



The Alliance for
**Just Deliberation on
Solar Geoengineering**

Building Solar Geoengineering Governance Capacity

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Solar Geoengineering and the Need for Capacity Building

Research and discussion of solar geoengineering has been steadily growing amidst mounting concerns that mitigation and adaptation efforts will be insufficient to limit severe and worsening climate impacts.¹ Solar geoengineering refers to a set of technologies and techniques that aim to artificially cool the planet by reflecting a small proportion of incoming sunlight back into space.² The most commonly studied method of solar geoengineering is stratospheric aerosol injection, which would achieve this cooling effect by dispersing particles into the stratosphere to scatter sunlight.³ Solar geoengineering has the potential to protect the most vulnerable from some types of major climate impacts, but also presents a range of ecological and social risks and challenges, which requires building just and effective forms of solar geoengineering governance.⁴ *Solar geoengineering governance* refers to:

the structures, processes, and actions through which private and public actors interact to address goals related to whether and how solar geoengineering research or deployment occurs. This includes any system of formal or informal institutions and the norms, rules, laws, regulations, procedures, or voluntary guidelines for deciding, managing, implementing and monitoring actions at any geographic or political scale, from global to local.⁵ In short, **solar geoengineering governance refers to actions that steer or influence how decisions about solar geoengineering are made.**

Climate vulnerable communities and countries are the populations that are most susceptible to the impacts of both climate change and solar geoengineering, and therefore have the most at stake in decisions about whether and how solar geoengineering research and deployment occurs.⁶ Principles related to good governance and procedural justice require that these communities are meaningfully engaged and centered in solar geoengineering governance and research decision making.⁷ People must have the opportunity to participate in decisions that deeply impact them.⁸ Anticolonial politics demands that climate vulnerable communities and countries from the Global South are empowered to engage in questions around whether and how solar geoengineering serves their needs.⁹ A recent report from the UN Environment Programme agrees, finding that solar geoengineering decisions “require an equitable, transparent, diverse and inclusive discussion” and that marginalized stakeholders from the Global South must be brought into a globally inclusive conversation.¹⁰

Engagement and inclusivity in solar geoengineering remains a massive challenge. The topic is complex, and meaningful engagement requires time, skills, abilities, and knowledge that are not always available, particularly in communities and countries that are already marginalized. Most of this research and discussion is currently taking place in the Global North, and there are minimal efforts to widen involvement. *Capacity building*, which refers to efforts that aim to develop skills, abilities, and knowledge to accomplish a task or achieve goals, is required to ensure that climate vulnerable

communities and countries are able to be equal partners in discussing, researching, and making decisions about solar geoengineering.

The Alliance for Just Deliberation on Solar Geoengineering (DSG) was created to work towards just and inclusive deliberation on research and potential use of solar geoengineering. A core pillar of that work is to provide this governance focused capacity building for civil society in collaboration with local partners in climate vulnerable communities and nations.

Civil society can be defined in many ways. We understand civil society as an arena for societal deliberation comprised of a network of groups, communities, and voluntary associations that is distinct from the state and that excludes profit-motivated entities.¹¹ Examples of civil society actors include non-governmental organizations, community-based organizations, and public interest groups. DSG focuses on building the capacity for *civil society* to govern solar geoengineering for several reasons. First, whereas states have been reluctant to take steps to govern solar geoengineering, civil society can play constructive roles in establishing inclusive and just forms of governance in the near future. Second, civil society can act as a conduit for diverse communities and groups to engage in solar geoengineering governance, thereby broadening the diversity of perspectives, values, and worldviews that are included in deliberations and considered in decisions. Third, governments and political institutions can be volatile, which can undermine the dedicated and consistent efforts needed to govern solar geoengineering over long time periods if left to states alone. For these reasons, building the capacity of civil society in vulnerable regions in the near term is needed to establish just forms of solar geoengineering governance that are inclusive of diverse communities and their perspectives and that are prepared to effectively govern solar geoengineering research and potential deployment long into the future.

This paper serves as the first version of our model for this critical work, which will continue to be iterated upon, adapted, and refined as we gain input from our potential partners and collaborators.

What is Capacity Building for Solar Geoengineering Governance?

DSG's work focuses on solar geoengineering governance capacity building.¹² But what does that mean, and what might it actually look like for communities and countries to *have* the capacity to govern solar geoengineering?

We define *capacity building for solar geoengineering governance* as:

A sustained process through which individuals, organizations, and societies mobilize and sustain knowledge, skills, tools, and practices that enable their ability to *engage in* and *implement* local, national, and international forms of solar geoengineering governance.

In short, it means a way of ensuring that communities and countries are able to implement and engage in solar geoengineering governance. Let's dig a little deeper into what it means to

engage in and *implement* governance. The ability to *engage in* solar geoengineering governance entails:

the ability to understand solar geoengineering and know how to participate in decision-making so that when decisions about solar geoengineering are being made, communities and countries have a seat at the table. This requires that people have skills and knowledge that enable them to decide whether different proposals for solar geoengineering research and governance meet their needs. This also includes skills and practices that enable communities and countries to oppose solar geoengineering research or deployment that would harm them.

For example, a future session of the United Nations Environment Assembly (UNEA) may wish to establish a framework for a global process for governing solar geoengineering research and potential deployment. A geographically diverse coalition of civil society organizations can enable a campaign to ensure that climate vulnerable communities are heard in UNEA's deliberations. Such a coalition could initiate widespread public engagement opportunities in climate vulnerable countries, informing communities of the UNEA negotiations and gathering their perspectives on what UNEA should do. Inside of the UNEA negotiations, civil society organizations could further influence negotiations by lobbying states and by disseminating perspectives from climate vulnerable communities, including by facilitating access for community leaders to address UNEA directly.

However, the ability to engage in governance is insufficient. Communities and countries must also be able to *implement* governance processes to directly shape research and potential deployment occurring within their jurisdiction. The ability to *implement* solar geoengineering governance entails:

the ability for communities and countries to directly decide whether and how solar geoengineering research or deployment occurs. This includes the ability to create and enforce policies, rules, and other forms of regulation to ensure that if solar geoengineering research or deployment activity moves forward, communities and countries are in control.

For example, countries will likely want to govern solar geoengineering experiments proposed to take place within the country. State regulatory agencies will need to work with local community organizations to collect public input on whether and how an experiment should occur. Based on the input, and in collaboration with community organizations, state agencies can build a regulatory framework that specifies a process for how an experiment can gain approval to proceed, which could include measures designed to minimize harmful impacts, engage local communities in planning, and ensure transparency of research activities and results.

These examples reflect 'good'-case scenarios for what solar geoengineering governance could look like. What these example activities share is that a tremendous amount of capacity - knowledge, skills, resources, and abilities - are needed across multiple parties - states, civil society organizations, and communities - to ensure these activities are successful. Without this capacity, the outcomes would likely look a lot different.

There are very few existing efforts that are doing work to build capacity in the Global South to participate in solar geoengineering discussions. For example, The Degrees Initiative (formerly the Solar Radiation Management Governance Initiative (SRMGI)) has been working since 2010 to create a diverse community of informed stakeholders that are able to contribute to debates surrounding solar geoengineering, primarily by hosting international conferences that bring together climate scientists and experts from the Global South to learn about and discuss solar geoengineering as well as funding researchers across Global South countries.¹³ These activities are needed to ensure that there is sufficient solar geoengineering knowledge and expertise in the Global South, which is one form of capacity needed to govern it. DSG is excited to work with the Degrees Initiative in the future, as well as others already involved in solar geoengineering capacity building. Our work focuses on building a wider range of capacities specifically in civil society that are needed to govern solar geoengineering, including capacities related to conducting community engagement and establishing regulatory frameworks. We believe that sustained efforts to build capacity for *governance* is ultimately necessary to ensure that important decisions about whether and how to research and potentially deploy solar geoengineering are made in just and equitable ways.

How will DSG do this work?

Organizations and institutions have been doing capacity building work on climate, environment and development for several decades now, and in that time, there have been significant learnings about what works and what doesn't work. In the 'classic' capacity building model, outside consultants, typically from private consulting firms in Global North countries, are brought into recipient countries on a short term basis to train personnel. As Khan and coauthors describe it, "When a lack of capacity is observed in a developing country by an aid agency wishing to help in area X, one or two consultants have typically been 'parachuted in': they organize some workshops and training programmes, the project gets done, and it all ends with the submission of a project report."¹⁴ This dominant approach to capacity building is commonly critiqued as short-term, projectized and sectoral, and led by many different donors, some with deep bias, with little coordination between them and without sufficient ownership on behalf of targeted countries or communities.¹⁵ In this model, no capacity building 'systems' or structures are left behind to continue the efforts.¹⁶ Importantly, the short term duration of the intervention and the lack of developing country ownership limits opportunities for long-term developing of systems and capacities, and may even counterproductively degrade existing capacity and harm local knowledge and management infrastructure.¹⁷ Nobody explicitly ascribes to this classic model, yet this is often how capacity building is done in practice.

In contrast, DSG's model is inspired by recent efforts to rethink this approach to capacity building.¹⁸ These efforts have culminated in the creation of a 'good' capacity building model that improves upon common critiques and limitations of the classic model.¹⁹ This good capacity building model aims to build long term, durable, and sustainable capacity systems that enable countries to effectively address issues and solve goals over time. The end result of this model aims to develop, for example, "institutional structures in countries that could autonomously handle climate change mitigation and adaptation issues in future years" (Khan et al. 2018, 12).²⁰ Echoing this, Virji and coauthors emphasize:

“To be effective and durable, capacity building effort must become much more expansive such that it moves beyond the still persistent focus on workshop-based training. It must be a long-term endeavor that strengthens institutions and builds human resource capabilities on an end-to-end basis that not only addresses capacity gaps in knowledge generation and sharing but also in the processes that catalyze efforts to move from knowledge to action.”²¹

Importantly, the key to success in the ‘good’ capacity building model, and arguably for all capacity building efforts, is ownership of the process and outcomes of capacity building by recipient countries and communities.²² This is emphasized as well in Article 11 of the Paris Agreement and the United Nations Framework Convention on Climate Change (UNFCCC) Capacity Building Framework.²³

At the core of DSG’s approach to capacity building are long-term partnerships with a range of local actors from civil society that understand the local context and needs and that can be focal points for sustaining and strengthening governance capacity long into the future. Multiple local partners in one region can also address different sectors within civil society (e.g. research oriented think tanks, policy advocacy, or community based organizations) to reach a wider set of publics. In classic capacity building models, there is also often an assumption of access. A DSG focus on civil society will also allow us to address this assumption through creating more tailored approaches through engaging with a diverse set of organizations across different geographies.

DSG is also building and implementing approaches to identify potential regions, partners, and participants. This will require collaborative and thoughtful landscape analyses, built through research and consultations. A major challenge even after identifying relevant regions is to determine who might be marginalized, which may require further analysis.

DSG’s capacity building model:

The DSG capacity building model focused on civil society is based around three major questions:

- What do participants need and want to learn?
- What are the best ways for participants to learn?
- What are the outcomes from the capacity building process?

This first requires defining the principles of implementation that will dictate how DSG will answer these questions. With inspiration from the capacity building literature,²⁴ initiatives from the Least Developed Countries (LDC) Group including the LDC Initiative for Effective Adaptation and Resilience (LIFE-AR);²⁵ as well as from intergovernmental outputs including the UNFCCC Capacity Building Framework, the DSG model framework:

- **Is in it for the long term:** capacity building should be conducted on a sustained basis over time to ensure real capacity remains with our partners long into the future.

- **Puts local communities at the center:** our local community partners should lead the way in identifying capacity needs and designing capacity building projects and outcomes.
- **Is driven by local context and needs:** there is no one-size-fits-all approach to capacity building. Successful capacity building will look different in different places and that have different capacity needs.
- **Builds off of what is already there:** we will work with our partners to identify forms of capacity that exist so we can build off of what our local partners already do well.
- **Features learning by doing:** the best way to build governance capacity in solar geoengineering is to engage with it, meaning we hope to help our partners use their knowledge in concrete ways.
- **Is collaborative:** we will partner and coordinate with other organizations working on solar geoengineering and related areas of capacity building to ensure our efforts align.
- **Is self-reflective:** we must continuously assess and improve how we do capacity building.
- **Is also about us:** we also have forms of capacity that need to be built and strengthened, such as the ability to understand local contexts and to provide education and training in the most effective ways possible.
- **Is holistic:** a wide breadth of skills and capacity among a wide range of actors is required to govern solar geoengineering, and we build capacities that are often taken-for-granted and less tangible and visible.
- **Is innovative:** we will work with local partners to develop deliberative methods that are best suited for local communities, including those that are unaccustomed to traditional methods involving printed text and lectures.
- **Is modular:** we aim to develop modular learning and projects that can be deployed in different arrangements and adapted to local contexts to make it easier for our capacity building efforts to reach as many people as possible over a short period of time.
- **Is anticipatory:** we must anticipate evolving trends in solar geoengineering research to ensure that our capacity building prepares local partners to respond to current developments.
- **Values diverse forms of knowledge:** our local partners can develop the most complete understanding of solar geoengineering and its implications by integrating science with other relevant ways of knowing, such as traditional ecological knowledge.
- **Prioritizes procedural justice:** we do not have bias around whether our local partners decide to support or oppose solar geoengineering research or potential deployment; we believe that they should have the opportunity to form their own positions and, critically, be able to engage when these decisions are made.

In addition to this framework, DSG has established a clear outline of the different potential modules of learning and is in the process of shaping potential mechanisms of and outcomes from a learning process.

Modules of Learning

The non-exhaustive list of general capacity needs for solar geoengineering governance are displayed in Table 1 below. Importantly, the level of understanding and familiarity necessary for each individual in each of the areas will likely depend on their particular needs, desires, and occupational or other roles. Additionally, the knowledge and skills listed for each of the areas do not apply exclusively to each area; rather, all forms of knowledge and skills build off of and complement each other. Moreover, the below list should not be read as a list of prerequisites that each individual must meet in order to engage in discussion on solar geoengineering. Rather, the list should be seen as a set of capacity needs that individuals could work to develop over time, with the ultimate aim being that the communities, organizations, and countries they are a part of become full, empowered, and effective partners in the global effort to govern solar geoengineering research and address climate change more broadly.

Table 1: DSG learning modules based on general solar geoengineering governance capacity needs

SCIENTIFIC UNDERSTANDING	
Develop knowledge of:	The nature of the climate problem as it relates to local and national impacts, such as how climate change might impact human, societal, and ecological well-being within a particular locality;
	How climate models work and what they can and cannot tell us;
	Solar geoengineering and how it is imagined to potentially address some climate impacts;
	Important characteristics associated with different proposed solar geoengineering techniques (i.e. marine cloud brightening and stratospheric aerosol injection);
	How solar geoengineering and other climate responses (e.g. mitigation, adaptation, and carbon dioxide removal) could interact in desirable or undesirable ways;
	Current knowledge on projected human, ecological, and infrastructural impacts and risks associated with solar geoengineering techniques, particularly those relevant for local and national levels.

IMPLEMENTATION OF GOVERNANCE: In addition to all previously stated capacity needs;

Develop knowledge of:	Existing relevant legal and political processes, systems, authorities, and capacities, including how policy and other rules are created and implemented, how political and scientific decisions are made and by whom, as well as how other norms, organizations, rules, and institutions shape society at local, national, and global levels.
	Existing local and national forms of research and technology development regulations and environmental review and assessment;
	Local issues and priorities that may shape interests on solar geoengineering or how solar geoengineering governance is implemented.
	Solar geoengineering governance models, frameworks, and principles proposed or implemented elsewhere, including how non-state actors can and do govern solar geoengineering research;
	Best practices for eliciting public and stakeholder perspectives and how to meaningfully incorporate those perspectives into decision making.
Develop skills and competencies to:	Assess the gaps and limits of the above forms of governance, in terms of how they may lack capacity to adequately govern solar geoengineering research occurring within their respective jurisdictions;
	Determine how existing local and national forms of governance can build capacity in the near term to meet specific local and national governance needs related to solar geoengineering. This is particularly important for those individuals within relevant organizations, positions, or roles;
	Imagine and create new institutions or processes needed to adequately govern solar geoengineering;
	Formulate interests, perspectives, and positions related to solar geoengineering research and governance;
	Formulate rationales and goals for solar geoengineering governance
	Formulate and implement actions to achieve those goals.
	Assess, reflect on and learn from previous governance actions;
	Adapt governance actions and activities based on new knowledge or changes in social or ecological events and circumstances.

ENGAGEMENT IN GOVERNANCE: In addition to all previously stated capacity needs;	
Develop knowledge of:	Existing formal and informal mechanisms and processes for public and stakeholder engagement in decision making, scientific research, and environmental review and assessment across local, national, and global levels;
	The process and authorities of international bodies relevant to solar geoengineering, e.g. CBD and UNFCCC, as well as contours of the broader array of international climate-related discussions and governance activities;
	The behaviors that are effective in local or national contexts for shaping the rules, institutions, and relationships that govern solar geoengineering.
Develop skills and competencies to:	Find information on solar geoengineering research projects occurring or planned to occur, as well their respective governance arrangements;
	Negotiate, articulate, and deliberate individual or collective interests in various forms of public or stakeholder engagement processes;

We believe that these modules are well suited to ensure that climate vulnerable communities become full, empowered, and effective partners in the global effort to govern solar geoengineering research and potential deployment.

Mechanisms & Outcomes

Mechanisms refer to ways for participants to learn while outcomes refer to how subsequent knowledge is used and to what end. We are excited to put this model into action through a number of preliminary near-term pilot projects we are currently developing that will have a range of different outcomes. All the pilot methods below will require an initial learning phase that is drawn from the set of modules in Table 1.

Co-production of research questions: DSG is planning to partner with a network of research and civil society institutions in multiple regions to convene meetings with civil society and researchers to co-produce a set of critical research questions that are feasible for researchers to engage with. These questions can be shared with local researchers or other institutions that have the capacity to be involved. Researchers would receive training on public engagement to come to the regions where questions were developed to present the results of the research to the institutions that co-produced the questions.

Deliberative polling: DSG is partnering with deliberative democracy and polling practitioners, researchers, and local partners to plan a deliberative polling exercise to better understand what climate vulnerable communities think about solar geoengineering. Participants in multiple regions

would learn about solar geoengineering and then work together to draft a set of questions to present to and discuss with experts. Surveys would gather participant perspectives before and after the exercise. This project will collect the largest and broadest data set of climate vulnerable community perspectives, including across 30 developing countries, to inform SG decision-making.

Solar geoengineering governance scenario development & exercises: DSG will partner with civil society and research partners to develop a scenario exercise where participants are 1) engaged in designing politically relevant scenarios and/or 2) participating in a solar geoengineering governance challenge. The specific scenario conditions and problems would be co-designed with local partners to maximize plausibility and relevance for the particular context to build a deeper understanding of political actors, outcomes, and governance capacity needs.

Conclusion

Our capacity building model and mechanisms will be continuously shared, assessed and adapted to ensure they enable DSG to meet several high-level objectives that drive towards its mission to work towards just and inclusive deliberation on research and potential use of solar geoengineering. The initial pilots will further dictate how success is defined, and how to ensure sustained capacity.

Endnotes

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4. NASEM 2021; National Research Council 2015; UNEP 2023.
5. Adapted from IPCC 2022; See also Chhetri, Netra, Dan Chong, Ken Conca, Richard Falk, Alexander Gillespie, Aarti Gupta, Sikina Jinnah, Prakash Kashwan, Myanna Lahsen, Andrew Light, Catriona McKinnon, Leslie Paul Thiele, Walter Valdivia, Paul Wapner, David Morrow, Carolyn Turkaly and Simon Nicholson. 2018. *Governing Solar Radiation Management*. Washington, DC: Forum for Climate Engineering Assessment, American University. <https://doi.org/10.17606/M6SM17>
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18. For example, see Khan et al. 2018; Casado-Asensio et al. 2022; Virji, Hassan, Jon Padgham, and Clark Seipt. 2012. "Capacity Building to Support Knowledge Systems for Resilient Development— Approaches, Actions, and Needs." *Current Opinion in Environmental Sustainability*, Open issue, 4 (1): 115–21. <https://doi.org/10.1016/j.cosust.2012.01.005>.
19. Several existing initiatives exemplify the 'good' capacity building model within their strategy. For example, the Least Developed Countries Universities Consortium on Climate Change (LUCCC) is a consortium "initiated by ten LDC universities to enhance knowledge on climate change through climate capacity building, with a focus on adaptation measures such as education and research." LUCCC aims to:
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24. Khan et al. 2018; Virji et al. 2012; Casado-Asensio et al. 2022.
25. The LDC Initiative for Effective Adaptation and Resilience (LIFE-AR) is an LDC created vision for an "effective, ambitious response to the climate challenge, with all countries and communities — from the least to the most vulnerable — working hand in hand for a climate- resilient future" (LIFE-AR 2019, 3). Key principles of LIFE-AR include equal decision-making between LDCs and the international community; integration of actors and sectors to achieve society wide solutions through long-term planning; and providing ownership to LDCs and their communities to empower their leadership on developing climate solutions.