Published by Lexington Books
A wholly owned subsidiary of The Rowman & Littlefield Publishing Group, Inc.
4501 Forbes Boulevard, Suite 200, Lanham, Maryland 20706
www.rowman.com

10 Thornbury Road, Plymouth PL6 7PP, United Kingdom

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British Library Cataloguing in Publication Information Available

Library of Congress Cataloging-in-Publication Data

Preston, Christopher J. (Christopher James), 1968-
Engineering the climate : the ethics of solar radiation management. Christopher J. Preston.
p. cm.
Includes bibliographical references and index.
ISBN 978-0-7391-7540-8 (cloth : alk. paper) -- ISBN 978-0-7391-7541-5 (electronic)
1. Solar radiation--Management. 2. Solar radiation--Moral and ethical aspects. 3. Climate change. I. Title.
QC911.P747 2012
174' 93337923--dc23
2012012642

The paper used in this publication meets the minimum requirements of American National Standard for Information Sciences Permanence of Paper for Printed Library Materials, ANSI/NISO Z39.48-1992.

Printed in the United States of America

Chapter Seven

The World That Would Have Been

Moral Hazard Arguments Against Geoengineering

Ben Hale

According to the United Kingdom's Royal Society Report Geoengineering the Climate, "one of the main ethical objections to geoengineering" is the purported "moral hazard" (Royal Society, 2009, p. 39). Roughly speaking, the moral hazard is the complication that the successful deployment of a geoengineering technology or, in some cases, the mere possibility of the successful deployment of a geoengineering technology, may cause individual or collective actors to turn attention away from alternate solutions to the climate crisis. A cursory review of the arguments, however, suggests that there is a good deal of confusion about what, exactly, the unique moral hazard associated with geoengineering entails.

For instance, David Keith characterizes the moral hazard as a concern that geoengineering will weaken a commitment to cutting emissions. He says: "knowledge that geo-engineering is possible makes the climate impacts look less fearsome. And that makes a weaker commitment to cutting emissions today. This is what economists call a moral hazard" (TED talk, September 2007).[1] Martin Bunzl, by contrast, characterizes the moral hazard slightly differently, claiming that geoengineering may in fact stimulate an increase in carbon output (Bunzl, 2008). Where for Keith it would appear that the problem lies in permitting business as usual, for Bunzl it would appear that the problem lies in encouraging bad behavior. The aforementioned Royal Society Report offers yet a third interpretation, suggesting not only that geoengineering will reduce support for mitigation policies but also that it will "divert resources from adaptation" (Royal Society, 2009, p. 4). For the Royal Soci-

ety Report, it would appear that the moral hazard lies in the diversion of resources. Clearly, the problems are related but quite distinct in their emphasis.

Is the problem that geoengineering may inspire fewer people to take notice of the gobalized impacts of their actions? That people will refuse to change their behavior if a geoengineering technology is deployed? That people *will* change their behavior if a geoengineering technology is deployed? There is little agreement amongst geoengineering discussants about what exactly the moral problem is. If the moral hazard argument against geoengineering is to carry any persuasive weight, then it must clearly specify what changes in behavior will follow from geoengineering. Unfortunately, articulations of the moral hazard are too ambiguous to do this work. More vexingly, however, there are many potential hazards associated with the moral hazard—environmental, psychological, sociological, political, policy-related, and militaristic—any one of which would require a different response from policymakers. In this respect, the moral hazard is not only ambiguous but also vague. Without a clear articulation of the problem, moral hazard arguments may besowing more confusion than adding clarification.

The problem with allowing this ambiguity and vagueness to stand is that the moral hazard has become a sort of catch-all used to refer to a suite of objections and hazards. Put somewhat illustratively, if a new technology emerges that will enable humans to eat as much as they want without putting on weight or suffering any health effects, some may object that the technology introduces a moral hazard. It may well do so. People will be inclined to change their dietary habits in the face of such a technology, and there may well be moral problems with such changes in behavior. Perhaps they will begin eating more gluttonously, which is bad for their character, or perhaps for the environment, or perhaps for animals. Perhaps, instead, there are better ways for them to live rewarding lives without the use of such a technology, in which case the problem is with what they will miss out on. On the other hand, perhaps their lives will be made infinitely richer, for now they will be empowered with the possibility of eating many delicacies that were otherwise too difficult for them. The moral hazard describes all of these cases, among many others, and when used without further specification, invites rebuttals that often prove more confusing than helpful.

This, in fact, is precisely how such arguments are playing out. As currently used, the alleged "moral hazard" associated with geoengineering functions as a falsely concrete straw man and, therefore, is both easy to offer as a criticism and equally easy to dismiss. For instance, the 2009 Royal Society Report claimed that "concerns have been expressed that geoengineering proposals couldreduce the fragile political and public support for mitigation and divert resources from adaptation" (Royal Society, 2009, p. 4). To address these concerns, the authors suggested that more research be done. Not a year after the release of the report, the Natural Environment Research Council (NERC) conducted just such a study. In their report, they found that a majority of those polled believed that "it would be ethically and practically important to link any new climate change solutions to continued mitigation" (Godfray, 2010, p. 1). From this, NERC concluded that "this evidence is contrary to the 'moral hazard' argument that geoengineering would undermine popular support for mitigation or adaptation" (Godfray, 2010, p. 2). Somehow NERC was able to draw such a sweeping conclusion even though the mere fact that many people *believe* that geoengineering should also be accompanied by mitigation or adaptation does not speak to how people *will actually behave* in the face of a geoengineering regime. Only a small number of moral hazard arguments are concerned that the population holds the right attitudes or has the right beliefs (see, for instance, the Hubris Objection and the Attitude Objection below). The moral hazard is more often a concern about increased exposure to risk: about actual behaviors, not individual beliefs and/or anticipated behaviors following from these beliefs. The problem with the NERC study of moral hazards and geoengineering, however, goes well beyond a simple misapprehension of the moral hazard It is a problem with the ambiguity and vagueness of the moral hazard argument against geoengineering altogether.

In this chapter, I argue that moral hazard arguments against geoengineering fail on their face. They fail not because they are wrong or incorrect but because they are far too complicated and multilayered to do the work that they are assumed to do. They are, as I argue here, both ambiguous and vague. Though moral hazard arguments ostensibly offer a compelling reason for avoiding geoengineering altogether, or at least proceeding cautiously, whatever moral hazards we identify do not present a *prima facie* reason—I am using the term in its Rossian sense[2] —for altering our approach to geoengineering. It is my view that geoengineering-related moral hazards are better addressed more directly with other arguments.

Building on previous work, I proceed first by offering a working definition of the moral hazard and of geoengineering. I then cover the variety of definitions of the moral hazard and clarify that moral hazards always require a supplementary argument to clarify what the wrong consists in. Second, I offer three variations on the generalized moral hazard claim. Each variation points to an important weakness with the successful deployment of geoengineering, but due to ambiguity, requires further careful articulation. Third, I introduce a compendium of hazards that might be said to accompany any of the three variant interpretations of the moral hazard. Coupled with the ambiguity of variations, the vagueness associated with the hazards proves crippling for the moral hazard as a stand-alone argument against geoengineering. Each of the variant hazards that falls under the penumbra of the moral hazard is a real concern, I believe, and each, in its way, stresses some increased risk

associated with behavioral change following from geoengineering. Inasmuch as the hazards are separate from the so-called moral hazard, each must be assessed on its own terms. Hopefully this compendium of arguments and objections will prove helpful when sorting through the various articulations of moral hazard arguments.

MORAL HAZARDS AND MORAL THEORIES[3]

The moral hazard is a market failure most commonly associated with insurance but also associated by extension with a wide variety of public policy scenarios, from geoengineering, to corporate bailouts, to health insurance, to environmental disaster relief.[4] Loosely defined, a moral hazard is said to explain the occurrence of behavioral change in the face of insurance. More colloquially, it is sometimes considered to be "taking advantage of" insurance. For the purposes of this paper, it should suffice to define the moral hazard as "the danger that, in the face of insurance, an agent will increase her exposure to risk."

For instance, suppose that Smith insures his house against fire. The reason that he might insure his house against fire is so that he will be reimbursed if a fire breaks out. But certainly, if Smith is insured, he has less to worry about, and consequently, he has less incentive to be attentive to the devices that a more cautious homeowner might use to protect herself. In this case, as Kenneth Arrow notes, the "probability of fire is somewhat influenced by carelessness, and of course arson is a possibility, if an extreme one" (Arrow, 1963, p. 961). The presumed problem, of course, is a natural one: what use is insurance if theinsured party changes his exposure to risk once he becomes insured?

Talk of moral hazards has been around since at least as long as the modern insurance industry, which some date back as far as 1662 (Hacking, 1975, 2003, p. 28). It was not until 1963, however, that Kenneth Arrow employed the concept to discuss the economics of medical care. By 1968, he and Mark Pauly had engaged in an exchange that was to invigorate the use of the concept in public policy economics for years to come. More than earlier investigations of the moral hazard, this exchange identifies the tendency of insurance coverage to change the behavior of individual actors (Arrow, 1963, 1965, 1968, 1985, Pauly, 1968).

Though the moral hazard is, in principle, easy enough to grasp, even within the economics community few are clear on the meaning of the term. There are unwritten ambiguities in Arrow's early formulation of the moral hazard mentioned above, for instance. On one hand, it appears that insurance forces a change in Smith's behavior such that he becomes more *careless*. On the other hand, it appears that insurance places Smith in a position in which he has greater incentive to take a deliberate action and torch his house to its foundations. It is not clear whether insurance encourages Smith to act or omit, for instance. This problem, among others, is endemic throughout the moral hazard literature. Bryan Dowd tries to salvage the idea of the moral hazard by explaining that there are in fact several manifestations of a moral hazard. "Insured individuals may exercise less caution (e.g., smoking) . . . insured individuals may seek professional intervention at a lower level of illness severity, demand a higher quality of care, or not shop as carefully for least cost providers as uninsured individuals" (Dowd, 1982, p. 443).

Eric Rasmussen takes another route to explain the ambiguities caught up in the idea of the moral hazard, warning that moral hazards sometimes bleed over into other market failures, such as adverse selection problems (Rasmussen, 2001).[5] As if underscoring the point, conservative commentator William Safire writes at times as though moral hazards are not adverse selection problems but instead a variant of the free-rider problem (Safire, 2003). By contrast, Brook Harrington invokes a different market failure to explain the moral hazard, characterizing moral hazards in terms of perverse incentives (Harrington, 2001). Bengt Holmström appears to believe the problem with the moral hazard is not a matter of free-riding or perverse incentives but a problem of asymmetrical information (Holmström, 979). It is my view that these various manifestations are not simply a function of one singular problem but rather of multiple moral concerns intercalated into one idea (Hale, 2009).

There is, thus, a range of characterizations of the moral hazard, particularly among those who use the term most frequently, though few economists have stopped to outline the true meaning of the term or even its applicability to moral theory. For this paper, I would like first to pick up three representative positions that reflect tensions within the moral community between consequentialist moral theory, deontological moral theory, and virtue ethics. Later I will extrapolate from these positions to get a clearer sense of the arguments that one might encounter in the geoengineering discussion. I pick the first three only because they each emphasize normative theoretical dimensions of the moral hazard that otherwise rest just below the surface.

E. J. Faulkner explains that the moral hazard is "the intangible loss-producing propensities of the individual assured" (Faulkner, 1960). Steven Shavell, somewhat more concretely, defines the moral hazard as the "tendency of insurance protection to alter an individual's motive to prevent loss" (Shavell, 1979, p. 541). John M. Marshall proposes that the "moral hazard is commonly defined as excessive expenditure due to eligibility for insurance benefits" (Marshall, 1976). From these explanations, we can discern at least three characterizations of the moral hazard: what I shall refer to as the efficiency view, the reasons view, and the vice view.[6]

Faulkner's "efficiency view" emphasizes losses and, thus, the consequences of the action. Faulkner's view might be interpreted to suggest that the loss-producing propensities of the insured individual lead the agent to act *inefficiently*. This position appears to offer little more than lip service to the possibility that a moral hazard has a moral component. If one can be said to be violating some moral norm or principle, it is the principle of efficiency. Though it is true that many view inefficiency itself as a moral offense or, more generally, that many consequentialist and welfarist doctrines can be boiled down to claims about the moral undesirability of inefficiency, it is hard to see what is especially moral about *moral* hazards. They could just as easily be characterized as simple inefficiencies, apart from any claim about their morality.

Shavell's "responsibility view" proposes that what is wrong with the moral hazard is that it creates the conditions for insured individuals to ignore or disregard countervailing reasons. On this view, what is wrong with the moral hazard is that it alters the *motivation* of the agent and, thus, the reasons of the agent for acting.

Marshall's "vice view" offers yet a different objection. In this case, it appears that what is wrong with the moral hazard is that it encourages parties to engage in overindulgent (e.g., undesirable, negative, naughty) behavior, suggesting, thus, that temperance and prudence have fallen by the wayside. My suspicion, in fact, is that this is something like the commonsense view of the moral hazard. If this is the case, the value element implied by the moral hazard is a matter separate from the assessment of its alleged wrong. Society would have to agree on what qualifies as undesirably overindulgent and then clarify that the insurance situation will bring this overindulgence about. It may well be that there are reasons to refrain from excessive driving, for instance, but if there is a viable geoengineering solution to the climate problem, then those reasons cannot appeal to the negative impacts on the climate.

Moreover, the vice view is fraught with problems related to the benefits of insurance. One could just as easily argue that there are equally as many moral *safeguards* with insurance.[7] Street lamps in dangerous neighborhoods produce incentives for rogues *not* to mug or kill. Health insurance for babies *encourages* parents to take them to the doctors. Excessive consumption of insurance does not *necessarily* pose a moral problem at all. For another thing, this creates difficulties for ballyhooers of the position who appeal to moral hazard logic as a reason to abandon public programs. If it is the case that public programs ought to be abandoned, not because exposing oneself to more risk is morally problematic but because of the undesirable bad that the moral hazard brings about, then those who argue that the provision of insurance brings about the undesirable bad must argue not that *insurance* is the problem but instead argue for the moral impermissibility of the action taken to excess.

AMBIGUITY: THREE VARIANT MORAL HAZARD ARGUMENTS AGAINST GEOENGINEERING

Few of the commentators who link moral hazard arguments to geoengineering go into great depth on the line of reasoning that supports their concerns. The argument is typically presented as an aside, a quick-and-dirty way of suggesting that geoengineering has a moral dimension. From its mere mention, commentators appear to presume that the term "moral hazard" describes an ethically undesirable phenomenon. One problem, first and foremost, is that the characterization of moral hazards from geoengineering is ambiguous. Not only can it be viewed through the three moral lenses I discuss above, but it also seems to pick out three separate phenomena related to behaviors, beliefs, and counterfactual states of the universe. Yet, despite these complications, several have noted that it is one of the most compelling arguments against geoengineering.[8]

Above, I addressed how the general idea of the moral hazard might be viewed through the lens of efficiency, responsibility, or vice, any of which reflects a strong tradition within the ethics literature. In this section, I cover concerns of ambiguity related to three specific manifestations of the moral hazard argument against geoengineering. I term these the business as usual (BAU), counterfactual trajectory (CFT), and perverse behaviors (PB) variations. Importantly, any of the variant moral hazard arguments that I detail below could be viewed through the lens of the three variant approaches to moral theory—efficiency, responsibility, or vice—thus yielding *at least* nine variant interpretations of the geoengineering-related moral hazard argument. I actually identify sixteen. Consequently, in the section that follows this one, I return to these moral lenses and extrapolate from the below-discussed variant moral hazard arguments to build a much wider list of hazards and objections. I use this extrapolation to explore issues of vagueness.

To begin, one possible source of ambiguity rests in the isolation of the causal origin of the purported moral hazard. Some seem to suggest that the actual deployment of geoengineering will spur a moral hazard. If a geoengineering technology is successfully engaged, then this generates some morally perfidious outcome. Others seem to suggest that the mere *possibility* of successful deployment will spur the moral hazard. The mere knowledge of a viable Plan B will encourage shifts in behavior: just as fireproofing a house might lead one to expose oneself to more risk, so might knowledge that a house is insured against fire lead one to expose oneself to more risk.[9]

Below I identify three variations on the moral hazard argument and try to demonstrate why these variant moral hazard arguments are more ambiguous than clarificatory. Though each may at first seem similar, the moral hazard arguments engendered within are actually slightly different. Each calls atten-

tion to unique features of behavioral changes associated with geoengineering, and each suffers from both epistemic and justificatory complications. Consider the following three possible variations of the moral hazard argument. I touched upon each briefly in the introduction, but I would like to spend more time dissecting them here.

A. Business as Usual (BAU) Variation: Geoengineering will make it possible to continue with BAU without any change in our (collective) behavior.

This, for instance, was David Keith's view mentioned above. It also is the view articulated by Arun Gupta, who notes that geoengineering may encourage the "continued use of oil, coal, and natural gas" (Gupta, 2010).[10] The hazarded wrong, in this case, is that behaviors associated with BAU will continue unabated. In other words, the underlying presumption of the BAU variation is that BAU is wrong or morally perfidious in some way. But there are at least two problems with this position. First, if the wrong of geoengineering consists in its permission of BAU, then there must be some attendant wrong with BAU. Most commonly, the wrong of BAU is presumed to be that BAU creates bad outcomes like climate change, though it is also conceivable that the wrong of BAU rests in a vice or an abdicated responsibility. If the wrong of BAU is fundamentally that the outcomes will be bad—that, say, BAU is causing climate change—and geoengineering changes those outcomes so that they are no longer bad, then the wrong of BAU would seem to disappear. So the BAU variation rapidly falls to tatters.

Second, despite its apparent wrongness, there are likely many positives of BAU. Burning fossil fuels, after all, brings many benefits, powering most of modern civilization. If we do geoengineer, this is the reason that we will have geoengineered in the first place: to *continue* with BAU without incurring the downside impacts of emitting. All SRM technologies are aimed primarily at avoiding only the downside impacts of climatic change, leaving in place many other problems related to land use, atmospheric carbon concentration, and ocean acidification. To suggest somehow that there is a problem with continuing with BAU requires an extra argument about why doing so is problematic. I will say more about these objections when I cover the objections and hazards below.

Consider instead a slightly different variation:

B. Counterfactual Trajectory (CFT) Variation: Geoengineering will inevitably become part and parcel of BAU—Plan B will become Plan A—as we use geoengineering to offset our concerns about climate pollution.

This appears to be the moral hazard as explained by Samuel Thernstrom of the American Enterprise Institute, who describes the moral hazard as "the idea that greater consideration of geoengineering's feasibility might lead people to conclude that it is a viable alternative to emissions reductions."[11] The hazarded wrong in this case is not that BAU will continue unabated, but that *geoengineering* will be adopted into BAU. This concern, if it is a concern, rests on the presumption that a better state of affairs includes a world in which geoengineering is avoided but where emissions reductions are achieved. In other words, the presumption of the CFT argument is that there is some associated wrong with *geoengineering*, not with BAU per se, or that there is some associated right with a state of the universe in which we reduce emissions (Preston, 2011).

Put differently, the claim works by suggesting that an otherwise plausible counterfactual trajectory is the desirable trajectory. Along some counterfactual trajectory of the universe—a trajectory in which there is no Plan B—we would certainly have changed our behavior, maybe by conserving more or emitting less, but because there is now a Plan B, we no longer have a reason to change our behavior and, thus, can be said to increase our exposure to risk. The good is in the CFT; the bad is in geoengineering+BAU.

The first problem with the CFT variation is clearly epistemic. We do not and can never know what the counterfactual trajectory of our behaviors would have been, so we cannot say with accuracy whether humans would actually have changed their behavior. The second problem is justificatory. It is precisely because we acknowledge the difficulties or costs associated with CFT (conservation, for instance), that we are driven to seek geoengineering in the first place. The geoengineering is justified precisely because changing our behaviors is too costly, whether in expense, effort, or time. As a consequence, the CFT variation requires a non-question-begging argument that illustrates why geoengineering itself is an impermissible course of action. Such an argument cannot appeal to the counterfactual state of affairs because doing so would simply stipulate that that state of affairs is a better state of affairs.

Now consider a final variation:

C. Perverse Behaviors (PB) Variation: Geoengineering will entice us to behave in ways that are different than those that we have behaved in the past, and we may thus change our exposure to risk.[12]

Martin Bunzl seems to interpret the argument in this way. He writes: "Moral hazard only arises for geoengineering if you think that research or, if it came to it, implementation would undermine other actions and lead to *more not less* [emphasis added] greenhouse gas output" (Bunzl, 2009). The PB variation suggests that the associated moral hazard is not simply a matter of permitting BAU, but rather of exacerbating greenhouse gas (GHG) emissions

either from what they currently are or from a hypothesized future state of the universe. The hazarded wrong in the PB variation implies that we well may be drawn to engage in behaviors that we might not otherwise. Perhaps we will increase our fuel consumption or our resource depletion; and perhaps these are undesirable or impermissible behaviors for other reasons. In other words, the presumption of PB is that there is something wrong with these new and encouraged behaviors.

Again, we face several problems if this is our interpretation of the moral hazard. The first is epistemic: there will certainly be pressures to increase our exposure to risk, but it is not clear that increasing our exposure risk by engaging in these behaviors is necessarily wrong. It may well be that geoengineering frees up money to build schools and hospitals, for instance. And if this is the case, it is hard to see where the problem is. Like eye wash stations in chemistry labs that serve as a constant reminder of the dangers of some chemicals, having an emergency solution on hand may offer the nudge into more responsible behavior that some environmentalists have been hoping for.

The second problem is again justificatory. If our concern is the instigation of perverse behaviors, then our reasoning needs to be checked. There must be some other feature of these behaviors that is problematic. If SRM enables us to build more hospitals and farms by offsetting the impacts of our carbon emissions, where is the wrong? If there is some other feature of these behaviors that is problematic, then we should be arguing against these problematic behaviors—that there are also attendant concerns about ocean acidification, land use, and air pollution—and not against geoengineering in general. The perverse behaviors variation simply asserts that SRM will permit these perverse behaviors to persist without offering a clear reason as to what makes these behaviors perverse.

To further complicate matters, all three of these variations do no work to specify what exactly the hazarded behavior is. In other words, each of these could specify myriad hazards, any of which might call into question the wisdom of a geoengineering scheme. The unique hazard, in other words, is vague.

VAGUENESS: HAZARDS AND OBJECTIONS

Now I would like to assess several related objections that could be alleged to inform concerns over moral hazards, whether of the BAU, CFT, or PB sort, and pair them with the moral hazard interpretations advanced by Faulkner, Shavell, and Marshall. These were, again, the efficiency view, the responsibility view, and the vice view. Working along two axes of ambiguity—the moral theory axis and the variant interpretation axis—we can begin to extrapolate a grid of more specific hazards.

	Moral Theory		
	Efficiency	**Responsibility**	**Vice**
Variations			
BAU		Hazards and Objections	
CFT		(Discussed Below)	
PB			

Figure 7.1. Table of Hazards

Since we can see above that the alleged wrong is ambiguous, and that in all instances an argument for the wrong or bad is external to the moral hazard argument itself (Hale, 2009), we will need to explore the various hypothesized hazards and objections in order to determine where the wrong might be.

One thing should however be clear: many of these arguments are not necessarily associated with increased exposure to risk. Sometimes moral hazard objections are better addressed when kept distinct from the confusing language of market failure. These are, therefore, what I am calling concerns of vagueness as it is not clear whether these hazards ought rightly to be considered the hazarded wrong that is the express concern of the moral hazard—that is, a consequence of geoengineering resulting in increased exposure to risk—or whether these are simply problems that emerge as mere consequences of geoengineering. At the end of the description of each hazard, I will indicate whether the hazard applies to the BAU, the CFT, or the PB variation.

One quick note before I begin. What follows is a complex and finely sliced assessment of a range of moral hazard arguments. Though the list is by no means exhaustive, I intend it as a compendium of individual hazards, each of which deserves treatment in its own right. Hopefully this list will motivate further research.

Efficiency Considerations

1. **Governance Hazard:** Geoengineering may lead to diminished public support regarding harder-to-implement policy interventions (Royal Society, 2009).[13] Just as a medical intervention that might cure alcoholism could encourage people to continue drinking without concern

for devebping an addiction, so too might geoengineering permit individuals to continue consuming fossil fuels without concern for the climate effects. Plainly, there may be many associated objections with consuming alcohol, in one case, or fossil fuels, in the other case, but to maintainpersuasive force, such arguments must offer further evidence that there is a wrong associated with BAU. Applies primarily to BAU.

2. **Snowbal Hazard:** By encouraging BAU (or also perverse behaviors), geoengineering actually increases the likelihood of a bad outcome (Bunzl, 2009). Just as protective helmets may inspire athletes to believe themselves to be withstanding minor hits without permanent damagethough they may be doing all-things-considered greater damage, so might geoengineering encourage behavior that results in a worse outcome than it otherwise might. What must be demonstrated for this argument is that there is such a phenomenon: that the damage associated with BAU+geoengineering outstrips BAU alone. Applies to BAU(or PB: see Equipment Hazard below).
3. **Technical Dependence Hazard:** We may grow so dependent upon geoengineering that we can never do away with it because we will always need to keep on top of things. Just as hydroelectric dams obviatethe need for alternative water distribution measures, just as a decision to make railroad tracks a certain width commits engineers to that width throughout the transportation infrastructure, geoengineering may become fixed as the technology upon which all parties depend. If we areever to lose funding or the capacity to geoengineer, climate changecould be abrupt and far worse than it might be if we were to allow it to unfold over decades. To maintain persuasive force, such arguments must explain why such technical dependence would be problematic. Applies to CFT.
4. **Equipment Hazard:** By encouraging perverse behaviors, geoengineering actually increases the likelihood of a bad outcome (Bunzl, 2009).Just as protective athletic gear may inspire athletes to hit harder and thereby take greater risks, so might geoengineering encourage behavior that results in a worse outcome. As with the Snowball Hazard, somust it be demonstrated empirically that the negative outcomes associated with PB+geoengineering outstrip BAU alone. Applies to PB (orBAU: see Snowball Hazard above).
5. **Militarization Hazard:** Geoengineering will enable or encourage individual nations or rogue, independent entrepreneurs to conduct large scale experiments without global consultation or permission, thereby exposing the world to more risk. Just as biotechnologies invite consideration of military uses, geoengineering invites consideration of hostile use or abuse of others. Several have discussed this concern, though often not in conjunction with the moral hazard (see, for instance, Robock, 2008). Says James Fleming: "It is virtually impossible to imagine that the world's powers would resist the temptation to explore the military uses of any potentially climate-altering technology" (Fleming, 2007). To maintain force, such arguments must offer an account of why the militarization would be wrong. Without an extremely stringent moral theory, few moral theorists would claim that all military technologies are morally problematic. Applies to PB.
6. **Regulatory Capture Hazard:** Geoengineering may enable or encourage institutional or regulatory capture (Stigler, 1971), thus decreasing the political viability of better options. Like corn ethanol, which initially was touted as a biofuels fix but eventually spawned perverse industries, concerns here focus on the potential for newly cemented political structures that may capture the political machinery and restrict further movement. As with many of the efficiency considerations, such a phenomenon must be empirically demonstrated both with regard to the presence of the phenomenon as well as the amplification of negative outcomes. If negative outcomes cannot be demonstrated, then a separate argument is required that offers a reason why regulatory capture is morally problematic. Applies to PB.

Responsibility Considerations

7. **The Band-Aid Objection:** Geoengineering treats only the symptoms and not the root cause of the problem.[14] If the symptoms disappear, the problem is allowed to fester. Like an industry that dumps pollutants into rivers, anticipating all the while that cleanup will be less expensive than installing cleaner technologies, geoengineering introduces the possibility that we are not actually addressing the core moral wrong of climate change (Hale, 2011). This is essentially the position advanced by Meinrat Andreae of the Max Planck Institute for Chemistry. Says Andreae: "You're papering over the problem so people can keep inflicting damage on the climate system without having to give up fossil fuels."[15] Blogger Jisung, a Ph.D. candidate in Harvard's economics department, also frames it this way. He writes: "Others believe that doing so might create a moral hazard problem, dis-incentivizing the necessary emissions reductions that must occur gradually, beginning now."[16] What must be explained here is why we have a responsibility to reduce GHG emissions if there are no negative consequences. Applies to BAU.
8. **Responsibility Abdication Objection:** Geoengineering will enable us to avoid or abdicate ourselves of responsibility for our wrongdoing now. Like a criminal who steals property but then pays to replace it, geoengineering permits us to get away with our crimes without paying

the true price. The hazarded wrong in this case is that we will not hold ourselves responsible for our wrong actions; geoengineering essentially provides a "get-out-of-jail free card" (citing an objection from Greenpeace: Royal Society, 2009). This hazard differs from the Band-Aid Objection in that it turns on responsibility and not on the act of wrongdoing. Applies to BAU.

9. **Political Noise Objection:** Geoengineering is a distraction for those who hope to engage in other activities.[17] Like a treatment for HIV that distracts from the many millions of people suffering from HIV, geoengineering promises to divert our attention away from our responsibilities to consider our emissions and our land use. Daniel Bodansky, for instance, understands the moral hazard problem as one that might "detract from emissions mitigation" (Bodansky, 2011). Again, this objection turns on political responsibilities. Applies to CFT.
10. **Cheating Objection:** Geoengineering inspires in actors a way of "cheating" on their responsibilities without going through the difficult moral retooling process engendered in other approaches to climate change. Like a student who cheats through an exam, geoengineering enables the world to "get the right answers" without doing any of the hard work required to get there. David Victor and colleagues argue that it will encourage "governments to deploy geoengineering rather than invest in cutting emissions. Indeed, geoengineering ventures will be viewed with particular suspicion if the nations funding geoengineering research are not also investing in dramatically reducing their emissions of carbon dioxide and other greenhouse gases" (Victor et al., 2009). Applies to CFT.
11. **Free Riding Objection:** Geoengineering will encourage people to avoid paying the costs of their actions and instead to free-ride, which is a problem. They can continue acting as they have always acted and also reap the benefits of a stable, controlled climate. Like offering international aid to the poor and destitute, geoengineering may encourage some people to rely on others, essentially eliding their own personal responsibilities. David Keith has offered an interpretation something like this: "[Changing one's behavior in the face of geoengineering] is not really a moral hazard; it's more like free-riding on our Grandkids."[18] To be persuasive, however, such arguments must explain why a given group must pull its fair share. It thus must also include a theory of fairness. Applies to PB.
12. **Political Strategy Hazard:** Geoengineering will enable individual nations or rogue entrepreneurs to *take advantage of* one another. Just as thermonuclear and intercontinental ballistic capacity enable individual nations to treat one another strategically, so too does geoengineering run the risk that individual nations or citizens will be treated strategically. Similar to the Militarization or the Regulatory Capture Hazards, the hazarded wrong is that it will entice people to behave badly toward one another or to begin manipulating one another. Applies to PB.

13. **Perverse Profits Hazard:** Geoengineering enables private companies to profit off of a known wrong, so there are perverse incentives for companies to push for a geoengineering policy that is otherwise morally suspect. Like dentists who distribute candy at Halloween, or prison companies that lobby for tougher sentencing laws, geoengineering creates perverse revenue streams. This argument requires some explanation as to what is wrong with profiting off of cleanup. This may spill over into the Regulatory Capture Hazard, though the Perverse Profits Hazard suggests that it is wrong to benefit off the misfortune or mistakes of others. Applies to PB.

Vice Considerations

14. **Extravagance Objection:** Geoengineering "is used as an argument against painful curbs on our extravagant lifestyle."[19] Like a glutton who eats candy without concern for his weight or for the impressions of others, only to have laser lipolysis or radiation therapy to remove the excess weight, geoengineering permits us to live extravagantly without considering the virtue or vice of our action.[20] The hazarded wrong is that we will either continue being vicious or perpetuate the vice of extravagance. As before, extravagance or gluttony must be demonstrated to be a vice, and it must be shown so without appeal to consequences. Applies to BAU.
15. **Hubris Objection:** Geoengineering is an act of hubris. Just as some in the deaf community argue that it is an act of hubris to restore hearing to deaf children, inasmuch as it deprives a deaf child of developing in ways that are beneficial to her and instead seeks to "fix" them (Paludneviciene & Leigh, 2001), so too does geoengineering engender this sort of moral hazard. In this case it is the geoengineers, not the subjects of the geoengineering, who will be driven to viciousness. Manipulating the earth's climate essentially places human geoengineers in the role of gods, and as such, there is a hazard that these engineers will come to believe themselves to maintain control of the climate. The moral hazard is engendered in instigating the vice of hubris, of encouraging us to adopt further approaches in a way unbecoming of a good person. Applies to CFT.
16. **Attitude Objection:** Geoengineering encourages us to shift our attitudes toward the world such that we see it as something we can dominate and control. Just as with the Hubris Objection, we may begin to

adopt objectionable attitudes such that we view ourselves as more powerful or more perfect than we are. The difference between the Hubris and the Attitude Objection rests in whether the wrong is associated with how we will be versus how we might have been (the Hubris Objection) or how we will be despite how we might have been (the Attitude Objection). The hazarded wrong is that we will wander the earth with vicious attitudes, not that our other attitudes will necessarily have been virtuous. Contrast this also with the other vice objection, the Extravagance Objection, which is a BAU objection and associates the wrong with how we are and may continue to be. This is the concern expressed in the U.S. Government Accountability Office Report: that geoengineering will "undermine political will" (U.S. GAO, 2011, p. 54)—in other words, that the public will adopt the wrong attitudes—though later in the report, the GAO suggests that the moral hazard runs the risk that resources could be diverted from adaptation (p. 67). Applies to PB.

The above list is obviously not exhaustive, though it is drawn from the basic conceptions of the moral hazard articulated in the previous two sections. Given its contours, it may well come close to exhausting the possible objections.

It should be clear that much of our determination of the moral wrong depends on what is meant by "moral" in moral hazard. If by moral we take the consequenialist line and reason that the best action is that action that maximizes the good for all, then insurance, when properly executed, is clearly the best possible option, even in spite of proposed moral hazards. If by moral we mean something akin to having the wrong character traits, or falling prey to vice, then we must make the argument for the moral failing. So too if one takes the deontological line and reasons that the best action is the action that functions according to a universalizable maxim, or to some principle of the right, then this maxim will remain steady regardless of consequences. The important point is that there are many possible hazards associated with shifts in behavior and captured under the "moral hazard" umbrella. Which of these hazards emerges as the core concern will depend in one part on the moral theory we apply and in another part on which of the several variant moral hazard arguments we invoke.

CONCLUSION

As we have seen above, there is no univocal moral hazard argument against geoengineering. Rather, there is a cluster of arguments, each related roughly to some ambiguous behavioral phenomenon that has been called the "moral hazard." As a consequence of this clustering, moral hazard arguments against geoengineering are beset with concerns of ambiguity and vagueness, not to mention accuracy. Confusion surrounding the moral hazard argument against geoengineering is a consequence of ambiguity about the very idea of the moral hazard. It emphasizes the behaviors (BAU), the geoengineering itself (CFT), or the increased exposure to risk (PB), and in doing so implicates this dimension of behavioral change as the dimension of ethical concern. Unfortunately, moral hazard arguments against geoengineering are not simply ambiguous. They are also vague. The vagueness of the moral hazard arguments rests in follow-on considerations regarding the alleged bads. As a consequence, all moral hazard objections require at least some further justificatory labor inasmuch as they are not self-explanatory bads.

Finally, it should not go without stating that all moral hazard objections raise empirical questions about accuracy. It is a fact of the world how people will respond to geoengineering, and so even if considerations of ambiguity and vagueness are addressed such that we finally gain a grip on the true moral hazard in question, we then must answer the question of risk: of whether the predicted outcomes are likely to come to pass. As mentioned earlier, the Royal Society Report recommends further research to analyze the extent of the moral hazard effect (Royal Society, 2009, p. 45). But no amount of empirical research will overcome the conceptual confusions associated with the various changes in behavior that geoengineering may provoke; and none will address concerns about the moral valence of these changes in behavior.

The problem with moral hazard arguments can thus be demonstrated. Inasmuch as moral hazard arguments are ambiguous and vague, they are easily sidelined and dismissed for any range of reasons: because they are deemed conceptually intractable, because they are thought to fall easily to simple retorts and replies, or because there is always more information that must be gathered to make the case. Consider Martin Bunzl's articulation of the moral hazard argument again: "Moral hazard only arises for geoengineering if you think that research or, if it came to it, implementation would undermine other actions and lead to *more not less* [emphasis added] greenhouse gas output" (Bunzl, 2009). I understand Bunzl's position to be either the Snowball or the Equipment Hazard. Bunzl then offers essentially the following dismissal of the Equipment Hazard: "Antilock braking systems

and airbags may cause some to drive more recklessly, but few would let that argument outweigh the overwhelming benefits of such safety features" (Bunzl, 2008).

Bunzl's reply illustrates how convoluted the discussion on moral hazards can become and why responses to the variety of moral hazard concerns are rarely satisfactory. Antilock braking systems and airbags may result in more reckless driving, this is true; but it is not clear that they result in *more injuries* from increased reckless driving, which is why we continue to use technologies like antilock braking systems and airbags. In fact, reckless driving, or at least faster driving, may be the sort of thing that we want to encourage, precisely so that we can each get to our destinations faster. We could easily drive five miles per hour and be exceptionally safe, but such safety measures would be overkill. What must instead be specified is *where the wrong is*. It clearly does not lie in taking our cars out on snowy days or driving at high speeds on designated roadways. That is the reason, after all, that we continue to utilize antilock braking systems and airbags.

Clarifying which of these problems the moral hazard argument engenders will go some distance in dispelling ambiguity and vagueness. What each argument needs is treatment that attends not only to the phenomenon that individual or collective actors will change their behavior in the wake of a policy intervention, but some clarification of what is wrong with changing behavior in that particular way. My suggestion is to be more specific in outlining the concerns associated with geoengineering. The above analysis illustrates that there are many complicated moral questions associated with geoengineering, any of which must be explored in greater conceptual and empirical detail. Further analysis will hopefully guard against confusions.

NOTES

1. www.ted.com/talks/lang/eng/david_keith_s_surprising_ideas_on_climate_change.html

2. Used thusly, a *prima facie* reason is an "intrinsically moral," albeit defeasible and non-absolute, reason (Dancy, 2010; Ross, 1930; Searle, 1978).

3. Portions of this section have appeared elsewhere, though they have been substantially revised to address the concern of moral hazards in geoengineering (Hale, 2009).

4. Another market failure typically associated with insurance is the adverse selection failure, but this is unrelated to concerns over geoengineering. (An adverse selection failure occurs when those most likely to need insurance are those who take out insurance, as would be the case with high-risk cancer patients who might take out health insurance with special knowledge of their condition. This has the effect of distributing risk across a narrower body of individuals instead of across the entire population, thereby driving the cost of insurance higher.) Because geoengineering is a global insurance plan, adverse selection is not a problem.

5. "From the principal's point of view, agents are identical at the beginning of the game but develop private types midway through, depending on what they have seen. His chief concern is to give them incentives to disclose their types later, which gives games with hidden knowledge a flavor close to that of adverse selection" (Rasmussen, 2001, p. 241).

6. To be fair, none of these authors set to the task of specifying the normative force of the moral hazard. All three of these articles define the moral hazard in one sentence and then proceed to assess its economic implications in given situations. Still, I think these positions provide a nice starting point for this discussion.

7. In recent work, Deborah Stone (1999–2000) has characterized such moral safeguards as "moral opportunities." I am inclined to agree with her characterization, though her approach is to argue that "the act of participating in insurance can be and often is a highly moral choice, because (following another long line of thought), insurance is a form of mutual aid and collective responsibility."

8. Apart from the Royal Society Report, see also: http://scienceline.org/2011/04/turning-down-the-sun/

9. For ease I use the term "geoengineering" throughout to refer both to the actual deployment of such a technology as well as the possible deployment of geoengineering. Thus, by "geoengineering" I mean "geoengineering or the possible successful deployment of geoengineering."

10. Gupta writes: "Is talk of geoengineering creating a 'moral hazard,' encouraging the continued use of oil, coal, and natural gas because we can presumably counter the effects?" http://www.zcommunications.org/geoengineering-the-planet-by-arun-gupta

11. Thernstrom clearly does not agree that this is a serious concern. He writes: "The one argument that could still derail research proposals is a misplaced fear of the moral hazard—the idea that greater consideration of geoengineering's feasibility might lead people to conclude that it is a viable alternative to emissions reductions." http://www.american.com/archive/2010/march/what-role-for-geoengineering

12. This view was advanced by Josh Horton on the Geoengineering Politics blog: "people will embrace geoengineering as an excuse to avoid emissions reductions, and current levels of fossil fuel consumption will persist if not increase." http://geoengineeringpolitics.blogspot.com/2010/09/what-moral-hazard.html

13. The International Risk Governance Council raises related concerns: "The moral hazard is that a decision to support geoengineering technologies could lessen efforts to reduce the global concentration of CO2 and other greenhouse gases" (www.irgc.org/geoengineering). Also expressed by John Shepherd, September 3, 2009. New Scientist. www.newscientist.com/article/mg20327245.600-geoengineering-is-no-longer-unmentionable.html. Also in the Royal Society publication: September 2009: http://royalsociety.org/Geoengineering-the-climate/

14. Advanced in the John Martin Geoengineering Working Group paper (p. 2): www.practicalethics.ox.ac.uk/_data/assets/pdf_file/0013/21325/Ethics_of_Geoengineering_Working_Draft.pdf

15. www.essc.psu.edu/essc_web/seminars/fall2006/KerrGeoengOct06.pdf

16. www.senseandsustainability.net/2011/08/29/does-investment-in-geo-engineering-create-a-moral-hazard-problem/

17. "Geoengineering could also be perceived as a moral hazard, as there is the possibility that it could decrease the political and social impetus to reduce carbon emissions." www.eastasiaforum.org/2011/07/29/geoengineering-and-tackling-climate-change/

18. Oral Comments, Royal Society Conference, "Geoengineering the Climate - Science, Governance and Uncertainty," September 2009. Author's note: This quote has generated some consternation amongst the blogging community. It appears to have been taken out of context by some groups that are vehemently opposed to geoengineering. In my characterization of the quote above, I believe I remain true to the spirit of the quote. Keith seems to think that the core concern of the moral hazard objection is not simply that people will change their behavior but that they will essentially be free-riding on others.

19. John Nissen; October 15, 2008. http://groups.google.com/group/geoengineering/browse_thread/thread/fc1acf7aa46903f/4e5f90b0aa645d9b?lnk=gst&q=hazard#4e5f90b0aa645d9b

20. Joe Romm sometimes uses examples of this sort: www.nytimes.com/2011/10/04/science/earth/04climate.html?_r=1 and http://thinkprogress.org/romm/2011/10/06/336676/geoengineering-panel-climate-remediation/