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The postmodern solution: an analysis of the geoengineering discourse in the public debate

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Introduction

Geoengineering refers to the deliberate manipulation of the Earth's global climate by using grand scale technologies. Geoengineering includes a wide range of proposed methods, which vary greatly in their technical aspects, scope in time and space and potential environmental impacts. There are two major categories of methods: solar radiation management (SRM) and carbon dioxide removal (CDR). SRM reflects sunlight and thus reduce global warming without addressing the concentration of carbon dioxide in the atmosphere and consists of options such as injecting aerosols into the stratosphere, orbiting space mirrors, creating artificial clouds out of the seawater or simply painting roofs white. CDR on the other hand reduces the amount of carbon dioxide already in the atmosphere by for example technologies for air capture or massive ocean iron-fertilization.

Since the publication of the Nobel laureate Paul Crutzen's seminal paper in *Climatic Change* in 2006 geoengineering has gained increased attention primarily within the research community but also among politicians. What was previously, with few exceptions, considered as merely science fiction or redundant options is now re-considered or assessed by prominent researchers and in the wake of these efforts a public debate is emerging. Geoengineering is not only a set of novel options for managing climate change, they also pose new challenges concerning global governance, man-nature relations, ethics, risk assessments and public deliberation. Geoengineering has the theoretical potential to become a tool that enables the humanity to alter the global climate according to her needs and desires, however at the potential costs of enormous environmental risks, political conflicts and irreversible unintended consequences. Consequently, geoengineering evokes both hopes and fears as either for example a technological fix that saves humanity from

climate collapse or as a far too complex technology that intervenes in the sensitive and unpredictable Nature.

In this paper we aim at creating an understanding of the public discourse of geoengineering. We focus on how different storylines and metaphors are related to each other and make up a general discourse in favor of the testing or deployment of geoengineering. In contrast to previous research that has been concentrated on mapping, identifying and quantifying different aspects of the discourse we apply a text analysis method and try to explain the rationales of specific storylines and the roles they play in the discourse, discerning and making sense of important aspects of the public debate on geoengineering as well as the overall pattern. This paper is based on the most extensive empirical mass media material on the public debate so far. About 1500 newspaper articles, published between 2005-2013, in English, German, Swedish, Danish and Norwegian from all over the world have been analyzed in order to enable the construction of coherent storylines that constitute the larger part of the discourse advocating geoengineering.

Previous research

A few studies on discourses, framings or storylines in the public debate and/or the scientific community have already been conducted. However, most of them apply content analysis methods trying to map the geoengineering discourse and quantify the number of positive and negative articles and how different frames correspond to negative or positive statements. Furthermore, the previous research is solely based on material in the English language, and in some cases only on articles in major and influential newspapers in the UK or the USA, and in general on a material comprising only 50-200 articles.

In a content analysis study, based on 85 (93?) articles in English from ten countries, on news media coverage of geoengineering Holly Jean Buck explains that the first impressions or frames for understanding geoengineering in the public sphere has yet to be set. She clarifies that it is important to study portrayals of environmental issues because they may change the course of both national and international policies, governance and public opinion.¹ That point of departure is also shared by the present paper, as well as Loukkanen's et al, Nehrlich & Jaspal's, Porter and Hulme's, Scholte's et al and Sikka's.² Buck analyzed storylines in the news media – how is the technology framed and by who? In contrast to Buck we do not include an analysis of how the frames enable or hinder specific forms of climate governance, however we certainly agree that the news media has substantial influence. In Buck's

¹ Buck, H J (2013) Climate engineering: Spectacle, tragedy or solution? A content analysis of news media framing.

² Loukkanen, M, Huttunen, S, Hildén, M. (2013) Geoengineering, newsmidia and metaphors: Framing the controversial. *Public Understanding of Science*. DOI:10.1177/0963662513475966. Nehrlich, B. and Jaspal, R. (2012) Metaphors we die by? Geoengineering, metaphors and the argument from catastrophe. *Metaphor and Symbol*. 27:2. P 131-147. Porter & Hulme 2013., Scholte, 2013, Sikka, 2012

analysis five dominant frames were constructed: catastrophic, managerial, cautionary, spatiotemporal struggle and bildungsroman. The most frequent discursive elements describe a climate crisis situation and frame geoengineering in an ecological modernization context; geoengineering is 'mega-gardening' or 'tending the wild' and implies governance and expert knowledge. As is shown in our analysis articles featuring ecological modernization are neither enthusiastic nor positive, rather they pretend to reluctantly support geoengineering.

In a review of a few major newspapers, political speeches and reports Tina Sikka identified four discursive frames applied by geoengineering advocates. However, she only analyses the two frames – “exceptionalism” and “the market and the economy”.³ The two frames are similar to Buck’s two categories “catastrophic” and “managerial”. Humanity is facing catastrophic global warming, but the technological fix – geoengineering - is coupled with severe environmental risks. The successfully deployed exceptionalism, Sikka explains, can be understood “as the process of setting up often false, ominous, and therefore exceptional, scenarios in which we as citizens must choose between two stark and generally unappealing choices”.⁴ Setting the catastrophic scene is commonly conducted by referring to climate tipping points, a rhetoric that according to Sikka is not inherently bad, but is misused by geoengineering advocates who take the analogy out of context – a context that primarily suggests conventional options for managing climate change. Combined with the frame of “the market and the economy” - the firm belief in the market, innovation and entrepreneurialism - the argument for geoengineering becomes even stronger. Sikka even claims that these two frames combined are hegemonic and force closure on both the scientific and public debates.⁵

Scholte et al is polemical to Sikka’s claim concerning hegemony and closure in the debate. They examined 181 articles in English-speaking newspapers between 2006 and 2011 in order to determine whether the debate is opening up or closing down. They claim having strong support for an opening of the debate, especially since 2009. After 2009 the number of overly deterministic frames, such as “the techno-fix and benefits for society”, decline and the distribution of the various frames becomes more balanced in quantitative terms.⁶

Matti Loukkanen et al⁷ expand on Birgitte Nehrlich’s and Rusi Jaspal’s⁸ geoengineering metaphor analysis by illustrating that the use of metaphors differs when speaking for or

³ Sikka, T. (2012) A critical discourse analysis of geoengineering advocacy. *Critical Discourse Studies*. Vol 9. No 2. 163-175.

⁴ Sikka (2012) p. 168

⁵ Sikka (2012)

⁶ Scholte, S. Vasileiadou, E and Petersen, A C (2013) “Opening up the societal debate on climate engineering – how newspaper frames are changing.” *Journal of Integrative Environmental Sciences*. 10:1. P. 1-16.

⁷ Loukkanen, M, Huttunen, S. Hildén, M. (2013)

⁸ Nehrlich, B. and Jaspal, R. (2012)

against geoengineering. The empirical material was delimited to *The Guardian* (UK) and *The New York Times* (USA) and the time period 2006-2010. In contrast to both Nehrlich's and Jaspal's analyses of promotional discourses based on 350 articles from 1988-2010, and Sikka's study, Loukkanen et al claim that framing geoengineering in a catastrophic context does not necessarily make geoengineering appear as an inevitable necessity, even if that seems to be most common case. However, Loukkanen et al claim that their study supports the findings by Nerlich and Jaspal concerning the identification of metaphors as well as their conceptual background. Loukkanen et al emphasize that geoengineering metaphors are used in a variety of contexts and may actually imply both negative and positive views. Metaphors relating to controllability were for example most often found in arguments for geoengineering and metaphors related to mechanism or health most often against, while a few others could be found to convey a variety of arguments.

Porter and Hulme analyze geoengineering from the first time the term entered the UK national print media in 1992 and until April 2011, totally 70 articles. They identify seven issue frames that they attribute to the articles. The most reoccurring frame is the innovation frame which is characterized by techno-centric optimism assuming nature is to be dominated, controlled and improved by human prowess and proficiency. They explain that this framing was also noted to be dominant by Buck⁹ in scholarly frameworks for assessing geoengineering. However, Porter and Hulme emphasize the limited generalizability of their study, due to the narrow geographical scope,¹⁰ but with the widened scope in the present study, in regards of both the material and the ambition to analyze the relations between the storylines, we will provide a broader picture.

Methodology

Discourse and storyline

As illustrated above at least five studies have been conducted analyzing the public debate on geoengineering in news media by applying the concepts metaphors, storylines, frames, discourses or combinations of them.

We will use the concept discourse to denote statements that are directed toward an object or a part of the world, and that take place within a specific field of knowledge. Discourses are being expressed in specific ways to speak about and represent the world.¹¹ The actors

⁹ Buck H J 2012 Climate remediation to address social development challenges: going beyond cost-benefit and risk approaches to assessing solar radiation management in Preston C J ed *Engineering the climate: the ethics of solar radiation management* The Rowan and Littlefield Publishing Group, Lanham, MD, 133–48.

¹⁰ Porter and Hulme (2013)

¹¹ Fairclough. *Analysing Discourse "Textual Analysis for Social Research"*. Routledge, London. 2003.

within a specific discourse use a particular kind of language that rests on common definitions, judgments, assumptions and contentions when addressing a topic.¹² In this paper we will only analyze discourses as they are represented in texts that are parts of the public debate. Our intention is to use the concept analytically to structure and order the extensive body of texts that will be examined. This means that we do not understand discourses as something that is inherent in the text material waiting to be discovered. Rather discourses are constructed in the research process in order to make it possible to speak about patterns in a heterogeneous and complex reality. This does not mean that they are randomly constructed. On the contrary, we are convinced that repeated readings of an extensive text material and accurate references to selected texts make our constructions well founded, even if they cannot be fully exhaustive.

One point of departure is a storyline approach, an approach that is more suitable than “discursive frames” when studying narratives in a milieu characterized by uncertainty and change, as for example the geoengineering debate.¹³ Storylines are narratives that allow actors to draw upon various and sometimes very apart aspects of the discourse they are a part of and give meaning to a specific phenomenon. Storyline is therefore, in relation to discourse, a middle-range concept with focus on the intra-discursive characteristics of the issue at hand. Furthermore, storylines are simplified explanations in the sense that they do not contain all uncertainties and diversity in the discourse. However, in addition to constructing the problem the storylines also play a key role in the creation of the social and moral order in a given terrain according to Hajer.¹⁴ Hajer explains:

The point of the storyline approach is that by uttering a specific element one effectively reinvokes the storyline as a whole. It thus essentially works as a metaphor. First of all storylines have the functional role of facilitating the reduction of the discursive complexity of a problem and creating possibilities for problem closure. Secondly, as they are accepted and more and more stakeholders start to use the storyline, they get a ritual character and give a certain permanence to the debate.¹⁵

¹² Heitmann Hansen, O, Langhelle, O, Anderson, R. (2008) Framework and Methodology: Regulation and Discourse analysis as a research strategy. In Mikkelsen & Langhelle (ed.) Arctic Oil and Gas: Sustainability at Risk?

¹³ Lovell, H, Bulkeley, H, Owens, S (2008) “Converging agendas” Energy and climate change in the UK.” *Environment and Planning C: Government and Policy*. 27(1) 90 – 109. Cf. Tikka (2012) who applies the concept discursive frames in order analyze how strategies have been used to construct geoengineering as necessary and natural. In contrast to the present study she has the ambition to find powerful discursive structures.

¹⁴ Hajer, 1995., Heitmann Hansen, O, Langhelle, O, Anderson, R. (2008)

¹⁵ Hajer (1995) p. 62-63

The concept storyline commonly work in pair with the concept discourse coalition,¹⁶ however we neither have the ambitions to map the actors nor in depth study the practices in which the discursive activities take place.¹⁷ Our aim is not to identify specific actors, or to pinpoint which discourses they belong to. Lovell et al claim that in some cases it is not even possible to find distinct groups of actors within the discourse coalitions.¹⁸ In this case we assume that there does not exist a strong link between storylines and discourse coalitions. In the geoengineering discourse a specific actor may make statements that rest on several storylines, and may also alter view over time. Furthermore we argue that geoengineering's novelty and the lack of formal political processes concerning its development and the limited number of actual field experiments raise problems for identifying or constructing discourse coalitions: the practice is in the making and the borders of potential coalitions are fluid. We also claim, as will be illustrated in the analysis, that the actor's statements in important aspects often are contradictory. It is not easy to find "pure" advocates, and storylines promoting geoengineering can also entail the most severe critique concerning its deployment. However, sometimes specific actors have occasionally been selected in order to exemplify a specific discourse or storyline, but we claim that they do not necessarily agree on the range of views that are expressed within that particular discourse. We also want to clarify that by the term advocate we primarily mean that the person supports more geoengineering research, however that does not exclude the possibility that the person also advocates the deployment of geoengineering.¹⁹

Material and method

In order to collect our empirical material we used the database Retriever and applied the search strings "climate engineering" and "geoengineering AND climate". Retriever is a database that provides access to several thousand sources globally. We limited the search to the English, German, Swedish, Norwegian and Danish languages, simply because these are the only languages that we master. However, we cover a large number of countries by including these languages. Most of the retrieved articles were in English and published in either the USA or the UK.

The texts were chronologically ordered and read several times in order to select the parts that were most relevant and important with regard to the geoengineering discourse. Specific texts and parts of texts were selected and read closely with the intention to identify central formations of meanings and story lines. The texts were thereafter coded and categorized accordingly, though the analytical process comprised continuous re-coding and

¹⁶ Hajer (1995) , Heitmann Hansen, O, Langhelle, O, Anderson, R.(2008)

¹⁷ Lovell, H, Bulkeley, H, Owens, S (2008)"Converging agendas" Energy and climate change in the UK." *Environment and Planning C: Government and Policy*. 27(1) 90 – 109

¹⁸ Lovell, H, Bulkeley, H, Owens, S (2008)

¹⁹ C.f. Hamilton, Clive. 2013. Moral Haze Clouds Geoengineering. *EuTrace Journal*. Essay No. 1., Lovell, H, Bulkeley, H, Owens, S (2008).

re-categorization.²⁰ In this way for example 40-50 texts were finally clustered and a coherent discourse emerged that were trying to interpret or give meaning to a specific aspect of the world, or to take a certain territory into possession. Even if the storylines and the discourses in this way are constructed in the analysis of specific as well as clusters of texts, we maintain that they are far from products of arbitrariness or coincidence. They rest upon repeated and systematic close readings of an extensive empirical material and every interpretation of discursive patterns is supported with a considerable amount of examples. Accordingly, we claim that there are solid grounds for establishing precisely the storylines and discourses that are in focus in the study at hands.

The analysis

The storylines analyzed here are the backbone of the geoengineering discourse. Together they constitute a group of central, well spread and influential formations of meaning that make a strong case for geoengineering. The storyline of the scientists' double fear depicts the problem, the apocalyptic situation and the dilemma that humanity has to handle. The second storyline carries the meaning that no solution can be expected from the process of international political negotiations. On the other hand the third storyline signifies that pure technology is the only possible solution and that it is an adequate substitution for politics. Lastly, the fourth storyline describes this solution in the form of grand scale technological enterprises, as something that nature has tried out for eons, and accordingly as something that works in line with the evolution and therefore secures survival.

The four storylines all point in the same direction, towards testing and deployment of geoengineering. They are hardly ever questioned in media by scientists, journalists, politicians or environmental organizations. There are some critics, as the ETC-group, a Canadian environmental organization, and a few social science researchers, but the proponents of geoengineering do not engage in political debates with the critics. This entails that the critical voices stay marginalized.

The scientists' double fear

The point of departure for the storyline of the scientists' double fear is the claim that the climate researchers that until very recently rejected geoengineering as "bizarre" ideas or foolishness, and considered these alternatives as "taboo", "anathema" or a distraction in order to manage climate change, now have re-evaluated the situation and that a majority of them have started to argue for conducting immediate research on various geoengineering options.²¹

²⁰ C.f. Coffey A. and Atkinson. P. (1996) Making sense of qualitative data – Complementary Research Strategies, SAGE, Thousands Oaks.

²¹ 56,73,77,104,275,11,144,417 (Kursivt är röd not och den vanliga svart)

The explanation for this shift is claimed to be the fact that the severity of climate change now justifies the assessment and investigation of all means that might have the potential to counteract the global warming. Climate scientists have become desperate,²² and reached their "social tipping point". Climate change is depicted as catastrophic in this storyline. The end of world as we know it is getting closer. The scientists are chocked by new scientific findings and observations. The alternatives, as they are presented, are to either inactively wait for the catastrophe or to head for the final option: geoengineering.²³

In order to emphasize the gravity of the situation even more, the time constrains and the pressing need for geoengineering, it is claimed that it might already be too late. The catastrophe is here and the negative effects are accumulated in the ecosystems. Even though it is too late, because of the delayed impact of already released greenhouse gas emissions, geoengineering opens up for the possibility to remove carbon dioxide from the atmosphere and contribute to a balance.²⁴

The fear of the consequences of climate change is therefore an asset in the discourse on geoengineering. The more alarming the global warming is presented, the more need of geoengineering, and consequently the less noteworthy the critique towards these options become. The fear that the geoengineers, popular science journalists and editorials talking within this discourse enact is their main resource. In some cases this fear is expanded to also include the deployment of geoengineering. Thus, the president of the Royal Society's panel of experts, John Shepherd, declared that he was not in favor of geoengineering but "feared" that it was likely that it would be needed as a complementary method.²⁵ At the prospect of COP15 in Copenhagen he declared that it was "scary" if humanity was obliged to "geoengineering solutions".²⁶ His colleague Ken Caldeira stated that he, if acting in a personal capacity, disliked geoengineering because of the substantial environmental risks, but that he as a scientist preferred sulphur particles in the atmosphere if the alternative was radical melting of Greenland's ice sheet.²⁷ Another colleague, Jason Blackstock, labeled geoengineering as "terrifying", but also added that the scientists did not develop these ideas "because of hubris, but because of fear".²⁸

The double fear expressed in interviews by these and other researchers are reproduced by journalists and entail a powerful rhetorical resource. If the researchers responsible for the development of geoengineering on the one hand proclaim and admit fear of their creation's consequences for the environment, and on the other hand in the light of an approaching

²² 26,77,104,100

²³ 56,146,276,283,300,11,57,144,168,182,261,288

²⁴ 90,93,300

²⁵ 394,406

²⁶ 831

²⁷ 159

²⁸ 869, *jmfr* 26,27

climate collapse also argue for the necessity of geoengineering, how can then citizens be able to question their tendency to expose the ecosystems for risks? They have already admitted the risks and taken the lead among those warning for geoengineering's consequences. These warnings and the admitted fear is a solid approach for creating legitimacy for these technologies. The more emphasis on the risks of geoengineering, in combination with advices for considering these options, the more inevitable tests and deployment seem. Hence, the risks of the technologies appear to be one of the main arguments for geoengineering. Scientists would never propose such risky measures if it was not completely necessary? Arguing for the technologies, in spite of their fear, confer the geoengineering scientists with both authority and trustworthiness. When the problem is formulated, as for example by Stephen Schneider, as a choice between "the lesser of two evils" who can argue for choosing "the most evil"?^{29 30} The implication of all these confessions is that geoengineers, in contrast to most other scientists and engineers, have both comprehended and highlighted the risks and side-effects concerning the technologies they are developing, and that they do not need to be informed by critical environmental movements, but this does not change anything because there exist no alternatives in the light of an acute climate collapse.

This way the researchers' carefully expressed double fear is both a precondition and a strong argument for increased investments in research or deployment of geoengineering – a rhetoric that popular science journalists and some editorials mediate without any noteworthy objections. In the light of this understanding a *Time* journalist's declaration that "the real disaster" would be to wait and not develop geoengineering until the climate change had taken on catastrophic proportions seems consistent.³¹ Geoengineering is in contrast to other large-scale technologies not accompanied with promises of a better world. The technologies' spokesmen do not offer future prosperity. Rather, the legitimacy is founded on the negative expectations.

Remarkably, these negative expectations are as illustrated related to both the global climate conditions and the direct consequences of geoengineering, in accordance with the logic that the more severe the global climate crisis is expected to become, the more environmental degradation and risks have to be accepted as a consequence of geoengineering. Additionally, several leading researchers in the field openly affirm how inadequate and insufficient the knowledge concerning geoengineering is. However, this is seldom turned into an objection against these technologies, on the contrary the knowledge deficit is portrayed as an argument for accelerated and intensified efforts in order to test and

²⁹ 56

³⁰ Jmfr Loukkanen et al who claim that this is not necessarily the case in the discourse

³¹ 300

evaluate geoengineering which the researchers know almost nothing about apart from its indispensability for saving the planet.³²

With this taken into consideration it is clear that geoengineering stands out as the first truly post-modern grand scale technology.³³ It differs for example from the technology carbon dioxide capture and storage (CCS) as it has abandoned linear modernity's promises of a prospering future and a technological development under control of the natural sciences. Such promises of progression and objective truth claims are not any longer the legitimation grounds for research and deployment of the actual technology. Geoengineering is guided by a promise to make an attempt, in a situation characterized by despair and uncertainty, not to succeed. This is also a reason why the proponents of geoengineering do not have to outline the advantages with an actual grand scale deployment, but can restrict themselves to make their case for intensified research in order to find out the potential of these technologies, even though history shows that there seldom is a strict demarcation between research and deployment, when it comes to geoengineering.³⁴

Accordingly, the storyline about the double fear of the scientists includes a vague notion of a solution to the problem. Geoengineering is, often in headlines, depicted as the last opportunity to save the world from the horrors of climate change or to save humanity from itself. It is commonly held to be a "cure" to global warming.³⁵ The situation is described as so alarming that it has become urgent to take on "extreme", "extraordinary", "risky", or even "dangerous" measures in order to make "survival of the civilization" possible.³⁶ Implicit in this storyline is the idea that it is the climate researchers and the geoengineering scientists that are the saviours of the world, acting as gods creating new atmospheric and planetary conditions for the benefits of all living organisms. The notion of the humble and self-critical scientists that demonstrate awareness of the fact that their knowledge and possibilities to ever understand the complexity of the ecosystems are heavily restricted stands in sharp contrast to the claim, most often made by journalists, that geoengineers are in the position to save the world, if they only are allowed to develop and deploy the lifesaving technologies they are advocating. This tension is fundamental to the storyline, yet never explicitly touched upon.

The failure of politics and cynical industrial fatalism

The storyline on the failure of politics of international climate negotiations and initiatives for reducing global carbon dioxide emissions constitutes an evenly important point of departure for the geoengineering discourse as the alarms concerning climate change. In the wake of a

³² Tex 26,27,56

³³ C.f. Buck (2013)

³⁴ C.f. Porter & Hulme (2012) and Buck (2013) who in contrast to our claim say that the ecological modern, or innovative frame was dominant.

³⁵ 163,417,460,483, 234,451,601

³⁶ Tex 56,77,178,286,300,11,57,107,144,168,182,261,417,420,798,898

more pressing climate situation, national governments and international institutions are repeatedly judged to be unable to conduct relevant measurements. Accordingly, the conclusions drawn by both popular science journalists and interviewed scientists are that the international political negotiations have come to the end of the road, and that other options to manage climate change now have to be considered by necessity. Geoengineering is consequently stressed as the most promising method. Hence, the argument underlines that the researchers have obtained the insight that they have to develop geoengineering because politics has failed and can no longer turn the situation around. Dr. Matt Watson notes that every time the politicians in the context of international climate negotiations prioritize economic growth or their own conditions to be re-elected they also indirectly make intensified efforts on geoengineering more necessary. In this way an antagonism is created between political negotiations regarding cuts in carbon dioxide emissions and geoengineering, where the latter is assumed to replace the former.

By some actors geoengineering and its consequences are framed as the prices that have to be paid because of the politicians' failure.³⁷ It is claimed to be possible to replace political solutions with what is depicted as non-political and purely technical solutions. Hence, politics obstructs an efficient management of climate change, while technology and science in this context are depicted as unproven and puffed as uncomplicated, even if this picture is supplemented with the reservation that geoengineering is only a complement to carbon dioxide reductions.³⁸

In particular the Kyoto Treaty and the UN processes are described as having no teeth. The Kyoto Treaty is explained to have not contributed to reducing the global emissions. The countries that have signed the treaty have neither reduced their emissions nor fulfilled their commitments. Consequently it is concluded that the Kyoto process has been more or less a waste of time. Anyhow, the procedures with international negotiations are portrayed as far too slow. The feasible emissions cuts thereof are characterized as far too limited and late. The world has not time to wait for the politicians. Even if a new and substantially more ambitious UN climate treaty would be agreed upon it would take decades before decreases in net global emissions would occur, thus more prompt measures are needed. Geoengineering is consistently portrayed as such a measure in this storyline.³⁹ Accordingly, a sharp distinction is generally made between geoengineering and UN lead emissions reductions. Even if this storyline is also emphasizing that geoengineering should not be considered as methods for making emissions reductions redundant, it is the claim that reductions have failed that provides the geoengineering advocates with their main nourishment.⁴⁰ In particular, this rationale was made explicit before and during the UN

³⁷ 418,481

³⁸ 56,59,90,125,130,275,372,11,90,100,144,146,413,415

³⁹ C.f. Sikka (2012)

⁴⁰ 90,113,125,141,372,11,14,144, cf 275

negotiations in Copenhagen in December 2009. In face of the conference several sources claimed that The Royal Society had denounced a warning saying that geoengineering is the only remaining alternative if the negotiations do not result in a treaty on significant reductions in carbon dioxide emissions.⁴¹ Another way to put it was that a failure in Copenhagen would result in a “big breakthrough” for geoengineering.⁴² Logically, in the wake of the vague treaties of Copenhagen some journalists draw the radical conclusion that “we will have to engineer the climate”.⁴³ These defeatist descriptions of the potential of politics lay the foundations for the claims concerning the necessity of geoengineering.

The resignation in this storyline rests on an industrial fatalism that enacts the impossibility to change the industrial society’s aspirations for economic growth. In spite of the alarming pictures of climate change, it is for example claimed that the use of electrical power in the world will increase by 50% until 2030, and that 77% of the increase will be produced by fossil fuels. With reference to the International Energy Agency it is maintained that the use of coal and oil will continue to rise, as if there were no choice in spite of greenhouse emissions. The governments of the world, it is said, are not prepared to compromise with their economic growth rates and especially countries like India and China are held to be, understandably, remote to accept expensive emissions cuts. There are also severe doubts on what Caldeira calls “the transcendent human capacity for self-sacrifice”, which emphasizes the need for geoengineering, a solution that does not interfere with the contemporary industrial rationality. Accordingly, the question is not whether it should be done, but how.⁴⁴ Given the socio-economic structure of contemporary industrial capitalism there is really no choice. Ulrich Beck has called this position industrial fatalism,⁴⁵ and it is usually combined with an optimistic belief that things will turn out well. However, when it comes to the geoengineering discourse there are no such reassurances. Instead the future is described as unsecure and threatening. The discourse is permeated of a cynical industrial fatalism, which denotes that there is no other choice than deploying geoengineering in spite of that the technologies in question might have environmentally devastating consequences and even make a catastrophic situation worse.

The scientists and the journalists advocating geoengineering are not forced to paint the future in bright colors, as proponents for grand scale technologies commonly are, because they are benefiting from despair and desperation evoked by climate change. So could for example John Shepherd declare that it had become necessary to invest in research in geoengineering since there were strong reasons to be “less optimistic” about decreasing the

⁴¹ 413,831

⁴² 868

⁴³ 898

⁴⁴ 60,64,125,187,280,444,462

⁴⁵ Beck. U (1995) Ecological politics in an age of risk. Polity Press.

levels of carbon dioxide.⁴⁶ It was a “price” that had to be paid, not a promise.⁴⁷ The geoengineering proponents’ message is merely that there is no choice but deploying geoengineering, no matter what the effects will be.⁴⁸ It is humanities only hope, even though there is no firm belief that it will work. The argument is that we have to take this course and it does not matter whether we believe in it or not. Hence, geoengineering has turned the fatalism of industrial society cynical.

Pure technology – a bridge to a sustainable future

The geoengineering discourse is overflowing of metaphors. The development of geoengineering is consequently called things like a “plan B”,⁴⁹ “last ditch”,⁵⁰ “parachute”,⁵¹ “airbag”,⁵² “tool-box”,⁵³ “fall back”,⁵⁴ “a last resort”,⁵⁵ and the like. What all these metaphors imply is that it is possible to test and evaluate the side-effects and the functions of the technologies before deploying them. Who would dare to use a parachute or an airbag if it had not been tested and proved to work properly? Paradoxically all these common metaphors that denote that the new technologies really is something to trust, something safe, are used by the same scientists and journalists that declare that it is impossible to at forehand know all the complex environmental consequences of geoengineering.

The metaphors suggest that there is a technological way out of a political dilemma and that geoengineering is pure technology in contrast to carbon emissions cuts which are complicated political measures that raise severe conflicts of interests. This storyline is also commonly spelled out in the discourse of geoengineering. Geoengineering is consequently depicted as a technological fix. The technologies are characterized as affordable, efficient and quick ways to solve the complicated problem of global warming with engineering measures and pure technological rationality as opposed to the slow process of negotiations concerning emission decreases and carbon taxes. These strictly technological measures will not solve the problem, but they will be a way of “buying time”, which is found to be absolutely necessary, since the international political process is found to be too inefficient. In the short run technological solutions are held to be necessary substitutes for political ones.⁵⁶

⁴⁶ 11

⁴⁷ e.g. 56,64,77,130,275,11,144,146,418,481

⁴⁸ 413,415

⁴⁹ 64,73,222f,294,300,11,413,415,417,828

⁵⁰ 11,56,73,298,412

⁵¹ 16,406

⁵² 545

⁵³ 73,256,159

⁵⁴ 825

⁵⁵ 130,135,253,825,831

⁵⁶ 21,73,90,113,141,154,159,187,233,11,15,55,234,451, Godell 23/9-2010.

The notion is closely related to the idea that geoengineering will be a “bridge” to the carbon free society built on renewables. In order to make it possible for the countries of the world to transform their energy systems geoengineering will be needed in order to bridge the gap between now and then. Problems related to this claim that are not touched upon regards whether it really will be easier to develop renewables in the future, when geoengineering is deployed, and if it will be possible to stop geoengineering if these technologies are once implemented. Another lacuna in the discourse is the implicit assumption that geoengineering will not generate the same type of political conflicts of interests and deadlocks that the request for renewables and carbon dioxide decreases did. Geoengineering is without argumentation or problematization taken to be a pure technology devoid from all political tensions. The question which political problems that will arise if it is deployed are consequently avoided, as if there was such a thing as a politically neutral technology or engineering practice. Governance issues are in rare cases mentioned, but not considered as serious problems. The new technologies are assumed to work without political or social friction.⁵⁷

The view of technology is dependent on the commonly proclaimed idea that it is possible to test, study and identify the environmental consequences in advance. At first sight this idea appears to contradict the storyline about the scientists double fear and warnings that geoengineering may carry harmful side effects, but intensified research are supposed to make sure that ecological impacts of geoengineering are understood and under control before deployment which enables “fine-tuning” of different techniques. Field tests are said to guarantee this, and grand scale research programs are held to be an insurance against “unanticipated side effects”.⁵⁸ The potential risks are used to underscore the urgent need for considerable research efforts, and if the tests are carried out in due time it will also, according to the storyline of pure technology, enable a slow and cautious deployment of different geoengineering technologies maintaining the possibility to reverse the process if something goes wrong. The alternative to introduce the technology under panic, without careful tests, should be avoided.⁵⁹ The technological rationality that this storyline rests on is strictly instrumental and presupposes that it is possible to study the complexity of global ecosystems under several coming centuries through minor field tests, although it at the same time is repeatedly admitted that such assumptions are highly problematic. Even if there is a declared ambition to take ecological side effects into consideration they are not perceived of as something that might be beyond the scope of contemporary engineering science, but as something calculable and knowable. There are no values, no politics and no unknown consequences inherent in geoengineering as it is thought of or depicted by its advocates, just pure technology to save the world. The replacement of inefficient politics by

⁵⁷ 90,146,187,253,25,33,55,234,417, *Godell 23/9-2010*.

⁵⁸ 141,186,460,522,104,142,144,406, *Caldeira 28/2-2013*

⁵⁹ 56,64,125,265,270,280

this value free technology has become a precondition for survival. Engineering the climate, beyond all political controversies, has proven to be the only alternative.

However, the discourse also contains some accounts of the new technology threatening to undermine the picture of geoengineering as solely resting on scientific grounds. Some journalists enthusiastically speak about their “personal favorite” geoengineering techniques fascinated by the “Blade runner atmosphere” and praising the “beauty of this system”. This “boyish sci-fi feel” reveals that there might be other grounds for developing these “wild ideas” than strictly scientific.⁶⁰ There is an aesthetics of technology and a fascination in relation to the sublime aspects of the grand scale enterprise to alter the climate of the planet, echoing in some of the texts advocating geoengineering. This is counteracted by declarations that geoengineering absolutely is not a “science-fiction playground for imaginative scientists and engineers”, even if some of the suggestions might evoke associations to a novel of Jules Verne or Mary Shelley’s *Frankenstein*. The need of this kind of demarcations indicates that there is a worry among advocates of geoengineering that the new set of technologies might be associated with romantic fantasies and praised for wrong reasons. This explicit romanticism of technology that tries to slip in through the back door is immediately refused entrance and shown away, but is there not a kind of romanticism hidden even in the hard core schemes of geoengineering that are the ones chosen to save the planet? We would argue that this is the case and that this is a strong reason to dismiss all praise on aesthetical grounds. Is not the idea of a pure and by politics unpolluted technology, saving the world from the final destruction, true romantics at heart, no matter what the scientists and engineers may claim? Would not Captain Nemo have felt rather comfortable with the company?

Just mimicking nature

In the geoengineering discourse even scientists and journalists advocating the technologies in question highlight the methods’ controversial character. Geoengineering is said to be “rife with controversy” or to involve “highly controversial proposals” but what the controversy is all about is seldom discussed. Rather the matter of controversy is subordinated the overwhelmingly global environmental problems that the technologies are supposed to solve and the urgency of this task. In this way the controversiality of the subject is both recognized and diminished or disregarded. Scientists and journalists advocating geoengineering do not engage in a political debate with its critics. They do not have to.⁶¹

As previously demonstrated geoengineering scientists and popular science journalists underscore both the great risks with technologies that they are pushing for and the lack of knowledge about what the “unknown unknowns” related to geoengineering will be. Despite this they argue that there is no other way out of the dilemma of global warming, at least at

⁶⁰ 65,288,483,137,261,262,274,418

⁶¹ Tex 90,142,176,249,11

short sight. Accordingly, neither the risks nor the lack of knowledge is acceptable as relevant grounds for opposing the proposed solutions, since this would unleash the horrors of climate change. This is why John Shepherd and his colleagues in interviews, in sharp contrast to scientists promoting technologies in other areas, can emphasize that geoengineering is no “silver bullet” or “magical bullet”.⁶² It will not solve all problems and it will not be without considerable costs. It is according to a common metaphor no “get-out-of-jail-free card”.⁶³ The geoengineers are not forced to promise anything and they can even stress the uncertainties and risks with their technology without losing support. On the contrary this is a way of gaining credibility.

However, the storyline of geoengineering as a way of mimicking nature is really heading in quite the opposite direction. Already in 2007 Dr. Kurt Zenz House declared that geoengineering in many cases just used the “cleaning process that Nature herself uses for greenhouse gas accumulation”. In this storyline scientists made processes in nature more efficient on artificial ways, but in principle there was no difference between for example volcanic eruptions and human efforts to release huge volumes of sulphur aerosols into the atmosphere.⁶⁴ The implied meaning of this storyline was of course that geoengineering not at all was hazardous or a dangerous human endeavor.⁶⁵ How could that be the case if nature had used the same processes before humans existed? This storyline stands in sharp contrast to the one emphasizing the double fear of the scientists or the controversiality of geoengineering. It really plays down the spectacular and extraordinary aspects of the actual technologies. During 2009 several journalists referring to declarations of scientists argue that the most promising geoengineering technologies lends their “proof of concept from nature”, explicitly mentioning that the 1991 volcanic eruption of Mount Pinatubo in the Philippines had a cooling effect on the planet for more than two years. This leads to the conclusion that injecting sulphur aerosols into the stratosphere is nothing but “mimicking nature”, implying that there is nothing strange, unnatural, or even hazardous with geoengineering.⁶⁶

From the end of 2011 and on this storyline is steadily gaining increased influence. Mimicking nature is over and over again characterized as something natural and logical for scientists to do, almost something inevitable. Nature has shown the way and humanity just have to follow. Spraying cooling aerosols into the atmosphere has already been demonstrated to be effective and safe by volcanoes. It works and there are no serious side-effects.⁶⁷

⁶² 234,387,394

⁶³ 56,223,483,98,182

⁶⁴ 21

⁶⁵ C.f Loukannen et al (2013)

⁶⁶ 139,262,274,594,868,889,898

⁶⁷ Tex 320,393,395,396,412,414,419,428,436,444,460,494,522

Ken Calderia even argues that “geoengineering concepts have been tested by nature”, implying that the geoengineers have an ally in nature and that technologies that cannot be tested in laboratories are to be comprehended as safe and tried out in full scale experiments by evolution for eons. In this understanding nature is assigned the status of a co-actor that intentionally takes part of the production of scientific evidence and technological solutions to environmental problems. Accordingly, there are no other technologies that have been as thoroughly tested as some of the geoengineering technologies and that the researchers know so well. If we cannot trust nature and evolution, what can we then trust? Could there ever be better guarantees than the ones produced by nature independent of human endeavors?

We argue that his storyline of geoengineering as something natural has gradually gained influence and during the last two or three years come to more or less replace the storyline of the scientist’s double fear. The naturalness of and trust in some geoengineering technologies have increasingly been put in focus, at the expense of a set of technologies that for certain are entailing great uncertainties and risks, but nevertheless represent the only way to avoid a global catastrophe. In other words geoengineering is increasingly depicted as a positive solution, and less as a desperate measure.

Concluding discussion

A discourse cannot be expected to be coherent and free from inconsistencies. The aim of analyzing the inconsistencies in the storylines is not to make the claim that the advocate’s statements are less trustworthy or more dishonest than statements made in more consistent discourses. Instead, by analyzing these inconsistencies we will create a richer understanding of the public discourse. The inconsistencies become more visible when comparing or combining the different storylines, analyzing what is omitted or marginal in the discourse and making comparisons with what is claimed in other contexts.

A recurring claim in the discourse is that politics has failed, in particular the UN lead Kyoto negotiations, making the case for geoengineering stronger. The Kyoto protocol aims at governing conventional and far more proven and familiar methods or technologies than geoengineering. There are a few but important aspects that are more or less absent, or at least downplayed, in the analyzed storylines, and when considering these inconsistencies emerge. Several important geoengineering options are truly global in respect of both effects and risks. In addition, the side-effects of geoengineering will, according to several scientific claims, not be evenly distributed, neither from intra- nor inter-generational perspectives. Some regions may face the chance of enjoying all the benefits of geoengineering (if any), while others inevitably will be burdened by primarily severe negative side-effects, or in the

worst case scenario only negative effects.⁶⁸ Governing a global risk-trade off situation that hardly can be depicted as a win-win situation and also is associated with negative expectations can arguably not be held as a lesser governance challenge than the ongoing UN negotiations. Geoengineering may generate new forms of conflicts and remodel global geopolitics. The global fine-tuning and calibration of technology and nature require a centralized and stable governance structure. Macnaghten and Szerszynski dismiss the possibility that democratic values can facilitate these conditions; hence geoengineering may negate democratic ideals.⁶⁹

A closely related issue is the statements concerning the development of geoengineering. On one hand it is claimed that geoengineering is pure technology that already has been tested by nature. Geoengineering is a matter of just mimicking nature, or even enhancing natural processes by a little help of human ingenuity. Geoengineering is frequently portrayed as a technological fix in the discourse. These statements are in stark contrast to commonly occurring claims in scientific journals about the limited value of geoengineering field experiments and even inherent scientific knowledge-gaps.⁷⁰ Paradoxically, as we illustrated, all these common metaphors that denote that the new technologies really is something to trust, something safe, are used by the same scientists and journalists that declare that it is impossible to at forehand know all the complex environmental consequences of geoengineering. If living the full scale experiment is the only option in order to gain reasonable control over geoengineering and the climate the value of geoengineering as insurance or a parachute against an escalating climate change, as commonly claimed in the discourse, is limited. Who would rely on parachutes if that technology was never tested before and nobody firmly and consistently reassured its feasibility and which even, in the worst scenario may create a situation worse than if it was never deployed? Consequently, can geoengineering as so often claimed really be a plan B? How can geoengineering be a plan B if tests and experiments can only render into either dismissing geoengineering or a maintained position that knowledge gaps are still inherent, or at least probably overwhelmed with major uncertainties? A common stance in the discourse is that the advocacy of geoengineering is explicitly limited to being in favor of more research, however if satisfactory scientific knowledge cannot be gained by small scale experiments and

⁶⁸ C.f. Moreno-Cruz J.B. and Keith, D.W. 2012. 'Climate policy under uncertainty: a case for solar geoengineering'. *Climatic Change* DOI: 10.1007/s10584-012-0487-4., Moreno-Cruz J.B. Ricke, K. and Keith D.W. 2012. 'A simple model to account for regional inequalities in the effectiveness of solar radiation management' *Climatic Change* 110: 649–668.

⁶⁹ Macnaghten, P. and Szerszynski, B. 2013. 'Living the global social experiment: An Analysis of public discourse on solar radiation management and its implications for governance. *Global Environmental Change* (in press).

⁷⁰ MacMynowski, D.G. Keith, D.W. Caldeira, K. and Shin, H-J. 2011. 'Can we test geoengineering?' *Energy & Environmental Science* 4: 5044-5052.

modeling, but only by full scale deployment, the boundaries between research and deployment become unclear or may even be equated.

Based on an analysis of the geoengineering discourse it is in many regards close to impossible to label or characterize geoengineering in specific ways. Categorizations or boundaries are blurred, for example advocacy, the potential of science, the known and unknown, governance, and furthermore the expectations are primarily negative. These observations further strengthens our case that geoengineering is postmodern.

The geoengineering discourse is permeated by an unintended, but nevertheless remarkable irony. As we have demonstrated the storylines supporting increased research and deployment of geoengineering consequently stress that it is close to impossible to foresee the environmental side-effects of grand-scale use of these technologies, that the risks cannot be controlled with the help of natural sciences, and that it is not possible to associate geoengineering with promises of future progress, economic growth, social welfare, or not even environmental improvement. The reason why it, according to the discourse, in spite of this ought to be developed is that everything that industrial modernity has created in terms of material, social and cultural welfare, as well as the resource base for modern society, run the risk of being destroyed together with the ecosystems of the planet if climate change is allowed to continue. Civilization is confronted with the risk to be totally annihilated, and the established solutions of industrial modernity, including the measures of rational politics on scientific ground are fundamentally put in doubt, as well as industrial modernity's promises of a better world. With geoengineering the grand scale technological solutions for the first time have become explicitly postmodern. In spite of this the main reason for developing this new set of technologies is that they carry a hope to save the planet and at the same time make possible the maintenance of the systems for transportation, energy supply and production that caused the climate crisis.

Accordingly, the profound purpose of these new postmodern technological solutions is to both save the climate and the modern project from self-inflicted destruction, and thereby, without promises of a better world, uphold unsustainable and self-destructive societal structures and ways of living, while these are found inescapable.

It is maintained that the final collapse can be postponed with the help of geoengineering, but only for a limited period of time and with strong reservations that the rescue operation might as well fail. When prevalence of the industrial modern society not any longer in a

convincing manner can be guaranteed with the help of technologies, based on the objective truth claims of the natural sciences, that carry promises of a better world, a postmodern set of technologies, geoengineering, enter the stage as a substitute, in accordance with the explicit conviction that there is no alternative. However, at the end of the period under study considerable efforts are made to enact geoengineering as a set of technologies that rests on mimicking nature. Thereby the previously declared uncertainty concerning the environmental consequences of geoengineering can be removed, the risks brought under scientific control again, the environmental dangers tamed, and the promises of a controllable, secure and prosperous future re-established. Future prospects for development, and the avoidance of environmental collapses, are given prominence as the fundamental motive for the investments in geoengineering. By that an attempt to integrate geoengineering in the logic of industrial modernity is made, and to adjust the understanding of the technologies to the rationality that anyway seems unavoidable and determined by fate. This implies that the postmodern character of geoengineering might be on its way to be dissolved, and accordingly also the ironic relation between geoengineering and the unsustainable societal structures that these new technologies are said to be able to preserve, while they save the global climate and the ecosystems of the planet.

Is it, with this taken into consideration, adequate to comprehend the discourse of geoengineering as hegemonic? Yes, at least we would argue that it is valid for the period under scrutiny.⁷¹ However, as geoengineering increasingly and inevitably becomes a matter of public concern, and not only a subject for scientists and popular science journalists, a critical discourse is slowly gaining ground. In a coming article we will analyze the alternative storylines that discourse rests on.

⁷¹ C.f Scholte, S. Vasileiadou, E and Petersen, A C (2013), Sikka (2012)