

Further reading recommended by speakers from the webinar:

***"A briefing and discussion on solar geoengineering:
science, ethics and governance"***

**Hosted by the Forum on Climate Engineering Assessment
(FCEA) and the Carnegie Climate Geoengineering Governance
Initiative (C2G2) on 16th May 2017**

**Webcast video recording, transcript and slides
available at: www.c2g2.net**

Solar Geoengineering Science

Current status of emissions, CDR, and analysis of various overshoot scenarios

Rogelj, J. *et al.* (2016) Paris Agreement climate proposals need a boost to keep warming well below 2 °C. *Nature* 534, 631–639.

Fuss, S. *et al.* (2014), Betting on negative emissions. *Nat. Clim. Change* 4,850–853.

Ricke, K.L., R.J. Millar and D.G. MacMartin, “Constraints on global temperature target overshoot”, *submitted*.

Recent references with more detail on geoengineering; the first here is a good recent review article, the second two are short ones with some specific (and obvious) focus

Irvine, P. J., B. Kravitz, M. G. Lawrence, and H. Muri (2016), “An overview of the Earth system science of solar geoengineering”, *WIREs Clim. Change*, 7, 815–833, doi:10.1002/wcc.423.

Keith, D.W. and Irvine, P.J. (2016) “Solar geoengineering could substantially reduce climate risks - A research hypothesis for the next decade.” *Earth's Future*, 4:549--559. doi:10.1002/2016EF000465.

MacMartin, D. G., B. Kravitz, J.C.S. Long, and P.J. Rasch (2016), “Geoengineering with stratospheric aerosols: what do we not know after a decade of research?” *Earth's Future*, 4, 543-548. doi: [10.1002/2016EF000418](https://doi.org/10.1002/2016EF000418)

Some of the most recent simulation results for stratospheric aerosols

Kravitz, B., D. G. MacMartin, M. J. Mills, J. H. Richter, S. Tilmes, J.-F. Lamarque, J. J. Tribbia and F. Vitt, “First simulations of designing stratospheric sulfate aerosol geoengineering to meet multiple simultaneous climate objectives”, *submitted*.

MacMartin, D.G., B. Kravitz, S. Tilmes, J. Richter, M. Mills, J.-F. Lamarque, J.J. Tribbia, and F. Vitt, “The climate response to stratospheric aerosol geoengineering can be tailored using multiple injection locations” *submitted*.

Tilmes, S., B. M. Sanderson, and B. O’Neill (2016), Climate impacts of geoengineering in a delayed mitigation scenario, *Geophys. Res. Lett.*, *43*, 8222–8229, doi:10.1002/2016GL070122.

Survey of experiments (a few years old)

Keith, D. W., R. Duren and D. G. MacMartin (2014), “Field experiments on Solar Geoengineering: An exploration of a representative research portfolio”, *Phil. Trans. Royal Soc. A.*, *372*(2031),. doi: [10.1098/rsta.2014.0175](https://doi.org/10.1098/rsta.2014.0175)

Cost Analysis

McClellan, J., D. W. Keith and J. Apt (2012), “Cost analysis of stratospheric albedo modification delivery systems”, *Environ. Res. Lett.* *7*.

On learning from analogs

Robock, A., MacMartin, D.G., Duren, R., and Christensen, M.W. (2013), “Studying geoengineering with natural and anthropogenic analogs,” *Climatic Change*,*121*(3): 445-458. (doi: [10.0007/s10584-013-0777-5](https://doi.org/10.0007/s10584-013-0777-5))

On adaptive management; detection for learning where models might not be right

Chris, R. (2015). “Systems Thinking for Geoengineering Policy: How to reduce the threat of dangerous climate change by embracing uncertainty and failure.” *Routledge*.

MacMartin, D. G., Kravitz, B., Keith, D. W., and Jarvis, A. (2014), “Dynamics of the coupled human-climate system resulting from closed-loop control of solar geoengineering”, *Climate Dynamics*, *43*(1-2): 243-258. (doi: [10.1007/s00382-013-1822-9](https://doi.org/10.1007/s00382-013-1822-9))

MacMartin, Irvine, Kravitz, Horton, “Characteristics of a solar geoengineering deployment: Considerations for governance” (*Currently just a working paper but will submit somewhere; talks about timescales for detectability, managing uncertainty*)

Forthcoming works include:

MacMartin, D.G., Ricke, K.L., Keith D. W., “Solar Geoengineering as part of an overall strategy for meeting the 1.5C Paris target”, currently being drafted for special issue of Phil. Trans. Royal Soc. A, *to be published late [2017] (includes projected climate impacts for a 1.5C target, title will likely evolve before submitting.)*

Governance of Solar Geoengineering

Overviews

Suarez, P. and van Aalst, M. K. (2017), “Geoengineering: A humanitarian concern.” *Earth's Future*, 5: 183–195. doi:10.1002/2016EF000464

Preston, Christopher J., (2013). “Ethics and Geoengineering: Reviewing the Moral Issues Raised by Solar Radiation Management and Carbon Dioxide Removal.” *Wiley Interdisciplinary Reviews: Climate Change* 4 (1): 23–37. doi:10.1002/wcc.198.

On more specific issues

Buck, HJ, (2016). “Rapid scale-up of negative emissions technologies: social barriers and social implications.” *Climatic Change*, 139(2): 155-167.

Buck, HJ, (2015). “On the possibilities of a charming Anthropocene.” *Annals of the Association of American Geographers*, 105(2): 369-377.

Buck, HJ, (2014), Andrea Gammon, and Christopher Preston. “Gender and Geoengineering.” *Hypatia: A Journal of Feminist Philosophy*, 29: 651–669.

Buck, HJ, (2014). “Village Science Meets Global Discourse: The Haida Salmon Restoration Corporation’s Ocean Fertilization Experiment.” In *Geoengineering Our Climate: Ethics, Politics, Governance*, <https://geoengineeringourclimate.com/2014/01/14/village-science-meets-global-discourse-case-study/>

Buck, HJ, (2013). "Climate engineering: Spectacle, tragedy or solution? A content analysis of news media framing." In *Interpretive Approaches to Global Climate Governance: Deconstructing the Greenhouse*, eds. Chris Methmann, Delf Rothe, Benjamin Stephan, New York: Routledge.

Buck, HJ, (2012). "Climate Remediation to Address Social Development Challenges: Going Beyond Cost-Benefit and Risk Approaches to Assessing Solar Radiation Management." *Engineering the Climate: The Ethics of Solar Radiation Management*, edited by Christopher Preston: Lexington.

Buck, HJ, (2012). "Climate engineering: re-making climate for profit, or humanitarian intervention?" *Development and Change*, 43(1): 253-270.

Elliott, Kevin, (2010). "Geoengineering and the Precautionary Principle." *International Journal of Applied Philosophy* 24 (2): 237-53.

Gardiner, Stephen M., (2010). "Is 'Arming the Future' with Geoengineering Really the Lesser Evil? Some Doubts about the Ethics of Intentionally Manipulating the Climate System." In *Climate Ethics*, edited by Stephen M Gardiner, Simon Caney, Dale Jamieson, and Henry Shue, 284-312. New York: Oxford University Press.

Hartzell-Nichols, Lauren, (2012). "Precaution and Solar Radiation Management." *Ethics, Policy & Environment* 15 (2): 158-71.

Morrow, David R., (2014). "Starting a Flood to Stop a Fire: Some Moral Constraints on Solar Radiation Management." *Ethics, Policy & Environment* 17 (2).

Preston, Christopher J. (Ed.), (2016). *Climate Justice and Geoengineering: Ethics and Policy in the Atmospheric Anthropocene*. London: Rowman & Littlefield Intl.

Preston, Christopher J. (Ed.), (2012). *Engineering the Climate: The Ethics of Solar Radiation Management*. Lanham, Maryland: Lexington Books.

Svoboda, Toby, Klaus Keller, Marlos Goes, and Nancy Tuana, (2011). "Sulfate Aerosol Geoengineering: The Question of Justice." *Public Affairs Quarterly* 25 (3): 1-42.

Forthcoming works include:

Buck, HJ and Ilona Mettiäinen. "Is the problem global mean temperatures, or political will? Navigating varied problem definitions while co-producing

research about albedo modification in the Arctic”, *Forthcoming*.

Buck, HJ. “Climate technology futures in California’s Imperial Valley: Insights from examining negative emission technologies at the landscape scale”, *Forthcoming*.

Buck, HJ. “Perspectives on albedo modification from Finnish Lapland: Viewing a global imaginary from a regional context”, *Forthcoming*.

Buck, HJ. “Climate engineering and climate-induced migration: when two emerging policy challenges intersect.” *Contribution to forum on Climate Engineering Governance: Institutions, Engagement, and Ethics, Forthcoming*.

Buck, HJ. “Climate engineering doesn’t stop ocean acidification”: addressing harms to ocean life in geoengineering imaginaries. In *Ocean Legalities: The Law and Life of the Sea*, eds. Irus Braverman and Elizabeth Johnson, Duke University Press, Forthcoming.

Moreno-Cruz, Juan, Jane Flegal, Anna-Maria Hubert, and David R. Morrow. “Geoengineering — A Review.” *Annual Review of Environment and Resources* 43. Forthcoming.

Svoboda, Toby, (2017). *The Ethics of Climate Engineering: Solar Radiation Management and Non-Ideal Justice*. Abingdon: Routledge.

Further useful references:

<http://www.umt.edu/ethics/resourcecenter/Bibliography/>