



Online Ethics Center
FOR ENGINEERING AND SCIENCE

Geoengineering Subject Aid

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Description

A short guide to some key resources and readings on the ethics of geoengineering.

Body

Many options have been explored for alleviating global warming, including replacement of fossil fuels by renewable energy sources and/or nuclear power, and removal of carbon dioxide and/or direct intervention in climate (geoengineering). When limited to the context of climate change, geoengineering may be called climate engineering or climate geoengineering, generally defined as the deliberate, large-scale manipulation of an environmental process that affects the earth's climate, in an attempt to counteract the effects of global warming. See results of Google search on "geoengineering definition" and Wikipedia entry accessed July 12, 2016 at <https://en.wikipedia.org/wiki/Geoengineering>.

Geoengineering is an example of a human intervention designed in ways that can have major effects on our planet. When human activities create large-scale changes in human situations and even human relationships with nature, questions of who benefits and who loses in relationship to those changes and their implications for social institutions and social justice will arise. These changes and proposals to

control them, in which science, engineering and technology must play an important role, affect all major systems by which humans organize their daily lives. Thus, ethical and social issues surrounding climate change and geoengineering must be addressed in the topics of social responsibility and social justice and science, engineering, and technology. See also entries for [Climate Change](#), [Energy](#), [Social Justice](#), [Environmental Justice](#), and [Social Responsibility](#).

Subject Overviews

Corner, Adam and Nick Pidgeon. 2010. "Geoengineering the climate: The social and ethical implications." *Environment*. 52(1): 24-37

This article discusses the social and ethical implications of geoengineering the climate. The authors argue that despite the increasing attention of mitigating dangerous climate change by reducing the amount of greenhouse gas emissions, anthropogenic influence on the climate will become increasingly severe. An over view of the proposed approaches to geoengineering, including carbon dioxide removal techniques and solar radiation management techniques, and the impacts of intentional manipulation of the global climate are presented.

Keith, David W. 2000. "Geoengineering the climate: History and prospect." *Annual Review of Energy & the Environment*. 25(1): 245.

Geoengineering is the intentional large-scale manipulation of the environment, particularly manipulation that is intended to reduce undesired anthropogenic climate change. The post-war rise of climate and weather modification and the history of U.S. assessments of the CO₂-climate problem is reviewed. Proposals to engineer the climate are shown to be an integral element of this history. Climate engineering is reviewed with an emphasis on recent developments, including low-mass space-based scattering systems for altering the planetary albedo, simulation of the climate's response to albedo modification, and new findings on iron fertilization in oceanic ecosystems. There is a continuum of human responses to the climate problem that vary in resemblance to hard geoengineering schemes such as space-based mirrors. The distinction between geoengineering and mitigation is therefore fuzzy. A definition is advanced that clarifies the distinction between geoengineering and industrial carbon

management. Assessment of geoengineering is reviewed under various framings including economics, risk, politics, and environmental ethics. Finally, arguments are presented for the importance of explicit debate about the implications of countervailing measures such as geoengineering.

Caldeira, Ken and David W. Keith 2010. The need for climate engineering research. *Issues in Science and Technology Studies*. 27(1):57-62. Accessed at <http://issues.org/27-1/caldeira/> on July 13, 2016.

Given the possibility of climate emergency, the US should mount a coordinated research program that includes climate intervention technologies. Without this, a haphazard and dangerous approach to such research may prevail

See “[Climate Change](#)” and “[Energy](#)” Subject Aids for entries about related controversies.

Policy or Guidance

The National Academies of Science, Engineering and Medicine. 2015. “Chapter Four: Governance of Research and Other Sociopolitical Considerations.” 149-175. *Climate Intervention: Reflecting Sunlight to Cool Earth*. Washington, DC: National Academies Press. <https://www.nap.edu/read/18988/chapter/6>. Accessed on the OEC, July 13, 2016.

This report examines albedo modification (changing the fraction of incoming solar radiation that reaches the surface) and includes consideration of the social, political, ethical, and legal issues with this area of research. In [chapter 4](#), it identifies and discusses ethical issues surrounding doing research in this area and considers issues with the deployment of these methods.

Royal Society. 2009. *Geoengineering the climate: science, governance and uncertainty*. London: The Royal Society. Accessed at <https://royalsociety.org/topics-policy/publications/2009/geoengineering-climate/> on July 13, 2016.

This report considers two geoengineering methods: carbon dioxide removal (CDR) and solar radiation management (SRM). It recommends: emphasis on mitigation and adaptation with agreement to reduce global emissions by 50% by 2050 and consideration of geoengineering only as part of a wider package of options, and regards CDR as preferable to SRM. It recommends also a 10 year geoengineering research program and a commitment from the Royal Society to developing a code of practice for such research and recommendations to the international scientific community to commit to a voluntary research governance framework.

Bibliography

[Climate Change, Engineered Systems, & Society Bibliography](#). Added May 5, 2011. Accessed March 16, 2017.

This bibliography includes a balance of articles addressing the effects of climate change on engineered systems and more philosophical articles looking at wider issues of climate change and justice and communicating about climate change to different stakeholders. There is also a section on education at the very end. Two articles from the OEC climate change bibliography are relevant to geoengineering and ethics; there are numerous others which contain some material relevant to these questions.

Corner, Adam and Nick Pidgeon. 2010. Geoengineering the climate: The social and ethical implications. *Environment*. 52(1): 24-37. Abstracted in Overview above.

Ralston, Shane. 2009. Engineering an Artful and Ethical Solution to the Problem of Global Warming. *Review of Policy Research*. 6:821-837.

This article reviews various proposed projects in the field of geoengineering as a way to reverse the global warming trend, and argues that geoengineering should not be so easily dismissed in policy debates concerning how to mitigate the anthropogenic emissions of greenhouse gasses. The author investigates the desirability of the geoengineering options to address global climate change in terms of its capacity to overcome collective action issues, to accommodate ethical norms, and to provide a creative solution to the problem. After exploring six ethical quandaries that are raised in global climate changed debates and

how they ameliorate or resolve the problem, he then concludes that a fundamental shift in perspective must occur if we are to take intentional climate change as a possible, if second best, tool in the environmentalist's tool kit.

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Bibliography

Parent Collection

OEC Subject Aids

Topics

Controversies

Geoengineering

Discipline(s)

Computer, Math, and Physical Sciences

Geological Sciences

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