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Perspectives on solar geoengineering from Finnish Lapland: Local insights on the global imaginary of Arctic geoengineering

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ABSTRACT

"Solar geoengineering" or albedo modification—changing the reflectivity of the earth, using methods like placing particles in the stratosphere—has been proposed as a means to potentially cool the Arctic and forestall climate tipping points. However, this concept has remained a global imaginary, grounded in coarse-resolution climate modeling. How do people actually living in the Arctic imagine themselves experiencing or shaping solar geoengineering? How can the experience of people in particular places inform discussions of solar geoengineering governance? This paper synthesizes perspectives from extended interviews with citizen stakeholders in Finnish Lapland. Rather than approaching solar geoengineering from the perspective of Arctic or local interests, respondents took a global view of its prospects and governance. However, the idea of solar geoengineering also sparked deeper discussions about northern or Arctic ways of living in the Anthropocene: how to coexist with loss and unfamiliar climates, relocalization and new rural livelihoods in the north, and dematerialization of northern economies. The results challenge some common tacit assumptions in geoengineering governance discourse: (1) that people's climate preferences are obvious or quantifiable; (2) that individuals will look at solar geoengineering through an personal, utilitarian lens, or as a game of maximizing benefits to their region, when in fact they may have a cosmopolitan or interconnected systems-perspective; and (3) that states act in the interests of their citizens, when in fact they may act in the interests of elites.

1. Introduction

1.1. Rationale

It is technically possible to place particles into the stratosphere to reflect a fraction of incoming sunlight and cool the earth. Called "albedo modification, "climate intervention", or "solar geoengineering", this prospect has been hotly debated in the scientific literature and the press over the past decade, with the case made for expanded research as well as for a moratorium on geoengineering activities. However, the "understanding of the ethical, political, and environmental consequences of an albedo modification action is relatively less advanced than the technical capacity to execute it", as noted in a recent National Academies of Sciences report (NRC, 2015). Commentary on solar geoengineering often poses the question: "Whose hand will be on the Earth's thermostat?"

Even though it is understood that the earth doesn't have a thermostat, and there wouldn't be one hand making a choice, there are decisions about this technology that may need to be made by individuals, organizations, and governments, including whether to stop talking about it or researching it. When it comes to the possibility of designing and implementing solar geoengineering, the choices are manifest, and could only be done by a collective over a vast period of time due to their complexity: where to place the particles, what sort of particles they are, who will do it, how it will be paid for, who will bear the liability, how many particles to form, how to monitor their progress, when to adjust, and, most importantly, how to decarbonize the energy system into net-negative emissions and ensure we would be able to phase out particle deployment. Without lowering carbon dioxide concentrations, there would be a risk of catastrophically rapid warming if the geoengineering was suddenly terminated. One person would not have the knowledge to plan out something this complex. But perhaps fifty people could, especially augmented with emerging computational tools. Better, perhaps, a thousand people having input—or a million? Or ten billion? For we would all be clients of the engineers, with a stake in the project—even regional climate interventions could have global repercussions.

How to design a governance system for an intervention of this scale can seem intractable, but a worthy first step is gathering multiple perspectives on it. Most of the social science literature on climate

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engineering has addressed the global scale, even though social science studies have happened in particular places. This paper aims to address regional and local dimensions of climate engineering, and examine how they interact with the global. In particular: How do local people experience a global imaginary, and how do they imagine themselves shaping it? What agency might they have in determining its research trajectory or use, and what experience can they bring to bear? And finally, what does placing albedo modification into a local context help us see regarding the prospects of governing this kind of global intervention?

1.2. Theoretical framework

1.2.1. Previous research on geoengineering "in place"

There is a modest body of about 30 empirical social science studies on public perceptions of climate engineering, about half of which are large-n surveys, and half using qualitative methods (focus groups or deliberative workshops) (Burns et al., 2016). Surveys often assess public knowledge of the topic, or explore variables like education, age, trust in institutions, etc., in determining perspectives on climate engineering (Merk et al., 2015). The qualitative work, on the other hand, has focused on "upstream" public engagement (Corner et al., 2012). A "second wave" of deliberative engagements focused on unframing geoengineering and repositioning it as a matter of public debate alongside other approaches to climate change (Bellamy and Lezaun, 2015). Studies have engaged with theory on moral hazard (Fairbrother, 2016; Merk et al., 2016; Corner and Pidgeon, 2014), views of naturalness (Corner et al., 2013), or the cultural theory of risk (Bellamy et al., 2017; Kahan et al., 2015).

However, few of these previous studies examined solar geoengineering in the context of a particular place. Most look at views of solar geoengineering as a global object, rather than analyzing how cultural knowledge, including history and geography, might have shaped perspectives on climate engineering. For example, Asayama et al. (2017) carried out six focus groups in Tokyo, and the dimensions they focused upon in their analysis, based on the data, were accountability, controllability, predictability, and desirability—they read the data in conjunction with the international discourse on geoengineering, rather than through the lens of being situated in Japan. However, Wibeck et al. (2015) studied public sense-making of geoengineering in Sweden, and did analyze their data with attention to Swedish awareness of the risks of other large-scale technologies. Visschers et al. (2017) conducted a six-country survey and found Chinese respondents to be more accepting of solar geoengineering than counterparts in North America or Europe, but the survey methodology only allows a speculative exploration of why that is the case. Carr (2015) is the only in-depth study to focus on geographically diverse places using qualitative methodology. His study focused upon vulnerable populations in Kenya, the Solomon Islands, and indigenous Alaska, and drew upon context-oriented vulnerability research; it differed from this study as it aimed to address the perspectives of vulnerable people. Notably, Carr states that "one of the most striking findings was that many interviewees expressed similar views despite considerable geographic and cultural diversity within the sample" (2015: 43).

In fact, in this small sample of around thirty studies, educated laypeople in developed countries had "recurring patterns" in their views about geoengineering (Burns et al., 2016): e.g. ambivalence about geoengineering experimentation, and concerns about its controllability, but support for researching the idea in case it might be needed in a climate emergency. This calls into question the relative importance of geographic factors in shaping perceptions of climate engineering. Moreover, a six-country study on perspectives on climate change using place-based methods by Crona et al. (2013) expected to see distinctive cultural models around climate change, but instead found a "'global', cross-cultural mental model around climate change and its potential impacts which in itself is linked to higher education" (2013); this global mental model may also be employed to understand climate engineering. I would suggest that the question of geographic, cultural, and historic factors in understanding geoengineering is still rather open, and in need of further research in diverse places.

1.2.2. Local and contextualized views of climate change and the Anthropocene

This paper is situated in conversation with two related literatures: the established literature on the importance of local perspectives in understanding the human dimensions of climate change, as well as emerging critiques of the inadequacy of the global earth system science gaze for understanding the Anthropocene. This first literature suggests that local perspectives on climate change are valuable for many reasons: they help in understanding actual climate impacts, as well as successful adaptations on interacting scales (Adger et al., 2005); they illuminate what motivates change to low-carbon behavior; they aid in climate change communication; and our understanding of the climate system itself can be improved through local observations (Byg and Salik, 2009). This place-based work affirming the importance of local perspectives can be read in conjunction with a wave of emerging scholarship that challenges the dominance of global modeling representations of the human dimensions of global change. This global gaze tends to render human beings invisible, both as agents or as victims of global environmental change (Lövbrand et al., 2015). In response, Biermann et al. (2016) have called for a "contextualized Anthropocene lens" to downscale the Anthropocene, a lens which is capable of viewing interconnected socio-ecological system and taking into account social inequalities. The problem is not just that the gaze of global change science often ends up being apolitical, unable to mention power, violence, or inequality (Castree et al., 2014). It is also that the standard metrics are unable to see many dimensions of the problem. In a commentary about loss and damage from climate change, Barnett et al. (2016) describe the things that are overlooked because they cannot be captured by standard metrics – landscapes such as ice fields, neighborhoods, cultures, social cohesion, daily practices, and occupational identities.

The inadequacy of the global gaze here matters immensely for climate engineering, because a discussion of geoengineering in terms which are unable to incorporate the things people care most about will lead to a rift between governance discussions and the people whose climate is being governed, at the very least. Looking at geoengineering through a theoretical framework grounded in this place-based literature allows us to not only incorporate discussions of cultural values. It also helps us to question some of the common assumptions in the literature on geoengineering: that people will necessarily want to set the thermostat at different levels, that they will rationally choose climate preferences based on their self-interests, that there will be winners and losers, and that people will hold widely divergent views on whether or how to embark upon geoengineering research (e.g. Barrett, 2014; Victor, 2008; see review by Harding and Moreno-Cruz, 2016). Bodansky (2013) summarizes major governance challenges:

> Who should decide whether and how to engage in geoengineering? Should individual countries be allowed to weigh the potential benefits and risks on their own? Or should geoengineering require collective decisions and, if so, what international body should have this responsibility? What limitations, if any, should be placed on individuals to prevent them from undertaking geoengineering? And how should the international community address attempts by individual states to engage in geoengineering?

These questions are set in terms of competition between actors, and who holds power to permit or limit. The idea of the utilitarian rational actor in particular has conditioned how we think about geoengineering and potential responses, and has even conditioned how some of the empirical social science literature is conducted.

These tendencies towards investigating individual