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A critical theory of technology applied to the public discussion of geoengineering

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ABSTRACT

In this piece, I examine geoengineering technologies through the lens of a critical theory of technology. A critical theory of technology aims "to account for the increasing weight of public actors in technological development" [15, p. 24]. Many argue that this is particularly necessary with respect to climate engineering since most discussions surrounding it have taken place far removed from public scrutiny. My operating assumption, in this piece, rests on an important question; namely, is democratic intervention into the use and design of technology essential and possible, whether it be on a normative level, in which democracy is understood as *the* overriding norm, or a practical level, in which the public is viewed as both capable and vital to perceiving and correcting the errors of so-called experts? I argue that a critical theory of technology adds an important dimension to this debate.

In this piece, I examine geoengineering technologies through the lens of a critical theory of technology. This approach moves beyond traditional approaches to technology, including instrumentalism, essentialism and substantivism, and pushes for ways in which technology can be made into a public issue. Critical theory of technology aims "to account for the increasing weight of public actors in technological development" [15, p. 24]. Many argue that this is particularly necessary with respect to climate engineering since most discussions surrounding it have taken place far removed from public scrutiny. My operating assumption, in this piece, rests on an important question; namely, is democratic intervention into the use and design of technology essential, whether it be on a normative level, in which democracy is understood as *the* overriding norm, or on a practical level, in which the public is viewed as both capable and vital to perceiving and correcting the errors of so-called experts? I argue that a critical theory of technology adds an important dimension to this debate. Moreover, my aim, in doing so, is to use critical theory to discuss and unpack the philosophical dimensions of geoengineering using concrete examples. This is particularly important since these technologies evolve in such political as well as social and economic contexts.

I begin this piece with a basic introduction to geoengineering, as it has been discussed in scientific and policy communities, followed by an overview of existing international law and the most cited objections to its adoption. I then provide a detailed overview of the genesis of the critical theory of technology approach and outline some of its basic presuppositions. I ask, in this section, what problems geoengineering poses to a critical theory of technology in relation to the perceived necessity for public intervention. I show that because, on the one hand, these technologies are inherently resistant to user intervention, since geoengineering, as a science-based technology with global consequences is not easily understood by the public, and, on the other, geoengineering tends to politicize science – which renders aposteriori democratic transformation difficult – the question of whether public involvement is essential becomes important. Finally, I examine whether a critical philosophical approach to technology, based on Andrew Feenberg's model, can be used as an informative tool to reject geoengineering well before any such unadvised

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attempts at technological intervention into the environment are made. I use the internet (also a global technology) and Western medicine (also science-based) as two examples of technologies that have undergone successful democratic transformations by the public and comment on the relevance of these two cases to geoengineering.

1. Geoengineering: a brief introduction

Geoengineering covers technologies and strategies that are meant to mitigate or even reverse climate change. They include carbon dioxide removal (CDR) techniques, which attempt to remove carbon dioxide from the atmosphere, and solar radiation management (SRM) strategies, which aim to reflect the sun's heat back into space. CDR, according to the Royal Society's assessment of geoengineering, titled, "Geoengineering the Climate," most often include the following:

- Land use management to protect or enhance land carbon sinks;
- The use of biomass for carbon sequestration as well as a carbon neutral energy source;
- Enhancement of natural weathering processes to remove CO2 from the atmosphere;
- Direct engineered capture of CO2 from ambient air;
- The enhancement of oceanic uptake of CO2, for example by fertilization of the oceans with naturally scarce nutrients, or by increasing upwelling processes.

SRM strategies, on the other hand, include:

- Increasing the surface reflectivity of the planet, by brightening human structures (eg by painting them white), planting of crops with a high reflectivity, or covering deserts with reflective material;
- Enhancement of marine cloud reflectivity;
- Mimicking the effects of volcanic eruptions by injecting sulphate aerosols into the lower stratosphere;
- Placing shields or deflectors in space to reduce the amount of solar energy reaching the Earth [30, p. x].

Many of the preceding may, upon first glance, appear outlandish and more comfortable in the realm of science fiction (this is particularly the case with placing shields in space and covering terrestrial structures with reflective material). However, what is both interesting and troubling about the current state of geoengineering is that several approaches are currently being tested, albeit on a small scale. In the following section I discuss one of the most significant legal structures that might restrict such research before going on to a basic review of the most cited arguments against geoengineering, followed by an introduction the critical theory of technology approach and a comprehensive discussion of its relevance to the study of this particular technology with respect to the need for public intervention.

2. Status of global policy and law

As noted, there are a number of significant existent international legal and policy tools, including conventions and treaties, which may serve to curtail particular forms of geoengineering experimentation. The first convention of note is the UN Convention on Biological Diversity (CBD). At present, all nations that are signatories to the CBD have agreed to de facto moratorium on any and all geoengineering experiments and projects. Consistent with the precautionary principle, with obligations for preserving diversity under the CBD and in line with a general consensus that such a prohibition is required, as long as there are no agreed upon science-based and global regulatory mechanisms, all CBD countries have determined that geoengineering is both dangerous and unnecessary.

Nonetheless, because the US has not ratified the CBD, this particular moratorium does not apply to one of the most, if not *the* most, significant global environmental player. Additionally, it is important to note that the position of the highly influential US National Science Foundation (NSF), whose conclusions are supported by a Congressional panel studying geoengineering, that further geoengineering research *must* be undertaken due to the significant threat posed by climate change. Although both bodies lament the fact that we must consider such drastic alternatives, and as such couch their support of geoengineering in regretful language, they are clear that geoengineering will be required in the future.

For example, according to Representative Bart Gordon (D-TN), Chairman of the House Committee, whose report is titled 'Engineering the Climate: Research Needs and Strategies for International Coordination': "Geoengineering should only be considered as a potential stopgap tool, in the event of a crisis, and should be part of a much wider package of climate change mitigation and adaptation strategies" [5]. While this conclusion is cautious, his report makes it clear that we cannot wait for a climate emergency to begin research. Gordon also makes use of the scientific freedom argument to criticize the CBD moratorium, which he claims could stifle research: "A research moratoria that stifles science, especially at this stage in our understanding of climate engineering's risks and benefits, is a step in the wrong direction and undercuts the importance of scientific transparency" [4, p. ii]: Also of note is the fact that these Congressional hearings on geoengineering were held in partnership with the UK House of Commons Science and Technology Committee. As such, both bodies reached similar conclusions.

Finally, and even more significantly, the current CBD moratorium does allow for countries to undertake controlled geoengineering experiments on a small scale. This move has opened the door for private corporations to begin experimentation. In fact, both Richard Branson and Bill Gates have given significant amounts of money to scientists active in the geoengineering community in support of continued research and future testing – particularly with respect to SRM technologies. ExxonMobil and Boeing are also active in biochar and carbon sequestration testing as well as ocean seeding. As well, and as more and more warming induced natural disasters are seen through the lens of national security, government bodies like Homeland Security have taken it upon themselves to study how to mitigate the effects of security threatening disasters like Hurricane Katrina. Additionally, the threat of environmental refugees, food