The Emerging Politics of Geoengineering

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As droughts, forest fires and centennial floods become more commonplace, people around the world are feeling the consequences of climate change. As a result, some scientists are putting forth ideas to engineer the climate, collectively summarized as ‘Geoengineering’. But no matter whether one thinks of massive attempts to filter greenhouse gases from the air or planetary sheets of reflective material, geoengineering will have significant political effects. This piece gives an oversight of what geoengineering means, how it came to be a part of the political discussion, and its contemporary status in climate politics.

Introducing Geoengineering

Running under different terminologies, geoengineering quintessentially describes large-scale, technological approaches aimed at stabilizing global temperatures. Importantly, these are all approaches that do not rely on the change of human behavior or energy consumption. Geoengineering differs from mitigation or adaptation measures which aim to *reduce the emission of greenhouse gases* and *adapt to the effects of climate change*, respectively. By contrast, geoengineering takes an end-of-pipe approach: once the emissions are there, how can we neutralize their effect?

As early as 1992, the US National Academy of Sciences (NAS) suggested that unprecedented, large-scale solutions might be needed to deal with climate change. Arguing that a phase-out of fossil fuels would be extremely difficult, Robert A. Frosch, vice-president of General Motors Research Laboratories at the time, convinced his co-authors in the NAS report panel to include a section on ‘geoengineering’: human-driven attempts to manipulate natural, planetary scale processes to their own advantage. Suggested strategies to counter-act the greenhouse gas effect included large-scale afforestation, ocean biomass stimulation, and sunlight screening through stratospheric dust or cloud stimulation. While highlighting the uncertainties of geoengineering technologies, the NAS report argued that they might be the only possibility to avoid the catastrophic effects of climate change.

More than twenty years later, geoengineering started entering the awareness of mainstream audiences. In 2014, the world-renowned Intergovernmental Panel on Climate Change (IPCC) introduced the idea of ‘negative emissions technologies’ into the climate change conversation. The modelers contributing to the expert assessment relied heavily on a technology called ‘BECCS’ (Bioenergy with Carbon Capture and Storage) to calculate a scenario in which the world would stay below 2° average warming. Similar to the large-scale afforestation or ocean biomass stimulation suggested in the NAS report, BECCS aims to remove atmospheric CO_2 at large scales and store it in liquid or solid form outside of the atmosphere.

This move was significant because it changed the fundamental assumptions of climate change politics. Climate models essentially rely on the idea of a ‘carbon budget’ – the total amount of CO_2 we can emit before reaching a given global average temperature. This is estimated to be about 600 to 1,200 billion metric tons of CO_2, provided that we want to stay below 2° average global warming (the maximum amount of warming considered acceptable). At current emission rates of about 36 billion tons per year, that leaves us with 16-33 years of fossil fuel use. Based on these numbers, we would need to shift the world economy to a carbon-free system by about 2050. What negative emissions did was to significantly extend this timeframe. By assuming that we would be able to remove CO_2 from the atmosphere in the future, the models introduced a ‘negative’ dimension to the carbon budget that extended the deadline for decarbonization until beyond 2100.

Wishful thinking

The almost magical properties of negative emissions did not go unnoticed. In reaction to the 2014 IPCC report, scientists began exploring what large-scale use of negative emissions would mean. They found that the amounts of BECCS used in the IPCC's models would require covering at least 1.1 giga-hectares of the most arable land – an area the size of India – in bioenergy crops, or eliminating more than 50 percent of natural forests worldwide. Considering the precariousness of global biodiversity, the growth of human population, and the centrality of land and water for food production, reliance on a land-based approach of negative emissions was shown to be highly unrealistic.

Why include a technology that is so obviously problematic in calculating future climate scenarios? Many of the reasons for the inclusion of negative emissions were political. The 2014 IPCC report was published just ahead of the negotiations for the Paris Agreement and served as the scientific basis for political discussions. After the perceived failures of Copenhagen to reach a global accord, it was quintessential that all puzzle pieces were in place to set the scene for a political success to maintain the legitimacy of the global climate change regime. The request for a scenario that demonstrated the feasibility of ambitious temperature targets was driven by European Union policy makers. Under pressure to deliver, modelers needed something that would make the models 'work' without including controversial policies like meat tax or restrictions on travel. BECCS seemed the logical choice. It was a combination of two technologies that were already known (Bioenergy on the one side, and Carbon Capture and Storage on the other), and where the cost and effect were comparatively simple to calculate. Furthermore, the high discount rates assumed in the climate scenarios (i.e. every activity done in the future is assumed to be less costly than activities done today) made BECCS a relatively cheap option. For the models, BECCS was the ideal solution.

1.5° and the Quest to Manage Global Sunshine

The continued feasibility of reaching an ambitious temperature target contributed to the realization of a surprising success: in 2015, at the United Nations climate change negotiations in Paris, all countries of the world agreed to stay below 2° average warming with an ambition to stay below 1.5°. The latter addition came out of a demand from small island states and least developed nations, who wanted to enforce mitigation efforts by large CO2 emitters. In exchange for limiting requests for compensation of climate change related loss and damages, industrialized countries accepted the 1.5° target.

The adoption of a 1.5° target sets a new precedent. For the first time, international policy makers were more ambitious than what climate scientists had ever hoped for. In fact, this target was so ambitious that most climate scientists think it is completely unrealistic. Even with negative emissions, 1.5° is hardly achievable given the very limited motivation with which many large emitters, including the USA and Australia, are pursuing efforts to reduce their use of fossil fuels. Yet, the target has initiated a new discussion in climate change science and politics. Might it be necessary to use the 'other' form of geoengineering suggested in the NAS report? Should we consider stabilizing global temperatures by screening out the sun?

The use of solar geoengineering, or solar radiation management, would reduce the overall amount of incoming sunlight on the planet by spreading reflective particles in the atmosphere or increasing cloud cover over the oceans. These technologies have been discussed by some scientists for about 15 years now but are still seen with great skepticism by many members of the scientific community. The main questions that arise here concern unintended physical and social consequences, ethics towards future generations, and the feasibility of managing such a planetary manipulation of the climate.

Since Paris, there have been several assessments and calls for introducing a governance system for solar geoengineering. These calls are motivated by two principal arguments. First, the possibility of runaway climate change might incentivize a single state to pursue solar geoengineering unilaterally. Assuming that this is a realistic scenario, governance would require laws that control or prohibit such a unilateral endeavor. Second, to enable research and development, political leaders need to create a safe environment for scientists to work in. The controversy of the approach and the importance of underlying values that characterize the solar geoengineering discussion make it difficult to receive funding and expose scientists working on the theme to much societal criticism. By politically acknowledging the need for research, work on solar geoengineering would become more accepted.

How to Confront an Elephant?

As the advocacy for the consideration of solar geoengineering is taking hold, governments see themselves confronted with a thorny issue. After Paris, ratcheting up mitigation and adaptation efforts are central to the international climate change negotiation agenda, and the introduction of a new and complex issue would distract from these priorities. If it did become an issue, the most difficult political questions would revolve around scale and jurisdiction. Where local efforts at carbon dioxide removal or sunlight reflection can easily be framed to be a part of countries' efforts to respond to climate change, large-scale, trans-boundary efforts to regulate global temperatures cannot go forth without international coordination.

In this international context, conversations with policy makers indicate apprehension about being a first mover in raising solar geoengineering. Traditional tensions between North and South have created a political context in which most industrialized countries would be accused of attempting to avoid their mitigation responsibilities if they started talking about solar geoengineering too positively. Without having done everything in their power to cut emissions, they lack political credibility. Simultaneously, countries with the legitimacy to bring up such an issue to the global agenda – highly vulnerable states with little or no contributions to climate change – often lack the resources to engage with complex technological issues that did not originate within their boundaries. These states would therefore need to be convinced by policy entrepreneurs of their own interest in carrying geoengineering forward. If this form of advocacy is successful, we might witness the formation of a coalition between industrialized countries with high research capacity and developing countries with high moral standing and climate legitimacy that initiates some form of international governance to support research and development for solar geoengineering.

At a national level, some countries are ahead of others in recognizing geoengineering as an issue of concern and providing funding for research. Most prominently, the UK's natural research council has provided £8.6m for inquiry and development of negative emissions technologies. Germany has a relatively large research program on the critical assessment of all geoengineering technologies. China recently provided $3m funding for a research program on the natural effects of land- and ocean-based geoengineering strategies. While research funding in the US is mostly by private philanthropies, Congress recently held a hearing on innovation, technology and research on solar geoengineering that might lead to more governmental interest in the technology.

Labels That Stick

Geoengineering is still an idea under investigation, but an idea with potentially major consequences on political behavior and decision making. The way that geoengineering is defined and the problems and solutions that are associated with it will make a fundamental difference in how and whether certain techniques are integrated into broader climate policy or not. It is unlikely that any approach labeled 'geoengineering' will be taken up without causing significant political controversy. We can see that a country like the UK, with a relatively advanced policy on negative emissions, has transitioned completely to speak only about 'Greenhouse Gas Removal technologies' – a more technical term that has lost almost all connection to the controversial geoengineering term. Similar efforts at re-conceptualization can be seen in other places, particularly in authoritative assessment reports put forth by the climate modeling community and in the shift that some NGOs are making in speaking about 'natural climate solutions' when describing some types of negative emissions technologies.

The emerging politics of geoengineering paints a complex picture. Values, interests, reputations and different kinds of power are weaving a colorful tapestry of social interactions. What the outcome of these interactions will be remains to be seen, but one thing seems certain: as emissions continue to grow and temperature changes are having tangible effects on people's lives, geoengineering technologies will not fade from the agenda. It is no longer a question of if we should talk about them, but rather how we do it and whose perspectives will shape the directions of the conversation.

About the author:

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