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# Countries look at ways to tinker with Earth's thermostat

*Cooling the climate*



Print edition | Science and technology

Mar 14th 2019

THE IDEA of cooling the climate with stratospheric sunshades that would shield the planet from the sun's warming rays moved up the international agenda this week, with mixed results. On the one hand, new research suggested that it is theoretically possible to fine-tune such a shield without some of its potentially damaging consequences. Publication of this work coincided with a proposal at the biennial UN Environment Assembly (UNEA), held in Nairobi, Kenya, for an expert review of such geoengineering methods. This was the highest-level discussion of the topic so far. On the other hand, the more than 170 nations involved could not arrive at a consensus. In a fitting illustration of the heat surrounding geoengineering, the proposal was withdrawn at the eleventh hour.

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Faced with this, some think there is a need to turn down the global thermostat using geoengineering. This encompasses a range of possibilities, including technologies that suck carbon dioxide out of the atmosphere and others that block incoming solar energy. One concern, however, is that these methods do not deal with the cause of the problem: greenhouse-gas emissions. Despite calls to map out the risks and benefits of geoengineering, progress on the international stage has been limited, in part, because it might detract from efforts to reduce emissions. That shifted this week when the delegates in Nairobi debated a proposal for an international assessment. It is the first time that geoengineering has been discussed at such a level and in a forum that includes America.

The UNEA resolution was tabled by Switzerland, and by the start of the week it had received support from most governments. It called for an expert review of the science of geoengineering, including studies on the suite of available technologies, how each might be deployed and how well they would or would not work, as well as any possible negative consequences. The proposal also called for an analysis of the challenges in regulating each approach.

Among the most controversial but also effective and affordable geoengineering options are planetary sunshades. By using high-flying aircraft, for instance, to spray a fine mist of mineral or man-made particles into the upper stratosphere, a portion of the sun's incoming energy could be bounced back out into space before it gets a chance to warm the planet. The decades-old idea is inspired by large volcanic eruptions, like that of Mount Pinatubo in the Philippines in 1991, which cooled global temperatures by up to 0.5°C for four years.

### In the shade

That event demonstrated that relatively simple sunshades could have a significant effect on global temperatures. Indeed, while climate models project that doubling the concentration of carbon dioxide in the atmosphere could cause between 1.5°C and 4°C of global warming, the models also suggest that it is theoretically possible to reduce temperatures by an equal amount using a sunshade.

But there are challenges. Stratospheric particles eventually fall back to Earth in rain, so the effect is short-lived. A sunshade would need to be continually resupplied, which is one reason for an international governance framework. If a sunshade were allowed to dissipate while atmospheric CO<sub>2</sub> concentrations remained high, global temperatures would rapidly shoot up, with devastating consequences in some regions of the world.

Another problem is the effect of solar geoengineering on the water cycle. Over the past decade, several studies have suggested that sunshades could disproportionately affect rainfall, bringing drought to some regions. But that argument may

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with present-day levels increased the cumulative intensity of all tropical cyclones by 17.6%. The partial sunshade brought that increase down to 2.4%. Limitations in the model made it impossible to see if this benefit was equally distributed across different regions, such as the Pacific and the Atlantic.

The researchers say their study is more relevant to real policy decisions because it shines some light on what could be done by, for instance, combining solar geoengineering with efforts to cut greenhouse gas emissions. But all this would require international consensus, and obtaining that may be a fantasy.

The barriers to unity were on display in Nairobi. In 2010 the Convention on Biological Diversity advised against geoengineering activities “until there is an adequate scientific basis” to justify them, but America is not a party to that convention. It was represented at UNEA. However, several delegates told this newspaper that America and Saudi Arabia opposed the Swiss proposal to review geoengineering, preferring the issue to be assessed by the Intergovernmental Panel on Climate Change (IPCC), which is due to include something about the technologies in its next big report, expected in 2021.

The distinction may seem procedural, but the Swiss proposal was for a more comprehensive appraisal and one that would be delivered more quickly, by August 2020. What is more, the IPCC's mandate is primarily to consider the science of geoengineering, not whether and how to regulate its various technologies. And the impact of those technologies on a regional and global scale means governance questions will be at least as tricky as the scientific ones. Indeed, there are concerns that some geoengineering methods could be unilaterally deployed by one or more nations, to the possible detriment of others. “UNEP is the right space because it is the anchor institution of the UN for the environment that collects information but also has a policy function,” said Franz Perrez, Switzerland's ambassador for the environment.

The Americans, some said, did not appear to want to make room for conversations, let alone make decisions, about a framework for geoengineering that could restrict their future options. A spokesman for their delegation declined to comment.

Supporters of the proposal insisted they sought an honest analysis. There is a bitter irony in the meeting's outcome. The only reason the world may need geoengineering is that talks about cutting emissions have gone on so long but achieved so little. Yet in Nairobi delegates could not even commission a report. Geoengineering, the toolbox that a decade ago nobody wanted, could end up stuck in the same international procedures as efforts to tackle the root cause of global warming.

*This article appeared in the Science and technology section of the print edition under the headline “Sunny with overcast features”*



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