



CLIMATE CHANGE

Do small outdoor geoengineering experiments require governance?

Standardized and/or centralized proactive research governance can lessen tensions

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In March 2024, Harvard University's proposed Stratospheric Controlled Perturbation Experiment (SCoPEX) would have been the world's first outdoor stratospheric aerosol injection (SAI) experiment. SAI, a type of solar engineering (SEI), seeks to cool the planet by releasing aerosols into the stratosphere to reflect sunlight. The co-authors here are members of the independent advisory committee (AC) convened by Harvard in 2019 to develop a research governance framework for SCoPEX. We frame below the importance of SCoPEX and SEI governance and recommend

After many years of work, the [Stratospheric Controlled Perturbation Experiments \(SCoPEX\) Advisory Committee](#) concluded our work earlier this year after the [research team at Harvard](#) made the decision to cancel the experiment. I was a member of the Advisory Committee for much of its time, serving as chair and co-chair of the committee for portions of our work. This week, the Advisory Committee members published [an article in Science](#) describing the tensions encountered in our process and recommendations for governance of solar geoengineering research in the future.

I believe (and sincerely hope) that our work can provide lessons and guidance for research governance in the future.

The SCoPEX Advisory Committee was the first body established to govern a planned outdoor solar radiation management (SRM) experiment. Our Committee started with a blank piece of paper, drew from existing experience, and worked together to develop and implement a governance framework. One of the things that was very clear from the beginning was that we were operating in the realm of [post-normal science](#) and that the standards, rules, and practices that we have applied to scientific research for centuries fall short. Because of this, our [governance framework](#) included four elements: financial review, technical and scientific merit review, legal review, and societal engagement. This framework is rooted in our [committee values](#) that included transparency, integrity and impartiality, and engagement, collaboration, and social responsibility. Not surprisingly, we encountered a number of struggles in its implementation, which we outline in the paper.

These are the lessons I want to share from this work:

- **Governance of geoengineering research is necessary and must be integrated at the start of the research process.** The SCoPEX Advisory Committee was established after SCoPEX had been underway, at least conceptually, for several years. The fact that the governance process did not develop and evolve alongside the research from the outset of the project was a struggle throughout our work. Externally, we appeared as an afterthought - and, at worst - were accused of being created just to enable and justify the project. Internally, we could not inform or affect elements of the project that took place in the early stages of the research that could have benefited from review, engagement, and other actions to provide more transparency in the project.
- **Transdisciplinarity is critical and necessary to ensure governance is a two way process.** Governance is not a one-way street - the committee does not say, “jump” and the research team jumps. The research team and the advisory committee struggled with questions of who should do what (should the committee lead engagement? The research team?). Research teams need the capacity to be able to be an active participant in a governance process - taking in guidance and actively integrating into the research process. Building in social science expertise and capacity on par with the scientific and technical capacity is necessary to ensure that a research team can engage in a meaningful governance process.
- **Establishing norms and processes for geoengineering research governance is urgent.** In a [recent profile](#), one of SCoPEX’s lead investigators stated in the context of the cancellation of a test flight in Sweden due to opposition by the Saami Council with the statement: “A lesson I’ve learned from this is that if we do this again, we won’t be open in the same way”. Without a sustained, predictable, and transparent governance process, there is a real risk that geoengineering research will go under the radar.

SCoPEX is not a one time thing - geoengineering research is needed and happening. A marine cloud brightening experiment in Alameda, California was [recently canceled](#) when elected officials voted to order the spraying of salt on the deck of the USS Hornet to cease. I fully respect the decision of leaders in Alameda and believe that it was due, in part, to lack of a transparent, genuine governance and engagement process.

I fear that, absent clear norms and standards for geoengineering research governance, the very public experiences in Sweden and in Alameda could lead researchers to become less transparent and accessible. Indeed, one has already said so! This is not the direction we need to go and increases the risk of irresponsible activities. I also fear what this could mean for experiments like SCoPEX and the Marine Cloud Brightening experiment, both of which I

believe are well designed, responsible efforts to improve our understanding of geoengineering. Without a predictable, shared governance process - will these experiments proceed? Will they be even more reluctant to engage with government and the public?

It is easy to look at SCoPEX and the Advisory Committee's work and dismiss it : the experiment was canceled, the societal engagement never took place, the process was messy and it took a long time. However, we do this at our peril - we need transparency in geoengineering research and we need to do the work to establish the norms, standards, and processes to make sure this happens.