



Introductory Reading - Overview of research

Schäfer, S., M., et al. (2015). The European Transdisciplinary Assessment of Climate Engineering (EuTRACE): [Removing Greenhouse Gases from the Atmosphere and Reflecting Sunlight Away from Earth](#).

Shepherd, J. G. et al. (2009) [Geoengineering the Climate: Science Governance and Uncertainty](#). The Royal Society. London. UK. ISBN: 978-0-85403-773-5*

UNEP (2017). [Bridging the gap - Carbon Dioxide Removal](#). Chapter 7 in The 2017 Emissions Gap Report. United Nations Environment. Nairobi. Kenya*

Introductory Reading - Commentary

ETC Group and the Heinrich Boll Foundation (2017). [A Civil Society Briefing on Geoengineering – Climate Change, smoke and mirrors](#). ETC Group and the Heinrich Boll Foundation

MacMartin D. G., Ricke, K.L and Keith, D.W. (2018). [Solar geoengineering as part of an overall strategy for meeting the 1.5°C Paris target](#). Phil. Trans. R. Soc. A 376: 20160454.*

Morton, O. (2015). [The Planet Remade: How Geoengineering Could Change the World](#). Princeton University Press, Princeton, NJ. ISBN 9780691148250

Pasztor, J., (2017). [The Need for Governance of Climate Geoengineering](#). Ethics and International Affairs. Vol. 31 Issue 4. Cambridge University Press. UK.*

Suarez, P. and van Aalst, M. K. (2017). [Geoengineering: A humanitarian concern](#). *Earth's Future*, 5: 183–195.*

Introductory Video

[Engineering the Climate?](#) IASS Potsdam (2014)

Further Reading - Geoengineering research

Overviews:

Morton, O. (2015). *The Planet Remade: How Geoengineering Could Change the World*. Princeton University Press, Princeton, NJ. ISBN 9780691148250

Schäfer, S., M., et al. (2015). The European Transdisciplinary Assessment of Climate Engineering (EuTRACE): Removing Greenhouse Gases from the Atmosphere and Reflecting Sunlight Away from Earth.

Solar Geoengineering:

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., 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*

MacMartin D. G., Ricke, K.L and Keith, D.W. (2018). Solar geoengineering as part of an overall strategy for meeting the 1.5°C Paris target. *Phil. Trans. R. Soc. A* 376: 20160454. <http://dx.doi.org/10.1098/rsta.2016.0454>*

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*

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

National Research Council (2015b). *Climate Intervention: Reflecting Sunlight to Cool Earth*. Washington, DC: The National Academies Press.*

Carbon Removal:

Burns, W. (2018). Carbon Dioxide Removal/Negative Emissions Technologies Bibliography. Forum for Climate Engineering Assessment. <http://ceassessment.org/cdrnets-bibliography/>

Fuss, S., et al. (2016). Research priorities for negative emissions. *Environmental Research Letters* 11(11).*

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

Haszeldine, R.S, et al. (2018). Negative emissions technologies and carbon capture and storage to achieve the Paris Agreement commitments. *Phil. Trans. R. Soc. A* 376: 20160447. <http://dx.doi.org/10.1098/rsta.2016.0447>*

National Research Council (2015a). *Climate Intervention: Carbon Dioxide Removal and Reliable Sequestration*. Washington, DC: The National Academies Press*

UNEP (2017). Carbon Dioxide Removal. Chapter 7 in *The 2017 Emissions Gap Report*. United Nations Environment. Nairobi. Kenya*

Further Reading - Governance of Geoengineering

Overviews:

Blackstock, J. and Ghosh, A. (2011). *Does Geoengineering Need a Global Response – and of What Kind?* Working Paper of the Solar Radiation Management Initiative. Council on Energy, Environment and Water. India.

Bodansky, D. (2013). The who, what, and wherefore of geoengineering governance. *Climatic Change* 121, 539–551. doi:10.1007/s10584-013-0759-7*

Bodle, R. S. et al. (2014). *Options and Proposals for the International Governance of Geoengineering*. Berlin: Ecologic Institute. Commissioning Organization: The German Federal Environment Agency (Umweltbundesamt).

Bracmort, K. et al. (2010) *Geoengineering: Governance and Technology Policy*. Washington, DC: Congressional Research Service.

Craik, A.N. and Burns, W. (2016). *Climate Engineering under the Paris Agreement: A legal and policy primer*. Centre for International Governance Innovation.*

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

Ghosh, A. (2014). *Geoengineering Our Climate? Ethics, Politics and Governance*.

Working Paper. Environmental Institutions, International Research Programmes and Lessons for Geoengineering Research.

Morrow, D. (2017). International Governance of Climate Geoengineering. A survey of Reports on Climate Geoengineering 2009-2015. Forum for Climate Engineering Assessment. FCEA Working Paper Series: 001 SSRN: 2982392.

Nicholson, S., Jinnah, S. and Gillespie, A. (2017): Solar radiation management: a proposal for immediate polycentric governance, *Climate Policy*, DOI:10.1080/14693062.2017.1400944*

Olson, R. (2011). *Geoengineering for Decision Makers: Science and Technology*. Washington, DC: Woodrow Wilson International Center for Scholars.*

Pasztor, J., Scharf, C. and Schmidt, K. (2017). How to Govern Geoengineering?, Editorial, *Science* 21 Jul 2017: Vol. 357, Issue 6348, pp. 231 DOI: 10.1126/science.aan6794*

Pasztor, J., (2017). The Need for Governance of Climate Geoengineering. *Ethics and International Affairs*. Vol. 31 Issue 4. Cambridge University Press. UK <https://doi.org/10.1017/S0892679417000405>*

Rickels, W. et al. (2011) *Large-Scale Intentional Interventions into the Climate System? Assessing the Climate Engineering Debate*. Scoping Report Conducted on Behalf of the German Federal Ministry of Education and Research (BMBF). Kiel: Kiel Earth Institute.

Shepherd, J. G. et al. (2009) *Geoengineering the Climate: Science Governance and Uncertainty*. The Royal Society. London. UK. ISBN: 978-0-85403-773-5*

Solar Radiation Management Governance Initiative (2010). *Solar Radiation Management: The Governance of Research*. SRMGI.

Talberg, A., Christoff, P., Thomas, S. et al. (2018). Geoengineering governance-by-default: an earth system governance perspective. *International Environmental Agreements* 18: 229. <https://doi.org/10.1007/s10784-017-9374-9>*

Williamson, P., and Bodle, R. (2016). Update on Climate Geoengineering in Relation to the Convention on Biological Diversity: Potential Impacts and Regulatory Framework. Technical Series No.84. Secretariat of the Convention on Biological Diversity, Montreal.*

Liu, Z. and Chen, Y. (2015). Impacts, risks, and governance of climate engineering.

Advances in Climate Change Research 6 (2015) 197-201.*

Governance of research:

Dilling, L., and Hauser, R. (2013). Governing geoengineering research: Why, when and how? *Climatic Change* 121, 553–565. doi:10.1007/s10584-013-0835-z.*

Hubert, A-M. (2017). Code of conduct for responsible geoengineering research. University of Calgary. Canada.*

Stilgoe, J. et al. (2014). Developing a framework for responsible innovation. *Research Policy*. 42 (2013) 1568-1580. Elsevier.*

Long, J. (2017). "Coordinated Action Against Climate Change: A New World Symphony." *Issues in Science and Technology* 33, no.3.

Parker, A. (2014) Governing solar geoengineering research as it leaves the laboratory. *Phil. Trans. R. Soc. A* 372: 20140173.
<http://dx.doi.org/10.1098/rsta.2014.0173>*

Parson, E. and Keith, D. (2013). End the deadlock on governance of geoengineering research. *Science* 339, 1278–1279. (doi:10.1126/science.1232527)*

Winickoff, D. and Brown, M. (2013). Time for a Government Advisory Committee on Geoengineering Research. *Issues in Science and Technology* 29: 79-85.

Ethical, humanitarian and other considerations:

Bellamy, R., Lezaun, J., and Palmer, J. (2017). Public perceptions of geoengineering research governance: An experimental deliberative approach. *Global Environmental Change* 45, 194–202. doi:10.1016/j.gloenvcha.2017.06.004.*

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, K., (2010). "Geoengineering and the Precautionary Principle." *International Journal of Applied Philosophy* 24 (2): 237–53.*
- Gardiner, S. 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, L., (2012). "Precaution and Solar Radiation Management." *Ethics, Policy & Environment* 15 (2): 158–71.*
- Morrow, D.R., (2014). "Starting a Flood to Stop a Fire: Some Moral Constraints on Solar Radiation Management." *Ethics, Policy & Environment* 17 (2).*
- Preston, C. J. (Ed.), (2016). *Climate Justice and Geoengineering: Ethics and Policy in the Atmospheric Anthropocene*. London: Rowman & Littlefield Intl.*
- Preston, C. J. (Ed.), (2012). *Engineering the Climate: The Ethics of Solar Radiation Management*. Lanham, Maryland: Lexington Books.*
- Preston, C. 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.*

Suarez, P. and van Aalst, M. K. (2017). Geoengineering: A humanitarian concern. *Earth's Future*, 5: 183–195.*

<https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2016EF000464>

Svoboda, T., Keller, K., Goes, M. and Tuana, N. (2011). “Sulfate Aerosol Geoengineering: The Question of Justice.” *Public Affairs Quarterly* 25 (3):1–42.*

Williamson, P., and Bodle, R. (2016). Update on Climate Geoengineering in Relation to the Convention on Biological Diversity: Potential Impacts and Regulatory Framework. Technical Series No.84. Secretariat of the Convention on Biological Diversity, Montreal.

Discussion of whether we need (or not) Geoengineering:

Barrett, S. et al, (2014). Climate Engineering Reconsidered. Commentary in *Nature Climate Change*. www.nature.com/natureclimatechange

Bipartisan Policy Center (2011) *Geoengineering: A National Strategic Plan for Research on the Potential Effectiveness, Feasibility, and Consequences of Climate Remediation Technologies*. Washington, DC.

Blackstock, J. et al. (2009) *Climate Engineering Responses to Climate Emergencies*. NOVIM Group.

ETC Group (2010). “Geopiracy: The Case Against Geoengineering.” Ottawa, ON. <http://www.etcgroup.org/content/geopiracy-case-against-geoengineering>

ETC Group and the Heinrich Boll Foundation (2017). *A Civil Society Briefing on Geoengineering – Climate Change, smoke and mirrors*. Briefing for civil society prepared by the ETC Group and the Heinrich Boll Foundation, 10 May 2017. (<http://www.etcgroup.org/content/civil-society-briefing-geoengineering>).

ETC Group, Biofuelwatch and the Heinrich Boll Foundation (2017). *Big Bad Fix: The case against climate geoengineering*. http://etcgroup.org/sites/www.etcgroup.org/files/files/etc_bbf_mar2018_us_v1_web.pdf

Frumhoff, P.C. and Stephens, J.C. (2018). Towards legitimacy of the solar geoengineering research enterprise. *Phil. Trans. R. Soc. A* 376: 20160459. <http://dx.doi.org/10.1098/rsta.2016.0459>*

- 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.*
- Millar, R.J., et al. (2017). Emission budgets and pathways consistent with limiting warming to 1.5C, *Nature Geoscience* (2017), 18 September 2017, doi:10.1038/ngeo3031*
- Millar, R.J. (2017). Why the 1.5C warming limit is not yet a geophysical impossibility, [Guest post in Carbon Brief](#)
- Parson, E. (2017). Climate Policymakers and Assessments Must Get Serious about Climate Engineering. *PNAS Opinion*. Vol. 114 no. 35. 9227–9230, doi: 10.1073/pnas.1713456114*
- Raftery, A. et al. (2017). Less than 2C warming by 2100 unlikely. *Nature Climate Change*, 31 July 2017, DOI: 10.1038/NCLIMATE3352.*
- Robock, A. (2016). Albedo enhancement by stratospheric sulfur injections: More research needed, *Earth's Future*, 4, 644–648, doi:10.1002/2016EF000407.*
- Rogelj, J. *et al.* (2016) Paris Agreement climate proposals need a boost to keep warming well below 2 °C. *Nature* 534, 631–639.*