

**Briefing Note on Solar Radiation Modification in the
Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6)
Working Group I: Climate Change 2021: The Physical Science Basis**

The IPCC AR6 Working Group I (WG-I) report published on 9th August 2021 assesses the physical science of climate change, including the need for emissions reductions to net-zero, Carbon Dioxide Removal (CDR) and Solar Radiation Modification (SRM). Part I of this briefing note summarises key findings from the report's assessment of SRM included in the main report and the Summary for Policymakers (SPM) as the basis. Part II provides C2G's initial analysis of the policy implications.¹ It will only be possible to make a full assessment of how AR6 deals with the issue of SRM in 2022, when the potential risks, ethics and public perceptions of the technique are expected to be assessed by WG-II (Impacts, Adaptation and Vulnerability) and SRM governance issues are expected to be addressed by both WG-II and WG-III (Mitigation of Climate Change).

Part I: Summary of key findings on SRM from the WG-I Report

- SRM techniques assessed in the IPCC report include Stratospheric Aerosol Injection (SAI), Marine Cloud Brightening (MCB), and surface albedo enhancements, all of which aim to cool the Earth by deflecting solar radiation back into space. Cirrus Cloud Thinning (CCT) seeks to lower temperatures by enabling more infrared radiation to escape from the Earth (see WG-I report, Chapter 4, table 4.7, p91 and section 4.6.3.3, p83 for more information).
- SRM is not included in the report's climate scenarios or in the Summary for Policymakers. SRM is, however, assessed elsewhere in the report. While the report notes there is currently a low level of confidence in our understanding of the climate response to SRM and specifically at the regional scale (Chapter 4, Executive Summary, p7) to inform considerations of SRM, various findings are reported, including:
 - it is conceptually possible for optimally designed SRM strategies to achieve multiple climate policy goals simultaneously (Chapter 4, section 4.6.3.3, p90);
 - SAI may be conceptually able to achieve a climate response leading to global cooling, however, the direct and indirect effects of SRM deployment would not be equal globally (Chapter 4, Section 4.6.3.3, p87-88 and Chapter 6, section 6.4.6, p56);
 - there is a high level of confidence that SRM may enhance CO₂ uptake in some circumstances, although the amount is uncertain (Chapter 5, section 5.6.3.1, p112);
 - SRM may affect crop yields, driven by changes in photosynthesis, diminished heat stress and plant and soil respiration - the cumulative balance of these effects varies across crop types and regions, thus there is an overall low level of confidence in the balance of effects on crop yields (Chapter 5, section 5.6.3.1, p112);
 - a sudden and sustained cessation of SRM would drive a rapid increase in global temperature, within a decade or two, endangering biodiversity, weakening carbon sinks (Chapter 5, section 5.6.3.2, p113), increasing precipitation and changing water cycles (Chapter 8, section 8.6.3, p115; and,
 - a gradual phase-out of SRM with concurrent emission reductions could reduce the large negative effect of sudden SRM termination (Chapter 5, Section 5.6.3.3, p113).

Part II: C2G's Analysis and Policy Implications

This part presents potential issues for consideration in relation to the governance² of Solar Radiation Modification (SRM) in light of the new findings presented in the IPCC AR6 WG-I report.

The Context: Why Discuss SRM

With a much greater degree of confidence than in earlier IPCC assessments, this report finds it is unequivocal that human influence has warmed the atmosphere, ocean and land (SPM, A.1, p5). Only two of the five scenarios for addressing the climate crisis assessed in this report would deliver the 1.5-2°C goals of the Paris Agreement (SPM, B1.1, B1.2, p17-18). Both scenarios rely on transformational emissions reductions and Carbon Dioxide Removal (CDR) measures to reach net-zero and subsequently net negative to achieve these goals (Figure SPM. 4, p15-16, Box SPM 1.1, p15). It is important to note that CDR at the levels needed in these two scenarios *does **not** currently exist*, a portfolio of CDR measures will be required, and a massive scale-up of CDR will take years if not decades.

Even in the scenario with net-zero emissions around or after 2050 (Box SPM 1.1, p15), and the greatest use of CDR, again, which currently does not exist, it is still more likely than not that global warming would overshoot 1.5 °C (SPM, B1.3, p18).

In addition, there is high level of confidence that CDR methods can have potentially wide-ranging impacts depending on the type, scale, duration and permanency of removals. Among impacts important for achieving the Sustainable Development Goals (SDGs), the report notes that CDR can influence the availability and quality of water, food production and biodiversity (SPM, D.1.4, p39). Effective governance of CDR will be critical to identify a portfolio of measures that minimize harms, maximize benefits and achieve the levels of CDR required to deliver the Paris Agreement goals.

SRM and Its Potential Policy Implications

Given these challenges, there is now growing interest in researching a variety of SRM techniques. As shown in the first part of this briefing, the WG-I report provides a limited assessment of the climate's response to these techniques. The following is a list of **initial SRM policy issues** identified by C2G.

- 1. Knowledge gaps** - Whilst the report notes it is conceptually possible for SRM, together with massive emission reductions and carbon removals, to help achieve the Paris Agreement goals, the report has low confidence in the world's current research capacity for accurately informing policy considerations of SRM. **Policymakers may wish to consider whether and how to address these knowledge gaps to inform decision making regarding SRM.**
- 2. Governance of research** - The report makes important observations about the low confidence in research capacity in this area. **Policymakers may wish to address concerns that researching SRM could distract, delay or downplay the critical need for transformative emission reductions and removals. They may also wish to weigh these concerns against the risks of not knowing whether,**

or not, SRM might be scientifically, socially, operationally, and politically viable as a possible additional climate response option.

3. **Governance gaps** - Currently there are no comprehensive international frameworks to provide space to exchange views on; to learn about the risks, benefits, and governance challenges of; and eventually to enable decision-making about SRM, leaving a governance vacuum that is itself a global risk. **Policymakers may wish to consider:**
 - **Whether, how and where to organize the needed inclusive, transparent, global discussions so that countries can together decide whether or not the risks and benefits of using SRM outweigh the risks and benefits of not using it;**
 - **Whether and how the world might minimize risks (both known and unknown) and maximize gains related to any potential use of SRM; and,**
 - **Whether and how to deal with the implications of adding SRM to - or removing it from - the list of potential climate responses.**
4. **Social appraisal** - Inclusive discussions with globally diverse audiences, including the voices and views of climate-vulnerable communities and drawing on multiple disciplines, could help to address the high level of complexity associated with any policy position on SRM. In addition, they could improve understanding of varying levels of risk tolerance and build a greater common understanding of the evidence base. **Policymakers may wish to consider whether and how to encourage and support such activities.**
5. **Multilateral discussions**, such as within the UN, could raise awareness and broaden understanding of the potential risks, benefits and governance challenges and opportunities around different climate response options (with and without SRM). Global discussions, knowledge sharing and reviews of SRM by entities like the UN Environment Assembly (UNEA) as well as assessments of the latest science by the IPCC may be useful. Such additional information could then help inform an initial consideration by the UN General Assembly (UNGA) of how SRM could be addressed in a sustainable development framework, and how it might or might not be considered a technique to address climate-induced global tipping points. **Policymakers may wish to consider whether and how to advance considerations of these issues in relevant intergovernmental bodies informally, as well as formally.**

This briefing is based on the [AR6 Working Group I report](#). Please notify contact@c2g2.net of any suggested corrections. This publication may be reproduced with acknowledgement of C2G.

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¹ More detailed information about emerging approaches to altering the climate and their governance is available on the C2G website: www.c2g2.net in addition, the [C2G Glossary](#) may provide useful information for those new to this topic.

² A comprehensive and inclusive concept of the full range of means for deciding, managing, implementing, and monitoring policies and measures ([IPCC SR15 Glossary](#), p550).