

Title: Putting Cats Back Into Bags. On the Reversibility of Solar Geoengineering

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Abstract:

In this paper I explore what role the concept of reversibility plays for the evaluation of Solar Geoengineering in the form of Stratospheric Aerosol Injection (SAI). I argue that the reversibility of both the societal and physical impacts of SAI are paramount regarding the technology's ethical assessment, especially due to the high degrees of uncertainty involved.

SAI entails spraying aerosols into the stratosphere, creating an artificial veil subsequently reflecting more sunlight back into space, reducing the earth's surface temperature. The ethical debate surrounding SAI's research (and potential deployment) is polarized, ranging from staunch opposition to tacit support for research. However, due to the uncertainties involved in the modelling and science behind SAI and its impact on the climate (Kravitz and MacMartin 2020), assessing the technology is ambiguous. By focusing on the concept of reversibility, this paper offers a possible way of dealing with the uncertainty and ambiguity involved in the assessment of SAI.

Following engineering ethics and science, technology, and society studies scholarship, I define reversibility as the capacity to stop current technological trajectories and development, and subsequently undo the impacts they had hitherto (Bergen 2016; Hartzell-Nichols 2012; Trouwborst 2009). Assuring reversibility therefore is a morally prudent measure, enabling adaption and changes when deploying technologies whose consequences are uncertain.

Reversibility is further reminiscent of the well-established concept of resilience, in that it implies the possibility of re-establishing some previously held state of affairs (Doorn 2017; Folke 2006).

Disentangling these two notions is another analytical aim of this paper.

I broadly distinguish between two kinds of reversibility. First, socio-political reversibility describes any reversibility connected to institutional or political avenues to cease and revert SAI research & deployment. Relevant aspects here are the issue of path-dependency and lock-in (Cairns 2014), as well as adaptive and reflexive governance approaches (Lee and Petts 2013;

Dryzek and Pickering 2019) and the reversibility of social harms (Pols and Romijn 2017). Second, environmental reversibility describes any physical or chemical impacts that SAI, both as a research project and through potential deployment might cause. Relevant aspects here are the concrete impacts SAI might have on the earth system as a whole, such as precipitation patterns (Da-Allada et al. 2020; Ferraro, Highwood, and Charlton-Perez 2014), stratospheric chemistry (Pope et al. 2012), acidity of the oceans, etc. (Ferraro and Griffiths 2016)

SAI is a curious case for both socio-political and environmental reversibility. On the one hand, some scholars argue that merely researching SAI will cause a slippery slope, ensuring political and scientific interests to outmanoeuvre justifiable worries once a research program is underway (e.g. Hamilton 2014). On the other hand, if deployed, SAI would have to be continued until safer levels of atmospheric CO₂ are reached, in order to prevent catastrophically rapid global warming (“termination shock”). SAI, once deployed, creates an incentive for temporary irreversibility in its deployment to avoid rapid warming.

Distinguishing between two kinds of uncertainty allows for a differentiated evaluation of what role the concept of reversibility should play in terms of assessing SAI. It highlights that the context within which reversibility is invoked matters. Investigating the role of reversibility also is of generic use for the evaluation and governance of New and Emerging Science and Technology (NEST) in general.