The importance of peer-reviewed research from both natural and deliberate experiments that build a research base has been discussed by Victor and co-authors [1]:

> "A broad and solid foundation of research would help on three fronts. First, it would transform the discussion about geoengineering from an abstract debate into one focused on real risk assessment. Second, a research program that was backed by the world's top scientific academies could secure funding and political cover for essential but controversial experiments. (Field trials of engineered aerosols, for example, could spark protests comparable to those that accompanied trials of genetically modified crops.) Such experiments will be seen as more acceptable if they are designed and overseen by the world's leading scientists and evaluated in a fully transparent fashion. Third, and what is crucial, a better understanding of the dangers of geoengineering would help nations craft the norms that should govern the testing and possible deployment of newly developed technologies. Scientists could be influential in creating these norms, just as nuclear scientists framed the options on nuclear testing and influenced pivotal governments during the Cold War."

It is unlikely that such a research foundation can be created without at least small-scale deliberate experiments. If such experiments were to be carried out now they would take place amid rancor and without an international community that had formed a consensus on the norms for such experiments.

One way to see if such international norms can be created is to build on international scientific cooperation successes in geophysical research. An international program that uses the next large volcanic eruption to gather data on the transport and fate of stratospheric aerosols is likely to build both organizations and trust that can materially assist evaluation of geoengineering. The relationships and trust built by such a program may very well be more valuable than the data.

Non-government scientific organizations can take an important role in building the structures that would allow discussion of geoengineering in a fact-based environment. Some of the functions that will be required for a risk analysis of geoengineering include:

- Systematize what is known about geoengineering for policy makers;
- Discuss norms for research, including transparency and the distinctions between tests and deployment;
- Plan for what the most important research to be done is and s cope the required funding;
- Articulate the scientific process that would provide a basis for large scale interventions.

The World Meteorological Organization would provide an extremely capable body to help prepare and organize scientific research that can take place when the next large volcanic eruption happens. journals. The Inter-Academy Council of the Academy of the Academies is a natural body to set up a regular series of international scientific exchanges on geoengineering. Reports can be then made periodically to bodies such as the G7, OECD global science forum and the

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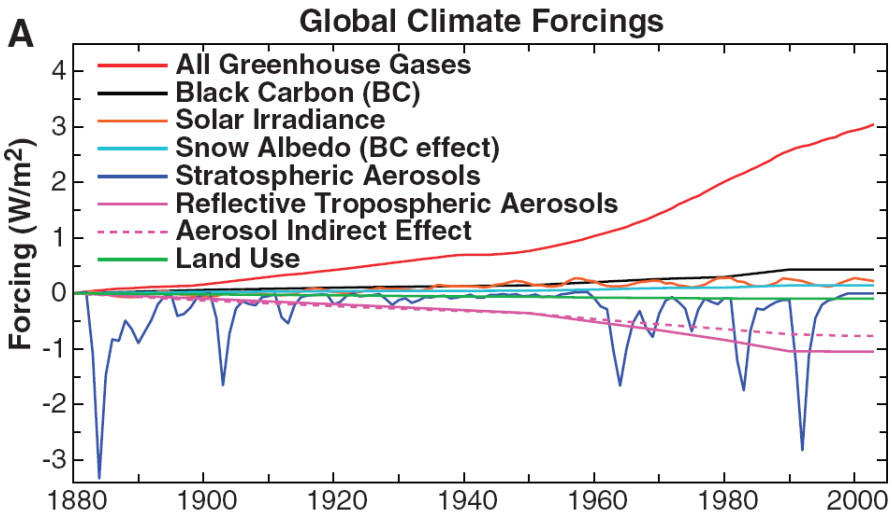
[1] Victor, D.G., M.G. Morgan, J. Apt, J. Steinbruner, and K. Ricke, *The Geoengineering Option: A Last Resort Against Global Warming?* Foreign Affairs, 2009. **88**(2): 64-76.

UNFCC. Goals of international exchanges should include information (transparency), common language, and what the most promising areas are.

While we cannot count on the next large volcanic injection of particulate matter, SO2, and water vapor happening any time soon, it is possible. The dark blue line in the figure below shows the radiative forcing from volcanic eruptions since 1884. Source: J. Hansen et al. *Science* 308 (5727): 1431-1435 (2005)



The science community could design an observation and analysis program to take advantage of such an event to learn about the fate, transport, and effects of stratospheric aerosols injected by eruptions. Although existing sensors may be used, new sensor networks might be designed and deployed. Cooperative research of this type can set a strong precedent that the data from geoengineering-related research should become part of the public domain.

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