Briefing note on Solar Radiation Modification

Moral hazard – Moral imperative

Key Messages

- There are multiple potential risks as well as benefits – both known and unknown – in researching, developing or potentially deploying solar radiation modification (SRM) to temporarily limit global warming. However, overshooting the Paris Agreement temperature goals and insufficient global mitigation and adaptation also entails risks for both humanity and the ecosystems we depend on for survival.
- Some say SRM could potentially be seen as a 'quick technological fix' that deters urgently needed action to reduce emissions and adapt to inevitable climate impacts, calling it a *moral hazard.*
- Others note that faced with increasing exposure and vulnerability to climate hazards, SRM could have potentially positive impacts, including for climate vulnerable populations at risk from extreme heat or those approaching potential climate tipping points. In this view, there is a *moral imperative* to explore SRM's potential, in light of inadequate climate action, and the increasing likelihood of exceeding 1.5ºC.
- There is currently no international consensus as to whether considering research or potential deployment of SRM would be a moral hazard or moral imperative to delivering the overall goals of the Paris Agreement, reducing human suffering, and protecting vital ecosystems. There is also currently no international process for addressing this challenge.

Context

- Our planet is getting hotter and human-induced climate change has already caused widespread adverse impacts and poses additional severe risks if global warming exceeds 1.5ºC.[1]
- Inadequate progress in reducing global greenhouse gases means that even with the deepest emissions reductions and removals scenarios assessed by the IPCC, it is now more likely than not that warming will exceed 1.5°C.[2] Almost half the people on the planet (and the ecosystems on which life depends) are already highly vulnerable to climate change[3] and despite some progress with adaptation, many gaps exist[4] and adaptation will reach limits with increased warming.[5]
- In addition to the primary focus on deep and rapid climate mitigation and adaptation, another approach – known as solar radiation modification (SRM) – is being explored to temporarily limit global warming (for example, if 1.5°C is exceeded), by enhancing the Earth's reflectivity.[6] SRM is coming under increasing scientific and public scrutiny. Further research could help contribute to a better understanding of the relative risks – with or without SRM – in a rapidly warming world. Some governments and non-state actors are investing into SRM research.[7]
- However, there is currently no dedicated, comprehensive international framework or fora to inform, guide and connect governance processes for SRM research, development, demonstration, or deployment. This in itself poses serious risks given that SRM would affect every country on the planet, but not necessarily equally.[8]

Moral hazard – Moral imperative

- Moral hazard is a term taken from the world of economics and refers to the reduced incentive to guard against risk when protected from its consequences, e.g., by insurance.
- SRM raises moral hazard[9] concerns around the risk that its availability (or even potential availability) might be viewed as a substitute for the transformative emission reductions and adaptation efforts needed to address the root cause of climate change and its wider impacts.[10,11] Moral hazard concerns may be further compounded by evidence that suggests some SRM methods could potentially alter the global mean temperature much faster than any other climate policy measure, at a comparatively lower direct cost.[12]
- Moral hazard concerns have previously been raised in relation to climate adaptation[13] and (more recently) large-scale carbon dioxide removal[14] although the need to pursue both these options, in addition to emissions reductions, is now widely accepted.[15] Nevertheless, societal acceptability of SRM research or its prospective deployment is considered to be partly contingent on how its moral hazard concerns are addressed.[16]
- Scholars have suggested various means to avoid or lessen potential moral hazard outcomes, among which are encouraging diverse SRM research avenues and methods; limiting research to low-risk techniques or to governance matters; subjecting research to breakpoints or stage gates (restricting progress subject to satisfaction of agreed criteria), or moratoria; communicating carefully, engaging proactively with publics and decision-makers; and internationally linking mitigation and SRM policies.[17]
- There is some evidence for a reverse moral hazard effect, namely that introducing consideration of SRM could actually increase motivations to reduce greenhouse gas emissions.[18] The argument that SRM research increases the likelihood of deployment (the 'slippery slope' argument), is also made, but some also found an opposite effect.[19]
- Concerns over inadequate action and plans to reduce greenhouse gas emissions have led some scholars and others to argue that SRM research is important now given that many parts of the world are already experiencing significant negative impacts of climate change and SRM might be able to reduce the severity of some of these impacts (at least temporarily) while emissions are being stabilized.[20] Others disagree.[21]
- Scholars have also argued that in the face of a potentially urgent future political need for knowledge (for example, in a scenario of extreme climate change where international sentiment could shift in favour of SRM) there would be a moral imperative to research SRM now to ensure sound information is available to advise future generations, including decision-makers on the potential risks and benefits involved.[22]
- Human rights concerns are another factor in the moral hazard/moral imperative calculus. A recent (2021) assessment by the US National Academies of Science highlights that research that advances understanding of the potential impacts of SRM on human rights could be consistent with the protection of such rights, which includes the right to enjoy the benefits of scientific research.[23] This issue is being explored by the Advisory Committee to the UN Human Rights Council, to be presented in a report to the Council in its fifty-fourth session.[24]
- The UNESCO World Commission on the Ethics of Scientific Knowledge and Technology (COMEST) is exploring the ethical dimensions around SRM in relation to the application and interpretation of the UNESCO Declaration of Ethical Issues in Relation to Climate change. For example, should the prevention of harm (Article 2) be seen as a moral duty or a moral impediment to exploring SRM? Does the precautionary approach (Article 3) support hesitancy in intervention, or an urgent need for action? Would SRM strengthen or undermine delivery of Sustainable Development (Article 5)?[25]

Notes and references

[1] IPCC (2022). Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change Cambridge University Press. Available from: www.ipcc.ch/report/ar6/wg2/

[2] In the lowest (very low) emissions scenario, the IPCC assess that it is it is more likely than not (>50% chance) that global surface temperature would decline back to below 1.5°C toward the end of the 21st century, with a temporary overshoot of no more than 0.1°C above 1.5°C global warming. See: IPCC (2021). Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 3−32. Available from: https://www.ipcc.ch/report/ar6/wg1/ (SPM B.1.3)

[3] IPCC (2022). Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change Cambridge University Press. Available from: www.ipcc.ch/report/ar6/wg2/ (SPM B.2)

[4] IPCC (2022). Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change Cambridge University Press. Available from: www.ipcc.ch/report/ar6/wg2/ (SPM C.1) See also: UNEP Adaptation Gap Report (2021) https://www.unep.org/resources/adaptation-gap-report-2021

[5] IPCC (2022). Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change Cambridge University Press. Available from: www.ipcc.ch/report/ar6/wg2/ (SPM C.3)

[6] SRM refers to proposals to increase the reflection of shortwave radiation (sunlight) back to space to counteract anthropogenic warming and some of its harmful impacts. A number of SRM options have been proposed, including: Stratospheric Aerosol Injection (SAI), Marine Cloud Brightening (MCB), Ground-Based Albedo Modifications (GBAM), and Ocean Albedo Change (OAC). For more detail, see: IPCC (2022). Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Available from: www.ipcc.ch/report/ar6/wg3/ (Chapter 14 Cross Working Group Box 4).

[7] C2G (2022). Status of global activities relating to solar radiation modification and its governance. 17 May 2022. Carnegie Climate Governance Initiative (C2G). Carnegie Council for Ethics in International Affairs. New York. Available from: https://bit.ly/GlobalSRM_TB (Accessed on: 07 July 2022).

[8] IPCC (2022). Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Available from: www.ipcc.ch/report/ar6/wg3/ (Chapter 14 Cross Working Group Box 4).

[9] Moral hazard in relation to SRM is also variously referred to as risk compensation, or mitigation deterrence, obstruction, or displacement. See: Reynolds, J., Ghosh, A., Harihar, N., Jain, P. (2022). Solar Radiation Modification: Governance gaps and challenges. Carnegie Climate Governance Initiative (C2G), New York. Available from: https://bit.ly/GlobalSRM_TB

[10] National Academies of Sciences, Engineering, and Medicine (2021). Reflecting Sunlight: Recommendations for Solar Geoengineering Research and Research Governance. Washington, DC: The National Academies Press. Available from: https://doi.org/10.17226/25762 (p121)

[11] According to the IPCC, addressing climate change risks cannot rely on SRM as the main policy response to climate change. SRM is, at best, a supplement to achieving, globally, sustained net zero or net negative CO2 emission levels. See: IPCC (2022). Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Available from: www.ipcc.ch/report/ar6/wg3/ (Chapter 14 Cross Working Group Box 4).

[12] IPCC (2022). Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK and New York, NY, USA. Available from: www.ipcc.ch/report/ar6/wg3/ (14.4.5.1)

[13] Lin, A. (2013). Does Geoengineering Present a Moral Hazard? Ecology Law Quarterly Vol. 40, No. 3 (2013), pp. 673-712. Available from: https://www.jstor.org/stable/24113611

[14] IPCC (2018). Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. In Press. Available from: https://www.ipcc.ch/sr15/ (Chapter 4 Table 4.6)

[15] IPCC (2021). Sixth Assessment Report of the Intergovernmental Panel on Climate Change Cambridge University Press. Available from: www.ipcc.ch/report/ar6

[16] National Academies of Sciences, Engineering, and Medicine (2021). Reflecting Sunlight: Recommendations for Solar Geoengineering Research and Research Governance. Washington, DC: The National Academies Press. Available from: https://doi.org/10.17226/25762 (p121)

[17] Reynolds, J., Ghosh, A., Harihar, N., Jain, P. (2022). Solar Radiation Modification: Governance gaps and challenges. Carnegie Climate Governance Initiative (C2G). New York. Available from: https://bit.ly/SRMGovGaps

[18] Merk, C., Pönitzsch, G. and Rehdanz, K. (2016). Knowledge about aerosol injection does not reduce individual mitigation efforts. *Environ. Res. Lett.* 11 054009. Available from: https://doi.org/10.1088/1748-9326/11/5/054009

[19] IPCC (2018). Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. In Press. Available from: https://www.ipcc.ch/sr15/ (4.3.8.3)

[20] National Academies of Sciences, Engineering, and Medicine (2021). Reflecting Sunlight: Recommendations for Solar Geoengineering Research and Research Governance. Washington, DC: The National Academies Press. Available from: https://doi.org/10.17226/25762 (p121)

[21] Biermann, F., Oomen, J., Gupta, A., Ali, S. H., Conca, K., Hajer, M. A., Kashwan, P.,Kotzé, L. J., Leach, M., Messner, D., Okereke, C., Persson, Å., Potoc̆nik, J., Schlosberg, D., Scobie, M., &VanDeveer, S. D. (2022). Solar geoengineering: The case for an international non-use agreement. WIREs Climate Change,13(3), e754. Available from: https://doi.org/10.1002/wcc.754

[22] Lawrence, M. G., and P. J. Crutzen (2017). Was breaking the taboo on research on climate engineering via albedo modification a moral hazard, or a moral imperative?, Earth's Future, 5, 136–143. Available from: https://doi.org/10.1002/2016EF000463

[23] National Academies of Sciences, Engineering, and Medicine (2021). Reflecting Sunlight: Recommendations for Solar Geoengineering Research and Research Governance. Washington, DC: The National Academies Press. Available from: https://doi.org/10.17226/25762 (p106).

[24] UNHRC (2021). Mandate of the Special Rapporteur on the Promotion and Protection of Human Rights in the Context of Climate Change: resolution / adopted by the Human Rights Council on 8 October 2021. Resolution A/HRC/RES/48/14. Available from: https://digitallibrary.un.org/record/3945637?ln=en (para 6)

[25] UNESCO (2021). World Commission on the Ethics of Scientific Knowledge and Technology (COMEST Concept note of COMEST on the ethics of climate engineering. Available from: https://unesdoc.unesco.org/ark:/48223/pf0000379991

Further briefings, information and learning resources are available at: www.c2g2.net

This content of this briefing note was prepared in good faith, based on the most recent high quality evidence sources available, and according to C2G's mission and principles. Corrections welcomed. Please notify contact@c2g2.net of errata.

Original version published on 9 August 2022 (English).