Governance of geoengineering in the face of normative uncertainties

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Geo-engineering, more specifically Solar Radiation Management (SRM), is the deliberate manipulation of sunlight that could alleviate some of climate change concerns. SRM is proposed to deal with some of the risks of climate change while it could be a disruptive technologies due to its potentially large-scale risks that could be spatially and temporally dispersed in unequal and unjust ways. Hence, decisions about geoengineering involve serious risk versus risks trade-offs.

Current concepts of risk and risk governance are insufficient in capturing the necessary ethical intricacy. We need a richer account to address the subtle yet extensive normative issues associated with risk decisions regarding SRM. In so doing, we need to acknowledge and address *normative uncertainties.* In this paper, we conceptualize normative uncertainties as situations where there are different partially morally defensible but incompatible options or courses of action, or in which there is no fully morally defensible option. These instances of normative uncertainties could be evolutionary, theoretical, conceptual and epistemic.

Evolutionary normative uncertainties relate to situations in which it is unclear which moral norm would apply to a certain situation creating technological risk, because both the technology and moral views could evolve in the future. I.e. the development and implementation of a specific SRM application (both the technology and its scale of application) could give rise to unanticipated consequences, which could render an earlier identified normative norm irrelevant, or add a new (not yet known) norm to the discussion.

The second category is theoretical normative uncertainty, that is, when different ethical theories offer different answers to an ethical question in risk governance. For example, aggregate consequentialist theories that aim to maximize the greatest good for the largest number of people often conflict in the outcome of their moral quandaries with deontological often more individualistic approaches. This is relevant when discussing the acceptability of risk people now and in the future could be exposed to as a result of SRM.

Conceptual normative uncertainties are situations in which different ethically relevant concepts (e.g. values) could be *prioritized* or *interpreted* differently. These differences could be revealed at both the conceptual and the empirical level, showing – for instance – that different prima facie ethically relevant concepts cannot be realized simultaneously and a trade-off is inevitable.

The fourth category is epistemic normative uncertainty. One might argue that epistemic normative uncertainties are a specific type of epistemic uncertainties, that is, a situation in which there is incomplete knowledge about fundamental phenomena, or different interpretations are possible about the same body of knowledge. Not all epistemic uncertainties carry normative weight, but in many instances epistemic uncertainties have a normative dimension, for instance in the formulation of scenarios based on the future behavior of aerosols in the stratosphere and how that would– spatially and temporally – influence the climate.