



# A NEW ERA OF POLICY IN SOLAR GEOENGINEERING



AN ASSESSMENT  
OF THE 2023  
WHITE HOUSE  
RESEARCH PLAN  
AND RECOMMENDATIONS  
FOR FUTURE RESEARCH  
GOVERNANCE



**January 2024**  
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# A NEW ERA OF POLICY IN SOLAR GEOENGINEERING:

## AN ASSESSMENT OF THE 2023 WHITE HOUSE RESEARCH PLAN AND RECOMMENDATIONS FOR FUTURE RESEARCH GOVERNANCE

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### INTRODUCTION

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The state of climate impacts on human systems is growing in severity. The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report indicates that climate change has adversely impacted water and food security, public health, and infrastructure across economic sectors (IPCC 2022a; IPCC 2022b). These impacts are significantly worsening across regions, amplified in the most vulnerable regions.

Mounting concerns that reducing emissions and scaling up carbon dioxide removal (CDR) will be insufficient to limit these severe and worsening climate impacts are starting to drive a broader conversation around solar geoengineering.

Solar geoengineering (SG), also known as solar radiation management/modification (SRM), refers to a set of proposed, large-scale, deliberate methods to increase the amount of sunlight reflected into space, which would reduce global mean temperatures. It is a small but growing field with recent momentum across the public, private, and academic sectors.

Historically, the topic of SG has been deeply controversial in the climate change community, with extreme hesitancy and taboo surrounding both scientific and governance engagement in the field. While there is still reticence, major institutions and organizations with strong influence are showing signs of a major shift

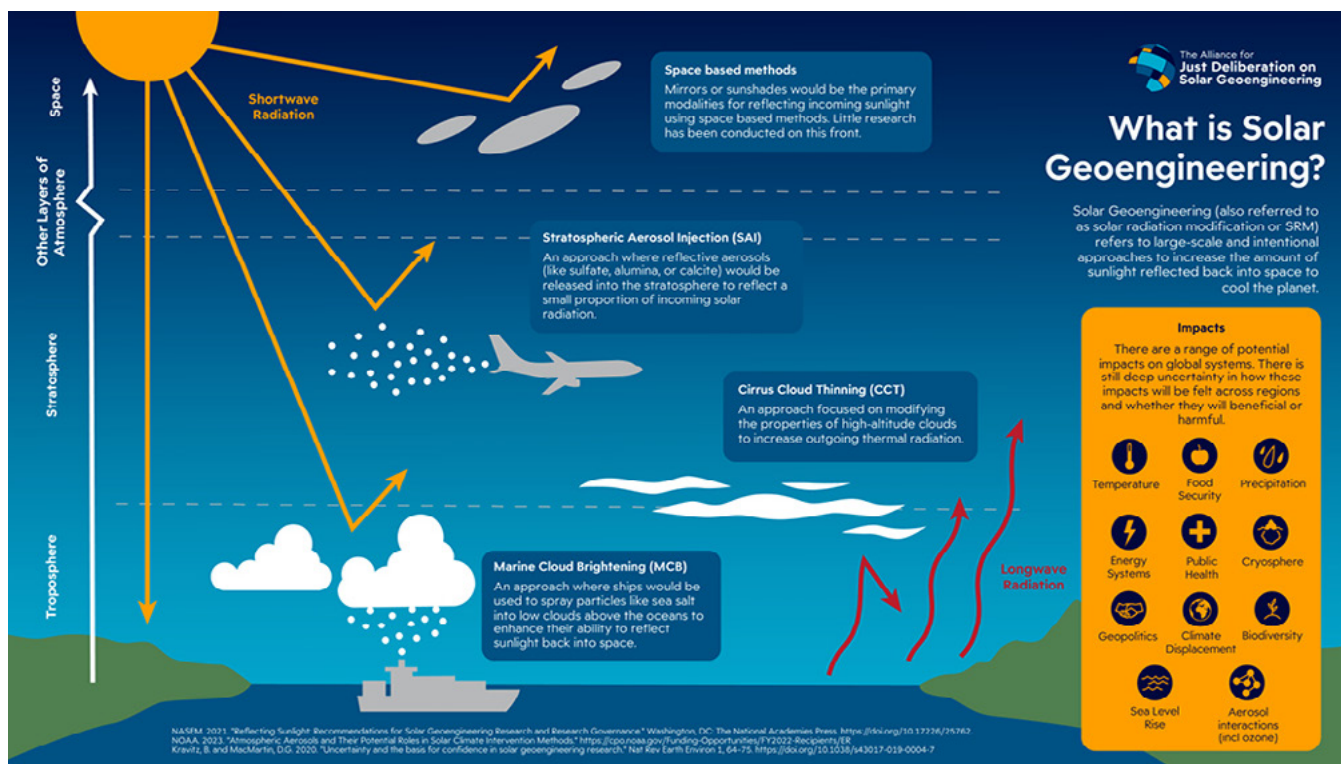
in perception, activity, and interest over the last two to three years. Research efforts are starting to expand, there has been a significant increase in focus on SG governance—both domestically and globally, and press coverage is mounting.

The question of how SG research and governance should proceed is still fraught with nuance and considerable debate. Yet the diversity of actors participating in the field has also remained extremely narrow across geographies and sectors with minimal discussion around how justice principles intersect with SG.

From a justice perspective, SG is double-edged. SG may have the potential to limit harm and suffering from climate change, but it also has the potential to exacerbate or create new forms of harm and injustice. We don't yet know what role SG could play due to the uncertainty of the science, but also because we don't yet know what climate-vulnerable communities may want (Taiwo and Talati 2021).

This policy brief will provide a summary of relevant terms and the state of the field, share an analysis of recent U.S. activity, explore the implications for domestic and international climate policy, and provide cross-sectoral recommendations for how SG governance and policy can move forward in both a just and scientifically robust manner.

FIGURE 1: AN OVERVIEW OF MAJOR SOLAR GEOENGINEERING APPROACHES AND POTENTIAL IMPACTS



Source: The Alliance for Just Deliberation on Solar Geoengineering 2023

## THE STATUS OF SOLAR GEOENGINEERING

While climate impacts are becoming more severe and frequent, global efforts to limit warming to 1.5°C are proving to be insufficient. While SG cannot address the root cause of climate change, it is an approach that may be able to address some types of climate impacts while mitigation, adaptation, and carbon dioxide removal are pursued more robustly.

The understanding of what SG impacts might look like, especially *in the context* of climate change impacts, is extremely limited, and more research is needed to understand what they may look like across different regions. There is an array of approaches, illustrated in Figure 1, and associated potential impacts (which could be beneficial or harmful) across physical and social systems. The most prominent of these approaches are stratospheric aerosol injection (SAI) and marine cloud brightening (MCB).

The implications of such a global technology merit a better understanding of governance for both research and potential deployment. Governance is a complex term. It is not simply oversight or regulation but is defined as any system of formal or informal rules or voluntary guidelines intended to affect or influence research or potential deployment (The Alliance for Just Deliberation on Solar Geoengineering 2023).

This includes the structure of funding, frameworks for transparency and public engagement, and potential international negotiations or agreements. Actors in governance are not only governments, but span academia and research institutions, civil society, and philanthropy. Research governance specifically is essential to build trust, ensure responsible activity, and create better research outcomes.

Influential processes and institutions are beginning to engage with the topic in important and different ways (see some examples in Table 1). There has also been increasing funding (though on a much smaller scale relative to other climate funding) from philanthropy

**TABLE 1: EXAMPLES OF MAJOR ACTIVITY IN 2021–2023 (UNEP 2023; EUROPEAN COMMISSION 2023; WHITE HOUSE 2023; IPCC AR6, 2022; NASEM 2021)**

Institution/Process	Title	Date	Description
<b>United Nations Environment Programme (UNEP)</b>	One Atmosphere	Feb. 2023	A multidisciplinary expert panel review of the state of scientific research providing recommendations for the field
<b>European Commission/Parliament</b>	Joint Communication from the European Parliament and the Council and subsequent Scoping Paper	June–Aug. 2023	Brief statement in a broader report on the risks, expressing support for broader assessment and international governance followed by a Scoping Memo on SRM from the European Commission's Group of Chief Scientific Advisors
<b>White House Office of Science and Technology Policy (OSTP)</b>	Congressionally-Mandated Research Plan and an Initial Research Governance Framework Related to Solar Radiation Modification	June 2023	OSTP produced a research plan and a research governance framework per a 2022 congressional mandate
<b>Intergovernmental Panel on Climate Change</b>	Sixth Assessment Report (AR6) WG I, II, & III	2021–2022	The IPCC Sixth Assessment Report engaged with SRM for the first time in all three Working Groups, but was not included in the Summary for Policymakers
<b>National Academies of Sciences, Engineering, &amp; Medicine (NASEM)</b>	Reflecting Sunlight: Recommendations for Solar Geoengineering Research and Research Governance	March 2021	NASEM produced an extensive report on both a SG research agenda and research governance

Other major bodies that produced major reports about or including SG in 2023 include (but are not limited to) the Climate Overshoot Commission, the UN Human Rights Commission, and UN Educational, Scientific and Cultural Organization (Climate Overshoot Commission 2023; UNHRC 2023; UNESCO 2023).

as well as the U.S. government, which is currently approximately \$11M/year (U.S. Congress 2023). It is still important to note, however, that there are still very few civil society organizations, policymakers, and academic institutions engaged in the topic, especially in climate-vulnerable regions.

## ■ A MAJOR SHIFT IN U.S. ACTIVITY

Of recent examples, the congressionally-mandated White House report is significant as the first U.S. federal policy engagement in SG outside of appropriations and the first major government report on the topic globally. Understanding the content of the report, how this report

came into being, and the process by which the report was developed all bear significance for how policy around SG may evolve in the future.

## WHITE HOUSE REPORT ORIGINS AND PROCESS

The report was authored by the White House Office of Science and Technology Policy (OSTP). It was supported by a cross-agency working group that included members from the U.S. Global Change Research Program, the National Oceanic and Atmospheric Administration (NOAA), the Department of Energy (DOE), the National Science Foundation (NSF), the Department of Defense, the Environmental Protection Agency (EPA), NASA, and the Department of State, among others.

The U.S. Congress mandated the White House report in fiscal year 2022 (FY22) appropriations report language with the following relevant sections (U.S. Congress 2022):

NOAA is directed to support OSTP, in coordination with DOE and NSF to provide a five-year plan, not later than 180 days after enactment of this Act, with a scientific assessment of solar and other rapid climate interventions in the context of near-term climate risks and hazards. The report shall include: (1) the definition of goals in relevant areas of scientific research; (2) capabilities required to model, analyze, observe, and monitor atmospheric composition; (3) climate impacts and the Earth's radiation budget; and (4) the coordination of Federal research and investments to deliver this assessment to manage near-term climate risk and research in climate intervention.

The congressional directive also subsequently requests that OSTP develop a “research governance framework to provide guidance on transparency, engagement, and risk management for publicly funded work in solar geoengineering research.”

Importantly, the authors were very clear that this report was only pursued due to the congressional mandate, with further major action in this space unlikely in the near term. The report states:

The issuance of this report does not signal any Executive Branch policy decision(s) regarding SRM. The report is only a response to the Congressional directive. Any future decisions around Federal SRM activities, including SRM research, must be considered in the broader context of scientific and societal factors, Administration priorities, and available resources.

While this signals that further action from the Biden administration will likely not be taken until there is a larger push, the congressional directive does exist, and the report enumerates U.S. government perspectives that did not yet exist prior to its release.

The external engagement process for the writing of this report is also important to consider as public participation and inclusion are emphasized as being critical in this field by major institutions and

researchers—including by this report itself (UNEP 2023; NAS 2023; OSTP 2023).

There was a public comment period, but it was only open for 21 days (USGCRP 2022). In addition, only the congressional language was provided to comment upon rather than a draft of the report. Overall, there was also minimal formal consultation with the expert community, especially the governance community, and with international institutions or experts.

## WHITE HOUSE REPORT SUMMARY

Substantive highlights of the report include:

**Strong support for expanded research, including outdoor experimentation.** The report states that outdoor experiments would be valuable alongside modeling and lab-based research. Importantly, there is more support from recent reports and open letters for expanded research (UNEP 2023; Hiar 2023). But outdoor experimentation remains one of the most fraught areas of SG, with some coalitions and groups calling for bans on such activities (Bierman et al. 2021; CAN International 2019).

The report also supports expanded scenario-based research and the development of monitoring capabilities to detect potential deployment from other actors. Significantly, the report supported an international assessment of the state of the SG field—a proposal that was also suggested by recent assessments this year (UNEP 2023; Climate Overshoot Commission 2023), as well as in a 2019 UN environment assembly resolution that failed, partly due to the U.S. government (Chemnick 2019).

**Strong support for robust research governance, but little discussion on implementation.** Significantly, the report stated that research should adhere to clear research governance standards, including transparency, oversight, safety, public consultation, international cooperation, and periodic review. It also suggested that any research program should be coordinated by USGCRP and helpfully notes the need for co-evolving standards as research progresses.

However, the dedicated “initial research governance framework” offered few details on how to accomplish

any of these goals. The recommendations listed did not draw from existing frameworks nor had tangible next steps or activities.

Most notably, while there was support for public consultation, there was also no discussion on how it would be built or funded, who would run and oversee such activity, and the different needs for which engagement would be necessary.

#### **Support for international research cooperation.**

The report discusses a high-level framework around why international cooperation is necessary, what cooperation should be on, whom cooperation might be with, and potential approaches (e.g., type and forum). There is a significant emphasis on building a culture of collaboration in an international context for both research and its governance.

The report recognizes that global partnerships can help build the foundation for a more inclusive field across sectors. However, there is limited discussion on how to empower the Global South and climate-vulnerable countries in research and governance processes and what fora might enable more equitable power distribution.

**Support for risk-risk framework.** The report supports the use of a risk-risk framework, an important lens that has become more prevalent in SG literature. This framework states that the potential risks and benefits associated with SG must be considered relative to those associated with climate change. The report states that this framing “would contribute to the necessary context in which policymakers can consider the potential suitability of SRM as a component of climate policy.”

**Support for an understanding of justice implications, but not holistically.** A discussion of environmental justice included a recognition of the potential of SG to both reduce or exacerbate inequities and highlighted the risks facing vulnerable and frontline communities. The report also helpfully raised issues of procedural justice (fairness in decision-making) as well as intergenerational concerns.

However, justice was only included as a “gap to inform research” rather than woven throughout the report as an overarching set of principles to guide a potential framework, including governance.

**Missing pieces.** Overall, there were several missing pieces in the report, including a discussion of the role of civil society, a robust discussion of the role of the Global South and climate-vulnerable countries, and how to build transparency beyond a research database.

## **BROAD IMPLICATIONS**

There are considerable high-level implications for SG research and governance, both domestically and internationally, especially in the context of volatile political environments.

One of the most consequential aspects is the existence of the report itself as the first major indication of U.S. federal policy involvement. One major outcome of such involvement is motivating more participation in SG discussions and research in other countries and in international bodies. While it remains to be seen how international governments or institutions will respond, the report is starting to be included in new discussions.

However, whether U.S. government interest is coming at the right time is a challenging question considering the political environment of the United States. SG research, especially outdoor experimentation, remains controversial. The context of what party is in power has a huge bearing on how potential federally-led, small-scale experimentation could be perceived.

For many in the SG field, and as stated in this brief, support for robust mitigation must be a priority and the foundation for potential consideration of SG. If that is not the case, the legitimacy of any research outcomes would be in question.

Broadly, the indication of public institutions involving themselves is also an important one. Public programs are a means of oversight and transparency. However, the type of public institution (e.g., a science agency versus a military institution) can drastically impact the level of public trust. Erosion in public perception of federal bodies could also create deeper levels of mistrust and misinformation. In this context, the role of civil society and academic bodies is critical to serve as institutions that can build accountability, legitimacy, and credibility.

## FUTURE RECOMMENDATIONS

As discussions and activity around SG grow, there must be more clarity around governance, the institutions involved, and requirements for research. Research will need to answer critical questions around the impacts, social dimensions, and potential viability for SG in the context of climate change, but the types and scale of research pursued and under what frameworks require more focused consideration.

The following are high-level recommendations for SG research governance for institutions conducting research, building research agendas, or participating in its governance. Responsible, equitable research is not possible without well-built, collaborative, and co-evolving governance mechanisms in place.

1. Research governance must be anticipatory, built collaboratively across sectors, and ultimately widely accepted across institutions. Researchers, especially for potential small-scale outdoor experimentation, must be able to function within a well-understood environment to be able to plan successfully. Further, publics must be able to trust the processes that research is functioning within for research outcomes to have legitimacy.
2. Any research agenda must include a robust plan and guidance for *meaningful* public participation and necessary capacity building. Public input cannot be a one-off but rather a much more substantive and robust process across a range of publics and stakeholders throughout a research process, especially for outdoor experimentation (i.e., from development to implementation to analysis and publication).
3. Clear pathways for legitimate collaboration with climate-vulnerable communities and nations must be enumerated, prioritized, and pursued in the research enterprise itself—including in the development of research questions, relevant scenarios, and the necessary governance frameworks.
4. Any research program must be created with full transparency surrounding guidance, funding, goals, outcomes, and involved actors.
5. The building and implementation of a research program should not only involve academia but also be deeply engaged with civil society. Civil society is a key sector in connecting with communities, building inclusion, and providing accountability.
6. Participation from institutions, organizations, or processes in SG discussions should not be painted as advocacy. There cannot be a taboo placed on organizations or individuals wanting to engage in SG discussion and deliberation.

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## ABOUT THE AUTHOR

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Shuchi Talati is the founder of The Alliance for Just Deliberation on Solar Geoengineering and a 2022–2023 Kleinman Center visiting scholar. Recently, she served as a Presidential Appointee at the U.S. Department of Energy in the Biden Administration.

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