Geoengineering Research Under U.S. Law

Rob James
Pillsbury Winthrop Shaw Pittman LLP

Geoengineering: The Legal Challenges of Climate Mitigation
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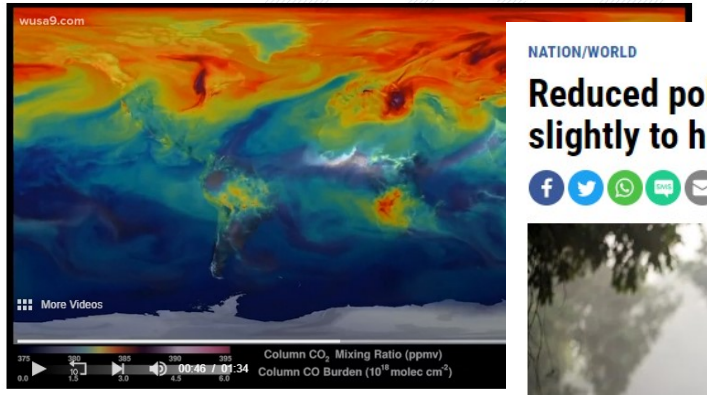
2020-21 has been an (involuntary) geoengineering experiment

- 2020 tied 2016 as the warmest year on record
- Less sulfate pollution, more warming (a "reverse volcano")
- CO2 emissions are down, but expected to bounce back with post-pandemic economic activity
- "Clean air warms the planet a tiny bit, but it kills a lot fewer people with air pollution."

WEATHER

2020 may have helped with air pollution, but not global warming

NASA scientists found that 2020 tied as the hottest year on record.



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NATION/WORLD

Reduced pollution during pandemic added slightly to heat of warming Earth, study finds

A man walks along a street amid smoggy conditions in New Delhi on Dec. 7, 2020. (JEWEL SAMAD/AFP via Getty Images)

by: Associated Press
Posted: Feb 3, 2021 / 10:18 AM PST / Updated: Feb 3, 2021 / 10:18 AM PST

Earth spiked a bit of a fever in 2020, partly because of cleaner air from the pandemic lockdown, a new study found.

Legal precursors

- Weather modification—permits, practices as well as litigation
  - 27 OKLA. L. REV. 409 (1973)
  - Friedrich et al. PNAS (2020)
- Studies of hurricane diversion (and accompanying ethical dilemmas)
- Geoengineering, adaptation, and climate change
- Unspeakable for years?
  - *"[Adaptation is] a kind of laziness, an arrogant faith in our ability to react in time to save our own skin."*
    Al Gore, EARTH IN THE BALANCE (1992)

Legal precursors

- Royal Society (2009) and other studies
- Bipartisan Policy Center, 2011 (Dole, Daschle, Mitchell, Baker)
- Individual experiments
- Debates in international forums

- But what is the legal framework?
- And what are the legal exposures and benefits?

Government activity

- March 5, 2021 – DOE Secretary Granholm approves $24 million for direct air capture research
- Appropriations Act of 2020—$4 million for NOAA's Office of Oceanic and Atmospheric Research (OAR) to investigate "Earth's radiation budget" and "solar climate interventions"
  - *NOAA is currently working with Arizona company to advance study of stratosphere*
- Carbon capture and sequestration tax credit (IRC, 26 U.S.C. § 45Q)
- California Low Carbon Fuel Standard (LCFS)
- Rhode Island H5135 – Geoengineering Act (re-introduced 1/25/2021)
- Geoengineering Research Evaluation bill, HR 5519 (Jerry McNerney (D-CA))—National Academies to develop research agenda and governance mechanisms (116th Cong.; died)

Debates continue whether to use geoengineering

- But our knowledge is insufficient to resolve the question
- We need research to determine efficacy, unintended consequences, alternatives—all the fruits of basic and applied research
- As with most climate hypotheses, we don't have a bunch of Earths and enough time with which to conduct controlled studies

The families of techniques: SRM

Solar Radiation Management

- Natural opportunities for research: volcanoes with stratospheric emissions
  - *Pinatubo, Krakatoa, Tambora, more recent events*
- Cloud brightening, other albedo modifications
  - *UCSD studies of cargo ship trails, 2011 (E-PEACE)*
- Tropospheric dispersal of sulfur aerosol particles
  - *Harvard SCoPEx balloon study, Summer 2021* – moved to Sweden

The families of techniques: CDR

Carbon Dioxide Removal

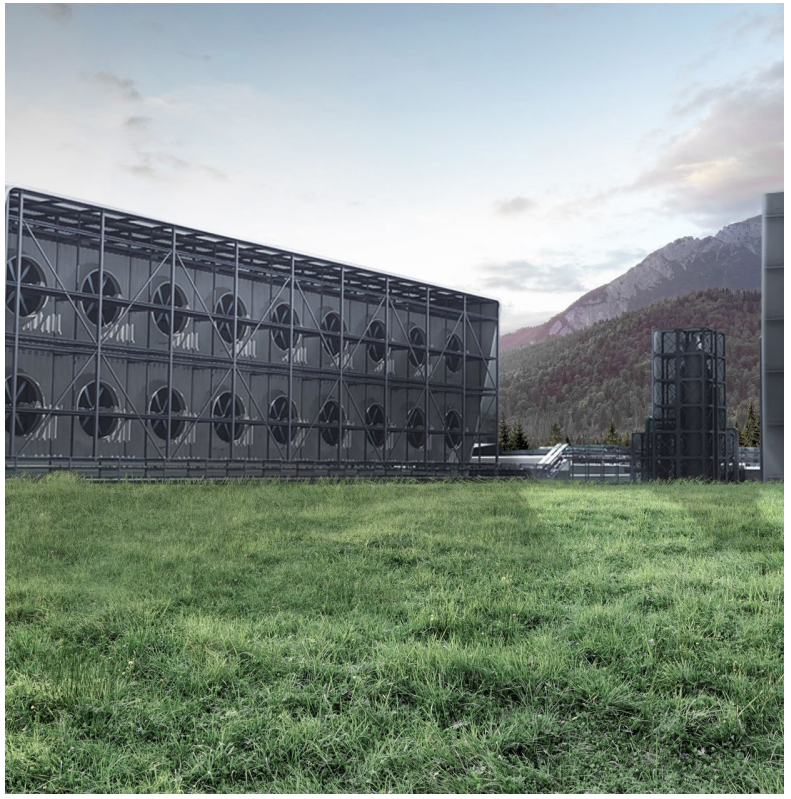
- A definitional issue: do you include point-source reductions like carbon capture and sequestration; carbon capture, use and storage; carbon fixation in products; afforestation?
- Direct air capture
- Stimulated growth of organisms that contribute to carbon sinks
  - *Ocean iron fertilization (OIF)—disperse iron, phosphorus or other growth-limiting substance to produce phytoplankton blooms, some of which permanently sinks*
  - *Haida Salmon experiment, 2012*
  - *Chilean permit application, 2017*

Other techniques, and other families, are still to come (e.g., Arctic dams)

Example – direct air capture

- **January 2021 – United Airlines announces investment in direct air capture project**
  - *Working toward voluntary goal of net-zero emissions by 2050*
  - *Sustainable fuels and "geography agnostic" carbon reduction*

- **OnePointFive venture with Carbon Engineering to finance and deploy large-scale plant in Permian Basin**
  - *Carbon Engineering investors Oxy and Chevron*
  - *Goal to build 27 plants*
  - *Each plant takes up about 100 acres, captures 1 million tons*



US environmental law: NEPA

- Applies to a federal government action
  - *FAA permits for rocketry, overflights*
  - *NOAA permits for monitoring*
  - *Funding restrictions*
  - *Use of airports, seaports, other facilities*
- Threshold issue: what is the NEPA "project"?
  - *A single overall program of research?*
  - *Or each separate experiment in a different jurisdiction, medium or altitude?*

US environmental law: NEPA

Environmental Assessment/Finding of No Significant Impact (EA/FONSI), or Environmental Impact Statement (EIS)?

- Research and technical studies are exempt, bar "extraordinary circumstances" (14 CFR 1216.304(c))
- ***But*** such circumstances include "weather modification, or other techniques that may alter a local environment" (45 CFR 640.3(b)(4))
- ***But but*** "long term effects" insufficient to trigger the bar (45 CFR 640.3(b))
- Research at small scale: insufficient alteration to lose the exemption?
- Review at R&D stage vs. implementation stage: *SIPI v AEC* (D.C. Cir. 1973)

US environmental law: NEPA

- What harms can occur from deployment of a technique?
  (Answer is part of the objective of controlled, managed research)
- Changes in weather; cascading effect on hydro-systems and bio-systems; ozone impacts of sulfur aerosols (but how significant?); carbon footprint of experiment itself; risk of "recidivism" if technique discontinued
- NEPA outcomes: adopt project or alternatives, including "no action"
- Remember the purposes of research
- Weigh immediate consequences of research *today* against increased understanding of the technique *when deployed at scale in the future*

State land use law

State NEPA analogues

- California's CEQA, anyone?
  - *Substantive—not just a report with sunlight*
- Further review and consideration of "alternatives"
- But what are the alternatives to a *research* program?

- Rhode Island bill approach: "any and all contemplated geoengineering activities"

Other environmental laws

- Clean Air Act
  - *Releases of sulfate aerosols, impact on ambient air quality standards attainment*
  - *Tracy Hester, "Remaking the World to Save It" (2011) ("major source" definition)*
- Endangered Species Act, Marine Mammal Protection Act, Clean Water Act, Magnuson-Stevens Fishery Conservation and Management Act
- Marine Protection, Research & Sanctuaries Act (MPRSA) and the London Convention on ocean discharges
  - *Actual precedent: Planktos / EPA dialogue, 2007*
  - *International Maritime Organization (IMO) framework, 2010*

US tort law

- **Trespass**
  - *Physical intrusion onto another's property*
  - *Atmosphere cases*
- **Nuisance**
  - *Private nuisance: actionable conduct interfering with another's use of property. But what is "actionable" is a matter of public policy*
  - *Public nuisance: interference with public interest, similar policy weighing considerations*
- **Negligence, strict liability for ultrahazardous activities, misrepresentation?**
  - *Again, research presents an opportunity to balance costs and benefits and to determine reasonableness*

US property and contract law

- **Consents to use of property**
  - *Airports, seaports, spacecraft launches*
  - *Easements for public and private property*
  - *Use of property dedicated to public use? Utilities and governments*
- **Intellectual property issues, common to all R&D**
  - *Available to public or others on reasonable terms, or for commercial exploitation?*
- **Contracts allocating rights and risks**

Research program structure and execution

- Akin to other forms of infrastructure project entitlement and development
- Identify stakeholders, and appreciate their concerns and drivers
- Find allies and reach common positions before girding for battle
- Transparency is key in communicating to all audiences
- Diversity and inclusion are gating conditions
  - *Compare advisors on UK Norfolk and Harvard SCoPEx*
  - *"Geoengineering's Gender Problem Could Put the Planet at Risk,"* WIRED (Dec. 18, 2019)
- Recall there are liability exposures for ***not*** responding to climate change
  - *Association of State Wetland Managers (ASWM),* GOVERNMENT LIABILITY AND CLIMATE CHANGE *(2016)*

Judge research according to its own rules and merits

- "Everything is what it is and not another thing" (Bishop Joseph Butler). Research is research
- Don't ritually apply background environmental, tort and property legal rules
- Crux: Research will be too limited to save the planet, but might create adverse local conditions that would offend some traditional view of domestic law
- Can't let that happen. We need research to determine whether any of these techniques, modified in ways informed by that research, should be deployed at the scale and for the duration needed to combat climate change

Thanks!

Norman F. Carlin & Robert A. James, *Geoengineering Research Under U.S. Law*, 18 PRATT'S ENERGY LAW REPORT 67 (2018), *available at* https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3149238

Robert A. James
Pillsbury Winthrop Shaw Pittman LLP
+1.415.983.7215
rob.james@pillsburylaw.com
Twitter @diogenes510

Additional slides

Shifting attitudes on science

- **COVID-19 pandemic highlighted relationship between science and policymakers**
  - *Science and Policy Collide During the Pandemic*, The Scientist (Sept. 1, 2020)

- **January 27, 2021 Biden Administration actions**
  - *Memorandum on Restoring Trust in Government Through Scientific Integrity and Evidence-Based Policymaking*
  - *Executive Order on the President's Council of Advisors on Science and Technology*

Current status of international governance

- **Convention on Biological Diversity (CBD)**
  - *International governance mechanism in place for research and development of one form of CDR – Ocean [Iron] Fertilization*
  - *Adopted decision on geoengineering in 2010 covering all technologies that may affect biodiversity – in nonlegal language*
- **London Convention and London Protocol on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter**
  - *2010 resolution guides assessment of ocean fertilization proposals (post Planktos)*
  - *2013 amendments regulate marine geoengineering activities*
- **UN Framework Convention on Climate Change (UNFCCC), Paris**
  - *Will likely be part of future discussions, but governance role is unclear*

International views of geoengineering research

- In March 2019, the UN Environment Assembly considered a proposed resolution to assess solar geoengineering's methods, evidence, current governance and possible future governance
  - *The resolution was blocked by the U.S., Saudi Arabia, and Brazil*
- Geoengineering will be a central part of the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) (2022)
  - *Some countries that opposed the UN Environment Assembly resolution suggested deferring action until after publication of this report*
  - *IPCC referenced SRM and CDR in its Fifth Assessment Report (2014), but will be dedicating more attention to these topics in the next report*
- IEA Report on Direct Air Capture—More efforts needed (June 2020)

To limit warming, humanity also needs **negative emissions technologies** (NETs) that, by the end of the century, would remove more CO_2 from the atmosphere than humans emit. The technologies would buy time for society to rein in carbon emissions, says Naomi Vaughan, a climate change scientist at the University of East Anglia in Norwich, U.K. "They allow you to emit more CO_2 and take it back at a later date."

Whether that's doable is another question. Some NETs amount to giant air-purifying machines, and many remain more fiction than fact. Few operate at commercial scales today, and some researchers fear they offer policymakers a dangerous excuse to drag their feet on climate action in the hopes that future inventions will clean up the mess. **"In many ways, we're saying we expect a bit of magic to occur,"** says Chris Field, a climate scientist at Stanford University in Palo Alto, California, **who instead favors drastic emissions reductions.**

—*Science* (February 15, 2018)