

ETHICS AND INTENTIONAL CLIMATE CHANGE

DALE JAMIESON

University of Colorado, Boulder, CO 80309, U.S.A.

Abstract. In recent years the idea of geoengineering climate has begun to attract increasing attention. Although there was some discussion of manipulating regional climates throughout the 1970s and 1980s, the discussion was largely dormant. What has reawakened the conversation is the possibility that Earth may be undergoing a greenhouse-induced global warming, and the paucity of serious measures that have been taken to prevent it.

In this paper I assess the ethical acceptability of ICC, based on my impressions of the conversation that is now taking place. Rather than offering a dispassionate analysis, I argue for a point of view. I propose a set of conditions that must be satisfied for an ICC project to be morally permissible and conclude that these conditions are not now satisfied. However, research on ICC should go forward so long as certain other conditions are met. I do not intend this to be the last word on the subject, but rather the first word. My hope is that others will be stimulated to think through the ethics of ICC.

1. Intentional Climate Change (ICC)

In recent years the idea of geoengineering climate has begun to attract increasing attention. In 1974, Kellogg and Schneider discussed various approaches to controlling climate and raised some serious questions about its advisability. Although there was some discussion of manipulating regional climates throughout the 1970s and 1980s, the discussion was largely dormant (see e.g., Glantz, 1977). What has reawakened the conversation is the possibility that Earth may be undergoing a greenhouse-induced global warming, and the paucity of serious measures that have been taken to prevent it.

The recent debate makes for strange bedfellows. Many of those who believe most strongly that climate change is occurring are reluctant to embrace geoengineering approaches to reversing it. This is because they believe that the 'hand of man' is implicated in most of our environmental problems and they see geoengineering as more of the same. Others, who are interested in exploring or developing geoengineering possibilities, are disinclined to believe that climate is changing. On their view planetary systems are relatively insensitive to human behavior and for that reason we shouldn't worry too much about the risks of geoengineering. So to simplify: some people believe that there is a problem but that geoengineering is no solution; others believe that geoengineering is a solution but that there is no problem. We might speculate that if a social consensus in favor of geoengineering emerges, it will be to attack a problem that we don't believe exists.

The recent discussion has largely occurred in the corridors of scientific meetings rather than in print or in formal sessions. By the time a significant literature on its moral acceptability develops, ICC may be a *fait accompli*. For that reason it is

important to discuss the arguments that are in the air, even if they cannot be pinned down to citable publications.

In this paper I assess the ethical acceptability of ICC, based on my impressions of the conversation that is now taking place. Rather than offering a dispassionate analysis, I argue for a point of view. I propose a set of conditions that must be satisfied for an ICC project to be morally permissible and conclude that these conditions are not now satisfied. However, research on ICC should go forward so long as certain other conditions are met. I do not intend this to be the last word on the subject, but rather the first word. My hope is that others will be stimulated to think through the ethics of ICC.

2. Ethical Preliminaries

Climatic Change: An Interdisciplinary, International Journal Devoted to the Description, Causes and Implications of Climatic Change is obviously not a journal of moral philosophy, and this is not the place to provide a tutorial on the subject (the interested reader might consult Rachels, 1993). However, some basic issues should be addressed.

In my assessment of ICC I draw upon the moral resources of the western tradition. The western moral tradition is not monolithic, and it can even be questioned whether it makes sense to speak of a single western tradition. The openness of the western moral tradition is reflected in the fact that common sense morality is contested; it is not universally shared, nor is it entirely consistent and coherent, much less complete. Still, my discussion presupposes that there is such a thing as common sense morality and that it makes sense to discuss its implicit claims and arguments (see also Parfit, 1984).

Some may think that this approach, though quite conventional in contemporary moral philosophy, is ethnocentric and therefore my project is doomed to triviality. The first response to this charge is that I make no claim that the western moral tradition is best, only that its precepts and principles resonate with many people around the world and serve to guide the behavior of many readers of this journal. The second response is that, as I have suggested, moral traditions are open-ended, rather than exhaustive lists of precepts, and whatever differences exist across traditions may be recapitulated within them. The third response, which follows, is more controversial.

I believe that many people these days are overly impressed by the apparent diversity of moral outlooks. Disagreement, as opposed to unintelligibility, actually presupposes zones of agreement. However in morality, as in science, disagreement is salient while those large areas of agreement become nearly invisible. Furthermore, in many cases what appears to be moral disagreement is really a difference of opinion about how the world works (e.g., Does the reappearance of the sun really depend on human sacrifice?). Even when there are clear moral disagreements, they

may not be as deep as they appear. Moral disagreements about particular cases often involve people assigning different weights to various principles to which they all agree. For example, everyone may agree that the consequences of actions, conformity to rules, and conduciveness to human excellence all have something to do with what makes right acts right, but disagree about the relative importance of these considerations. Hard analysis is required in order to determine the depth and extent of cross-cultural disagreement about morality. Superficial impressions of difference, which are as old as Heroditus, are not very revealing.

However much diversity there is within and across traditions, we must begin an ethical investigation from where we are, and it is clear that common sense morality is where many of us are much of the time. As an author I am situated within a cultural tradition and I am addressing a particular audience – the readers of this journal. While I think my conclusions should command broad agreement, I make no claim for their universality or timelessness (for more on method in moral philosophy see Jamieson, 1991).

3. A Common Sense Objection to ICC

A number of approaches to ICC have been discussed (e.g., in NAS, 1992). These approaches range from the familiar (e.g., tree-planting) to the exotic (e.g., space-mirrors). Some may wonder why anyone would object to geoengineering climate since hardly anyone objects to planting trees. What makes geoengineering suspect in the eyes of many is lack of familiarity with the technologies, and the scale and magnitude of the proposals. Unfamiliar technologies (e.g., ocean fertilization) generally are more suspect than familiar ones (e.g., tree-planting). And large-scale projects (e.g., planting vast areas of Earth's surface with trees selected and managed for their carbon sequestering properties) are more suspect than small-scale projects (e.g., planting one tree). Many geoengineering proposals that have been discussed involve both large-scale environmental transformations and relatively unfamiliar technologies. In short, these proposals involve the sort of engineering that many people would find objectionable.

One widespread, common sense argument against ICC rests on the idea that it is wrong for humans to interfere dramatically with fundamental natural processes. In reply, some would point out that humans are already interfering with fundamental natural processes. ICC proposals are directed toward reversing the inadvertent climate change that may already be occurring. The goal of ICC is to return the climate system to its 'original' state before humans began to affect it.

This argument appears to be convincing to some scientists, but is not persuasive to many other people. First, both the objection and the reply share a problem: do we really know what climate would be like were it not affected by humans; and if so, is this a realistic target at which to aim? Moreover, if we go into the business of ICC, why should we settle for returning climate to what it was before? Why not try

to improve climate and make it more conducive to human activities? While these are serious questions, the objection that resonates with many people is one that is deeply rooted in our moral traditions. Many people believe that 'two wrongs do not make a right'. On this view ICC, rather than righting a wrong, would just add a second wrong to the first. Indeed, many people would say that the second wrong of intentionally changing climate would be worse than the first wrong of inadvertently changing climate, even if this second wrong returned us to the 'original' climate.

The idea that there is an asymmetry between what is brought about intentionally and what is an inadvertent result of an action is a central feature of common sense morality. Intentionally running over a pedestrian is generally regarded as worse than doing so inadvertently or accidentally. When trying to evade responsibility for an action, people often claim that what happened was not what they intended ('I didn't mean to do it').

This supposed asymmetry between what is intended and what is (merely) brought about reaches its fullest expression in the Doctrine of Double Effect (see Glover, 1977 for discussion). This doctrine, which grew out of Catholic moral theology, implies that people are responsible for what they intend but not for the foreseeable but unintended consequences of what they do. The doctrine is reflected in the distinction made in war between intentionally killing civilians and 'collateral damage' – inadvertently causing their deaths in the pursuit of legitimate war aims (see Anscombe, 1961). It is also enshrined in the widely accepted principle in medical ethics that it is permissible to let patients die but wrong to kill them intentionally (see the papers collected in Steinbock, 1980).

I believe that the proposed asymmetry between what is intended and what is merely brought about cannot be maintained. For reasons that I cannot explain here, in some circumstances we are as responsible for what we cause but do not intend as for what we intentionally bring about (see Singer, 1993 for further discussion). But even if the common sense argument against ICC that rests on this distinction can be defeated, it does not follow that ICC is ethically acceptable. A positive moral case for ICC is still required.

4. The Case for ICC

In an attempt to open up discussion, I propose that the following conditions must be satisfied for an ICC project to be morally permissible:

- (1) the project is technically feasible;
- (2) its consequences can be predicted reliably;
- (3) it would produce states that are socio-economically preferable to the alternatives;
- (4) implementing the project would not seriously and systematically violate any important, well-founded ethical principles or considerations.

The first condition raises questions that are primarily technical, and I will not try to address them. The second and third conditions have important conceptual dimensions that require further elaboration, and the fourth condition is explicitly ethical. I will discuss the last three conditions in order.

4.1. RELIABLE PREDICTION

If anything can be learned from the environmental movement, it is that many of our technological interventions have unanticipated negative consequences. Although many of these technologies have made important contributions, pesticides create superbugs, nuclear energy involves unprecedented problems of waste disposal and CFCs, the miracle chemicals that made modern refrigeration possible, have turned out to be ozone depleting. As Commoner (1971) points out, "there is no such thing as a free lunch". The problem with our technological interventions is that we often don't know the price of the meal in advance or even the currency in which it will be extracted.

From cognitive psychologists we have learned that people tend to be overconfident about their judgments (Kahneman et al., 1982). There is even reason to believe that in some cases greater expertise leads to even greater levels of overconfidence. (I ignore the paradox of whether cognitive scientists tend to overestimate their expertise when claiming that experts tend to overestimate their expertise.) This result should give experts about geoengineering some humility about the reliability of their predictions. Their guesses about what will occur may be no better than those of novices (Adelson, 1984).

If we couple the pervasiveness of unintended effects and the tendency of experts to overestimate their expertise with the incredible complexity of the climate system, the grounds for skepticism about reliably predicting the effects of ICC seem very strong. Not only is there reason to doubt that the consequences of ICC can be predicted reliably, but there is reason to be suspicious of those who claim otherwise (see also Jamieson, 1988a).

It might be claimed that this condition rules out too much: reliable prediction is hard to come by. I agree, but reliable prediction has been one of the central goals of science since at least the seventeenth century, as well as one of the stated goals of the US Global Change Research Program (CENRR, n.d.: 5). If technological interventions have the potential to bring about quite profound negative effects, it is not too much to ask that their advocates know what they are doing. And in this case, there is little evidence that they do.

4.2. SOCIAL AND ECONOMIC PREFERABILITY

It is even more difficult to be confident that a proposed attempt at ICC would be socially and economically preferable to its alternatives, than to predict the consequences of such an attempt. This is because of the problem of cascading

uncertainties: if the consequences of ICC cannot be predicted reliably then it will be difficult to show that the results of ICC would be socio-economically preferable to the alternatives. Not only do attempts to satisfy this condition inherit the uncertainties that attach to the previous condition, but further problems arise in assessing the societal costs and benefits of any climate change.

The effects of a climate change would be global in scale and would impact not only economies, but also non-market features of peoples' lives. Climate change would affect ways of life, patterns of trade, migration and systems of international relations to mention just a few of its potential effects. These impacts would be felt in regions which barely have economies, much less monetarized economies. Because of the breadth and pervasiveness of the effects of climate change, it is extremely difficult to make an informed judgment between intentional or inadvertent climate change on grounds of socio-economic preferability (for more on this point see Jamieson, 1992).

Not only are judgments of socio-economic preferability difficult because of a lack of certainty about various effects, but such judgments are fundamentally interpretive and in the present context quite contestable. In a general way this can be seen by the fact that some people (perhaps, e.g., Bentham, 1789/1970) prefer states in which the total wealth of society is greater even if its distribution is unequal, while others (perhaps, e.g., Rawls, 1971) prefer states in which there is greater equality but less wealth.

One way of making preferability judgements between states relies on the notion of Pareto-superiority (PS). State A is PS with respect to state B if and only if no one is worse off in A than he or she is in B, and at least one person is better off in A than B. No one could reasonably object to this criterion, but obviously in the real world few states are PS with respect to other states. For this reason the notion of Potential Pareto-superiority (PPS) has been defined: some state A is PPS with respect to state B if and only if there is enough wealth in A so that those who were better off in B than in A could be compensated and there would still be at least one person better off in A than in B. Many people would regard PPS as an adequate criterion for socio-economic preferability.

But one problem with supposing this is that PPS is insensitive to distributional issues and to whether compensation is actually paid. Suppose that some attempt at ICC was PPS with respect to the inadvertent climate change that we are undergoing. But suppose further that ICC would make the rich richer and the poor poorer and, the world being what it is, no transfers would be made from the rich to the poor. Some people would say that total wealth is what matters and therefore ICC is preferable to inadvertent climate change. Others with more egalitarian values would deny that ICC is socio-economically preferable to inadvertent climate change because of its effects on the poor.

It is difficult to satisfy this third condition because judgments of socio-economic preferability inherit the uncertainties involved with predicting the effects of attempting ICC and because these judgments introduce their own uncertainties as well. In

addition, there are deep problems in interpreting the meaning of socio-economic preferability (for further discussion of the latter point see, e.g., Griffin, 1986).

Once again it can be objected that this argument proves too much. A referee commented on an earlier draft of this paper that for many of the same reasons discussed in this section it is difficult to assess the socio-economic preferability of a global free-trade regime. Quite so. Rather than demonstrating that such judgments with respect to ICC are more tractable than might have been thought (the referee's conclusion), I believe that this observation shows that the case for global free trade is less obviously persuasive than some have thought (for some of the complications see Esty, 1994).

5. Ethical Principles and Considerations

At least three important ethical considerations bear on the permissibility of ICC. These are the importance of democratic decision-making, the prohibition against irreversible environmental changes, and the significance of learning to live with nature. I will explore these principles and their relevance in turn.

5.1. THE IMPORTANCE OF DEMOCRATIC DECISION-MAKING

Independent of the substantive question of who would win and lose, there is the procedural question of who would make the decision to undertake ICC. Climate is a global system that affects everyone on Earth. In some ways those in poor countries are even more affected by climate than those in rich countries, since in many cases they have less ability to protect themselves from climate impacts. The climate change that may now be occurring is largely caused by people in rich countries and their ancestors. People in poor countries were not consulted about the wisdom of changing climate, nor have they reaped much benefit from the activities that may be resulting in climate change. Just as poor people in poor countries (e.g., the periphery of the periphery) did not give their consent to inadvertent climate change, so it is unlikely that they would be asked to consent to ICC. A decision to undertake ICC would likely be made by the same people who are causing inadvertent climate change and have reaped most of the benefits from fossil-fuel driven industrialization: people in rich countries and their political, social, and economic leaders. But if the world belongs to anyone, it belongs to the poor as much as to the rich, and no decision to go forward with ICC could be morally acceptable that did not in some way represent all of the people of the world (Jamieson, 1994). Even if people in poor countries would benefit from ICC, it would still be wrong to change their climate without their consent.

In principle it might be possible to design a deliberative procedure that could render a just decision about ICC. However, such a procedure would be unwieldy because it would have to be representative of everyone on Earth and not just "the

global middle class" (Sachs, 1993). Some may even think that other nonhuman living things should be represented in such a decision procedure (e.g., Rolston, 1988). In addition to who should be represented and how, questions also arise about what would constitute a mandate for action. Would it require unanimity among nations, a simple majority, or a decision of the United National Security Council? Indeed, it can even be questioned whether nations are the proper vehicles for making such decisions (see Jamieson, 1994). However these questions might be answered, the bottom line is that, unless conditions change radically, there is unlikely to be a democratic decision authorizing ICC. There would be too much risk involved and too many people would be afraid of losing what they have. Still, I doubt that this would be the end of ICC. The same people who are avoiding and evading the difficult decisions that might prevent or mitigate inadvertent climate change might well decide to implement ICC if they felt it was in their interests.

5.2. THE PROHIBITION AGAINST IRREVERSIBLE ENVIRONMENTAL CHANGES

Many different moral and legal traditions regard irreversible changes as extremely serious. Murder is an especially heinous crime in part because no restitution is possible. Restitution can be made to someone who loses property but not to someone who loses his or her life. Irreversible environmental changes are especially serious for the same reason. For many environmental conditions and states, once they are lost they can never be restored (at least not on time-scales of interest to human beings). Irreversible environmental changes deprive future people of choices and opportunities that they otherwise would have had. If the effects of ICC were irreversible, then those who made the decision to undertake ICC would be choosing one climate path for future people rather than another. Bringing about irreversible changes also deprives present people from learning from their mistakes. No mid-course corrections are possible. There is no going back on a bad or ill-considered choice.

Those who are sympathetic to ICC say that it is reversible. We can stop fertilizing the oceans with iron; mirrors can always be removed from orbit. But while we may be able to reverse the processes that set a climate change in motion, we may not be able to reverse the climate change itself once it is under way. And even if some ICC technologies would produce reversible climate changes, we cannot be sure that they are reversible unless we actually try to reverse them.

In 1957, Revelle and Suess pointed out that by injecting greenhouse gases into the atmosphere we are conducting a large-scale geophysical experiment. Their point was that although we are not injecting greenhouse gases into the atmosphere in order to conduct an experiment, by observing the effects of our behavior we can hope to learn about rates and mechanisms of CO₂ exchange. If we were to implement ICC we would be undertaking an experiment involving the alteration of one of the fundamental systems that governs our planet. Despite assurances to the contrary, no one can be sure of the outcome of such an experiment.

Changing human behavior is often a more conservative response to a problem than changing physical systems. Humans are capable of a broad spectrum of behaviors and succeed in conforming to a wide range of diverse cultural patterns. Behavior is flexible and has the potential to adapt quickly to new conditions through learning and adaptation. This does not mean that human behavior is always responsible or appropriate, nor that behavior change is costless or easy to implement. Old habits die hard even when they are obviously defective, destructive, or dysfunctional. But, in principle, changes in behavior can always be modified or reversed.

This is not the case with changes in physical systems. We now have the power and potential to change planetary systems so profoundly that it is not practically possible to recover their original states. This is dramatically clear in the case of nuclear weapons and nuclear power, but it may also be true in the case of a greenhouse-gas-induced climate change. If we succeed in changing climate inadvertently, we may not be able to reverse this change, however hard we try.

Since human behavior is revisable, modifiable, and affected by learning, behavior change is the best response strategy for addressing many environmental problems. In my view it is also the most ethically responsible strategy in many cases, since it demands that solutions to problems be located in their source: humans, their behavior, and their institutions.

5.3. THE IMPORTANCE OF LEARNING TO LIVE WITH NATURE

Many of our environmental problems flow from attempts to manipulate nature in order to make it conform to our desires rather than forming our desires in response to nature. We have 'improved' nature in many ways – bringing water to places where people want to live, exterminating animals who prey on those we raise for food, dredging harbors and filling wetlands so towns and cities can be developed. Although it is not possible or desirable for humans always to 'let nature take its course', there is a growing sense that modern societies have erred on the side of excessive intervention. We have become arrogant and intrusive in attempting to manage all elements of nature. The growing interest in (admittedly ill-defined) concepts such as 'sustainable development' reflects in part this growing sense that things have gone too far.

The idea that technical fixes are forthcoming for almost all of our important problems was especially influential in the United States in the 1950s and 1960s. Weinberg (1966) explicitly argued that in many cases technological fixes are superior to what he called 'social engineering', the only alternative to technological fixes that he considered. Although the 'technofix' idea came to prominence in the post-World War II period, its spirit goes back to the foundations of modern western culture.

Francis Bacon, the sixteenth-century theorist of the scientific revolution, broke with his predecessors when he taught that the purpose of knowledge was not

contemplation, but rather power over nature (see Merchant, 1980, for discussion). Bacon's language was revealing: he talked about 'dominating', 'manipulating', and even 'torturing' nature to get her to give up her secrets. He identified nature with the passive female principle and science with the active male principle. In his utopian society science would replace religion. Bacon even mentions the intentional control of climate as one of the accomplishments of his utopian society.

But suppose that the following is granted: that there is a lack of fit between human desires and the environment and that all too often we have changed the environment instead of our desires. It still does not follow that ICC would be wrong. Perhaps in general we should be more modest in our manipulation of nature, but some human changes of the environment are justified and perhaps even morally required. ICC may be one of them.

This objection raises an important point. Environmental destruction is not an all or nothing matter. Ehrlich and Ehrlich (1990) compare the loss of species to the loss of rivets in an airplane. It is difficult to say in advance when a critical mass of rivets will have been lost or which rivets are particularly crucial. Yet it is clearly unwise to be in the business of rivet-popping.

We can think of large-scale human manipulations of the environment as popping the rivets in the attitudes and dispositions that are required in order to live peaceably with nature. Attempting to change global climate would be a very grand gesture. I have given various reasons for supposing that such an attempt would be risky and probably ethically wrong. But even if ICC were successful, it would still have the bad effect of reinforcing human arrogance and the view that the proper human relationship to nature is one of domination.* Although it is difficult to assess precisely, in the longrun this attitude may be more destructive of both humans and the rest of nature than global warming itself.

6. Concluding Remarks

On the basis of what I have argued thus far, my first (enthusiastic) conclusion is that we should not now try to geoengineer climate. This is a conclusion which virtually everyone claims to accept, although people may not agree with the arguments that I have given in support of it. The more contentious question is whether research in this area should go forward and whether ICC should be seriously contemplated as a possible response to inadvertent climate change.

My second (unenthusiastic) conclusion is that research should continue on whether ICC can be carried out in a way that is consistent with the conditions that I have outlined. My reason for this is straightforward: we may reach a point at

* A referee accuses me of arrogance in "denounc[ing] the traditional and current fundamentalist christian [sic] view of human dominion over nature as bad without actually taking the trouble to show that it is so." While the pages of *Climatic Change* is not the place to debate fundamentalist Christians, it should be noted that traditional Christian attitudes towards nature are much more complex than is suggested by the referee's remarks. For discussion, see, e.g., Passmore, 1974 and Attfield, 1991.

which ICC is the lesser of two evils. Still, my enthusiasm for research in this area is lukewarm, and I will devote the rest of this paper to explaining why.

The case for research in almost any field seems obvious and unassailable. It is better to know more than less, serious research means peer-reviewed publication and the weeding out of the worst ideas, and research gives us options and capabilities to respond to dire or unexpected situations. But even if we accept all of this the risks in initiating an ICC research program remain profound.

First, money invested in one area of research is not available for research in other areas. We cannot afford to know everything about everything or to develop all possible capacities that may protect us against any imaginable threat. Research spending needs to be prioritized and traded off against other uses of the resources.

Second, initiating research on ICC involves investing in a particular approach to the problem of global warming. Whatever resources and energy go to research on ICC will not be available for preventing inadvertent climate change or mitigating its effects.

Third, and most serious, researching a technology risks inappropriately developing it. Often we think of research as being quite independent of development. We move from one to the other only on the basis of clear-minded, unbiased decisions, it might be thought. Unfortunately this often is not true. In many cases research leads unreflectively to development. There are at least two reasons for this.

The first is that we seem to have a cultural imperative that says if something can be done it should be done. For whatever reason technologies in this society often seem to develop a life of their own that leads inexorably to their development and deployment. Opposing the deployment of a technology is seen as 'Luddite' – an attempt to turn back progress that is doomed to failure (for a recent history of the Luddites, see Sale, 1995).

The second impetus to move unreflectively from research to development is well-documented with respect to medical technology. A research program often creates a community of researchers that functions as an interest group promoting the development of the technology that they are investigating (Jamieson, 1988b). Since the researchers are the experts and frequently hold out high hopes for a rosy future if their technology is developed, it can be very difficult for decision-makers to resist their recommendations. In many cases the social and ethical issues created by the deployment of the technology are explored only after we are already committed to it, but by then it is too late.

Although I favor ICC research going forward, there is a serious risk that ICC projects will be implemented even if they are unwarranted. For this reason safeguards should be built in to any research program from the beginning. We should reject the idea that ethical and societal concerns are relevant only to decisions about development, and not to decisions about research. Societal concerns should be articulated, weighed, and considered at every step along the way. In my opinion, research on ICC can be justified only if iterative ethical evaluations are part of the entire process of research and development. Ethical and societal concerns should

figure in decisions about what to research, at what level of funding, with what urgency. Serious systematic work should also be done on the conditions that would have to be satisfied for the deployment of ICC technologies to be justified.

It is important to recognize how different this recommendation is from the increasing tendency to give lip service to ethical considerations, but then to structure programs in such a way that ethical concerns are raised very far downstream in isolation from the conduct of the science. Generally, the atmospheric sciences have made no serious attempt to integrate ethical considerations into the design of research programs, but experiments in other areas of science have been quite instructive. For example, the Human Genome Project spends four to six percent of its budget on ethical, legal, and societal studies that relate to the development and use of genetic information (Juengst, 1994). While this attempt at societal evaluation is far from perfect, it is an important step toward taking the societal implications of science seriously.

In summary, we should not now attempt ICC. I believe that research should go forward, but only on condition that such a program takes ethical and societal issues seriously. We should learn from the past and build in societal assessment from the very beginning. This is not only a good thing to do, but in my view it is morally required if research on ICC is to be ethically justified.*

Acknowledgments

This paper was written when I was a visitor in the Environmental and Societal Impacts Group (ESIG) at the National Center for Atmospheric Research. I am grateful to ESIG for its hospitality and support, and to Michael Glantz for his searching comments on several versions of the manuscript, not all of which I have been able to take into account. I also thank Forrest Briscoe for pointing out a serious mistake, two anonymous referees, and my colleague, Claudia Mills. An earlier version of this paper was presented as part of the AAAS Symposium on Geoengineering Climate, held in San Francisco in February, 1994. I thank my fellow symposiasts and the session organizers, Gregg Marland and Frances E. Sharples, for useful discussion. Despite all of the good advice that I have gotten, I alone am responsible for the opinions expressed in this paper.

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* For further discussion of some related issues see McGinn, 1979.

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(Received 17 April 1995; in revised form 31 January 1996)