

Pictures: 7 Emergency Climate Fixes

Geoengineering

<http://news.nationalgeographic.com/news/2010/03/photogalleries/100324-global-warming-geoengineering-pictures-asilomar>

1. Artificial Volcanoes



Photograph by Emory Kristof, National Geographic

Can we combat climate change by changing the climate? It's worth a try, say advocates of geoengineering—manipulating the climate to reduce the effects of heat-trapping greenhouse gases in Earth's atmosphere. (See: ["5 Last-Ditch Schemes to Avert Warming Disaster."](#))

One such potential fix is dubbed artificial volcanoes, or pumping bits of sulfur—an ingredient from volcano ash that becomes a gas—into the atmosphere. Like ash from real volcanoes, (pictured, a volcano erupts on Iceland's Heimaey Island), [the particles bounce the sun's light and heat back into space](#).

This and other emergency measures are under the microscope this week as part of the first [Asilomar International Conference on Climate Intervention Technologies](#) in Pacific Grove, California. The meeting will attempt to draft the world's first voluntary guidelines for ethical behavior in geoengineering schemes, most of which are still no more than ideas.

That's not to say any of the schemes will be deployed in the near future, noted [Samuel Thornstrom](#), co-director of the Geoengineering Project at the American Enterprise Institute, a Washington, D.C.-based policy-research institute.

But experts should seriously consider all options, Thornstrom said, including altering the climate: "There is no argument for ignorance—we should know more about geoengineering."

—Christine Dell'Amore

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2. Greening the Desert

Photograph by Naftall Hilger, ArabianEye, Photolibrary

Greening the desert may be a way to trap more atmospheric greenhouse gases such as carbon dioxide, experts say—a geoengineering idea already taking root in Africa.

For instance, 13 African countries are building a ["Great Green Wall" of trees that would gobble up carbon while halting the Sahara's spread](#). And organizers of the ambitious Sahara Forest Project plan to plant trees alongside their [massive renewable energy complexes, which are intended for deserts around the globe](#).

If [greenhouse gas](#) emissions continue to skyrocket, however, a green desert likely wouldn't have enough carbon-trapping heft to make a dent, said [Michael MacCracken](#), chief scientist for climate programs at the nonprofit Climate Institute, a Washington, D.C.-based climate-advocacy organization.

But in a lower-carbon world, he said, green deserts could be a good strategy for keeping emissions down.

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3. "Biochar" in Soils

Photograph by Jeff Hutchens, Getty Images

It may be old as dirt, but the Amazonian practice of making "biochar" could be a climate saver, experts say (pictured, a farmer holds biochar in West Virginia in 2008).

When returned to the soil, biochar—a rich, highly porous charcoal made by heating agricultural waste—can trap carbon in soils for hundreds to thousands of years, according to the International Biochar Initiative. By contrast, the carbon-holding powers of trees are limited, because greenhouse gases escape if a tree is cut down or dies.

The American Enterprise Institute's Thernstrom puts biochar in his "deserves to be explored" category, as does the Climate Institute's MacCracken, who noted that the substance has the added benefit of improving soil quality. (See ["Superdirt Made Lost Amazon Cities Possible?"](#))

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4. Seaweed Farms

Photograph by Jason Edwards, Bio-Images, National Geographic Stock

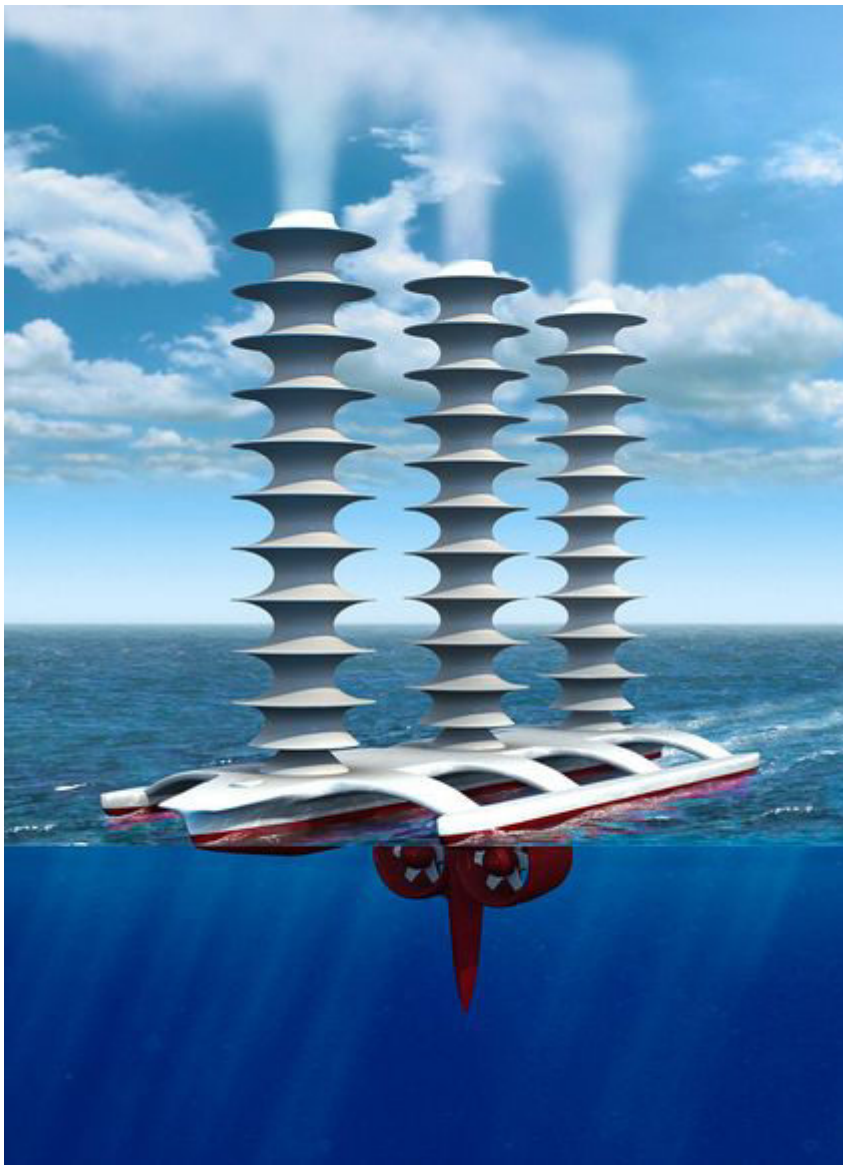
It may be a cousin to pond scum, but seaweed has attained a more noble status among scientists advocating seaweed farms as carbon sinks (above, a woman in Bali, [Indonesia](#), harvests seaweed in an undated photo).

Half of the world's photosynthesis—a process that uses sunlight to convert carbon dioxide into energy—takes place in the oceans. But most of that occurs in tiny marine plants called phytoplankton, which can't be farmed, according to the Seaweed Clean Development Mechanism Project at Korea's [Pusan National University](#).

Enter seaweed, which can be easily cultivated along coasts—a possible solution for scientists looking to boost the oceans' carbon-zapping contribution. (Related: ["Earliest Known American Settlers Harvested Seaweed."](#))

As a bonus, farmed seaweed can be harvested and turned into a renewable fuel—"a joint benefit," said the Climate Institute's MacCracken.

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5. Cloud-making Ships

Illustration by John MacNeill

With a design reminiscent of an oceangoing pogo stick, this "cloud ship" may give some bounce to geoengineering efforts to combat climate change.

The wind-powered devices take in ocean water and spray a fine mist of sea salt, which generates ocean clouds. Such clouds are denser and whiter than regular clouds, so they reflect more of the sun's heat back into space.

Deploying about 1,500 of these relatively inexpensive vessels could have an immediate cooling effect, said the American Enterprise Institute's Thornstrom.

"We're a long way from knowing for sure whether that would work," he said. "But it's a plausible theory that does deserve serious investigation."

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6. White Roofs

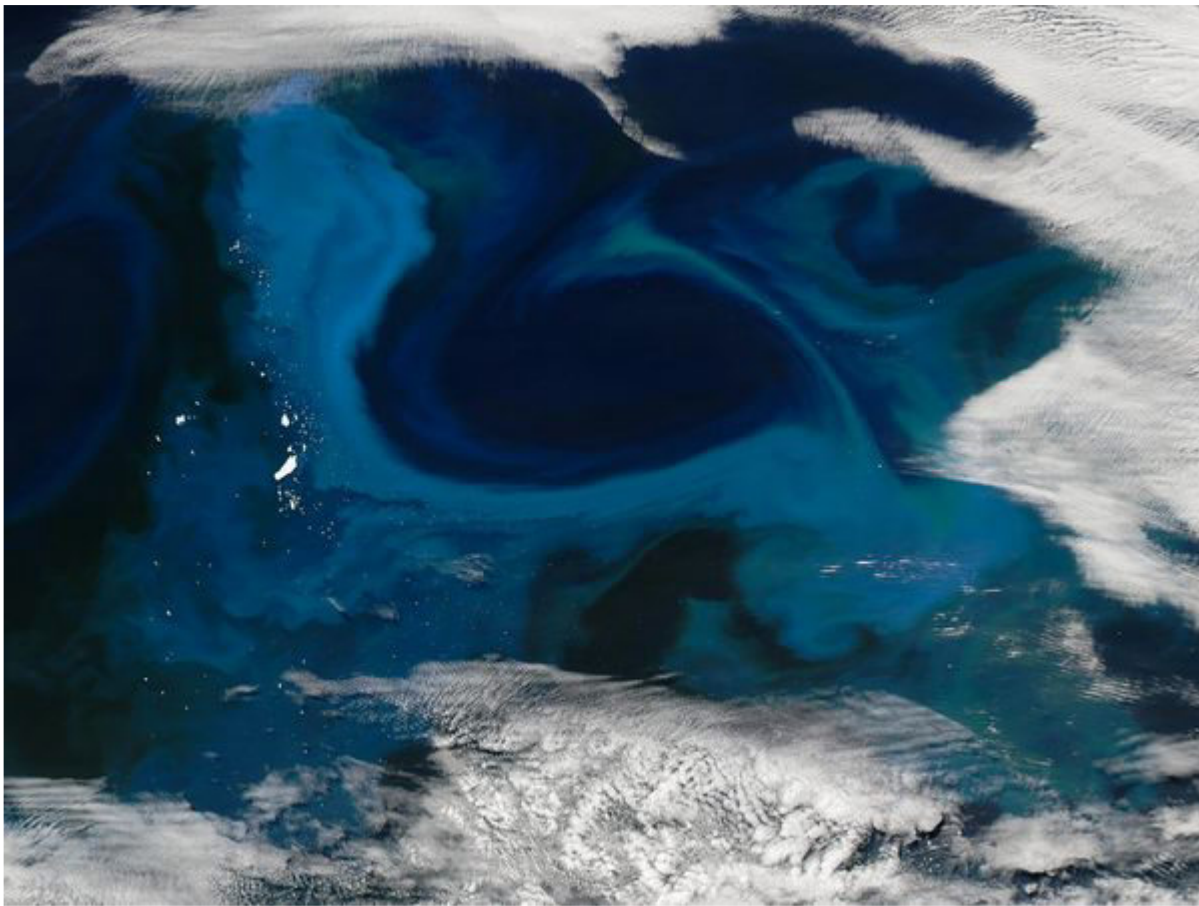
Photograph by George Oze, Superstock, Photolibrary

Fighting climate change is hardly black-and-white. But making roofs more reflective by painting them white—like these rooftops in Hamilton, [Bermuda](#)—may be one of the simplest geoengineering fixes.

Dark roofs reflect about 10 to 20 percent of sunlight, whereas so-called cool roofs send about 70 to 80 percent of the sun's rays back into space, according to researchers at California's [Lawrence Berkeley National Laboratory](#). (Read [more about white roofs in National Geographic's Green Guide](#).)

What's more, white roofs boast an added climate boon: Reflective-roofed buildings don't get as hot on the inside, reducing the need for air conditioning, the Climate Institute's MacCracken noted.

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7. Dumping Iron Into Oceans

Image courtesy NASA via LBL

Artificially seeding the oceans with iron—a nutrient naturally carried into the ocean by wind—encourages the growth of tiny marine plants called plankton, which absorb carbon (pictured, a natural plankton bloom off Antarctica). (See ["Plan to Dump Iron in Ocean as Climate Fix Attracts Debate."](#))

Scientists have already conducted about a dozen preliminary iron-seeding experiments around the world, with varying degrees of success. In one test, the iron-stimulated plants were promptly [gobbled up by shrimplike animals](#), negating any carbon-absorbing benefits.

Regardless of the method, finding a way forward for geoengineering is crucial, since many schemes would be long-lasting—"imposing an obligation on future generations," the Climate Institute's MacCracken said. "And that's a huge issue."

But both MacCracken and the American Enterprise Institute's Thernstrom agree that geoengineering may be the only viable option left. (Related blog post: ["Earth's Future May Rest on Risky Geoengineering, Scientists Conclude."](#))

"Geoengineering is a lot like chemotherapy," MacCracken said. "You don't want to do it, but it's better than the alternative."

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