2018

# Understanding Risk

## Disrupt. Communicate. Influence.

Proceedings from the 2018 UR Forum

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# A Conversation on Geoengineering:
## Altering the Planet, Envisioning Risk Financing Mechanisms

Using innovative, interactive approaches, this UR2018 session drew from science, policy, and art to offer participants a tailored introduction to solar geoengineering—including a creative visual overview of one of its most discussed technologies, a consideration of ethical and governance challenges, and last but not least a look at the implications of geoengineering for disaster risk managers, researchers, donors, the private sector, and other stakeholders.

## What Is Geoengineering? Scientific Concepts and Governance Challenges

Geoengineering is commonly defined as deliberate, large-scale intervention in the global climate system to help manage and reduce climate change risks. This increasingly feasible technological option was once seen as crazy and taboo but is now gaining momentum. In response to a rapidly changing climate, the insufficient international response to date, and the growing risk of extreme events and slow-onset crises like sea-level rise, one option currently under consideration is a type of solar geoengineering—that is, dispersal of a small volume of aerosols into the atmosphere (for example via high-altitude jet) in order to reflect a small fraction of incoming sunlight back to space, thereby temporarily cooling the planet and partially counteracting some negative effects of global warming.

The consequences of this approach are largely unknown. Current analyses are based on computer models and analysis of the impact of volcano eruptions. Likely impacts include the intended decrease in global temperature, but also strong impacts on precipitation (large-scale volcano eruptions decrease global rainfall, for example). Solar engineering also has very different impacts across regions and activities, which create strong redistribution of climate benefits and risks, thereby scrambling the roster of climate "winners" and "losers." Even in one place, some people may benefit from reduced temperatures while others lose from changed precipitation patterns. Finally, one major issue with aerosol-based solar geoengineering is the fact that particles do not stay long in the atmosphere, meaning that this approach would require a continuous dispersion of aerosols to maintain the world temperature. If solar geoengineering is used at scale and the dispersal is interrupted, the temperature would rapidly rise again to the approximate level it was originally, creating massive, grave risks for ecosystems and life as we know it today.

Solar geoengineering is envisioned as a complement to conventional emissions reduction and adaptation measures, and never as a substitute for them. In addition, since solar geoengineering does not remove carbon from the atmosphere, any potential deployment would also require large-scale use of carbon removal technologies—along with a radical reduction in emissions and enhanced adaptation—in order to credibly address climate change.

Solar geoengineering has major implications in terms of disaster risks, from local to global levels, in areas ranging from research and modeling to governmental policies and risk financing. Solar geoengineering has the potential to provide considerable benefits in terms of disaster risk reduction, but also to exacerbate existing risks and create new ones.

The technical side of solar geoengineering is actually the easy part. More challenging is how to equitably govern an emerging technology with planet-altering impacts. Whose hand would be on the global thermostat, making the decision about if—and by how much—we should seek to cool global temperatures? And under what process would such a decision be made?

Would the world's poor and most vulnerable—those who currently suffer first and worst from climate change—have a fair say in whether this technology is deployed? After all, they would be affected most by any potential use. How would their voices be brought into the decision-making process? What about future generations: how could we take their welfare into account? And how would those who lose rather than benefit from deployment of solar geoengineering be compensated? Is there even such a thing as fair compensation under these circumstances? How might these complex issues be addressed in the real world of political horse-trading and power politics where decision making is far from perfectly rational?

At present, there is no comprehensive, coherent set of international frameworks for governance of solar geoengineering. This situation poses a serious risk in and of itself, as a state or even a nonstate actor could potentially deploy solar geoengineering in the not-too-distant future without adequate information on potential

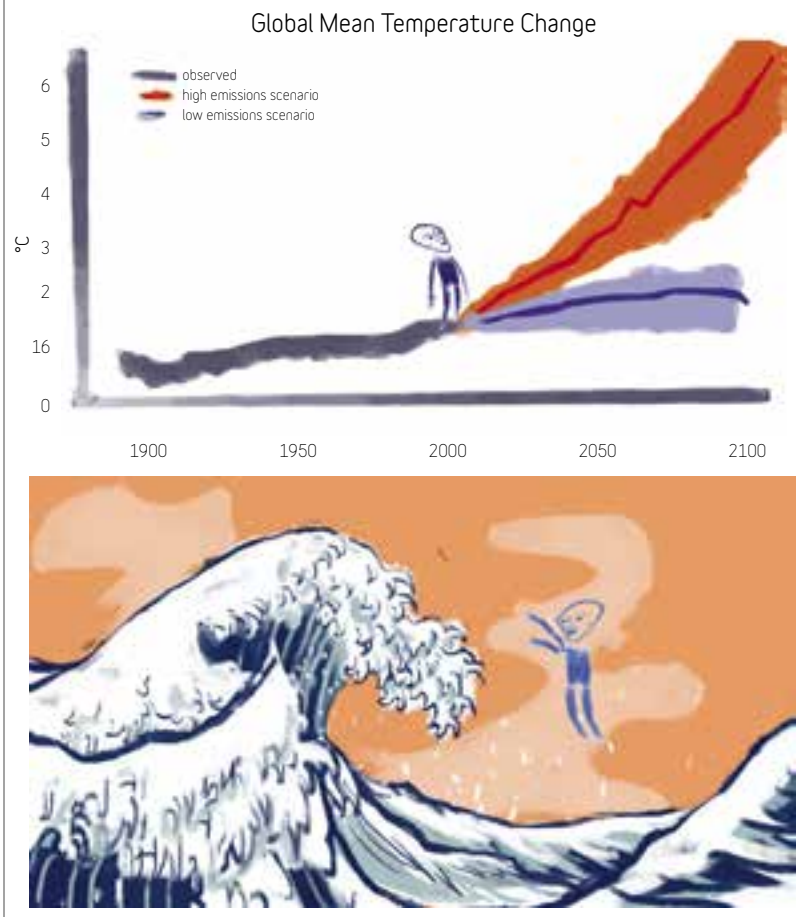
risks and benefits—and without a transparent discussion, let alone agreement, by the international community. The ethical, governance, environmental, and geopolitical implications of solar geoengineering need to be openly discussed by all sectors of society, including those currently working to minimize disaster and climate risks.

So far, however, the Understanding Risk community has largely been absent from geoengineering deliberations. Geoengineering may be perceived as too theoretical, too complex, and not imminent enough to merit attention. However, early engagement by the sector is imperative to ensure that humanitarian and development considerations are integrated into policy decisions that will shape the future of disaster risks.

## Innovations in Solar Geoengineering Communication

Fully embracing the "communicate," "disrupt," and "influence" themes of UR2018, this session took an unconventional approach to sharing the basics of geoengineering, including distributing printed copies of the UR geoengineering crossword puzzle (see pp. 60-61). After welcoming remarks by the moderator and a short presentation on basic concepts and prospects, participants were shown two art-infused short videos.

**Figure 1.** A Munch-inspired figure appeared in the short video mashing up IPCC data (top) and famous works of art (bottom).




*Credit:* Suarez, Ryvola, and Mendler de Suarez 2018.

The first video was an animation that blended scientific graphs from the Intergovernmental Panel on Climate Change (IPCC) with recognizable works of art, such as Monet's *Woman with a Parasol*, Hokusai's *Great Wave off Kanagawa*, and Escher's *Day and Night*. The video conveyed the basics of solar geoengineering in four minutes. The character weaving the narrative together was adapted from the human figure in Edvard Munch's *The Scream* (figure 1).

The second video, also four minutes long, drew on poetry and specifically Shakespeare to ponder the prospect of deliberately reflecting sunlight to cool down the planet. It showed literary performer Regie Gibson reciting "To geoengineer or not to geoengineer" (figure 2), a deliberate modification of Hamlet's soliloquy that captured key questions about a difficult and possibly imminent choice.

**Figure 2.** To geoengineer or not to geoengineer, that is the question posed in a short video shown at the UR2018 session on geoengineering.

*Credit:* Gibson et al. 2018.

## Explorations in Index Insurance

Global warming will have uneven regional climatic effects, and so would solar geoengineering. During this session, some initial ideas were presented on financial instruments that could be applied to compensate for the side effects of geoengineering, with index-based insurance being one example.

## Discussion

In order to elicit questions and insights from participants, the session broke into parallel discussions among four groups: (1) science and technology, (2) governance, (3) index insurance, and (4) communicating geoengineering through art.

When the topic of geoengineering is introduced to a new audience, it elicits a broad range of powerful reactions. The prospect of deliberately manipulating the global climate is frightening, if not repellant, to many people. One common response is to suggest that even raising the topic of geoengineering may deter efforts to mitigate emissions or adapt to climate change (also known as moral hazard); another common response is concern about the portrayal of known and unknown risks. Both these reactions were evident among session participants.

The group that focused on index insurance was particularly lively, with strong opinions expressed about the ethics of geoengineering, the wisdom of global-scale climate interventions, and the moral hazard of pursuing geoengineering at the expense of arguably more pressing policy priorities. Given legitimate and widely shared concerns about the stakes involved in seeking to deliberately alter the climate, some exchanges were understandably intense. The session nonetheless enabled participants to communicate their views, opinions, and anxieties about this increasingly unavoidable topic.

The group that focused on communicating geoengineering through art was also lively. Members of this group shared their thoughts about the animation and the poetry video; one common thread was that art had the power to activate people's emotional core, and that the films had made the ethical elements of geoengineering decision making truly personal. The vivid visuals, compelling sound, and emotional language were intended to bring questions around geoengineering close—almost uncomfortably close—to the viewer. Participants pondered, "Would it have been possible for people to connect so deeply to the issues had the films not primed them? Would the session instead have been characterized by high-level, philosophical, and mainly rational discussion?" The session ended in agreement that poetry, film, and other forms of creative communication have an important role to play, especially when the issues are abstract, the stakes are high, and the goal is to promote comprehensive deliberation and discussion.

Importantly, while previous geoengineering events have mostly engaged climate scientists, governance experts, environmental activists, and other stakeholders, this session was, to

our knowledge, the first time that geoengineering was brought to the disaster risk management and financing community—and also the first time that the emotional dimensions of risky decisions were intentionally elicited through art. Not surprisingly, the intensity of the discussions matched the gravity of the issues at stake.

## References and Further Resources

C2G2 (Carnegie Climate Geoengineering Governance Initiative). https://www.c2g2.net/.

———. 2018. "Using Creativity to Communicate about Geoengineering." May 17. https://www.c2g2.net/using-creativity-to-communicate-about-geoengineering/.

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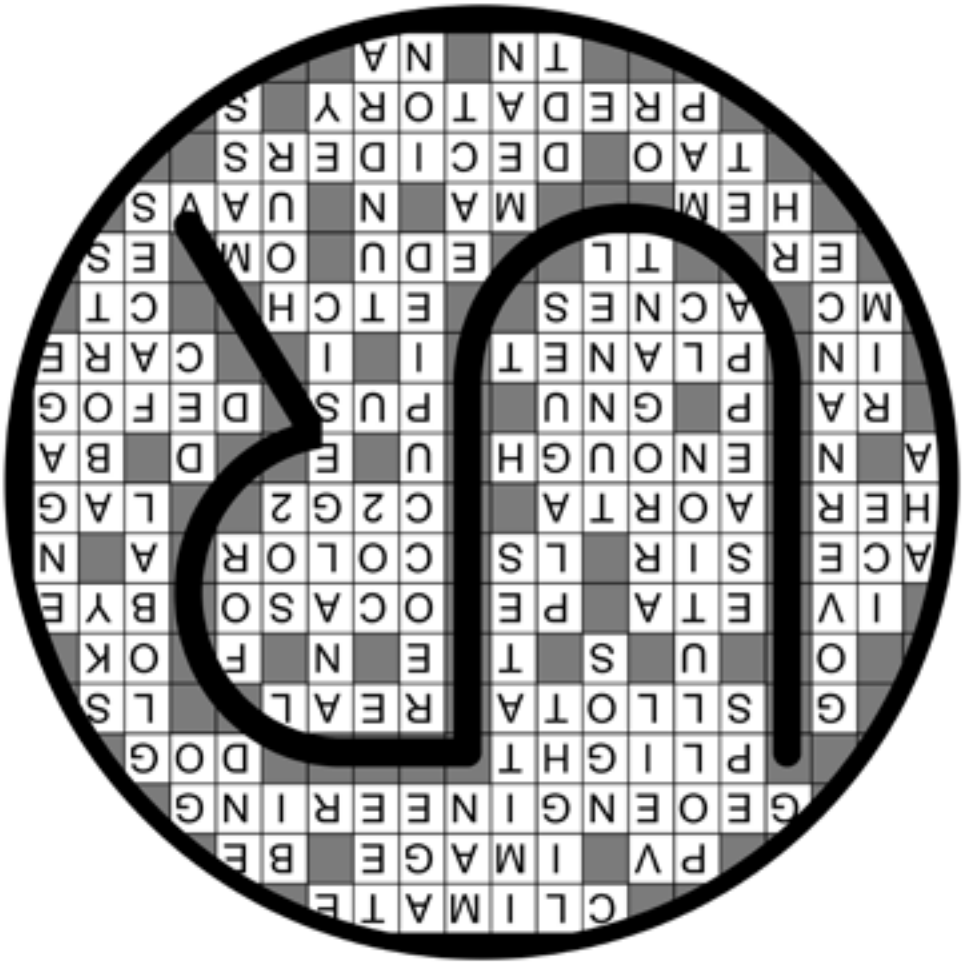


Answers to crossword puzzle featured on pp. 60–61.

*ACROSS*

***1. It's changing, needs fixing***

7. Solar way to make electricity. Good for decarbonizing

9. Worth a thousand words

10. To ___ or not to ___ (relevant for geoengineering)

***15. Dangerous, difficult situation***

16. Barking pet

***19. esir level aes yb denetaerht ,sdnalsi feer depahs-gniR***

20. Not fake

22. Least Squares

25. Fine

26. Four

27. Estimated time of arrival (for geoengineering, we don't know…)

29. Performance evaluation

30. 'Sunset', in Spanish

33. Adios

35. Highest card

36. Option for addressing a gentleman

37. Light speed

38. Visual attribute of things

39. Belonging to a lady

40. Blood leaves the heart through this artery

***42. Carnegie Climate Geoengineering Governance Initiative***

43. Delay

45. Sufficient

47. Bachelor of arts

***48. Egyptian Sun God***

49. Large antelope

50. Yellowish goo resulting from infection

51. Remove condensation from windshield

53. Not out

***54. "The ___ Remade", a geoengineering book. Also, satellite company***

***56. Serious, kind concern to avoid risk. Should drive geoengineering debates***

57. Master of ceremonies

58. Many pimples on the face (plural)

59. Engrave

62. Technology for communication

***63. Room where you go in emergencies. There isn't a planetary one…***

65.Thallium

66. University emails often end with this

67. The sound of meditation

69. 'It is', in Spanish

70. Sewn edge of cloth

73. Mother

***74. Drones. Could eventually be used for deploying 32 down in the stratosphere***

75. The Way, combining Yin and Yang

75. Forces something into place

***77. Those who define what to do. For geoengineering, who shall it be?***

***80. ____ Geoengineering: seeking to benefit self at the expense of others***

***81. Ton***

***82. Sodium***

*DOWN*

***2. Visible solar energy. Geoengineering would dim it***

***3. Geoengineering _____ explosive volcanic eruptions***

4. Cause of the Anthropocene

5. Era

6. A target in certain games

7. Presence of harmful substance

***8. A fine layer used to prevent light from passing***

10. Preface for two

11. Goal

12. Ensemble prediction system

13. Non-governmental organizations

14. Last board game to see humans lose to machines

***17. _____ Warming: What geoengineering aims to address***

***18. Manner of setting policies and actions***

20. bsorbed n orrying houghts

21. Substance that relieves pain

22. Extra large

***23. Atmosphere and outer space, seen from Earth***

24. In support of

***26. Solid water, rapidly dwindling in the Arc<c***

27. yfsitas ,eveileR

28. Pompous

30. Contagious diseases that spread fast

***31. This gas, added to the atmosphere, is heating up Earth***

***32. This gas, added to the stratosphere, can cool down Earth***

***34. Become involved. We need to ___ in geoengineering***

35. Abrupt awareness

41.[2 Down] at the end of the ____

44. Ends before completion

46. Before Jan

48. Circular edge

52. Confronts

55. Low carbon

***60. Arctic region, can release methane & speed up warming***

61. Sixty minutes

64. Blood factor

66. Pecise, acurate, crrect

68. E / c2

71. "That's ___ !": same as 45 across

72. Flat depiction of all or part of Earth

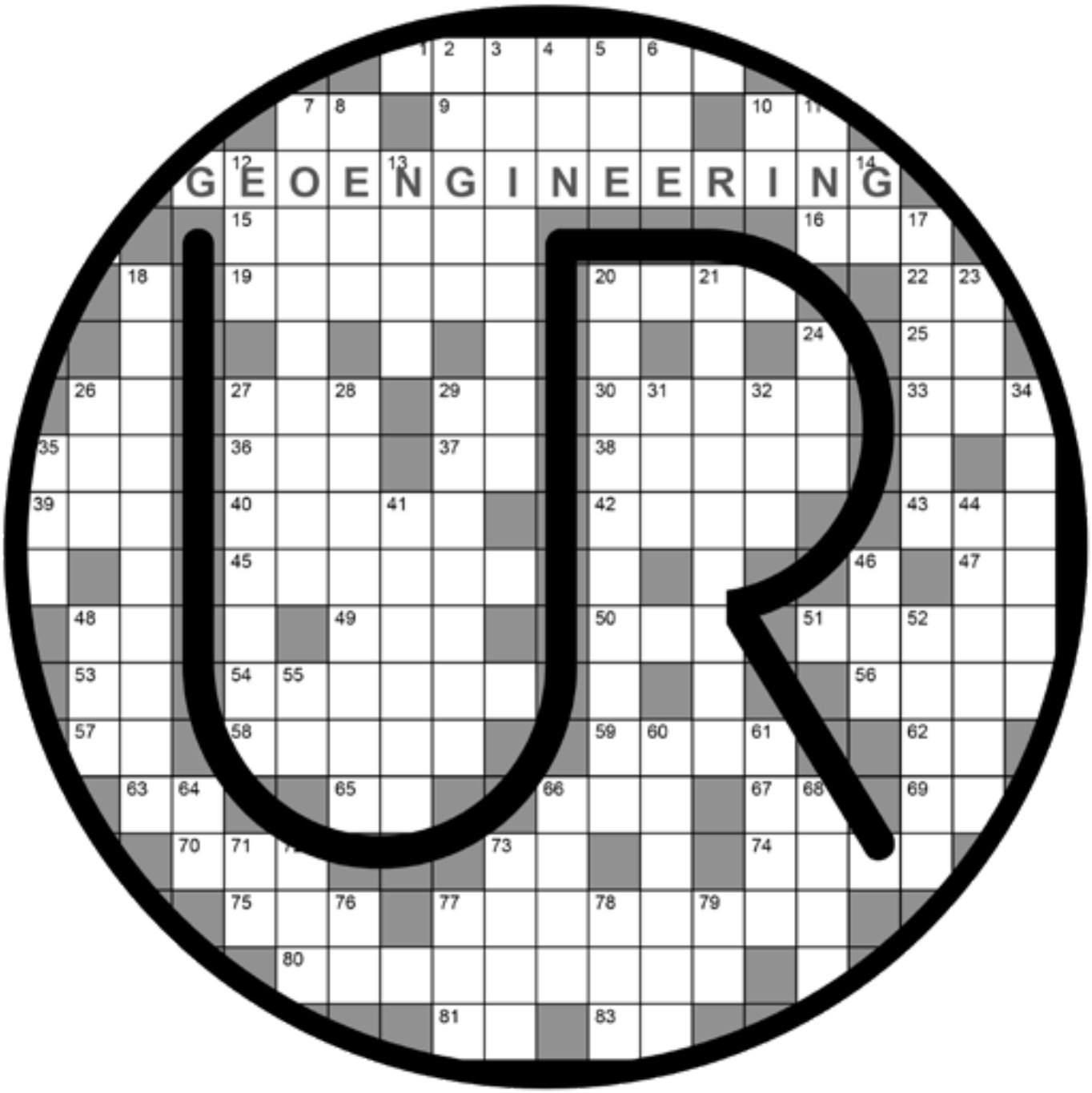
73 Average. Unfair

***76. To geoengineer ___ not to geoengineer? The time to face this choice is coming near***

77. Insecticide

78. Charged molecule

79. Execution year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