"Rather than get halfway down the track and give up because we're exhausted from the challenge and demoralized from losing the battle, why don't we use all the tools at hand better?"

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