Is Geoengineering the Answer to Global Warming?

Learning Objectives

Students will:

- Describe a number of proposed geoengineering strategies that show how technology could potentially be used to manipulate the climate and curb global warming.
- Analyze the pros and cons of spraying chemicals into the stratosphere in an effort to decrease the temperature of the planet.
- Discuss the ethical and political challenges of trying to manipulate the climate.
- Develop a series of Tweets that provide concise summaries of their views about geoengineering as a solution to global warming.

Themes

- Environmental Ethics
- Environmental Stewardship
- Geoengineering
- Technology
- Social Justice

Materials Needed

All materials are available for download at **thischangeseverything.org/studyguide**.

Book excerpt: "Managing the Sun" (pg 257-261, *This Changes Everything*)
Handout: Is Geoengineering the Solution to Global Warming? (p. 51-52 of this guide)
Film clip: "Mastering the Earth" (1:23) (for optional Go Further activity)

Activity

1. As a warm-up, have students respond in writing to whether or not they agree with the statement, "The Earth is ours to control." After a few minutes, allow students to share their views with a partner and then invite a few to read what they have written with the class. Explain that views about this statement play a central role in how people respond to issues related to our use of fossil fuels and their impact on the environment.

2. Tell the class that a scientific organization called the Royal Society held a meeting in 2011 to discuss issues related to "geoengineering," a term that describes how technology might be used to manipulate the climate and curb global warming. Give each student a handout and ask them to complete it as they read more about this meeting in the *This Changes Everything* book excerpt, "Managing the Sun" (pg 257-261)

3. As a class, discuss the ethical and political issues related to geoengineering:

- Who should decide whether or not something is put into the earth's atmosphere to alter the temperature of the planet? How confident are you that something like the Pinatubo Option could be managed fairly and responsibly? Explain.
- As you consider the pros and cons of the Pinatubo Option, do you think the technique should be used to address global warming? Why or why not?
- Are there limits to human control over nature? Give examples to support your answer.

4. Have students express their views about geoengineering as a solution to global warming in a series of three Tweets that concisely summarize their points in 140 characters or less. Students can choose whether to tag you and post their Tweets on Twitter or to submit them to you as a list.

Go Further

- Show the film clip, "Mastering' the Earth" (length: 1:23). Ask students to explain in their own words how learning how to extract and burn fossil fuels was such a turning point in human history. Create timelines that illustrate this turning point with examples of how humans handled different tasks before and after this discovery. What impact did this discovery have on how humans viewed themselves and their relationship with the planet? What have been the positive and negative consequences of these changes?
- Have students create political cartoons or infographics that represent this point made by Klein in her book about geoengineering. "These technologies respond to the lack of balance our pollution has created by taking our ecosystems even further away from self-regulation. [Geoengineering] would require machines to constantly pump pollution into the stratosphere and would be unable to stop unless we invented other machines that could suck existing pollution out of the lower atmosphere, then store and monitor that waste indefinitely… And the risks are greater still because we might well be dealing with multiple countries launching geoengineering efforts at once, creating unknown and unknowable interactions. In other words, a Frankenstein world, in which we try to solve one problem by making new ones, then pile techno-fixes onto those."
- Compare and contrast the following perspectives on the relationship between humans and the earth:

  > "Our Earth needs constant concern and attention. Each of us has a personal responsibility to care for creation, this precious gift which God has entrusted to us. This means, on the one hand, that nature is at our disposal, to enjoy and use properly. Yet it also means that we are not its masters. Stewards, but not masters. We need to love and respect nature, but instead we are often guided by the pride of dominating, possessing, manipulating, exploiting; we do not 'preserve' the Earth, we do not respect it, we do not consider it as a freely given gift to look after. Respect for the environment, however, means more than not destroying it; it also means using it for good purposes." – Pope Francis

> "...it is possible to find a practical philosophy, by means of which, knowing the force and the actions of fire, water, air, the stars, the heavens, and all the other bodies that surround us, just as distinctly as we know the various skills of our craftsmen, we might be able, in the same way, to use them for all the purposes for which they are appropriate, and thus render ourselves, as it were, masters and possessors of nature." – René Descartes, *The Discourse on the Method, 1637*

- For a more in-depth analysis of the geoengineering issues explored in these activities, see this paper from climate scientist and geoengineering expert Alan Robock: "20 Reasons Why Geoenginering May Be a Bad Idea" (http://climate.envsci.rutgers.edu/pdf/20Reasons.pdf).
- As part of the class discussion about the ethics and politics of the Pinatubo Option, watch Stephen Colbert interview geoengineering researcher and advocate David Keith on The Colbert Report (http://www.cc.com/video-clips/lv0hd2/the-colbert-report-david-keith). What do students think is the biggest risk of spraying sulfuric acid into the stratosphere? Is there a place for geoengineering in the discussion for how to address global warming? Why or why not?
- Explore society's lack of control over the earth by considering whether humans are addicted to extreme risk in finding new energy, financial instruments, and more. Watch Naomi Klein's 2010 TED Talk, "Addicted to Risk" (http://www.ted.com/talks/naomi_klein_addicted_to_risk). Discuss what can be done to help society stop its reckless behavior and recognize that the planet has limits.

Lesson 8 Handout

Is Geoengineering the Answer to Global Warming?

Instructions: Read the *This Changes Everything* book excerpt, "Managing the Sun," which describes a number of geoengineering proposals, or how technology could be used to manipulate the climate and curb global warming. Then, respond below.

1. List the different geoengineering strategies described in the text. For each strategy, note how it is intended to reduce global warming.

Strategy	**Intended Effect**

2. Describe how the Pinatubo Option would work.

3. According to the text, what are the pros and cons of the Pinatubo Option?

Pros	**Cons**

4. What impact could Solar Radiation Management (SRM) strategies like the Pinatubo Option potentially have on global weather patterns?

5. According to the text, who would be most at risk if SRM caused widespread drought and reduced freshwater resources? What are the potential consequences of these conditions? In your view, how does the potential risk of these consequences compare to the potential benefit of curbing global warming?

6. In your view, do geoengineering strategies encourage or discourage efforts to reduce pollution? Explain.