

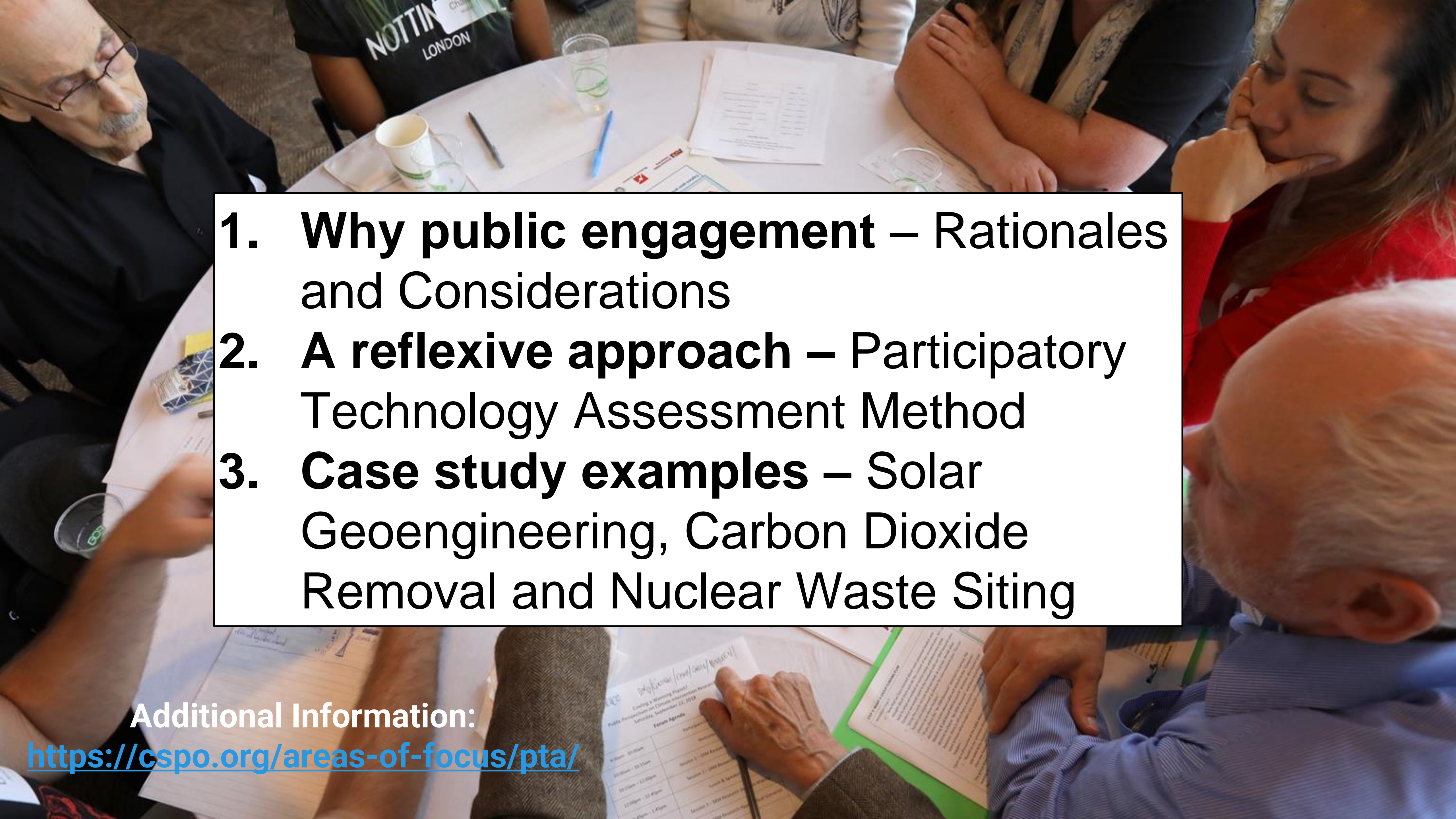
Public and Stakeholder Engagement in Environmental Policy and Decision-making



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- 1. Why public engagement – Rationales and Considerations**
 - 2. A reflexive approach – Participatory Technology Assessment Method**
 - 3. Case study examples – Solar Geoengineering, Carbon Dioxide Removal and Nuclear Waste Siting**

Additional Information:

<https://cspo.org/areas-of-focus/pta/>

1. Why do we need Public Engagement in Science and Technology Policy?

Normative Proposition

- Lay publics have valuable knowledge and perspectives to share
- Intentional, Informed and Inclusive deliberations lead to better societal outcomes

Science will be made more reliable and more valuable for society today not by being protected from societal influences but instead by being brought, **carefully and appropriately**, into a direct, open, and intimate relationship with those influences.

- - Dan Sarewitz, *Saving Science*, New Atlantis

- When done well, public participation improves the **quality and legitimacy** of a decision and builds the capacity of all involved to engage in the policy process.
- It can lead to **better results** in terms of environmental quality and other social objectives. It also can **enhance trust** and understanding among parties.
- Achieving these results depends on using practices that address difficulties that **specific aspects of the context** can present.

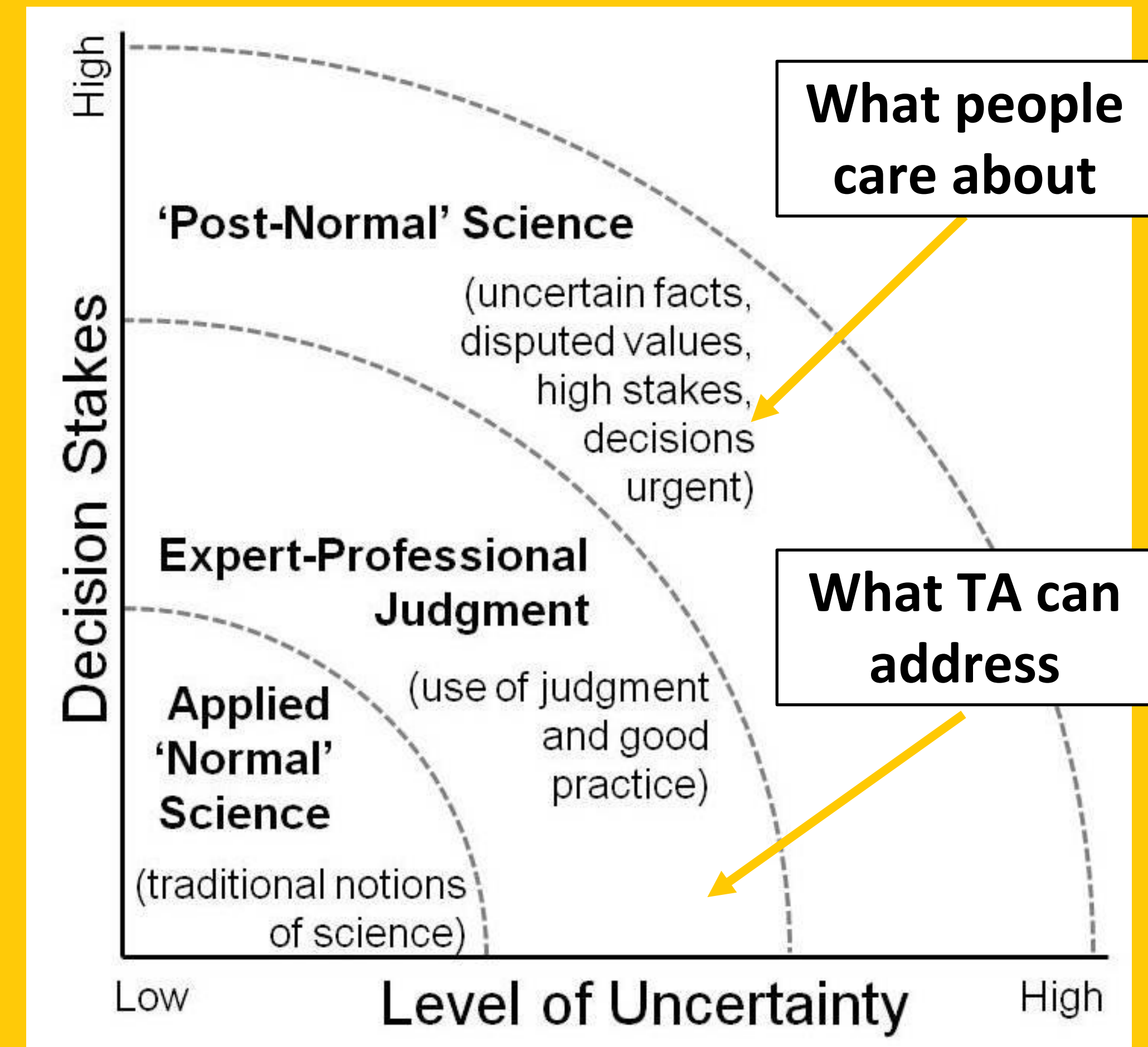
- U.S. National Academy of Science, Committee on the Human Dimensions of Global Change, Division of Behavioral and Social Sciences and Education, (2008)

Technology Assessment (TA) can't effectively manage certain sociotechnical uncertainties

Post-Normal Science (PNS)

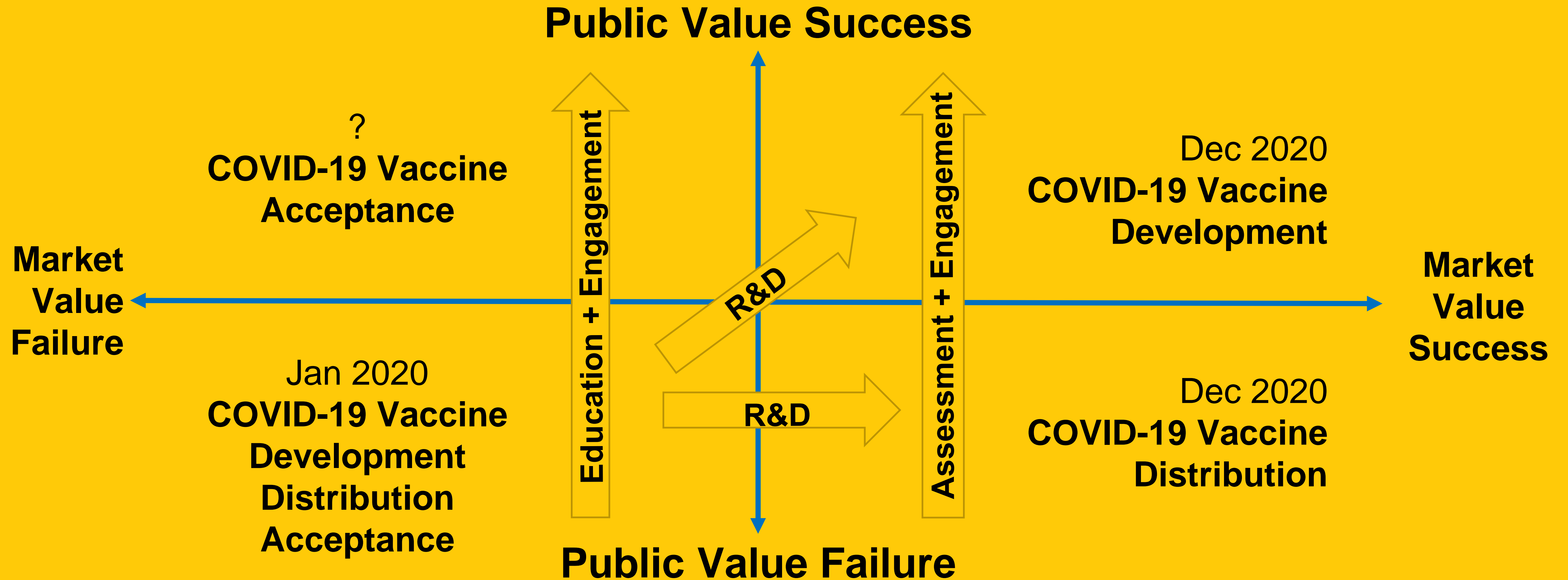
Problems

- Facts *Uncertain*
 - Values in *Dispute*
 - Stakes *High*
 - Decisions *Urgent*
- **Requires extended societal peer review**
- **Think COVID-19!**

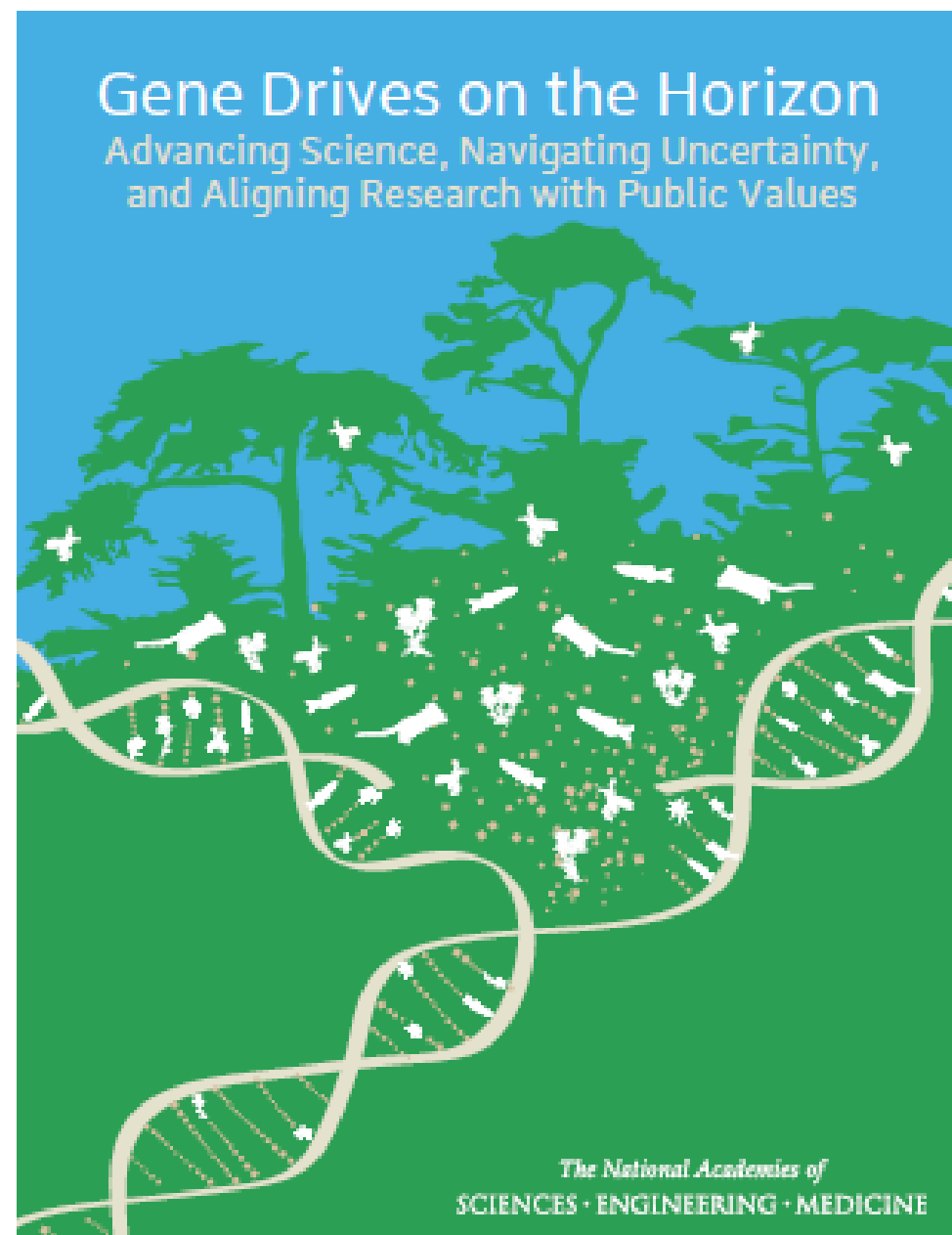


Adapted from: Funtowicz and Ravetz,
1993

Addressing Public Values, Filling Democratic Gaps



“Public Engagement Cannot be an Afterthought”



“The outcomes of Engagement may be as crucial as the scientific outcomes to decisions about whether to release a gene-drive modified organism into the environment.”

- U.S. National Academies of Sciences, Engineering, and Medicine (2016)

“This [AV development] is something we need to do with society, with the community, and not at society. And we take that very seriously. ... The tech adage of ‘move fast and break things’ most assuredly does not apply to what we’re doing here.”

— Dan Amman, GM Cruise, November 2019

“To maximize the benefits and minimize the potential harm of technologies such as artificial intelligence and synthetic biology, we must engage nontraditional stakeholders and diverse voices in NSF research, including civic organizations, labor, local and tribal governments, farmers, and even the public at large.”

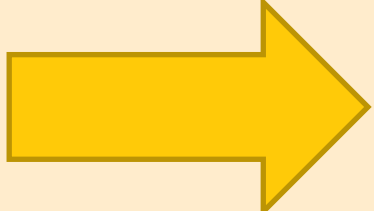
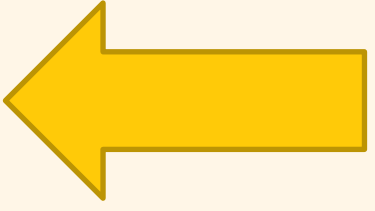

- Eddie Bernice Johnson, Chairwoman, Science, Space and Technology Committee, May 6, 2021

2. Who are the “Publics” in Public Engagement



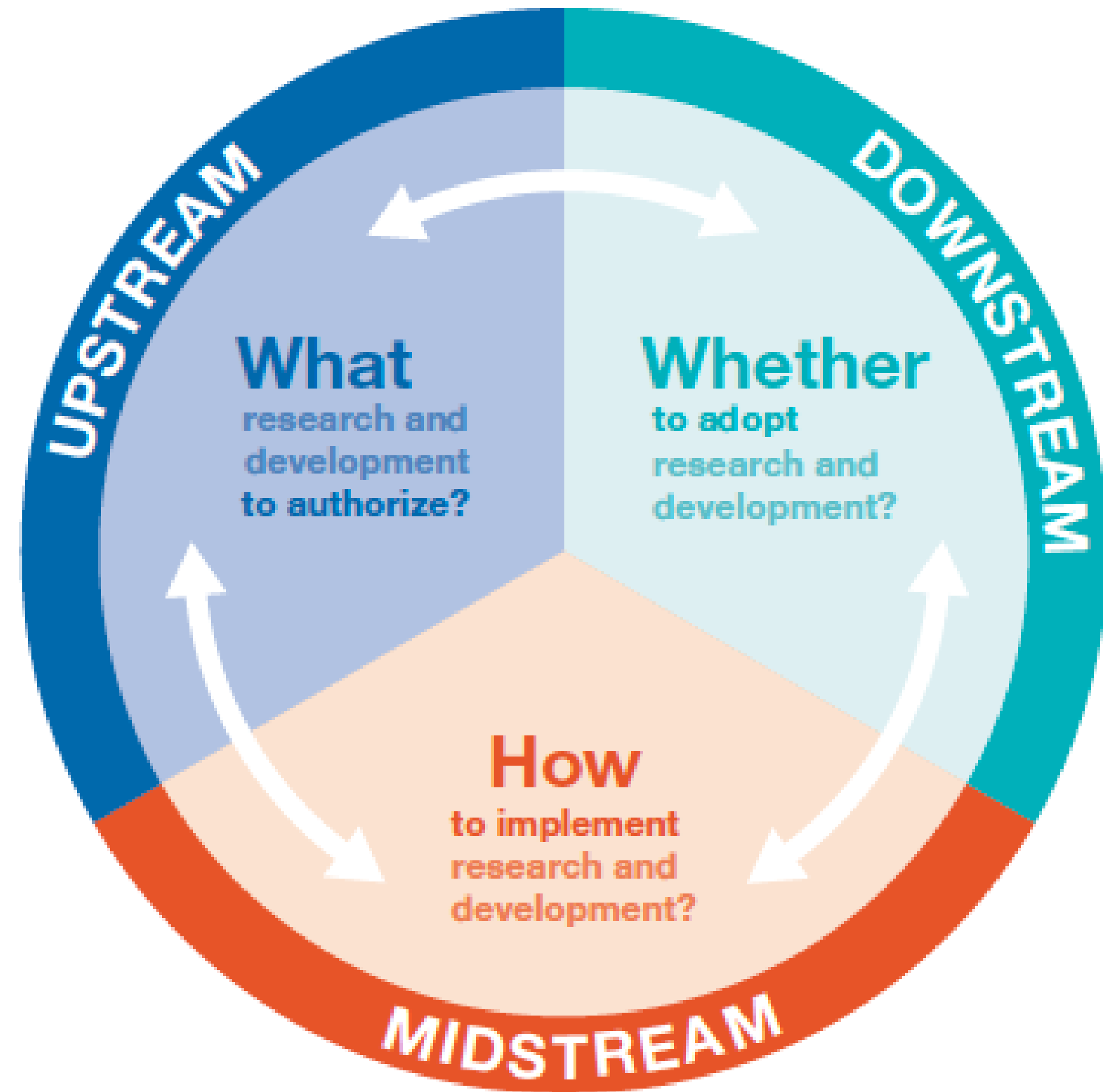
- Adapted from U.S. National Academies of Sciences, Engineering, and Medicine (2016)

3. How can we engage the public?

Type of Engagement		Information Flow	
Public Communication	Sponsor		Public
Public Consultation	Sponsor		Public
Public Participation	Sponsor		Public

- (Rowe and Frewer, 2005)

4. When should we engage the public?



Schuurbiers & Fisher (2009)

Public Engagement Questions

- 1. Upstream (Research):** Should we or should we not? Geoengineering, Gene Editing, Synthetic Biology, etc.
- 2. Midstream (Development):** If we should, then how? Asteroid Detection and Mitigation, Automated Vehicles, Vaccine Development, etc.
- 3. Downstream (Deployment):** How do we maximize benefits and minimize harms? Internet Governance, Climate Change Response, Vaccine Distribution, etc.

Participatory Technology Assessment

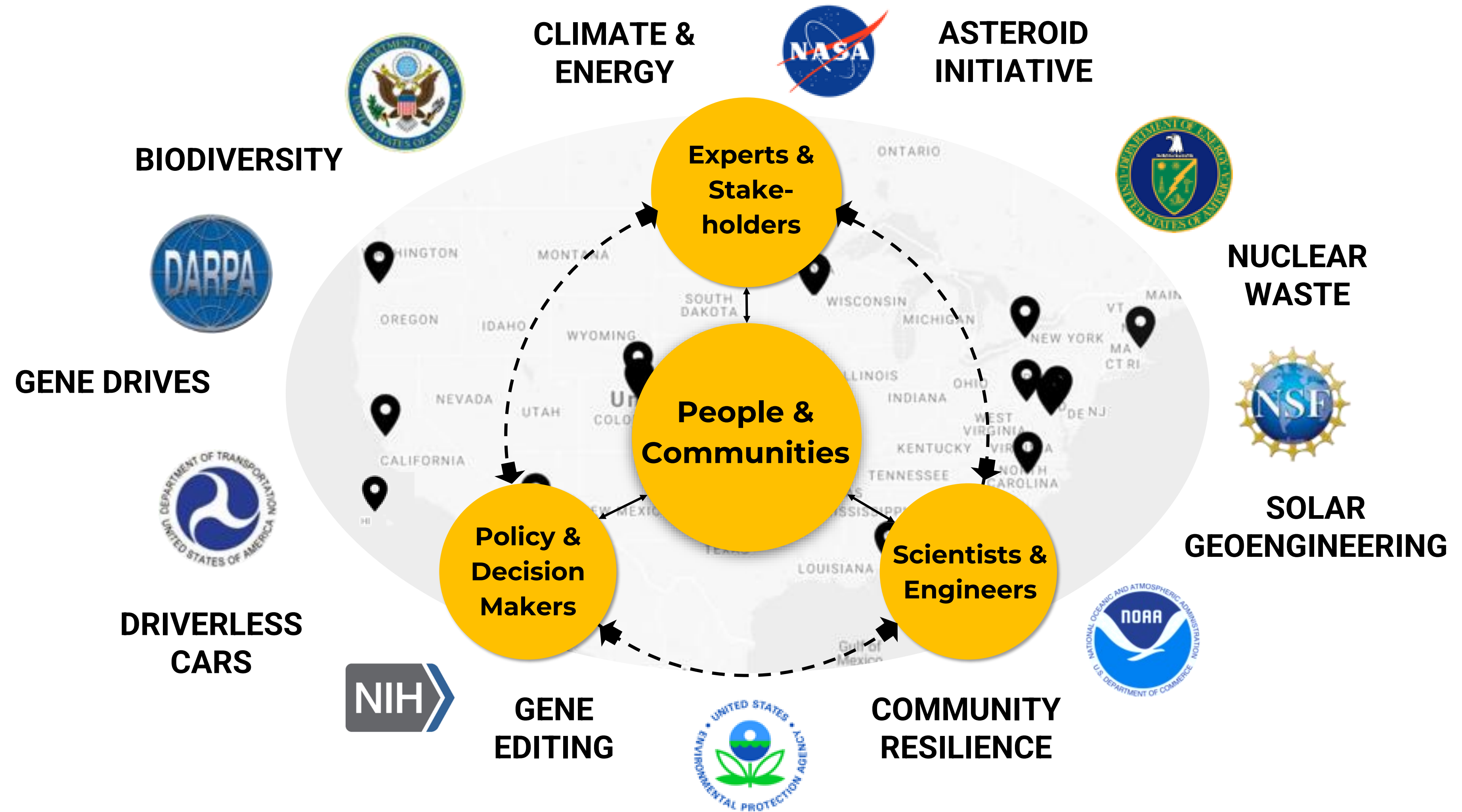
A Decision-making tool to:

- Assess public value
- Manage uncertainty
- Fill democratic gaps

Participatory Technology Assessment (pTA) is an engagement model that seeks to improve the outcomes of science and technology decision-making through **dialog with informed citizens**. Participatory technology assessment involves engaging a group of non-experts who are representative of the general population but who—unlike political, academic, and industry stakeholders—are **generally underrepresented in science and technology related policymaking**.

A distributed network for institutionalizing pTA as a tool for exploring public values to help inform key decisions for a 21st century alternative to Technology Assessment

- *Participation + Expertise*
- *Distributed + Agile + Collaborative*
- *Institutionally Non-partisan*
- *Inviting and integrating diverse value perspectives*
- *Continuous innovation of concepts and practices*
- *Integrated into government policy-making + wider societal deliberation + technological R&D*



50+ forums **20+** cities **3000+** citizens

ECAST pTA Process: 3 Deliberative Activities

Problem Framing & Design

- Literature Review
- Focus Groups
- Design Workshop

ECAST Deliberations

- Content and Protocol Development
- Recruitment and Training
- Citizen Deliberation Forums

Results & Integration

- Preliminary Results
- Results Workshop
- Reports and Briefings

Design Principles:

1. Diverse Representation
2. Deliberative Multi-Directional Learning
3. Informed Community Participants
4. Clear, Comparable, and Usable Outputs, Formats, Outcomes

Outputs and Outcomes

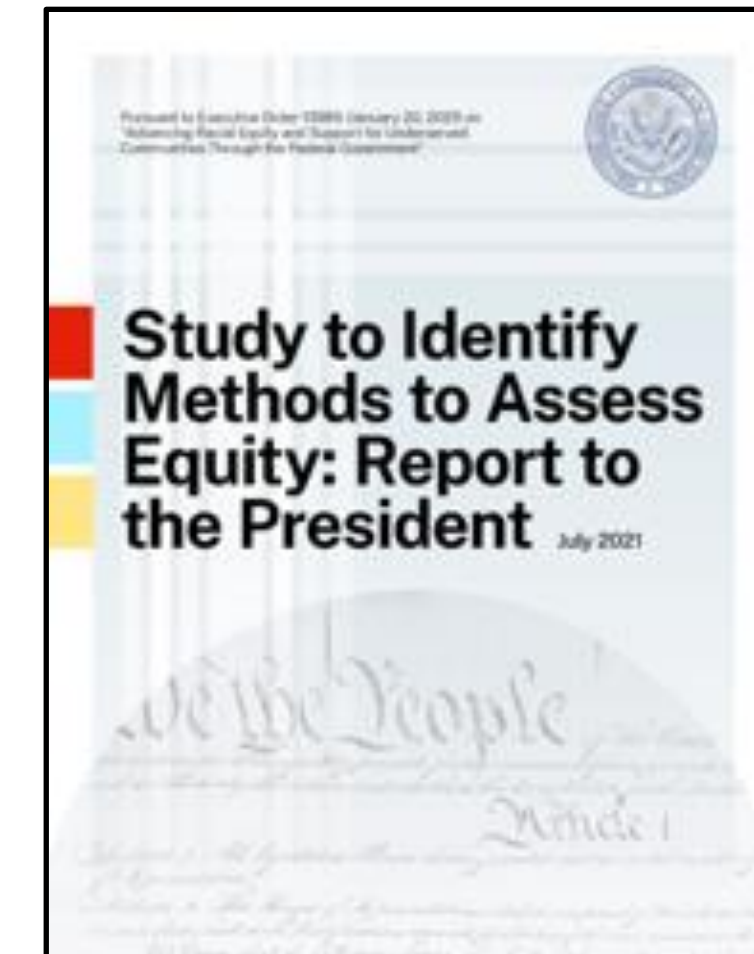
Public Reports



Informing Decisions & Policy

1. Public priorities
2. Within a choice (e.g., cost, schedule, safety of space observation of asteroids)
3. Among choices (e.g., different technical or policy options)
4. Public value mapping
5. Emerging areas of agreement – knowledge for framing future messaging
6. Insight on how the public understands S&T and handles complexity
7. Input for designing future public engagement (iterative process)
8. Anticipating emerging issues
9. Unanticipated outcomes (e.g., public makes unexpected connections)

Innovating Governance



Scholarly Articles and Book Chapters



Impacting Governance



Uncertainty

Lock-in

Moral hazard

Governance



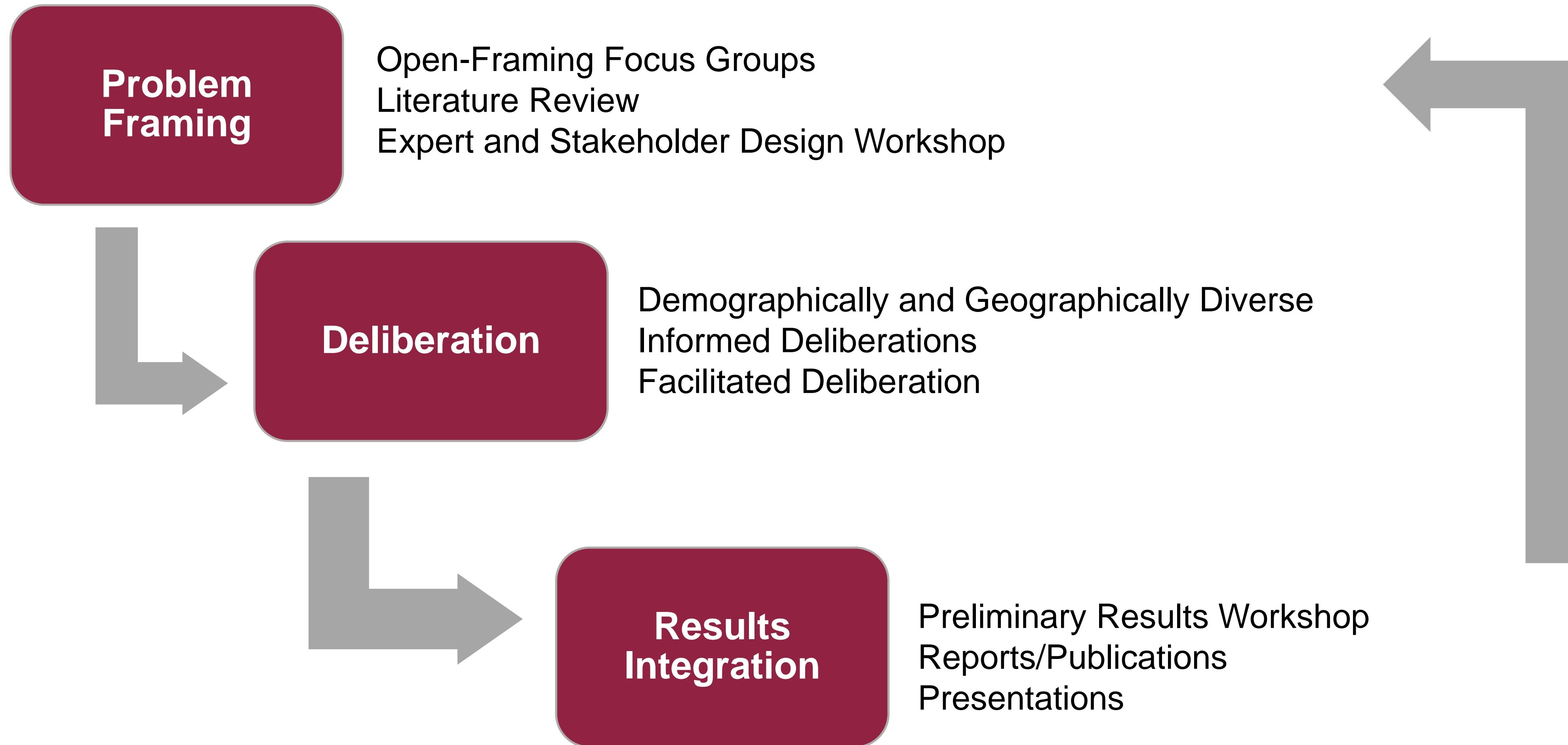
**Cooling a Warming Planet?
Public Forums on Climate
Intervention Research**

Project, Design and Results Overview

Project Timeline: Jan 2018 – April 2019



Alfred P. Sloan
FOUNDATION



What research topics?

Who should fund research?

Who should make decisions?

Cirrus Cloud Thinning

Release of sulfate aerosols from high altitude aircraft to brighten clouds

- Large potential for climate cooling
- Potential for high cost
- Exciting research
- Climate impact

Stratospheric Aerosols

Release of sulfate aerosols from high altitude aircraft to brighten clouds

- Large potential for climate cooling
- Potential for high cost
- Exciting research
- Climate impact

Marine cloud brightening

Spraying sea salt into Earth's atmosphere to brighten clouds over the ocean

- Inherent risks
- Potential for high cost
- Climate impact
- May be difficult to implement

Ocean Surface Microbubbling

Fleets of ships dispersing air bubbles across the ocean surface to cool the water

- Easily implemented
- May have potential for high cost
- Potential for high cost

Sea Ice Thickening

Pumping seawater to the Arctic ice surface to increase ice thickness

- Easily implemented
- May have potential for high cost
- Potential for high cost

Cool Infrastructure

Painting roads, roofs, and other infrastructure in reflective colors and increasing reflective plant cover could help reflect incoming sunlight and reduce local temperatures.

- Easily targeted
- Few unpredictable impacts
- Effects are small on a global scale

Nongovernmental Organizations (NGOs)

Who are they? Nonprofit organizations similar to those that exist on a local, state, or federal level, but often with a broader mission.

What types of projects do they fund? NGOs fund a wide range of projects, often with a narrow focus on a specific area of research.

How much funding do they provide? Funding varies significantly, from small grants to large-scale programs.

How will they use the research? NGOs use research to inform their mission and to advocate for policy changes.

Federal Government

Who are they? The US Department of Energy, National Science Foundation (NSF), National Aeronautics and Space Administration (NASA), and the Environmental Protection Agency (EPA).

What types of projects do they fund? Federal agencies fund a wide range of projects, often with a focus on basic research and large-scale programs.

How much funding do they provide? Funding is substantial, often in the billions of dollars.

How will they use the research? The federal government uses research to inform policy and to fund large-scale programs.

Military

Who are they? The US Department of Defense and the National Security Agency (NSA).

What types of projects do they fund? The military and NSA fund research that is relevant to national security and defense.

How much funding do they provide? Funding is substantial, often in the billions of dollars.

How will they use the research? The military and NSA use research to inform defense policy and to develop new technologies.

Corporations

Who are they? For-profit organizations that fund research to advance their business interests.

What types of projects do they fund? Corporations fund research that is relevant to their business, often with a focus on applied research.

How much funding do they provide? Funding varies significantly, from small grants to large-scale programs.

How will they use the research? Corporations use research to inform their business strategy and to develop new products.

Philanthropies

Who are they? Philanthropic organizations typically fund a wide variety of projects that support research relevant to their foundation's mission.

What types of projects do they fund? Philanthropies often award grants for research that is relevant to the foundation's mission through a proposal and review system.

How much oversight do they provide? Each philanthropy has different processes for tracking project progress and providing oversight.

How will they use the research? Philanthropies may discuss the research projects as evidence of their commitment to their stated mission, but are unlikely to further develop the research on their own.

Researcher Self-Governance

Who makes decisions? Decisions are made by the researchers themselves, often with input from their peers.

Whom do they represent? The researchers represent their own interests and the interests of the scientific community.

How do they make decisions? Decisions are made through a process of peer review and self-regulation.

Independent Advisory Committees

Who makes decisions? Independent advisory committees provide expert advice to the government or other stakeholders.

Whom do they represent? These committees represent the interests of the scientific community and the public.

How do they make decisions? Committees provide recommendations based on their expertise and the evidence presented to them.

Local & Regional Government

Who makes decisions? Local and regional governments make decisions about research funding and implementation.

Whom do they represent? These governments represent the interests of their local and regional communities.

How do they make decisions? Decisions are made through a process of public consultation and political decision-making.

Federal Government

Who makes decisions? The federal government makes decisions about research funding and implementation.

Whom do they represent? The federal government represents the interests of the entire United States.

How do they make decisions? Decisions are made through a process of public consultation and political decision-making.

International Negotiation

Who makes decisions? International actors create a high-level SRM policy through negotiation and treaties.

Whom do they represent? International actors represent the interests of their respective countries and the global community.

How do they make decisions? Decisions are made through a process of international negotiation and treaty-making.



Watch Video



Table Discussion



Group Plans & Individual Response

**Individual Voting: Session 1: Step 5
MAKE YOUR OWN RESEARCH DIRECTION PLAN**

1 Circle the two research directions you support the most:

2 Circle the two research directions you support the least:

Why did you choose these directions?
(Please explain what you think are the most important considerations are for this plan!)

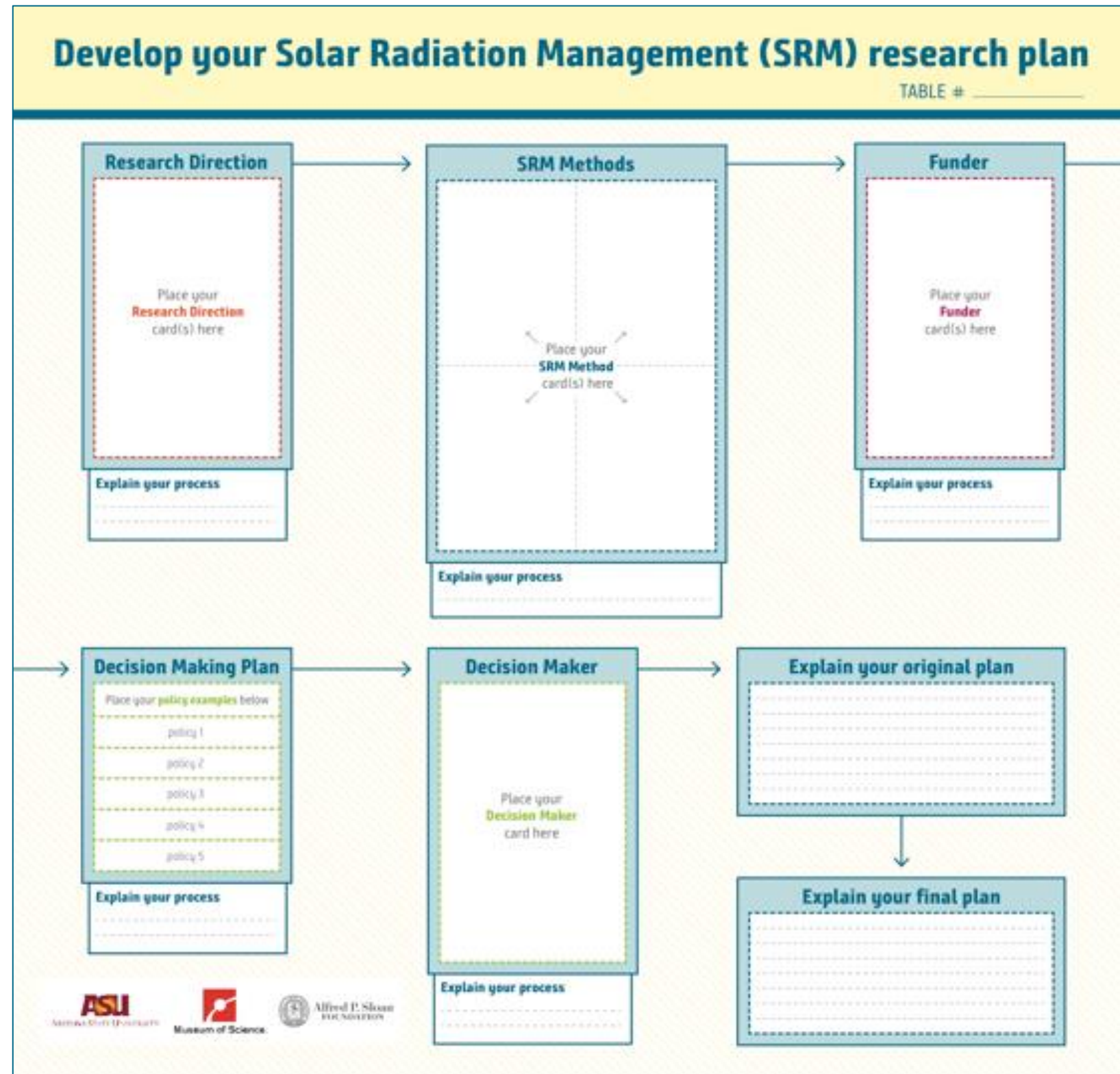
Develop your Solar Radiation Management (SRM) research plan

TABLE # _____

Research Direction Place your Research Direction card(s) here Explain your process	SRM Methods Place your SRM Method card(s) here Explain your process	Funder Place your Funder card(s) here Explain your process
Decision Making Plan Place your policy examples below: policy 1 policy 2 policy 3 policy 4 policy 5 Explain your process	Decision Maker Place your Decision Maker card here Explain your process	Explain your original plan Explain your final plan



Share Results



Demographic Data

Pre and Post Surveys

Group Boards/Activities

Individual Response Sheets

Table Observer Notes

Table Recordings

Individual Voting: Session 1: Step 2
RESEARCH DIRECTION

1 Select the box that most accurately describes how much you support each SRM research direction.

	VERY MUCH	SOMEWHAT	NOT REALLY	NOT AT ALL	NOT SURE
Computer Modeling & Lab-Based SRM Research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Small-Scale SRM Field Trials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Decentralized, High-Investment SRM Research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coordinated National Effort	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
No SRM Research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2 Why did you rank the directions this way?
(Please describe the reasoning for your choices)

Participant Code _____

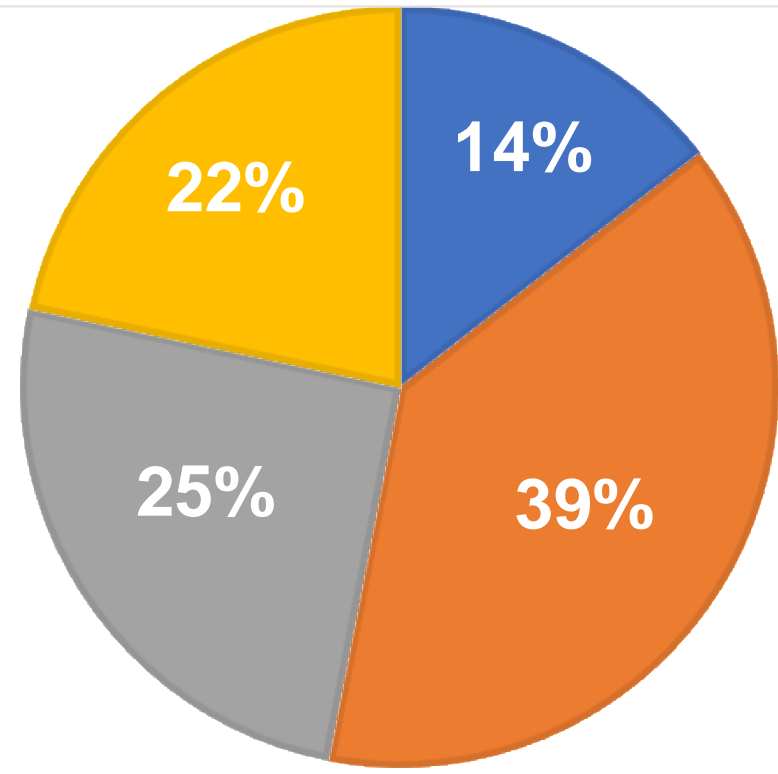


Table 5

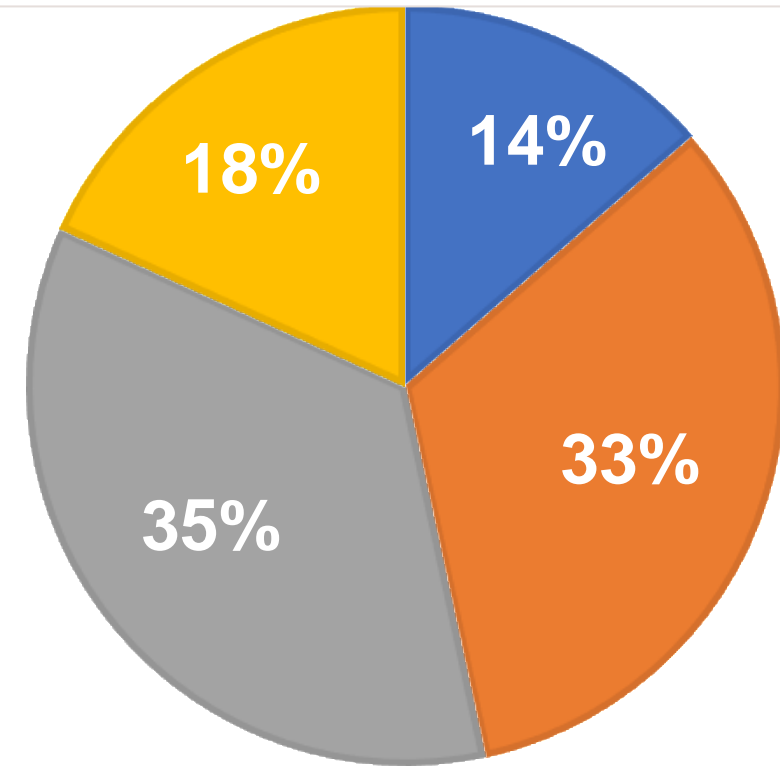
Table 4

AGE

MA

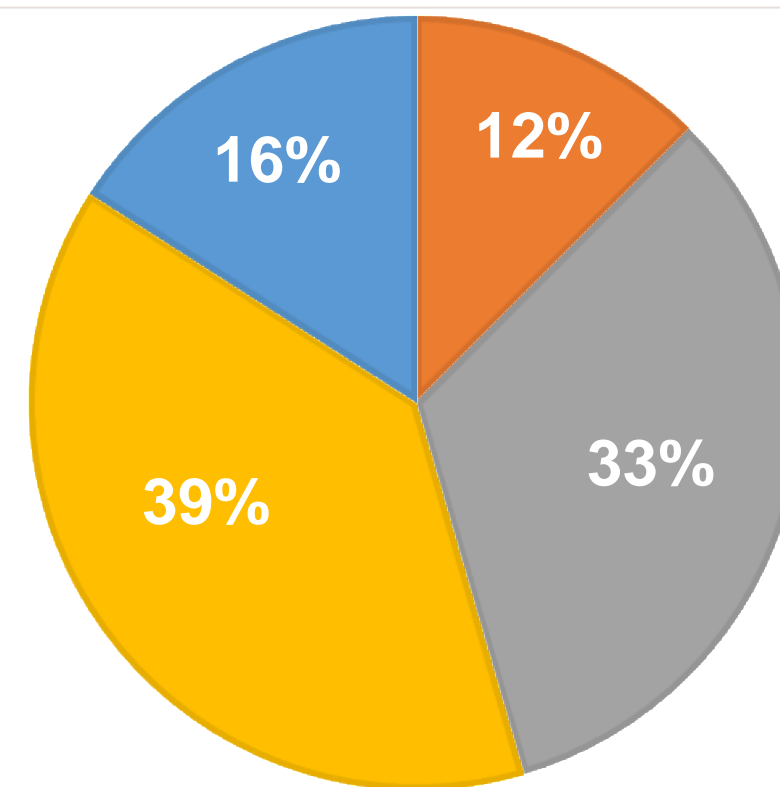
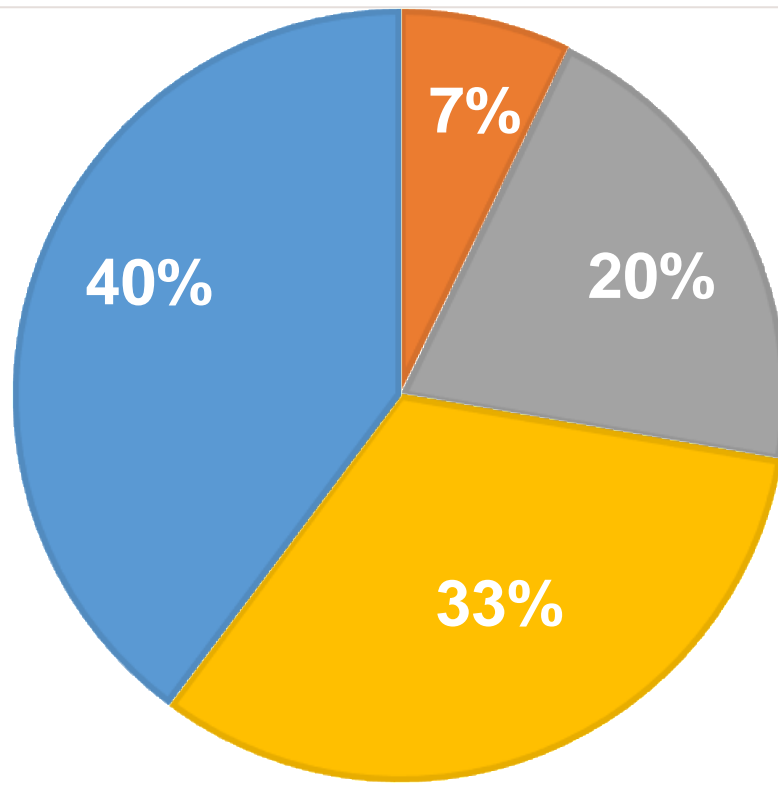


AZ



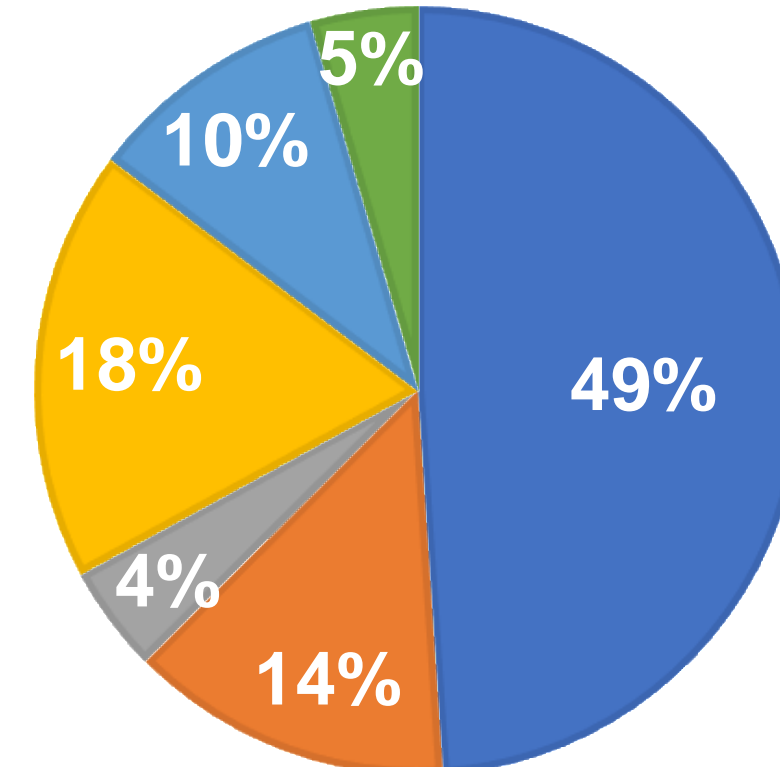
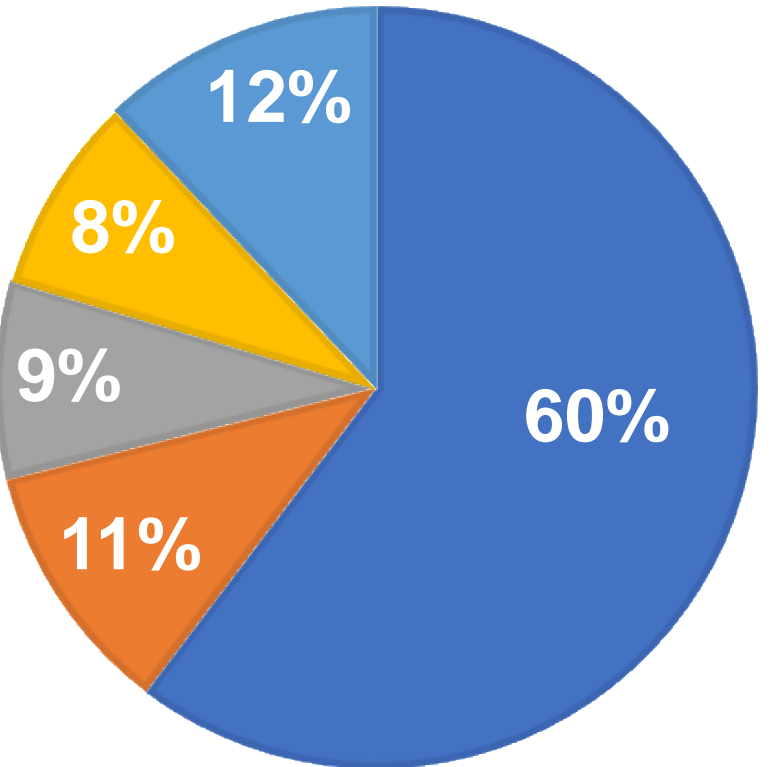
- 18-25
- 25-44
- 45-64
- 65+

EDUCATION



- No HS
- HS
- S Coll
- B Deg
- G/P Deg

ETHNICITY



- White
- Hispanic
- Black
- Mixed/Other
- Asian
- Native American

Who Attended

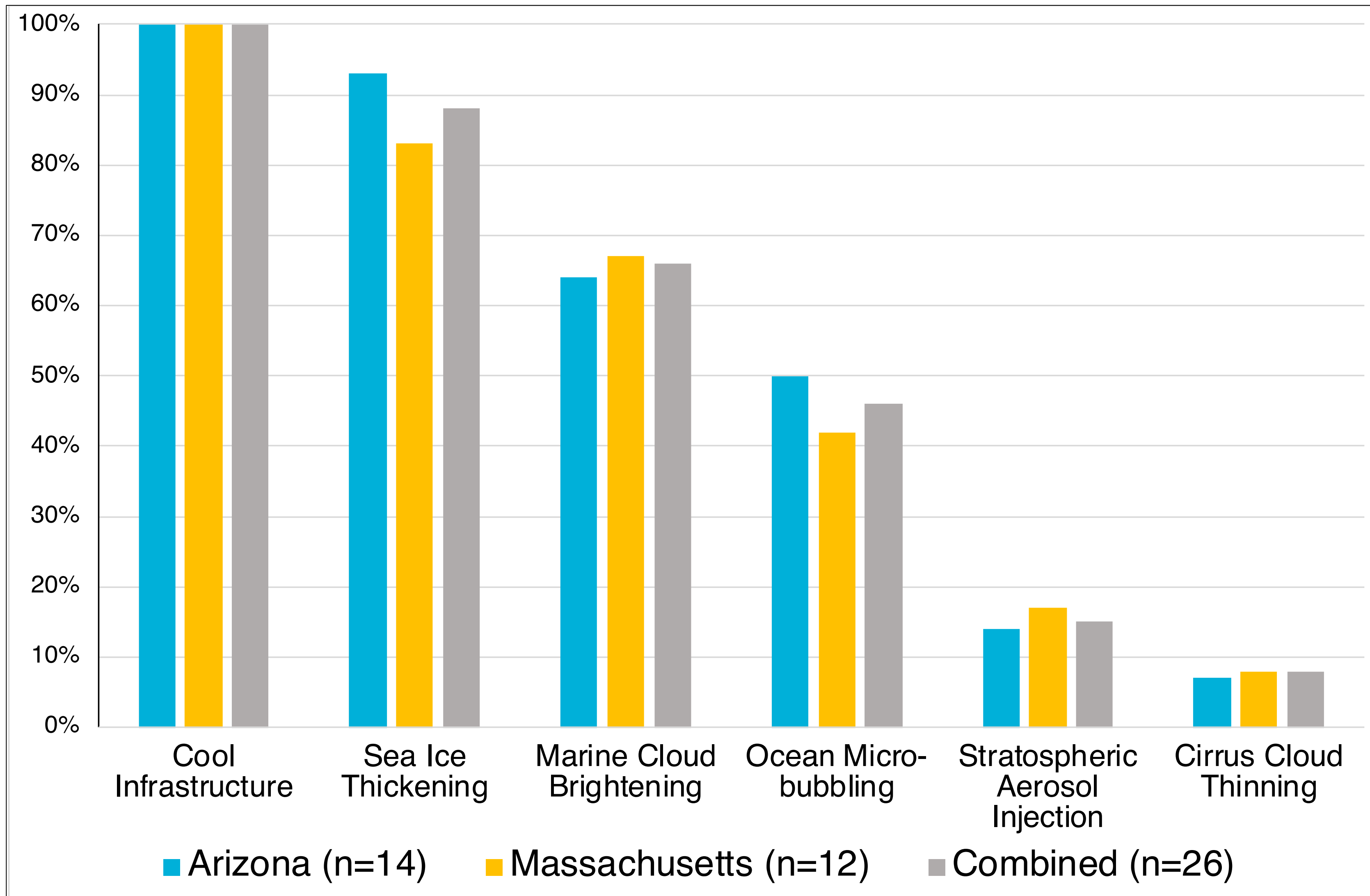
AZ: 88
MA: 83

Climate Change Research Attitudes

	Combined Pre	Combined Post	Combined Pre vs. Post T-Test
<i>Pre/Post Survey Comparison Questions</i>	Average	Average	p
SRM research is crucial to understanding how to battle the effects of climate change.	2.7	2.4	0.027
Experts and science in general will help solve most climate change problems.	3.4	2.9	0.0074
Technology generally causes more problems than it solves.	4.7	4.9	0.37
It is important to collect data on the public's ethical concerns about SRM research.	2.3	1.8	0.0019
It is important to collect public opinion data on decisions about SRM research directions.	2.4	1.9	0.00068



Group Results: What to Research?



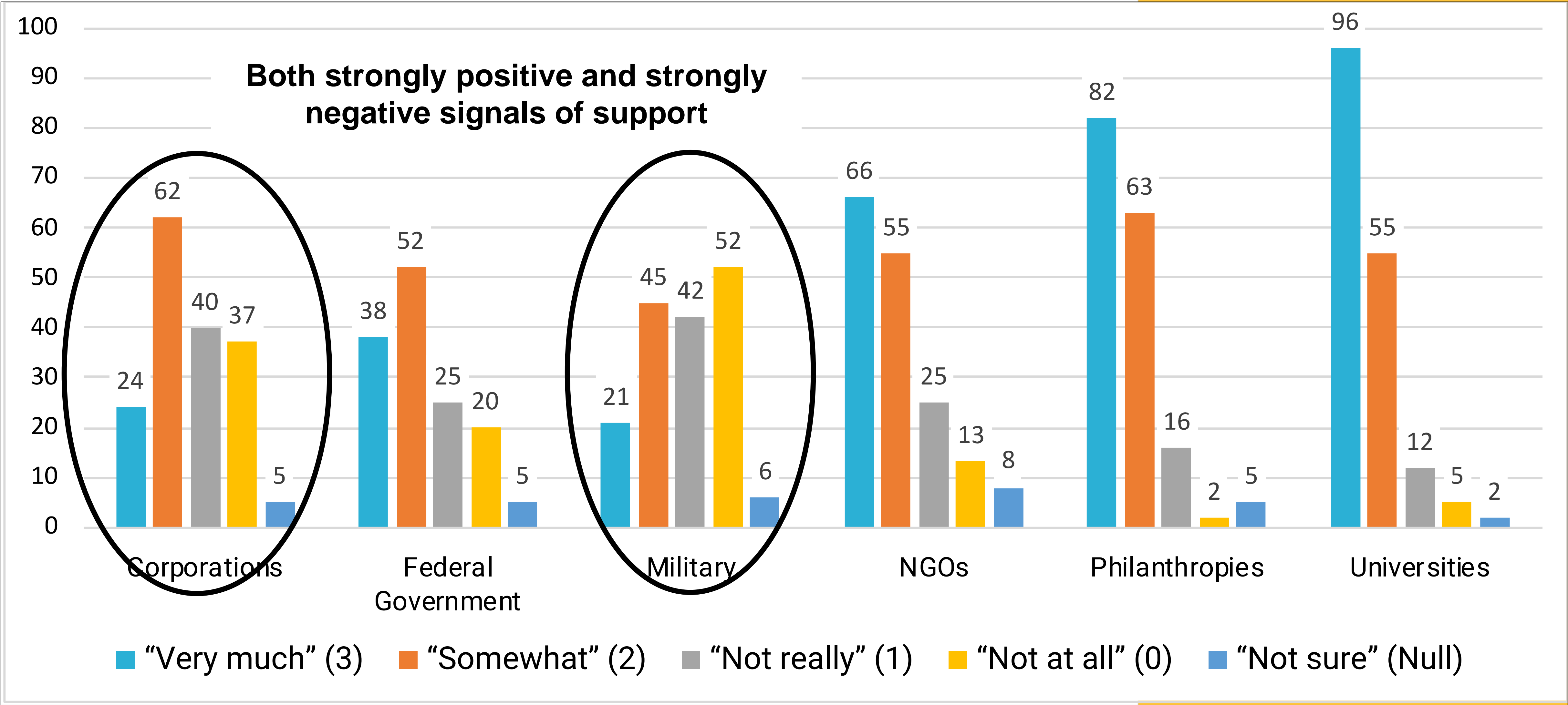
Narratives

Natural vs. Human-made: “They can come up with a lot of experiments that doesn’t need to use a lot of energy and bad chemicals;” “Methods that focus on reflection not on altering the atmosphere.”

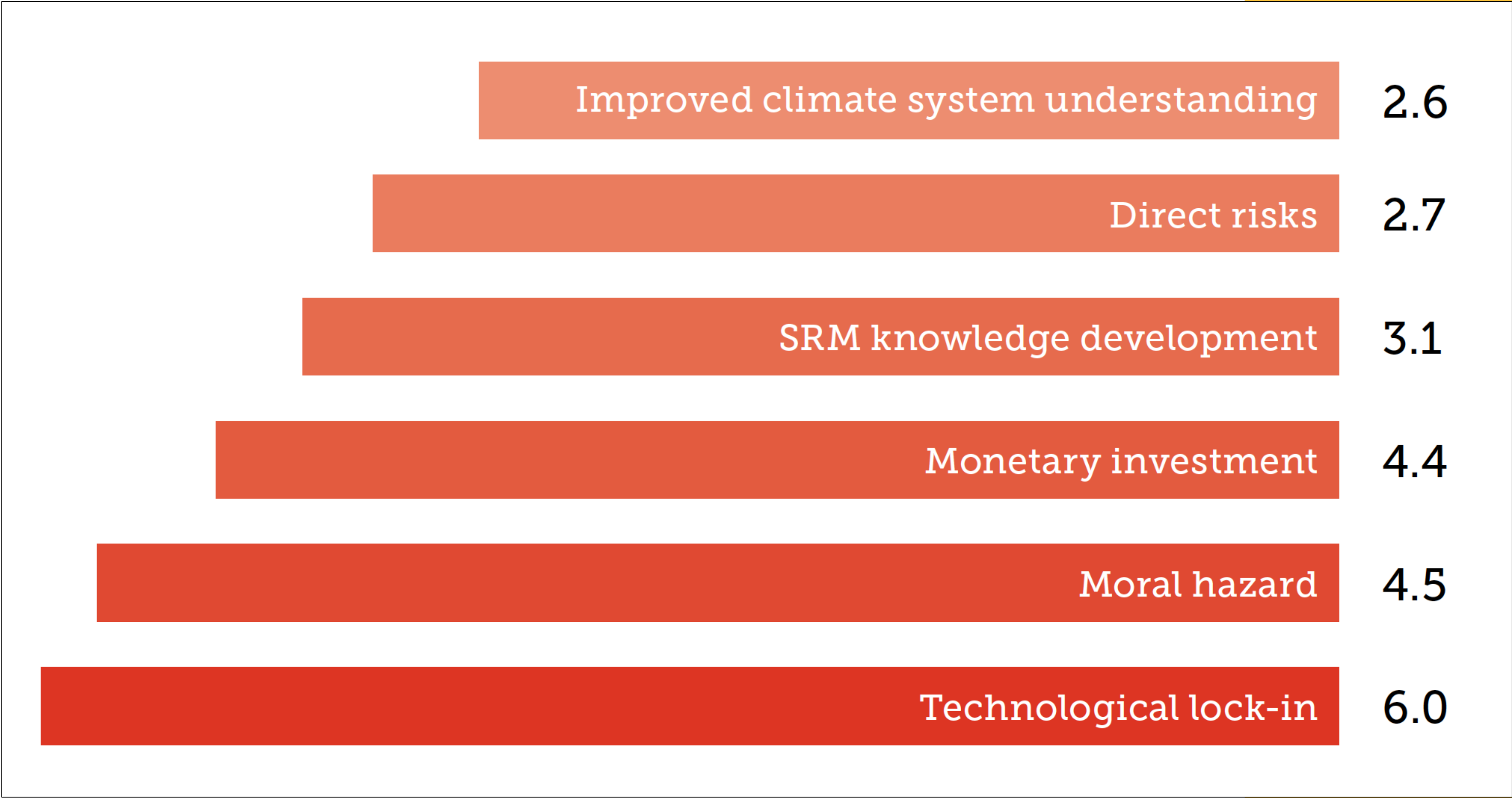
Pragmatic: “Practical, quick,...;” “Ideal for small-scale trials.”

Reversibility: “All low risk, easily stopped.”

Individual Funder Support Ratings



Issues to Consider



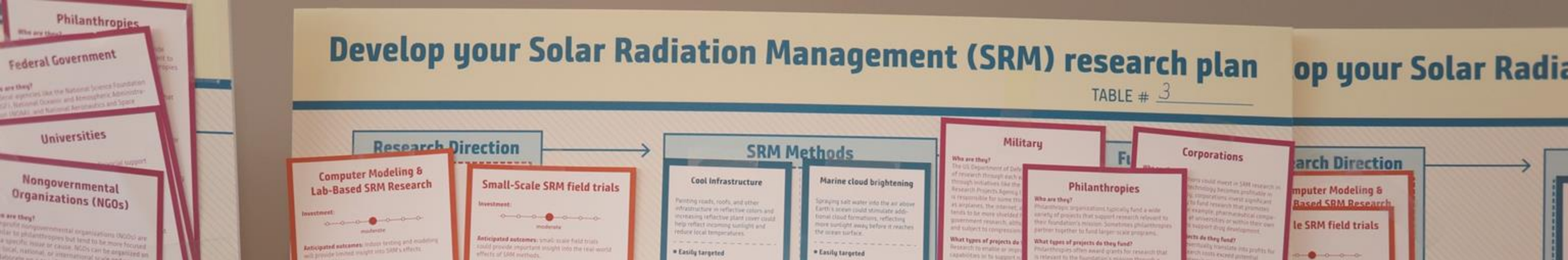
↑ Most important

↓ Least important

Conditional Acceptance

PRIMARY/SECONDARY THEME	# of Statements	PRIMARY/SECONDARY THEME	# of Statements
<i>Research Process – conditions related to research methods, data collection, outcomes, and approaches.</i>		<i>Risk & Uncertainty – concerns about risk associated with the conductance and outcomes of research.</i>	
Data accuracy and reliability	53	Unspecified risk	35
Computer and lab research first	33	Environmental risk	24
Small-scale research first	17	Moral hazard	14
Context-specific research	6	Reversibility of research	8
Many approaches strategy	6	Social impact	3
National-scale research first	3	Energy consumption of research	2
<i>Economic Cost – concerns about the cost of SRM, including political implications.</i>		<i>Governance – conditions related to governing the research process.</i>	
Large-scale research expensive	17	Appropriate governance necessary	35
Small-scale research cost effective	17	Public engagement necessary	11
Funding is political	6	Oversight and accountability	8
General statements about cost	6	Researcher autonomy	2
Private funding preferred	5	Transparency	1
Cost isn't a factor	1	Property rights	1
<i>Cooperation – assertions that cooperation is necessary or difficult to achieve.</i>			
Leads to agreement	12		
International cooperation necessary	9		
Agreement is difficult	8		
Leads to diverse ideas	5		

Three-quarters of participants set some sort of condition on SRM research



“Keep things small; govern transparently, flexibly, and inclusively; learn from past mistakes and be prepared to reverse course. Proceed—but with caution.”





**Consortium for Science,
Policy & Outcomes**
at Arizona State University



UNIVERSITY OF CALGARY
FACULTY OF LAW



Museum of Science.



ECAST

EXPERT AND CITIZEN ASSESSMENT
OF SCIENCE AND TECHNOLOGY

Public Forums on Carbon Dioxide Removal in the United States and Canada and their Application to Governance Frameworks

Project Funding from:



**Alfred P. Sloan
FOUNDATION**

Project Aim

Aim 1

Research informed **public views** on CDR technology research, development, and deployment with emphasis on ocean-based approaches in six regions in the U.S. and Canada using Participatory Technology Assessment (pTA) methodology. (Phases 1 & 2)

Aim 2

Research **modes of governance** of CDR technology research, development, and deployment with emphasis on ocean-based approaches in the U.S., Canada, and globally. (Phases 1 & 2)

Aim 3

Inform and integrate public views (Aim 1) into modes of governance (Aim 2) for CDR technology research, development, and deployment with emphasis on ocean-based approaches in the U.S., Canada, and globally. (Phase 3)

CDR pTA Project Stages

Phase 1: Problem Framing

- Literature reviews
- **25 Stakeholder interviews**
- **3 Focus groups**
- **Design workshop**

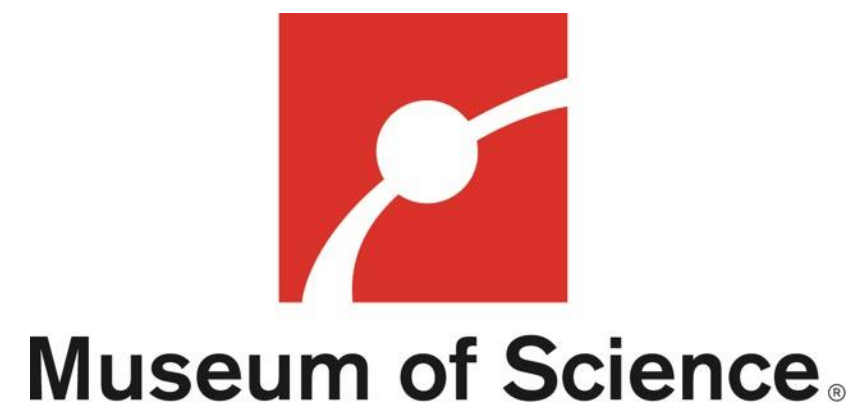
Phase 2: Citizen Deliberation

- Forum design & dev.
- Forum site selection
- Evaluations, test & training
- **6 Public forums in USA and Canada**

Phase 3: Results Integration

- Preliminary analysis
- **Results workshop**
- **Policy Briefs**
- **Research Publications**
- **Conference and Meetings**

Consortium for Community Engagement Innovation and Learning on Consent Based Siting in Arizona (CCEIL-AZ)



DOE's Consent-based Siting for
Interim Storage Program:
DE-FOA-0002575



U.S. DEPARTMENT
OF ENERGY
NUCLEAR
AWARDEE™

Overview of Process



Public Values Assessment for CBS

Overall approach guided by Participatory Technology Assessment

- **Co-development: Communities, stakeholders, experts, and project team working together**
- **Developing a variety of engagement methods to inform deliberative forums, including focus groups, storytelling, and citizen science.**
- **Qualitative and quantitative analysis of public values captured through surveys and participant observations**
 - **Equity and justice considerations to be integrated throughout the project**
- **Project evaluation focused on 1) participant activities, 2) project process, and 3) project outcomes**





Cooling a Warming Planet?
Public Forums on Climate
Intervention Research

November 2019

Final Results Report

Additional Information:

<https://cspo.org/areas-of-focus/pta/>

Questions?