Before Engineering the Climate, We Must Engineer a Debate

https://www.e-ir.info/2011/08/26/before-engineering-the-climate-we-must-engineer-a-debate/

SEAN J LOW, AUG 26 2011

The lay reader may be forgiven if geoengineering- the use of technology to manipulate the planetary climate system in order to forestall the worst effects of global warming- sounds like science fiction. Once upon a time, so did Asimov's artificial intelligence, Jules Verne's submarine, and even Da Vinci's helicopter. The science of such interventions remains uncertain, but assessments are proliferating. The technological capacity exists, though operationalization remains a matter of contention. The only thing fictional about the debate is the notion that the technologies- and the political will to use them- do not exist.

Geoengineering received its catalyzing boost in 2006, when Paul Crutzen, who won a Nobel Prize for work on the ozone layer, published an editorial arguing that sulphate aerosols injected into the stratosphere could reflect sunlight, avoiding absorption into greenhouse gas concentrations. The literature broadened into streams examining two sister suites of technologies. *Solar Radiation Management* (SRM) acts as a sun-block, using sulphate aerosols or synthetic variants such as nano-particles. Enhancing the reflective quality of clouds, urban environments, vegetation, and even the ocean is less-discussed, while 'space mirrors' remain at the far end of feasibility. *Carbon Dioxide Removal* (CDR) techniques, on the other hand, sequester the greenhouse gases that absorb sunlight. Ocean fertilization and biochar are the most well-known options, while Direct Air Capture uses technology to mimic the carbon-capturing qualities of trees and other natural sinks.

Of course, there are nuances and qualifications. CDR is relatively costly and slow acting; drawing down existing atmospheric carbon concentrations is a decades-long enterprise. It also addresses the source of the greenhouse effect, as- in theory- a unit of carbon captured is equivalent to a unit of carbon that was never emitted. SRM, especially sulphates and nano-particles, are, by comparison, cheap, easy to manufacture and deploy, and take effect within a short time. A small fleet of sulphate-spraying aircraft could shield enough sunlight to compensate for this century's projected temperature increase for *one-hundredth* of the costs of conventional efforts to cut the requisite global emissions.

It is SRM, therefore, that has received the most attention as a 'Plan B': an insurance policy should mitigation efforts prove unequal to the task, or should unforeseen tipping points in the climate system result in extreme events. SRM is, however, laden with more risk than CDR. SRM would not address ocean acidification or its human impacts. Its physical impacts may alter regional weather patterns, affecting lives and livelihoods; there may even be offshoot externalities on human and state security. There are also potential risks in clandestine or unilateral deployment, with unknown repercussions for international security and climate governance. Moreover, if SRM is deployed without a corresponding reduction in 'business as usual' emissions, the sudden cessation of deployment will result in a massive and catastrophic greenhouse effect in the atmosphere's accumulated store of now-unshielded carbon.

It remains a subject of study and speculation whether the risks of geoengineering outweigh those of climate change. There are calls within the current academic community for further technological development and assessments of their risks and impacts on physical and human systems. The implication is that if one takes the predictions of climate science as seriously as the inertia of our carbon-based mode of civilization, then to paraphrase John Holdren: no option can be left off the table. Yet, this is not the only positioning on the issue. Bjorn Lomborg, Newt Gingrich, and

the authors of *Superfreakonomics* have more blithely proposed that geoengineering presents an economically viable alternative to costly green transitions. Some civil society groups and academics have argued that geoengineering should be comprehensively banned, as it creates moral hazard in reducing carbon emissions at source, results in uncertain impacts, and displays a hubristic optimism in the efficacy and longevity of such 'techno-fixes'. Even within the proponent camp, there are debates over the scale, scope, and normative thrust of geoengineering, with ethical, political, and technological points of contention. Meanwhile, although the Convention on Biological Diversity in 2010 instituted a qualified moratorium on large-scale experiments or deployments, the IPCC has this year held scoping meetings for the inclusion of geoengineering in its 2013-2014 Assessment Report.

The very *newness* of geoengineering is polarizing. It is what academic and policy circles term a 'wicked' issue: a problematique of such novel complexity that there is no protocol for immediate, technical management, and probing the boundaries of the debate is hesitant and incoherent. When such novelty is combined with the uncertainty and comprehensiveness of the enterprise- geoengineering, after all, proposes to toggle planetary switches- there are few issues, agendas, or actors on Earth that would not be affected. The present cacophony of opinions reflects this disparity. Worse, it is difficult to predict how dynamics will be altered by further evolutions in the technology, in the physical climate system, or in the surrounding complex of actors. We might note that the debate- for now- remains low-key. However, let us indulge in a hypothetical. Not a single state government has presently taken a clear position on geoengineering. Yet any such action might cause a cascade of nationally oriented agendas, resulting in anything from a technology race, to unilateral deployment and its political and physical fallouts, to the confusion of the climate regime and other bodies of international law.

There are many dangers here, and responsibilities as well. There is a tendency in the research community to narrow the examination of geoengineering to its technical aspects- the costs, feasibilities, and impacts of deployment, along with calls for research programs, field tests, and governance mechanisms. But when the planet is the proposed petri dish, technocracy is insufficient; even dangerous. We must acknowledge the complexity of geoengineering as an ethical and social issue that intersects with many physical systems and politicized communities- in security, humanitarian concerns, industry, development, energy systems, air and ocean pollution, and agriculture and land-use; in all geographic regions and at all levels of governance. If geoengineering is to be deployed or banned, the global community must develop a crosscutting understanding of the risks in either option.

A key part of these assessments is responsible messaging. The 'Superfreakonomists' of the world do us all a disservice by packaging geoengineering as a *Deus ex machina*; at the same time, more credible analysts have a responsibility, in scoping and framing the risks of deployment, to avoid self-fulfilling prophecies (say, the hypothetical weaponization of geoengineering). Another is the need for adaptive scoping and management: we must avoid the proverbial 'locking in' of the debate by generating engagement, research, and regulatory mechanisms that evolve with the science, technologies, and politics.

The crux of the geoengineering debate is this: *how might we explore and govern a social and technological imaginary; whose existence might be necessary, but whose impacts might be dangerous?* This is, of course, an exercise in educated guesswork. The fact is that all current scopings of a geoengineered future are imagined scenarios extrapolated from nascent developments or from analogous governance debates in novel, risky technologies (nanotechnology, genetic recombination, or even nuclear proliferation), by a rather small set of academic analysts and technology developers.

And the only outlet from this uncertainty is to understand how much we do not understand. We know what the technology is designed to do, but not what it will or should do. We know that the technology exists, but not how it will or should evolve. We know that geoengineering, like every technology since the discovery of fire, is a simply a tool; but we do not know what hands might choose to wield it, or why. It is time these questions were put to the global community.

Sean J. Low *is a contract researcher in global climate governance, having completed his B.A (Political Science Honours) at the University of British Columbia, and his M.A. (Global Governance) at the University of Waterloo. He is part of a growing network of geoengineering science and policy scholars across North America and Europe, and*

his work is situated on the interface between building 'futures' scenarios for geoengineering governance and policy engagement.