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The Climate Coup: Democracy in the Age of Climate Engineering

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by

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Introduction

For most of the Earth's history, only nature possessed the power to reshape planetary systems. Most of the radical impacts created were by nature itself, like the ice age, the appearance of a new species, etc. Human societies were capable of affecting landscapes with urban centers, but the rest of the power stayed with the Earth. This shifted when the usage of fossil fuels emerged. By harnessing hundreds of millions of years of stored solar energy and combining it with increasingly powerful technologies, humanity acquired an influence once reserved for planetary forces themselves. This created a gaping hole in the energy reserves of the Earth and the ecosystem. Following that, an idea long considered taboo is now in motion following humanity's efforts to now reduce the damage caused by their havoc-wreaking acts. Geoengineering is currently gaining mainstream attention. As humanity's efforts to decarbonize fall short, climate change further accelerates to a dangerous level that cities now face extreme summers, unpredictable weather and consequently, a loss of habitats. Policy circles are increasingly discussing solar geoengineering as a last-ditch effort to protect Earth from dangerous warming.

The idea that once was limited to science fiction movies is now a major debate in policy circles. The Earth is a very complex interconnected system which has proved many times over that one single interference can result in consequences that are beyond the predictions of an expert. The whole series of feedback loops and countless interactions is not something that we can comprehend and replicate, especially given the limited

amount of knowledge that we possess of the earth. The impact of any planetary-scale intervention would necessarily be planetary. Yet, proponents of geoengineering such as the Economist refer to this as a "respectful idea".

Not everyone agrees with this optimism, but its advocacy also stems from another school of thought. At a discussion held during Harvard Climate action week on June 10, leading scholars from atmospheric chemistry, climate physics, economics and philosophy discussed our current understanding of solar geoengineering, highlighting areas of uncertainty, and identifying ways to move forward on research. Billy Pizer, president and CEO of Resources for the Future, an independent think tank, highlighted the shift in mentalities on how climate adaptation has lost its stigma.

"The impacts of climate change were significant enough that people could not ignore having conversations about adaptation. That's an important lesson for us here," Pizer said. *"Geoengineering may happen whether you want to talk about it or not," "If you don't want to be surprised by it, you need to get ahead of it. National security people and others are going to begin to think about this as something they can't just say, 'we're not going to do anything.' Governments are beginning to tiptoe into this topic."*

This illuminates that despite its various consequences and sane explanations; geoengineering is going to be inevitable.

Should humans inject aerosols into the stratosphere to reflect sunlight and cool the planet? If yes, then which aerosols? How would that impact the weather? Who has the power to control it and choose where it is deployed? Is it guaranteed that every state will agree to its use in a common space? Will it mean the commercialization of the global commons? And who is prepared to take the fall for the consequences?

Analysis

There are two parts of this analysis. The first part will include the techniques that are currently being debated, and its individual effects, and the second part will incorporate different concerns raised by policy and climate experts.

1. Geoengineering Techniques and its Direct Impacts

Geoengineering encompasses a spectrum of technological interventions designed to mitigate anthropogenic climate change, The first technique is solar radiation management (SRM) that seeks to attenuate or reflect back part of the incoming

sunlight that reaches the Earth, attempting to reduce global mean temperatures: for example, stratospheric injection of sulphate aerosols to mimic the effect of volcano clouds, or brightening marine stratocumulus clouds augment their reflectivity.

The main three gases used for geoengineering would be sulphate, aluminum oxide and calcium carbonate, although the stratospheric sulphate injected does not pose a heavy toll, but sulphate dioxide does. Inhaling high amounts of toxic particles triggers DNA fragmentation in reproductive cells, reducing overall fertility potential. Similarly, aluminum oxide is directly related to cause infertility when inhaled. When such gases are released at large to trickle down, it may trigger massive drop-in birth rates which raises a concern that what good is a future when no one is alive to live it?

Sulfates produce well-known side effects: to human health, to the ozone layer. *"Sulfur is the devil we know,"* said Frank Keutsch, Stonington Professor of Engineering and Atmospheric Science, who believes scientists must investigate *"alternative materials that may have fewer side effects."*

The second cluster of techniques is oriented towards technological removal of carbon dioxide from the atmosphere. In a technique known as BECCS, extensive monoculture plantations are cultivated to produce bioenergy, and the resulting emission of carbon is captured and stored. Ocean fertilization dumps iron into oceans to increase plankton blooms that would absorb more carbon. Enhanced weathering, which would dump tons of reactive minerals into marine environments, alter the oceanic chemistry thereby augmenting their absorption capacity for carbon dioxide. The common ground in all of these methods is the sheer arrogance that they have in assuming that they contain the right or ability to control such a large swathe of the globe.

Ocean fertilization risks promoting toxic algal blooms that create oxygen-free dead zones, devastating marine food chains. An intervention that is apparently contained under an underwater barrier can also interfere with oceanic circulation and disrupt marine life infront of a single glacier in ways that could propagate far beyond the intervention site.

The proposals based on models where the full complexity remains only partially understood are contested as well. *"I've done a lot of work building complex models. And that makes me inherently distrustful of models,"* said Robin Wordsworth, Gordon McKay Professor of Environmental and Planetary Science. He argues, *"larger*

experiments because our best models are only ever as good as the laboratory experiments that constrain them."

2. Geoengineering and its Indirect Impacts

The second part of this analysis explores other concerns regarding the democratic tendency of these practices, possible side effects, and offers a look into the future of geoengineering.

a. Lack of Participatory Governance

The first and foremost problem on the agenda of the debates is the lack of participatory governance. Britta Clark, who is completing her doctorate in Harvard's Philosophy Department, debates, *"So, someone will say, 'Look, I'm really optimistic about solar geoengineering and the prospects of a just and equitable governance scheme, but I'm really pessimistic about the chances of a rapid and just global energy transition.' Those are inconsistent assumptions."*

Panelists largely agreed that solar geoengineering research will proceed, but that if universities do not lead, governments and militaries may dominate the field. *"Part of the reason that I've advocated working on this over the last 20 years is that I feel like we have limited time. Because we don't get to decide who gets to use it, or whether somebody uses it,"* said Daniel Schrag, Sturgis Hooper Professor of Geology. *"The real question is, how can we influence the thinking of people who might have the power to make the decisions in the future?"*

This turns Earth into a risky lab and raises questions like who gets to control the Earth's thermostat and adjust the climate? A vast majority of geoengineering researchers operate in the US. Moreover, they work in climate sciences and engineering rather than social sciences which naturally pulls them away from the social impact that it will create on the world, especially the Third world countries. They are also mostly patents and shareholders of big companies which will create a spatial and demographical gap between them and the effects of their research which will inevitably repeat broad patterns of inequality in distribution and power.

This might also motivate competitors of the US to scale up their own research which might produce counter geoengineering, mainly for removing effects of unilaterally conducted geoengineering and eradicating the effects of such a risky process altogether. This exacerbates worry amongst experts on how a global multilateral

democratic mechanism can be established where all governments can participate on an equal basis, and all decisions depend on a consensus.

In 2008, 2010, 2012, and 2016, the CBD took different consensus decisions calling for a moratorium on ocean fertilization and geoengineering. The London Convention (LC) in 2013 took a decision prohibiting ocean-fertilization activities except for those that constitute "legitimate scientific research." Notwithstanding, several geoengineering promoters continue to argue that these moratoria are just recommendations, in an effort to downplay their relevance. Replacing more stringent regulation, these parties suggest the use of nonbinding "ethical guidelines," "codes of conduct," and similar voluntary measures which make a mockery of the concept of democratic governance.

b. Commercialization of the Global Commons

"The global commons are conventionally understood to refer to the high seas, the atmosphere and outer space: domains that lie beyond any state's national ownership and form part of collective heritages of humankind, free from claims of territory or privatization."

Even the global commons are in a rapid process of commodification and enclosure. The global space economy alone is projected to exceed $1.8 trillion within a decade, reflecting the capitalization of extraterrestrial domains. Reflect Orbital, a US start-up driven by financial gains rather than climatic imperatives, is developing a constellation of satellites designed to redirect sunlight to paying customers. "Sunlight on demand," as the company puts it, with plans to grow from two satellites in 2026 to more than 50,000 by 2035. Parallel ventures extend this logic into atmospheric manipulation. The sale of 'cooling credits' could also be questioned in the same way as monetizing carbon credits. Make Sunsets, a US-based company, is already selling "cooling credits" and releasing balloons carrying Sulphur dioxide into the stratosphere. Overall, this points to the colonization of global commons.

c. Transboundary Impacts

If geoengineering changes weather patterns, says Lili Fuhr, CIEL's fossil economy programme director, it could harm and disrupt people's rights to life, health and livelihood. And, by design, technologies like solar engineering have effects across borders, making it virtually impossible to get free, prior, and informed consent from everyone affected.

Proponents of geoengineering argue that they are aware that this will create *'winners and losers'* but that is an utterly ignorant euphemism. In some cases, there will be millions or billions of "losers." Injecting sulfate aerosols in the stratosphere above the Arctic to mimic volcano clouds, for example, could disrupt the monsoons in Asia and increase droughts, particularly in Africa, endangering food and water sources for two billion people. And those are just potential side effects. Less well-understood proposals could be worse. Some techniques, particularly those in the vein of solar radiation management, have military origins and could be weaponized as a way of controlling temperature and rain patterns.

d. Moral Hazard Risk

The gravest risk of geoengineering, as per the UN Human Rights Council's Advisory Committee, is that it deters efforts to cut emissions now. This is sometimes called a moral hazard risk. This is an economic term where an industry is insured against a particular undesired outcome and thus feeling protected; they take bigger risks. This speculative future provides an excuse that might encourage risky behavior or influence the willingness of parties to engage in mitigation and adaption and pursue business as normal. If geoengineering is perceived as license to the public that they can continue their carbon intensive lifestyles, they would curb all voluntary efforts, and the relapse would be even more significant than before. This would be an individual level consequence. At a social moral hazard, social norms specifying the urgency of preventative climate policies could shift. Finally, at a political level, resources might be diverted away from mitigation and adaptation efforts. Financial support for existing climate policies could decline.

According to Nikki Reisch, climate and energy programme director of the Center for International Environmental Law (CIEL), relying on the promise of speculative technologies instead of existing proven ones delays urgently needed climate action and increases the chance that global temperature rise will go over the 1.5°C threshold.

e. Termination Shock

Another known problem with stratospheric aerosol injection is that, once begun, humanity must continue the effort indefinitely, as long as greenhouse gases continue to accumulate in the atmosphere. Aerosols only stay aloft at that altitude for a year or two. Were the solar veil not maintained, Earth would face what is known as

termination shock: The planet would rapidly heat to account for all the new carbon dioxide and other heat-trapping gases released since the climate intervention began.

It is also important to remember that small-scale experiments will not reveal anything about the effect of geoengineering on climate change. For that, an experiment would need to be carried out over a long time and on such a large scale that it couldn't be called an experiment making some parts of the Earth a control group without their approval. Geoengineering can't really have an experimental phase.

Policy Recommendations

Geoengineering is neither an insurance for buying time nor is it a viable solution for mitigation. It has far more dangerous consequences if applied than its probable advantages, and it requires constant deployment till the end of time, which is impossible to even think about.

Instead of chasing magical techno fixes, governments should urgently prioritize the real and radical solutions for addressing this climate crisis. This includes equitably phasing out fossil fuels and supporting the many diverse, and readily available alternatives for ecologically sustainable production and consumption patterns. The global north needs to take accountability and take their fair share of responsibility for causing the climate crisis and the lethal conditions it has fostered in the global south. Practices such as fast fashion and unhealthy levels of consumption should be aborted right away. MNC's should face a heavy fine and even imprisonment for violations. This will enable countries on the frontlines who have done the least to cause such problems to cut emissions and adapt to climate impacts. Similarly, urban centers should be stopped from further expansion.

This further includes protecting and investing in restoring the forests, oceans and polar and other ecosystems that are our best allies in the fight against climate change, which will not just repair their habitat but also ours. Additionally, this also means upholding the rights of the Indigenous peoples who are in direct relationship with these ecosystems, and the communities who depend on them for their livelihoods.

Conclusion

If such an outstanding democratic and equitable system had worked before, we would not have a climate crisis in the first place because the governments would have already been able to arrive at a solution with healthy discussion. If consensus that are similar

to the Paris agreement, which is currently dominated by wealthy hegemonies and only requires a change of government in US to withdraw, is reached for geoengineering then it is humanely impossible to deal with such issues.

Other UN bodies have long acknowledged the potential risks of geoengineering. In 1978, the ENMOD Convention (1978) against the hostile uses of environmental modification emerged in response to US use of weather modification in the Vietnam War. From 1966 to 1973, the US conducted the now declassified "Project Popeye," a rainmaking campaign deploying 2,300 cloud-seeding missions over the Ho Chi Minh Trail during the Vietnam War, to swamp Vietnamese supply lines.

As climate scientist Raymond Pierrehumbert observes, *"It's bad enough that Trump has his hands on the nuclear weapons launch codes. Do we really want to give someone like him the tools to monkey with the world's climate as well?"* This is again, likely, to end with geoengineering technologies which will only be available to powerful actors who could use them unilaterally for their own interests, which history suggests they will.

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