

2009

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Recommended Citation

Biber, Eric (2009) "Climate Change, Causation, and Delayed Harm," *Hofstra Law Review*: Vol. 37: Iss. 4, Article 4.
Available at: <http://scholarlycommons.law.hofstra.edu/hlr/vol37/iss4/4>

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CLIMATE CHANGE, CAUSATION, AND DELAYED HARM

*By Eric Biber**

The causal linkage between human activity and climate change has been the locus for contentious debate over the past twenty years or so. It has been a proxy for larger debates over whether and how policymakers should respond to the possibility of significant anthropogenic global climate change. Questioning the causal linkages between human activity and climate change has been an argument adopted not only by those who sincerely doubt such a connection, but also by those who question climate change in the first place and by those who simply question the need for a major policy response to the possibility of climate change (whatever they might believe about whether climate change is happening or not, or is harmful or beneficial).

Thus, today there are a non-trivial number of activists, policymakers, lobbyists, and scientists who contend that there are alternative explanations for any changes in the global climate system, with the most common alternative explanation being variations in sunspot activity.¹ These arguments inevitably undercut and undermine the political momentum towards efforts to regulate human activities that emit carbon dioxide, methane, and other “greenhouse gases.” If, as these skeptics contend, there is no connection between these human activities and climate change, then (as they vehemently maintain) regulatory efforts would be counterproductive.²

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1. See, e.g., Phil Chapman, *Sorry to Ruin the Fun, but an Ice Age Cometh*, THE AUSTRALIAN, Apr. 23, 2008, <http://www.theaustralian.news.com.au/story/0,25197,23583376-7583,00.html> (discussing the correlation between the sunspot cycle and the Earth’s climate); Peter N. Spotts, *Are Sunspots Prime Suspects in Global Warming?*, CHRISTIAN SCI. MONITOR, Sept. 27, 2007, <http://www.csmonitor.com/2007/0927/p13s03-sten.html> (discussing the controversy over the role of sunspots in global climate change).

2. Eric Biber, *Climate Change and Backlash*, 17 N.Y.U. ENVTL. L.J. 1295, 1307 (2009).

It may well be that despite the arguments by these skeptics, Congress and the President are convinced enough of the human connection to climate change that they will proceed to act. Indeed, the political tea leaves at the moment appear to indicate that action will occur in the next year or two. Certainly, the international community appears to be convinced enough to take action, as evidenced by the Kyoto Protocol.³

However, the fact that the skeptics' arguments might be overcome in the present moment, leading to the initiation of regulation, does not necessarily mean that their arguments will be stilled forever more. In fact, the passage of any climate change legislation might only be the first round in a longer struggle over the connections between human activity and climate change—even if the proponents of regulation are correct about the causal connections between the two. To understand why this is so, one must first understand one of the fundamental characteristics of climate change—its nature as a delayed harm.

The current mainstream consensus among climate scientists connects changes in the global climate system to emissions of greenhouse gases by human activities. However, the climate system does not immediately respond to the changes in greenhouse gas emissions. Instead, there is an extended period of delay between the emissions of gases into the atmosphere and the full expression of the impacts of those gases on the global climate system.⁴ The primary cause of this delay is the “thermal inertia” of the oceans.⁵ Because water has a high heat capacity, it takes much longer to heat up than the atmosphere does. Accordingly, it will take decades or even centuries for the full impacts of historic greenhouse gas emissions to be felt in changes to global temperature levels, sea levels, etc.

The delayed nature of climate change is not a unique phenomenon in environmental law. Other types of environmental harms also occur only after an extended delay period. For instance, the harms that individuals experience from the exposure to a range of chemicals and drugs may take years or decades to be expressed (what is often called a

3. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: SYNTHESIS REPORT, SUMMARY FOR POLICYMAKERS 18 (2007), available at http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf [hereinafter IPCC].

4. See Gerald A. Meehl et al., *Global Climate Projections*, in CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS, CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 747, 822-23, 825, 827 (Susan Solomon et al. eds., 2007).

5. See *id.* at 822.

“latency period”).⁶ For example, the drug DES was prescribed to pregnant women in the 1950s and 1960s as an artificial estrogen supplement.⁷ DES resulted in birth defects and increased cancer risks for the daughters and granddaughters of the women who took it.⁸ But the nature of those birth defects was often not fully understood until those daughters or granddaughters themselves had their own children, while cancer would often not manifest itself until many years later.⁹ Similar delayed harm dynamics have played themselves out for products such as tobacco and asbestos.¹⁰

Legal scholars have long noted that these kinds of “latent harms” caused by chemical exposure or drug side-effects posed difficult problems to the tort system that (at least in the United States) was the primary legal means of redress and response. In particular, scholars noted that these kinds of “latent harms” made drawing the causal connections between the initial exposure to the chemical or drug and the subsequent harm very difficult.¹¹ First, the time delay made establishing the principle of a causal linkage between the exposure and the harm—“general causation”—extremely challenging.¹² Experiments or epidemiological studies would have to cover years or decades of time in order to reach conclusions about causal linkages, and the extended delay period raises the possibility of many different intervening activities or exposures that might confound the drawing of the causal connection.¹³ Second, even if “general causation”—for instance, between exposure to DES and the increased risk of cancer or birth defects—can be

6. See, e.g., Edward J. Schoen et al., *An Examination of the Legal and Ethical Public Policy Consideration Underlying DES Market Share Liability*, 24 J. BUS. ETHICS 141, 142 (2000); Jane Stapleton, *Compensating Victims of Diseases*, 5 OXFORD J. LEGAL STUD. 248, 249 (1985).

7. See Schoen et al., *supra* note 6, at 142.

8. *Id.*

9. *Id.* at 142, 151.

10. See, e.g., Donald G. Gifford, *The Peculiar Challenges Posed by Latent Diseases Resulting from Mass Products*, 64 MD. L. REV. 613, 621-22, 624-25 (2005) (discussing litigation based on allegations of latent harms from a wide range of chemicals and products including tobacco, asbestos, Agent Orange, lead paint, and DES); Charles T. Greene, *Determining Liability in Asbestos Cases: The Battle to Assign Liability Decades After Exposure*, 31 AM. J. TRIAL ADVOC. 571, 572 (2008) (discussing delayed harms in the context of asbestos).

11. See, e.g., Michael D. Green, *The Paradox of Statutes of Limitations in Toxic Substances Litigation*, 76 CAL. L. REV. 965, 973-74 (1988); Robert L. Rabin, *Environmental Liability and the Tort System*, 24 HOUS. L. REV. 27, 29-30 (1987); see also Stapleton, *supra* note 6, at 248, 250.

12. See Margaret A. Berger, *Eliminating General Causation: Notes Towards a New Theory of Justice and Toxic Torts*, 97 COLUM. L. REV. 2117, 2122 (1997) (defining the terms “general causation” and “specific causation”).

13. See Robert F. Blomquist, *Emerging Themes and Dilemmas in American Toxic Tort Law, 1988-91: A Legal-Historical and Philosophical Exegesis*, 18 S. ILL. U. L.J. 1, 43 (1993).

established, tort remedies still required the drawing of a causal connection between a particular defendant's actions and a particular plaintiff's harms—"specific causation."¹⁴ But with the passage of time, memories faded, records were lost, and so it often became difficult or impossible to provide that kind of proof.¹⁵ In the case of DES litigation, it was often impossible for individual plaintiffs to show which particular company's DES pills a particular mother had taken during pregnancy.¹⁶ Finally, as a practical matter, the passage of time may make it impossible for a plaintiff who can show general and specific causation to even find the defendant or obtain compensation from that defendant, who may have died, disappeared, or gone bankrupt in the intervening years.¹⁷

These causation issues present obstacles to the use of a liability tort system as a mechanism to address any form of delayed harm, and climate change is no exception. And causation is perhaps one of a number of reasons why liability solutions are likely not to be the primary policy tool that will be used to address climate change. However, as noted above, causation is also an obstacle to the establishment of a regulatory system for carbon emissions—the debates over whether greenhouse gas emissions are connected to climate change as a general matter certainly are part of the bigger debate over whether to have a regulatory system in the first place.

But consider what might happen if and when the debates over causation are (at least temporarily) resolved in favor of regulatory action. Assume that a stringent carbon emissions regulatory system is developed and fully implemented in the United States, and indeed at the global level. Even if such a regulatory system succeeded in drastically reducing carbon emissions on a national and international basis, we would still expect to see global temperatures rise and global sea levels rise.

The reason for this is directly connected to the delayed harm nature of climate change. Even if the activity that causes a delayed harm (such as climate change) is terminated immediately through a regulatory system, that does not mean that the harm will terminate immediately as

14. See Berger, *supra* note 12, at 2122.

15. See Steven Shavell, *Liability for Harm Versus Regulation of Safety*, 13 J. LEGAL STUD. 357, 363, 370 (1984).

16. See *Hymowitz v. Eli Lilly & Co.*, 539 N.E.2d 1069, 1072 (N.Y. 1989).

17. See Al H. Ringleb & Steven N. Wiggins, *Liability and Large-Scale, Long-Term Hazards*, 98 J. POL. ECON. 574, 578, 589-99 (1990) (finding empirical evidence in support of this concern); see also Shavell, *supra* note 15, at 370.

well. Indeed, absent efforts to undo the harm from the activity, the harm will continue to exist for at least as long as the delay period. That is because the delayed harm has to be “completely realized” from the environment over time.¹⁸

Indeed, if the delayed harm is both persistent and cumulative, the harm may actually continue to increase even after the initiation of regulation.¹⁹ And that is the case with climate change, where the carbon dioxide that is emitted into the atmosphere today will likely linger in the atmosphere for centuries to come. (One research group has concluded that carbon dioxide remains in the atmosphere for approximately 1000 years after emission.)²⁰

There are a number of implications of this delayed response to regulation, implications that I develop elsewhere.²¹ However, here I want to focus on the implications of this delayed response for the inevitable debates over causation and climate change. As I indicated at the beginning of this piece, the causal connections between climate change and human activities continue to be disputed, albeit primarily at the fringes of the policy debate.²² It may well be that those arguments about causation will be overcome and a regulatory system will be implemented.

But what if the new, stringent regulatory system that has been set up to address climate change is an apparent failure? What if, a few years after its implementation, temperatures continue to rise as do sea levels? What if serious climate-related events occur that cause massive economic damage and loss of life—another hurricane striking the U.S. Gulf Coast or Bangladesh, the flooding of a small Pacific Ocean island nation, massive droughts in North America, Africa, or South Asia, or historic forest fires in North America or Australia? Wouldn't the continued changes to the global climate and the related impacts on human and natural systems raise questions at least in the eyes of some about whether the regulatory system is working? And wouldn't questions about whether the regulatory system is working imply

18. See Biber, *supra* note 2, at 1298, 1301.

19. *Id.* at 1312-14.

20. See Susan Solomon et al., *Irreversible Climate Change Due to Carbon Dioxide Emissions*, 106 PROC. NAT'L ACAD. SCI. 1704, 1705 (2009), available at <http://www.pnas.org/content/early/2009/01/28/0812721106.full.pdf+html> (noting that carbon dioxide levels will continue at high levels for about 1000 years even if emissions are ended).

21. See Biber, *supra* note 2, at 1301-04.

22. See *supra* p. 977.

questions about whether the regulatory system is really targeting the actual cause of global climate change?²³

It seems likely that after the enactment of a climate regulatory system, there will be economic and political winners and losers from the new system—just think of utility companies in the United States which are highly dependent on coal-fired power plants for power production or the coal mining companies that serve them. And it seems just as likely that even after the initiation of the regulatory system, the economic and political losers will not simply give up the battle and accept the new regulatory system. Instead, they may make efforts to undo that system, either in whole (through repeal) or in part (through watering down the regulatory system).

There are reasons to believe that, in the context of a regulatory system that attempts to tackle delayed harm (as with climate change), the parties that seek to challenge the regulatory system will find fertile political ground. After all, the very nature of a delayed harm problem means that it takes an extended period of time before we discover that a human activity is causing environmental harm.²⁴ During that extended period of time, it is likely that there has been significant economic investment in the harm-causing human activity—think of the coal-fired power plants and the coal mining companies—and those individuals or corporations that have made the investments will have a significant incentive to try and undermine the regulatory system. Public choice theory indicates that these parties who suffer concentrated, high costs from the regulatory system will have an organizational advantage.²⁵

But there are additional reasons why the political ground will be fertile for any challenges to the regulatory system. Long-standing human activities attract not just economic investment, but psychological investment as well. It seems unlikely that individuals or societies will easily give up cherished activities that have been pursued for so long—and the “endowment effect” or “status quo bias” literature provides support for this hypothesis.²⁶ In the context of climate change, activities

23. Of course, the scenario I am describing here would undermine arguments that there is no climate change occurring, but that is a separate question from arguments that propose that human activity is not causing climate change.

24. See Biber, *supra* note 2, at 1301.

25. See Eric Biber, *The Importance of Resource Allocation in Administrative Law*, 60 ADMIN. L. REV. 1, 40-41 (2008).

26. See Holly Doremus, *Takings and Transitions*, 19 J. LAND USE & EVTL. L. 1, 22-24 (2003) (noting the presence of an “endowment effect” and “status quo bias” as explanations for the existence of a resistance to regulation); Lisa Heinzerling, *Environmental Law and the Present Future*, 87 GEO. L.J. 2025, 2068 (1999) (discussing the influence that habits and the “status quo”

such as the use of automobiles, flood rice irrigation, and clearing of forests for agriculture have all been undertaken for many years (millennia in some cases) by many people. A stringent carbon regulatory system will constrain these activities and thus create fertile ground for a “backlash.”²⁷

In this context, questions about the causal relationship between human activities and climate change might find receptive audiences—particularly when those questions can be framed based on the “actual” experience of real-world climate regulation. “Why should we give up long-standing practices, or make significant economic sacrifices, when it’s already been shown that it isn’t doing any good? In fact, why should we believe that our actions are causing climate change, when things aren’t any better?”

It is worse than this, however. To this point, I have been framing the situation as one where there is, in fact, a causal connection between human activity and climate change, but the delayed harm nature of climate change makes it easy for plausible but spurious arguments to the contrary to be made. To be clear, I am of the opinion that this is the case. But it may not be. Whether it be in the case of climate change or other areas of delayed harm, the delay makes drawing conclusions about causation tricky (as noted earlier).²⁸ Until and unless the time “gap” between the initiation of regulation and the decrease or termination of harm passes, there will be uncertainty as to whether, in fact, the activity regulated is actually the cause of the harm. During that time “gap,” both scenarios—for example, the world where the activity does cause the harm and the world where the activity does not cause the harm—will result in the same on-the-ground results: regulation without any obvious improvement in environmental condition. Thus, when those who would question the regulatory scheme point to the lack of any change in environmental conditions as proof of a lack of causation, they will have a point. Their arguments will, in fact, be consistent with the facts on the ground.

Is there anything that could be done to forestall or reduce the risk of these kinds of arguments? One option, which I explore in more detail

have on implementing environmental regulations); Daniel Kahneman et al., *Experimental Tests of the Endowment Effect and the Coase Theorem*, J. POL. ECON. 1325, 1326, 1328, 1345 (1990) (suggesting the “endowment effect” is not limited to physical goods); Michael A. Strahilevitz & George Loewenstein, *The Effect of Ownership History on the Valuation of Objects*, 25 J. CONSUMER RES. 276, 276, 285 (1998) (providing empirical evidence of an increase in the “endowment effect” as the duration of ownership increases).

27. See Biber, *supra* note 2, at 1313.

28. See *supra* notes 11-16 and accompanying text.

elsewhere, would be to try and change the political dynamics such that questions about causation do not find such fertile ground.²⁹ For instance, the new regulatory system might encourage the development of new constituencies and interest groups that would support the regulations against efforts to roll them back³⁰—in the context of climate change, new wind and solar power industries might be developed by the regulatory system and provide support for it against these types of arguments.

Another option involves taking active steps to undo the harm from the prior human activities, so that interim, short-term progress is evident. I call this the “restoration” option, and it has been pursued in a range of other contexts, such as endangered species protection and hazardous waste remediation.³¹ The potential here is that by directly addressing the built-up harm, rather than the activity causing the harm, it might reduce the “gap” between regulation and environmental improvement and therefore reduce the political effectiveness or salience of arguments that question causation. However, restoration can be costly, time-consuming, and uncertain of success. It certainly is no magic bullet.³²

One option that is most definitely worth consideration is public education—both about the nature of causation in the context of delayed harm and the problems that delayed harm poses to any regulatory system. The evidence for causation that was developed prior to the enactment of regulation should be marshaled as carefully as possible and presented to the public to make the case for a causal linkage (and therefore regulation) as clear as possible.³³ In many ways, the IPCC reports on climate science have performed a valuable function in this respect for elite policymakers by gathering together the climate science literature in one place in a relatively accessible and easy-to-understand

29. See Biber, *supra* note 2, at 1307-08.

30. *Id.* at 1332-33.

31. *Id.* at 1342-43.

32. *Id.* at 1350.

33. An additional advantage of marshalling evidence in this manner is that it can assure policymakers that, to the extent feasible, the causal linkage has been adequately established. As noted above, one challenge of regulation of delayed harms is that it may take significant time after the regulation is implemented for harm to be reduced in a way that provides definitive evidence of the causal linkage. In other words, delayed harms have potentially much higher levels of uncertainty as to causal linkages compared to other areas—raising the risk of costly environmental regulations that are misguided in the activities they target. Carefully gathering the causal evidence prior to regulation can be a way to assure policymakers that there is a minimal risk that the environmental regulation is misguided.

form.³⁴ But even broader dissemination—and more easily accessible summaries of the science—would be necessary to provide the public as a whole the full evidence of causation. Moreover, the educational materials must also provide not just the evidence on causation, but also a warning about the delayed harm nature of climate change and its implications for the success or failure of climate regulation. Here, the IPCC materials are less transparent—in many ways, the cumulative, persistent, and delayed nature of climate change has only begun to register with climate scientists and policymakers.³⁵ Much more should be done to inform legislators and the public as a whole about the inherent challenges of any climate regulatory system. Otherwise, we run the risk that all of our efforts to implement a climate regulatory system will, in the long run, be for naught.

34. See, for example, the summary report provided by the IPCC for policymakers on the science of climate change. IPCC, *supra* note 3, at 2.

35. The IPCC summary for policymakers mentions the fact that even if carbon dioxide levels are kept constant at year 2000 levels, global temperature may continue to rise, but the report does not develop the implications of this point. *See id.* at 7-8. Recent scientific studies have prompted press reports that have begun to develop the implications of the delayed harm of climate change. *See, e.g.*, Cornelia Dean, *Emissions Cut Won't Bring Quick Relief, Scientists Say*, N.Y. TIMES, Jan. 27, 2009, at A21 (discussing Solomon et al., *supra* note 20).
