Metaphors we die by? Geoengineering, metaphors, and the argument from catastrophe

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ABSTRACT: Geoeengineering the climate by reflecting sunlight or extracting carbon dioxide from the atmosphere has attracted increasing attention from natural scientists, social scientists, policy makers and the media. This article examines promotional discourse related to geoengineering from the 1980s to 2010. It asks in particular how this option for dealing with the problems posed by climate change were framed through the use of conceptual and discourse metaphors and whether one can argue that these are metaphors we 'live by' or metaphors we might 'die by'. Findings show that an overarching argument from catastrophe was bolstered by three conceptual master-metaphors, namely *The Planet is a body, The Planet is a machine* and *The planet is a patient/addict*, linked to a variety of discourse metaphors, older conceptual metaphors and clichés. This metaphorical landscape began to shift while the article was being written and will have to be closely monitored in the future.

Keywords: geoengineering; metaphor; science communication; public understanding; discourse analysis; cognitive linguistics; qualitative research

Metaphors we die by?

Geoengineering, metaphors, and the argument from catastrophe

Introduction

Geoengineering the climate involves the "deliberate large-scale intervention in the Earth's climate system in order to moderate global warming" (Shepherd, 2009). Two major approaches to geoengineering are reflecting sunlight away from the planet or extracting carbon dioxide from the atmosphere. A small-scale test of so-called solar radiation management, funded by various UK research councils, was announced in September 2011, entitled *Stratospheric Particle Injection for Climate Engineering* or SPICE (http://www.nerc.ac.uk/press/releases/2011/22-spice.asp). The test should have started in October 2011, but has now been postponed to April 2012. Following this and other events and reports (e.g., Bipartisan Policy Centre report, 2011), public debate about geoengineering as one way of dealing with the problems posed by climate change is increasing at present. But how did this debate start, when did it start and who started it in the first place? And how was geoengineering the climate initially framed? These are some of the questions that we attempt to address in this article. We examine how geoengineering was promoted as an option for dealing with climate change or global warming and how this promotional activity was linguistically framed or engineered.

Discussions about geoengineering the climate have been going on since the 1970s (Marchetti, 1977), when climate change itself slowly emerged as an issue in scientific literature. They became a more prominent topic for media coverage during 2006 and 2007, that is, at the height of recent policy and media attention to climate change (Grundmann & Krishnamurthy, 2010). In 2006, for example, Paul Crutzen, a Nobel prize winner, atmospheric chemist and coiner of the term 'anthropocene', published an article in *Climatic Change*, in which he argued that an "escape route" was needed if global warming began to run out of control (Crutzen, 2006: 216). In 2009 the UK's Royal Society published a report on geoengineering entitled "Geoengineering the climate: Science, governance and uncertainty (Shepherd, 2009) which was widely discussed in the traditional media and the blogosphere.

Geoengineering as climate modification, or as some call it now, 'climate remediation' (Bipartison Policy Center report, 2011), has some of its roots in attempts to modify the weather, which reach back to the mid-19th century when the US military toyed with the idea of using weather as a weapon, and the mid-20th century when this became again a political topic in the context of the cold war (see Fleming 2006, 2007, 2010a, b; Bonnheim, 2010). One of those involved in this enterprise, Edward Teller, wrote an article in 1997 entitled "The Planet needs a sunshade" (Teller, 1997).

Now that geoengineering is beginning to be taken more seriously yet again by some policy makers and has gradually entered the public sphere, social scientists and philosophers have started to debate its social and ethical implications (see Gardiner, 2011a; Corner & Pidgeon, 2010; Corner et al., 2011), its implications for responsible innovation (Stilgoe, 2011), as well as studying public attitudes and perceptions. However, the use of metaphors as framing devices remains under-explored in existing social sciences research into geoengineering. This is an important lacuna in the literature, given that 'as knowledge of geoengineering proposals proliferates, the metaphors that emerge in the public discourse [...] will be telling' (Corner & Pidgeon, 2010, p. 31).

Despite the increasing attention paid to geoengineering by natural scientists, social scientists, policy makers and parts of the media, knowledge about geoengineering amongst the

general public is still relatively low. As Holly Buck (2010a), one of the first to study media coverage of geoengineering, has pointed out, according to a recent US poll, "74% of respondents had never heard of geoengineering—and only 3% of the respondents had a correct idea about what it actually is" (Leiserowitz, 2010; NERC, 2010). Buck goes on to quote Leiserowitz as saying that the "first impression, frame, and narrative has yet to be set" (quoted in Buck, 2010b: 1). Another study by Mercer et al. (2011) has shown that public understanding may be somewhat higher but stresses that "public opinions are just forming" and "thus all reported results are sensitive to changes in framing, future information on risks and benefits, and changes to context" (2011: 1).

We argue that the core narrative frame setting of geoengineering has been going on for quite some time, has consolidated recently. There have however been recent attempts at frame-shifting which will have to be examined in the future, especially after the protests provoked by the SPICE project in 2011.

Using metaphor analysis, this paper aims to explore the way geoengineering was framed, or, as one might say, linguistically engineered, between 1988 and 2010. We ask whether the metaphors used are 'metaphors we live by' or may be 'metaphors we die by' (see Romaine, 1996), and we reflect on some of the social and ethical implications of this metaphorical framing. Qualitative approaches to metaphor attend to social context in all its complexity and fluidity, focussing upon the localised context in which the metaphor appears (Lyons & Coyle, 2007). To that extent, our small, qualitative study complements research carried out by Buck (2010a), who used content analysis to study a large corpus of English language news and online debates about geoengineering between 1990 and 2010.

Geoengineering and metaphor

Geoengineering is a highly speculative and highly abstract technological intervention, or rather a raft of possible interventions, in the Earth's climate. It therefore may appear to be a purely technological problem. However, it is also, and perhaps even more so, a societal and an ethical issue. How it is metaphorically, argumentatively and even visually framed can have deep ethical implications which need to be scrutinized. We focus here on metaphor which enables us to see and understand one thing as another or one thing in terms of another. In some respects metaphor, a tool we use to think and act with, is a linguistic technology that needs as much ethical oversight as the technologies we 'see through' it, such as geoengineering. Metaphors are the mind's eyes and society's tools. They provide us with visions of the world and instruments to change it.

As Ivor Armstrong Richards, a sometimes forgotten founding father of metaphor theory, remarked, a command of metaphor plays a role in "the control of the world that we make for ourselves to live in" (1936:135-136), an issue that is of prime importance in the context of climate change. Geoengineering is one perspective or lens through which to see or frame the future of the world that we make for ourselves to live in. For some this implies control over or conquest of "the climatic future" (Hulme, 2008b). This vision of the future relies "implicitly or explicitly, upon ideas of control and mastery, whether of the planet, of global governance or of individual and collective behaviour" (Hulme, 2008b: 5). Mike Hulme goes on to say that these "attempts at 'engineering' future climate seem a degree utopian and brash. Understanding the cultural dimensions of climate discourses offers a different way of thinking about how we navigate the climatic future" (ibid.).

Aims and objectives

In this article we aim to understand the way that geoengineering was, in some sense, linguistically engineered or 'framed' between 1988 and 2010. Using a qualitative approach to metaphor analysis, we chart the metaphorical, and therefore also cultural, signposts or pointers used to direct us into or away from a future world controlled by climate engineering, and reflect upon some of the social and ethical implications of the metaphorical framing of geoengineering.

METHOD

The newspaper database Lexis Nexis was searched with the key words 'geoengineering' and 'climate', with no start date but with an end date of 31 December 2010 (that is, before the more recent protest movements related to SPICE, mentioned in the introduction). LexisNexis Academic (www.lexisnexis.com) contains full-text access to more than 350 newspapers from the U.S. and around the world (http://academic.lexisnexis.com/online-services/academic-content-news.aspx) collected from around 1985 onwards. The corpus for this analysis was derived through first searching *All English News* using, which retrieved over 1200 articles, and then selecting one qualitatively manageable sub-corpus, *Industry Trade Press*, which consisted of 103 articles (of which 39 appeared in the popular science magazine *New Scientist* and the rest in 25 other outlets such as *Carbon Control News*, *Environment and Energy Daily*, *Public Utilities Fortnightly* and so on).

We chose this corpus of what one might call the proselytising and popularising press articles as it is possibly here where an initial framing, albeit a positive one, of geoengineering might have emerged. This will, of course, in the future have to be compared to press articles and online voices that are perhaps more critical of geoengineering.

We examined articles published between 1988 and 2010, as 1988 was the first year when the term 'geoengineering' was used in our corpus (in a reference to Marchetti, 1977). Coincidentally, 1988 was a salient date in climate change debates and may be regarded as the point at which climate change entered the socio-political domain in English speaking countries (Jaspal & Nerlich, in press), for a variety of social, political and geological reasons (see Hulme, 2009: Hulme & Turnpenny, 2004). It was also the beginning of what Hulme calls the dominant framing of climate change (2008b) as a purely physical phenomenon. As a problem frame this then invites physical or technological solutions, such as geoengineering.

After controlling for duplicates, 91 articles remained. This small sample was chosen so as to make a qualitative (metaphor) analysis feasible (Lyons & Coyle, 2007; Cameron & Maslen, 2010a; Lynne and Cameron, 2010b). All 91 articles were reviewed by the two authors and metaphorical descriptions of geoengineering and arguments related to them were extracted, compared between the researchers, and ordered into groups and patterns until consensus was achieved.

Our decision procedure for the identification of metaphors is based on older research into 'conceptual' metaphors (Lakoff & Johnson, 1980) and more recent research into 'discourse' metaphors (Zinken et al., 2008). Discourse metaphors are relatively stable metaphorical projections that function as key framing devices within a particular discourse over a certain period of time. They are conceptually grounded but their meaning is also shaped by their use at a given time and in the context of a debate about a certain topic, in this case geoengineering. We tried to identify salient discourse metaphors in the first instance and then link them to more linguistically hidden conceptual metaphors. We regard conceptual metaphors as 'fundamental' in two ways; as the conceptual ground in which discourse metaphors are partially rooted; and as top-level or overarching or master-metaphors. We did not extract what one might call lower-level conceptual

metaphors such as the use of the word ‘give’ in ‘give an answer’, for instance. Our purpose was to find those metaphorical framings that might have the most political and performative force in the discourse surrounding geoengineering. We see framing as “the process by which a communication source, such as a news organization, defines and constructs a political issue or public controversy" (Nelson, Oxley, & Clawson, 1997: 221).

Frames make us see and act upon the world in specific ways. They create visions and expectations, which, as the sociologist Nik Brown puts it, can “mobilize the future into the present” (Brown, 2003: 3) (or in the case of geoengineering mobilize actions to avert a future that is framed as catastrophic). They can be used to orientate users (whether as institutions, groups or individuals) to particular possibilities for action (e.g. invest in small feasibility projects), or away from them, and thus have an effect on material economic investment (Nerlich & Halliday, 2005), and in the case of geoengineering, on the survival of the human species or the type of world we want to live, or, indeed, die in.

This can, of course also be achieved through arguments. Whereas metaphors invite mappings from one domain of experience, say, of sunscreens onto another, say, geoengineering, so arguments invite (very roughly speaking) a conceptual mapping between a statement and a supposed reason for accepting a statement or between a premise and a conclusion. In his book *Arguments and Metaphors in Philosophy*, Daniel Cohen argues that metaphors are narratives, short stories that invite interpretation and action (Cohen, 2004) This narrative force of metaphors is enhanced when they are embedded in or used in conjunction with arguments, which themselves tell stories that need interpretation, and in principle need to be acted upon.

In the following we shall not go more deeply into argument-theory but discuss a certain prevailing argument for geoengineering as part of its overall metaphorical framing.

ANALYSIS

The present section outlines the following broad themes, which emerged from the qualitative metaphor analysis of the corpus: (i) “Geoengineering as a technofix”; (ii) “Geoengineering as a medical fix”; (iii) “Geoengineering as Plan B” (iv) “Metaphors and arguments of discontent”. Metaphors and arguments will be discussed mainly in a chronological order, with the exception of metaphors and arguments of discontent. An overview of the conceptual and discourse metaphors identified in the study is presented systematically in the appendix to this article.

“Geoenginnering as a techno-fix” and the argument from catastrophe

Although early articles in the corpus discussed geoengineering in a context of emerging awareness of the dangers posed by climate change, they remained very factual and what one could call ‘bland’. We did not detect any use of discourse metaphors to persuade readers of the rightness or wrongness of geoengineering. The focus was on technical detail, on the one hand, and on personalities, on the other.

The first article that contains a suite of discourse metaphors for geoengineering was written by Nicola Jones for *New Scientist* on 23/09/2000 and entitled: “Sunblock”. Curiously, no reference is made to Edward Teller’s influential 1997 article. Jones’ article talks about “a dimmer switch on the sun”, of the installation of “a dimmer switch on daylight”, of “regulating our daily dose of sunlight”, and of giving us “a global thermostat” in order to cool the planet threatened by global warming. The discourse metaphors GEOENGINEERING IS APPLYING SUNBLOCK TO THE PLANET and GEOENGINEERING IS MANIPULATING THE PLANET’S THERMOSTAT are rooted in two overarching conceptual or master metaphors, namely THE PLANET IS A MACHINE (car, thermostatic

heating system, computer etc.) (that needs cybernetic fixing or controlling) and THE PLANET IS A BODY (that needs to be protected from harm).

These metaphors in turn are linked to an argument that is also metaphorically framed, and that we encountered in many other incarnations throughout the corpus (flanked by metaphors and extended analogies), namely that geoengineering is needed *if* we "can't plug the flow of carbon into the atmosphere" (here humanity's carbon emissions are conceptualised as flowing into the atmosphere like dirty planetary bathwater, but bathwater that cannot be stopped by just putting in a plug). However, more critically, geoengineering is also described as just a "fix", or more negatively still as a way "to dig a deeper grave" for the planet and as a "runaway technology" over which we may lose control. These and other metaphors that deviate from the mainstream positive technofix metaphors will be discussed in a separate section below.

Some of the key figures in the field of geoengineering are mentioned in this article whose names recur in many of the articles in the corpus, and this almost from the very beginning in 1988: most importantly Ken Caldeira, but also Bala Govindasamy, Edward Teller, Lowell Wood, Michael Mac Cracken. As Buck has shown, these and other scientists, such as David Keith, belong to what science writer Eli Kintisch refers to in his 2010 book *Hack the Planet*, as the "Geoclique" (Buck, 2010b: 7). "This is a pretty interesting situation, where a small group of people has power to really frame a topic, at least in the mass media or traditional press" (Buck, 2010a: 20).

The next important discourse metaphor emerges in an article for *Public Utilities Fortnigthly* written by Michael Burr in February 2007, based on an interview with Caldeira about "some radical ideas for fighting global warming". Here older conceptual metaphors, such as DEALING WITH GLOBAL WARMING IS WAR ('war on climate change', 'fighting climate change') (Cohen, 2010), are reactivated in the context of geoengineering by a link to an image well-known from the cold war, namely the political "panic button", which becomes the "Climate Panic Button" in the article's headline.

This article also contains the first major attestation of what one may call the 'master argument' used to promote geoengineering, which, in this instance, goes like this: "We should avoid geoengineering if possible, but we need it in our toolbox in case of catastrophe". Here the metaphor of geoengineering as a techno-fix or a tool in our political toolbox is embedded in an argument structure, which has been neatly summarised elsewhere (Gardiner, 2010). This argument can be called the argument from catastrophe or argument from necessity. Gardiner calls it, using the DEALING WITH CLIMATE CHANGE IS WAR metaphor, the 'arm the future' argument or AFA:

> If there is a presumption against geoengineering, how might this be met? One promising approach is based on the general idea that "we may reach the point at which [geoengineering] is the lesser of two evils". This idea has been influential in discussions about geoengineering for climate change since the earliest days, and has appealed to both its enthusiasts and its detractors.
>
> 1. The Basic Argument
>
> The Core Proposal offers one kind of lesser evil argument, and so appears to fit neatly into this framework. As we have seen, the basic structure of this argument seems to be as follows:
>
> (AFA1) Reducing global emissions is by far the best way to address climate change.
>
> (AFA2) In the last fifteen years or so, there has been little progress on reducing emissions.

(AFA3) There is little reason to think that this will change in the near future.
(AFA4) If very substantial progress on emissions reduction is not made soon, then at some point (probably forty years or more into the future) we may end up facing a choice between allowing catastrophic impacts to occur, or engaging in geoengineering.
(AFA5) These are both bad options.
(AFA6) But geoengineering is less bad.
(AFA7) Therefore, if we are forced to choose, we should choose geoengineering.
(AFA8) But if we do not start to do serious scientific research on geoengineering options soon, then we will not be in a position to choose it should the above scenario arise.
(AFA9) Therefore, we need to start doing such research now. (Gardiner, 2010: 9)

This argument is used more explicitly in a 2007 article by David Chandler for *New Scientist*. The article is entitled (echoing Teller, 1997) "A Sunshade for the planet". Here we find the discourse metaphor GEOENGINEERING IS BUILDING A SUNSHADE FOR THE PLANET, which is linked to the conceptual metaphor THE PLANET IS A BODY. The subtitle of the article contains the argument itself: "If we can't stop global warming, as a last resort, researchers are devising ways to cool the planet by shading it from the sun" (21/07/2007) (also echoing Crutzen, 2006): "Fortunately, if the worst comes to the worst, scientists still have a few tricks up their sleeve". Here the techno-fix metaphor is reframed as a magic trick.

In a September 2007 article in *American Aerospace*, Caldeira uses a technology-based analogy (linked to the conceptual metaphor THE PLANET IS A MACHINE) to support the master argument derived from aeroplane safety engineering. He is quoted as saying:

> "I hope I never need a parachute, but if my plane is going down in flames, I sure hope I have a parachute handy," he says. "I hope we'll never need geoengineering schemes, but if climate catastrophe occurs, I sure hope we will have thought through our options carefully."

Equally, in an article for *New Scientist* published in February 2009, Caldeira is quoted again as saying, this time without using an analogy: "If you wait for a climate catastrophe then you need to deploy fairly full-scale fairly quickly which means you wont' have time to look at the risks."

Over the following years technofix metaphors continue to be used alongside more extended medical and safety analogies, which will be discussed below. The latter are used mostly by scientists in the context of elaborating the master argument.

The most pervasive metaphorical frame or discourse metaphor was initially GEOENGINEERING IS BUILDING A SUNSHADE FOR THE PLANET (based itself on the overarching conceptual metaphor THE PLANET IS A BODY). The word *sunshade* appeared 29 times in the corpus and was used in headlines three times. The second most popular discourse metaphor was that of the thermostat, a pattern of discourse metaphorical framings that can be summarised as GEOENGINEERING IS MANIPULATING THE EARTH'S THERMOSTAT (linked to the conceptual metaphor THE PLANET IS A MACHINE), and the word *thermostat* was used seven times in the corpus. It was qualified by adjectives such as *global, adjustable, planet wide* or used with action verbs such as *tweak, turn down* and so on.

These technofix metaphors are surrounded by the quasi-metaphorical use of *fix* as a verb (*fix our atmosphere, quest to fix, how to fix*), *fixing* as a gerund (*fixing the sky, fixing the weather, fixing the climate*), and as a noun (*geoengineering fix, engineering fix, technological fix, fix to*

global warming, quick and easy fix, short-term fix, quick fix, messy fix, etc.).

This framing is linked to the use of another important metaphor, that of a *toolkit* or *toolbox* (*useful, powerful, invaluable*). Although fixing the climate can be read non-metaphorically as managing the climate, the surrounding metaphors, especially that of the toolbox, make a non-metaphorical reading almost impossible. What happens instead is that climate is framed as an object, such as a car, that can be fixed or repaired using technological tools to do so (GEOENGINEERING IS REPAIRING THE PLANET). The emerging discourse metaphor is GEOENGINEERING IS A TOOL IN SCIENTISTS' TOOLBOX. As repairing a car is nowadays easy and routine, fixing the climate is framed as easy or routine and within the grasp of scientists and engineers. Common-sense knowledge of technology and engineering in particular is therefore the most important source domain from which metaphors, as well as analogies are drawn to frame geoengineering as the metaphorical target domain.

At the very end of 2009 a new type of discourse metaphor emerges rooted in the PLANET IS A MACHINE metaphor, namely that of GEOENGINEERING IS HACKING THE PLANET. In this case the machine is not a car or mechanical engine but a computer or digital engine. Science journalists like Kintisch begin to use the metaphor of "'hacking' the climate" (NS, 12/12/09). This is even extended to calling small-scale field experiments 'micro-hacks'. Here the planet is still seen a machine that can be fixed (like a car, using a wrench or like a heating system, using a thermostat), but it is a special machine, a computer, which can be fixed using hacking, in the positive sense of that term, as an inelegant but effective solution to a computing problem.

The discourse metaphor of hacking the planet/climate was used around the time of the Asilomar International Conference on *Climate Intervention Technologies*, held in March 22-26, 2009, which itself was modelled on the seminal 1975 Asilomar Conference on recombinant DNA. The metaphor became famous when Eli Kintisch, a reporter for *Science Magazine*, published his book *Hack the Planet* in March 2010 (Kintisch, 2010). Geoengineering was then being discussed in the context of increasing climate change denial following 'climategate' (see Nerlich, 2010; Washington & Cook, 2011), as the belief by climate change sceptics or deniers that global warming is a "hoax" could halt the technology: "If that were to happen with geoengineering, our escape route [a metaphor used by Crutzen in 2006] would turn into a roadblock" (anonymous article, "To hack the planet, first win trust; we urgently need robust public debate on geoengineering", *New Scientist*, 03/04/10). Here the ubiquitous conceptual metaphor SCIENCE IS A JOURNEY is used creatively to argue for geoengineering.

"Geoengineering as a medical fix"

The above article on 'hacking the planet' quotes one of the major players in the field, Stephen Schneider (1996, 2008), who was one of the first to use an extended medical metaphor or analogy to reframe the argument from catastrophe and to view the planet through the lens of addiction, withdrawal, medical treatment and so on, a framing that became quite prominent in the debate about geoengineering:

> "If you have a heroin addict, the correct treatment is hospitalisation, therapy and a long rehab. But if they absolutely refuse, methadone is better than heroin."

Schneider's argument is that we are addicted to burning carbon fossil fuels. To deal with this addiction we can either spend a lot of time and money on rehabilitation or, when things are too

bad, go for replacing the addictive substance by a replacement. This analogy implies that geoengineering is a real option in managing anthropogenic climate change. It is linked to the overarching conceptual metaphor THE PLANET IS A PATIENT which itself is linked to the broader metaphor THE PLANET IS A BODY.

In this context the older discourse metaphor of a "sunscreen", previously also readable as 'sunshade', becomes medicalised, as you "apply 'sunscreen' to the whole planet", conceptualising the earth as a human body that needs medical protection. Schneider also medicalises other metaphors and clichés, such as using geoengineering as a "last resort" or as an "insurance policy":

> "We're not going to implement it," he says, but we certainly have to know what's possible. It's like emergence back-up surgery: you never want to do it, but you still have to practice it."

An article in *Aerospace America* published in September 2007 speaks of manipulating "the environment in a healing way". These medical metaphors and analogies are all linked to the discourse metaphor GEOENGINEERING IS APPLYING MEDICAL TREATMENT TO THE PLANET, which itself is linked to the conceptual metaphors THE PLANET IS A BODY and the PLANET IS A PATIENT.

Another important member of the 'geoclique', David Keith also uses a medical analogy:

> It is "like chemotherapy," Keith said. "No one wants to have it… but we all want the ability to do chemotherapy and know its risks should we find ourselves with cancer." (Katie Howell, Climate: Scientists call for interagency geoengineering research program, Environment and Energy Daily, 05/02/2010)

Some scientists combined the technofix and medical framing of geoengineering and created mixed metaphors. Caldeira, for example, is quoted in an article entitled "Climate change: A geoengineering fix?" by Leonard David for *Aerospace America* in September 2007 as saying: "'If we become addicted to a planetary sunshade, we could experience a painful withdrawal if our fix was suddenly cut of'", or Catherine Brahic writing for *New Scientist* (21/03/09): "Clouds that are 'doped' in this way should in theory act as sunshades." Here the word 'fix' is mapped onto two conceptual domains at the same time, that of technology and that of addiction (THE PLANET IS A MACHINE and THE PLANET IS A PATIENT). Geoengineering is metaphorically viewed as a techno-medical project.

Beside these older metaphors and metaphor mixes, some other metaphors (or rather old clichés) emerge towards the end of our survey period. When reporting began about the Royal Society's activities in the field of geoengineering a new metaphor entered the discourse, namely "Earth's Plan B", the title of an article by Catherine Brahic for *New Scientist* published on 28/02/09. The subtitle ties this in with the master argument: "We may soon have no choice but to fiddle with the climate - but are we ready?" The Plan B metaphor was mostly use with reference to the work by the Royal Society and by Tim Lenton from the University of East Anglia and the Nobel Laureate Paul Crutzen.

"Geoengineering as plan B"

The Plan B metaphor (also *back up plan*) was used extensively by John Shepherd, chair of the Royal Society group that prepared the 2009 report, when interacting with the media and he also

linked it to the master argument. However, he also used the master argument in a different way, not only to persuade policy makers that something needs to be done, but also to persuade 'the public' that something needs to be done. The Royal Society report was partly based on focus group research as it wanted to explore the 'moral hazard argument' related to geoengineering, namely that if you are insured against something, you may behave in more risky ways, in this case burn more fossil fuels. The moral hazard argument is linked to the discourse metaphor GEOENGINEERING IS AN INSURANCE POLICY (on the shortcomings of this argument, see Gardiner, 2011a). However, based on the results from the focus group research, Shepherd argues that mentioning 'geoengineering' might actually be beneficial in terms of public engagement with climate change. He wrote an article on this topic for *New Scientist* entitled "Do mention the 'G' word; Fears that the mere mention of geoengineering might undermine support for emissions reductions appear to be unfounded" (5/09/09):

> Encouragingly, our study suggests that introducing the idea of geoengineering into the discussion could help close this perceived gap [between the scale of the problem and the ability to address it] and spur some people to take greater action to reduce their carbon footprint. This appears to be because geoengineering puts the reality of climate change into perspective. … the very notion that something as drastic as geoengineering may be required dramatically underlines the seriousness of the problems as one member of the council of the Royal Society remarked later, if we really need to consider actions like these, we must be in serious trouble.

This implies that the argument from catastrophe should be used in public engagement exercises (to counteract the moral hazard argument, to some extent), which is a rather dubious option. We are led to believe that using the Plan B metaphor can persuade people to embrace Plan A - namely climate change mitigation. As Corner et al. (2011) point out:

> But presenting geoengineering to people as a possible response to a climatic emergency is problematic, especially if linked to the need to conduct research at an early stage: It provides a very strong framing of necessity, which is likely to have artificially enhanced the acceptability of conducting research into these technologies. (Corner, Parkhill & Pidgeon, 2011: 11).

The Plan B metaphor, used quite often in conjunction with the argument from catastrophe, is as flawed as the argument itself, as highlighted by Gardiner in his recent book *A Perfect Moral Storm: The Ethical Tragedy of Climate Change* (Gardiner, 2011b). He argues that the Plan B framing will divert attention from Plan A, namely carbon reductions and asks why geoengineering is seen as a 'good' plan (B), as opposed to other possible Plan Bs. Focusing on this plan alone blinkers societal imagination.

The Plan B metaphor is also used in the title of an anonymous article for *Petroleum Economist*, published in October 2009 which quotes Shepherd as saying:

> "It is an unpalatable truth that unless we can succeed in greatly reducing CO2 emissions we are headed for a very uncomfortable and challenging climate future, and geoengineering

> will be the only option left to limit further temperature increases,"…

The Lexis Nexis corpus ends with references to various books on geoengineering, showing that the topic had come of age by the end of 2010. Fred Pearce reviews Fleming's book *Fixing the Sky* for *New Scientist* (18/09/10). John Shepherd reviews two books for *New Scientist*, one by Jeff Goodell, *How to Cool the Planet: Geoengineering the audacious quest to fix Earth's climate* (Goodell, 2010) the other by Eli Kintisch, *Hack the Planet: science's best hope - or worst nightmare - for averting climate catastrophe* (Kintisch, 2010). In this review article, Shepherd refers to media coverage of geoengineering after the release of the Royal Society report and summarises it like this:

> On the one hand, there is the view that geoengineering is the quick-and easy fix to all our climate troubles; on the other, we find a picture of mad scientists destroying the world. Unfortunately, both narratives have marketable traction.

As Buck (2010a) has shown in her extensive study of traditional and online media coverage of geoengineering, there is some truth in this assertion. However, as we have seen, mad scientists destroying the Earth are far outnumbered by some real scientists using the argument from catastrophe in conjunction with a range of mainly technological/cybernetic and medical analogies to argue that geoengineering may perhaps be the only option humanity has to 'save the planet'.

Summary

Overall then, in this small corpus we found one master argument, according to which geoengineering is the only option to avoid a planetary catastrophe. This is linked more or less directly to two main metaphors according to which geoengineering is the only Plan B we have and the only insurance policy we have for this planet. Alongside this master argument and related metaphors we found various metaphors which can all be related to one conceptual master metaphor or master frame according to which the earth is a machine or cybernetic system (car, heating system, computer) that is broken but can be fixed (THE PLANET IS A MACHINE). On the other hand older metaphors also framed the earth or planet as a person suffering from sunstroke and in need of a sunscreen or sunshade, related to the conceptual metaphor The PLANET IS A BODY.

Together with these metaphors, scientists also deployed a variety of analogies which went beyond the master argument and the master metaphor and were more nuanced and reflective in some way. Most of these analogies tie in with a well-established conceptual metaphor according to which the earth or the planet is a patient that needs to be 'saved' or THE PLANET IS A PATIENT. In the context of geoengineering, the patient is conceptualised as being ill because of over-indulgence in or over-consumption of, even addiction to, carbon. The implication of such a metaphor is a moral obligation to help this 'patient' and end its suffering.

The two conceptual metaphors THE PLANET IS A MACHINE and the PLANET IS A BODY/PATIENT are themselves metaphorically and conventionally linked in (mostly deterministic and reductionist) philosophical, scientific and biomedical discourse (THE BODY IS A MACHINE) and through conceptualising the planet/body as a complex adaptive system.

In summary, the corpus revealed one master argument (The earth is

seriously/catastrophically broken/ill and can only be fixed/healed by geoengineering) which was linked to three conceptual master metaphors: THE PLANET IS A BODY, THE PLANET IS A MACHINE, THE PLANET IS A PATIENT. The Persuasive force of this discourse emerges from a fusion of the master-argument with the master-metaphors. It exploits what Beck (1992: 24) called "the political potential of catastrophes". It should be stressed however that this is the result of a very small and very specific sample of media articles and that scientists at large working on geoengineering or reflecting on its social and ethical impact may not use the argument from catastrophe in this way.

Metaphors and arguments of discontent

As one can expect from trade journals, the overall framing of geoengineering is positive. However, one can also find some metaphors that frame geoengineering more negatively. Despite the dominant use of positive frames in relation to geoengineering, even a minority of negative metaphors can shape social thinking in radically diverse and potentially dilemmatic ways (Jaspal & Nerlich, in press). This highlights the theoretical importance of exploring empirical 'outliers' of this kind, which is fully compatible with qualitative approaches (Lyons & Coyle, 2007). Geoengineering is depicted in terms of as 'Playing with fire', 'Pie in the sky', as a 'Band-Aid used to give governments more time' (linked to the 'buying time' argument discussed in Gardiner, 2011a, b), as 'Playing God with the elements' (Fleming) and so on (especially in the *New Scientist* part of the corpus). The cybermetric control metaphor of the thermostat is criticised by pointing out that "There is not a single global thermostat" (David Santillo, Greenpeace).

Questions are also framed metaphorically and playfully: "What happens if we tinker, then change our minds" (Brahic, NS, 28/02/09); "The great white hope or verging on the lunatic fringe?" (ENDS Report, 31/07/09). Some point out that geoengineering is "Not a silver bullet" (ENDS Report, 30/09/09), "Not a magic bullet" (Environment and Energy Daily, 1/02/10) (a metaphor first used in the context of health care by Paul Ehrlich about a century ago, see Washer, 2011: 30). Others argued that it is "a fig leaf" (ibid), and is a "gamble" (Rasch, several times, Philip Rasch, a climate scientists and a laboratory fellow at the Pacific Northwest national Laboratory, early 2010). Using the newest of the metaphors, a *New Scientist* article points out that "We hack the climate at hour peril" (NS, 06/02/10). And finally, one can even find a negatively framed analogy in our corpus, created, for once, not by a scientist but by a US politician:

> "It is a little bit like padding a car to avoid injuries from [a drunken driver'," Inglis said [Bob Inglis, Senior Republican]. "Maybe what you should do is stop people from [driving drunk] rather than putting pads on the car." (Derek Sans, Scientists offer House exotic options to help reduce greenhouse-gas levels, Inside Energy, 8/02/10)

Outside this corpus negative framing is beginning to appear in various online publications, mainly linked to anti-geoengineering groups, such as *Hands off Mother Earth* (http://www.handsoffmotherearth.org/), or techno-sceptical groups such as the ETC, who brought out a document entitled *Geopiracy* in 2010 (ETC, 2010). Both are now active in critiquing the SPICE project mentioned at the beginning of this article.

DISCUSSION

In the small corpus of trades articles studied here, metaphors, analogies and arguments were mainly used to frame geoengineering as a last resort technology that has to be adopted in a context of impending catastrophe (see appendix for a summary of the metaphors identified in the article).

Most of this rhetorical framing occurred in quotes from scientists, especially those belonging to the so-called 'geoclique'. Dissenting metaphors and arguments were only rarely used towards the end of our sample period, suggesting a more consensual use of metaphor in earlier media representations of geoengineering. Over time, some metaphors changed. Arguments (especially the master argument from catastrophe) stayed the same but were used to convince distinct implicit audiences (initially members of industry and politicians, later the 'general public') that geoengineering is practically the only option for 'saving the planet'. Thus, while the substantive content of the metaphors remain the same, their *social functions* evolve.

If framing climate as catastrophe can lead to demoralisation and fatalism among policy makers and within society (Hulme, 2008a, 2009), then using the catastrophe frame to 'sell' geoengineering to the masses seems equally doomed to failure. The geoengineering metaphors and arguments found in this corpus therefore seem to be closing down debates about geoengineering and, in the process, debates about climate change mitigation, rather than opening them up (Stirling, 2008). This is largely coterminous with the related argument that religious metaphors surrounding climate science can stifle political debate (Nerlich, 2010). This rhetoric limits social and ethical reflection on the issue of geoengineering by implicitly establishing the boundaries of 'legitimate' debate.

The problem with most of the metaphors used in the context of geoengineering is that they are couched in a language that says: if you want to live, survive, save humanity, the only option is to engage in geoengineering; if not you will die, humanity will not survive. These could be called 'metaphors we live by' or 'metaphors we survive by'. However, when looking more closely at the options for achieving this 'survival' through geoengineering, it becomes increasingly clear that implementing them may arguably contribute to the extermination of our species, as we replace a rather messy anthropogenic climate catastrophe with a more systematically controlled and technologically advanced anthropogenic climate catastrophe. The metaphors can therefore also be seen as 'metaphors we die by' (Romaine, 1996).

This metaphorical ambiguity or tipping point seems to have been grasped by some scientists who therefore, consciously or unconsciously, supplement the argument from catastrophe with metaphors and analogies of healing and medicine, as did Sir Paul Nurse, the current President of the Royal Society, when writing a letter in support of a geoengineering feasibility study, published when we were finalising this article: "Geoengineering research can be considered analogous to pharmaceutical research." (The Guardian, 9 September, 2011).

The problem is that the restorative discourse cannot shift the metaphors-we-die-by framing to the metaphors-we-live-by framing as easily as that, as healing and medicine are directly linked to illness, medical failure and death as well as medical quackery. Healing or restorative metaphors for geoengineering can therefore be easily subverted by saying for example that geoengineering is like liposuction for the planet (Adam Corner p.c.), while others might argue: "It is not even like fighting obesity with liposuction: it's like fighting obesity with a corset, and a diet of lard and doughnuts. Should the corset ever come off, the flab would burst out as if the corset had never been there at all." (Wood, 2009) In short, metaphor use is not always clearly delineated, which highlights the possibility of slippage between one conceptual or discourse metaphor and another.

This paper demonstrates the potential clout of metaphor use in shaping social, political and psychological meaning-making vis-à-vis geoengineering as a means of coping with what is increasingly regarded as the 'threat of climate change'. Recently, campaigners have begun to mobilise against geoengineering and it remains to be seen whether their metaphorical framings will re-set the public agenda and how it might differ from the framings of scientists described in

the present paper. In any case, the power of metaphor to influence political debate and public understanding firmly attests to the validity of Romaine's (1996: 192) assertion that "it matters which metaphors we choose to live by. If we choose unwisely or fail to understand their implications, we will die by them."

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APPENDIX

Master argument: Argument from catastrophe:
If emissions continue to rise we face global catastrophe and geoengineering might be the only option left to avert it.

Master conceptual metaphors - Based on three pervasive mappings based on the personification of the planet

The planet is a machine (car, heating system, computer)
Linked to the following discourse metaphors
GEOENGINEERING IS FIXING THE PLANET
Geoengineering is repairing the Planet
GEOENGINEERING IS MANIPULATING THE PLANET'S THERMOSTAT
GEOENGINEERING IS HACKING THE PLANET

The planet is a body
Linked to the following discourse metaphors
GEOENGINEERING IS BUILDING A SUNSHADE FOR THE PLANET
GEOENGINEERING IS APPLYING SUNCREAM/SUNBLOCK/SUNSCREEN TO THE PLANET

The planet is a patient/addict
Linked to the following discourse metaphors
GEOENGINEERING IS APPLYING MEDICAL TREATMENT TO THE PLANET
GEOENGINEERING IS CURING THE PLANET'S ADDICTION

Older conceptual metaphors
DEALING WITH GLOBAL WARMING IS WAR
SCIENCE IS A JOURNEY

Other metaphors or clichés
Plan B
Escape Route
Lasts resort
Insurance Policy
And some mixtures of mechanic and organic metaphors

Overarching metaphor and argument
The planet (as a body/machine) is critically/catastrophically broken/ill and can only be fixed/healed by geoengineering