



Original research article

Battling Promethean dreams and Trojan horses: Revealing the critical discourses of geoengineering

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ABSTRACT

Geoengineering could counteract climate change by either altering the earth's global energy balance by reflecting sunlight or removing CO₂ from the atmosphere. Geoengineering evokes various ethical and political challenges that are increasingly reflected in public debate and deliberation. Via a qualitative textual analysis of 1500 articles, we investigate discursive claims critical of geoengineering, considering what subjects are the most controversial, and what worldviews, values, and problematizations are shared by the actors subscribing to this discourse. We argue that the controversy about geoengineering differs, discursively, from other techno-political conflicts. Geoengineering proponents are described as reluctantly favouring research and deployment and displaying an unusual self-reflexivity, as they are well aware of and seriously consider all the technology's risks. Our analysis demonstrates that the discourse critical of geoengineering differs from and questions the dominant pro-geoengineering discourse in several profound ways with lasting implications for energy scholarship and analysis.

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1. Introduction

Geoengineering is a set of heterogeneous technologies that could counteract climate change by either altering the earth's global energy balance by reflecting sunlight or removing CO₂ from the atmosphere. The options that attract the most attention are the injection of sulphur aerosols into the stratosphere, cloud seeding/whitening, air CO₂ capture, and ocean fertilization, but more spectacular options such as space mirrors are also considered geoengineering [1]. Due to the potentially severe environmental risks accompanying several of these technologies, major uncertainties, and the fact that most of these options are unproven, geoengineering was long deemed undesirable or marginal in both international climate negotiations and scientific research [2]. It was not until Nobel laureate Paul Crutzen's [3] cautious encouragement of research into geoengineering, in a 2006 special issue in *Climatic Change*, that a more lively and open public debate on geoengineering emerged.

In the wake of this special issue, positive aspects of geoengineering dominated the debate, although serious concerns were

raised [4,5]. In autumn 2013, geoengineering entered the agenda of the IPCC meetings, and geoengineering options will be considered by all three working groups contributing to the forthcoming Fifth Assessment Report in 2014. Its most vocal advocates even urge that these options must be treated as viable options, beside conventional mitigation methods, in international climate negotiations [6]. This marks a radical shift from the IPCC's 2007 statement, made despite the absence of cost calculations and risk assessments, that geoengineering options "remain largely speculative and unproven, and with the risk of unknown side-effects. Reliable cost estimates for these options have not been published." [7, p. 15]. Today the concern that climate change may be irreversible without geoengineering has become more common even in the climate science community than it was only few years ago [8].

As large-scale geoengineering ultimately entails exerting far-reaching control of the global climate system by applying technology, it evokes various ethical, emotional, and political challenges that are increasingly reflected in the public debate. Recurring arguments for geoengineering research are that the severity of climate change justifies new means to counteract global warming and that political failure means that conventional methods will be insufficient [4]. Sovacool [9], and Stirling [10] explain that a discourse analysis is a fruitful approach for social scientific scholars interested in for example climate change and energy issues because it can deepen the understanding of how objects, concepts and practices mutually constitute each other and are given

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meaning. In line with this understanding geoengineering is a narrative, based on a system of ideas, beliefs and ideology, which is laden with contradictions that are constantly re-produced and negotiated. By applying this perspective social science may independently contribute to a wider plurality of social interpretations and hence influence framing priorities and questions for further research, and possibly also laying a ground for critique of prescriptive policy recommendations [cf. 10].

Portions of the mass media debate on geoengineering have been examined in previous research, though the focus has not been on the critical discourse [4,11]. Buck [12] and Scholte et al. [11] claim that the geoengineering debate in the 2006–2009 period predominantly conveyed arguments for more geoengineering research; it was not until 2011 that geoengineering controversies were reported more explicitly and frequently in the mass media, probably because minor field experiments had taken place.

Previous research into the mass media debate on geoengineering applied content analysis primarily to quantify or categorize various themes or characteristics in a rather narrow set of articles from US or UK newspapers. Frames, discourses, metaphors, and storylines are concepts that have been applied to systematize, describe, and explain this material [11–16]. The present paper advances this research by scrutinizing the global public debate, predominantly the previously ignored critical discourse, but is unlike previous research in applying qualitative text analysis. Despite our qualitative approach, we have amassed a larger sample of articles with a wider geographical scope than used previously. By contrasting the critical discourse with prior research, we have expanded the analysis and deepened the understanding of the geoengineering debate.

In mass media research into geoengineering, Scholte et al. [11] and Nehrlich and Jaspal [14] have emphasized investigating whether or not the geoengineering debate is opening up, i.e., whether the coverage of geoengineering is becoming wider-ranging and more diverse over time, and have reached opposite conclusions. Although we support Scholte et al.'s [11] conclusion that the debate is opening up, we argue that this matter is not of primary importance. It is more important to address the question raised by Cairns [17], i.e., what broader implications and states can be discerned behind the political pluralities in the debate? The present paper identifies the central claims in the discourse critical of geoengineering, exploring what subjects are the most controversial, and what worldviews, values, and problematizations are shared by the advocacy and critical discourses on geoengineering.

2. Theory: discourse and storyline

To organize statements about a particular object or part of the world, we apply the concept of discourse. We treat discourses as specific ways to speak of and represent the world [18; cf. 4], and the actors within a specific discourse as using a language based on common definitions, judgments, assumptions, and contentions when addressing a topic [19]. We use the discourse concept analytically to structure and order the examined texts: discourses are not inherent to the texts, waiting to be discovered, but are constructed by the researcher. Discourses are constructed in the research process to make it possible to speak about patterns in a heterogeneous and complex reality. Lovell et al. [20] claim that complex environments are suitable for the storyline approach, which is a middle-range concept in relation to discourse. This means a focus on the intra-discursive characteristics and somewhat simplified explanations, in the sense that a storyline does not contain all the uncertainties and diversity of the discourse. Nevertheless, storylines play a key role in filling the gap between the more abstract concept of discourse and concrete textual events, for example, statements in

articles, according to Hajer [21] and Heitman et al. [19]. The discourse concept helps explain the criticism of geoengineering at a more abstract level, while the storyline concept focuses on specific aspects and is closer to the empirical material. Hajer [21] explains:

Story lines are devices through which actors (stakeholders) are positioned, and through which specific ideas of blame and responsibility, and of urgency and responsible behaviour, are attributed. Through story lines stakeholders can be positioned as victims of pollution, as problem-solvers, as perpetrators, as top scientists or as scaremongers. (pp. 64–65)

The storyline concept commonly works in tandem with the concept of discourse coalition [19,21]; however, we aim neither to map the actors nor study, in depth, the practices in which the discursive activities take place [20]. We do not intend to identify specific actors or to pinpoint the discourses with which they are aligned. Lovell et al. [20] claim that it is sometimes not even possible to identify distinct groups of actors within the discourse coalitions. In the present case, we assume that there are no strong links between the storylines and discourse coalitions. In the geoengineering discourse, a specific actor may make statements belonging to several storylines, and actors may also be ambivalent and change their views over time. We claim that geoengineering's novelty, the lack of formal political processes concerning its development, and the few relevant field experiments complicate the identification and construction of discourse coalitions: the practice is in the making and the boundaries of potential coalitions are also in the making.

We also admit that there are few "pure" critics, as even actors criticizing geoengineering may express some conditional support for its deployment. Though specific actors have occasionally been selected in our analysis to exemplify a specific discourse or storyline, we assert that they do not necessarily agree on the range of views expressed in that discourse. However, as mentioned, the analytical focus is on discourses and storylines, i.e., abstractions of the content of mass media articles and various actors' statements and not on groups of actors taking a stand on geoengineering (cf. [22]).

3. Materials and methods

The analysis relates primarily to our previous research, conducted in spring 2013, examining approximately 1500 articles published between 2006 and summer 2013. We used the Retriever database (a Nordic version of LexisNexis), which covers more than 12,000 newspapers globally, and applied the search strings "climate engineering" and "geoengineering AND climate". We included all articles written in either English, German, Swedish, Danish, or Norwegian, simply because these are the languages in which we are fluent. A total of about 115 articles, approximately 8% of the total, were categorized as critical of geoengineering, considerably fewer than the articles advocating geoengineering. Like Scholte et al. [11], we do not consider articles mentioning or discussing both the pros and cons of geoengineering as necessarily "balanced"; instead, we make the categorization depending on the articles' main argument, recommendations, or conclusions. However, in some articles both the discourse advocating geoengineering and the discourse critical of geoengineering were represented.

To enable comparative analysis of the discourses advocating and/or critical of geoengineering, we use a method identical to that of our previous study [4]. The texts were chronologically ordered and read several times to identify the most important passages relevant to the discourse critical of geoengineering. The texts were then coded and categorized in an ongoing analytical process of recoding and re-categorization. Recurring metaphors, emblems, notions, assumptions, claims, and other central meaning

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