Re-Thinking the Unthinkable: Environmental Ethics and the Presumptive Argument Against Geoengineering[1]

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ABSTRACT

The rapid rise in interest in geoengineering the climate as a response to global warming presents a clear and significant challenge to environmental ethics. The paper articulates what I call the 'presumptive argument' against geoengineering from environmental ethics, a presumption strong enough to make geoengineering almost 'unthinkable' from within that tradition. Two rationales for suspending that presumption are next considered. One of them is a 'lesser evil' argument, the other makes connections between the presumptive argument, ecofacism, and the anthropocentrism/non-anthropocentrism debate. The discussion is designed to prompt reflection on how environmental ethicists should orient themselves to the rapidly moving geoengineering debate and what they should think about the moral significance of the earth's large-scale biogeochemical processes compared to the moral significance of individuals, species, and ecosystems.

KEYWORDS

Geoengineering, presumptive argument, environmental ethics, lesser of two evils, anthropocentrism, fundamental biogeochemical processes

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Within the last year, climate engineering has secured a prominent place at the table in the discussion of what to do about anthropogenic global warming. Prior to the 2009 United Nations Climate Change Conference in Copenhagen, the idea of deliberately geoengineering the climate stood well outside of the mainstream.[2] The failure of the Copenhagen meeting to produce a binding agreement on carbon dioxide emissions, however, has rapidly propelled geoengineering out of the shadows. In the absence of effective plans to limit atmospheric carbon, the question of what the global community will do to mitigate the impending harm of global warming is becoming increasingly urgent. Interest in geoengineering has soared. No fewer than four books on the topic were published last year (Goodell, 2010; Kintisch, 2010; Fleming, 2010; Launder and Thompson, 2010) with a number of conferences, workshops and studies also completed or in the works.[3] Discussion about the merits of prospective field trials and appropriate regulatory mechanisms is already taking place. Technologies that only recently were viewed as entirely in the realm of science fiction are now being talked about as potential policy options.

Geoengineering has been coarsely but helpfully defined by Canadian researcher David Keith as 'the intentional, large scale manipulation of the environment' (Keith, 2000: 245). Stephen Schneider has offered a more technical definition of geoengineering as the 'manipulation[s] of stocks and flows of components of the Earth's biogeochemical processes to alter the radiative balance of the atmosphere' (Schneider, 2008: 3850). The climate manipulation under consideration today is designed to combat the worst effects of anthropogenic warming. An influential report by the UK's Royal Society separated geoengineering technologies into two main categories; carbon dioxide removal (CDR) and solar radiation management (SRM) (Royal Society, 2009). Since space considerations preclude a fuller discussion here, this same report is a good source of information on the range of technical options currently under consideration.[4]

The recent push on geoengineering finds a good deal of support within the scientific community. Despite several years of computer modelling on the various geoengineering technologies, much uncertainty remains (Bala, 2009). Scientists need not only to test techniques for possible deployment, they also need to gain real world data on their efficacy for cooling the planet, together with much better knowledge of their potential side-effects (Robock et al., 2008). If the global community were to reach the point where it became serious about pulling the trigger on geoengineering, they would need considerably more confidence about how (and whether) it was going to work. Not only advocates of geoengineering but also those more sceptical are often keen for increased research on the science.

Despite the considerable scientific questions that remain, it is probably not the state of the science (nor the projected cost [Barrett, 2008]) that provides the biggest barrier to the implementation of geoengineering. In fact, the Royal

Society suggested that the 'greatest challenges to the successful deployment of geoengineering may be the social, ethical, legal and political issues associated with governance, rather than scientific and technical issues' (2009: xi). Many of the pressing ethical issues mentioned in the report lie in governance challenges of how to develop just, legal and fair procedures for implementing geoengineering.[5] Additional quandaries lie in questions about how the prospective benefits and burdens will be distributed and how to compensate those who might suffer the greatest burdens. For many of the technologies in question, the desired reductions in temperature and the side-effects on local weather patterns are likely to be uneven and uncertain, leading to the potential for geopolitical unrest.[6] As numerous observers have pointed out, nations will want to know 'whose hand is on the thermostat?'

Concerns about social justice and geopolitical stability are clearly some of the most important ethical issues that geoengineering faces. Additional considerations such as the reduction in the effectiveness of photovoltaic panels and the visually appreciable whitening of the sky resulting from deployment of stratospheric aerosols are also relevant (Robock, 2008). While all of these concerns are important, none of them belongs exclusively to environmental ethics. The morality of altering some of earth's basic biogeochemical parameters, on the other hand, does. Several pertinent questions could be asked. How does the idea of manipulating earth's fundamental processes sit with some of the core beliefs in the field? Do any of these core beliefs require revision in the face of today's discussion of climate engineering? Is environmental ethics in its current form equipped to deal with the prospect of geoengineering? Such questions require serious attention if the environmental ethics community is to have a voice in the burgeoning discussion of intentionally engineering the climate.

GEOENGINEERING AND MANAGED SKIES

Interviewed for Jeff Goodell's book *How to Cool the Planet*, David Keith raised a concern about using geoengineering to save Arctic sea ice that gives a hint of the problem. Keith suggested we need to think very seriously before initiating geoengineering because it would involve '…the end of wildness – or at least our idea of wildness. It means consciously admitting that we live on a managed planet' (Goodell, 2010: 45). For Keith, managing the skies is tantamount to managing the planet as a whole since the climate is a key determinant of the fate of everything on earth from rocks to rivers, to polar bears, people, and larval hatches. As a scientist with a deep love for northern environments, Keith fears the change that geoengineering would create. The Arctic would become 'a museum piece, a place for the elites to go someday and remember what the real Arctic used to be like' (ibid.). Humanity would henceforth need to acknowledge

that they were living in a zoo, Keith said, playing the role of both the animals and the zookeepers.

Goodell interprets Keith as mainly being worried about the psychological impact of a constructed climate. Geoengineering would sever 'that primal link with nature that has shaped human evolution' (Goodell, 2010: 45–6). On this view, our original connection to nature – one of an evolved organism progressively learning how to cope with an unpredictable and often challenging environment – is a connection with great psychological and philosophical import. John Stuart Mill once characterised nature as 'the cradle of our thoughts and aspirations' (Mill, 1977: 756), a cradle that allows humans to explore their unique abilities and learn how to prosper. This original connection is one against which the whole of human history has been crafted and is, adds Dale Jamieson, the 'background against which we live our lives' (Jamieson, 2010: 442). Managing the climate would fundamentally change that background prompting what environmental writer Jason Mark has called an 'existential anxiety' (Mark, 2009).

Keith's worries clearly resonate with Bill McKibben's (1989) well-known discussion of anthropogenic climate change. In *The End of Nature*, McKibben argued that it is not just species but also ideas that can go extinct. The idea of nature untouched by humans is threatened by anthropogenic climate change. In a warming world, said McKibben, '…each cubic yard of air, each square foot of soil, is stamped indelibly with our crude imprint, our X' (McKibben, 1989: 96). The loss of nature – something McKibben characterised in a sentence very reminiscent of Keith's as, 'the separate and wild province, the world apart from man to which he adapted and under whose rules he was born and died' (48) – generates a crisis of self-understanding. With anthropogenic climate change, McKibben suggested, 'the *meaning* of the wind, the sun, the rain – nature – has already changed' (ibid.).[7]

Keith's and McKibben's worries are clearly related, but they differ in at least one significant respect. McKibben alerted readers to a change that was wholly unintentional. In the year *The End of Nature* was published, the idea of *deliberately* engineering a cooler climate had hardly been broached.[8] Unintended anthropogenic climate change through greenhouse gases was the only game in town. Since a geoengineered climate of the future would, in contrast, be intentionally manufactured, it would create a different type of change in meaning than unintentional change. There is every reason to think that this change in understanding would be even greater than the change caused by inadvertent warming. The reason for this greater change lies in the generally negative disposition of environmentalists towards *artificity*.

In her book *The Natural and the Artifactual*, Keekok Lee offered an extended discussion of the impact of certain artefacts on our basic understanding of nature. She contrasted the natural and the artifactual using a distinction first articulated by Aristotle:

> '[T]he natural' … refers to whatever exists which is not the result of deliberate human intervention, design, and creation in terms of its material efficient, formal, and final causes … The natural comes into existence, continues to exist, and goes out of existence entirely independent of human volition …[B]y contrast, 'the artifactual' embodies a human intentional structure. (Lee, 1999: 82)[9]

To put Keith's point in Lee's/Aristotle's terms, a geoengineered climate, in contrast to one affected merely by unintentional anthropogenic climate change, would contain human intentional structure. It would be an artefact in a way that an unintentionally altered climate could never be. While humans might still bear responsibility for an accidentally altered climate, they assume much clearer responsibility for a climate they alter intentionally.

Even though some think artificity need not be viewed negatively (e.g. Vogel, 2003), it is clear that if climate engineering were implemented on a global scale, humanity would from that moment onwards live in a climate bearing traces of their own design. At the same time, they would assume primary responsibility for making it hospitable. As a result, rather than viewing our surroundings as a deep source of meaning, suggests Mark (2009), we might start to view them as a constant, potential threat. The climate would require careful and continuous management to maintain the delicate balance of solar radiation, greenhouse gases and cloud cover needed to keep us (and other species) safe. The skies themselves, a sacred space previously thought to be the 'domain of the Gods' (Donner, 2007), would have become simply another human artefact. The behaviour and, ultimately, the meaning of everything subject to their influence would shift, becoming less 'natural' and more a product of human works.[10]

ENVIRONMENTAL ETHICS AND MANAGED SKIES

Both Keith's and McKibben's laments appear, in essence, to be laments about loss. They both worry that something previously cherished – valued for being outside the human sphere – would disappear. Lee called this phenomenon 'ontological impoverishment', the elimination of a category of thing that previously held significance (Lee, 1999: 119). The application of certain technologies, even when embarked upon with the best intentions, can come with this deeper cost. This is not just a superficial impact such as when air and water pollution sully the surface, but a deeper one that reaches all the way down to the very meaning of nature.

In the face of these worries about loss, it is tempting to reply that all this might simply be an unhelpful wistfulness, a mourning for Arcadia. Perhaps McKibben and Keith (and Lee) should simply 'get over it' and get used to living under managed skies. After all, one might argue (as many have done in the wilderness debates[11]) that the idea of living in 'pristine' nature is mostly a

fantasy anyway. Humans have been influencing their environments for millennia. Most Europeans have been living within managed landscapes for centuries with the idea of completely untouched nature having receded far into historical memory. Even McKibben admits that humans have been living in an altered climate since they first started pumping greenhouse gases into the atmosphere during the industrial revolution. Perhaps a geoengineered Earth is little more than a grander version of the European experience that simply needs to be accepted as the new normal.

To counter the 'get over it' reaction, one needs to find an argument that managing nature on such a grand scale is wrong in itself. To put it another way, one needs an argument that an artifactual climate is inherently wrong. Dale Jamieson, in one of the first articles on the ethics of what he then called 'intentional climate change', gestured towards such an argument. As one of three ethical considerations relevant to geoengineering, Jamieson cited the worry that 'modern societies have erred on the side of excessive intervention' (Jamieson, 1996: 331). He called intentional climate change a 'very grand gesture' taking us in the opposite direction of 'learning to live with nature'. More recently Jamieson has added that, whatever the complexities involved in assigning personal or political blame, climate change without doubt 'violates the duty of respect for nature because it is a central expression of the human domination of nature' (Jamieson, 2010: 441). Climate alteration, intentional or not, demonstrates a culpable attitude of domination and is quite probably a 'paradigm of disrespect' (ibid.). This culpability fits with what Jamieson called in the earlier article a 'common sense' presumption that 'it is wrong to interfere dramatically with fundamental natural processes' (1996: 325).

It is clear that humans interfere with nature in countless ways every day, from diverting water, to planting crops, to harnessing solar radiation, to building homes. If one scales up these local management practices to management of the climate itself, has one really crossed a new moral line? Whether one chooses to find the fault in the exhibition of a human vice or in the interference with valuable natural processes, are there grounds to suspect that climate engineering is a particularly egregious action from the perspective of environmental ethics?

An affirmative answer to this question can arguably be found close to the core of modern environmental ethics. In fact, it is hard to imagine any of the central positions in the literature endorsing the alteration of earth's fundamental biogeochemical processes. While most environmentalists acknowledge the necessity of managing some portion of the earth in order for humans to survive at all, the emphasis has usually been on keeping that management within limits. In the earliest work in modern environmental ethics, heavy-handed management was roundly criticised by Aldo Leopold. His request for 'gentler criteria' when 'remodeling the Alhambra with a steam shovel' exhibited this sentiment (Leopold, 1970: 226), as did Lynn White's rejection of the 'dogma of man's

transcendence and rightful mastery over nature' in his critique of Christian attitudes towards the environment (White, 1967: 1206). In a seminal 1973 article, Richard Routley stated that policies of 'complete interference' are wrong since they fail to acknowledge that 'some worthwhile parts of earth's surface should be preserved from substantial human interference, whether of the "improving" sort or not' (Routley, 1973: 205). Tom Regan, also seeking to define the parameters of a genuinely environmental ethic, advocated a 'preservation principle' which cashed out as 'a principle of nondestruction, noninterference, and, generally nonmeddling' with nature (Regan, 1981: 32). Similarly, Paul Taylor articulated a *prima facie* duty of non-interference which stated 'we must not try to manipulate, control, modify, or 'manage' natural systems or otherwise intervene in their normal functioning' (Taylor, 1986: 175). All of these authors suggested that the management of nature on a grand scale is wrong. Climate engineering would appear to run counter to this basic environmental intuition against meddling with earth's fundamental processes.

Many of the philosophers just mentioned subscribe to non-anthropocentric positions in environmental ethics. Since non-anthropocentrists generally believe there is moral significance to the earth independent of human interests, it is perhaps not surprising that they all lean towards some version of a principle of non-interference. However, the same leanings are also widespread amongst anthropocentrists in environmental ethics. Eugene Hargrove, for example, promoting his own 'weak anthropocentric' argument to preserve natural beauty, states that this duty 'does not make sense if it calls for human involvement in the creative process of nonhuman nature' (Hargrove, 1996: 195). He claims that our duty is to promote natural beauty 'through action and inaction that does not restrict, impinge on, redirect, or bring to an end the geological and biological activity on which the indifference of natural creativity depends' (ibid.). Earth's basic geological and biological processes must be left alone to continue creating the forms humans find beautiful.

Another well-known anthropocentric environmental ethicist, Bryan Norton, argues for the maintenance of desirable options within human culture but adds that '…culture can be perpetuated only if it respects limits inherent in the land context' (Norton, 1994: 219). There are basic biogeochemical limits that humans must understand and learn to live within. The environmental position Norton embraces in *Why Preserve Natural Variety?* rests on the view that '...it is bad to thwart…natural processes, to interrupt well established patterns, to introduce irreversible changes' (Norton, 1992: 207). For both Hargove and Norton, earth's fundamental biogeochemical processes should largely be left alone.

While these few selected quotes are not intended to form a watertight case, they do illustrate the perhaps unsurprising position that both anthropocentric and non-anthropocentric environmental ethicists have generally advocated finding ways to live within earth's existing limits. In a paper that investigated the moral

significance of a different emerging technology, synthetic biology, I suggested that one only has to look at the numbers to find the source of this intuition.

> Nature unmodified by human intention may be increasingly hard to find today but, as a matter of historical fact, there were close to 4.6 billion years of geological history on Earth that preceded the arrival of our first, artifact-creating ancestor, *Homo habilis*, approximately 2 million years ago. During these 4.598 billion years of earth's history there were independent processes at work ultimately responsible for creating everything environmentalists find of value today. (Preston, 2008: 27)

This long stretch of geological and evolutionary history occurring independently of human interference serves to anchor a central environmental intuition.

This intuition about the moral significance of earth's history independent of human interference appears repeatedly throughout the environmental ethics literature. Part of the reason we protect wildlands, claims Holmes Rolston, III, is that they provide 'the profoundest historical museum of all, a relic of the way the world was during 99.9% of past time' (Rolston, 1988: 14). Robert Elliot suggests that causal continuity with the historical evolutionary past is important. The value of places such as Hetch Hetchy to John Muir, claims Elliot, lay in the fact that they were '…part[s] of the world that had not been shaped by human hand' (Elliot, 1982: 90). It is their relationship to processes embedded deep in earth's history that confers significance upon them. Eugene Hargrove points out in a similar vein that 'when we interfere with nature, regardless of whether our intentions are good or not, we create a break in [that] natural history' (Hargrove, 1996: 195). Clearly, the ancient processes have significance.

In all of these cases, the presumption central to environmental ethics is that human actions need to be circumscribed in such a way that the human-independent processes are left largely intact. If environmentalists tend to value the fundamental, human-independent processes, then geoengineering will obviously be a cause for concern. Climate engineering creates biogeochemical processes that are artificial (in the Aristotelian sense of embodying human intention). Given the central environmental intuition, this could form a *prima facie* reason, or a presumptive argument, for opposing many geoengineering projects. Emerging popular environmental opposition to geoengineering often employs something close to this argument.[12] The presumptive argument is bolstered by recognition of the extraordinary complexity of earth's ecological system and often a deep scepticism about scientists' ability to manage it. With this additional prudential argument in mind, one could probably push the presumptive argument further and suggest that, for many environmental ethicists, the prospect of geoengineering the climate qualifies for the category of what Stephen Gardiner (citing Bernard Williams) has called 'the unthinkable', action that is dishonourable or morally absurd to even think about (Gardiner, 2010: 299). Henceforth it will be assumed that there is a potential presumptive argument against geoengineering in environmental ethics.[13]

TWO CHALLENGES TO THE PRESUMPTIVE ARGUMENT

The conclusion reached thus far is likely to be somewhat under-whelming. It will come as no surprise that large portions of the environmental ethics community may oppose geoengineering. Environmentalism for the last 40 years has maintained as one of its key tenets the idea that humans must change their ways and learn to live within the ecological parameters presented to them. In contrast, climate engineering is a way to modify earth's parameters so that humans do not need to change. If anthropogenic climate change shows that we have failed to live within Earth's limits and if environmentalists typically find humans culpable for that failure, then geoengineering hardly demonstrates a break with the past. As Audre Lorde pointedly put it in another context, 'the master's tools will never dismantle the master's house' (Lorde, 1984).[14]

Admittedly, most advocates of geoengineering insist that the technology is only a way of 'buying time' until such a point that greenhouse gas emissions are reduced enough for the climate to stabilise. However, the idea of returning to a 'natural climate' post-geoengineering is not without its own problems. What will count as a natural climate? How much 'fine-tuning' will be required after the main project had ended? With considerable uncertainty about the course of both anthropogenic climate change and natural fluctuations in earth's climate, the distinction between geoengineering as 'buying time' and geoengineering as a tool to permanently manage for a desirable climate may prove hard to maintain.

If geoengineering runs contrary to the basic tenets of so many positions in environmental ethics, then the fact that geoengineering has so rapidly become a topic of serious policy consideration begs for some explanation. The recent rush of climate policy in the direction of geoengineering suggests that the presumptive argument in environmental ethics must either be, 1) relatively unknown, 2) so far off the mainstream that it can be safely ignored, or, 3) defeasible in part, under the right circumstances. Forty years after the first Earth Day with environmental sentiments widespread, option 1 is simply implausible. (Moreover, it would be unproductive for environmental ethicists to think their job is to simply shout the presumptive argument more loudly). Option 2 obviously appears wrong to environmental ethicists. It also would not explain the hesitation that preliminary social science research suggests initially greets the mention of many climate engineering technologies amongst the wider public.[15] A more promising strategy is to focus on the third alternative and explain why the basic environmental intuition may be partially defeasible under tightly proscribed conditions. Doing so would at least allow environmental ethicists to be active participants in the discussion of the social, ethical and legal issues that the Royal Society identified as being the most urgent. Participating in these discussions may also provide environmental ethicists with the opportunity to explain why some types of geoengineering should not happen at any cost.

In what remains of this paper, two possible rationales enabling environmental ethicists to maintain the presumptive argument but accept a partial defeasibility condition will be briefly offered. One rationale suggests that geoengineering may, under the right circumstances, be justified as the lesser of two evils. The other suggests that, even within environmental ethics, the idea that humans are morally permitted to take urgent steps to protect their vital interests is already widely accepted. These two rationales are not entirely separable from each other – the lesser evil argument may come into play exactly when large numbers of human lives are at stake – but they warrant separate consideration due to the different ways they bear on existing literature. The discussion below is not intended to be complete, but it is intended to highlight potential trade-offs between the value environmental ethicists find in fundamental natural processes and other values they also care about.

THE LESSER OF TWO EVILS

The framing of the case for geoengineering as the lesser of two evils – or the option of last resort – has been widespread since Nobel Laureate Paul Crutzen first gave climate engineering its new legitimacy (Crutzen, 2006). Few of those who advocate for geoengineering would confess to liking it for its own sake. Those who favour it tend to cast it as an emergency measure in a bad situation. Before discussing the benefits of albedo enhancement, Crutzen was careful to state unequivocally in his paper that '[b]y far the preferred way to resolve the policy makers' dilemma is to lower the emissions of the greenhouse gases' (2006: 211). A major report by the Council on Foreign relations displays similar thinking in its title: 'The Geoengineering Option: A Last Resort Against Global Warming' (Victor et al., 2009). Even Samuel Thernstrom, a proponent of increased geoengineering research based at the politically conservative American Enterprise Institute acknowledges that '…[y]ou'd have to be crazy to consider this a first, best option'.[16] But as a last option before an impending crisis, it is argued that geoengineering may indeed be the lesser of two evils. Editors of the Royal Society special issue on geoengineering, Launder and Thomson, endorse the lesser evil argument when they write '…[w]hile such geoscale interventions may be risky, the time may well come when they are accepted as less risky than doing nothing' (Launder and Thompson, 2010: xv). In the more near term, it is argued that commencing serious geoengineering research now is the only way to 'arm the future' should the decision to pull the trigger on geoengineering eventually need to be made.

Steven Gardiner (2010) has offered a critical evaluation of the lesser evil rationale. Gardiner's paper has a fairly narrow goal. It is not intended to argue for (or against) the decision to deploy any particular geoengineering scheme.

Nor does it take a position on geoengineering in general. The purpose is to look at the moral context in which the decision to undertake serious geoengineering research takes place. Pronouncing geoengineering the lesser of two evils in advance and then initiating research now, he claims, demonstrates a peculiarly trenchant form of moral corruption.

To make the case, Gardiner borrows and extends some of the arguments from his 'Perfect Moral Storm' account of the ethics of climate change (Gardiner, 2006, 2011b). Gardiner convincingly shows that the perfect storm of climate change encourages moral corruption in the present generation. Even if we are willing to acknowledge that anthropogenic climate change is a problem, its intergenerational nature, the geographically dispersed nature of its agents and its effects, and the lack of theoretical and institutional resources to address the problem make it tempting to defer action, to seek out uncertainty in the science, and to avoid what would otherwise be seen as clear moral obligations. Climate change, Gardiner argues, is the type of problem that 'provides each generation with the cover under which it can seem to be taking the problem seriously … when really it is simply exploiting its temporal position' (Gardiner, 2006: 408).

Gardiner compellingly argues that the language of 'lesser evils' or 'last resort' in geoengineering skews the debate and opens the door to a continuation of the same moral corruption. The decision to initiate geoengineering research is portrayed by its backers as demonstrating the 'heroic seriousness' of someone investing resources towards solving a worrying problem. But Gardiner counters that, given the known political inertia governing climate policy as a whole, initiating research on geoengineering in fact serves as a mask for a number of vices. These vices include moral corruption, laziness and buck-passing, as well as knowingly putting the future generation that would actually initiate climate engineering in an undesirable position. The decision to pursue research in geoengineering shows that we have 'failed to take on the challenge facing us, and instead have succumbed to moral corruption. Indeed, the decision to geoengineer might reveal just how far we are prepared to go to avoid confronting climate change directly, and this may constitute a tarnishing, even blighting, evil' (Gardiner, 2010: 304).

If the widely held lesser evil rationale for geoengineering is to be sustained in the light of Gardiner's exposure of its flaws, his claims about moral corruption need not be proven wrong, but they must be shown to be surmountable. As a first response, one might grant everything Gardiner has said about the decision to engage in geoengineering research demonstrating moral corruption and comprising a tarnishing evil. At the same time, one might still insist through a weighing of costs and benefits that this tarnishing evil may not be as bad as the evil of subjecting millions of people to increased drought, disease and food shortages caused by unabated anthropogenic climate change. Admittedly, this would be an almost impossibly complicated cost-benefit analysis to perform.

An accounting that was global in scale, intergenerational in nature, projecting many centuries into the future, and ranging across both human *and* environmental well-being would present insurmountable technical problems. However, there is nothing theoretically at odds with the idea that geoengineering could, at the end of the day, remain the lesser evil.[17] One could agree that Gardiner's paper is successful at shifting the burden of proof back towards the would-be geoengineer, but still insist that climate engineering might at the end of the day prove to be the lesser of two evils.

There is a second aspect of Gardiner's observations about the lesser evil rhetoric that prompts critical reflection. He leaves the door open to ways our current moral corruption could be mitigated. The body of his paper includes five main arguments ('Which Nightmare?' 'Other Options', 'Other Liabilities', 'Fatal Silence' and 'Lingering Inertia') for why the lesser of two evils rationale is problematic. While space considerations make it impossible to pick apart the layers of Gardiner's arguments here, it is worth noting that four of these five to some extent involve the assumption that the option under consideration today is 'modest geoengineering research only'.[18] The moral corruption Gardiner is primarily concerned about is clearly most manifest when all we do to prepare for climate change is to 'spend a few million dollars on research our generation will probably not have to bear the risks of implementing' and little else (Gardiner, 2010: 295). Our ducking of responsibility is at its most egregious when we change little about our own lives except to fund a few scientists to do a small amount of research relevant to some future person's dilemma.

While there is no question that, in the light of the known political inertia on the issue, we are currently failing to pursue a path that might free us from moral corruption, there exist at least two considerations to suggest that the amount of moral corruption being shown when supporting geoengineering could be less than Gardiner suspects. The first is that very few advocates of geoengineering research have posed it as a stand-alone strategy for addressing the challenge of climate change. The Royal Society report begins with the key recommendation that '[g]eoengineering methods of both types [SRM and CDR] should only be considered as part of a wider package of options for addressing climate change' (Royal Society, 2009: x).[19] At the same time as affirming the 'essential' nature of further research on geoengineering, the statement of the scientific organising committee at the March 2010 Asilomar Conference on Climate Intervention Technologies made it clear that 'a strong commitment to mitigation of greenhouse gas emissions, adaptation to unavoidable climate change, and development of low-carbon energy sources' remained necessary (Asilomar, 2010). Efforts to reduce greenhouse gas emissions continue at various levels of intensity. The wider social and governance issues associated with geoengineering are also actively being studied and discussed.[20] Climate policy, both inside and outside of the geoengineering community, already appears to be much broader than

Gardiner's 'modest geoengineering research only' characterisation suggests. Even if what is being done currently is not yet enough to insulate the current generation entirely from moral corruption, the corruption may be less than the suggested worst-case policy of 'modest geoengineering research only'. There is also unlimited potential to reduce it still more.

The second consideration that may reduce the moral corruption is that many who advocate for geoengineering research today do so not simply as a strategy for passing the responsibilities off onto future generations. The potential for moral failure Gardiner identifies is displayed most prominently when the lesser evil strategy is an excuse for passing the buck and doing nothing significant in the current generation. But what if there is not enough time left for the buck to be passed? If geoengineering research is pursued with the intention of deploying it in the current generation then the moral corruption diminishes. 'Arming the future' becomes a matter of 'arming the present' involving less in the way of morally troubling procrastination. While it is often unnecessary to specify precisely for whom any particular piece of research is being conducted, few climate engineering researchers can have certain knowledge that their work will benefit *only* future generations.[21] None of this is to deny Gardiner's claim that current responses to greenhouse gas emissions are inadequate. It is clear, however, that the more serious and aggressive are the climate strategies today, then the less likely are these strategies to show moral corruption.

A final avenue for surmounting Gardiner's challenge to the lesser evil argument concerns his discussion of 'marring evils' and those that are 'tarnished' or 'blighted' by performance of them. A 'marring evil' is an evil that results in 'a negative moral evaluation of an agent's action … that is licensed when the agent (justifiably) chooses the lesser evil in a morally tragic situation, and which results in a serious negative moral evaluation of that agent's life considered as a whole' (Gardiner, 2010: 301). If the negative evaluation is irredeemable, Gardiner calls it a 'blighting' evil. This part of the discussion is designed to illustrate how, even if climate engineering were the lesser of two evils, it still might be something that comes with a very high, and perhaps unacceptable, moral price. Not only might the deployment of geoengineering be a blighting evil, so might be the pursuit of research itself that, by detracting from the job at hand and creating institutional commitments, ultimately pushes a future generation further towards geoengineering.

To support this position, Gardiner draws on arguments similar to Jamieson's to complain about the 'hubris', 'recklessness' and 'obstinate resistance to look at the central problem' of the kind of people who might knowingly go down this path. With geoengineering, Gardiner says, we might 'cross a new threshold on the spectrum of environmental recklessness' demonstrating 'continued' and 'deepening' failure (2010: 303). The decision to pursue geoengineering may, Gardiner warns, blight humanity forever.

While there is no doubt that the decision to pursue geoengineering does indeed reflect a moral failure on climate change, a plausible response to this argument can begin by considering the use of the word 'continued'. Gardiner acknowledges that pursuing geoengineering is a sign that '…we, as a species, have failed to meet a basic challenge and should be saddened or ashamed for that reason' (304). But it needs to be noted that this shame and whatever blighting accompanies it results from an *existing* failure to address greenhouse gas emissions despite full awareness of the path down which this was taking us. Gardiner reveals that he concurs with the basic environmental presumption in favour of living within ecological limits when he states '…[a] basic question that faces us as humans, then, is whether, amidst all this, we can meet the challenge of adapting to the planet on which we live' (ibid.). Our failure to address greenhouse gas emissions means the answer is already clear and the blighting has already occurred. Any discussion of the tarnishing or blighting that might result from the decision to geoengineer may be moot. The moral damage has already been done.

Clearly the fact that we are already blighted does not provide free reign to compound our moral condition by performing additional evils. But climate engineering may not in the end be a compounding evil. Rather, it could be a serious attempt to make amends. If the intention to lessen human suffering, to protect non-human species, and to preserve environmental values, then it is not clear that geoengineering adds to the blight. Some might even view climate engineering as an admirable attempt at ecological restoration, providing a possible argument from environmental ethics in its favour, despite the presumptive argument against it.[22] As Gardiner has capably demonstrated, the context of the argument is what matters.

In sum, then, one might find Gardiner's paper to be wholly successful at illustrating how lesser evil arguments can be 'dangerously shallow', 'opaque' and a cover for continued 'moral corruption'. However, it might still be the case that, under the right circumstances, geoengineering remains the lesser evil. Gardiner's arguments against this rationale cannot be ignored but they can be blunted, especially if renewed efforts are made to lessen our moral corruption. Gardiner knows this and acknowledges as much, stating that it is not possible to conclude from his arguments that '…no lesser evil argument for research on, or deployment of, geoengineering can ever succeed' (ibid., 305). At the very least, it remains an open question as to whether geoengineering should be pursued despite the further tarnish it might add our lives. At this point, it is illuminating to consider a second line of thinking that adds weight to the defeasibility argument.

PRIORITISING HUMAN WELL-BEING.

A second way to probe the presumptive argument against geoengineering is suggested by the following counterfactual thought experiment.[23] While this thought experiment takes us some distance from the anthropogenic warming scenario and completely eliminates Gardiner's primary concerns about moral corruption, it is useful for thinking about how the presumptive argument against meddling with fundamental biogeochemical processes might shift under certain climate scenarios.

> If it were the case that humans had not released large quantities of greenhouse gases into the atmosphere and that the world was warming naturally at the same dangerous rate that it is now warming due to anthropogenic greenhouse gases, would the environmentalist presumption against geoengineering be enough to preclude taking measures to prevent the impending change?

It is far from clear that environmental ethicists would maintain their opposition to geoengineering under these circumstances. It appears unlikely that humans would – or should – sit back and watch the disruption and suffering caused by rapid natural warming on the basis of any presumptive argument against climate engineering centred on the value of fundamental biogeochemical processes. When factoring in the environmental values also at stake, it seems probable that the presumptive argument would become defeasible.[24] If the alternative were to watch all the prospective disvalues associated with runaway climate change unfold before one's eyes, including drought, starvation, disease, forced migration and international conflict – to say nothing of the effects on existing wildlife species – it is reasonable to propose humans ought to attempt to engineer an alternative.[25]

The evidence for this intuition comes from the existing response of the environmental ethics community to the possibility of ecofascism. To refuse to engineer an alternative to rapid warming, would be to embrace a form of ecofascism by omission rather than by act. It would be ecofascism because the preservation of systemic processes would have been determined to trump the value of human (and other individual) lives. Refusing geoengineering would involve knowingly letting people die – and perhaps even letting the human species disappear[26] – in order to ensure earth's fundamental processes remained unperturbed. Even if it is maintained that there is a moral difference between acting and omitting to act – a position that has its own philosophical challenges[27] – the omission here would come with considerable culpability. It would be to value the integrity of earth's fundamental bio-geochemical processes over the lives of millions of humans.

If this is ecofascism by omission, then the reaction against ecofascism in the environmental literature has been vigorous enough to suggest that even those

sympathetic to the presumptive environmental argument would baulk. Outside some of the misanthropic ideas advocated in the *Earth First! Journal* in the nineteen-eighties, there has been very little in the environmental ethics literature arguing in favour of letting people die in order to protect environmental values. The closest mainstream environmental ethics has come to this position is Holmes Rolston, III's suggestion that there are certain tightly circumscribed occasions when one should save nature rather than save people (Rolston, 1996). The rapid negative reaction to Rolston's piece by (amongst others) Robin Attfield (1998), Ben Minteer (1998), Alan Carter (2004) and Victoria Davion (2007) suggested that Rolston's views lie well outside of the mainstream. In other writing, Rolston has insisted (more in line with his critics' views) that the emergence of culture out of nature marks a fundamental break from natural processes. As a result of this break, Rolston suggests that we have a strong obligation to lessen human suffering. 'Different rules do apply to persons', he states, '…and even to persons in exchange with nature' (Rolston, 1988: 82). This is why humans (for the most part) don't sit back and watch each other die from curable, naturally-occurring bacterial infections and drown in annual floods. We try to do something about it. The significant obligations we have to other humans suggest that even those who value the natural processes that have characterised earth's history might be prepared to interfere with these processes if enough human lives and human suffering were at stake.

If this intuition about the defeasibility of the presumptive argument from environmental ethics is correct, then one obvious implication is that, in these extreme circumstances, the anthropocentric position in environmental ethics appears to have won out over the non-anthropocentric one. The values embodied in earth's basic biogeochemical systems are not so high that they trump human interests in this tightly circumscribed scenario. Alligators would not be allowed to reappear in Greenland if the consequences included an extinct, or a dramatically reduced, human population. When the values at stake are no longer trivial ones but vital interests affecting a large percentage of the human population, the intuitions shift.

At the same time it should be noted that the anthropocentric/ non-anthropocentric debate has lost some of its clarity at this point. Many of the environmental values cherished by non-anthropocentrists – polar bears, glaciers, migratory songbirds – would also be at risk under extreme warming. In a rapidly changing climate, human *and* wildlife interests/values would be pitched against the value of climatic processes. Only a certain type of radical environmental position would allow for great harm to people *and* the extinction of many species in order to protect earth's fundamental biogeochemical processes. It seems more likely that an environmental intuition towards saving species would align with the humanistic intuition towards saving persons. A more positive, competing narrative about climate engineering might then emerge as geoengineering started

to be viewed as a humane act of ecological protection rather than reckless, environmental meddling.[28]

CONCLUSION

The two arguments above are designed to illustrate ways that the presumptive argument against geoengineering from environmental ethics may be defeasible under the right circumstances. Even though there is a grave risk of moral corruption when advocating geoengineering, it remains theoretically possible that it might, under the right circumstances, be the lesser of two evils. The right circumstances are those in which severe warming poses a devastating threat to the human population and to familiar environmental values. It may then be appropriate to proceed with certain forms of geoengineering.

Even if the presumptive argument is defeasible, something that should not be lost in this discussion is that the presumptive argument must be accorded the weight that forty years of environmental ethics has provided it. The circumstances must be conclusively shown to be appropriate for the presumption to be waived. There is clearly plenty of room for moral corruption in the way that a lesser evil argument gets presented. As Gardiner pointed out, '[P]art of the point of claiming that one is in morally exceptional circumstances', he says, 'is in order to secure an exemption from the usual norms and constraints of morality … morality sometimes seems inconvenient to us' (Gardiner, 2010: 291). There is no doubt that Gardiner's arguments need to be heeded, especially given the track record on climate change and the moral corruption that has already been displayed.

However, a second important conclusion to draw from the discussion in this paper is that, tempting as it is, environmental ethicists need to do more than simply insist upon a presumptive rejection of geoengineering *tout court*. There are pragmatic reasons for this, including the fact that important ethical discussions about geoengineering are already taking place and environmental ethicists need to join them. Being party to these discussions will allow environmental ethicists to use their expertise on the relationship between human and environmental values in order to have some influence on policy that is already being formed. As David Victor points out, making geoengineering taboo in precisely those countries where open, sophisticated and transparent discussion and research is most likely to occur risks leaving geoengineering research to only those countries where it is not (Victor, 2008).

In addition to these pragmatic reasons, there are also theoretical reasons. The presumptive argument may have limits to its application, limits that we may be fast approaching. Climate change and the possibility of geoengineering not only forces environmental ethicists to confront questions of the relative value of human interests against those of natural processes. It also forces them

to confront questions concerning the value of existing wildlife species as they stack up against the value of the fundamental processes responsible for creating them. How important is the integrity of fundamental biogeochemical processes relative to the value of species (and persons) under threat? If the limits to the presumptive argument are indeed approaching, this may not only say something about the necessity of changing some initial reactions to geoengineering. It may also say something about the necessity of changing certain common assumptions in the field of environmental ethics.

NOTES

[1] Research time for this paper was supported by US National Science Foundation grant number SES 0958095.

[2] The terms 'climate engineering' and 'geoengineering' will be used interchangeably.

[3] See meetings and reports issued by the Royal Society, the US House Science and Technology Committee, the Asilomar International Conference on Climate Intervention Technologies, the US Government Accounting Office, the US Congressional Research Service, the UK's Natural Environment Research Council's study, the US's National Commission on Energy Policy Task Force on Geoengineering, the New America Foundation Conference, and the University of Montana Workshop on the Ethics of Solar Radiation Management.

[4] For other summaries, see Goodell (2010), Kintisch (2010), Launder and Thompson (2010) and the UK House of Commons Committee on Science and Technology (2010).

[5] Gardiner (2011a) has suggested that the focus on governance may be somewhat distracting from other ethical issues such as accountability (170).

[6] Models suggest that the deployment of stratospheric aerosols might cool the poles but disrupt monsoon patterns in Asia and Africa. This could lead to devastating crop failures in the populations that are least prepared to handle it (Robock et al., 2008, Schneider, 2008).

[7] McKibben's concerns have been challenged by numerous authors including Vogel (2002), Cronon (1995), and Borgmann (1995).

[8] Notable exceptions are Kellogg and Schneider (1974) and Schneider and Mesirow (1976). See Fleming (2010) for a history of attempts at regional weather modification.

[9] Lee draws a stark contrast between the natural and the artifactual. A more moderate position would acknowledge degrees of artificity (see note 10).

[10] There is a great deal of complexity to the question of what counts as natural and artificial. Different artefacts seem to contain different degrees of artificity. A mud hut is a different kind of artefact from an iPod, but an artefact nonetheless. Restored wetlands and municipal landfills are both technically artefacts but they differ in value for most environmentalists. These complexities will largely be set aside in this paper so that the focus can remain on the significance of living under managed skies.

[11] See Callicott and.Nelson (1998) and Nelson and Callicott (2008).

[12] See the H.O.M.E. website at www.handsoffmotherearth.org for numerous expressions of this opposition.

[13] Clare Palmer (2011) has recently argued for the surprising claim that environmental ethicists might struggle to specify particular harms to future entities (animals, species and ecosystems) caused by climate change. The presumptive argument sketched here, however, rests on the wrongness of straying outside the parameters provided by certain fundamental processes. It does not rely on any supposition of harm to particular entities.

[14] Albert Einstein similarly remarked that we are unlikely to solve big problems with the same kind of thinking we used to create them. Those who deride climate engineering as an inadequate techno-fix are often echoing Lourde and Einstein.

[15] In a recent social science study, afforestation, air capture technology, and biochar were viewed positively from the start. Cloud brightening, sulphate aerosols, liming the oceans, space mirrors, ocean fertilisation and roof whitening all received less than 50% support when first explained (NERC 2010, 24).

[16] Quoted in Mark (2009).

[17] Gardiner is fully aware of this, which is why he directs his argument towards the morality of the decision to engage in research now rather than considering the cost-benefit analysis itself. He states that '…[e]ven if one accepts in principle that one should make a lesser evil choice in some highly stylised case, such as the nightmare scenario, this fails to justify a policy of preparing to make that choice' (Gardiner, 2010: 292). Furthermore, as Gardiner points out on p. 299, from the fact that something is the lesser of two evils it does not follow that it should be done. Both evils could be morally prohibited.

[18] Gardner 2010, 295, 296, 305.

[19] In the case of solar radiation management, the continuation of ocean acidification is an obvious reason why.

[20] Examples of this work in ethics and policy include the UK Parliament Science and Technology Committee hearings and the Royal Society's Solar Radiation Management Governance Initiative. The US National Commission on Energy Policy Task Force on geoengineering will include a section on ethics and policy in its recommendations and the US National Science Foundation funded a team from the University of Montana to investigate the ethics of solar radiation management.

[21] Whether geoengineering might be necessary in the current generation rather than later presumably hinges on whether certain climate tipping points have been (or will soon be) reached. This question remains subject of much debate. Recent events, including the hottest January–June (2010) period in history measured by NASA, the hottest summer on record in the Eastern United States (2010), and the breaking off the Jacobshavn and Petermann Glaciers in Greenland (January and August 2010) all provide fodder for those who believe those tipping points are here. Several of the scientists participating in the Googlegroup devoted to Climate Intervention suggest that certain tipping points have been passed.

[22] This position was suggested to me by Ned Hettinger. Hale and Grundy (2010) warn, however, that restorative geoengineering to remediate climate impacts could never erase the blame for causing those impacts in the first place.

[23] This thought experiment was suggested to me by Ned Hettinger.

[24] Some environmental ethicists may insist that no environmental values are at stake. Natural warming, they might say, however extreme, is inherent in the operation of the system and has only positive value.

[25] One reviewer has suggested that to take this position is to beg the question against the potential power of ecocentric ethics.

[26] The very richest people would presumably find a way to engineer their own survival, whatever resources this took.

[27] See, for example, a special issue of the *Journal of Medical Ethics* **26** (2000) for a discussion of the acts/omissions debate.

[28] See an unpublished paper by Holly Jean Buck ('What can geoengineering do for us? Public participation and the new media landscape' available at: http://www.umt.edu/ethics/EthicsGeoengineering/Workshop/articles1/Holly%20Buck.pdf) for ideas about how to generate a positive narrative around geoengineering.

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