U.K. to Fund 'Small-Scale' Outdoor Geoengineering Tests

As climate change continues unabated, the goal is to examine technologies that could artificially cool the Earth "responsibly and ethically."

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A cloud brightening experiment in Alameda, Calif., in April, that was swiftly stopped after a public outcry. Outdoor tests of geoengineering have incited tremendous pushback.Ian C. Bates for The New York Times

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By Christopher Flavelle and David Gelles

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A British science agency will provide 57 million pounds, or about $75 million, for researchers to examine ideas for artificially cooling the planet — including outdoor experiments to determine whether any of those ideas could actually work.

The announcement, by the Advanced Research and Invention Agency, or ARIA, is among the largest single infusions of money to date toward research into "solar geoengineering": the notion of injecting particles into the air to deflect some of the sun's radiation back into space with the goal of reducing the Earth's temperature.

The government initiative is focused on testing several types of solar geoengineering. Those approaches could include injecting aerosols, such as sulfur dioxide, into the stratosphere or shooting sea-salt aerosols into low-lying marine clouds to reflect more sunlight away from the Earth.

Frank Keutsch, a geoengineering researcher at Harvard, said that as far as he knew, it was the first time that a government has called for proposals for outdoor experiments.

The funding comes as the effects of climate change are becoming increasingly destructive. Last month was the warmest August on record, as measured by average global land and ocean surface temperatures, according to the U.S. National Oceanic and Atmospheric Administration. Heat-related deaths are rising around the world. The United States suffered through 28 billion-dollar disasters last year, three times as many as a decade before. Heat waves, wildfires and other calamities have become increasingly common across Europe and the rest of the world.

And yet, the greenhouse emissions that are driving climate change keep rising as humans continue to burn coal, oil and gas.

ARIA said it was pursuing geoengineering research because “even under the most aggressive scenarios” of cutting greenhouse gasses, it may not be possible to reduce those emissions fast enough to prevent dangerous increases in global temperatures.

That has led governments and scientists to increasingly consider ways to artificially cool the planet, effectively trying to buy time while heat-trapping pollution is reduced.

But without conducting physical tests of those strategies, the agency said, “there is no prospect of being able to make proper judgments” about whether any type of geoengineering is “feasible, scalable, and controllable.”

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To comply with a request from Congress, the Biden administration released a solar geoengineering research plan last summer that said that “outdoor experiments would be valuable,” but did not go beyond that.

The idea of outdoor experiments with geoengineering has incited tremendous pushback elsewhere. In 2021, Harvard University researchers were forced to cancel a geoengineering test in northern Sweden after an outcry from environmentalists. This year,

Tennessee became the first state to ban geoengineering. In April, local officials in Alameda, Calif., near Oakland, stopped an experiment that was testing a machine that might one day be used to brighten clouds, despite a determination from the city's own analysis that there was no risk to the public.

Opponents of geoengineering say it would distract from the urgent need to reduce the greenhouse gas emissions. And they worry that the technology could have severe unintended consequences, even at a small scale.

"We do appreciate that these outdoor experiments are the most challenging and controversial part of the program," Mark Symes, the director of ARIA's solar geoengineering funding program, said in an interview. Still, "you would want to do outdoor experiments if you'd really want to find out if some of these things work."

To address the concern about outdoor experiments, the program will apply a set of constraints when it judges research proposals, British officials said. The technologies being examined must already have undergone modeling and indoor tests, and researchers must show that critical scientific questions "cannot be answered without an outdoor experiment."

Moreover, the outdoor experiments cannot involve "the uncontrolled release" of toxic materials. The effects of any outdoor experiments must be "geographically confined," and be done at the smallest possible scale and timeline. If the effects of those experiments are expected to last more than 24 hours, there must be a practical mechanism for "turning off" those effects.

The goal of the program is to create a model for transparency that other funding programs could adopt, said Ilan Gur, ARIA's chief executive.

"Anything we would fund is basically benign," Dr. Gur said. "And yet there is so much we can learn about these approaches."

Dr. Gur said that even if the research were to discover that a technology was not practical, the effort would still be considered a success because it had helped to "invalidate" that approach.

The agency, which is publicly funded but has a degree of independence from the British government, is soliciting proposals from researchers around the world, and expects to announce the recipients in the first half of next year.

The British effort is the latest in a string of funding announcements for geoengineering research.

Harvard's solar geoengineering program has received grants from philanthropies, including the William and Flora Hewlett Foundation and the Alfred P. Sloan Foundation, and attracted donations from the Microsoft founder Bill Gates and the venture capitalist Chris Sacca. Dustin Moskovitz, a Facebook co-founder, and his wife, Cari Tuna, also gave $2.5 million to the program.

And the University of Chicago's new climate interventions program, which will examine solar geoengineering as well as other technologies, could cost $100 million over the next decade, according to David Keith, the scientist who is perhaps the best known geoengineering advocate in the United States and who is leading the effort.

"People are yearning for engineering fixes that might forestall the worst-case scenarios while we do the arduous work of moving from fossil fuels," said Michael Gerrard, a professor at Columbia Law School who edited a book about how a framework for governing geoengineering might be created. "They might work, they might not, or they might do more harm than good, but without much more research, we won't know."

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Christopher Flavelle is a Times reporter who writes about how the United States is trying to adapt to the effects of climate change. More about Christopher Flavelle

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