

GEO-ENGINEERING CLIMATE SOLUTIONS

In an emergency, we're told to "break the glass" and reach for the fire extinguisher.

Some would argue we're in the midst of a climate emergency – so what's the solution? Can we spray a firehose into the sky to cool down our atmosphere? It may sound like science fiction, but there are climatologists who believe we can – and should – do something very much like it.

It's called geoengineering, and as climate scientist Ken Caldeira explains, there are basically two approaches to cooling the earth. One is to remove the carbon dioxide we're adding to the atmosphere. The other is "basically, to emulate what big volcanoes do," he explains, "put material in the stratosphere to reflect sunlight."

As early as 1965, scientist Roger Revelle warned President Johnson of the effects of greenhouse gases on the climate, and suggested putting "lots of little reflective bubbles on the surface of the ocean." More recent climate-fixing experiments include spraying reflective material into clouds and dumping iron into the ocean to increase photosynthesis.

Critics have predicted that tinkering with the stratosphere in this way could lead to a man-made ice age; just such a scenario was the premise of the 2013 sci-fi film *Snowpiercer*. But science fiction author Kim Stanley Robinson says those fears are unfounded; as we've seen from the volcano example, such cooling would be only temporary, "so it's a little bit safer than other things that might be suggested."

Still, Robinson continues, there could be a third option for remaking the planet: remaking our societies. "If we plant a lot of forests, if we give all the women on the planet their full legal rights, we've changed the climate of the earth in a radical way – so that's geoengineering too."

Oliver Morton of *The Economist* is concerned about a too-hasty "break the glass" approach. "At a time when the earth is already going through severe climate changes and geopolitical panic is exactly the wrong time to launch a large planet-changing sort of effort," he warns. "It seems to me that it's much, much wiser to talk about introducing small amounts of geo-engineering at a time when the world is not completely freaked out than large amounts of the time when it is."

"Unfortunately, the most environmentally responsible way is also the most politically difficult," counters Caldeira. "If there's a leader of a country whose people are starving, and they think by injecting some particles in the stratosphere they can feed their people and alleviate suffering, the political pressure to do that is going to be intense."

Jane Long co-chairs the Task Force on Geoengineering at the Bipartisan Policy Center. She explains that the panel was formed at the request of the US government, "because they wanted to hear from scientists about whether or not this was a good idea...and lo and behold, it wasn't just scientists actually. We had people that were diplomats. We had political scientists. We had ethicists on this panel." The unanimous conclusion, she reports, was "that we needed to start looking into this technology."

Physicist Armand Neukermans is part of a team that has been exploring what he calls "marine cloud brightening," based on an idea by atmospheric scientist John Latham.

Adding water droplets to clouds makes them brighter, Neukermans explains, enabling them to reflect more light. "The idea is that if you would help by a natural means to bring more droplets in there, nuclei as they call it, they will become droplets too. The clouds will lighten...this is a relatively simple idea that basically uses the clouds like a mirror."

It sounds clever enough. But even if it does work, could there be unexpected complications? What are the technical, moral and political implications of tinkering with Mother Nature?

Albert Lin, professor of law at UC Davis, says the idea is definitely controversial "because it's talking about potentially trying to affect, influence the climate at this very broad scale, akin to perhaps you could say playing God. And the question is, of course, who would do this?"

The question of who would control the technology – and be responsible for its consequences – should be made by the international community as a whole, says Lin. But the controversial aspect may be one reason that spray-painting the sky remains in the experimental stage.

On the question of morality, Long is adamant. "I think it's immoral not to do it," she asserts. "I think we have to take responsibility for the earth, because that's where we all live and because that's where our children and their children are going to live. And so the need to learn how to take responsibility is paramount in our survival.

"Are we doomed? We're not doomed -- if we take responsibility."

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