The Alliance for Just Deliberation on Solar Geoengineering

Legitimacy

When those most affected have real agency to shape a decision if they choose to, and others can trace the process back to genuine opportunities for input — visible, accessible, and consequential.

Actual legitimacy

A genuinely inclusive process where affected communities can shape decisions about research and its governance.

Perceived legitimacy

Broad recognition that the process was fair. Trust lives in what people can see and verify.

These are co-dependent. Impeccable but invisible gets distrust. Inclusive-looking but hollow gets backlash.

Not perfection. The best effort to create just and inclusive processes within what is reasonable and realistic.

WHY SRM DEMANDS THIS

Global, uneven effects. Decisions by a few alter conditions for everyone. No community can opt out. Those most affected didn't create the problem.

Communities need legitimate input into what gets studied, how, who controls it, and what deployment scenarios are even on the table.

Without legitimacy, research triggers backlash and bans. With it, communities become allies and governance holds.

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The Context- Research Is Moving Faster Than the Infrastructure to Make It Legitimate

CLIMATE IMPACTS

Earth's energy imbalance highest in 65 years. Ocean absorbing 18x annual human energy use. Changes in decades, consequences for centuries to millennia.

DETERIORATING POLITICS

Trust in institutions eroding. Scientific agencies politicized. Multilateral systems fraying. The idea these systems will stand up SRM governance in the near term is not serious.

ACCELERATING RESEARCH

SRM research expanding globally. It will proceed regardless. But research quality, public confidence, and the ability to distinguish science from profit-seeking all depend on governance.

NEW ENTRANTS

Commercial actors arriving without accountability. But also: policymakers, advocates, and publics forming views right now — in the absence of credible governance to point to.

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What's Missing Isn't Principles — It's Implementation

There is broad agreement that SRM research requires transparency, engagement, and scientific merit.

But no operational infrastructure exists to translate those principles into practice.

No shared transparency system

No common disclosure platform for research plans, funding, or engagement across institutions and regions.

No proportional engagement guidance

No framework to determine what engagement should look like for different research activities and scales.

No independent review pathway

Privately and philanthropically funded research lacks agency review processes. No alternative exists.

Multilateral system unlikely to fill this gap

A real international regime is a decadal process. In the meantime, activity expands without guardrails.

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Going Slowly, As Quickly As Possible

Work that cannot be skipped or compressed — trust, capacity, and position-forming require sustained presence and time.

Developing and testing engagement models

Sustained relationship-building across regions — Latin America, Africa, South Asia — building replicable approaches and going back. Not stopping at Step 1.

Building the pipeline

Climate Intervention Network for early-career researchers globally. Residency program embedding fellows from the Global South in governance work.

Supporting partners in international policy spaces

Working with local and regional partners to build capacity to engage in relevant spaces of international decision-making — on their terms and when they see value.

Shaping how SRM is considered

Making space for serious consideration. Building journalists' capacity to cover the longer story. Countering misinformation with justice-oriented, evidence-based framing.

THE PRACTICAL CASE

Legitimate processes don't just avoid backlash — they build trust in the process itself.

Do it well and communities that participate in shaping governance become invested in its integrity.

This work is necessary. It will take time. Which is exactly why it needs to start now.

The Alliance for Just Deliberation on Solar Geoengineering

15 CEEW THE COUNCIL

AGU ADVANCING EARTH AND SPACE SCIENCE

NRDC

The Solar Geoengineering Research Governance Platform (SGRG)

Voluntary, multi-node governance infrastructure, to make well-informed, transparently governed research easier to conduct, and rushed, uninformed, or unaccountable research harder to do.

Research Governance Charter

Co-created, evolving baseline on transparency, engagement, scientific merit, and conflict of interest — proportional and responsive as research develops.

Transparency & Research Registry

Clear disclosure expectations feeding a structured public registry of plans, funding, and commitments — scaled proportionally.

Engagement Guidance & Oversight

Proportional expectations and ready-made tools for genuine community engagement — strengthening legitimacy, not creating vetoes.

Independent Merit Review

External scientific review with transparent, published reasoning — especially valuable where no agency review applies.

Research Question Database

Structured collection of questions from communities and stakeholders — showing that input is tracked and taken seriously.

Accountability Frameworks

Practical tools including non-adherence processes, IP norms, researcher liability guidance, and institutional accountability.

All meant to make well-informed, transparently governed research easier to conduct, and rushed, uninformed, or unaccountable research harder to do.

sgrg.org

The Alliance for Just Deliberation on Solar Geoengineering

Two Paths to 2030

WITHOUT THIS WORK

More actors, less coordination. Commercial entrants operating without transparency.

Polarization hardened — prohibition vs. speed-first, no credible middle path.

Communities most affected still excluded from decisions about their futures.

At moment of decision, no legitimate infrastructure exists. Decisions by default, under emergency pressure, driven by power and expedience rather than fairness or legitimacy.

WITH THIS WORK

A functioning Research Governance Charter adopted across institutions and regions.

A transparency platform where anyone can see what research is happening and how commitments evolve.

Regional partners shaping governance from within their own contexts — not having standards applied to them.

When decisions need to be made — infrastructure of trust, participation, and accountability makes meaningful global choices possible.
Researchers and communities in conversation rather than in opposition.
Funders confident that what they support meets credible standards.
Governments with a foundation to build on when they're ready to act.

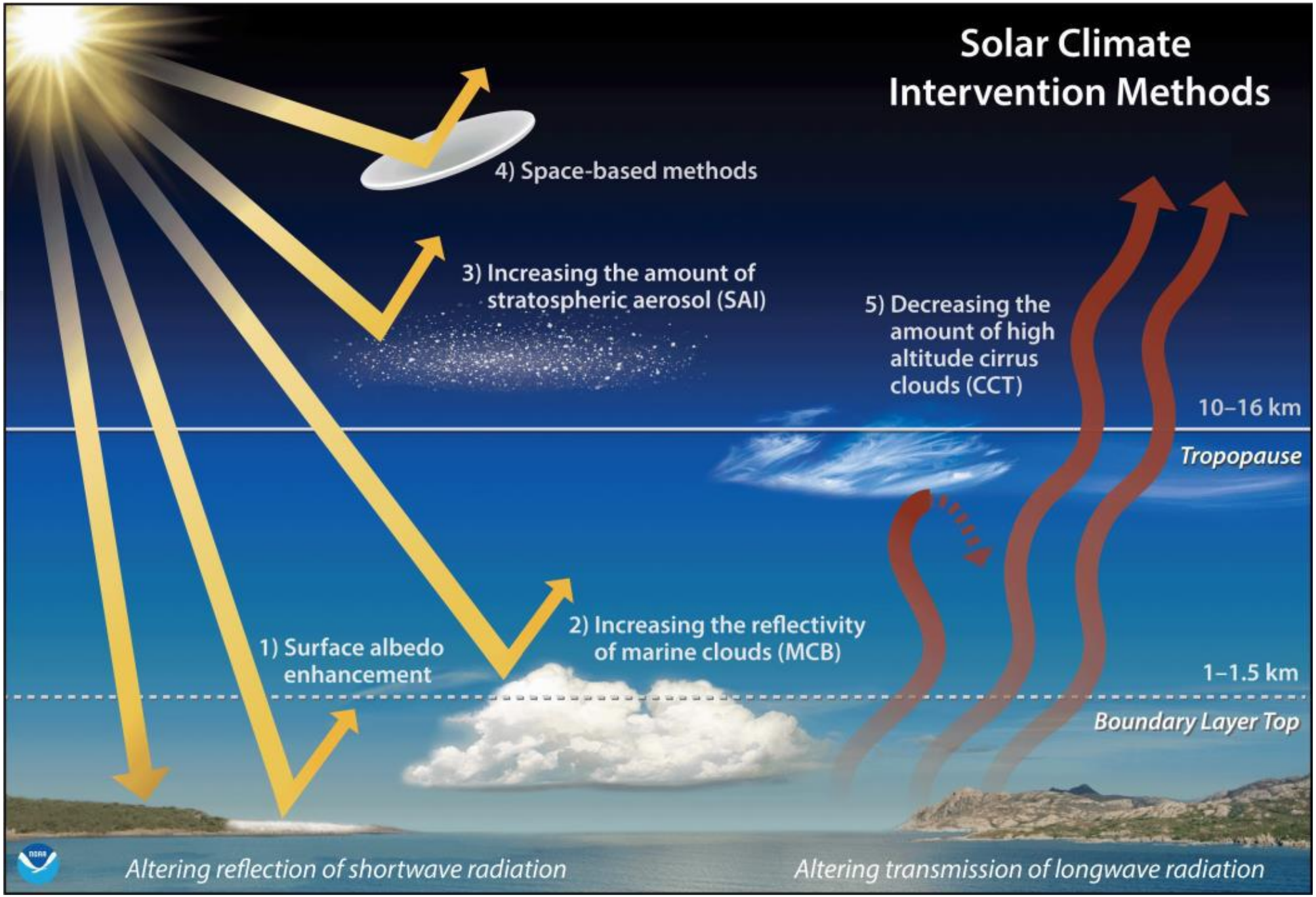
Not 'morally right' vs 'politically pragmatic' — it's both. The only durable path to enabling responsible research is to build the legitimacy infrastructure now.

- Notes on a Federal Climate Intervention (SRM) Research Plan

- Kei Koizumi

- Began as a 2022 legislative provision to provide a research plan for “solar and other rapid climate interventions.”
- Released in June 2023 by the White House (OSTP, and NOAA).
- OSTP to develop a “research governance framework to provide guidance on transparency, engagement, and risk management for publicly funded work in solar geoengineering research.” An initial Research Governance Framework is included in part I of the report.
- “This document focuses on atmospheric-based approaches to solar radiation modification (SRM), specifically stratospheric aerosol injection (SAI) and marine cloud brightening (MCB), ”
- The “Research Plan mentions cirrus cloud thinning (CCT), even though this works by increasing outgoing thermal radiation and hence is not strictly speaking SRM.

OSTP. (2023). Congressionally Mandated Research Plan and an Initial Research Governance Framework Related to Solar Radiation Modification. Office of Science and Technology Policy, Washington, DC, USA.


Solar Climate Intervention Methods
4) Space-based methods
3) Increasing the amount of stratospheric aerosol (SAI)
5) Decreasing the amount of high altitude cirrus clouds (CCT)
10–16 km
Tropopause
1) Surface albedo enhancement
2) Increasing the reflectivity of marine clouds (MCB)
1–1.5 km
Boundary Layer Top
Altering reflection of shortwave radiation
Altering transmission of longwave radiation

Top-line summary

A call for research on the scientific and societal implications of SRM research

A program of research into the scientific and societal implications of solar radiation modification (SRM) would enable better-informed decisions about the potential risks and benefits of SRM as a component of climate policy, alongside the foundational elements of greenhouse gas emissions mitigation and adaptation. Such a research program would also help to prepare the United States for possible deployment of SRM by other public or private actors. A research program characterized by transparency and international cooperation would contribute to a broader basis of trust around this issue.

A (very) initial research governance framework

1. The U.S. Government will model responsible behavior through well governed and transparent research programs, including reporting, data sharing, and, as appropriate, regulations or rulemaking.

2. The U.S. Government will encourage other countries and non-Federal entities to share research plans and results, in line with principles of open science and transparency.

3. Federal science agencies commit—and encourage non-Federal entities to commit—to promoting open scientific research aligned with F.A.I.R.E.R. (Findable, Accessible, Interoperable, Reproducible, Equitable, and Responsible) principles of data and data use.

4. The U.S. Government will seek to ensure transparency, oversight, safety, public and Tribal consultation, and periodic review of future research governance standards to allow governance to co-evolve with research findings. New knowledge and capabilities may present unforeseen circumstances that require new guidance and/or governance mechanisms.

Research Plan Pillar 1: Physical Aspects of Solar Radiation Modification

Observations from instruments on ground-based, airborne, and spaceborne instruments support understanding of the physical processes and outcomes associated with SRM.

Maintaining key satellite measurements is important for SRM research.

Outdoor experiments would be valuable in combination with model and laboratory studies for understanding the processes involved with potential SRM deployment.

The ability to detect any global or regional SRM deployments would be of value for decision-making.

An international scientific assessment of the state of understanding of SRM methods would be valuable in establishing a common understanding and frame of reference for what is known and not known regarding this topic.

Research Plan Pillar 2: Development of Scenarios for Solar Radiation Modification

Development of a standard set of SRM scenarios would be an important integrating aspect of a comprehensive research program.

A research program would most usefully assess risks and benefits associated with SRM scenarios in comparison to risks associated with plausible climate change scenarios not involving SRM.

Research Plan Pillar 3: Socioeconomic and Ecological Outcomes

Decisions concerning whether and how to deploy SRM should be based upon an understanding of the risks and benefits to human health and well-being of its implementation relative to those anticipated under the current climate change trajectory.

Cultural, moral, and ethical considerations are often overlooked in model-based evaluations and may be equally, if not more, important to different communities.

Further assessment of outcomes to ecosystems in SRM scenarios relative to those in scenarios without SRM is needed.

Research into the geopolitical ramifications of SRM would be aimed at reducing the likelihood and/or severity of [geopolitical] risks.

Research Plan Pillar 4: International Cooperation of Solar Radiation Modification Research

If Federal science agencies were to support a large-scale program of SRM research, they could consider engaging in appropriate international cooperation.

Research Plan Pillar 5: Research Coordination

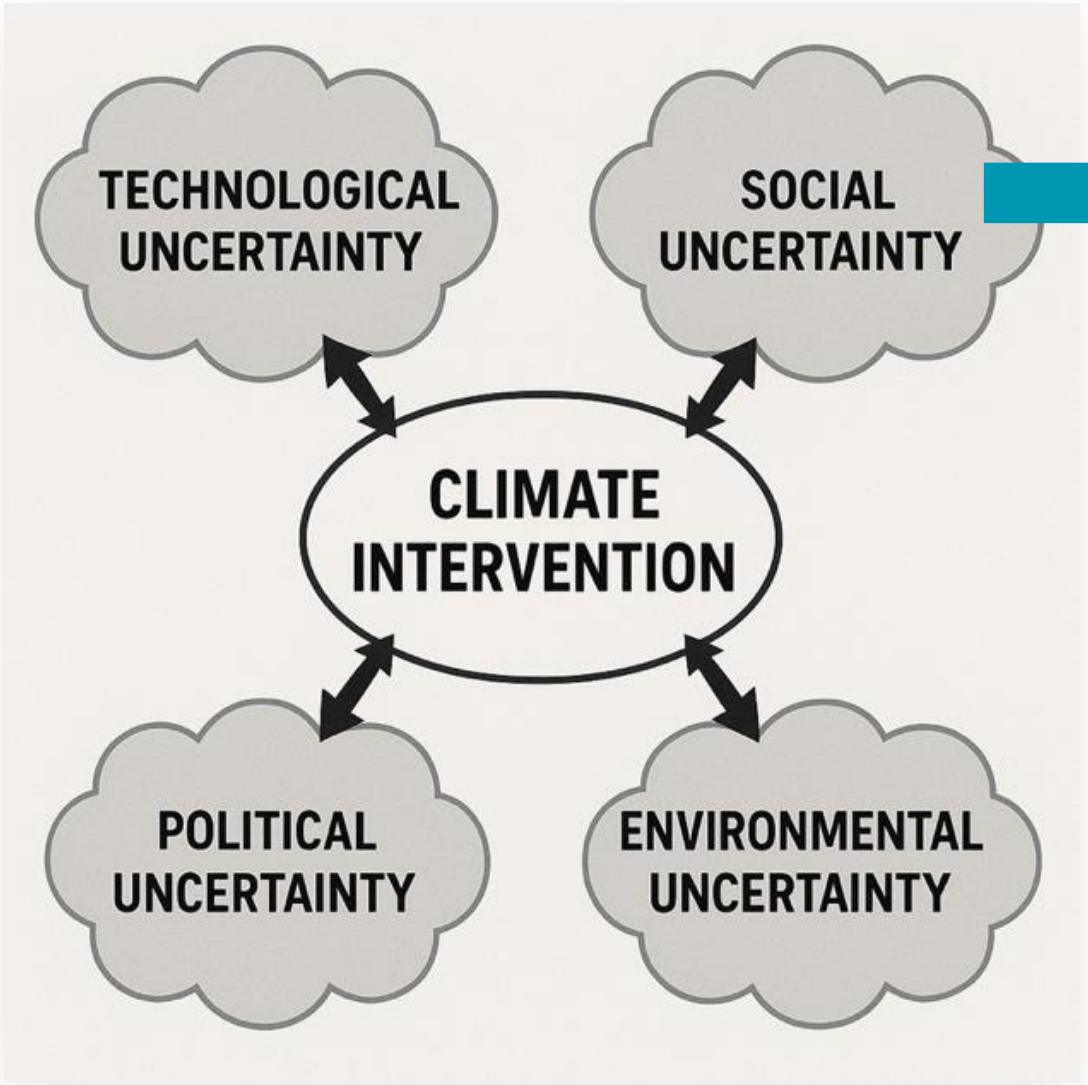
Any large-scale, multi-agency Federal research program into SRM should be coordinated by the U.S. Global Change Research Program.

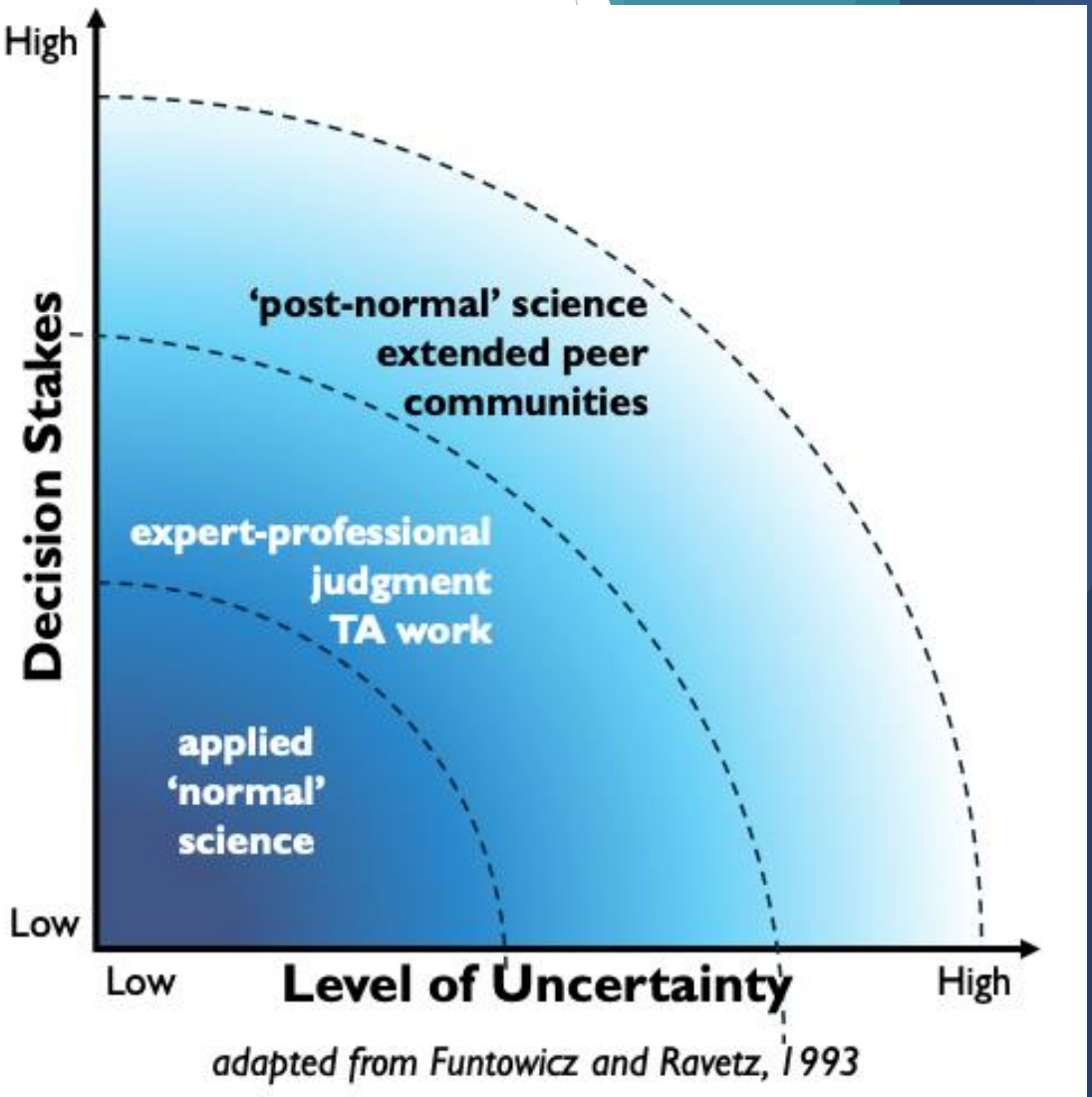
Engineering our Planet: From Reactive Interventions to a Participatory Technology Assessment Platform

- Mahmud Farooque & Darcy Gentleman

Consortium for Science, Policy & Outcomes
at Arizona State University

the challenge: decision-making under conditions of dynamic uncertainty

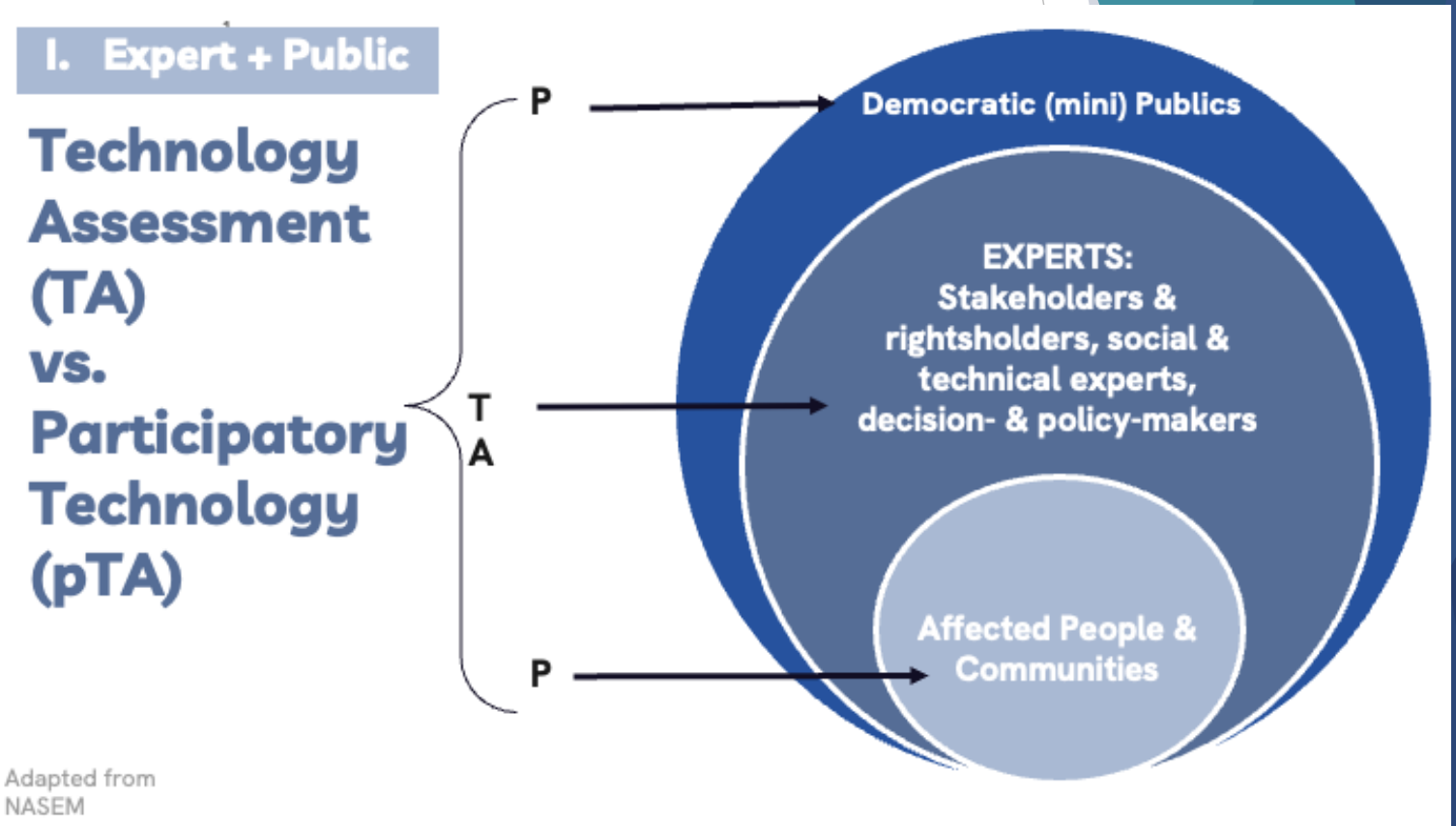




Participatory Technology Assessment [pTA]

A proven, reflexive, adaptable, replicable, scalable platform for social assessment

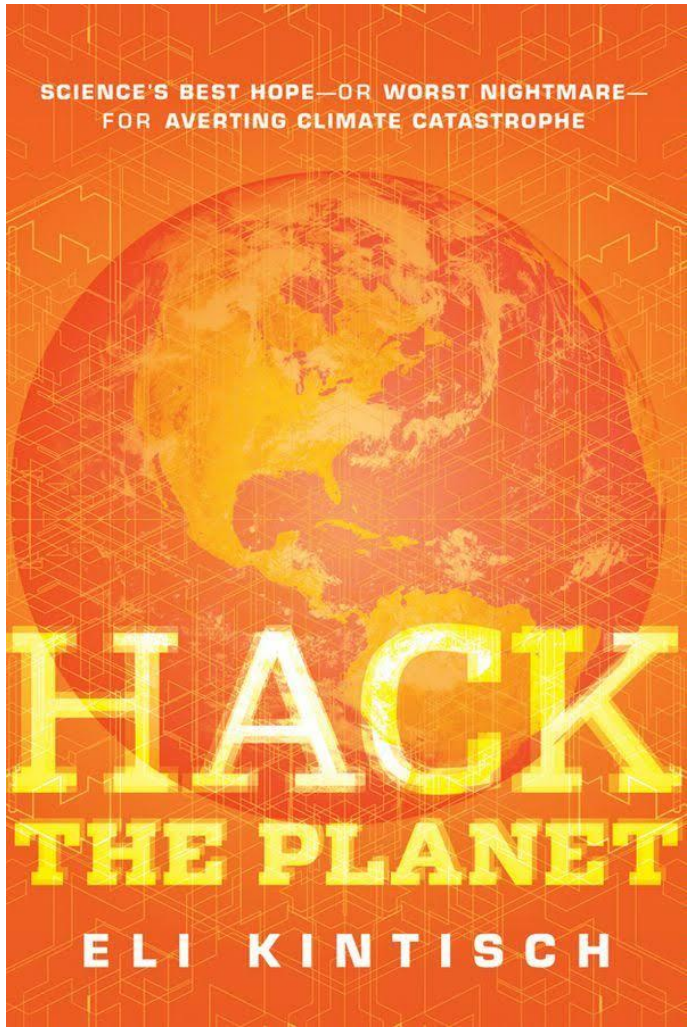
- An engagement platform that seeks to improve the outcomes of science and technology decision-making through dialogue with informed publics and communities.
- pTA engages groups of non-experts who are representative of the general population who – unlike political, academic, and industry stakeholders – are typically not represented in science and technology related decision-making.



Adapted from NASEM

Consortium for Science, Policy & Outcomes
at Arizona State University

First Geoengineering pTA Project, 2010



Tinkering with the Temperature of Planet Earth: A citizens' deliberation on climate geoengineering

September 27 – October 19, 2010

Second Geoengineering pTA Project, 2017

Geoengineering briefing

SCoPEx Stratospheric Controlled Perturbation Experiment

Location:
World View Spaceport
Tucson, Arizona, USA

Key Players:
Frank Keutsch, David Keith, John Dykema, and Lucie Bates, all Harvard Professors. Bates and Keith head the Harvard Solar Geoengineering Research Program.

Budget:
$10 million [$7m raised as of Oct. '17]

Summary:
The Stratospheric Controlled Perturbation Experiment (SCoPEx) is a planned experiment in a form of geoengineering known as Solar Radiation Management (SRM). SRM techniques aim to block or reflect sunlight before it reaches the earth's atmosphere, which would hypothetically slow down global temperature rise. SCoPEx aims to develop a form of SRM known as Stratospheric Aerosol Injection.

The SCoPEx project would spray water, finely-ground chalk and sulfur particles into the upper atmosphere from a high-altitude balloon and measure how effectively the resulting clouds block sunlight, while also tracking any effects on the air in the upper atmosphere. While the environmental impacts are currently unknown, the political effects of the project, however, are the most consequential. If the experiments are allowed to proceed, they would legitimize geoengineering and move us one step closer to a global consensus and more geoengineering in the region.

Funding:
Funding comes from Harvard University and its Solar Geoengineering Research Program, which is funded by Bill Gates, several venture capitalists and hedge fund higher-ups, a former senior VP at Google, the Hewlett and Alfred P. Sloan foundations (among other philanthropic organizations), and a foreign policy research center with military ties.

Key dates:
Project initiated: 2015
Research activities: 2017-2024
First field tests programmed: 2018

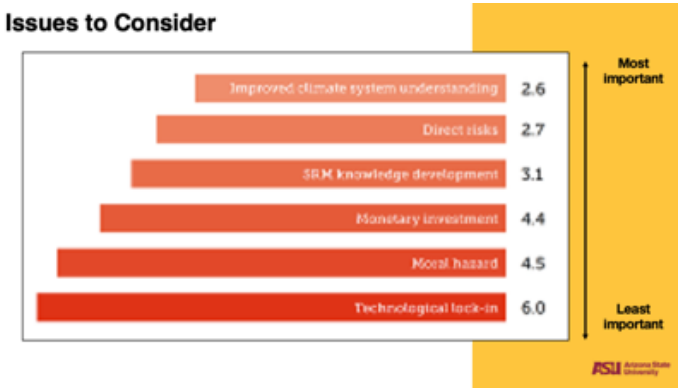
Regulatory status:
The UN Convention on Biodiversity has passed a moratorium on ocean fertilization (2008) and on geoengineering (2010) that cover SRM and experiments like this. However, the US is not a party to the CBD. The UN Environmental Modification Convention (ENMOD) prohibits military use of weather modification technology globally.

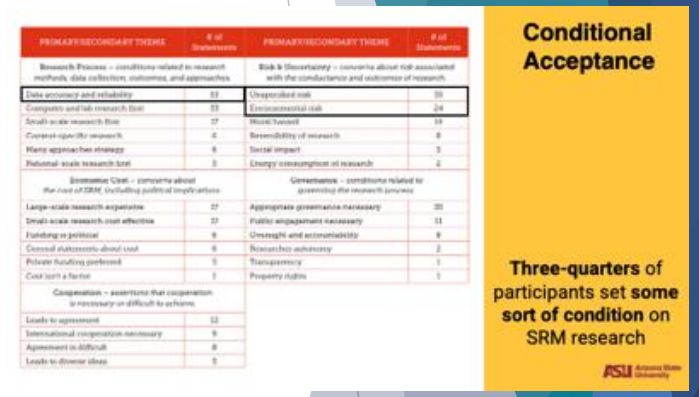
Under US Federal law (National Weather Modification Policy Act of 1976), any modification of the weather is required to be reported to the National Oceanic and Atmospheric Administration, and the results of research must be made public.

The Oscthum Nation, represented by a handful of tribal governments, have lived in the area around the World View Spaceport for thousands

SCoPEx Funders:
William and Flora Hewlett Foundation, The Open Philanthropy Project, Pritzker Innovation Fund, The Alfred P. Sloan Foundation, Vulcan Foundation, The Weatherhead Center for International Affairs, G. Leonard Baker, Jr., Alan Eustace, Bess Garrett, Bill Gates, John Kaspauer, Michael Smith, Bill Trenchard.

etc group





A Series of Geoengineering Projects:

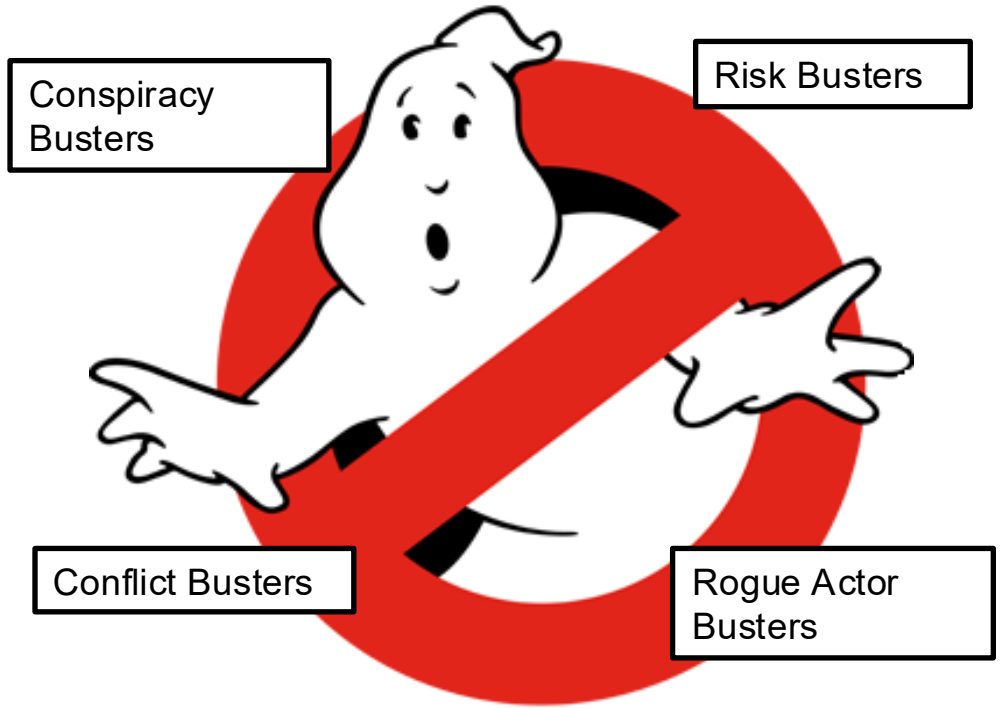
Exploring Democratic Governance of Solar Geoengineering Research (Sloan, 2017)

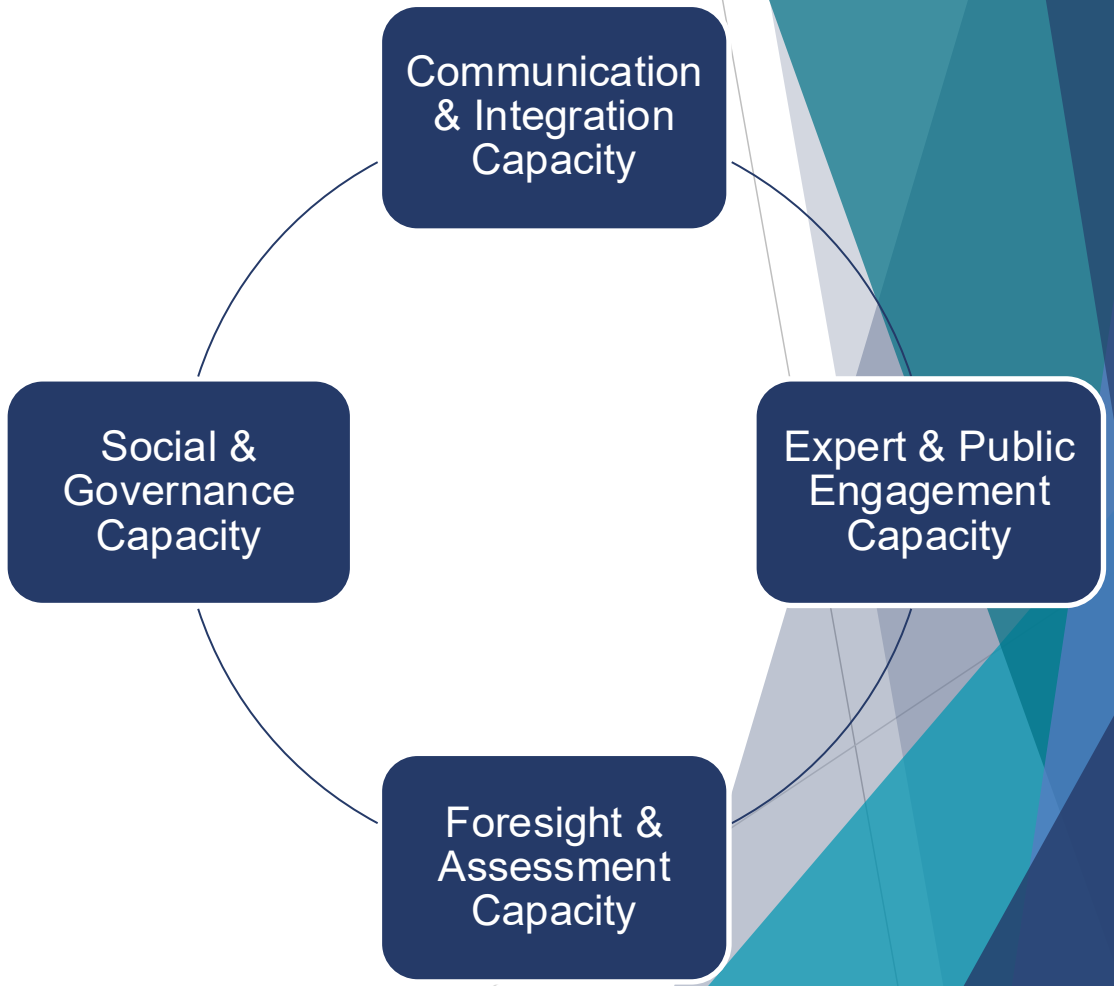
CDR Technology Public Forums and Applications in U.S. and Canada (Sloan, 2022)

Shared Principles for Community Collaboration for DAC Hub in Louisiana (DOE, 2023)

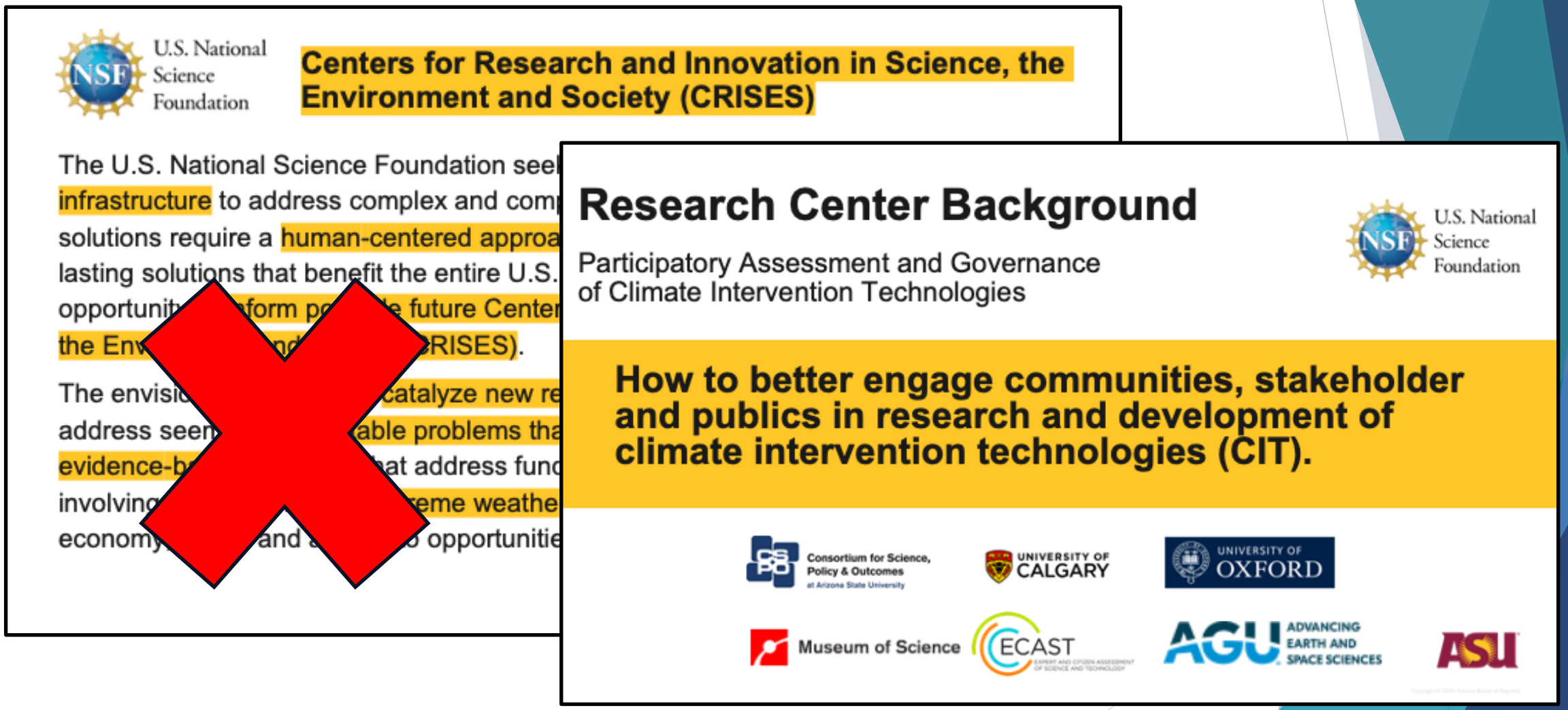
Building Involved and Engaged Community for Responsible mCDR (NSF, 2024)

Could we move Geoengineering pTA from a reactive intervention to an anticipatory capacity?

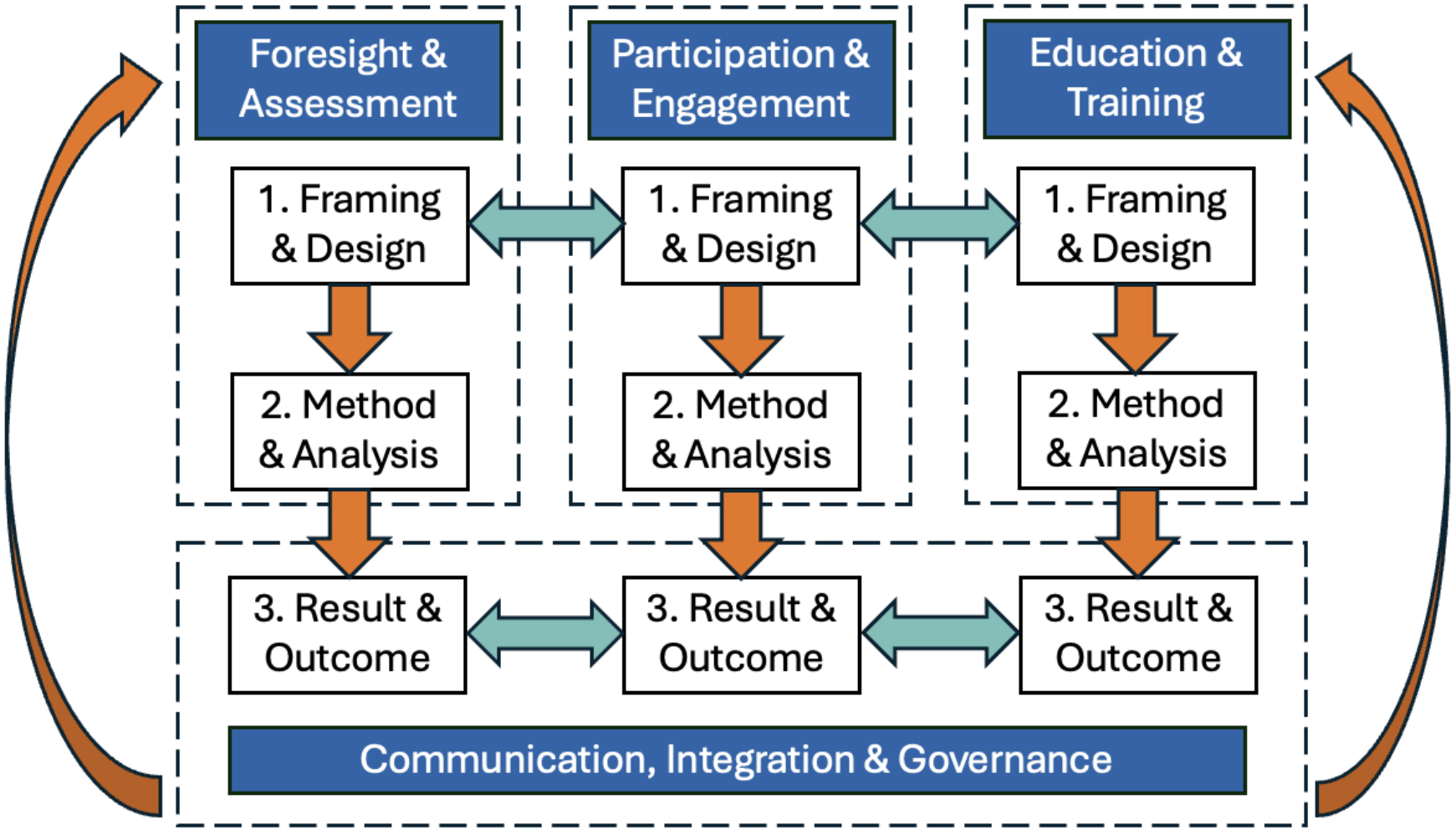




opportunity & the proposal…



The result - a pTA research platform for anticipatory governance



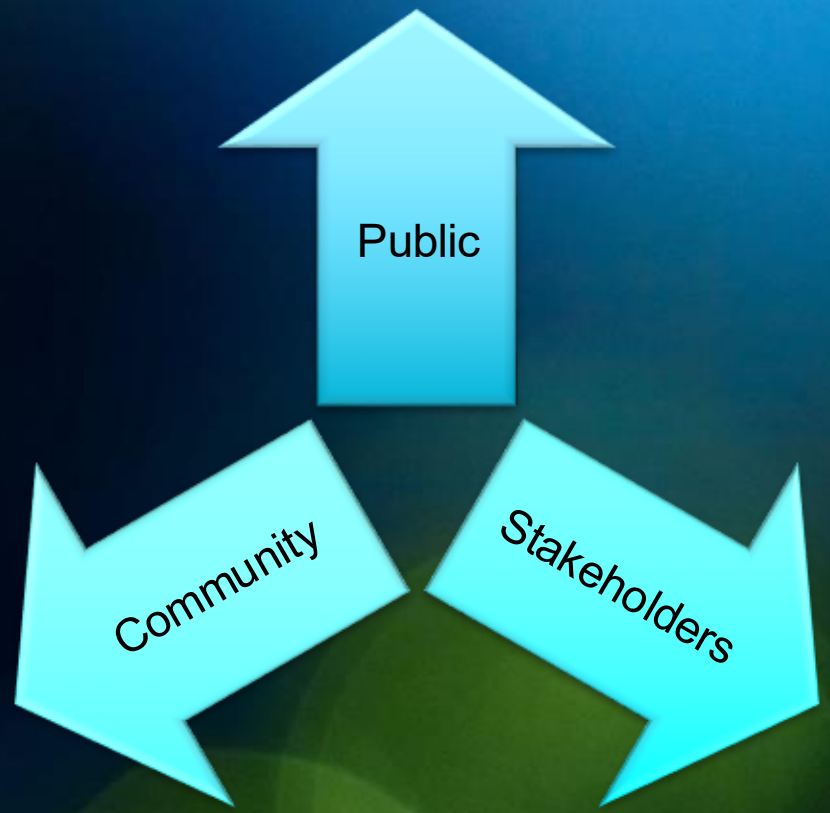
I. Foresight & Assessment: Model-based, Scenario-based, Analogy-based, …

- Integrate models and stakeholder participation
- Couple Earth system + human systems
- Co-design scenarios and metrics
- Improve salience, credibility, legitimacy

Research Chapter Leads
- Monica Morrison (NCAR)
- Michael Barton (ASU)

II. Community, Stakeholder and Public Engagement: Co-design, Inclusive, Useful ….

- Focus on Reach, Partnerships, Narrative
- Address access and trust barriers
- Prioritize upstream engagement
- Use participatory and community-based methods



Research Chapter Leads
- David Tomblin (UMD)
- Julia Jenty (AGU)

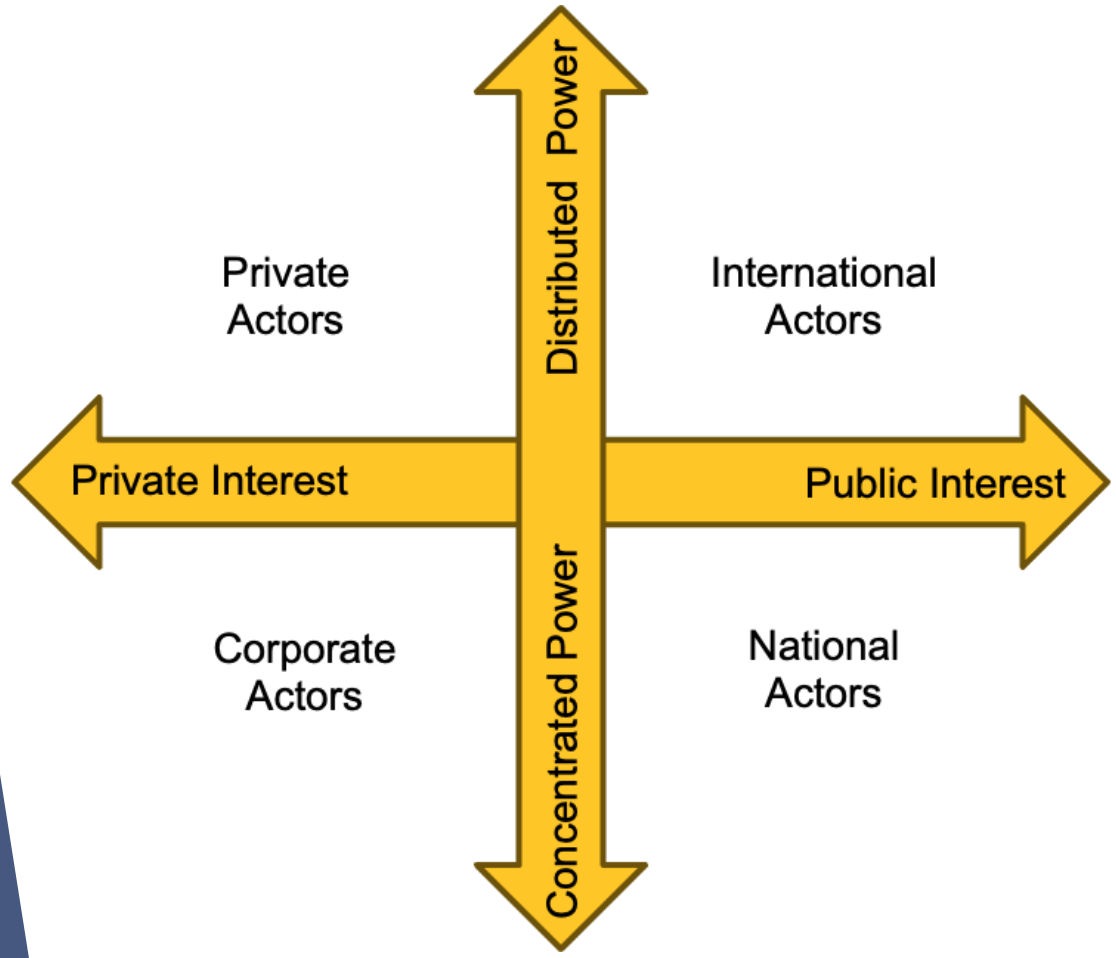
III. Education & Training: Capacity and Infrastructure for Generative, Authentic and Meaningful Participation

- Shift to generative governance capacity
- Train across scientists, policymakers, communities
- Build facilitation and systems thinking skills
- Enable distributed participation

Research Chapter Leads
- David Sittenfeld (MOS)
- Raj Pandya (ASU)

- Scientists and Engineers
- Policy and Decisionmakers
- Students and Teachers
- Journalists and Advocates
- Curators and Storyteller
- Ethicists and Faith-leaders

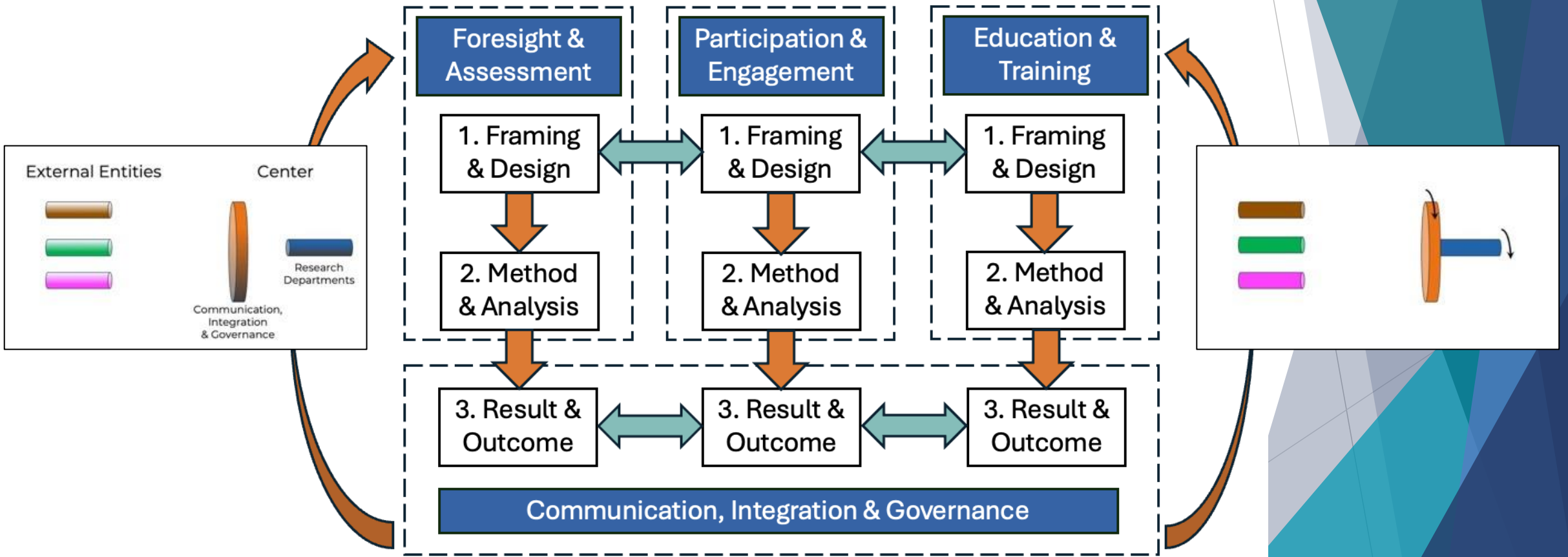
IV. Communication, Integration and Governance: Ethical, Useful, Adaptive, Reflexive and Anticipatory



- Align science, values, institutions
- Ensure transparency and accessibility
- Use integrated engagement systems
- Govern with equity and accountability

Research Chapter Leads
- Jason Delborne (UW)
- Mahmud Farooque (ASU)

THE PLATFORM –
a virtuous cycle engine & flywheel – fit for purpose



THE PLATFORM –
– 2 initial examples of possible outcomes