

## KNOWLEDGE, UNCERTAINTY, AND RESPONSIBILITY: RESPONDING TO CLIMATE CHANGE

Steve Vanderheiden

**H**ow much must we know about a predicted hazard before costly preparations designed to mitigate that hazard are warranted? This question is central to the current debate over the proper policy response to mounting evidence that anthropogenic climate change—caused by a combination of fossil fuel combustion (which collects gases in the atmosphere that trap heat and alter weather patterns) and land use changes (especially deforestation) that diminish the biosphere’s capacity to absorb carbon dioxide—threatens to cause a variety of serious ecological (and subsequently social, economic and political) problems across the globe. The science of climate change, while relatively new, is fairly sophisticated, drawing upon a vast network of data collection, advanced computer models, well-organized and funded research institutes, and has for over a decade been widely and carefully disseminated by a prominent international body (the Intergovernmental Panel on Climate Change, or IPCC) charged with assessing current research and issuing prescriptions for mitigation.

The IPCC was created in 1988 by the United Nations Environment Program to investigate anthropogenic climate change, report upon its causes and potential effects, and assess possible responses to it. The commission released its First Assessment Report in 1990, concluding that human activity was indeed producing climate change, and declaring it to be a “common concern of mankind.” Since then, it has issued two more Assessment Reports (most recently in 2001), amending earlier findings and updating data, but each time reinforcing the general conclusions that human activity was causing climate change, that these changes were highly likely to produce significant, even severe, climate-related hazards in coming decades, and that current emissions rates must be significantly reduced to avoid the worst outcomes.

The panel's reports, and the science upon which they are based, have not been without elements of uncertainty. Climate is the product of highly complex processes, and the mathematical models employed to predict future climate patterns rely upon a vast array of variables and possible scenarios (ecological, social, political, and economic). Despite an exhaustive peer-review process and a commitment to consensus, disagreement concerning the effects of current practices, the efficacy of various mitigation strategies and the long-range impacts upon health, economy, environment, food production, and global security has appeared among IPCC members. This uncertainty is endemic to their line of work (imagine forecasting global climate in 2050 when meteorologists have trouble with tomorrow's weather), but most are not troubled by it, and conceive of their work as minimizing and "managing" uncertainty rather than attempting to eliminate it entirely (an impossible task).<sup>1</sup>

Concerning the reality of anthropogenic climate change, there exists no reasonable uncertainty among reputable climate scientists. Atmospheric carbon dioxide (CO<sub>2</sub>) concentrations have increased from their pre-industrial equilibrium of 280 ppm to 372 ppm, with the vast majority of that increase occurring after 1950 due to changes in land use and the burning of fossil fuels. Largely as a result, surface temperature increases during the twentieth century were the largest of the millennium, and the 1990s was the warmest decade of the century. Scientists expect average global surface temperatures to increase by between 1.4 and 5.8° C in the period 1990–2100,<sup>2</sup> a projected rate of warming that would be unprecedented in over 10,000 years. Global temperatures and weather patterns have already been demonstrably altered, although the worst effects are expected in the intermediate future. Expected changes include increasingly severe weather, increased threats to human health, diminished ecological productivity and biodiversity, decreased crop yields and increasing water shortages. Despite the uncertainty that surrounds much of their work, these predictions were made with medium to high confidence (or ninety percent certainty) with the consensus of all IPCC scientists.<sup>3</sup>

Critics of the IPCC and of the larger political effort to combat anthropogenic climate change (as through the Kyoto protocol) have seized upon this uncertainty as a way to question the panel's conclusions and ultimately to forestall regulatory action. The Bush Administration, for example, has repeatedly questioned the link between human actions and climate change, even after its own EPA released an official report confirming that causal connection. In 2001, it led the ouster of IPCC working group head Dr. Robert Watson in an apparent effort to weaken or intimidate the panel into backing off some of its findings. As part of a broader

strategy to maintain the current greenhouse gas emission trajectory, in which the US is the world's largest overall and per capita GHG polluter, it (along with its allies in and out of government) has repeatedly attacked the science, politics, and economics of climate change mitigation, as well as exerted political pressure upon allies to undermine the ongoing (absent the US) international effort to mitigate anthropogenic climate change, and attempted to block state and local efforts to fill the domestic leadership vacuum left by the Administration on this issue.

A comprehensive exploration of the motives behind this line of attack on climate science is beyond the scope of this essay, although the use of uncertainty as a political and public relations strategy shall be explored below. The connections between the Bush Administration and the biggest greenhouse polluters (and, not coincidentally, the staunchest opponents of carbon regulation) are well known. At issue in this paper is not whether or not the Administration's attack on the credibility of the IPCC is disingenuous—it may be, but in a philosophically uninteresting way—but whether a valid argument might be crafted in its place to urge a more skeptical reception of the panel's conclusions, and of the need for initiating a serious mitigation effort to avoid the worst of the predicted consequences of climate change.

#### RESPONSIBILITY

To what extent can an agent be held responsible for consequences of acts committed under conditions of uncertainty? Uncertainty, as used here, refers not only to the lack of certain knowledge causally connecting acts with particular consequences (as in anthropogenic climate change), but also to a more general skepticism about the efficacy of various alternative courses of action in avoiding some predicted future consequences. For the purposes of this paper, agents are assumed to be *morally* responsible (as opposed to merely being *causally* responsible) for their acts (or omissions) insofar as they can reasonably anticipate the consequences of those actions (or inactions). What distinguishes a reasonable from an unreasonable failure to anticipate such consequences shall be explored in the third section of the paper, below.

We might examine the problem of climate change in light of several familiar ethical principles. The *principle of responsibility* holds that agents are to be held accountable for consequences that arise from voluntary choices, but not those that are the product of luck alone. This principle, which lies at the core of much contemporary philosophical work on distributive justice, is concerned with the problem of *desert*. It seeks to distinguish those good and bad products of an agent's actions

for which she can be held morally responsible (that is, what she *deserves*), and those for which she cannot. Thus, an agent might be *causally* responsible for some set of unforeseen (and unforeseeable) outcomes, but could only be held *morally* responsible for them insofar as she ought reasonably to have anticipated their occurrence as the result of her actions. To fail to foresee (and to avoid) the harmful consequences of one's acts, when a reasonable person would have done so, is *negligence*.

Although most often applied to individuals, the principle of responsibility might similarly be used to assess desert among nation-states, which are the principle actors in the current debate over global climate change. In this case, the principle holds that nations ought to bear exactly the costs of climate change for which they (through their contribution to both problem and remedy) are responsible. No nation should be forced to suffer burdens for which they are not responsible, and those bearing responsibility cannot be allowed to shirk the costs that they impose. This analysis views the atmosphere as a global commons, upon which all depend but into which all global greenhouse gas (GHG) emissions are trapped, making climate change efforts subject to the logic inherent in the "tragedy of the commons."<sup>4</sup> As a common resource, the primary problem is overcoming the logic that impels each to degrade the commons in a way detrimental to all.

Expressed in this way, climate change threatens to turn the principle of responsibility upon its head. The biggest per capita greenhouse polluters (the US, Canada and Australia) are expected to suffer relatively modest damage from climate change, while those nations likely to be most severely affected (sub-Saharan Africa, the Indian subcontinent, and various low-lying or drought-prone regions within the developing world) have contributed little (if at all) to the problem. As the IPCC notes: "The impacts of climate change will fall disproportionately upon developing countries and the poor within all countries, and thereby exacerbate inequities in health status and access to adequate food, clean water, and other resources."<sup>5</sup> Costs of GHG pollution, caused primarily by the affluent of the world (nations and individuals), are likely to be borne primarily by the world's poor. The principle of responsibility, therefore, would seem to demand not only a GHG abatement effort, but also a program of remedial action to correct for this inequity between greenhouse pollution emissions and their resultant harm.<sup>6</sup>

The philosophical problem with the principle of responsibility (as well as a political problem for negotiating climate change agreements) comes via the distinction between what comes about from voluntary choices and what arises from luck. Here, the distinction between *causal responsibility* (in which an agent, consciously or not, directly causes

some effect by some act or omission) and *moral responsibility* (or culpability, in which the agent, having causally produced some effect, ought to be held accountable for that effect, or deserves its consequences) comes to the fore. Luck, in this analysis, is simply the difference between these two kinds of responsibility. Deserved benefits and burdens are those that result from voluntary choices made under conditions of minimal certainty (i.e., choices freely made and in the context of knowledge about their likely consequences), and are encompassed within the concept of moral responsibility.

Causal responsibility, then, is a necessary but insufficient condition for moral responsibility. By what standard should an agent be held morally responsible for an effect for which they are causally responsible? If a person suddenly realizes that a byproduct of an otherwise benign series of acts (say, tending a rose garden in her backyard) has caused some kind of harm (e.g., attracting bees to which her neighbor has a severe allergy, unbeknownst to her), then she is causally responsible for that harm. But can she be morally blameworthy for that action; ought she to have acted otherwise? Although she could have done so (instead electing to tend a rock garden, for example), she could not have done so on the basis of a motive of non-malevolence. That is, she could not have avoided causing those adverse effects, except by luck (in having fortuitously made an alternative landscaping decision). If a bee that was attracted by her roses stings a neighbor, then she is (partly) *responsible* for that harm, but she cannot be *blamed* for it. Instead, her neighbor's misfortune is exactly that—bad luck.

Thus, a provisional supposition holds that agents are culpable for harm that is intentionally brought about, either by voluntary acts or omissions. Unintentional harm, while unfortunate, is accidental, and agents unintentionally causing that harm cannot be blamed for it. Or can they? An agent can be found *negligent*—a term that denotes both causal and moral responsibility—for inflicting a harm about which she is unaware, but about which she *should* have known. Given her ignorance (willful or otherwise), she is negligent if it is true both that she did not in fact know that she was acting wrongly, but that she *should* have known that she was committing a harmful act. Knowledge of the consequences of one's actions, therefore, cannot be a prerequisite for moral responsibility. Only *reasonable* ignorance can count as a defense against harmful acts, and unreasonable ignorance is negligent. Agents can be held morally responsible only for those consequences (harmful or beneficial) which they can reasonably be expected to anticipate, even if they do not in fact anticipate them.

A relevant question for determining each nation-state's moral responsibility for remedial action and to compensate for climate-related harm is the extent to which each is culpable for present concentrations of atmospheric GHGs. The *polluter pays* principle is a corollary of the principle of responsibility (it is the remedial component), and entails (when combined with the idea of *equity*) that larger contributors of GHGs have proportionately larger mitigation burdens and compensatory costs than smaller polluters. Historical GHG emissions, which remain in the atmosphere for 140 years, are causally responsible for present and future climate-related harm. Counting historical emissions against present remedial or compensatory burdens would entail greater responsibility for nations (like the United States) that industrialized early, relative to an alternative scheme in which only present or recent contributions were counted. How much of its historical emissions is the US culpable for contributing? To put the question another way, at what point did moral responsibility begin to coincide with causal responsibility?

Arguably, early industrial emissions should not be counted toward present compensation burdens, since nation-states could not reasonably have predicted their eventual consequences. The Swedish chemist Arrhenius, however, accurately described the greenhouse effect in 1898, after which the claim to reasonable ignorance concerning the harmful effect of GHG emissions started to become less plausible. By 1988, when the National Academy of Sciences published its landmark report on the greenhouse effect (spurring the creation of the IPCC), this ignorance had become significantly less plausible. In 2003, following three scrupulously researched and compiled IPCC assessment reports, claims to reasonable ignorance concerning anthropogenic climate change are fully implausible, despite the uncertainties that remain in climate science. Even if the predictions about the harmful consequences of climate change turn out to be overstated, ignoring the considered recommendations of the vast majority of the world's scientific community can only be described as willful ignorance, and cannot exonerate one from moral responsibility for resultant harm.

The most defensible starting point for assessing moral responsibility for historical emissions is the year 1990. By then, governments were aware of the likely effects of various kinds of human activity on global climate, and could have initiated emissions mitigation programs (as they were urged to do by the NAS report). In fact, the 1992 Framework Convention on Climate Change (signed and ratified by the U.S.) bound it the 178 signatory nations to efforts to freeze emissions at 1990 baseline levels pending further developments. This treaty, while non-binding, spurred proactive emissions reduction efforts in Europe but was essen-

tially ignored in North America. In the interim, GHG emissions have increased by fifteen percent in the US, while they have declined by four percent in Europe, by forty percent in the former Soviet Union, and have stabilized in China at 1990 levels. These changes, affected under full knowledge of their consequences for global climate (albeit not always with the motive of climate change mitigation, as in the cases of Russia and Ukraine, which saw their emissions decline as a result of economic collapse), ought to affect the assignment of remedial and compensatory burdens. Indeed, the principle of responsibility holds that nations ought to be held morally responsible for harm resulting from *all* emissions since 1990, with credit allowed for emissions reduction and additional penalties assigned for emissions increases.

It is sometimes suggested that an agent, after demonstrating a long pattern of some kind of action, acquires a property right in further like acts. Historical use patterns, for example, are often used to grant users right-of-way on private property. In antipollution regulation, this idea has been wielded in the service of established polluters, which are often grandfathered into new regulations through a series of exemptions (as in those granted to inefficient older coal-fired power plants under the US Clean Air Act). One might argue on behalf of these polluters that they are responsible only for that additional annual pollution beyond the baseline of their emissions at the time in which new rules were promulgated. Prior to that point, their emission levels were considered “safe” (because not legally prohibited), and so they can be held culpable only for additional emissions beyond what they reasonably surmised were an innocuous level. Requiring established polluters to retrofit their physical plant with expensive new technology, therefore, would (arguably) constitute an undue burden upon them.

This claim, despite enjoying considerable political currency in the US, is philosophically flawed in at least two ways. First, it conflates two separate distinctions. While it may be mistaken to assess legal culpability for pollution emitted prior to some new antipollution regulation,<sup>7</sup> it is quite another matter to exempt a polluter for emissions *after* that regulation so long as subsequent emissions don’t exceed the regulation year baseline. One cannot acquire a “property right” in knowingly committing harm, even if one can acquire legal permission to do so. Hardship exemptions are sometimes granted to existing polluters for economic and political reasons, but these exemptions cannot sustain critical scrutiny as justified ethical exceptions to conventional principles of nonmalfeasance. Given a choice between forcing old, dirty power plants out of business by making compliance prohibitively expensive and achieving less than desirable air or water quality, regulators often opt

for the latter, but do so from an expedience that undermines the regulations themselves. Insofar as such plants emit levels of pollution that are widely known to be harmful their operators are morally responsible for that harm.

Second, this claim confuses the moral with the legal. While it may be true that pollution that is known to have harmful effects is sometimes legal (at least up to some level for a given polluter), legal permission does not exonerate an offender from moral responsibility. Most regard the decision to grandfather older coal-fired power plants into antipollution regulations at significantly higher (and recognizably unsafe) emissions caps to be a bad one (and one made significantly worse by the recent revisions to New Source Review requirements, which will allow these exemptions to exist in perpetuity). These plants have been granted a legal right to cause harm; a right which is both vigorously defended and exercised. This insidious legal permission, however, is irrelevant to moral responsibility. Equally irrelevant would be the claim that, since antipollution laws were routinely unenforced throughout the 1980s, any harm resulting from that pollution was excused under some tacit "right" to poison the planet.

Ultimately, the reasoning behind such a claim to exemption from moral responsibility (as opposed to legal culpability, which depends upon the political will of institutions of enforcement) is circular: some act is assumed to be morally innocuous because it is legally permitted, and it should remain legally permissible because morally innocuous. Though based upon a logical fallacy and in contradiction with widely accepted facts about the toxicity of mercury or sulfur dioxide, such non-sequiturs remain politically popular. Nonetheless, the earlier contention holds: a polluter is morally responsible for the pollution she emits (and the harm subsequently caused) insofar as she could reasonably be expected to foresee those consequences. Baseline emissions levels, while relevant to the magnitude of the burden undertaken by polluters to adequately reduce the harm associated with their polluting activities, are irrelevant to their moral responsibility for that harm.

At this point, we might draw three tentative conclusions. First, the industrialized nations have disproportionately contributed to anthropogenic climate change, given estimates regarding the distribution of climate-related harm. Second, developing nations, which are expected to bear the brunt of such harm, have contributed relatively little to current GHG concentrations. Finally, humankind as a whole needs to significantly reduce its rate of GHG emissions.<sup>8</sup> This third conclusion recommends a global GHG mitigation program, whereby current rates of GHG emissions are reduced (through some global regulatory regime)



and a combination of mitigation and compensation (to address avoidable and unavoidable harm) efforts are undertaken by those responsible nations and for those adversely affected but not causally responsible ones, to begin at once. The first two conclusions inform the design of that program, along with an ancillary compensation scheme to remedy existing unjust distributions.

#### UNCERTAINTY

International action to mitigate climate change has repeatedly been frustrated by the interests of carbon-intensive multinational corporations and their representatives in and out of government, which have consistently claimed that climate science has not yet established with adequate certainty the connection between fossil fuel combustion and climate change.<sup>9</sup> This claim is plainly false. These claims about uncertainty, advanced by climate skeptics through a coordinated public relations campaign against carbon regulation, lack scientific merit, and can be found only in industry propaganda rather than in legitimate peer-reviewed scientific publications. Thus, the ignorance they produce is unreasonable. However, their *raison d'être* is not to advance knowledge (as scientific dissent, in other circumstances, aims to do) but rather to inhibit it. Reports by climate skeptics are not intended for a scientific audience, but aim rather to confuse the public and to provide political cover for complicit public officials. They seek to manufacture uncertainty and to use it to ward off profit-reducing regulation.

As a public relations strategy, claims of uncertainty are deceptively advanced as rhetorical ploys in the service of either deregulation or continued non-regulation, and as a legal subterfuge for deflecting tort liability claims.<sup>10</sup> The tobacco industry, for example, for decades denied any causal connection between smoking and health, despite being in full knowledge of both internal and external studies confirming that connection. This legal and political strategy, while successful, is ethically repugnant. Attempts to regulate tobacco have repeatedly been turned away on the false premise that no conclusive evidence links smoking and health problems, while compensatory lawsuits brought by some of the thousands of people killed by tobacco have been denied on three mutually contradictory grounds: either that causal responsibility cannot be established (that is, smoking is not known to be hazardous to health), that the smoker assumed the risks by smoking (that is, that the health hazards of smoking are widely known), or that the smoker is deceased and therefore lacks legal standing to sue the producer of the poison that killed her. Uncertainty, in this case, is merely the first line of defense.

Claims about uncertainty, in the cases of both GHG emissions and tobacco, are often intended to obfuscate the scientific facts in order to “manage” concerns about the public health effects of smoking and the causes and consequences (as well as the very existence) of climate change. The tobacco industry continues to call for further study regarding the causal links between smoking and the adverse health effects that have long been established in the scientific literature, and the Administration appears to be following a similar strategy on climate change. A leaked memo from the political consultant Frank Luntz to the White House advised: “Should the public believe that the scientific issues are settled, their views about global warming will change accordingly. Therefore, you need to make scientific certainty a primary issue in the debate.”<sup>11</sup> The Administration, along with Exxon/Mobil—a staunch opponent of the Kyoto treaty and a major source of funding for the climate skeptics<sup>12</sup>—have both announced significant grants to further study climate change, including provisos that regulatory action be reconsidered when studies are completed in 2010.<sup>13</sup> Proposals to further study problems like smoking and climate change are not inherently insidious, but become so when accompanied by requests to delay meaningful policy responses to serious problems about which reasonable scientific certainty already exists.

The first objective of the legal and public relations strategy of manufactured uncertainty is to forestall carbon regulation as long as possible, and to do so it seeks to discredit the science upon which the IPCC’s reports are based. Like the tobacco industry, the “carbon club” (a term coined by Jeremy Leggett to refer to the fossil fuel industry’s anti-Kyoto campaign<sup>14</sup>) seeks to manufacture enough skepticism to maintain this position indefinitely, but is savvy enough to have two fallback positions if it should fail. First, it claims that GHG emissions reductions would be prohibitively costly to attain, exercising a kind of economic blackmail on state regulatory institutions. Second, should these first two lines of defense fail (if, as the IPCC has reported, climate change is real and “substantial low cost mitigation opportunities exist”), the “carbon club” claims that the global framework for climate change mitigation constitutes an unfair burden upon the largest polluters and the nations in which they set up shop. The goal is avoiding regulation, and the strategy has worked brilliantly in the United States, where the denial of complicity in this impending crisis provides a more comforting narrative for a populace that appears all too willing to accept any pretext for its unabated consumption.

The initial question remains: how much knowledge about the harm associated with GHG pollution is needed in order to justify potentially

costly mitigation efforts and to initiate a compensatory program for unavoidable (but culpable) harm? Before proceeding any further, one prefatory observation ought to be made concerning costs. While the “carbon club” has insisted that the emissions reductions prescribed by the Kyoto protocol would be prohibitively costly to the U.S. (estimating compliance costs at between two and five percent of GDP), these estimates should be regarded with skepticism. In 2000, the Department of Energy estimated that the United States could reduce emissions to 1990 levels by 2010 with no net loss to the economy—\$50–90 billion would be initially required to develop and implement energy-efficient technologies in industry, transportation, and utility sectors, but energy cost savings would entirely offset start-up costs by 2010. Likewise, the IPCC estimates U.S. compliance costs for Kyoto at 0.52 percent of GDP, which pales in comparison to the “business as usual” scenario costs of between 1 and 1.5 percent of GDP resulting from climate change. In short, the costs of such efforts are often deliberately overstated, and may be negligible or even negative, given the production of ancillary benefits (in reduction of other known toxins that also result from fossil fuel combustion) from GHG abatement efforts.

The political barrier created by such cost overestimates, however, should not be understated. Responding to the industry-organized campaign against the Kyoto protocol, in which constituents were responding to television spots predicting the massive export of manufacturing jobs to unregulated developing countries resulting from the US participation in the climate treaty, the 1997 Byrd-Hagel resolution (named after two of the Senate’s prominent climate skeptics) symbolically rejected (in a 97-0 vote) any climate treaty that *either* has significant economic costs *or* exempts developing nations from binding commitments during the initial implementation period (through 2012). As a result, President Clinton made no serious effort to introduce the signed treaty in the Senate for ratification, and the Kyoto protocol would likely face insurmountable odds even without the pronounced opposition of the Bush Administration.

#### KNOWLEDGE

One might very well object that the industrialized nations should have known prior to 1990 that greenhouse pollution was likely to be harmful, and thus should now bear moral responsibility for that harm. Indeed, the literature of the Industrial Revolution showed a remarkable cognizance of the damage being inflicted upon the environment by industrialization. Even if Blake and Dickens had been unable to grasp

contemporary atmospheric science, they well knew that the “dark satanic mills” weren’t innocuous. Furthermore, we’ve known quite well for three decades that the burning of fossil fuels causes a wide variety of other, quite harmful, kinds of pollution. Should we be exonerated for a secondary harmful effect, when we commit an act that we know to have a primary harmful effect? If we commit an act that we know to be harmful, but the harm exceeds our expectations, are we culpable only for the expected harm, or for the actual harm? How important, that is, are our intentions in assessing culpability and desert?

When an assault victim dies from injuries sustained in an attack in which the offender intended bodily harm but not death, charges against the assailant are rightly upgraded to homicide from. The actual outcome, and not merely the expected one, is relevant in assessing the seriousness of the offense. That the assailant intended a lesser harm is irrelevant to guilt, even though, in the sense derived from the principle of responsibility, they are charged with a less serious offense than premeditated murder. Insofar as they acted in such a manner (and with malicious intent) that they should have anticipated that their victim may die as a result of the harm they intentionally inflicted (even if considerable uncertainty surrounded that possibility), they are culpable for both assault and homicide. Actual intentions, that is, matter less than reasonable expectations about possible consequences.

Thus, it is not so much the actual knowledge of an agent that counts in assessing moral responsibility, but is instead the reasonable expectation of consequences from some action. With regard to the causal connection between GHG emissions and climate change (and its associated costs), the nature of such reasonable expectations has been the object of contention. Despite the widespread dissemination of three IPCC Assessment Reports, some still dispute the panel’s findings, disingenuously claiming that the scientific jury is still out; that not enough work has been done to establish with “certainty” the link between particular kinds of human activity and climate change. As suggested above, this claim intends to establish an ignorance defense—such a defense deliberately seeks to lower the bar for what counts as reasonable ignorance by manufacturing the appearance of a dissensus among climate scientists. If experts cannot agree about the consequences of some action, it suggests, no person can reasonably be expected to anticipate those consequences. Absent “certainty” (defined as unanimity among “experts”), persons can only be causally responsible but not culpable for harm they cause. Only after some hypothetical future point at which “uncertainty” ceases to exist can agents be held morally responsible for the harm they cause.

At issue is what constitutes reasonable certainty and uncertainty. Different institutions make the cut between the two in different places. As approximated in criminal procedure, defendants are presumed innocent so long as "reasonable doubt" exists for any member of a presumably reasonable jury. As applied to the climate debate, this standard implies that no agent could be held as culpable for any emissions occurring prior to the point at which adequate scientific consensus on the link between human activity and climate related harm was established. Lack of consensus among experts, in this case, would amount to a reasonable doubt, and opponents of climate change mitigation claim that such existing uncertainty surrounding the IPCC's findings warrants a decade of further study (read: inaction). Given the economic costs of compliance with the Kyoto protocol, one can at least imagine an argument for a reasonable doubt standard of certainty as a prerequisite for binding emission reduction targets.

Such a standard would not justify a delay of assignments of culpability all the way up to some (perhaps infinite) future point at which *unreasonable* climate skeptics cease to exist, but would require a general consensus among reasonable ones (such a consensus would seem to be evidenced by the IPCC reports, which reflect a consensus process and position) as the starting point for assessing culpability. One might plausibly make the case that 1995 or 2001 ought to serve as baseline years (instead of 1990), since those IPCC Assessment Reports represented higher levels of confidence in the commission's findings, but the claim that reasonable doubt continues to exist regarding the basic causes and consequences of anthropogenic climate change is considerably less plausible, and relies upon an indefensibly demanding conception of certainty.<sup>15</sup> On the other hand, the applicable standard of certainty could follow the rules of civil procedure, where a majority need only find a "preponderance of evidence" in favor of the connection. This considerably weaker demand was certainly met with all three IPCC reports. Is there any reason to prefer one of these standards of certainty to the other?

The analogy to rules of legal procedure is again instructive. The exceptionally high "reasonable doubt" standard of certainty in criminal procedure is justified by the widely-held conviction that it is better to let hundreds of guilty persons go free than to falsely convict and punish one innocent person. Anything less than the highest level of certainty allows for the possibility of the latter. The tradeoff of the former for the latter, that is to say, is deliberately made, and the interests of justice are served thereby. In civil cases, where monetary damages compensating one party for harm done by another are the norm (instead of imprisonment for one party having offended society at large), the standard of

certainty is lower. Not only are outcomes reversible in ways that criminal penalties are not (a person falsely imprisoned for half her life *cannot* be adequately compensated for that loss), but the lower standard of proof in civil procedure serves the interests of justice in ensuring a proper balance between the contending parties. A higher standard of proof in civil cases would undermine justice on balance, since it would dismiss far more valid claims than it would uphold.

The question for the climate debate, then, is which of these two standards of certainty is more appropriate. Should climate change mitigation efforts be postponed until no doubt whatsoever concerning anthropogenic climate change exists? Does the presence of any doubt (especially in the form of manufactured uncertainty) amount to "reasonable doubt" in a defensible standard of certainty? If the willingness of at least one scientist to take a skeptical position is taken to constitute such doubt, then these efforts are likely to be postponed indefinitely. Climate skeptics will continue to exist so long as polluters are willing to pay for them. What, if anything, might justify this demanding standard?

Compared against falsely convicting an innocent defendant, the failure to convict many guilty ones is a lesser evil, justifying the high standard (and consequent failure to act in some ways that would otherwise be desirable). A strong burden of proof upon the prosecution is warranted when the downside risk of punishing the innocent is possible. However, the failure to take action now to avert climate change is highly likely to create irreversible harm for many. Balanced against this possible (if "uncertain") outcome are the costs of a greenhouse gas abatement program, if it turns out that the consensus view of the IPCC is indeed false. Which is the greater evil? On the one hand, there is ecological devastation (and the social, political, and economic damage that accompany it), combined with the injustice of the inequity between culpability and harm. On the other, there is the future recognition that, due to scientific error, persons in the industrialized nations were for a time required to consume fewer fossil fuels, but consequently enjoy less pollution, a richer resource stock, and a more equitable global allocation of resources as a result of the foregone consumption-oriented welfare of a relative few. Viewed in terms of consequences, criminal procedure recommends a high standard of certainty in a way that the climate debate (which more closely resembles a civil case) cannot. Rather than imposing an impossibly strong presumption against mitigation action, the alternative scenarios suggest a preponderance of evidence approach.

The consensus view of the world's paleoclimate experts ought to suffice for adequate certainty, and the disingenuous rejection of the scientific community's conclusions ought to be regarded as based in unreasonable

ignorance. The IPCC, which includes 400 contributors, 500 peer reviewers, and 177 delegates from 96 countries, plus 28 lead authors for scientific chapters, and which works from consensus (sometimes spending hours upon a single sentence), concludes: “The overwhelming majority of scientific experts, whilst recognizing that scientific uncertainties exist, nonetheless believe that human-induced climate change is already occurring and that future change is inevitable.” In 1997, a letter from 1500 scientists, including a majority of the world’s living Nobel laureates, strongly urged President Clinton to act on climate change, declaring: “With the health and well-being of future generations at stake, we cannot afford to wait any longer. The time to act is now.” In 2001, the Royal Society (consisting of 16 national academies of science) noted that “the balance of evidence demands effective steps now to avert damaging changes to the earth’s climate.” Causal responsibility for climate-related harm, committed in the face of strong recommendations by recognized experts to GHG abatement, entails moral responsibility, and continued inaction constitutes inexcusable negligence.

While genuine uncertainty does exist in many areas—climate science included—it cannot be allowed to be used as a subterfuge that serves to protect offenders in their harmful acts. Justice demands impartiality between the parties to a dispute, and the rules of procedure that govern the adjudication of those disputes must be neutral with respect to the parties in order to produce an outcome that is untainted with either personal or institutional bias. This procedural neutrality, however, cannot entail that the mere production of a single contrary “expert” washes the consensus view of an entire community of experts. The *ignorance defense*, as described above, sets the standard of proof so high that it undermines the principle of responsibility and produces patently non-neutral outcomes. If unreasonable ignorance (based upon, for example, the production of a climate skeptic) is sufficient to exonerate a polluter from responsibility, then the outcome will invariably be to favor the offender and hurt (by allowing unabated harm, or denying compensation, or both) the victim. That is, it would be a non-neutral procedural rule disguised as a neutral one, turning the very idea of impartiality upon its head.

In cases of environmental harm, this problem is especially acute, since deferral of action to some future point at which “uncertainty” disappears not only vastly exacerbates the problem during the time in which remedies are denied, but often makes future remedies impossible. Greenhouse gases, for example, remain in the atmosphere for centuries, trapping heat and altering weather patterns, and the window of opportunity for mitigating the worst effects of those changes will eventually close (perhaps not far into the future). As in the case of tobacco liability

defense, where offenders seek to delay a remedial or compensatory order until a victim dies (at which point the case is dismissed for lack of standing), a remedy delayed is, in the climate case, a remedy denied.

For this reason, greens have urged—and the 1992 Rio Declaration legally declares—a commitment to the *precautionary principle*: “Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.” Amounting to a shift in the burden of proof to those who would claim that GHG emissions are benign, the justification for the principle is clear enough: “full scientific certainty” is an elusive business, especially given the willingness of climate skeptics to auction their “expert” opinions to large polluters (in whose public relations material their “research” is presented), and thereby to impede political programs such as the Kyoto treaty. To forestall action until such “certainty” exists (which, more than likely, would be never) undermines any possibility of addressing problems in time. If such willful ignorance served as a defense against harmful acts, the principle of responsibility would be fatally undermined, since offenders can almost always invoke it in their defense.

#### CONCLUSIONS

It would seem that sufficient knowledge of the disparity between the industrialized world’s contribution to the problems associated with climate change and its deleterious effects upon other nations warrants remedial action in order to reduce the problem itself, and to compensate the developing world for the unjust burden that greenhouse pollution has forced upon them. Sufficient knowledge constitutes the reasonable expectation that one’s current actions are likely to produce harmful effects, which the three IPCC Assessment Reports amply provides. Given the precautionary principle—and the more general case for employing a standard of certainty that requires only preponderance of evidence linking human activity to the hazards of climate change—there ought by this analysis now be sufficient knowledge of anthropogenic climate change, and its principle causes and likely effect, to require (by the principle of responsibility) a remedial program consisting of mitigation and compensation. Failure to act on this pressing global issue, that is, cannot continue to be justified as it has been; as a problem of inadequate knowledge or lack of sufficient certainty. If the industrialized world (or specific nations within it) fails to adequately respond to climate change, it shall do so irresponsibly.

*University of Minnesota-Duluth*



NOTES

1. The IPCC's disclaimer on uncertainty: "Decision making has to deal with uncertainties including the risk of non-linear and/or irreversible changes and entails balancing the risk of either insufficient or excessive action, and involves careful consideration of the consequences (both environmental and economic), their likelihood, and society's attitude toward risk." Intergovernmental Panel on Climate Change, *Climate Change 2001: A Synthesis Report*, ed. by R. T. Watson and the Core Writing Team (New York: Cambridge University Press, 2001), p. 39.

2. The temperature range is based upon a variety of emissions scenarios that stabilize atmospheric concentrations of CO<sub>2</sub> at between 540 and 970 ppm. The most significant uncertainty variable driving the range of emissions scenarios is the global political response to mitigate climate change.

3. IPCC, 2001, p. 12.

4. See Garrett Hardin, "The Tragedy of the Commons," in *Science*, vol. 62 (13 December, 1968), pp. 1243–1248.

5. IPCC, 2001, p. 12.

6. Henry Shue has argued that this disparity warrants a remedial and compensatory program, in "Global Environment and International Inequality," *International Affairs*, vol. 75, no. 3 (1999), pp. 531–545.

7. Moral culpability is another matter. Typically, reasonable certainty concerning the harmful effects of pollution predates antipollution regulations, and so a polluter would be morally responsible (if not legally culpable) for that pollution produced following that reasonable certainty.

8. Even in the IPCC emission scenario with the highest atmospheric CO<sub>2</sub> concentration—1000 ppmv, which would likely result in severe climatic changes—eventual stabilization requires significant emissions reductions from the 1990 baseline.

9. For an excellent exposé of the media campaign to impugn the science of climate change forecasts, see Ross Gelbspan, *The Heat Is On: The Climate Crisis, the Cover-Up, the Prescription* (Reading, Mass.: Perseus Books, 1998). Gelbspan claims that the small group of skeptics—which conducts no original research and is in the employ of the energy industry—have waged a thus-far successful disinformation campaign in the US and a somewhat less successful one in Europe to discredit the consensus view of the IPCC and others linking human action (especially burning fossil fuels) and climate change.

10. Both the anti-Kyoto effort and the campaign by the tobacco industry to avoid regulation employed similar public relations strategies and, in some cases, similar organizations. See Sheldon Rampton and John Stauber, *Trust Us, We're Experts! How Industry Manipulates Science and Gambles with your Future* (New York: Putnam Publishing Group, 2000).

11. Andrew Gumbel, "U.S. Says CO<sub>2</sub> is Not a Pollutant," *The Independent*, online edition, August 31, 2003.

12. See Rampton and Stauber (2000).

13. See Andrew Revkin, "Exxon-Led Group is Giving a Climate Grant to Stanford," *New York Times*, online edition, November 22, 2002.

14. See Jeremy Leggett, *The Carbon War: Global Warming and the End of the Oil Era* (New York: Routledge Press, 2001).

15. Certainty of the kind demanded by climate skeptics is a straw man in these kinds of scientific predictions, insofar as it is understood as certain knowledge. Scientific predictions about the future effects of different levels of climate variables are made under higher and lower levels of confidence, and such confidence levels are noted within the IPCC Assessment Reports.