



WORLD CLIMATE RESEARCH PROGRAMME

JSC-43 Update: Climate Intervention Task Team

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International
Science Council

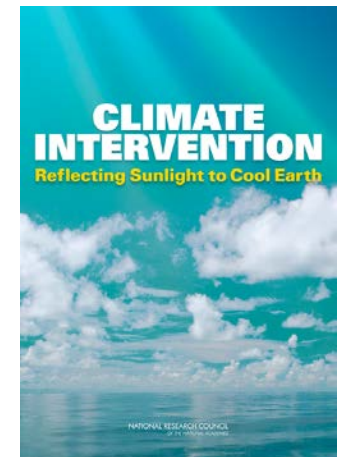
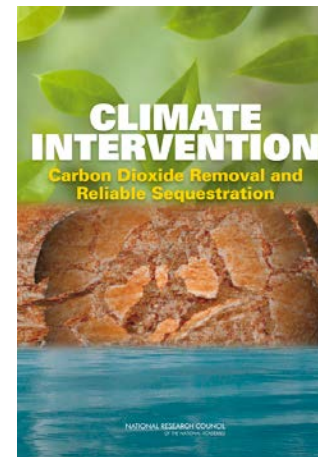


Climate Intervention

the deliberate large-scale manipulation of the planetary environment to counteract anthropogenic climate change

Royal Society 2009

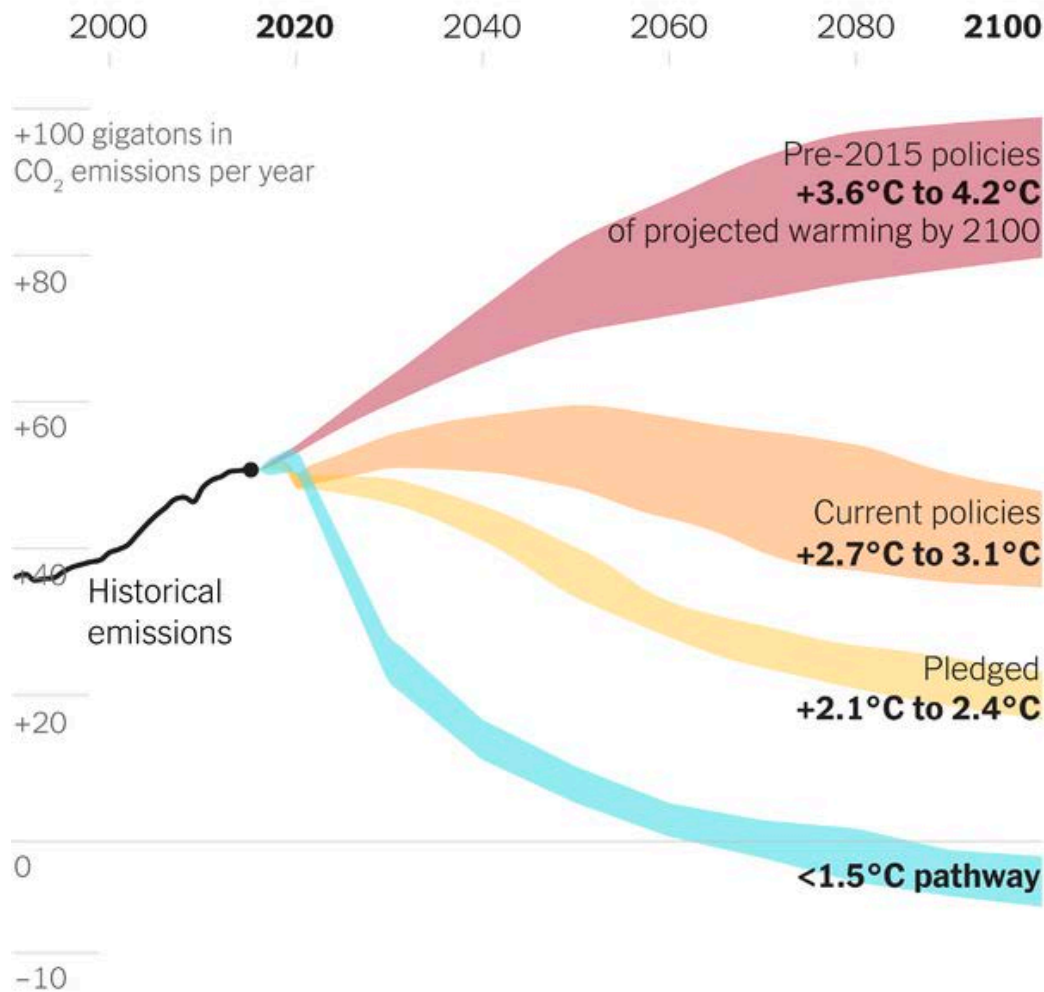
- Climate Intervention (CI) includes both **Carbon Dioxide Removal** (CDR) and **Solar Radiation Modification** (SRM)
- US National Academy Reports (2015):
 - CDR: “the removal and long-term sequestration of CO₂ from the atmosphere in order to reduce global warming”
 - SRM: Even though it is not a solution to anthropogenic climate change, much more research is needed to understand feasibility and especially impacts



Progress in Climate Mitigation

But Much More is Needed ... Including a Role for CI

Pathways of global greenhouse gas emissions



Before the Paris climate agreement, the world was on track to heat up ~4°C (7.2°F) by 2100, an outcome widely seen as catastrophic.

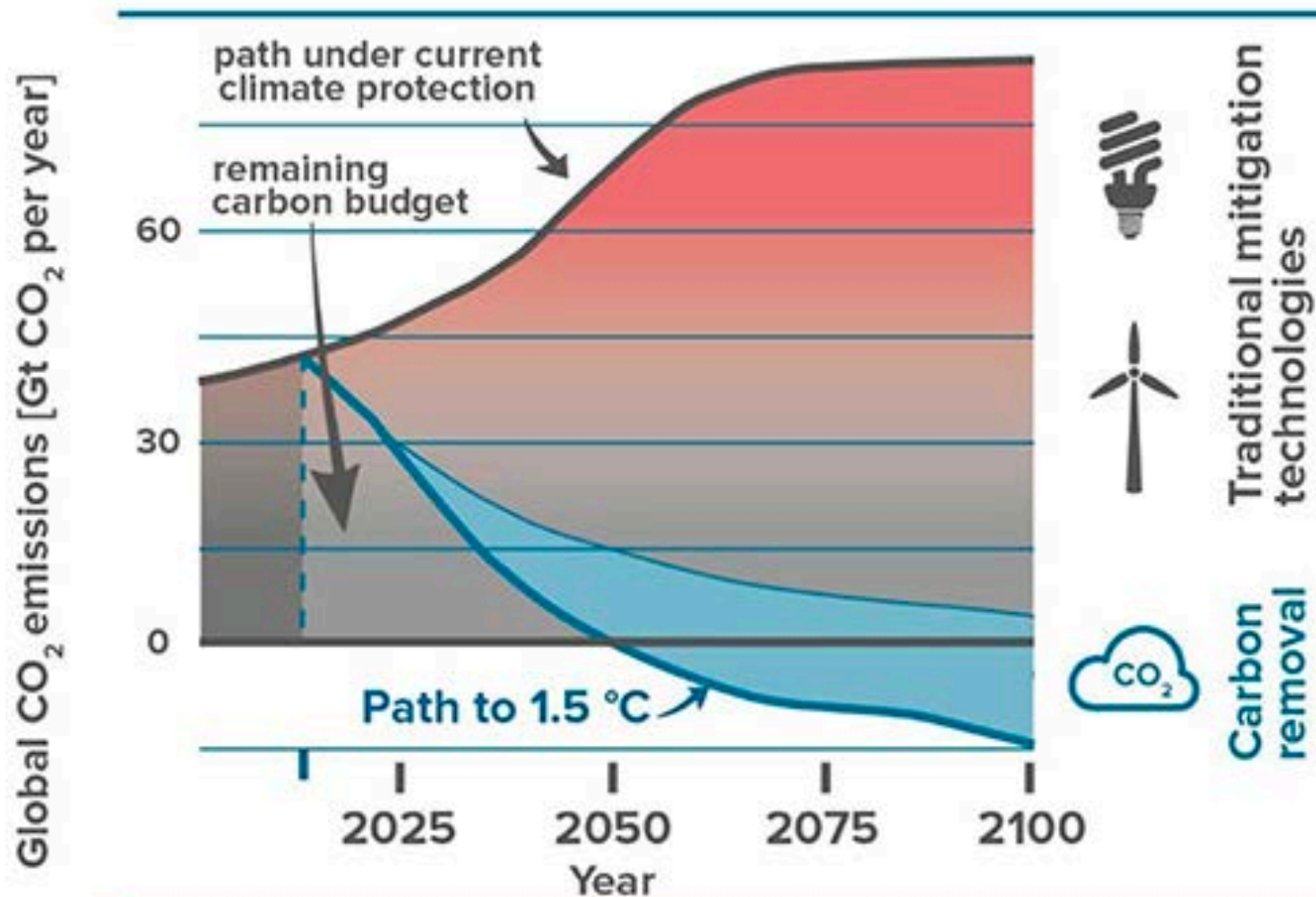
Thanks to growth in clean energy, current policies put us on pace for ~3°C of warming by 2100 — a better result, but still devastating.

Many countries have vowed to slash emissions even faster. If they follow through, the warming might be limited to just over 2°C by 2100.

Yet science says even 2° of warming is too risky. To hold global temperature rise to a safer limit of 1.5°C, far more drastic action is needed.

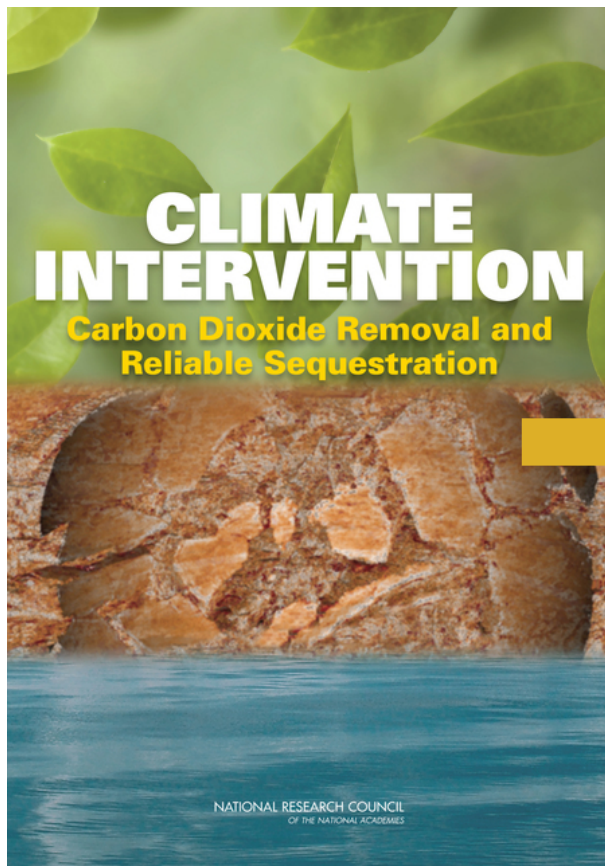
Emission Reductions and The Necessity of CDR

How to keep global warming below 1.5 °C.

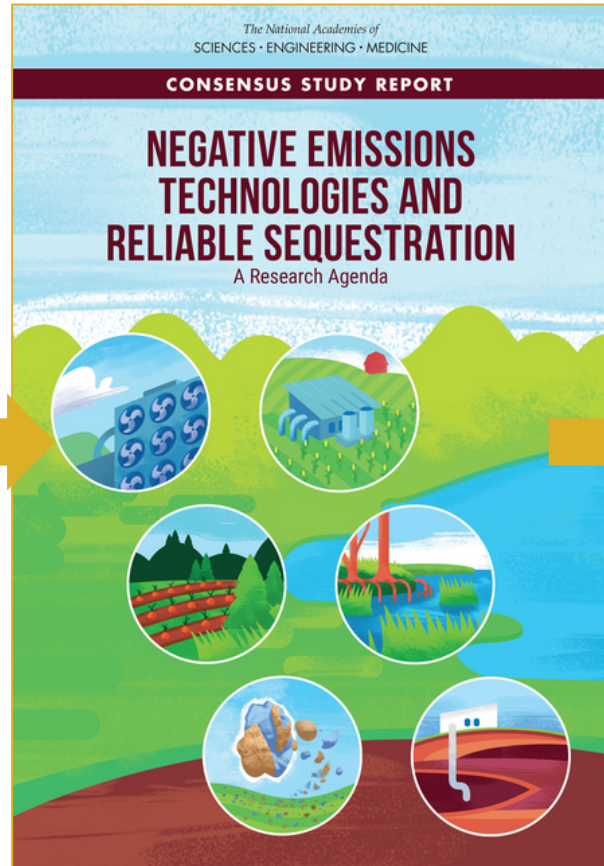


Data source: IPCC, Mercator Research Institute

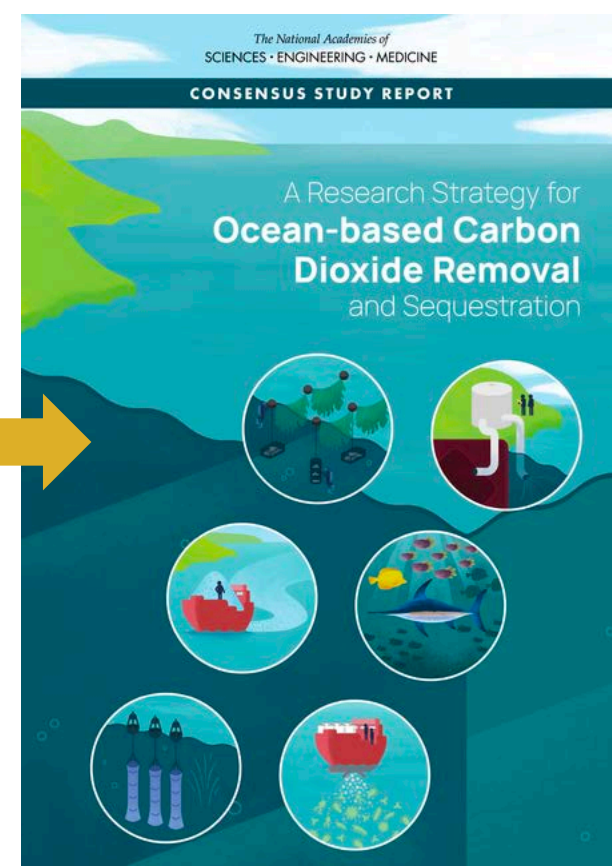
CDR – Recent U.S. Academy Reports



2015

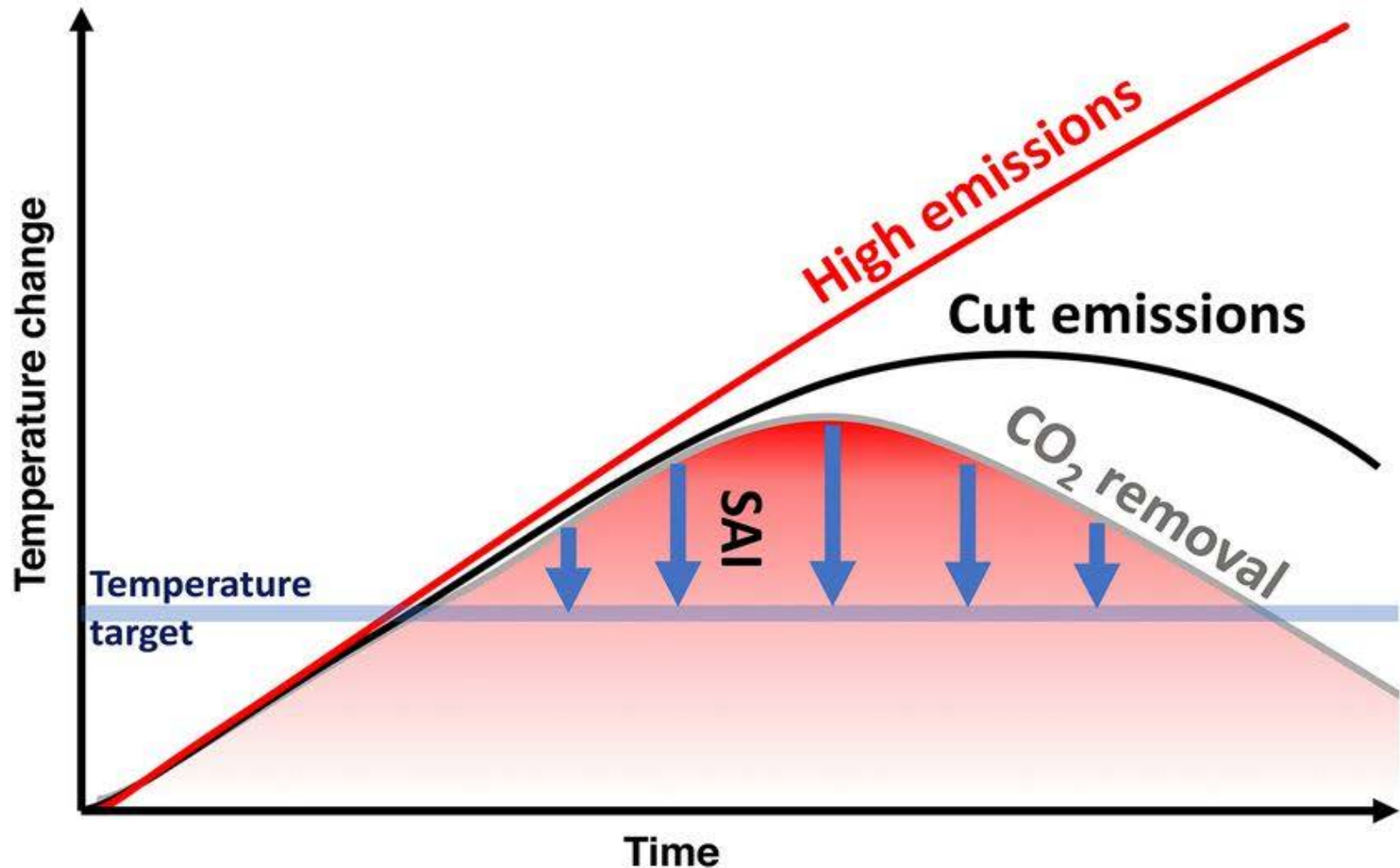


2019



2021

Is Solar Radiation Modification a Viable Tool?

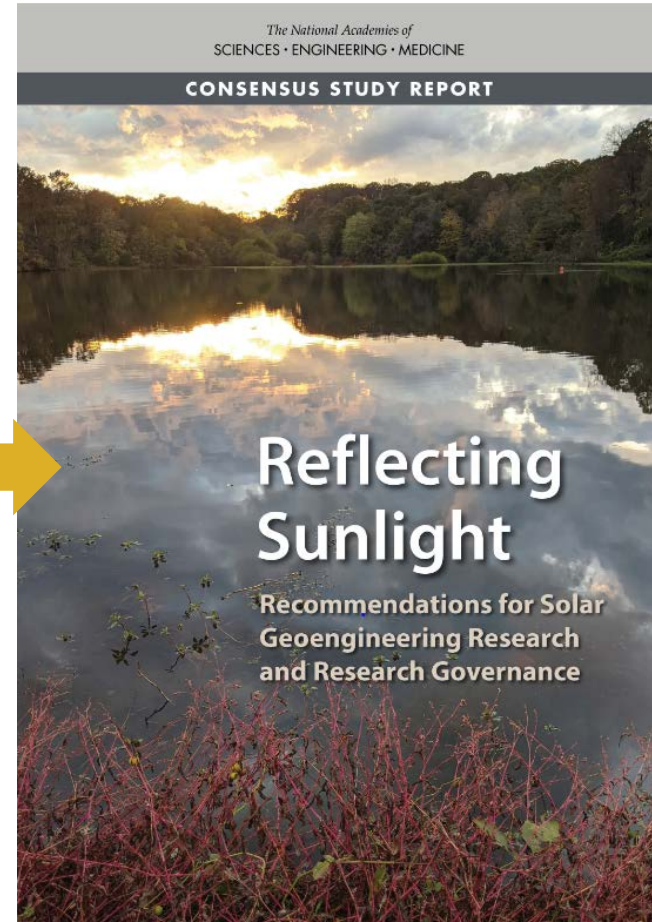


Zarnetske et al. 2021,
Proc. Nat. Acad. Sci., **118** (15)

SRM – Recent U.S. Academy Reports

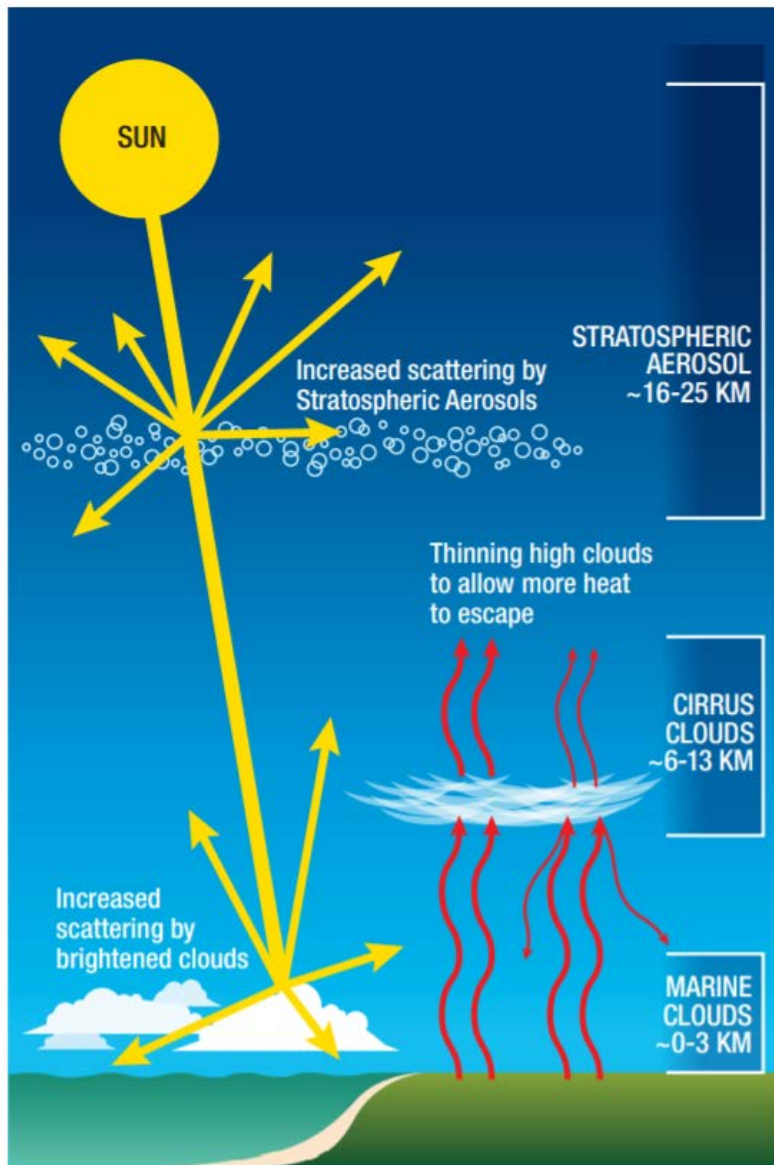


2015



2021

Solar Radiation Modification



Attempts to moderate warming by increasing the amount of sunlight that the atmosphere reflects back to space or by reducing the trapping of outgoing thermal radiation

- Stratospheric Aerosol Injection (SAI)
- Marine Cloud Brightening (MCB)
- Cirrus Cloud Thinning (CCT – not strictly SG)

Some Guiding Principles

- Given the urgent, growing risks of climate change, it is important to understand the **feasibility, efficacy, risks, and benefits** of CDR and SRM as possible response strategies in addition to **emission reductions and climate adaptation**.
- The current state of understanding of CDR and SRM is not sufficient for supporting **informed decisions**.
- Research programs should focus on developing **policy-relevant knowledge**, rather than advancing a path for deployment, and operate under robust research governance.
- Research should be **transdisciplinary** and coordinated **internationally**.
- A role for **WCRP!**

Role of WCRP

- **Climate Intervention Task Team:**
 - **Document** current research efforts in CDR and SRM – internal and external to WCRP – and those in which it makes most sense for WCRP to engage.
 - Determine the **value** WCRP could add to existing research efforts, as well as identify research gaps that WCRP could help fill.
 - Identify **partners**, including other international research programs required for transdisciplinary research.
 - Determine how CDR and SRM research efforts **best fit** within the new WCRP organizational structure
- **Final Task Team recommendations will be made to the JSC in Fall 2022**

Tentative Recommendations and Findings

- WCRP could play a major role in CI research (both CDR and SRM)
 - All core projects and LHA
 - Emphasis on evaluating feedbacks and impacts across physical and biogeochemical systems (partner for social-political systems and governance)

I. Document current research efforts in CDR and SRM

- There are a number of activities already underway within WCRP; e.g.
 - ✓ GeoMIP, Core Projects and communities (e.g., SPARC - CCMI), LHA (e.g., Safe Landings), ...
- And numerous external (in a formal sense) to WCRP; e.g.
 - ✓ US (Carbon Program, CCIS project, GMRC, SCRI, ...)
 - ✓ UK and EU (Consortia to address marine and terrestrial CDR, ...)
 - ✓ WMO 2022 Ozone Assessment, Future Earth/SOLAS, CI Biology Working Group, ...
- But, overall, ad hoc, uncoordinated and under-funded

Tentative Recommendations and Findings

2. **Determine the value WCRP could add to existing research efforts, as well as identify research gaps that WCRP could help fill**
- CI is relevant to activities across WCRP, but it is not well coordinated across different activities and communities
 - WCRP could establish an inventory of existing and planned efforts, as well as gaps, and it could help coordinate activities and plans across its core teams, including identifying and prioritizing research questions and approaches
 - WCRP could make a strong (and visible) statement in support of CI research (research does not equal endorsement)
 - WCRP could assess benefits and risks of CDR and SRM and synthesize results – playing the role of a honest broker and a well-heard voice
 - WCRP could lead or play a major role in a coherent, ongoing scientific assessment framework
 - WCRP could initiate a “CI Research Code of Conduct”, particularly relevant for field experiments but perhaps other activities, or it could lead a UN effort

Tentative Recommendations and Findings

- 3. Identify partners, including other international research programs required for transdisciplinary research**
- There are a number of relevant national programs and efforts (as mentioned earlier) but they are not coordinated, and communication across them is lacking
 - Coordination and communication with Future Earth and other international research programs is also needed, and also national academies
 - WCRP could assume a leadership role, in not only coordinating internally, but also across this broader array of efforts
 - This could include a role for WCRP in bridging science (physical and social), politics and governance
 - WCRP could initiative formal exchanges with the IPCC on CDR and SRM, possibly towards issuing an authoritative assessment report

Tentative Recommendations and Findings

4. Determine how CI research efforts best fit within the WCRP structure

- Three views have emerged:
 1. WCRP does not need another major activity or project, although coordination is needed. Leverage existing LHAs (e.g., Safe Landing Climates) and task with a coordinating role
 2. CI is an emergent topic that will gain increased attention. The amount of work to be done justifies a new LHA
 3. A limited-time working group is needed to better define options, given the number of open issues and options
- Other suggestions:
 - A WCRP CI web page that links to relevant WCRP activities (and perhaps those of partner organizations), so that researchers can more easily find them and connect with one another
 - WCRP could proactively develop webinars, targeted meetings and workshops, or commissioned papers, in collaboration with external groups

We welcome JSC input and guidance!



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Thank You!



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