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Environmental Law and Policy Annual Review

Environmental Law and Policy Annual Review

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The Environmental Law and Policy Annual Review

Dear Readers:

The Environmental Law and Policy Annual Review (ELPAR) is published by the Environmental Law Institute's (ELI's) *Environmental Law Reporter* (*ELR*) in partnership with Vanderbilt University Law School. ELPAR provides a forum for the presentation and discussion of the best law and policy-relevant ideas on the environment from the legal academic literature each year. The publication is designed to fill the same important niche as *ELR* by helping to bridge the gap between academic scholarship and environmental policymaking.

ELI and Vanderbilt formed ELPAR to accomplish three principal goals. The first is to provide a vehicle for the movement of ideas from the academy to the policymaking realm. Academicians in the environmental law and policy arena generate hundreds of articles each year, many of which are written in a dense, footnote-heavy style that is inaccessible to policymakers with strong time constraints. ELPAR selects the leading ideas from this large pool of articles and makes them digestible by reprinting them in a short, readable fashion accompanied by expert, balanced commentary. The second goal is to improve the quality of legal scholarship. Academicians have strong incentives to write theoretical work that ignores policy implications. ELPAR seeks to shift these incentives by recognizing scholars who write articles that not only advance legal theory but also reach policy-relevant conclusions. By doing so, ELPAR seeks to induce academicians to generate new policy-relevant ideas and to improve theoretical scholarship by inducing them to account for the hard choices and constraints faced by policymakers. To draw on an old joke in the academy, policymakers cannot simply assume a trap door when they need one, and theoretical scholarship will be far better if scholars cannot either. The third and most important goal is to provide a first-rate educational experience to law students interested in environmental law and policy.

To nominate articles to be included in ELPAR, the ELPAR Editorial Board and Staff conducted a key word search for "environment!" in an electronic database. The search was limited to articles published from August 1, 2009, until July 31, 2010, in the law reviews from the top 100 *U.S. News and World Report*-ranked law schools and the top 50 Washington & Lee-ranked environmental law journals. Student comments were excluded. The students then screened articles for consistency with the five ELPAR selection criteria, with the first two criteria receiving greatest weight: issue of environmental quality importance; policy-relevant solution; creative/novel approach; feasible/implementable; and readability/persuasiveness.

Through discussion and consultation, the students ultimately chose 20 articles for review by the ELPAR Advisory Board. The Advisory Board provided invaluable insights to the students on article selection. Vanderbilt University Law School Prof. Michael Vandenbergh, ELI Senior Attorney Linda Breggin, and *ELR* Editor-in-Chief Scott Schang also assisted the students in the final selection process. Responses on the selected papers then were solicited from practicing experts in both the private and public sectors.

On March 30, 2011, at Vanderbilt University Law School, and on April 15, 2011, on Capitol Hill, ELI and Vanderbilt cosponsored conferences at which some of the authors of the articles and responses presented their ideas to an audience of business, government (federal, state, and local), think tank, media, and nonprofit representatives. The conferences were structured in a manner that encouraged dialogue among presenters and attendees. Audio recordings of these events are posted on the ELI and Vanderbilt University Law School ELPAR websites.

The students worked with the authors to shorten the original articles and to highlight the policy issues presented, as well as to edit the responses. Those articles and responses are presented as ELPAR, which is also the August issue of *ELR*.

Linda K. Breggin, Senior Attorney, Environmental Law Institute,
Adjunct Professor of Law, Vanderbilt University Law School

Scott Schang, Editor-in-Chief, *Environmental Law Reporter*

Michael P. Vandenbergh, Professor of Law, Tarkington Chair in
Teaching Excellence, Vanderbilt University Law School

ARTICLE

Environmental Enforcement in Dire Straits: There Is No Protection for Nothing and No Data for Free

by Victor B. Flatt and Paul M. Collins Jr.

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While much of the world debates what our environmental laws should be,[1] the less esoteric question of whether the environmental laws we already have are being properly enforced continues to be insufficiently examined. As we approach the fortieth anniversary of modern environmental law, the answer to this "$64 billion question" still is not clear.

Numerous commentators have noted that the difference between environmental laws that actually protect the environment and those that do not is highly dependent on whether, and in what way, these laws are enforced.[2] Testing whether we are correctly and/or adequately enforcing our environmental laws, however, has proven remarkably difficult as measures of environmental quality have changed over time and differ between locations.[3] This makes the actual connection between enforcement actions and environmental improvements very difficult to ascertain.

Throughout much of the history of environmental law, the assumption has been that vigorous enforcement deters noncompliance with laws, and thus, brings about the desired outcomes.[4] This assumption is reflected in the very structure of the cooperative federalism model for the administration of environmental laws,[5] as well as the theories underlying citizen suit provisions.[6] However, merely examining the number of such state and private actions taken against noncomplying parties may not tell us much about the overall effectiveness of an environmental program.[7]

Additionally, recent "second generation" regulatory proponents have suggested that direct enforcement may not achieve effective compliance (and thus, environmental improvements), and that so-called cooperative mechanisms may work better.[8] As noted by Professors Clifford Rechtschaffen and David Markell,[9] "many states have actively championed this strategy," pushing towards market mechanisms for pollution control, and proposing to change environmental enforcement from primarily deterrence-based enforcement to a cooperative regime. Some of

This Article is excerpted from the Notre Dame Law Journal, 85 Notre Dame L. Rev. 55 (2009), *and is reprinted with permission.*

1. *See, e.g.*, Marcilynn A. Burke, *Green Peace? Protecting Our National Treasures While Providing for Our National Security*, 32 Wm. & Mary Envtl. L. & Pol'y Rev. 803, 805 (2008) (discussing requested changes to a host of federal environmental laws to accommodate national security); Charles de Saillan, *The Use of Imminent Hazard Provisions of Environmental Laws to Compel Cleanup at Federal Facilities*, 27 Stan. Envtl. L.J. 43, 205–06 (2008) (arguing that individuals and organizations should take a more proactive approach in using federal and state laws to initiate the cleanup of hazardous facilities); Robert V. Percival, *Environmental Law in the Twenty-First Century*, 25 Va. Envtl. L.J. 1, 2–4 (2007) (suggesting a history of partisan politics delayed the implementation of cohesive environmental reform).
2. *See* William L. Andreen, *Beyond Words of Exhortation: The Congressional Prescription for Vigorous Enforcement of the Clean Water Act*, 55 Geo. Wash. L. Rev. 202, 211 (1987); Victor B. Flatt, *Spare the Rod and Spoil the Law: Why the Clean Water Act Has Never Grown Up*, 55 Ala. L. Rev. 595, 596 (2004); Robert L. Glicksman & Dietrich H. Earnhart, *The Comparative Effectiveness of Government Interventions on Environmental Performance in the Chemical Industry*, 26 Stan. Envtl. L.J. 317, 319–21 (2007); *see also* Joel A. Mintz et al., Environmental Enforcement 5–15 (2007) (discussing the various theories and objectives of environmental enforcement).
3. Robert W. Adler, *The Two Lost Books in the Water Quality Trilogy: The Elusive Objectives of Physical and Biological Integrity*, 33 Envtl. L. 29, 49 (2003); Clifford Rechtschaffen & David L. Markell, *Improving State Environmental Enforcement Performance Through Enhanced Government Accountability and Other Strategies*, 33 ELR 10559, 10565 (Aug. 2003).
4. Glicksman & Earnhart, *supra* note 2, at 320.
5. *See* Richard J. Pierce Jr., *Issues Raised by* Friends of the Earth v. Laidlaw Environmental Services*: Access to the Courts for Environmental Plaintiffs*, 11 Duke Envtl. L. & Pol'y F. 207, 234 (2001) (arguing that the environmental federalism standard allows no or very little second guessing of state enforcement decisions).
6. Peter A. Appel, *The Diligent Prosecution Bar to Citizen Suits: The Search for Adequate Representation*, 10 Widener L. Rev. 91, 91 (2004).
7. Michael P. Vandenbergh, *Beyond Elegance: A Testable Typology of Social Norms in Corporate Environmental Compliance*, 22 Stan. Envtl. L.J. 55, 66 (2003) (citing Clifford Rechtschaffen, *Deterrence vs. Cooperation and the Evolving Theory of Environmental Enforcement*, 71 S. Cal. L. Rev. 1181, 1219 (1998)); *see also* Victor B. Flatt, *A Dirty River Runs Through It (The Failure of Enforcement in the Clean Water Act)*, 25 B.C. Envtl. Aff. L. Rev. 1, 17–19 (1998).
8. *See* Rena I. Steinzor, *Myths of the Reinvented State*, 29 Cap. U. L. Rev. 223, 231–32 (2001).
9. Clifford Rechtschaffen & David L. Markell, Reinventing Environmental Enforcement & the State/Federal Relationship 2 (2003).

the cooperative-based enforcement literature propounds the theory that in addition to better results, cooperative-based enforcement may cost less, and thus, be a more cost-efficient form of effective environmental enforcement.[10]

Theories regarding different environmental policies and enforcement strategies are important to making environmental protection efficient and responsive to societal needs, but what is really needed is an empirical examination of which kinds of environmental enforcement strategies work successfully.

This Article seeks to gather data and conduct statistical analyses that can take the discussion even further. By using data painstakingly culled from the states and combining that data with newly available EPA enforcement data, we put forward some important new conclusions regarding the resource allocation necessary for effective environmental enforcement strategies.[11] Just as importantly, we use the knowledge gained from the process, and results of data collection to propose ways that data can be improved to make future analyses of environmental enforcement and progress both easier and more useful.

I. Prior Empirical Analyses

From 2005 through 2008, a research group at the University of Kansas surveyed opinions of major National Pollutant Discharge Elimination System[12] (NPDES) permit holders to determine which types of enforcement mechanisms were believed to be most effective, and also sought to see what happened to source compliance following various enforcement actions.[13] Their findings have been an important source of new information, particularly about the effectiveness of state enforcement versus federal enforcement.

Although most of the data examining the effectiveness of either deterrence- or compliance-based enforcement are industry specific, a 1996 through 1998 statistical analysis by one of the authors of this Article looked at state enforcement of the Clean Water Act (CWA) in two states and examined enforcement across all industrial groups for that program.[14] The study found that although enforcement actions may have been occurring at the same rate, the individual nature of each state's enforcement actions meant that actual compliance achievement was not uniform even for similarly situated sources.[15] This finding challenged the assumption that "enforcement" automatically leads to compliance and focuses us more on the type or kind of enforcement that is occurring.

Despite prior empirical analyses, we still have no real idea how we determine to what extent resource allocation is necessary for effective enforcement, or whether cooperative- or deterrence-based enforcement is more effective. We know that states are required to meet the same federal standards and implement the same federal statutes.[16] The states are also increasingly responsible for primary enforcement of the environmental laws, which means that their ability to effectively enforce the standards and the laws determines whether our environment is protected.[17] As a result, examining the effectiveness of various state programs might be a good way to determine optimal enforcement strategy.

The following are the interrelated stories of the construction of possible statistical methods for testing our findings, and the attempt to gather data to provide the raw inputs for such analyses.

II. Research Background, Methodology, and Data Collection

A. *Outcome Measurement Issues*

The underlying issue in trying to conduct the statistical analysis of the effectiveness of any variable, such as different environmental enforcement strategies, is determining an outcome measurement. In the environmental arena this is particularly problematic because, in general, there is no direct measurement of environmental quality.[18] Therefore, there must be some effective substitute for environmental markers that replicates or comes close to replicating the actual state of the environment.

One can try to test whether enforcement actually alters the way that pollution sources comply with the law[19] by measuring the average length of time violators are out of compliance and comparing it to the actual harm that the environment is undergoing.[20] This is an appropriate measure because, even when the enforcement strategy changes, the sources themselves must still self report technical compliance with the standards on a monthly basis. Its use is limited though, as it fails to capture those sources that are outside the regulatory net altogether and so it cannot test whether we are regulating the correct things or not.[21] Nor does it determine whether the permit terms themselves are consistent with the legal requirements of the federal regulations, which is another concern with administrative discretion.[22] It simply tells us the effects of various regulatory strategies on the legal compliance issues.

Nevertheless, as the structure of the environmental laws suggests that compliance effectuates the goal of a clean environment, we propose the use of noncompliance with

10. Steinzor, *supra* note 8, at 233.
11. *See* 85 Notre Dame L. Rev. 55, 84-86; *see also* sources cited *infra* note 30.
12. *See* Federal Water Pollution Control Act, 33 U.S.C. §§1251–1387 (2006). Section 402 of the CWA established the NPDES. *Id.* §1342.
13. Glicksman & Earnhart, *supra* note 2, at 329–32.
14. *See* Flatt, *supra* note 7, at 21–26.
15. *Id.* at 26–27.
16. *See* William W. Buzbee, *Asymmetrical Regulation: Risk, Preemption, and the Floor/Ceiling Distinction*, 82 N.Y.U. L. Rev. 1547, 1550 (2007).
17. *See* Flatt, *supra* note 7, at 20.
18. *See* Adler, *supra* note 3, at 49.
19. Flatt, *supra* note 7, at 24.
20. *Id.* Courts have affirmed the assumption that violating congressionally mandated standards can be reasonably assumed to harm the environment. *See, e.g.*, Friends of the Earth, Inc. v. Laidlaw Envtl. Servs., 528 U.S. 167, 184–85 (2000).
21. Flatt, *supra* note 7, at 22.
22. Glicksman and Earnhart attempt to measure this. *See* Glicksman & Earnhart, *supra* note 2, at 504–09.

permits history, which are self reported, as the output variable to test the effects of various enforcement strategies. In addition, we also examine the amount of fines levied against facilities for environmental violations as a second means to gauge compliance. While this second measure is somewhat crude, it is nonetheless useful because monetary fines can potentially act as a deterrent to polluting activities and thus encourage facilities' compliance with environmental laws.[23] This proxy for enforcement thus assumes that facilities fined for environmental violations are more likely to come into compliance with environmental regulations as a result of this enforcement strategy.

B. Data

Below, we discuss for comparison the issues regarding federal data from the EPA concerning pollution sources and individual state data concerning environmental funding and enforcement policies.

1. Federal Data From the EPA Concerning Pollution Sources

In response to continuing difficulties in tracking enforcement, the EPA introduced its Integrated Data for Enforcement Analysis[24] (IDEA) in the early 1990s. Nevertheless, the introduction of IDEA has still not generally enabled outside examinations of enforcement effectiveness. The current online version allows one to search for permitted sources using several factors such as location, compliance, and history[25]; however, this is not in a format that allows for the downloading of data to conduct comparisons across state variables.[26]

Compliance data is presented to the public through the system known as Enforcement and Compliance System Online (ECHO); however, data available on ECHO do not contain a description of the permitted source that would allow a researcher to control for source differences in making comparisons of compliance of sources between states.[27] Additionally, through a blocking program, the EPA prevents data from being downloaded from the ECHO site by a computer system, thus requiring manual entry of data.[28]

We learned that it was possible for the public to directly access the IDEA data, but to do so, one would need to obtain an EPA mainframe user ID and account and obtain remote access via a web browser.[29] The description of the data fields in IDEA seemed to indicate that if we could obtain the compliance data for three major federal environmental laws—the Clean Air Act (CAA), the CWA, and the Resource Conservation Act (RCRA)—we could meet our research needs. With respect to the air data, the number of quarters that a source is noncompliant—one of our proposed dependent variables—is listed for the two years preceding the date of a facility's inspection.[30]

There were also data fields that would help us to control for differences between sources.[31] With respect to the use of number of quarters a source is in noncompliant status, there are variables that describe the kind of noncompliance more specifically. This indicated that we could separate reporting violations from permit violations. There are also fields that assist in testing the dependent variables that we have at issue, and those that show the amount of penalty, the action taken, and the date of a completed compliance action.[32]

Our empirical analyses focus only on the following dependent variables: (1) the penalties assessed against facilities for violations of CWA regulatory requirements; (2) the penalties assessed against facilities for violations of CAA regulatory requirements; and (3) the number of quarters (in the two years preceding the inspection date) that facilities were in violation of compliance with CAA regulatory requirements. In other words, due to a lack of data availability, we exclude compliance with RCRA requirements from our empirical analyses.

2. Data From States for Comparison Purposes

Because we are examining attitudes about environmental enforcement, at least loosely correlated with political orientation and possibly with regional differences,[33] we felt

23. *See, e.g.*, Mark A. Cohen, *Empirical Research on the Deterrent Effect of Environmental Monitoring and Enforcement*, 30 ELR 10245, 10250 (Apr. 2000) (suggesting that public awareness of sanctions may damage the value and reputation of sanctioned firms, helping to increase general environmental deterrence); Surabhi Kadambe & Kathleen Segerson, *On the Role of Fines as an Environmental Enforcement Tool*, 41 J. Envtl. Plan. & Mgmt. 217, 218, 224–25 (1998) (developing a model for analyzing the effect of fine amounts on regulatory compliance); Dorothy Thornton et al, *General Deterrence and Corporate Environmental Behavior*, 27 Law & Pol'y 262, 278-83 (2005) (questioning the "explicit" deterrent effect of fines but suggesting that they "implicitly" reinforce the general deterrence of other informal sanctions). *But see* Montserrat Viladrich Grau & Theodore Groves, *The Oil Spill Process: The Effect of Coast Guard Monitoring on Oil Spills*, 10 Envtl. & Resource Econ. 315, 322–24 (1997) (noting that relatively low fines had no significant effect on the frequency or size of oil spills).

24. *See* Peter J. Fontaine, *EPA's Multimedia Enforcement Strategy: The Struggle to Close the Environmental Compliance Circle*, 18 Colum. J. Envtl. L. 31, 57–58 (1993).

25. *See* U.S. EPA, *Enforcement & Compliance History Online, Compliance Data (Air Program)*, *at* http://www.epa-echo.gov/echo/compliance_report_air.html (last visited Sept. 20, 2009).

26. *See id.*

27. *See* Memorandum from Victor B. Flatt to Member Scholars of the Ctr. for Progressive Reform on Sufficiency of IDEA Data for Proposed Analysis (May 1, 2005) (on file with the author) [hereinafter Flatt Memorandum].

28. *Id.* This is ostensibly because of the large computer time costs the EPA would incur through such a download. Because our study has hundreds of thousands of pieces of data, this would make analysis virtually impossible.

29. *See* U.S. EPA, *Integrated Data for Enforcement Analysis*, *at* http://www.epa.gov/compliance/data/systems/multimedia/idea (last visited Sept. 24, 2009).

30. *See* Professional Homepage of Victor B. Flatt, Clean Air Data, http://www.law.uh.edu/faculty/vflatt/cleanair.pdf (last visited Oct. 2, 2009) [hereinafter Clean Air Data] (providing a publically accessible, permanent link to EPA's data); Professional Homepage of Victor B. Flatt, Clean Water Data, http://www.law.uh.edu/faculty/vflatt/cleanwater.pdf (last visited Oct. 2, 2009) [hereinafter Clean Water Data] (same).

31. *See id.*

32. *See id.*

33. *See*, *e.g.*, Riley E. Dunlap, Chenyang Xiao & Aaron M. McCright, *Politics and Environment in America: Partisan and Ideological Cleavages in Public Support for Environmentalism*, 10 Envtl. Pol. 23, 28–33 (2001); David M.

that it was important to select states with different political orientations. The states selected were Alaska, Arizona, California, Colorado, Connecticut, Florida, Georgia, Indiana, Kansas, Maryland, New Jersey, New Mexico, New York, North Carolina, Ohio, Oregon, Tennessee, and Texas. Though we originally hoped to obtain data for ten years, we focused on the overlapping time in the states searched.

The states' budget numbers did not exactly match up with one another. For example, states might report budgets based on authorizations or expenditures, and the budgets might be subdivided by medium (air, water) or by expense category (personnel, fines, etc.).[34] It seemed that the best option we had for comparing budget numbers was to start with the largest common categories that were informative. We decided that this would be total environmental expenditures, assuming that most states categorized "environmental" similarly.

3. State Per Capita Environmental Spending

A cursory examination of the state budget data seemed to indicate wide swings in per capita environmental spending,[35] so the authors revisited each state's budget data to see how the budget was broken down. In several cases, we discovered that the state budget numbers were not comparable due to common differences in whether broad health, agriculture, or recreation programs were included in the state's "environmental" or "natural resource" category. We made adjustments to the figures of some of the states per capita environmental studies as appropriate.

Ultimately, though we contacted sources in Georgia multiple times, we received no return calls or information; therefore, Georgia was dropped from consideration. With this data in hand, our measure of *State per Capita Environmental Spending* represents each of the seventeen states' per capita environmental spending, calculated by year. This variable allows us to examine the relationship between state environmental spending and compliance with CAA and CWA regulatory requirements.

4. State Ideology

As noted above, we were also interested in whether the choice between cooperative versus deterrence-based enforcement strategies has a significant effect on source compliance. After conducting research on such state policies, we could find no uniform legislative or regulatory marker indicating whether cooperative versus deterrence-based enforcement strategies was dominant in a particular state.

We did find, however, a *State Elite Ideology* proxy capable of capturing the nuances between the political ideologies of the American states, provided by William Berry and his coauthors.[36] Their measure, calculated yearly for each state, is based on three points of information: interest group ratings of a state's members of Congress, the power division among Republicans and Democrats in a state's legislative chambers, and the ideology of a state's governor.[37]

These scores have been shown to have substantial face validity and are able to capture the differences between the underlying ideologies of the major political parties that vary between states.[38] Given the power offered by the Berry et al. scores, we utilized them to operationalize our measure of *State Elite Ideology*.

III. Empirical Results

Table 1: OLS Regression Estimates of the Penalty Assessed Against a Facility in Violation of Clean Water Act, 2000–2003

Variable	Coefficient
State per Capita Environmental Spending	17.94*** (8.43)
State Elite Ideology	–14.32*** (3.74)
Constant	–443.06 (649.1)
R^2	0.075
N	101,498

Entries are ordinary least squares regression coefficients. Numbers in parentheses indicate robust standard errors, clustered on facility. *** $p < .05$ (two-tailed tests).

Model includes 94 dummy variables controlling for the Enforcement Action Code of the facility, 31 dummy variables controlling for the Inspection Type Code of the facility, and 97 dummy variables controlling for the Standard Industrial Code clusters of the facility (results not shown).

Sample includes the following states: Alaska, Arizona, California, Colorado, Connecticut, Florida, Indiana, Kansas, Maryland, North Carolina, New Jersey, New Mexico, New York, Ohio, Oregon, Tennessee, and Texas.

Konisky, *Regulator Attitudes and the Environmental Race to the Bottom Argument*, 18 J. Pub. Admin. Res. & Theory 321, 323 (2007); Eugene S. Uyeki & Lani J. Holland, *Diffusion of Pro-Environment Attitudes?*, 43 Am. Behav. Sci. 646, 658–60 (2000).

34. For full breakdowns of the states' budgets from each year, see Professional Homepage of Victor B. Flatt, *State Budget Data*, *at* http://www.law.uh.edu/faculty/vflatt/state-budget-data (last visited Oct. 2, 2009) [hereinafter State Budget Data].

35. *See* Federal Water Pollution Control Act, 33 U.S.C. §§1251–1387 (2006), ELR Stat. CWA §§101-607. Section 402, 33 U.S.C. §1342, of the CWA established the NPDES.

36. William D. Berry et al., *Measuring Citizen and Government Ideology in the American States, 1960–93*, 42 Am. J. Pol. Sci. 327, 330–31 (1998). These ideology scores have subsequently been updated through 2006. *See* Richard C. Fording, *State Citizen & Government Ideology*, *at* http://www.uky.edu/~rford/stateideology.html (last visited Sept. 20, 2009) (containing updated ideology scores through 2007).

37. Berry et al., *supra* note 36, at 330-31.

38. *Id.* at 341–43.

Table 1 reports the results of the model that captures the penalty assessed against a facility in violation of compliance with CWA regulatory requirements. As our dependent variable,[39] the monetary penalty levied against a facility is a continuous variable, and we utilize ordinary least squares regression (OLS) to model the influence of *State per Capita Environmental Spending* and *State Elite Ideology* on the penalty assessed against a facility.[40] This table reveals that the more a state spends per capita on its environmental budget, the higher the fines levied against polluters for violations associated with the CWA. In substantive terms, for each $1 per capita increase in state environmental spending, the fine levied against a facility increases by about $18, holding all else constant. The results of our proxy for *State Elite Ideology* indicates that as a state's political elite become more liberal, the fines levied against polluters for violations of CWA regulatory requirements decrease. All else equal, a one-unit increase in the liberalism of the state's political elite corresponds to a $14 decrease in the monetary penalty levied against a polluter.

Table 2 presents the results of the model that captures influences on the penalty assessed against a facility for violations of compliance with CAA regulatory requirements.[41] The results of the CAA model indicate, unlike the results of the CWA model, that neither *State per Capita Environmental Spending* nor *State Elite Ideology* influences the monetary penalty assessed against a facility. This is evidenced by the fact that the coefficients associated with these variables fail to obtain statistical significance at conventional levels.

Table 2: OLS Regression Estimates of the Penalty Assessed Against a Facility in Violation of Clean Air Act, 2000–2003

Variable	Coefficient
State per Capita Environmental Spending	–2.59 (31.90)
State Elite Ideology	–2.83 (6.86)
Constant	8855.30 (10,435.90)
R^2	0.007
N	99,428

Entries are ordinary least squares regression coefficients. Numbers in parentheses indicate robust standard errors, clustered on facility.

Model includes 12 dummy variables controlling for the Air Program Code of the facility, 15 dummy variables controlling for the National Action Type Code of the facility, and 113 dummy variables controlling for the Standard Industrial Code clusters of the facility (results not shown).

Sample includes the following states: Alaska, Arizona, California, Colorado, Connecticut, Florida, Indiana, Kansas, Maryland, North Carolina, New Jersey, New Mexico, New York, Ohio, Oregon, Tennessee, and Texas.

Table 3 reports the results of the model that captures the number of quarters that a facility was in violation of the CAA regulatory requirements. As this dependent variable[42] is a non-negative count, we utilized a negative binomial regression model.[43] Table 3 also reports the percentage change in the number of quarters a facility is in violation of CAA regulatory requirements corresponding to a one-unit change in each independent variable. This Table reveals that for each $1 per capita increase in state environmental spending, the number of quarters a facility is in violation of the CAA decreases by 0.6%, *ceteris paribus*. For example, compared with a state that spends $28 per capita

39. The mean of the dependent variable in Table 1 is 903.8 (standard deviation = 15,159.87; range = 0 to 792,000). The data used in Table 1 include facilities that were assessed monetary penalties for violations of CWA regulatory requirements, as well as those facilities that were not assessed monetary penalties. The data contain 25,282 unique observations of facilities, meaning that, on average, facilities appear in the data 3.93 times. To account for this non-independence of observations, we estimate the regression model employing robust standard errors, clustered on facility. *See generally* M. Arellano, *Computing Robust Standard Errors for Within-Groups Estimators*, 49 Oxford Bull. Econ. & Stat. 431, 433 (1987) (explaining a formula for calculating robust standard errors).

40. Damodar N. Gujarati & Dawn C. Porter, Basic Econometrics 55–80 (5th ed. 2009) (explaining the methodology behind and relative simplicity of the OLS regression model). *See generally* Christopher H. Achen, Interpreting and Using Regression 18–34 (John L. Sullivan & Richard G. Niemi eds., 1982) (providing an overview of OLS regressions).

41. The mean of the dependent variable in Table 2 is 2250.3 (standard deviation = 60,139.4; range = 0 to 8,000,000). The data used in Table 2 include facilities that were assessed monetary penalties for violations of CAA regulatory requirements, as well as those facilities that were not assessed monetary penalties. The data contain 15,407 unique observations of facilities, meaning that, on average, facilities appear in the data 6.59 times. To control for the non-independence of observations, we estimate the regression model utilizing robust standard errors, clustered on facility.

42. The mean of the dependent variable in Table 3 is 1.55 (standard deviation = 2.01; range = 0 to 8). The data used in Table 3 include facilities that were in violation of CAA regulatory requirements, as well as those facilities that were not in violation of CAA regulatory requirements. The data contain 25,282 unique observations of facilities, meaning that, on average, facilities appear in the data 3.93 times. To account for this non-independence of observations, we estimate the negative binomial regression model employing robust standard errors, clustered on facility.

43. The negative binomial regression model (NBRM) is preferable to the OLS regression model given the makeup of our dependent variable. The NBRM is distinct from the most obvious alternative, the Poisson model, in that the NBRM does not make the assumption that the variance is equal to the conditional mean of the dependent variable. Rather, the NBRM estimates a parameter, α, that accounts for the unobserved heterogeneity among observations in the data. In order to test for the appropriateness of the NBRM as compared with the Poisson model, we estimated a log likelihood test for over-dispersion in the data, which indicates that the NBRM is the more appropriate modeling strategy. For a general discussion of the NBRM, see, for example, A. Colin Cameron & Pravin K. Trivedi, Regression Analysis of Count Data 70–77 (1998) (discussing generally the use of the NBRM) and J. Scott Long & Jeremy Freese, Regression Models for Categorical and Limited Dependent Variables Using Stata 372–75 (2d ed. 2005) (explaining the advantages of NBRM compared to the Poisson regression model).

on the environment, in a state that spends $68 per capita, the number of quarters a facility is in violation of the CAA decreases by 0.2 quarters.

Table 3 also indicates that for each one-unit increase in state elite liberalism, the number of quarters a facility is in violation of the CAA increases by 0.2%, all things being equal.

Table 3: Negative Binomial Regression Estimates of the Number of Quarters a Facility Is in Violation of Clean Air Act, 2000–2003

Variable	Coefficient	Δ%[a]
State per Capita Environmental Spending	–.006*** (.003)	–0.6***
State Elite Ideology	–.002*** (.001)	+0.2***
Constant	.513 (.225)	
α	3.98 (.290)***	
Wald χ^2	34,651.06***	
N	99,428	

Entries are negative binomial regression coefficients. Numbers in parentheses indicate robust standard errors, clustered on facility. *** p < .05 (two-tailed tests).

[a] Indicates percentage change in the number of quarters a facility is in violation of compliance with Clean Air Act Regulatory Requirements corresponding to a one-unit change in the independent variable.

Model includes 12 dummy variables controlling for the Air Program Code of the facility, 15 dummy variables controlling for the National Action Type Code of the facility, and 113 dummy variables controlling for the Standard Industrial Code clusters of the facility (results not shown).

Sample includes the following states: Alaska, Arizona, California, Colorado, Connecticut, Florida, Indiana, Kansas, Maryland, North Carolina, New Jersey, New Mexico, New York, Ohio, Oregon, Tennessee, and Texas.

IV. Summary of Empirical Results

Our most important finding is that with regard to the CAA, the more a state spends per capita on its environmental budget, the shorter time a permitted source is in violation of the Act. This finding supports the conclusion that funding of environmental programs plays a very important role in how successful an agency is in avoiding, catching, and/or ending violations.

To the extent that support for cooperative-based enforcement has been premised on accomplishing compliance at a cost savings, we show that "cost savings" in environmental programs are very strongly associated with less compliance, and thus, should be removed as a supporting reason for using more cooperative types of enforcement. While this finding does not reject the idea that cooperative enforcement may assist compliance in some circumstances, or that it can be productively paired with deterrence-based enforcement in certain circumstances,[44] it does indicate that any effective cooperative enforcement that has been used would not have resulted in significant cost savings.

We have also shown that increased state environmental spending translates into better compliance, thus potentially improving the quality of the environment. Unfortunately, with regard to the CWA data, we were not able to show the same correlation because the EPA incorrectly entered the data for the important variable that measures how many quarters a source is noncompliant. We also do not know how splitting environmental budgets into different categories in each state might help in more efficient enforcement. Nevertheless, this result is important.

We also found that for administration of the CWA, the more a state spends per capita on its environmental budget, the higher the fines levied against polluters. Though we cannot make any definitive conclusion about how this relates to noncompliance times, if the CAA results were replicated in the CWA context, it might indicate that higher fines spur compliance, or that higher per-capita-spending states support higher fines.

Our results indicate that facilities are assessed larger fines for violations of the CWA and remain out of compliance with the CAA for shorter periods of time in states governed by conservative political elites. To the extent our other results suggest that cooperative-based enforcement is not particularly effective, this result might seem surprising, particularly if we believe that conservative political ideologies are more likely to be associated with cooperative-based enforcement.

Because we do not know how ideology actually relates to cooperative- versus deterrence-based enforcement, we can draw no real conclusions. However, the CWA finding could suggest that conservative ideologies allow polluters to reach worse violations, which in turn support higher fines. Conversely, the CAA finding may suggest that conservative state ideologies foster better compliance, perhaps through the use of more cooperative methods. It is possible that *adding* the carrot of cooperative schemes for enforcement in certain circumstances to the stick of deterrence-based enforcement may improve results overall.

V. Implications for Enforcement Policy

Resources do matter. For purposes of enforcement policy, this is the most important finding in our research. The strong relationship between per capita spending on state environmental programs and shorter noncompliance times in the CAA across many states of different sizes, environmental challenges, and political governance, demonstrates this. That "resources do matter" means that states cannot adequately do their jobs in enforcing environmental laws without necessary resources.

Our study shows that a lack of spending creates noncompliance rates outside what the American public would

44. Rechtschaffen & Markell, *supra* note 9, at 251–52.

assume or expect for enforcement of environmental programs. Presumably, this implication applies to federal environmental enforcement as well. Coupled with the results demonstrating that more resources lead to higher fines, the study also suggests that deterrence-based enforcement is important in actually creating effective compliance.

The efficacy of cooperative-based enforcement, either alone or in combination with deterrence-based enforcement, is harder to evaluate. We can see that at least during the time of our study, no cooperative-based enforcement was able to successfully produce effective environmental compliance at a significantly lower cost.

The substantive effect of elite ideology is not as strong as the effect of per capita state spending on the environment, but it is provocative. As noted above, it might suggest that some combination of cooperative- and deterrent-based enforcement is the optimal formula. We do know that one cannot get compliance on the cheap and that whether one uses cooperative- or deterrence-based enforcement, one still must spend money to protect the environment.

Data is important to understanding the effectiveness of environmental policies. The other important implication from our four-year study is related to the acquisition and reporting of the data. Though we believe that this study goes further than some previous studies, it does not answer more subtle questions directly. These questions can only be answered by an improvement in the availability of relevant data. For instance, to test the efficacy of cooperative-based enforcement more thoroughly, we would need to procure data from each state about how money in environmental enforcement is spent in each arena.

Of course, it is likely that data problems are themselves related to money spent on environmental programs. According to research done on EPA enforcement by Professor Joel Mintz, budget shortfalls are directly linked to poor data keeping and record collection.[45] According to Professor Mintz, "[W]hen faced with tight budgets, enforcement managers tend to cut record keeping first rather than contract the size and principal responsibilities of their staffs of inspectors, engineers, attorneys, etc."[46]

The time has come for the EPA to tackle this head on. To really understand which state programs promote better compliance, the EPA needs to receive enforcement data and information about resources in a uniform manner. This could be accomplished without impinging on federalism. States can create and operate their budgets in any manner they see fit, but they should be required to report data on delegated programs in a uniform manner. One option could be to require states to organize their data to show how much money was spent on environmental programs, how much went to enforcement, and of that, how much went to different kinds of enforcement. States already have this information, and changing to uniform reporting should not be too difficult.

Although the EPA has moved in the direction of providing more data to the public, the current publicly available database, ECHO, is difficult to use. Moreover, longstanding flaws in the data suggest that there is no effective mechanism to ensure correct reporting and entry of data.[47] Without these corrections, it will continue to be difficult to understand enforcement.

VI. Conclusion

Although our modern environmental programs have been in existence for decades, we have not learned all we need to know about which ways of enforcing these programs work and which do not. In our study, we were not able to put to rest the question of which is "better"—cooperative- or deterrence-based enforcement. In fact, sweeping generalizations may never be possible because most every state conducts its programs in a unique way.

However, we were able to empirically demonstrate that higher per capita spending by states on environmental enforcement programs is strongly associated with better program compliance, and thus, presumably better environmental results. This important finding should spur reexamination of theories about how cheaper enforcement can still provide adequate environmental protection. The study also creates interesting questions regarding state ideology and program effectiveness that will have to wait for more comprehensive data in order to more fully untangle these relationships.

Just as importantly, our study demonstrates the incredible difficulty in answering such questions, primarily because of the lack of data in usable form or the failure to effectively monitor and give attention to the data support systems. Given these ongoing problems in understanding how well environmental programs work, it is difficult to avoid reaching the conclusion that the lack of adequate and uniform data is a partial function of the contentious nature of American politics in which public officials, corporations, and interest groups may profit from this state of affairs. This Article should be a call to action in finally making the EPA compel uniform data reporting or, in the alternative, explain why it should not.

45. *See* E-mail from Joel Mintz, Professor of Law, Nova Southeastern University, to Victor B. Flatt, A.L. O'Quinn Chair in Environmental Law, University of Houston Law Center (Dec. 26, 2008, 2:11 EST) (on file with author).

46. *Id.*

47. *See, e.g.,* 85 Notre Dame L. Rev. 55, 72 n.96 (2009) (describing Clean Water Data, *supra* note 30, and discussing NPDES Data Codebook's incorrect display of numbers for quarters of noncompliance with CWA regulations).

RESPONSE

Comment on *Environmental Enforcement in Dire Straits: There Is No Protection for Nothing and No Data for Free*

by John C. Cruden

John C. Cruden is former Deputy Assistant Attorney General, Environment and Natural Resources Division, U.S. Department of Justice.

While I take issue with the title, suggesting that environmental enforcement is in "dire straits," the body of Professors Flatt and Collins' article does not actually evaluate enforcement, but rather enters the oft-discussed world of attempting to find metrics for measuring the effectiveness of state environmental enforcement actions. Using selected Clean Water Act (CWA) and Clean Air Act (CAA) enforcement data, the authors' four-year survey compares certain enforcement indicators with two parameters: state per capita environmental spending and the type of state government. While the survey methodology could be challenged, their statistical analysis raises some interesting points and several of their conclusions are consistent with my own observations. Most notably, my experience meshes with their thesis that they can "empirically demonstrate that high per capita spending by states on environmental enforcement programs (at least with respect to the CAA) is strongly associated with better program compliance, and thus, presumably better environmental results." Although the authors also intended to examine the effectiveness of cooperative-based versus deterrent-based enforcement, their conclusions are more limited but still valuable. Where, however, the article went astray, is the authors' attempt to somehow categorize and apply state ideology as a metric.

I. Setting the Stage: the Survey

As someone who has supervised federal civil enforcement for two decades, I welcome academic studies evaluating environmental enforcement, as that allows us to channel resources where they will be the most beneficial. Enforcement professionals tend to focus on the crisis in front of them and the need to act promptly to protect human health and the environment. Here, the authors have jumped into the vexing question of identifying appropriate measures to evaluate the effectiveness of environmental enforcement.

Measuring enforcement has been the subject of a great deal of academic debate. And, as the literature on this subject, including this article, has consistently observed, obtaining valid and relevant statistical evidence is a challenge complicated by the "cooperative federalism" underlying modern environmental law. This means that data can derive from a multitude of federal, state, and local sources. In fact, although the article is silent on this issue, it is quite well known that state and local governments undertake the most enforcement actions by quantity.

While the number of actions is a common metric, it often does not adequately address the environmental importance of the action. Several routine environmental enforcement actions, for instance, may not be nearly as important as a single large, multi-facility, or multi-state case.

Facing this historic quandary, the opening part of the article discusses enforcement strategies. While interesting, others have delved into this important area, and there is little in the way of new information. Further, several salient points that influence enforcement strategies are not addressed, including the vagaries of environmental statutes, with their varying penalty amounts (or lack thereof), timing concerns, or preconditions to suit. Of more value in the article is a summary of prior empirical analyses of environmental enforcement, and their suggestions as to areas where future statistical analysis would be valuable.

Much of the article describes the authors' research methodology and data collection, how and why they obtained the data they used for their survey, and the states they selected. In particular, they discuss what led them to use selected CWA and CAA enforcement data as indicators. The details on how they measured state per capita environ-

mental spending for 17 states[1] were quite interesting and, I believe, the first-time use of such data as a metric.

Less objective and more problematic is the authors' choice to use what they termed "State Ideology," attempting to determine whether "the choice between cooperative versus deterrence-based enforcement strategies has a significant effect on source compliance." Citing only to a 10-year-old article, they theorized that "cooperative-based enforcement has been associated with a conservative political viewpoint," and they used that thesis to characterize each state. Then, the authors made an inductive leap of some magnitude, using State Elite Ideology tables as a proxy for whether state management was liberal or conservative. In fact, these tables bear little relation to the actions by actors in environmental enforcement in a particular state. While these factors may be relevant to environmental policy or legislation, state attorneys general and local enforcement officers typically handle enforcement.

The results of their study are in three tables for the years 2000-2003, highlighting: (1) penalties assessed for CWA violations; (2) penalties assessed for CAA violations; and (3) estimates of the quarters a facility was in violation of the CAA. In each table, the enforcement results are compared to State per Capita Environmental Spending and the State Elite Ideology score.

From all of this, the authors state that their findings "are both expected and surprising." First, that for the CAA, "the more a state spends per capita on its environmental budget, the shorter time a permitted source is in violation of the Act." Second, that for the CWA, "the more a state spends per capita on its environmental budget, the higher the fines levied against polluters."[2] As significant fines provide an important deterrence (or recapture any economic benefit from wrongdoing), that is a valuable conclusion.

II. Evaluating the Study

That higher amounts of spending by a state would result in increased enforcement, with additional penalties in some instances, validates what seasoned enforcers would predict. Similarly, in the CAA study, the strong correlation between increased spending and reduced periods of noncompliance would not surprise seasoned enforcers. Vigorous enforcement programs not only ferret out non-compliers, but also provide stimulus to similarly situated companies.

Penalties and reduced periods of noncompliance, however, are only part of the enforcement picture. Federal and state enforcing agencies are normally seeking some form of behavior change, injunctive relief to repair or mitigate environmental harm, penalties, and/or supplemental environmental projects. If done correctly, the non-penalty aspects of the relief will restore the injured resource, add pollution abatement equipment, clean up spills, or achieve other action necessary to achieve compliance with the law in the future and make the environment whole for past misconduct. Penalties, on the other hand, punish the wrongdoer, deter future conduct, and secure a level economic playing field (recovering any economic benefit gained by the wrongful act). Measuring the effectiveness of these various forms of remedies has always been daunting.

When measuring the effectiveness of enforcement, the first step should be to evaluate the actual case brought or resolved by the enforcing entity. That is, did the enforcement action adequately correct the problem, restore the environment, and assure that the same conduct does not occur again? For most enforcement agencies that I work with, that is their fundamental emphasis in each case. Similarly, the effectiveness of the enforcement action is best judged by the environmental results, not just a penalty. The U.S. Environmental Protection Agency (EPA), for instance, has changed their reporting of enforcement results to make clear the environmental and other values of their actions, as opposed to simply quantifying the number of enforcement actions or the amount of penalties obtained. For example, when EPA announced their 2010 results, the headlines were "More than 1.4 billion pounds of harmful air, land, and water pollution to be reduced."[3]

Emphasizing environmental and public health outcomes, rather than just the number of enforcement actions, EPA stated that their 2010 results:

> represent[ed] between $6.2 billion and $15 billion annually in avoided health costs. As a result of water cases concluded in FY 2010, EPA is ensuring that an estimated 1 billion pounds of water pollution per year will be reduced, eliminated or properly managed and investments in pollution control and environmental improvement projects from parties worth approximately $8 billion will be made. EPA's civil enforcement actions also led to commitments to treat, minimize or properly dispose of more than an estimated 11.8 billion pounds of hazardous waste.[4]

III. Cooperative-Based Enforcement

Although the statistical basis for conclusions concerning the effectiveness of cooperative-based enforcement are clearly not as statistically supported as that for the CWA and CAA programs evaluated, the article was still able to reach some interesting conclusions. Specifically, the authors conclude, "no cooperative-based enforcement was able to successfully produce environmental compliance at a significantly lower cost."

To the extent that "cooperative enforcement" is thought to be a program based solely on voluntary actions, it is not

1. The authors originally selected Alaska, Arizona, California, Colorado, Connecticut, Florida, Georgia, Indiana, Kansas, Maryland, New Jersey, New Mexico, New York, North Carolina, Ohio, Oregon, Tennessee, and Texas. Although they had planned to obtain data for 10 years, they ultimately limited their research to four years to correspond to available EPA data (2000-2003). Unfortunately, the research assistants had problems correlating the budget numbers. Further, there were wide swings in per capita environmental spending. After dropping Georgia, they were left with 17 states.
2. Interestingly, for each $1 increase in budget, the fines increased by $18.00. A second table, however, for CAA penalties did not show increases with more budget expenditures.
3. U.S. EPA, Compliance and Enforcement Annual Results 2010 (Dec. 6, 2010), *at* http://www.epa.gov/compliance/resources/reports/endofyear/eoy2010/index.html.
4. *Id.*

surprising that data does not exist to support the hypothesis that this type of enforcement works in any real way or is cost-effective. In fact, such voluntary acts may fail in the very first measure of enforcement effectiveness: confirmation that the voluntary measure really halted the violations of law and restores the environment.

That is not to say, however, that cooperative actions do not have a place in the toolbox of an overall program. In fact, effective enforcement has many parts, ranging from criminal enforcement (also not discussed in the article)[5] to education and persuasion through frequent and thorough governmental inspections to industry outreach. My own experience, however, has been that "cooperative enforcement" is an oxymoron. Although effective outreach to companies may have a very positive effect in helping to achieve prompt compliance with new laws, traditional deterrent-based enforcement is the engine that drives the train of compliance. Seeking voluntary compliance must be done with the clear understanding that, after the outreach, the next step is hardly consensual, and it usually demands more relief than what could have been agreed to voluntarily.[6]

In the one remaining area I found the article and survey less satisfying: their somewhat awkward attempt to categorize and apply what they labeled "ideology." Given the authors concession that "[b]ecause we do not know how ideology actually relates to cooperative-versus deterrence-based enforcement, we can draw no real conclusions," the value of their speculations is questionable.

Contrary to the authors' unsupported assertions, no evidence was provided to indicate that conservative political ideologies were more likely to adopt cooperative-based enforcement. In my own experience, those ideological conclusions are only theoretical, and enforcement—always constrained and guided by legislation—is best achieved by individuals who adhere to and advocate forcefully the rule of law in all instances.

Similarly, I do not find it helpful attempting to characterize the political nature of the government in power or suggest that conservative governments are more likely to favor cooperative enforcement than more liberal ones. In fact, most governments adhere to rule of law concerns and promote lawful compliance no matter their political leanings. Far more important today would be the amount of resources available, the priority placed on environmental enforcement, and the adequacy of the legal structure already in place.

IV. Future Challenges

The authors conclude: "Resources do matter. For purposes of enforcement policy, this is the most important finding in our research. The strong relationship between per capita spending on state environmental programs and shorter noncompliance times in the CAA across many states of different sizes, environmental challenges, and political governance, demonstrates this."

Though somewhat intuitive and not all that surprising, the authors' empirical demonstration of this point makes it a valuable insight worthy of consideration by policymakers. There are, of course, real world consequences to reducing state funding commitments to environmental enforcement. Without a robust and well-funded enforcement component, clear legislative directives and implementing regulations may fall by the wayside, and the rule of law suffers. As importantly, knowledgeable and law-abiding companies that seek to comply with the law may find themselves at an economic disadvantage when competing with companies that have not invested in pollution controls or safety measures that the law requires. Environmental enforcement, therefore, is not only valuable because it secures compliance with the law, but it also provides a level competitive playing field, protecting the vast majority of companies and individuals who are working diligently to be in compliance.

5. An example of the value of information that could encourage voluntary compliance is EPA's recent enhanced interactive mapping tool that allows the public to view detailed information about the enforcement actions taken at more than 4,500 facilities that concluded in FY 2010. The new map shows facilities and sites where civil and criminal enforcement actions were taken for alleged violations of U.S. environmental laws regulating air, water, and land pollution. The mapping tool also displays community-based activities like the locations of EPA's environmental justice grants awarded in FY 2010.
6. Although unstated in the article, the survey appears to be directed solely at civil and administrative enforcement, and not criminal actions. Studies are limited to fines and injunctive relief, the hallmark of civil actions, and there is no mention of incarceration. Criminal enforcement, of course, raises different issues concerning effective actions, and another study could be done of what are perceived to be low levels of recidivism after criminal enforcement, one clear indicator of success. EPA's criminal enforcement program opened 346 new environmental crime cases in FY 2010. These cases led to 289 defendants charged for allegedly committing environmental crimes, (the largest number in five years), 198 criminals convicted, and $41 million assessed in fines and restitution. U.S. EPA, *supra* note 3.

RESPONSE

Measuring Enforcement's Value: One Step at a Time

by Eric V. Schaeffer

Eric V. Schaeffer is Director of the Environmental Integrity Project.

How well are environmental laws in the United States being enforced, and what difference does that make to the quality of our air and water? Professors Flatt and Collins work hard to find the answers in *Environmental Enforcement in Dire Straits: There is No Protection for Nothing and No Data for Free*, but run into some familiar roadblocks.

The obstacles that make it so hard to link government actions to environmental results are well outlined in the article. The relevant data is too often inconsistent, unreliable, or unavailable, and fractured by a federal system that splits enforcement responsibility between the U.S. Environmental Protection Agency (EPA) and state or local agencies. The number of both independent and dependent variables is overwhelming, as there are so many ways to measure enforcement activity, compliance behavior, and environmental outcomes. Those variables are constantly shifting or being redefined, making it hard to determine whether there is some kind of logical relationship between any of them.

The authors courageously try to pick their way through these minefields. I suffered with them as Flatt and Collins struggle to locate and decode the data they need, and get all the moving parts they examine to sit still long enough to be analyzed. But in the end, I do not think their principal conclusions can be supported based on the data and methodology presented in the article. Also, as the initial hypotheses shifted to compensate for data limitations, I lost track of what the authors were trying to prove.

At the outset, the objective seemed to be to assess how well enforcement achieves broad environmental or public health goals, secures compliance with the law, and punishes violators, compared to more cooperative approaches that rely on voluntary efforts or technical assistance. The authors conclude with a more limited analysis that evaluates the impact of state environmental budgets and "elite" political ideologies on the frequency and duration of Clean Air Act and Clean Water Act violations, and the dollar value of penalties collected.[1]

Because key concepts are not clearly defined, it is hard to accept the "cause and effect" logic the article suggests. For example, the authors sometimes treat "enforcement" as a stand-in for all environmental programs; while at other times, it seems to mean the narrower range of activities that include finding and prosecuting violations. If the authors mean to evaluate the latter, total state environmental spending as a measure of enforcement effort is not a convincing surrogate, as agency budgets must cover a host of unrelated activities, such as sewage treatment grants, permit writing, poster contests, and voluntary programs.

While it is seems reasonable to count the number of violations, a good enforcement program will sometimes multiply those, at least in the short run, because it is more effective at uncovering noncompliance. Also, it is not clear that the authors distinguished between federal and state penalties in their assessment. EPA retains jurisdiction to enforce the Clean Air and Water Acts in all states, its penalties can be quite large, and the federal agency is more likely to act when its state counterparts have not, which may explain why the author found larger penalties in states with more "conservative" ideologies.

While far from perfect, the measures that EPA has developed might have served as a useful starting point for analysis. EPA generally defines enforcement to include the "timely" and "appropriate" prosecution of violations that agencies have identified. Timeliness means moving cases swiftly, with the goal of eliminating noncompliance as quickly as possible. Appropriate actions usually penalize the most serious offenders with fines, and even jail time for criminal defendants, to take away any benefits earned from wrongdoing, and to warn others to avoid making the same mistakes.

These relatively simple concepts mask some internal tensions, though EPA policies try hard to resolve these. For example, enforcement actions tough enough to punish serious violators will take longer—sometimes much longer—than cut-rate settlements designed to get companies back into compliance quickly. On the other hand, cheap settlements reduce both the moral and financial cost of noncompliance, making it easier (and sometimes cost-effective) to pay the fine next time. Speedy resolution and just punishment may not always work in tandem, especially in the U.S.

1. At the beginning, the authors discuss evaluating the relative effectiveness of enforcement and softer approaches that rely on voluntary efforts or technical assistance, but seem to abandon that attempt in the face of data limitations.

judicial system, and the government's agents are forced to choose between these worthwhile objectives every day.

Flatt and Collins frequently acknowledge that government works with limited resources, which suggests that agencies ought to target cases with the greatest impact on environment or the public's health. For more than a decade, the federal agency has consciously focused on violators with the biggest environmental footprints, such as coal-fired power plants, sewage treatment facilities, or big confined livestock operations. The pollution reductions achieved through EPA enforcement actions are tallied up in settlement announcements and annual settlement reports. As with any measure, there are tradeoffs: emphasizing cleanup values can short-change enforcement meant to prevent serious accidents, such as the spectacular blowout of BP's well in the Gulf of Mexico in April 2008.

However it is measured, enforcement response is only part of the story; at least as important is the quality of the effort used to determine whether a violation has even occurred. Historically, both EPA and state agencies have relied upon inspection frequency, but in my experience, the testing, monitoring and reporting conditions of permits have a greater impact, since inspectors can do little when emissions data is simply unavailable. For example, power plants are required to monitor and report hourly emissions of sulfur dioxide and nitrogen oxide, while large wastewater dischargers must sample their effluent periodically and report any results to states. Data from these large sources is online and comparatively easy to search.

In contrast, while power plants, cement kilns, incinerators, and other industries are required to meet hourly emission limits for particulate matter, testing is done so infrequently in many states that the requirements are almost meaningless. We found that some large coal-fired power plants in Texas had not tested particulate matter emissions in more than twenty years, while refineries report many releases based on methods that EPA has determined to be of very poor quality. The problem is widespread, even after a D.C. Circuit decision in December 2008 that upheld a 20-year-old provision of the Clean Air Act requiring that every operating permit for a major source require monitoring sufficient to determine compliance. In too many cases, we just do not know whether a facility is violating the law or not.

Regardless of how monitoring and enforcement response is measured, the end game is getting and keeping facilities in compliance and reducing their impact on the environment. Flatt and Collins wisely avoid chasing after a one size fits all "compliance rate" for industries, since it would be impossible to fit the myriad of requirements under multiple statutes on a single scoreboard. Instead, the authors select "significant violators" under the Clean Air and Clean Water Acts. That is a rational benchmark, but only where monitoring and reporting systems are effective enough to flag serious noncompliance.

The authors conclude early that we lack the means to measure improvements in environmental quality, but that is an overstatement. For example, federal law requires monitoring to determine whether air quality standards are being met, and changes in ambient levels of key pollutants like ozone or particulate matter are tracked over time. Although data quality is much more uneven, states track key indicators of water quality on a regular basis, and they identify rivers and streams that are "impaired" by specific pollutants. It would be challenging to isolate the impact of enforcement on these indicators, which can be influenced by so many other factors.

But although some data is available, I share the authors' concern that it is not enough. We lack reliable indicators of public exposure to many types of pollution, including some of the deadliest carcinogens. Reductions in ozone in a metropolitan area ought not to be used to rationalize the illegal release of toxic chemicals in another community. And even where the environment has improved, it is useful to try to understand what combination of actions brought that about.[2]

Flatt and Collins set out to compare the effectiveness of state programs, but were understandably confounded by so many differences in the type, quality and availability of data that agencies collect. Since the authors began their research, EPA has taken some steps to organize better and present what is available by, for example, posting agency evaluations of state performance programs online. While the federal agency can do more, doing so will be a tough sell given tight state budgets and the current "anti-Washington" political environment.

Meanwhile, we can better use the information we already have by starting small and working with a manageable set of data to try to tease out some modest conclusions. Here are a few ideas:

- We should know what the largest sources of pollution are releasing to the environment, and whether they are meeting emission standards. Research could help compare state monitoring and reporting standards for important provisions of the Clean Air Act or other statutes, and EPA could do more to raise the bar for authorized programs, since so much of this information is already required by law. States that report violations more frequently may actually be taking the time to find them in the first place, instead of making it a practice to "see no evil."
- A few programs, e.g., sewage treatment plants and large industrial sources, are already subject to more or less consistent monitoring and reporting requirements. Closer analysis of these sources could help identify significant differences in the rate, severity, or length of violations. The authors cite a study by University of Kansas researchers that follow this route to compare results from state versus federal enforcement actions for major Clean Water Act dis-

2. It is always challenging to isolate the impact of enforcement or any government program on environmental indicators, which can be influenced by so many different factors.

chargers. This approach would be even more valuable if it focused on similar sources, e.g., sewage treatment plants of approximately the same size and age, or large cement kilns. Analysts could then work backward isolate those factors that seemed to explain differences between one state and another. Perhaps state environmental spending is a key determinant, as Flatt and Collins suggest, but that is hard to know without a more methodical approach that considers other factors.

- Some distinctions ought to be made based on what violators are required to do once they are caught. Researchers could focus on how much and how quickly emissions were reduced, and how frequently the same violators fall back into noncompliance, looking at a subset of requirements for a related group of facilities. Even anecdotal evidence could help, so long as any conclusions are appropriately limited.

The more cautious approach that I suggest would require patience, but could build our knowledge over time, and eventually lead to broader conclusions about how to get the most out of environmental programs.

Meanwhile, we should always remember that environmental law enforcement is also supposed to deliver justice. In plain English, the public will always expect those polluters who can afford it to pay, and any program that fails to deliver that will eventually lose legitimacy. However government agencies choose to measure their own performance, they should never lose sight of that simple truth.

RESPONSE

Getting Through the Straits: It's Not How Much You Spend, It's Charting the Right Course That Counts!

by LaJuana S. Wilcher

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Professors Flatt and Collins should be commended for seeking to answer one of the most perplexing questions that has plagued environmental protection advocates and regulators in the United States for over 40 years—how to improve compliance with federal environmental laws, and therefore, improve the quality of the environment.[1]

Regrettably, Flatt and Collins reach significant policy conclusions and make major environmental enforcement recommendations based upon a single variable or two, after recognizing that many variables will affect the effectiveness of environmental enforcement. They also give too much weight to the variables they researched, interesting though they may be. While a comprehensive analysis may be difficult and time-consuming, major policy recommendations should not be based on one or two factors to the exclusion of others.

This comment will address the factors relied upon by Professors Flatt and Collins to reach their conclusions, assess those factors' value as a foundation for their recommendations, and add some additional recommendations to address how we might move toward improved environmental protection.[2]

I. The Data

The authors compare the following data sets: penalties assessed against facilities for violations of the Clean Water Act (CWA) and Clean Air Act (CAA) regulatory requirements, as well as the number of quarters (in the two years preceding the inspection date) that facilities were in violation of CAA regulatory requirements. The authors use these data sets to ascertain states' environmental funding levels and reach conclusions about the impact of states' funding for environmental enforcement on improvements in environmental protection. I have several concerns with this approach.

First, there is no demonstration that states fund environmental enforcement as a consistent percentage of the states' overall environmental budgets, either from year to year or among the various states. One state could spend more on environmental programs but less on environmental enforcement, while another could choose to spend a larger portion of its overall environmental spending on environmental enforcement. Per capita environmental spending by states has not been shown to be an adequate surrogate for spending on improved environmental enforcement or for greater improvements in environmental quality.

Second, even the data concerning the environmental *spending* per state were, in the authors' words, "skeletal."[3] The data sets were obtained from different state sources, which used budgetary categories and descriptions differently. To the authors' credit, they attempted to harmonize the data by allocating certain funding categories to environmental spending and others to wildlife, agriculture or other programs that can include the type of environmental funding the authors attempted to measure; until those allocations are confirmed with the states, however, they should not be used to make policy recommendations.

1. Victor B Flatt & Paul M. Collins Jr., *Environmental Enforcement in Dire Straits: There Is No Protection for Nothing and No Data for Free*, 85 Notre Dame L. Rev. 55 (2009).
2. An interesting twist in the article was the analysis concerning which states had better environmental enforcement, those dominated by (using the authors' terminology) the liberal political elite or those dominated by the conservative political elite. The authors apparently were surprised that conservative political leaders often foster a culture of compliance at levels higher than their liberal counterparts. The best rationale that the authors could surmise for higher CWA penalties in conservative-led states was, curiously, that conservative ideologies allow polluters to have more serious violations, which in turn would support higher fines. That is certainly creative. Is it possible, however, that the conservatives are as committed to the rule of law, or more so, than the liberal political leadership in states? At least the authors recognized that ". . . the CAA finding may suggest that conservative state ideologies foster better compliance, perhaps through the use of more cooperative methods." All of which raises the question: Is Red or Blue the new Green?
3. *Id.* at 74.

Third, the source data relied upon by Professors Flatt and Collins, culled from EPA and states, appears to be for 2000-2003—over a decade old in many cases.[4] Significant differences can and probably have occurred in the eight to eleven years since those data were reported to EPA with regard to the penalties assessed by the states selected for comparison purposes. By way of example, Kentucky assessed over one million dollars in civil penalties in 2004 for violations of the state Pollutant Discharge Elimination System (authorized under the CWA). Even though Kentucky was not selected for use in this analysis, states are not static creatures and may have assessed significantly different penalties in the past decade than is shown in the older data utilized to support the conclusions and recommendations of the authors.

Based upon these old data, and armed with estimates of each state's environmental spending, the authors found the greater spending per capita for environmental programs correlated with a decrease in CAA penalties and an increase in CWA penalties. These results are inconclusive at best and contradictory at worst.

The other data analyzed was the comparison of *estimated* spending per capita for environmental programs to the number of quarters that certain CAA facilities were not in compliance. The authors reported that "compared with a state that spends $28 per capita on the environment, in a state that spends $68 per capita, the number of quarters a facility is in violation of the CAA decreases by 0.2 quarters." That appears to mean that for every dollar a state spends per capita over $28, the number of quarters a facility is in violation of the CAA would decrease by .005 quarters—less than one half of one day per year. Even if that difference is statistically significant, the significance in the level of environmental improvement is not.

In addition, the authors chose to use the only the most populous states for their analysis, and, significantly, failed to make any adjustments based upon the cost of living in each state, which will affect how much a dollar of environmental spending will buy. For example, a state like Tennessee, where the cost of living is relatively low and government employees are paid less than those in states like California or New York, one might find that spending $28 per capita may yield more environmental protection than significantly more money spent per capita in a state where state environmental employees are paid significantly more. In other words, each environmental protection dollar should result in greater environmental benefits where environmental agencies' employees' salaries are lower.

II. Navigating Through the Straits: How Do We Chart the Course?

Bean counting the number of environmental enforcement cases and the amount of penalties recovered by regulatory agencies provide little empirical data concerning the relationship between environmental enforcement and improvement of the environment. That is likely the reason that the debate continues after all these years. If tracking the money put into state environmental budgets for environmental programs does not necessarily translate to environmental enforcement funding, how can we answer the $64 billion question posed by Professors Flatt and Collins? How do we improve compliance with federal environmental laws, and therefore, improve the quality of the environment?

Outcome indicators, like reduced emissions or improved water quality, are the lodestars by which we should navigate. To do less is a great disservice to the regulatory agencies, the regulated community, and the citizens of this county. If we are able to write permits with limits measured in parts per quadrillion, we should be able to measure actual water quality improvements. Until we are able to address the challenges associated with measuring environmental quality and improvements effectively, we should not fetter the states with additional directives concerning how they accomplish that which we cannot measure.

III. Times Change, Charts Change

Since EPA was created in 1970, the issues of how to enforce and how to measure enforcement efforts have been major topics of discussion at the Agency and in the public. My experience with the regulated community in a range of roles (federal enforcer, state enforcer, and compliance and defense counsel) has convinced me that the regulated community of today is vastly different than it was in the early days of EPA. In general, municipalities, corporations and individuals from every walk of life know more about compliance and environmental protection than they did thirty or forty years ago, and act upon that knowledge. Popular books such as Professor Daniel Esty's *Green to Gold* document a new corporate culture that recognizes the benefits of complying with environmental laws or going beyond compliance. This result is consistent with the intermediate outcome indicators of enforcement actions described above.

To achieve compliance, we need to focus on why people comply. Compliance stems from behavioral motivation, which may be considered based on the "logic of consequences" or the "logic of appropriateness." The "logic of consequences" views actors as choosing rationally among alternatives based on their calculations of expected consequences, but the "logic of appropriateness" sees actions as

4. *Id.* at 73.

based on identities, obligations, and conceptions of appropriate action.[5]

I suspect that the "logic of consequences" was a principle governing factor in environmental compliance in the early days of EPA. Today, however, the culture of environmental protection has become ingrained at the individual, municipal and corporate levels. A great deal of decision making is made today, I believe, based upon "the logic of appropriateness."[6] Many environmental compliance decision makers and technicians today make decisions to do the right thing because it is the right thing to do, not simply because of the fear of government reprisal.

The time has come to capitalize on the change of attitude that has occurred and to work even harder to complement enforcement efforts. It is time to work collaboratively with the regulated community to solve the remaining environmental problems in the most cost-effective way possible, considering all factors, including today's economic state.

Indeed, enforcement that is deemed heavy-handed or seems unreasonable can have the effect of causing people to be less enthusiastic about protecting the environment and more skeptical about the value of EPA and state environmental agencies. That attitude is becoming increasingly apparent in the 112th Congress and in the public's opinion of the need for additional environmental regulation.

IV. And the Answer Is?

There is no single answer to the $64 billion question posed by the authors, just as there is no single answer to how a sailor should navigate straits. At sea, the sailor must consider the depth of the passage, the speed and direction of the wind, tides and currents, how much the boat draws, the distance to the shore, and changes in the charts at the very least. When at sea, considering only one of these factors will likely result in disaster.

Similarly, there is no single answer to the question of how regulators can best spend taxpayers' monies to improve the environment. We need to do a better job of educating and assisting those who are regulated, and we need to work with them toward achieving compliance. We need to promulgate regulations that are clearly within the environmental agency's statutory authority, and we need to keep the regulations as understandable as possible. We need to maintain standard measurements of environmental quality so we can measure environmental improvements from year to year and place to place, if not for any other reason than to be able to congratulate ourselves on the accomplishments we have made as a nation, although we always should try to do better. We need EPA and the states to work hand in hand instead of as adversaries, recognizing that states are becoming increasingly frustrated with EPA's actions to become more dominant in state-issued permits and enforcement. Enforcement actions and resources should focus on cases that will have the greatest environmental benefits. We should seek alternate, cooperative compliance assistance efforts. And finally, we should not believe that simply spending more money will bring about the environmental improvements we all want to see. The issue is much too complex for that. If that were true, we would find that the states that spend the most on environmental enforcement would have the cleanest water and the freshest air, barring significant upstream, upwind contributions.

In sum, the authors have introduced no data that supports the premise that more state *per capita* spending on environmental enforcement improves compliance or the quality of the environment. Common sense tells us that environmental enforcement is an important part of our nation's laws that preserve, protect and restore the environment. And common sense tells us that some conservative states have stronger environmental programs, and some have weaker ones, and that the strength of the programs will ebb and flow over time.

More important than the per capita levels of spending, I believe, or which political sector is in power, is the culture of compliance that can be fostered through leadership, information, education, and setting sensible priorities. If environmental agencies seek major penalties for minor infractions, the harvest is mistrust and resentment. Things are different now than they were forty years ago, and we must recognize and work with positive changes that have occurred, instead of spending more and more on less and less.

Nothing is free, but throwing money at nothing is not the answer.

5. Dave Grossman & Durwood Zaelke, An Introduction to Theories of Why States and Firms Do (And Do Not) Comply With Law, Proceedings from the Seventh International Conference on Environmental Compliance and Enforcement, April 9-15, 2005, http://www.inece.org/conference/7/vol1/13_Grossman.pdf, (last visited Apr. 15, 2011).
6. This is based upon no empirical data, but instead upon interactions with environmental professionals and staff over the years.

ARTICLE

Climate Change and U.S. Interests

by Jody Freeman and Andrew Guzman

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I. Introduction

There is, after years of debate, a widespread though not universal consensus in the United States that climate change is real, that it is primarily the result of human activity, and that it poses a serious global threat.[1] A consensus on the appropriate U.S. response, however, remains elusive. While the new focus on climate change suggests that the United States may play a key role in attempts to negotiate a new international agreement to reduce global emissions,[2] there is serious debate in academic and policy circles over whether doing so would be in the national interest. Indeed, some argue that a straightforward cost-benefit analysis weighs against U.S. action.

The argument against American action goes something like this: Cutting greenhouse gas emissions will be costly for the United States, and it is not entirely clear that the benefits are worth it, especially since a warmer climate will impose fewer costs on the United States than on most countries.[3] Put another way, climate change is a collective action problem, and the best American policy would be to free ride on the efforts of more significantly affected states.[4]

This Article takes issue with this "climate change winner" argument. We demonstrate that its conclusions that harm to the United States will be small or perhaps even nonexistent reflect a significant misunderstanding of existing studies on the impact of climate change. If one examines those studies critically it becomes clear that the climate change winner argument is fatally flawed. The argument fails to account for the full spectrum of costs that climate change will impose on the United States, including spillover costs that the United States is almost certain to absorb. Once we account for both of these influences, the climate change winner argument withers, and the case for aggressive American action becomes compelling.

A. *The Climate Change Winner Argument and Its Limits*

The climate change winner argument relies on the consistent projections of both the scientific and economic literature that adverse effects of climate change will be distributed unequally.[5] The most affected countries will be those that have contributed the least to global greenhouse gas concentrations and are the poorest in the world.[6] That

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1. *See* Anthony Leiserowitz, *Climate Change Risk Perception and Policy Preferences: The Role of Affect, Imagery, and Values*, 77 Climatic Change 45, 46 (2006) ("Since the year 2000, numerous public opinion polls demonstrate that large majorities of Americans are aware of global warming (92%) ... and already view climate change as a somewhat to very serious problem (76%)."); *see also* Nat'l Acad. of Sci. et al., *Understanding and Responding to Climate Change 3* (2008), *available at* http://dels.nas.edu/dels/rpt_briefs/climate_change_2008_final.pdf (on file with the *Columbia Law Review*) (stating "[t]here is no doubt" climate change is occurring).
2. For a collection of proposals for what should replace the Kyoto Protocol, see Architectures for Agreement: Addressing Global Climate Change in the Post-Kyoto World (Joseph E. Aldy & Robert N. Stavins eds., 2007).
3. For a characterization of this line of thought, see Cass R. Sunstein, *The World vs. the United States and China? The Complex Climate Change Incentives of the Leading Greenhouse Gas Emitters*, 55 UCLA L. Rev. 1675, 1677 (2008) [hereinafter *Complex Incentives*]. Though Sunstein advances the argument that the costs of action outweigh the benefits for the United States, he also argues that the United States may wish to act out of a sense of moral responsibility. *Id.* at 1696-98.
4. Several members of Congress employ this argument. *See e.g.*, 155 Cong. Rec. S202 (daily ed. Jan. 8, 2009) (statement of Sen. Inhofe); 154 Cong. Rec. S4022 (daily ed. May 12, 2008) (statement of Sen. Voinovich) ("Americans should not suffer for symbolism while countries such as China and India emit increasingly large quantities of greenhouse gases without consequences.").
5. *See* William Nordhaus & Joseph Boyer, Warming the World 96-97 (2000) (noting United States has "low vulnerability to catastrophic climate change"); Nicholas Stern et al., The Stern Review: The Economics of Climate Change 105 (2006) [hereinafter Stern Review] ("[Climate change] will have a disproportionately harmful effect on . . . poor communities who are already living at or close to the margins of survival.").
6. *See, e.g.*, Robert Mendelsohn et al., *The Distributional Impact of Climate Change on Rich and Poor Countries*, 11 Env't. & Dev. Econ. 159, 173 (2006) [hereinafter Mendelsohn et al*., Distributional Impact*].

the United States will fare better than most other countries has led some commentators to advance the climate change winner argument, claiming that it is irrational for the United States to take unilateral steps to mitigate climate change or to participate in a globally optimal international agreement to reduce emissions.[7]

The climate change winner argument relies on economic models of the impact of climate change on the United States. If one believes that the results of these models represent an accurate forecast of climate change impacts, then the climate change winner argument has considerable force. But these models provide only a lower bound on climate change's possible impact rather than an accurate prediction of its likely effects. They engage in a series of simplifying assumptions that, while necessary to make the models tractable, create a systematic downward bias on the projected impacts. The climate change winner argument fails to adequately consider this bias and so understates the threat of climate change.

No study to date has assessed all of the potential costs of climate change to the United States, including cross-sectoral, indirect, and cumulative effects on the U.S. economy[8] and nonmarket costs, such as loss of biodiversity and ecosystem services and the possibility of catastrophic losses.[9] These omissions are not anyone's fault, but rather result from the inherent limitations of economic modeling.[10] They also lead to a consistent bias toward an understatement of climate impacts. Ignoring these shortcomings has serious implications, however. Without a more complete cost-benefit analysis we cannot think coherently about the full range of likely impacts of climate change, and reliance on these models without a full understanding of their limitations could lead to misguided policy responses.

To date, the primary response to the climate change winner argument has been to insist that regardless of the cost-benefit calculation, the United States is morally obligated to act[11] either because it is the largest historic contributor to the problem (the corrective justice argument), or because it ought to help poorer nations (the distributive justice argument).[12] Alternatively, some suggest that the United States has an ethical obligation to future generations.[13]

In this Article, by contrast, we address, head-on, the cost-benefit calculus that lies at the heart of the climate change winner argument. Though we believe the moral arguments for U.S. action on climate change are compelling, we doubt that they will, on their own, convince U.S. policymakers of the need for mitigation. American international environmental policy is typically driven by utilitarian calculations about the national interest,[14] which in this instance has led to a remarkably powerful reluctance to act.[15] It persists even in the face of an increasingly solid scientific consensus that climate change is man-made, and pressure from state and regional climate programs,[16] the U.S. Supreme Court,[17] powerful industry players,[18] and the international community.[19] For this reason we restrict

7. Robert Mendelsohn & James E. Neumann, Synthesis and Conclusions, *in* The Impact of Climate Change on the United States Economy 315, 321 (Robert Mendelsohn & James E. Neumann eds., 1999) (noting warming may be beneficial to United States economy); Sunstein, *Complex Incentives*, *supra* note 3, at 1677 ("[American] unilateral reductions would impose significant costs and by themselves produce no significant benefits.").
8. Most models estimate direct market losses to agriculture, commercial water supplies, human health, and the like. *See generally* William Cline, Global Warming and Agriculture 67-71 (2007) (estimating impact of climate change on agriculture by country); Stern Review, *supra* note 5; Richard Tol, *Estimates of the Damage Costs of Climate Change Part II: Dynamic Estimates*, 21 Envtl. & Resource Econ. 135, 157 (2002).
9. *See generally* Robert L. Fischman, *The EPA'S NEPA Duties and Ecosystem Services*, 20 Stan. Envtl. L.J. 497, 498 (2001).
10. *See, e.g.*, R.O. Mendelsohn et al., *Country-Specific Market Impacts of Climate Change*, 45 Climatic Change 553, 567 (2000) (noting their models exclude nonmarket effects and have various other limitations) [hereinafter *Country-Specific*]; Mendelsohn & Neumann, *supra* note 7, at 317 (noting their model excludes nonmarket impacts, particularly health, aesthetic, and nonmarket ecosystem effects like species and wetlands loss).
11. *See, e.g.*, Daniel A. Farber, *The Case for Climate Compensation: Justice for Climate Change Victims in a Complex World*, 2008 Utah L. Rev. 377, 379.
12. *See, e.g.*, Daniel A. Farber, *Adapting to Climate Change: Who Should Pay?*, 23 J. Land Use & Envtl. L. 1, 18-34 (2007) (considering corrective and distributive justice in determining who should pay for climate change adaptations); Benito Müller, *Varieties of Distributive Justice in Climate Change*, 48 Climatic Change 273, 277 (2001) (considering distributive justice in emission allocations). *See generally* Edward A. Page, Climate Change, Justice, and Future Generations (2006) (examining climate change through lens of distributive justice).
13. *See* Page, *supra* note 12, at 7-11.
14. For example, the United States joined the Montreal Protocol, the treaty to eliminate ozone depleting substances, largely because the benefits of the agreement to the United States clearly outweighed the costs. *See, e.g.*, Cass R. Sunstein, *Of Montreal and Kyoto: A Tale of Two Protocols*, 31 Harv. Envtl. L. Rev. 1, 6 (2007).
15. Since this Article was first published, the United States did sign the "Copenhagen Accord" at the 15th Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change, in December 2009. While not an international treaty that includes targets and timetables for GHG mitigation, the Accord does commit all of the major economies, including China and other major developing countries, to an aspirational goal of limiting global temperature increase to 2 degrees Celsius; a process for countries to enter their specific domestic mitigation commitments by January 31, 2010; broad terms for the reporting and verification of countries' actions; a collective commitment by developed countries for $30 billion in "new and additional" resources in 2010-2012 to help developing countries reduce emissions, preserve forests, and adapt to climate change; and a goal of mobilizing $100 billion a year in public and private finance by 2020 to address developing county needs. *See* http://www.pewclimate.org/international/copenhagen-climate-summit-summary. The U.S. Congress has failed to pass legislation putting a market-based cap on carbon, and is currently implementing regulation of GHGs under the Clean Air Act. For a summary of regulatory initiatives under both the mobile and stationary source provisions of the Act, see http://www.epa.gov/climatechange/initiatives/index.html.
16. *See, e.g.*, California Global Warming Solutions Act of 2006, Cal. Health & Safety Code §§38500-38599 (West 2007) detailing California's state program to combat climate change); Reg'l Greenhouse Gas Initiative, Overview of RGGI CO_2 Budget Trading Program (2007), *available at* http://rggi.org/docs/program_summary_10_07.pdf (on file with the *Columbia Law Review*) (describing cap-and-trade coalition of Northeastern states).
17. Massachusetts v. EPA, 549 U.S. 497, 533-35, 37 ELR 20075 (2007).
18. Corporations that have joined the U.S. Climate Action Program, which advocates for strong federal regulation of greenhouse gases, include General Electric, Caterpillar, Shell, and the Environmental Defense Fund. U.S. Climate Action Partnership, *at* http://www.us-cap.org/ (last visited Aug. 21, 2009) (on file with the *Columbia Law Review*).
19. In January of 2009, for example, Stavros Dimas, the E.U. Commissioner for Environment, published an open letter calling on the United States to take a leadership role in efforts to reduce carbon emissions. Letter From Stavros Dimas, E.U. Commissioner for Environment, to President Barack Obama (Jan. 29, 2009), *at* http://ec.europa.eu/commission_barroso/dimas/news/doc/letterpresidentObama.pdf (on file with the *Columbia Law Review*).

our argument to consequences that would be taken seriously in a no-nonsense cost-benefit analysis. We argue that the calculation of American self-interest on which the climate change winner argument rests is simply mistaken. This is not because we dispute the general point that the United States may fare well relative to many other states in a warmer world, but because what matters are not the relative costs, but the absolute costs of inaction. If the absolute costs justify expenditures for mitigation, the U.S. government should make them.

B. Costs Omitted From the Climate Change Winner Argument

One of the more striking features of climate models, embraced (perhaps implicitly) in most climate change winner arguments, is a curiously isolationist approach to a truly global problem. They fail to consider, at least in any serious way, the possibility that many of that the harms that impact other countries are likely to spill over to the United States. We argue that this spillover is likely to occur in the form of national security threats, economic spillovers, spillovers resulting in the spread of infectious disease, human migration, and the risk of food and water shortages, species extinction, and biodiversity loss.

The United States cannot sequester itself from all such spillovers. To assume otherwise seems unduly optimistic—perhaps even naïve—given the reality of global interdependence. Economic, political, military, and public health developments in one region of the globe can have seismic impacts in another.[20]

Moreover, in our view, it is unlikely that the United States will react to world crises by attempting to retreat into isolation. If the United States hopes to shape its strategic position in an increasingly interdependent world, it must expect to bear at least some costs associated with responding to crises that arise elsewhere, including some that arise because of climate change. Yet a policy of U.S. isolationism is what the climate change winner argument implicitly assumes.

Even if a strategy of going it alone were possible, it would be extraordinarily expensive for the United States to try to insulate itself from outside events. Yet no model we know of accounts for the costs of isolationism.[21] Although such costs are hard to quantify, this challenge is no reason to count them as zero.

The fact that economic models fail to account for all relevant impacts is not news. The authors of these studies recognize as much and usually make their assumptions clear.[22] Our concern is not with the models themselves, but with the way in which some commentators and policymakers may interpret the results and overlook the limits that the assumptions impose. Climate change winner arguments tend to take the results of economic studies at face value, without serious consideration of their limits, and acknowledge imperfections in the economic models—if at all—only in footnotes and minor asides. Consequently, the fact that existing estimates systematically understate the likely impacts is ignored.

C. The Self-Interested Argument for Action

A more realistic assessment of relevant costs and benefit changes the calculus of whether it makes sense for the United States to cut domestic emissions. To the extent the argument against such action turns on prevailing estimates of the relative costs and benefits of doing nothing, we think it is wrong.

While it is surely correct that climate change poses a collective action problem, it is also true that large players may internalize enough of the benefits from the production of collective goods (here, mitigated climate change) to make it worthwhile to invest in those goods. A more complete accounting of cost matters because every player has an incentive to take action up to the point where the State's marginal cost of action exceeds the marginal benefit. A large, hegemonic player like the United States internalizes a significant fraction of the global gains of climate change abatement, making it worthwhile to bear at least some costs of emissions reductions.

Thus, a more comprehensive assessment of what the United States has at stake if climate change continues unabated suggests it is in the national interest to invest in mitigation. That is true even if the United States cannot fully internalize the benefits of mitigation, and even if some nations free ride on U.S. efforts.

It is important to separate the climate change winner argument we seek to debunk from other reasons why the United States might hesitate to act. For our purposes, these reasons are: (1) the "futility thesis"—the belief that any effort at mitigation will be overwhelmed by the sheer volume of emissions generated elsewhere; (2) the "leakage thesis"—the concern that any isolated effort at mitigation will be ineffective because emission-intensive industry will relocate to unregulated jurisdictions; and (3) the "fairness thesis"—which says it is simply unfair to expect the developed world to bear all the cost of mitigation.

These three concerns are quite different from the climate change winner argument. First, they do not dispute the basic proposition that climate change is a threat to the United States and that some form of global action is needed. Second, while they might be persuasive either alone or in combination, each requires a separate defense. For example, it is debatable whether unilateral cuts by the

20. C.B. Field et al., North America, *in* Intergovernmental Panel on Climate Change, Climate Change 2007: Impacts, Adaptation and Vulnerability 617, 640 (M.L. Parry et al. eds., 2007) [hereinafter IPCC, Impacts] ("In this interconnected world, it is possible that profoundly important impacts of climate change on North America will be indirect consequences of climate change impacts on other regions, especially where people, economies or ecosystems are unusually vulnerable.").

21. *See, e.g.*, Dale W. Jorgenson et al., *Pew Ctr. on Global Climate Change, U.S. Market Consequences of Global Climate Change*, at iii-iv (2004), *available at* http://www.pewclimate.org/docUploads/Market_Consequences-report.pdf (on file with the *Columbia Law Review*).

22. *See, e.g.*, *id.*

United States would, in fact, be futile. Futility predictions depend on controversial assumptions, including that U.S. leadership on emissions cuts will be met with international free riding, as if the United States has no instruments of persuasion at its disposal.

In any event, such arguments, though important, are not our focus here. We seek only to disprove the climate change winner argument, which we think takes too much for granted by bracketing the underlying methodological limitations of its cost-benefit analysis. In essence, we challenge the extent to which the United States ought to be viewed as a net "winner" from climate change by questioning what it means to be a "winner," especially in an interdependent world. How to count costs, what costs to include, and what to do when there is no established method for capturing costs are among the most important questions in the debate over U.S. action on climate change. A more comprehensive accounting reveals that it is in the United States' interest to take unilateral action to mitigate climate change, and, indeed, that the United States would be better off paying the full cost of mitigation (if this were possible) rather than allowing the world to continue in a "business as usual" fashion.

Our argument proceeds as follows: Part II explains why the methodologies of projections underlying the climate winner thesis are overly optimistic. Part III analyzes how spillover effects will impact the United States and generate additional, as yet unconsidered, costs. Part IV explains why the more complete assessment of costs justifies aggressive U.S. action to address climate change, notwithstanding some other countries' reluctance to act. We conclude by arguing that the risks of these costs justify unilateral action. If we are right, the case for American action strengthens considerably.

II. The Leading Scientific and Economic Projections

A. *Scientific Projections of Impact*

We take the predominant scientific consensus—that climate change is indeed occurring,[23] that its rapid acceleration in the last 150 years has been caused primarily by human behavior,[24] and that it poses significant risks of substantial harm from a variety of impacts—as a starting point. The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (FAR) provides "best estimates" and "likely" ranges for global average temperature under six different scenarios with different assumptions about emission rates, technological development, and adaptation, among other things.[25] The IPCC's best estimate for the low emissions scenario is 1.8°C warming (with a "likely" range of 1.1°C to 2.9°C), and a best estimate for the high emissions scenario of 4.0°C warming (with a "likely" range of 2.4°C to 6.4°C).[26]

At current emission rates, GHGs are projected to reach an atmospheric concentration level of 550 ppm by 2050, which is expected to cause an increase in temperature of more than 2°C.[27] The more likely scenario, however, is that emissions will increase as economies grow,[28] especially developing economies, and that GHG concentrations will reach 550 ppm by 2035. The IPCC FAR projects that a variety of impacts—including loss of coastal lands, flooding that could displace hundreds of millions of people, more extreme weather events, stress on regional water supplies, and significant biodiversity loss—will occur under all the scenarios considered.[29]

These global estimates mask the fact that impacts will vary globally. There is little doubt that the United States is relatively well positioned to avoid the worst impacts. Not only is the United States geographically well situated to withstand the warming trend, but it has comparatively robust adaptive capacity from both strong domestic institutions and a relatively healthy, diversified economy.[30]

This story of relative effects, however, misses the point that, for policymaking purposes, it is absolute impact on the United States that matters. For this reason, the following section discusses the economic consequences of climate change in absolute terms and explains why existing economic projections systematically underestimate their impact.

23. Before industrialization, the average concentration of greenhouse gases in the atmosphere was approximately 280 parts per million (ppm). Hervé Le Treut et al., Historical Overview of Climate Change Science, *in* Intergovernmental Panel on Climate Change, Climate Change 2007: The Physical Science Basis 93, 100 (Susan Solomon et al. eds., 2007) [hereinafter IPCC, Physical Science Basis]. As of 2009 it was approximately 384 ppm. Earth Sys. Research Lab. Global Monitoring Div., Nat'l Oceanic & Atmospheric Admin., Trends in Atmospheric Carbon Dioxide, *at* http://www.esrl.noaa.gov/gmd/ccgg/trends (last visited Aug. 6, 2009) (on file with the *Columbia Law Review*). This change has caused the earth to warm by an average of 0.5°C, and will lead to at least an additional 0.5°C of warming in the coming decades. Stern Review, *supra* note 5, at 6, 15. Such increments of temperature rise may sound small, but small changes in global average temperature have significant impacts. *See* Mark Lynas, Six Degrees 17 (2008).

24. The most recent Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC FAR), which represents the consensus of the international scientific community, concludes that anthropogenic greenhouse gas emissions are "very likely" responsible for "most of the observed increase in global average temperatures since the mid-20th century." Richard B. Alley et al., Summary for Policymakers, *in* IPCC, Physical Science Basis, *supra* note 23, at 1, 10.

25. *Id.* at 18.

26. *Id.* at 11 tbl.SPM.3.

27. A recent analysis projects a temperature rise of 2°C in the long term even if there is no growth in emissions due to warming already "in the pipeline." James Hansen et al., *Target Atmospheric CO_2: Where Should Humanity Aim?*, 2 Open Atmospheric Sci. J. 217, 225 (2008).

28. Alley et al., *supra* note 24 at 12 ("For the next two decades, a warming of about 0.2°C per decade is projected.... Even if the concentrations of all greenhouse gases and aerosols had been kept constant at year 2000 levels, a further warming of about 0.1°C per decade would be expected.").

29. *Id.* at 12 ("Sea ice is projected to shrink in both the Arctic and Antarctic under all SRES [Special Report on Emissions Scenarios] scenarios.").

30. The United States is not unique in this respect; other nations will also be less adversely affected. *See* Nordhaus & Boyer, *supra* note 5, at 96 (Japan, Russia, and China); Mendelsohn et al., *Distributional Impact*, *supra* note 6, at 170 (former Soviet Union and Eastern Europe); *see also* Stern Review, *supra* note 5, at 110-13 (discussing weak adaptive capacities of many developing nations).

B. *Economic Projections of Cost to the United States*

To generate estimates of the economic impact of climate change, economists rely on integrated assessment models (IAMs), which typically frame costs as changes in the level of gross domestic product (GDP) attributable to climate change.[31] Most of the economic models that focus specifically on the United States estimate that the long-term economic harm attributable to climate change will be between 0-3% of GDP.[32]

In this section, we explain why the methodological limitations of these models almost certainly cause them to understate the cost of climate change. We identify five problems that many of the studies share: optimism about projected temperature rise; failure to account for the possibility of catastrophic loss; omission of cross-sectoral impacts; exclusion of nonmarket costs; and optimism about projected economic growth.

1. Optimism About Temperature Rise. Creating an estimate of the economic impact of climate change begins with assumptions about the extent of warming over time. The most important economic studies to date have generally chosen relatively optimistic estimates about temperature changes, most in line with the IPCC FAR's low emissions scenario.[33] The resulting economic impact is 0-3% of global GDP lost.[34] If, however, one considers the possibility of 5-6°C warming, the economic impact is 5-10% of global GDP.[35]

Though it is possible that most IAMs overstate future warming,[36] it is much more likely that they underestimate the dangers we face. First, measurement difficulties cause some warming effects to be ignored.[37] Water vapor, for example, may increase the effects of rising carbon dioxide (CO_2) concentrations, but we do not know with any confidence how large such an effect could be.

Second, there is a possibility of "tipping points" or "threshold effects" which could result in "abrupt and irreversible change in the climate system"[38]—but are not factored into the IPCC FAR conclusions.[39] These include, for example, the risk of a rapid collapse of ice sheets in Greenland or the Antarctic.

Third, almost every surprise about climate change thus far has underestimated both the rate of warming and its effects. For example, Arctic sea ice is retreating at a significantly faster rate than predicted by the best computer models, including all eighteen models used by the IPCC in preparing the FAR.[40]

Fourth, the process that generated the projections makes understatement more likely than overstatement. There have been numerous allegations of political influence over the IPCC process, from charges that members have been voted out of the Panel for being overly aggressive in advocating policy responses[41] to claims that the IPCC has softened or deleted parts of the Report.[42] Governments with an interest in delaying progress on climate change have been known to challenge conclusions in assessment reports aggressively during the line-by-line approval process, leading to allegations that drafters ultimately weaken claims in order to garner consensus.[43] The process by which IPCC assessment reports are produced is highly constrained by the need for consensus, making it more likely to produce cautious and centrist conclusions.[44] It is also fair to suggest that as a matter of disciplinary training and shared norms, scientists tend to err in the direction of conservative estimates that can be defended on the basis of existing data.[45]

Many models also implicitly assume that GHG emissions will level off or decline very soon. Yet present estimates suggest just the opposite.[46] Annual GHG emissions

31. For examples of such models, see Nordhaus & Boyer, *supra* note 5, at 3-7 (Regional dynamic Integrated model of Climate and the Economy (RICE) and Dynamic Integrated model of Climate and the Economy (DICE)); Mendelsohn et al., *Country-Specific*, *supra* note 10, at 554 (Global Impacts Model).
32. *See* Joel B. Smith et al., Vulnerability to Climate Change and Reasons for Concern: A Synthesis, *in* Intergovernmental Panel on Climate Change, Climate Change 2001: Impacts, Adaptation and Vulnerability, at 913, 943 fig. 19-4 (summarizing several prominent IAM studies).
33. *See* Alley et al., *supra* note 24, at 13 tbl. SPM.3.
34. Stern Review, *supra* note 5, at 166 fig. 6.2.
35. Nordhaus & Boyer, *supra* note 5, at 95 fig. 4.3.
36. *See, e.g.*, David Henderson, *Governments and Climate Change Issues*, 8 World Econ. 183, 194-209 (arguing IPCC process has made numerous mistakes, especially in its treatment of economics, and is insufficiently transparent).
37. *See, e.g.*, Daniel P. Schrag, *Confronting the Climate-Energy Challenge*, 3 Elements 171, 173 (2007).
38. *Id.* at 174.
39. Alley et al., *supra* note 24, at 14.
40. *See* Julienne Stroeve et al., *Arctic Sea Ice Decline: Faster Than Forecast*, Geophysical Research Letters (May 2007) (arguing IPCC models underestimate real trends in ice melting).
41. *See* Al Gore, Op-Ed., *The Selling of an Energy Policy*, N.Y. Times, Apr. 21, 2002, §4, at 13.
42. Following the release of the Fourth Assessment Report in 2007, David Wasdell, who served as "an accredited reviewer of the report," viewed preliminary drafts of the report and asserted that "'reference to possible acceleration of climate change [was] consistently removed' from the final report." Fred Pearce, *Climate Report "Was Watered Down,"* New Scientist, Mar. 10, 2007, at 10.
43. David Biello, *Conservative Climate: Consensus Document May Underestimate the Climate Change Problem*, Sci. Am., Apr. 2007, at 16.
44. *See* Intergovernmental Panel on Climate Change, *Principles Governing IPCC Work*, app. A (2003), *available at* http://www.ipcc.ch/pdf/ipcc-principles/ipcc-principles-appendix-a.pdf (on file with the *Columbia Law Review*) (detailing procedures for production of IPCC reports and other materials)
45. To us, it is entirely reasonable to support a policy of taking somewhat more action than the IPCC projections indicate is necessary, both to account for the possibility that existing estimates understate the actual impacts and to recognize that some risk aversion is appropriate. To some commentators, climate change is a situation that calls for action as a kind of investment in insurance. *See, e.g.*, Richard A. Posner, Catastrophe: Risk and Response 56 (2004) ("It would thus be a mistake to say that because some climatologists doubt there is a global warming problem we can ignore the problem until climatologists get their act together and forge a unanimous agreement on the problem and its solution.").
46. Intergovernmental Panel on Climate Change, Synthesis Report 58 fig. 4.1 (2007), *available at* www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf (on file with the *Columbia Law Review*) (indicating under IPCC's A2 "business as usual" scenario, GHG emissions are expected to increase by thirty gigatons CO_2-e between 2000 and 2030). A recent study by Anderson and Bows shows that stabilizing CO_2-equivalent (CO_2-e) concentrations at 450 ppm (which yields a 46% chance of not exceeding 2°C warming) would

in the United States, for example, are projected to rise from 7.2 gigatons CO_2-e in 2005 to 9.7 gigatons in 2030,[47] and economic growth in the developing world is virtually certain to dramatically increase emissions.[48]

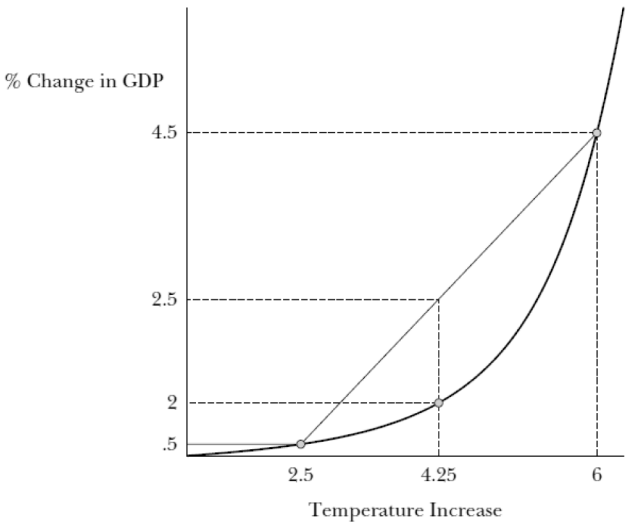
A focus on higher expected temperature change, along with associated changes in precipitation and other weather events, would significantly affect the predicted economic analysis. For example, assuming a temperature rise of 3-4°C instead of 2-3°C causes an additional estimated loss of approximately 1% of GDP.[49]

2. Asymmetry Around Point Estimates. An additional problem arises because discussions about climate change often focus on a single point estimate, rather than a range of temperature changes. The point estimate, while intuitively satisfying, produces misleading results because economic harm increases at an accelerating rate as temperatures rise.[50]

Increases in temperature around a given average will generally have a larger impact on economic well-being than will reductions in temperature. For example, a 2-3°C rise in temperature is expected to cause a 0-3% loss of GDP while a 5-6°C rise would reduce GDP by 5-10%.[51] Notice that doubling the assumed temperature increase from 3°C to 6°C more than triples the predicted economic impact. An accurate estimate of economic impacts, then, requires consideration of the full probability distribution of potential climatic changes.[52]

A better estimate would average the estimated economic impact over a range of possible climate outcomes. Figure 1 demonstrates this point, using data from Nordhaus and Boyer. They predict an impact on GDP of 0.5-4.5% where changes in global temperature range from 2.5-6°C.[53] The midpoint temperature increase would be 4.25°C, which Nordhaus and Boyer estimate would have an impact of 2% of GDP.[54] However, averaging the impact of a 2.5°C temperature increase (0.5% of GDP) and a 6°C increase (4.5% of GDP) yields an expected economic harm of 2.5% of GDP.[55] For policy purposes, the higher estimates more accurately reflect expected economic impact.

Figure 1: Temperature Increase Impact on GDP



Many (perhaps most) IAMs address this problem by estimating multiple scenarios, with alternative climatic assumptions.[56] When the results are deployed in policy discussions, however, the mid-range scenarios are the ones most frequently cited,[57] resulting in a tendency to understate climate change's expected economic impact.

3. Failure to Account for Catastrophic Events. Because IAM estimates are essentially extrapolations of existing experiences to expected climatic changes, they are unable to account for the risk of "catastrophic" climate events that could overwhelm all of the effects IAMs currently take into account.[58] While there is no doubt, for example, that

require heroic action to combat warming, with global emissions peaking in 2015, declining by 6-8% per year between 2020 and 2040, and eventually reducing to zero by 2050. Kevin Anderson & Alice Bows, *Reframing the Climate Change Challenge in Light of the Post-2000 Emission Trends*, 366 Phil. Transactions of the Royal Soc'y A 3863, 3877 (2008).

47. *See* McKinsey & Co., *Reducing Greenhouse Gas Emissions: How Much and at What Cost?*, at 6 (2007), *available at* http://www.mckinsey.com/clientservice/ccsi/pdf/US_ghg_final_report.pdf (on file with the *Columbia Law Review*).
48. Jayant Sathaye et al., Sustainable Development and Mitigation, *in* Intergovernmental Panel on Climate Change, Climate Change 2007: Mitigation of Climate Change 691, 706-07 (Bert Metz et al. eds., 2007).
49. Nordhaus and Boyer predict a 0.0-0.75% loss for the United States if temperatures rise 2-3°C, but a loss of 0.75-1.75% for a 3-4°C change in temperature. Nordhaus & Boyer, *supra* note 5, at 96 fig. 4.4. Note that because similar adjustments are appropriate to account for weaknesses in existing models, the cumulative impact is substantially greater.
50. The "average projected change in temperature" is typically cited as the midpoint of the 5-95% confidence interval of projected temperature changes. This confidence interval is generated using probabilistic techniques that incorporate various kinds of uncertainties. *See, e.g.*, Tom M.L. Wigley & Sarah C.B. Raper, *Interpretation of High Projections for Global-Mean Warming*, 293 Science 451, 451 (2001). In addition to asymmetry within the confidence interval, the exclusion of the most extreme 5% of temperature increases may lead to a downward bias in the point estimate.
51. Stern Review, *supra* note 5, at 166 fig. 6.2.
52. Using the average expected change in temperature also ignores the fact that the climate models do not account for the possibility of major shocks that might amplify the rise in temperature, such as unexpectedly rapid disintegration of major ice sheets.
53. Nordhaus & Boyer, *supra* note 5, at 96 fig. 4.4.
54. *Id.*
55. This simple averaging of the endpoints is fairly crude. Ideally one would calculate the expected change in GDP over the complete probability distribution function of potential temperature changes. This more thorough approach would yield similar results.
56. *See, e.g.,* Nordhaus & Boyer, *supra* note 5, at 96.
57. *See, e.g.*, Jerry Taylor & Peter Van Doren, *What Will Climate Change Cost Us?*, Dec. 18, 2008, Cato.org, http://www.cato.org/pub_display.php?pub_id=9850 (highlighting only mean, median, and modal summary estimates from IAMs). It should be noted, though, that in some secondary analyses, the use of point estimates is occasionally compelled by mathematical limitations. *See, e.g.*, U.S. EPA, *Analysis of the Lieberman-Warner Climate Security Act of 2008*, at 108 (2008), *available at* http://www.epa.gov/climatechange/downloads/s2191_EPA_Analysis.pdf.
58. Martin Weitzman, *On Modeling and Interpreting the Economics of Catastrophic Climate Change*, 91 Rev. Econ. & Stat. 1, 1-2 (2009). Weitzman argues that the low probability, highly uncertain scenarios of very large global average temperature increases (on the order of 10°C or more by 2200)

climate change will increase the incidence and the magnitude of floods, droughts, and storms, most IAMs do not adequately consider the potentially serious costs from such events.[59]

One exception is the study by Nordhaus and Boyer. By assuming a warming of 2.5°C they yield an estimated economic impact from catastrophic risk of slightly less than 0.5% of GDP for the United States, and about 1% globally. To this, one must add other impacts (agriculture, coastal resources, etc.), leading to a total estimate of harm of about 0.5% for the United States and 1.5% of GDP globally.[60] For a warming of 3-4°C, they predict loses of 1.5-2% of U.S. GDP. Using a relatively pessimistic assumption of 6°C warming yields an alarming forecast of a 10% loss of global GDP and 4.25% for the United States.[61]

4. Failure to Account for Nonmarket Costs. IAMs also tend to omit significant nonmarket costs, including those associated with the environment and human health.[62] These impacts are potentially enormous but the absence of reliable market prices makes them difficult to evaluate. A significant loss of biodiversity is very likely to occur yet is rarely included in estimates of economic harm, considered to be either too negligible or uncertain to quantify.[63] Although these costs are indeed difficult to quantify and hence uncertain, it is highly unlikely that they will be negligible.

Among the many reasons to be concerned about such significant biodiversity loss is a self-interested motive: the value of preserving biodiversity to support ecosystem services for human populations such as pollination, soil fertilization, and genetic resources used for medical research and pharmaceutical development.[64] These services would require considerable cost to replace—one study estimated their value in the mid-1990s at $33 trillion, about 1.8 times the value of global GNP at the time.[65] Although the portion of this value attributable solely to biodiversity is difficult to estimate as many ecosystem services are of mixed biological and nonbiological origin,[66] authors of another 1997 study estimated the value of biodiversity to be $319 billion annually for the United States and $2.93 trillion annually for the world.[67] Hsiung and Sunstein combined this estimate with the 15-37% estimated extinction rate to calculate the estimated value of biodiversity loss due to climate change in 2050 as $539-1,322 billion for the world and $58-144 billion for the United States.[68]

These are dramatic estimates, but they should nevertheless be viewed as conservative. To cite just one reason, the authors assume no more than modest temperature increases (0.8-2°C).[69]

The impact of species extinctions on human health and the pharmaceutical industry in particular illustrates the magnitude of these costs. Approximately 60% of anti-infective and anti-cancer drugs are either derived from or modeled after natural products.[70] The loss of the species from which such discoveries could be made is a cognizable economic loss. The magnitude of possible species losses at issue here—possibly one quarter to one half of species worldwide—overwhelms the argument that the value of any single species to new discoveries is negligible.[71] In addition to unexplored potential, some species that currently provide important services to human populations—like Rosy periwinkle, the source of two anti-cancer drugs[72]—may be threatened by climate change.

Therefore, although it is difficult to estimate the precise cost or harm to the ecosystem, strong evidence suggests that it is greater than zero, and potentially much larger. At a minimum, uncertainty cannot justify ignoring these costs altogether.

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merit further investigation, because the potential economic impact of these high risk scenarios could overwhelm the conventional cost-benefit analysis of current IAMs. *Id.* at 1-2.

59. *See* Megan Ceronsky et al., *Checking the Price Tag on Catastrophe: The Social Cost of Carbon Under Non-Linear Climate Response* 18-21 (Hamburg Univ. & Ctr. for Marine & Atmospheric Sci., Working Paper FNU-87, 2005), *available at* http://www.uni-hamburg.de/Wiss/FB/15/Sustainability/catastrophewp.pdf (on file with the *Columbia Law Review*).
60. Nordhaus & Boyer, *supra* note 5 at 91 tbl. 4.10. The impact on the United States is approximately 0.5% in both cases because the net impact in other sectors is roughly zero. The 1.5% global GDP loss is calculated by weighting countries by output level. Weighting countries by population yields a larger global GDP loss (about 1.9%). *Id.*
61. *Id.* at 95-96 figs. 4.3 & 4.4. Global GDP loss is calculated by weighting countries by output level. Weighting countries by population yields a larger loss of 11% of global GDP. *Id.* at 96 fig. 4.3. Intermediate temperature changes predictably yield intermediate results, with global GDP losses of about 5% for a 4°C warming and harm to the United States of slightly less than 2% of GDP for that same change in climate. *Id.* at 95-96 figs. 4.3 & 4.4.
62. *See* Richard S.J. Tol et al., *How Much Damage Will Climate Change Do? Recent Estimates*, 1 World Econ. 179 (2000), 191.
63. Although the impact on food production is often considered, the categories relating to natural biological processes have been ignored. Wayne Hsiung & Cass R. Sunstein, *Climate Change and Animals*, 155 U. Pa. L. Rev. 1695, 1716 (2007). *See also, e.g.*, Nordhaus & Boyer, *supra* note 5, at 85-87 (noting "rather wild" economic valuations of species extinction and serious need for quantitative work in area).
64. As the supply of ecosystem services approaches zero, the demand and total economic value approach infinity, because ecosystem services are necessary to support human life. *See* Robert Costanza et al., *The Value of the World's Ecosystem Services and Natural Capital*, 387 Nature 253, 257 (1997).
65. *Id.* at 259 (calculating figures in 1994 U.S. dollars).
66. *See* Wayne Hsiung & Cass R. Sunstein, Climate Change and Animals, 155 U. Pa. L. Rev. 1695, 1715-16 (2007) (noting significant portion of ecosystem value is generated by biological sources). Nonbiological services include, for example, ozone in the atmosphere for UVB protection and the weathering of rock in the soil formation process.
67. Daniel Pimentel et al., *Economic and Environmental Benefits of Biodiversity*, 47 BioScience 747, 748 tbl. 2 (1997).
68. Hsiung & Sunstein, *supra* note 66, at 1715-19. The low range in their estimates corresponds to a 0.8-1.7°C increase in global temperature, and the high range corresponds to an increase in global temperature that exceeds 2°C. *Id.* at 1703 n.37.
69. *Id.* at 1703 n.37. *See* Costanza et al., *supra* note 64, at 253 (noting their estimate represents minimum value because of uncertainties, which would probably increase "with the incorporation of more realistic representations of ecosystem dynamics and interdependence").
70. Walther H. Adey, *Coral Reef Ecosystems and Human Health: Biodiversity Counts!*, 6 Ecosystem Health 227, 232-33 (2000).
71. *See* Amy B. Craft & R. David Simpson, *The Value of Biodiversity in Pharmaceutical Research With Differentiated Products*, 18 Envtl. & Res. Econ. 1, 2 (2001).
72. Gordon C. Rausser & Arthur A. Small, *Valuing Research Leads: Bioprospecting and the Conservation of Genetic Resources*, 108 J. Pol. Econ. 173, 178 (2000).

5. Failure to Account for Cross-Sectoral Impacts. Many studies calculate costs on a sector-by-sector basis to arrive at an estimated aggregate impact.[73] This approach, though understandable given the complexity of considering all sectors simultaneously, understates the impact of climate change by not capturing potential cumulative impacts on a particular sector. To illustrate, we draw on the leading work of Robert Mendelsohn, who calculates the cost of climate change to the U.S. economy based on an enumerative approach that cannot account for either cross-sectoral or international spillovers.[74]

Mendelsohn begins with an estimate of climate change taken from one or more General Circulation Models, which attempt to predict what will occur as a result of warming.[75] He identifies several sectors (agriculture, forestry, coastal resources, energy, and water) likely to be sensitive to the estimated change in climate and projects a "climate-response function" to estimate the welfare impacts in each of these sectors.[76] The economic impact on a sector can be estimated as a function of temperature, precipitation, sea level rise, CO_2 concentration, and a set of additional parameters (e.g., land area, economic growth).[77] Mendelsohn then sums the sectoral impacts to produce an aggregate impact for a country.[78]

These models omit economic effects that implicate multiple sectors, however.[79] The impact of climate change on energy prices, for example, will not be reflected in the estimated impact of climate change on agriculture, even though climate-induced negative impacts on both water resources and the energy sector might combine to reduce agricultural outputs.[80] Mendelsohn attempts to measure the economic impact of climate change on agriculture, forestry, coastal resources, energy, and water independent of each other, and assuming all other economic forces are unaffected by that same climate change.

Cross-sectoral spillover effects might be insignificant if Mendelsohn's assumption of 2°C warming proves accurate, and if the impact of climate change in each sector turns out to be both positive and very small, as he has found.[81] If, however, warming turns out to be greater than 2°C, some of the impacts in the United States become more worrisome, and there is a greater risk of costly interaction among the sectors.

6. Growth, Productivity, and Long-Term Projections. Finally, existing IAMs tend to be static, representing a snapshot of the economic situation. They generate predictions by varying one variable at a time, which greatly simplifies the task, but fails to capture other changes in the system. That failure is particularly problematic when, as with predicting climate change impacts, the analysis covers very long time periods of, say, 100 years or more, over which time the rate of economic growth will have a critical influence on economic welfare. A 2% growth rate over 100 years implies a more than seven-fold increase in the size of the economy, but a 1% growth rate would lead to an economy less than half that size. It follows that when estimating the value of mitigation, investments today to prevent even a small reduction in growth rates can yield enormous future benefits. A reduction in GDP due to climate change is likely to cause a drop in investment. Lower investment will, over the long term, cause a reduction in the capital stock and, therefore, a drop in productivity.

Fankhauser and Tol estimate the impact of such a reduction in saving and investment[82] and find that the capital accumulation effects are more important in places where climate change impacts are modest overall.[83] Under certain conditions they find that the capital accumulation effect may be larger than the "direct impact" measured by existing models. In other words, accounting for the capital accumulation effect may cause estimates of harm to be doubled.

III. Spillovers

Overlooking international spillovers also leads existing models to understate the likely costs of climate change. Virtually all models to date have focused on a single part of the world; there is almost no discussion of how impacts in different countries, and across regions, might affect other parts of the world.

Observers calculating climate change costs generally examine only the direct—and geographically local—costs of a change in the environment.[84] Yet it hardly needs emphasizing that in this era of globalization the economic security of the United States relies heavily on political and economic stability in other parts of the world. We can only understand the impact of climate change on the United States if we understand how its impact elsewhere affects us. To illustrate, the Nordhaus and Boyer model predicts that a 6°C warming would reduce European GDP by about

73. *See, e.g.*, Nordhaus & Boyer, *supra* note 5, at 10-12; Robert Mendelsohn & Michael E. Schlesinger, *Climate-Response Functions*, 28 AMBIO 362, 363 (1999); Robert Mendelsohn & Larry Williams, *Comparing Forecasts of the Global Impacts of Climate Change,* 9 Mitigation & Adaptation Strategies for Global Change 315, 323 (2004).
74. *See, e.g.,* Mendelsohn et al., *Country-Specific*, *supra* note 10, at 554-60.
75. For example, in his 2006 article, Mendelsohn uses two different University of Illinois at Champaign-Urbana (UIUC) models: the UIUC11 and UIUC2 models. Mendelsohn et al., *Country-Specific*, *supra* note 10, at 555. Mendelsohn & Williams, *supra* note 73, at 316, use five models.
76. Mendelsohn et al., *Distributional Impact*, *supra* note 6 , at 161.
77. *Id.* at 161, 163.
78. *Id.* at 161.
79. The climate-response functions do take into account that the economy will grow over time, but they ignore the possibility that harm in one sector may have an impact on other sectors or that harm abroad could affect the United States.
80. Mendelsohn et al., *Country-Specific*, *supra* note 10, at 558 tbl. 1.
81. *Id.* at 558.
82. Samuel Fankhauser & Richard S.J. Tol, *On Climate Change and Economic Growth,* 27 Resource & Energy Econ. 1, 3-6 (2005).
83. *Id.* at 13.
84. Although we are concerned in this Article with U.S. policy, many of the indirect effects we describe will affect other countries as well. That includes some countries that are crucial to solving the climate change problem, such as India and China.

17%.[85] Were Europe to face harms of this magnitude, there is little doubt that there would be serious consequences for the United States.[86]

Economic models of climate change do not take such spillovers into account for good reason: It is difficult enough to estimate the impacts within a single economy. Additionally, the methodological limitations in even our most advanced models leave us with only a partial picture of the likely impacts and costs of climate change. It would thus be unfair to criticize IAMs as being poorly or irresponsibly done. That said it is critical for policymakers to keep the models' limitations in mind, including their failure to account for cross-border spillovers. As we show below, once one takes into account the likely spillovers from climate change, the costs to the United States are clearly much larger than typically portrayed.

The analysis below focuses on a number of areas in which the United States is likely to suffer negative consequences from climate change. The magnitude of these spillovers will obviously depend on the impact of climate change on other countries. To give some perspective, recall that the Stern Review estimates that a "business as usual" approach would lead to a global reduction in per capita consumption of 20%.[87] Even if this estimate overstates the actual impact, many parts of the world stand to be badly affected, creating competition for resources, demands for political change, increased migration, more disease, and other harms that would negatively impact American interests and require U.S. investment of resources.

A. *Economic Spillovers*

Although the costs of reducing GHGs will be significant, the cost of not reducing them may well be even greater. There is widespread, if not universal, agreement that climate change will have a large impact on many parts of the world, including relatively wealthy Europe, where rising seas are projected to bring severe flooding, land loss, salinization of groundwater, and the destruction of physical infrastructure.[88] Other parts of the world stand to suffer even more. In Asia, decreases in crop yields are expected to place hundreds of millions of people at risk of hunger, while large-scale hydrologic changes will expose millions more to epidemics.[89] In Africa, the food and water security consequences of climate change are projected to be particularly grave, especially given the continent's already limited capacity to adapt.[90] In Latin America, water stress and extreme loss of biodiversity are expected in fragile ecosystems.[91]

The United States is integrated into the world economy in many important ways. With respect to trade, for example, eleven percent of American GDP is exported, and seventeen percent is imported.[92] Private parties in the United States benefit from opportunities to invest and do business abroad, and rely on the global financial community to raise capital. In these and countless other ways, the United States benefits from engagement with the rest of the world.

It is admittedly impossible to assign dollar amounts to American losses resulting from climate change in other parts of the world. The precise amount of warming experienced by foreign countries and the associated environmental impacts are uncertain, and the effect of these changes on the economies, governance, and behavior of foreign countries is difficult to predict. How much stress on the availability of freshwater in the Persian Gulf region will it take to cause a major disruption in the oil supply? Will Europe adopt protectionist strategies in reaction to the pressures generated by climate change? It is also difficult to anticipate how the supply and demand of many American imports will be affected. Even if all of the relevant impacts were known, the predictions of the appropriate economic models come with large variances.

The inability to generate precise numerical estimates of the economic impact of climate change spillovers does not mean, however, that they are unlikely to occur. The discussion that follows confirms the intuition that American integration into the international economic system virtually guarantees that broad-based and substantial hardship abroad will lead to welfare losses in the United States. Any sensible policy consideration of the costs of climate change on the United States must account for the prospect of such impacts.

1. Shocks to International Trade. The first and most obvious way that climate change's foreign impacts are likely to affect American trading interests is through diminished trade flows. To the extent the foreign markets for American products contract, American exporters will suffer. To the extent that foreign sources of production are affected by climate change, American imports may become more expensive or of lower quality. If states (including the United States) engage in protectionism as a response to climate change, the effects on both imports and exports will be further aggravated.

85. Nordhaus & Boyer, *supra* note 5, at 96 fig. 4.4.
86. There are other synergistic and multiplier effects that might arise if one considers the possibility of both cross-sectoral and international spillovers. *See supra* Part II.B.5.
87. Stern Review, *supra* note 5, at 186-87.
88. Joseph Alcamo et al., Europe, *in* IPCC, Impacts, *supra* note 20, at 541, 551.
89. *See* Rex Victor Cruz et al., Asia, *in* IPCC, Impacts, *supra* note 20, at 469, 471 (summarizing effects of climate change on Asia).
90. Michel Boko et al., Africa, *in* IPCC, Impacts, *supra* note 20, at 433, 435.
91. Graciela Magrin et al., Latin America, *in* IPCC, Impacts, *supra* note 20, at 581, 583.
92. U.S. Census Bureau, Foreign Trade Div., U.S. Trade in Goods and Services—-Balance of Payments Basis (June 10, 2009), *at* http://www.census.gov/foreign-trade/statistics/historical/gands.txt (on file with the *Columbia Law Review*) [hereinafter Census—-U.S. Trade (BOP Basis)]; World Bank, World Development Indicators, *at* http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20398986~menuPK:64133163~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html (last visited Aug. 7, 2009) (on file with the *Columbia Law Review*) [hereinafter World Bank Indicators].

A conventional approach to short-run supply shocks assumes that their impact fades over the long term. In the context of climate change, however, there are good reasons to think these shocks may last beyond the short term. First, because climate change is a process playing out over many years with potentially profound impacts, it is at least plausible that the world will face a series of serious to severe supply shocks stretching over an extended period of time. These events could severely hamper economies for decades, creating a lasting economic (not to mention political and social) crisis.

A second way in which supply shocks could have long-term effects is through a loss of raw materials. Climate change poses a serious threat to the supply of critical resources like water and energy, and severe shortages of either could wreak havoc on worldwide production for decades. In standard economic models the long-run rate of growth is ultimately determined by productivity, which is taken to be exogenous. If growth is to be affected in the long run, then it must be through productivity.[93] Unfortunately, there are no good models of factors that influence productivity, making it difficult to assess the impact of a hypothetical shock on long-term growth rates.

We live in a global market with global prices. If climate change has the effect of driving up prices due to a supply shock, then the United States will suffer along with everyone else. Such a shock could result from water shortages in Asia (as Himalayan glaciers melt), a disruption in energy supply from the Middle East and Africa, a drop in global food production due to changing climatic conditions, or any of the many other possible disruptions that could take place. Any of these outcomes would harm the United States along with everyone else in the world.

In addition to the above supply shocks, demand for American exports may be reduced by the economic harm imposed by climate change on foreign states. As discussed in the context of supply shocks, these demand shocks would normally be considered short-term rather than long-term problems. To the extent climate change creates a series of negative demand shocks spread over many years, however, the impact on the United States could be felt for generations. Table 1 shows the contribution of exports to the U.S. economy in recent years.

Table 1: U.S. Exports as Percentage of GDP[94]

Year	Exports (% of GDP)	Exports (Billions of $)
1993	9.9	654
1994	10.3	723
1995	11.1	812
1996	11.2	869
1997	11.6	934
1998	11.0	933
1999	10.8	966
2000	11.2	1071
2001	10.3	1005
2002	9.7	975
2003	9.5	1018
2004	10.1	1161
2005	10.5	1284
2006	11.1	1457
2007	11.6	1646
2008	12.9	1843

To get some sense of the impact that a reduction in trade might have, we turn to the economic literature on the gains from international trade.[95] Note that total estimated gains to the United States from trade are enormous, on the order of $1 trillion per year since the Second World War.[96] This represents a permanent increase in national income, meaning the gain is enjoyed every year.[97] How much of that value is at risk from climate change depends on how much trade is disrupted. One way to get a sense of the potential magnitudes is to examine the impact of recent events, such as the economic impact to the United States of the trade liberalization associated with the WTO's Uruguay Round, which took effect in 1995. Brown, Deardorff, and Stern estimate that the total impact of the agreement that emerged from this round of trade talks was $19.8 billion,[98] which represents slightly more than one quarter of 1% of U.S. GDP in 1995.[99] The trade flows that generated this modest increase in GDP were a similarly modest increase in imports of about $19 billion and an increase in exports of about $18 billion.[100] Assuming that climate change causes a significant contraction of foreign demand for U.S.

93. The previous two examples of how climate change might have a long-run impact are consistent with this statement. The first, that the shocks may themselves persist over decades, is really a claim that the "long term" is sufficiently far off that we should be concerned with short-term shocks. The period over which the shocks continue is most accurately called the short term, but when this period extends to fifty years or more, the importance of worrying about the short term is clear. The second example is a special case of a shock affecting productivity. If natural resources (or any other essential inputs) are scarce, the productivity of labor is reduced and prices (though not wages) rise.

94. World Bank Indicators, *supra* note 92. The query was limited to Country: United States, Series: Exports of goods and services (% of GDP), and Time: 1993 through 2008. For 2006–2008 census data, see Census—U.S. Trade (BOP Basis), *supra* note 92.

95. *See generally* Scott C. Bradford et al., The Payoff to America From Global Integration, in the United States and the World Economy: Foreign Economic Policy for the Next Decade 65-66 (C. Fred Bergsten ed., 2005) (summarizing gains in post-World War II trade and gains to come); Drusilla K. Brown et al., *Computational Analysis of Multilateral Trade Liberalization in the Uruguay Round, in The World Trade Organization: Legal, Economic and Political Analysis*, Part III: Economic, Political and Regional Issues 23 (Patrick F.J. Macrory et al. eds., 2005) [hereinafter Brown et al., *Computational Analysis*] (describing international trade as driving increased national income).

96. Bradford et al., *supra* note 95, at 68.

97. *Id.*

98. Brown et al., *Computational Analysis, supra* note 95, at 31.

99. World Bank Indicators, *supra* note 92 (citing for GDP amount).

100. Brown et al., *Computational Analysis*, *supra* note 95, at 28 tbl. 1.

goods, one would expect much larger effects. To illustrate, see Table 2 for the impact of the recession of 2009-2010 on exports.

Table 2: U.S. Monthly Exports[101]

Period	Exports (Billions of $)
January 2008	149
February 2008	153
March 2008	150
April 2008	155
May 2008	157
June 2008	163
July 2008	167
August 2008	165
September 2008	154
October 2008	150
November 2008	141
December 2008	133
January 2009	125
February 2009	127
March 2009	124

As the chart shows, US exports fell 25% from their peak in July 2008 to March 2009. This is a much larger shock than that considered by Brown, Deardorff, and Stern. If one assumes that climate change will cause a disruption in trade flows half as large as what was experienced from July 2008 to March 2009, the result is a reduction in exports of about $20 billion per month, or $240 billion per year. As Table 1 shows, this would not be out of line with fluctuations in exports that we have seen over the last fifteen years.

What would be the impact of this reduction in trade flows on welfare? The Brown, Deardorff, and Stern estimates suggest a rough 1:1 ratio between exports and GDP impact, at least over this relatively modest increase in exports. Bradford, Grieco, and Hufbauer estimate the total impact of trade and investment to be approximately $1 trillion in 2003.[102] In 2003 the United States had just over $1 trillion in exports.[103] Again, we see a 1:1 ratio between exports and welfare impacts. Assuming that this ratio is accurate, the above-mentioned $240 billion reduction in exports can be expected to correspond to a $240 billion reduction in welfare—more than 1.5% of 2008 GDP.

2. Financial Markets. Climate change's impact on financial markets may be even more important than its trade effects. The United States has run a current account deficit for many years, with the difference between imports and exports being made up with borrowing from abroad.[104] As countries suffer climate-induced economic contraction, perhaps for long periods of time, their enthusiasm for continuing to lend to Americans is likely to wane more quickly than it otherwise would. In practical terms, this reluctance to lend would mean higher interest rates in the United States, a contraction of investment, and a reduction in consumption.

Of course financial markets matter for more than simply bringing the current account into balance. Private parties in the United States, including virtually all of the largest and best known American firms, invest abroad and could face losses if foreign economies suffer. This translates to lower returns on investment in these firms for everyone, including individual shareholders.

More systemically, there is a risk that a global economic downturn would lead to a drying up of capital markets, an increase in the cost of credit, and a resulting reduction in investment. Climate change could trigger such global slowdowns in the future, and it is clear that the United States would be unable to isolate itself from the impacts.

B. National Security

Until recently, climate change received virtually no sustained analysis in either academic or policy circles as a potential threat to national security.[105] In the last few years, however, a number of important studies on the topic have emerged from well-respected academic, government, and nongovernment sources. In 2008, the National Intelligence Council produced the most comprehensive analysis to date of the implications of climate change for U.S. national security over the next twenty years.[106] According to news reports, the classified assessment concluded that climate change could destabilize fragile political regimes, exacerbate conflicts over scarce resources, increase the threat of terrorism, disrupt trade, and produce millions of refugees—all of which would seriously affect U.S. national security interests.[107]

The consistent message of these studies is that while climate change may not provoke national security threats by itself, it is certain to be a "threat multiplier,"[108] exac-

101. Press Release, Foreign Trade Div., U.S. Census Bureau, U.S. International Trade in Goods and Services, *available at* http://www.census.gov/foreign-trade/Press-Release/current_press_release/exh1.pdf (last visited Aug. 22, 2009) (on file with the *Columbia Law Review*).
102. *See* Bradford et al., *supra* note 95, at 69.
103. *See* Census—U.S. Trade (BOP Basis), *supra* note 92.
104. *See* Press Release, Bureau of Econ. Analysis, U.S. Dep't of Commerce, U.S. International Transactions: First Quarter 2009 (June 17, 2009), *available at* http://www.bea.gov/newsreleases/international/transactions/2009/pdf/trans109.pdf (on file with the *Columbia Law Review*).
105. Jon Barnett, *Security and Climate Change 2* (Tyndall Ctr. for Climate Change Research, Working Paper No. 7, 2001) (on file with the *Columbia Law Review*).
106. *See* Tom Gjelten, *Intel Report Eyes Climate Change-Security Link*, NPR, June 23, 2008, *at* http://www.npr.org/templates/story/story.php?storyId=91819098 (on file with the *Columbia Law Review*) (describing classified report).
107. *Id.*
108. *See National Intelligence Assessment on the National Security Implications of Global Climate Change to 2030: Joint Hearing Before the H. Select Comm. on Energy Independence and Global Warming and the H. Permanent Select Comm. on Intelligence*, 110th Cong. 4-5 (2008) (statement of Thomas Fingar, NIC Chair) [hereinafter *Fingar Statement*], *available at* http://globalwarming.house.gov/tools/2q08materials/files/0069.pdf (on file with the *Columbia Law Review*) ("[T]he most significant impact for the United States will be

erbating political instability around the world as weak or poor governments struggle to cope with its impacts.[109] In especially hard hit nations, deteriorating economic conditions could lead to the fall of governments, creating, at worst, safe havens and, at best, fertile recruiting grounds for terrorist groups. Floods, droughts, and conflicts over scarce resources are projected to create refugees—"climate migrants"—potentially inflaming political tensions and burdening the already-stressed economies in host nations.[110] Climate change also threatens to interrupt the free flow of trade in critical resources such as oil, gas, and other essential commodities on which the United States depends.

Though the message from the national security studies is unambiguous, none of the leading studies of economic impacts have tried to quantify these effects. It is possible, however, to provide a qualitative sense of potential threats that ought to be factored into any analysis of climate policy.[111] We offer some examples below.

In Asia, rising global temperatures are projected to result in reduced agricultural productivity, shrinking supplies of drinkable water, and increased risk of flood, drought, and extreme weather events.[112] Many glaciers in Asia could, at current rates of climate change, disappear within the coming decades.[113] Such a disappearance would have serious long-term consequences for the half billion people in the Himalaya-Hindu-Kush region, and for an additional quarter billion people downstream, in countries like Pakistan, who rely on glacial melt waters for their water supply.[114] In addition, cereal crop yields are expected to drop between 2.5 and 10% in South, Southeast, and East Asia, contributing to a risk of hunger for as many as fifty million people as soon as 2020.[115]

These impacts will have spillover effects on the United States. For example, Bangladesh could find the fifth of its country comprised of low-lying regions uninhabitable by the end of the century.[116] Bangladesh has already become a security concern for the United States as the impact of Islamic extremism has grown.[117] The effects of population displacement from flooding,[118] along with additional economic stress in an already unstable region, are likely to create fertile grounds for terrorist groups.[119]

China, a rising international power of tremendous strategic importance to the United States, is also vulnerable to disasters precipitated by climate change.[120] Climate change likely will affect China by reducing water supplies in the North, causing extreme weather in the South, and raising the sea level, threatening hundreds of millions of people in densely populated coastal regions.[121] China faces serious indirect costs, as well, as it is especially vulnerable to unstable energy supplies in regions that will be among the hardest hit by climate change.[122] A serious interruption of supply could considerably slow China's growth, which could in turn undermine the legitimacy of the ruling Communist Party, leading to political instability. While this series of events is speculative, it is certainly plausible.

The impact of climate change on many nations in Africa is projected to be especially severe, with their high risk of impact and low adaptive capacity.[123] Moreover, Africa possesses critical natural resources over which there is increasingly intense competition,[124] and various countries in Africa pose a risk to the United States as potential bases for terrorist groups. Consider the impact of climate change on Nigeria, on which the United States increasingly depends for oil.[125] Nigeria already faces severe challenges as rebel groups undertake attacks in an effort to disrupt oil production,[126] and would risk further major domestic turmoil as a result of climate change. It is easy to imagine a collapse in oil exports due to a combination of increased rebel activity (fueled in part by more acute struggles for food and water throughout Nigeria and the continent) and

indirect and result from climate-driven effects on many other countries and their potential to seriously affect US national security interests."); Ctr. for Strategic & Int'l Studies & Ctr. for a New Am. Security, The Age of Consequences: The Foreign Policy and National Security Implications of Global Climate Change 103, 105 (Kurt M. Campbell et al. eds., 2007), *available at* http://www.cnas.org/files/documents/publications/CSIS-CNAS_AgeofConsequences_November07.pdf (on file with the *Columbia Law Review*) (describing different impacts of climate change on world and arguing it "has the potential to be one of the greatest national security challenges that this or any other generation of policymakers is likely to confront") [hereinafter *Age of Consequences*.].

109. *See* John M. Broder, *Climate Change Seen as Threat to U.S. Security*, N.Y. Times, Aug. 9, 2009, at A1.

110. *See infra* Part III.C.

111. Consistent with the leading assessments, we adopt a broad definition of "national security." *See Fingar Statement*, *supra* note 108, at 3 (describing NIA definition: "We first considered if the effects would directly impact the US homeland, a US economic partner, or a US ally. We also focused on the potential for humanitarian disaster [and] ... if the result would degrade or enhance... Geopolitical, Military, Economic, or Social Cohesion....").

112. Victor Cruz et al., *supra* note 89, at 471.

113. Nearly 70% of the world's freshwater is locked in glaciers and icebergs, which are already melting because of climate change. Adger et al., Summary for Policymakers, *in* Climate Change 2007: Impacts, Adaptation and Vulnerability 13 (M.L. Perry et al. eds, 2007).

114. Current trends in glacial melt suggest that the Ganga, Indus, Brahmaputra, and other rivers in India may become seasonal rivers as a consequence of climate change, which could significantly and adversely affect the economies in the region. Victor Cruz et al., *supra* note 89, at 493.

115. *See Fingar Statement*, *supra* note 108, at 8-9.

116. Stern Review, *supra* note 5, at 104, 129.

117. Sudha Ramachandran, *The Threat of Islamic Extremism to Bangladesh*, The Mail Archive, July 27, 2005, *at* http://www.mail-archive.com/cia-drugs@yahoogroups.com/msg00909.html (on file with the *Columbia Law Review*).

118. *See* Lisa Friedman, *Bangladesh Endures Ugly Experiments in "Nature's Laboratory,"* N.Y. Times Climate Wire, Mar. 9, 2009, *at* http://www.nytimes.com/cwire/2009/03/09/09climatewire-ugly-experiments-in-natures-laboratory-10035.html (on file with the *Columbia Law Review*).

119. *See* John Podesta & Peter Ogden, *The Security Implications of Climate Change*, Wash. Q., Winter 2008, at 118 ("The combination of deteriorating socioeconomic conditions, radical Islamic political groups, and dire environmental insecurity brought on by climate change could prove a volatile mix with severe regional and potentially global consequences.").

120. *See China Sees Climate Impacts Ahead*, BBC News, Apr. 23, 2007, *at* http://news.bbc.co.uk/2/hi/science/nature/6585775.stm (on file with the *Columbia Law Review*).

121. *Id.*

122. Podesta & Ogden, *supra* note 119, at 117-20.

123. *See* Boko et al., *supra* note 90, at 435.

124. The United States imports several hundred thousand barrels of oil a day from Nigeria, making Nigeria the fifth largest oil exporter to the United States. Energy Info. Admin., U.S. Dep't of Energy, Crude Oil and Total Petroleum Imports Top 15 Countries (2009), *at* http://www.eia.doe.gov/pub/oil_ gas/petroleum/data_publications/company_level_imports/current/import.html (on file with the *Columbia Law Review*).

125. *Id.*

126. *Id.*

a central government weakened by reduced agricultural production, flooding in Lagos, and already weak institutions. There is, of course, no way to predict exactly how these events might play out, let alone to quantify them. Yet, as is familiar from American history in the Middle East, the United States considers threats to its oil supply to be threats to its national security.

The United States has significant security interests in the Middle East as well. Among the threats to stability in this historically volatile region is the possibility of severe water shortages combined with rapidly growing populations.[127] The Middle East and adjacent North Africa have 6.3% of the world's population, but only 1.4% of its renewable freshwater.[128] With the exception of Turkey, every country in the region depends on water that originates outside its borders.[129] Climate change will likely adversely affect surface availability of major rivers in the region, like the Euphrates and the Tigris, which will increase in the winter and decrease in the spring.[130] The danger here is that competition for freshwater will exacerbate existing regional tensions and perhaps lead to violent conflicts. This is entirely plausible given the history of serious conflicts over precious water resources in the region.[131]

There is no satisfactory way to estimate the costs of these security concerns. Much depends on exactly which security issues arise and how the United States and others respond. We can, however, fairly conclude that climate change raises the stakes for the United States with respect to global security issues, and that this threat is likely to translate into economic costs as well. One could fairly respond to the scenarios described above by saying that they are highly speculative, virtually impossible to model, and extraordinarily challenging to quantify. Nevertheless, sensible policy cannot simply ignore the potential for climate change to trigger events that would be costly for the United States. To be sure, any projected costs must be discounted to reflect the uncertainties involved, but to simply ignore these risks is intellectually indefensible.

C. Migration

In many parts of the world, climate change will present challenges that make life not simply difficult, but impossible. When populations are unable to survive where they are, they will do what people have done in similar situations throughout human history: They will move.[132]

On a small scale, migration can help to reduce the stress in some regions while bringing a needed increase in population to another. This has been, for example, the story of migration from East to West within the United States. On a massive scale, however, migration's results are often much less benign.

To illustrate, consider the most likely source of spillover into the United States: migration from Latin America. Even now, the impact of unauthorized immigration on the United States is significant. Northern Mexico is expected to suffer severe water shortages as the earth warms, creating a large increase in U.S. immigration.[133] If the United States is unwilling to admit larger numbers of Mexican immigrants legally, we can expect them to cross the border without authorization, amplifying the pressures and challenges of unauthorized immigration.

If history is any guide, racial animosities may be exacerbated as locals resist the arrival of new populations and the (real or perceived) impact on employment, political influence, social services—and competition for resources.[134] Quite apart from one's views on unauthorized immigration, substantial additional migration caused by climate change would have economic implications in North America.

While it is impossible to quantify the costs associated with climate-induced migration, the impacts will be real, and the appropriate political response will require U.S. resources. The fact that the leading economic models overlook such costs leads to an incomplete picture of what the United States stands to lose from climate change impacts that occur elsewhere.

D. Disease

Economic costs estimates to date have excluded transmission of disease into the United States as a result of climate change. The global disease burden will likely increase as a result of climate change as disease both becomes more prevalent in the world and the resources to contain disease become less available.[135] Although scholars have anticipated

127. Farzaneh Roudi-Fahimi et al., Population Reference Bureau, Finding the Balance: Population and Water Scarcity in the Middle East and North Africa 2 (2002), *available at* http://www.prb.org/pdf/FindingTheBalance_Eng.pdf (on file with the *Columbia Law Review*).
128. *Id.* at 1.
129. Podesta & Ogden, *supra* note 119, at 122.
130. *See* Victor Cruz et al., *supra* note 89, at 483.
131. In 1990, Turkey disrupted the water supply from the Euphrates River into Syria to fill a Turkish reservoir. Turkey threatened to cut off the water supply when Syria supported the Kurdish Workers Party. Turkey also possesses the ability to cut off the water supply to northern Iraq. Podesta & Ogden, *supra* note 119, at 122. Water allocation also remains a contentious issue in Israeli-Palestinian negotiations and in Israeli-Syrian negotiations over the Golan Heights. Israel remains highly dependent on water from outside its borders. *Id.*
132. Michael McCarthy, *Climate Change "Will Cause Refugee Crisis,"* CommonDreams.org, Oct. 20, 2006, *at* http://www.commondreams.org/headlines06/1020-05.htm (on file with the *Columbia Law Review*) ("Mass movements of people across the world are likely to be one of the most dramatic effects of climate change in the coming century.").
133. *See Age of Consequences*, *supra* note 108, at 56 ("Northern Mexico will be subject to severe water shortages, which will drive immigration into the United States in spite of the increasingly treacherous border terrain."). Some of this migration has already begun to occur. Andrew Simms & Hannah Reid, Working Group on Climate Change and Dev., *Up in Smoke? Latin America and the Caribbean: The Threat From Climate Change to the Environment and Human Development* 40 (2006), *available at* http://assets.panda.org/downloads/upinsmoke_lac.pdf (on file with the *Columbia Law Review*).
134. *See* Rafael Reuveny, *Climate Change-Induced Migration and Violent Conflict*, 26 Pol . Geography 656, 659 (2007).
135. Anthony J. McMichael et al., Global Climate Change in Comparative Quantification of Health Risks 1543, 1609 (Majid Ezzati et al., World Health Org. eds., 2004), *available at* http://www.who.int/publications/cra/chapters/volume2/1543-1650.pdf (on file with the *Columbia Law Review*).

some of the adverse health impacts of climate change, current predictions are almost certainly low because of the inherent limitations of the models.[136] This threat, like those posed by national security concerns, is difficult to quantify but nonetheless real.

The volume of population displacement discussed above likely will augment the extent of these health impacts. It is unlikely that the ultimate destinations of most refugees will be adequately prepared.[137] Thus, public health infrastructures could be strained, likely in places where they are already quite fragile yet most needed. Even balanced with some positive health implications (such as decreased mortality from cold), the impacts of climate change on global health "will be overwhelmingly negative."[138] Additionally, climate change may have implications for the emergence of new diseases. Ecological changes factor directly in the emergence of new diseases,[139] and indirect factors like migration and public health infrastructure breakdowns will likely be exacerbated by climate change.[140]

The direct effects of disease on the United States are significant—climatic conditions in the United States are expected to become more hospitable to the root causes of pathogens like Lyme disease and West Nile virus[141]—but the indirect effects are much greater.[142]

Preventing the introduction and spread of infectious diseases is extraordinarily difficult and, depending on the nature of the disease, could prove impossible. Diseases arrive through a variety of pathways, including migration of people or animals,[143] travel,[144] and transportation of goods.[145] West Nile virus, malaria, avian flu, monkeypox, SARS, and Rift Valley fever have all traveled across national borders through one or more of these means. As the global disease burden grows, the incidence of such transmissions (including to the United States) can be expected to grow as well.[146] Given all of the possible pathways for transmission, no country can prevent the introduction of infectious agents without changes that seem politically and economically infeasible, such as substantial prohibitions on travel and radically reduced trade.[147]

The economic costs associated with an outbreak are not simply the obvious ones of public health measures, treatment, loss of life, and reduced productivity, but also the economic ripple effects of employee absenteeism and substantially reduced demand on the services sector as people avoid contact with others.[148] Infectious diseases can also

136. *Id.* (noting potential omissions include "many infectious diseases, the health consequences of drought and famine[,] ... population displacement, destruction of health infrastructure in natural disasters, . . . and risk of conflict over declining natural resources").

137. The increased health risks of mass displacements are already apparent from the incidence of disease and other health problems in existing refugee settlements. *See, e.g.*, Joseph Fair et al., *Lassa Virus-Infected Rodents in Refugee Camps in Guinea: A Looming Threat to Public Health in a Politically Unstable Region*, 7 Vector-Borne & Zoonotic Diseases 167 (2007).

138. Ulissess Confalonieri et al., Human Health, *in* IPCC, Impacts, *supra* note 20, at 391, 407.

139. S.S. Morse, Factors and Determinants of Disease Emergence, 23 Sci. & Technical Rev. 443, 445 (2004). We have seen this effect already. For example, the emergence of the Nipah virus in Malaysia was related to deforestation, drought, and increased pig farming. The virus caused encephalitis in humans with a 38% mortality rate and devastated the Malaysian pig industry. R.C. Bengis et al., *The Role of Wildlife in Emerging and Re-Emerging Zoonoses*, 23 Sci. & Technical Rev. 497, 499-500 (2004).

140. Morse, *supra* note 139, at 445 tbl. 1.

141. *See* Field et al., *supra* note 20, at 625 (discussing relationships between climate change, West Nile virus, and Lyme disease).

142. *See, e.g.*, Jonathan A. Patz et al., *The Potential Health Impacts of Climate Variability and Change for the United States: Executive Summary of the Report of the Health Sector of the U.S. National Assessment,* 108 Envtl. Health Persp. 367, 373 (2000) (suggesting past weather shifts may have caused worldwide epidemics, such as lepitosis in Nicaragua and Brazil, Lyme disease in United States and Europe, and dengue fever in Mexico).

143. The degree of the health impact related to migration is largely determined by two factors: (1) the degree of difference between health in the migrants' countries of origin and the United States; and (2) the size of the migratory population entering the United States. Brian D. Gushulak & Douglas W. MacPherson, *Globalization of Infectious Diseases: The Impact of Migration*, 38 Clinical Infectious Diseases 1742, 1742-43 (2004). Both of these factors will increase as a result of climate change. Much of the developing world will be severely affected by climate change, and as a result there will be more desperate attempts to migrate to the United States. In addition, warmer temperatures in the United States will create conditions more favorable to mosquito hosts and to the incubation of disease within the host, further enhancing the risk of local transmission.

144. Disease can be spread through human travel or accidental simultaneous transport of carriers like mosquitoes. We also see the implications of travel for the spread of disease with "airport malaria," locally acquired malaria clustered near international airports. Andrew J. Tatem et al., *Estimating the Malaria Risk of African Mosquito Movement by Air Travel*, Malaria J., July 2006, at 1, 3.

145. Most often disease from trade in goods involves trade in animals, though there are other means. Rift Valley Fever was transmitted from Africa to the Arabian Peninsula through livestock trade and ultimately infected 1,700 people. C. Brown, *Emerging Zoonoses and Pathogens of Public Health Significance—An Overview*, 23 Sci. & Technical Rev. 435, 437 (2004). Mad cow disease is also transmitted through trade, and fears of its spread have led to bans on imports and destruction of animals. *See* Thomas E. Walton, *The Impact of Diseases on the Importation of Animals and Animal Products*, 916 Annals of the N.Y. Acad. Science 36, 40 (2000). Finally, another established mode of transmission is through migratory animals, especially wild birds, who played a significant role in the transmission of avian flu. *See* Bjorn Olsen et al., *Global Patterns of Influenza A Virus in Wild Birds*, 312 Science 384, 384 (2006).

146. As the incidence of such diseases rise, the likelihood that refugees and immigrants will arrive carrying an infectious disease also will increase. Obviously, migrants harboring an infectious disease could infect local populations within the United States. John R. MacArthur et al., *Probable Locally Acquired Mosquito-Transmitted Malaria in Georgia,* 1999, 32 Clinical Infectious Diseases e124, e127 (2001). Certainly, communities can and do put measures in place to reduce such transmissions, but those measures have costs. And we should not assume that control measures are 100% effective. As the incidence of disease increases, the spread of infectious disease most likely will continue and sharpen despite the implementation of control measures.

147. The United States already recognizes the importance of other countries' preparedness, surveillance and detection, and containment to reduce or prevent the spread of disease. President Bush and Congress authorized $434 million in expenditures to facilitate these activities in other nations and reduce the risk of a pandemic flu outbreak. U.S. Dep't of State, United States International Engagement on Avian and Pandemic Influenza 2 (2007), *available at* http://www.state.gov/documents/organization/95933.pdf (on file with the *Columbia Law Review*).

148. *See* World Bank, East Asia Update November 2005: Countering Global Shocks 13 (2005), *available at* http://siteresources.worldbank.org/INTEAPHALFYEARLYUPDATE/Resources/EAP-Brief-final-full2.pdf

affect animals, including valuable livestock.[149] Taking these diverse costs into account, the total immediate economic effect of SARS in East Asia is estimated at 2% of the regional GDP at the time, although the number of deaths was limited to 800.[150] Projections for an influenza pandemic are much higher.[151]

SARS illustrates the difficulty and expense of controlling the spread of disease. In Taiwan, 151,270 people were quarantined and over 2.7 million passengers had their temperatures taken.[152] Taiwan is a country with eighteen airports, only two of which are international, and a population of approximately twenty-three million people. Imagine the astronomical social and economic costs of trying to replicate that response for a country the size of the United States.

Imagine further what would be required in Indonesia, a country of 222 million people and seventy-one airports (seventeen of which are international). There, or in the many other places where the impact is expected to be far worse than in the United States, it is reasonable to assume that public health infrastructure will be more strapped, that public officials will be more overwhelmed, and that governments with already-fragile economies will be more concerned about the economic consequences of reporting outbreaks. Thus, the United States can expect more delays and less openness from affected nations when it comes to reporting potential infections—the direct opposite of the integrated global alert and response system that the World Health Organization (WHO) says is necessary to prevent widespread outbreaks.[153] In the interconnected modern world, the United States not only is susceptible to imported diseases, but also heavily dependent on cooperation with other nations to prevent and limit outbreaks.

IV. The Rational Case for Action

The dilemma of climate change is often described (accurately) as a collective action or public goods problem.[154] No single country has an incentive to control its GHG emissions optimally because the cost of those emissions are borne by all countries, while the benefits are enjoyed entirely by the emitting state. The standard prediction of such problems is that each player, if behaving rationally, should "free ride" on the efforts of the others.

One might think, therefore, that it is in the self-interest of the United States to do nothing, or very little. A slight variation is that the United States should not act unless all other major contributors to climate change also take action. A common argument in contemporary political discourse is that American business, especially energy-intensive trade-exposed manufacturers, will be put at a competitive disadvantage if countries like China do not adopt comparable mitigation measures.[155] Thus far, high emitting developing countries—notably India and China—have signaled their reluctance to make binding commitments.[156] The result is a dangerous stalemate.[157]

We certainly agree that the problem of climate change is global and requires a collective solution by the major emitters and largest emerging economies. Even aggressive domestic mitigation efforts by the United States could not, without more, stabilize and mitigate its effects. Yet that reality does not answer the question whether it is in the interest of the United States to address climate change—to cut emissions at home and subsidize reductions elsewhere—even in the face of reluctance by some other major emitters to act.

In the face of a collective action problem, large players may internalize enough benefits to justify an investment in the production of those goods. Every player, large or small, has an incentive to take action up to the point where the marginal cost of further action equals the marginal benefit. A large hegemonic player like the United States internalizes a significant fraction of the global gains, making it worthwhile to bear at least some costs.

To illustrate, consider the (admittedly controversial) estimates provided by the Stern Review, placing the annual cost of stabilizing GHGs at approximately 1% of global GDP by 2050.[158] World GDP in 2007 was approximately $54 trillion, $13.8 trillion of which was accounted for by the United States.[159] The estimated cost of a global stabilization of GHGs, then, would represent less than 4% of American GDP. Even if the Stern Report understates stabilization costs dramatically, the costs to the United States of failing to act are likely to remain larger than the total

(on file with the *Columbia Law Review*) ("[D]uring SARS ... people tried to avoid infection by minimizing face-to-face interactions, resulting in a severe demand shock for services sector....").

149. *See id.* at 12.

150. *Id.* at 13.

151. *See id.* at 14 ("[A] new flu pandemic could lead to between 100,000 and 200,000 deaths in the US, together with 700,000 or more hospitalizations, up to 40 million outpatient visits and 50 million additional illnesses.").

152. Kow-Tong Chen et al., *SARS in Taiwan: An Overview and Lessons Learned*, 9 Int'l J. Infectious Diseases 77, 82 (2005).

153. World Health Org., Global Outbreak and Response Network—GOARN, *available at* http://www.who.int/csr/outbreaknetwork/goarnenglish.pdf (last visited Sept. 11, 2009) (on file with the *Columbia Law Review*).

154. *See* Kenneth J. Arrow, *Global Climate Change: A Challenge to Policy*, Economists' Voice, July 2007, at 3, *available at* http://www.bepress.com/ev/vol4/iss3/art2 (on file with the *Columbia Law Review*). Daniel Cole, *Climate Change and Collective Action*, 61 Current Legal Probs. 229 (2009), *available at* http://ssrn.com/abstract=1069906 (manuscript at 4, on file with the *Columbia Law Review*).

155. *See, e.g,* Sen. Pete V. Domenici & Sen. Jeff Bingaman, U.S. Senate Comm. on Energy and Natural Res., *Design Elements of a Mandatory Market-Based Greenhouse Gas Regulatory System* 14 (2006) ("[W]ithout greenhouse gas mitigation efforts by all major emitters, including our largest trading partners, the U.S. economy could be placed at a competitive disadvantage.").

156. Jonathan Weisman, *G-8 Climate-Change Agreement Falls Short*, Wall St. J., July 9, 2009, at A8 (describing how at G-8 conference "[d]eveloping countries have responded that they shouldn't have to slow or sacrifice their fossil-fuel-based economic growth to help the West atone for its historical consumption patterns").

157. Again, since this Article was originally published, the major economies of the world have signed the Copenhagen Accord, described *supra* note 15. The Accord is not an international treaty containing binding mitigation targets.

158. There is a range of +/- 3% around this estimate, meaning that the costs are likely to fall somewhere between 4% and -2% of GDP. Stern Review, *supra* note 5, at 279.

159. World Bank Indicators, *supra* note 92.

global costs of acting. If, for example, one doubles the Stern estimate, the total global cost of stabilizing GHGs is 8% of U.S. GDP. As shown in Table 3 below, the cost of climate change to the United States is likely to exceed 10% of GDP.

Consider now that, taken together, the United States and the EU account for 58% of global GDP.[160] If they were, jointly, to bear the global cost of stabilization the impact would be less than 2% of their combined GDP. Broadening the pool of countries further, the cost of stabilization would be approximately 1.3% of the GDP for OECD countries.[161]

Assuming GHGs could be stabilized at 500-550ppm by 2050, and the total global cost of doing so would be approximately 4% of U.S. GDP, we have figures against which to compare the costs of climate change. The following table provides a partial summary of how the conventional assessment of economic harm to the United States might be adjusted, accounting for the factors we have discussed that cause that conventional estimate to understate harms.

Table 3: Quantitative Adjustments to Conventional Estimates of Climate Change Impacts

Factors Considered	Conventional Estimates of Reduction in U.S. GDP (%)	Marginal Impact on Annual GDP (%)
Conventional IAM Estimate	0.5	0.5
Optimism About Temperature Rise	0	1
Asymmetry Around Point Estimates	0	0.5
Catastrophic Events	0	0.5-3
Nonmarket Costs	0	1.4-3.5[162]
Export Losses	0	1.5
SUBTOTAL	**0.5**	**5.4-10**
Growth and Productivity	0	Double Above Impacts
TOTAL	**0.5**	**10.8-20**

Several factors discussed in this Article are omitted from the above table because we are unable to estimate their impact in quantitative terms. It is important not to lose sight of these potential harms, which are presented in Table 4.

Table 4: Qualitative Adjustments to Conventional Estimates of Climate Change Impacts

Factors Considered	Examples of Impacts
Cross-Sectoral Effects	If climate change affects energy prices, agriculture will be affected
Supply Shocks from Abroad	Energy prices
Global Financial Markets	Impact on American investments abroad; lending to fund current account deficit
National Security	Political Destabilization; resource conflicts; need for militaryresponse (e.g., total cost of Iraq War to 2009 = $3 trillion[163])
Migration	Racial and ethnic tensions, undocumented immigration,
Disease	Pandemics; new diseases

The impacts presented in Table 4 are not minor. National security, for example, could easily generate costs that exceed any of those listed in Table 3. The estimate produced in Table 3, therefore, most likely understates the full impact of climate change.

To be sure, the figures presented above are highly speculative. Yet the impacts we have identified and sought to quantify represent a critical set of issues for policy debates about climate change. We are confident that estimating each of these effects to be zero (as is often done) is much less accurate.

With these limitations in mind, what is the lesson for U.S. policy? If we simply tally the effects presented above in Table 3, the resulting impact of climate change on GDP reaches 7.7%,[164] excluding the impact on growth and productivity. If we follow Fankhauser and Tol,[165] estimating that capital accumulation effects on productivity would double this figure, the total decrease in GDP is 15.4%. To this, one would have to add the factors from Table 4.

If one accepts the estimate of a 15.4% impact on the United States (or even 7.7%), and if one accepts that the global cost of action would be about 4% of U.S. GDP, the obvious conclusion is that the United States would be better off paying the full cost of mitigating the impact of climate change by itself rather than allowing the world to continue in a "business as usual" fashion. This result is even stronger if Europe and perhaps the rest of the OECD are assumed to participate.

The point here is not that the United States should actually bear these costs alone (or even that it could do so if it wanted to). Rather, the point is that it may still make sense

160. *Id.*

161. World Bank, Key Development Data & Statistics, *at* http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20535285~menuPK:1192694~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html (last visited Sept. 18, 2009) (on file with the *Columbia Law Review*). We can expect the American and European share of global GDP to shrink because the economies of other states like China and India continue to grow rapidly. That said, the United States and the OECD represent a substantial share of global GDP for the next hundred years under any plausible assumptions about growth rates. As such, the United States will have an interest in bearing a large share of the global costs of reductions in emissions.

162. This includes only biological costs.

163. Joseph E. Stiglitz & Linda J. Bilmes, The Three Trillion Dollar War: The True Cost of the Iraq Conflict (2008).

164. Where there is a range of costs in Table 3, we have used the midpoint to calculate the total impact.

165. Fankhauser & Tol, *supra* note 82, at12-14.

for the United States to invest in mitigation without waiting for every other major country to act. While the problem is indeed a collective action problem, free riding is not a rational strategy for a player as large as the United States.

At a minimum, all of this suggests that the United States should put considerable energy into the negotiation and entry into force of an effective international treaty to address climate change concerns. Beyond that, it suggests that if such a treaty is not possible in the near term, the United States may wish to enact significant domestic measures to reduce domestic emissions of GHGs.

This argument is subject to an important caveat about the impact of the discount rate on the analysis. There is a dramatic difference between expenditures today and costs borne many years in the future. To evaluate costs and benefits across time it is necessary to specify some discount rate, and the choice of discount rate is the source of much debate within climate change discussions. Our own view is that a low discount rate is more appropriate, and our reasons reflect those that have already been discussed in the literature.[166] We simply flag the issue here, noting that if one chooses a sufficiently high discount rate, even the costs and benefits mentioned above will not support an argument for substantial expenditures today.

There remain some potentially credible arguments against unilateral action by the United States, including the futility, leakage, and fairness arguments we mentioned in the introduction. Although we do not tackle them in detail here, the persuasiveness of these arguments is not self-evident. The first two require an empirical defense: how much mitigation is so little that it is not worth acting? Will unilateral action in fact lead to massive flight of energy intensive industry? The third argument requires a normative defense. We note only that there are certainly competing views on this question.

Although it is conceivable that a credible U.S. threat to do nothing until the major emerging economies agree to share the burden of mitigation could increase the prospects of persuading other countries to participate in a new global climate change regime, the climate change winner argument is fatally flawed regardless. This Article will have succeeded if the strategic question of how best to induce cooperation becomes the focus of the climate change debate, and the climate change winner argument is abandoned.

V. Conclusion

Our goal in this Article has been to debunk the climate change winner argument, which suggests that because the United States will fare better than many nations of the world as global temperature increases, it is not in the interest of the United States to take aggressive action to mitigate greenhouse gas emissions.

Our argument shows that the leading economic models of climate change's impacts are methodologically limited in ways that systematically skew toward an understatement of costs. The models understate some impacts because of their optimistic assumptions about the rate and magnitude of warming and fail to account for certain categories of impacts that are difficult to quantify. In addition, leading models tend to adopt a myopic single economy view that does not account for international spillover effects. We think this kind of mistake is the linchpin of the climate change winner argument: the argument only succeeds if we assume that climate change impacts in other parts of the world do not reverberate in the United States.

Economists may well appreciate these shortcomings, but policymakers may not. It would be irresponsible to base policy recommendations on current models without acknowledging their significant limitations. A more developed accounting of the costs associated with climate change not only calls the climate change winner argument into question but shows it to be wrong.

166. The most central reason for a low discount rate relies on the notion that the welfare of future generations should be valued on par with our own. *See* William Nordhaus, A Question of Balance: Weighing the Options on Global Warming Policies 169-90 (2008); Stern Review, *supra* note 5, at 35. *But see* Robert O. Mendelsohn, *A Critique of the Stern Report*, Reg., Winter 2006-2007, at 42-43 ("[U]sing low discount rates is unfair to every generation; the welfare of future generations will be reduced by low discount rates just as much as current ones.").

Comment on *Climate Change and U.S. Interests* by Freeman and Guzman

by Laurie T. Johnson and Daniel A. Lashof

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I. Introduction

In this sobering article, Freeman and Guzman (FG) challenge the argument that the United States could be a "climate change winner," which asserts that, due to its temperate climate and advanced economy, climate change will benefit the United States relative to other countries or even in absolute terms. They argue that, setting aside any moral argument that the United States has an obligation to act aggressively to reduce emissions, it is independently in its self-interest to do so.

The article for the most part focuses on systematic downward biases in economic damage estimates, including: (1) undue past and present optimism about future warming; (2) symmetric treatment of uncertainties that have asymmetric impacts on damages; (3) failure to account for catastrophic events, non-market costs, cross-sectoral impacts, and impacts on productivity; and (4) failure to account for the ways in which climate change impacts abroad, including increased food and water scarcity, extreme weather events, and disease outbreaks, could affect U.S. economic and military security.

The authors conclude with a rough benefit-cost assessment. They add up a collection of estimates for several damages missing from the models, and compare these against the cost of mitigation for a 500-550 parts per million stabilization scenario in 2050. They find that the benefits to the United States of mitigation exceed the costs: for a global expenditure equal to 4% of U.S. gross domestic product (GDP), the United States could avoid damages equal to 15% of GDP—an estimate that still excludes many potentially severe damages they identify.

FG concede that any individual damage estimate in this exercise might not stand up on its own. Nevertheless, they argue, the sum of them provides a more accurate and reliable figure than one that ignores them altogether.

We think this conclusion is sound and can think of several other factors that would increase the benefit-cost ratio in further support of FG, including current impacts of climate change that are outpacing expectations, appropriate discount rates, equity weighting, and risk aversion. We discuss these in Sections II and III below. We then shift focus in Section IV, and ask a bigger question: is benefit-cost analysis the best way to answer the "climate change winner" question? While we commend the authors' valiant attempt—papers like this are unavoidable in climate policy debates and need to be written—huge risks and path dependency make cost-benefit analysis a poor instrument for assessing appropriate climate policies. We suspect the authors agree, but that they realistically recognize that winning the debate in a benefit-cost framework is important, given its predominant influence in economics.

II. Current Impacts

Although damage estimates represent impacts from *additional* emissions above baseline levels, the paper would benefit from a discussion of U.S. impacts already underway, because they suggest the severity of future damages caused by inaction. We make three observations: (1) the inventory of current impacts is largely negative, and shows that even small changes in global temperature can lead to high damages; (2) average global temperature changes mask variation—some regions have experienced increases far above the average; and (3) adapting to these impacts has proved difficult.

The list of current negative impacts associated with climate change in the United States is staggering; it would be impossible to do it justice in a short comment. To note just a few: large-scale forest dieback; record numbers and sizes of forest fires; record floods and other heavy precipitation events; record heat waves; record pest and insect outbreaks; increased pollen production and asthma rates; population relocations from impacted coastal areas; sinking infrastructure above melting permafrost; stresses on energy and water systems, including salinization of fresh water supplies and early winter snowpack melting; ocean acidification; coral reef destruction; loss of sea ice, wildlife,

and wildlife habitats; rapidly melting glaciers; and declines in cold-water fish populations.

An increase *of only 1.5 degrees F* in average global temperatures is associated with all of these changes, some still not fully materialized due to lags in the system. Many of these changes have been large in magnitude and have obvious economic impacts. Some statistics from a recent report[1]: the number of days with very heavy precipitation increased from 12% to 58% across different regions of the United States from 1958-2007 (p.44); since the mid 1980s, the average number of acres burned in forest fires increased from 45 to approximately 100 (p. 82, 5 year average); in the Cascade Mountains in the Northwest, snowpack declined by an average of 25% over the past 40 to 70 years, with some areas losing up to 60% (p.135); between 1999 and 2007 reservoirs in the Colorado River system, which supplies over 30 million people, lost approximately half of their water storage after the worst drought in 100 years of record keeping; Alaska average winter temperatures have increased by 6.3 degrees F, and the Midwest and Great Plains more than 7 degrees F (p.139 and 9, respectively); since 1992, the number of extreme weather electricity grid disturbances increased 10 fold (p.58); since 1999, 28,000 cases of West Nile virus have been reported, with over 1,100 deaths (p.95); between 1995 and 2009, the seasonal length of allergenic ragweed pollen production increased by as much as 44%.[2] The list goes on and on.

The report finds very few adaptation measures being taken in response to these strains. And, against all of the negative impacts, only a handful of positives, e.g., slightly longer growing seasons, reduced heating demand (but increased cooling demand), and increases in warm water fish species.

In addition to the impacts FG detail, these observations further suggest that damage estimates are too low, in particular estimates currently being used to inform U.S. climate policy. In February 2010, the U.S. government published its first official damage estimate for use in regulatory impact analysis. One of the models it used predicted net benefits from warming up to almost 5.4 degrees F (3 degrees C; FUND model)[3]; the impacts already underway suggest this is unrealistic. The models have also been criticized for making overly optimistic adaptation assumptions. For example, the default version of PAGE2002 assumed that in developing countries, eventually 50% of economic damages (e.g., property damage from rising sea levels) would be eliminated by low cost adaptation. In the wealthier OECD countries, it assumed that 100% of the economic damages resulting from the first 3.6 degrees F (2 degrees C) of warming, and 90% of economic damages above 3.6 degrees F, would eventually be eliminated. For non-economic (e.g., impacts on wilderness areas and animals) and non-catastrophic damages, adaptation is assumed to eventually remove 25% of impacts everywhere.[4, 5, 6] Current trends make adaptation assumptions like these implausible.

III. Discount Rates, Equity Weighting, and Risk Aversion

The inability to monetize impacts clearly keeps damage estimates low. Of equal importance are three parameters imposed upon the damages that actually are monetized, but were not addressed in detail by FG. The first is the social discount rate, used to compare costs and benefits now to those in the future,[7] the second is equity weighting, used to compare the impact of costs imposed on poor countries compared to rich ones, and the third is risk aversion, used to capture the fact that people are willing to pay premiums to reduce risks.

A. *Discount Rates*

FG note in their conclusion that sufficiently high discount rates could make the costs of mitigation appear higher than the benefits. The flip side of that is that a low discount rate could do the reverse, independently of the additional damages they discuss.

1. Global Climate Change Impacts in the United States, (Thomas R. Karl et al., eds., Cambridge Univ. Press 2009), *available at* http://downloads.globalchange.gov/usimpacts/pdfs/climate-impacts-report.pdf.
2. Lewis Ziska et al., *Recent Warming by Latitude Associated With Increased Length of Ragweed Pollen Season in North America,* Proc. Nat. Acad. Sci., Feb. 2011, *available at* http://www.pnas.org/content/early/2011/02/11/1014107108. Calculation from North Dakota observation in Table 1.
3. Interagency Working Group on Social Cost of Carbon, Appendix 15A. Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866, *in* U.S. Department of Energy, Final Rule Technical Support Document (TSD): Energy Efficiency Program for Commercial and Industrial Equipment: Small Electric Motors (2010), *available at* http://www1.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/smallmotors_tsd/sem_finalrule_appendix15a.pdf.
4. No adaptation is assumed for catastrophic damages. All assumptions in PAGE2002 and PAGE09 discussed here were confirmed through personal communication with the model's author, Chris Hope. More detail for PAGE 2002 can also be found in Chris Hope, *The Marginal Impact of CO_2 From PAGE2002: An Integrated Assessment Model Incorporating the IPCC's Five Reasons for Concern,* 6 Integrated Assessment 19, *available at* http://journals.sfu.ca/int_assess/index.php/iaj/article/download/227/190.
5. The updated version of PAGE, PAGE09, has significantly revised adaptation assumptions that better reflect observed trends. After the first 1 degree C of warming, only 15% of economic damages from the next 2 degrees C can be eliminated in developing countries, and 30% in developed. Economic damages *beyond 3 degrees C total* of warming can no longer be eliminated anywhere by low cost adaptation. 15% of non-economic damages up to 2 degrees C can eventually be removed by adaptation, and (as in PAGE2002) no adaptation is assumed to be possible for catastrophic damages in PAGE09. *Id.*
6. Frank Ackerman et al., *Did the Stern Review Underestimate U.S. and Global Climate Damages?* 37 Energy Pol'y 2717–21(2009).
7. The social discount rate is used for assessing social costs and benefits, including externalities, in contrast to the private discount rate, which is used to assess private investments.

Guidelines by the U.S. Environmental Protection Agency (EPA) stipulate a social discount rate of 1% to 3% for impacts spanning multiple generations, while the U.S. Office of Management and Budget prescribes a social discount rate of 3% to 5%, allowing for sensitivity analysis from 1% to 3% for intergenerational impacts. Yet, in calculating its damage estimate (called the "social cost of carbon," or SCC), the U.S. government chose 2.5%, 3% and 5%. It used the SCC with the 3% rate as its main (or "central") estimate, arriving at a value of $21 per ton of CO_2. At 2.5% and 5%, respectively, the SCC was $35 and $4.7. Using the same models but proscribed intergenerational discount rates produces much higher SCCs. Johnson and Hope[8] re-ran the models used by the government, obtaining SCCs of $266, $122, and $62, for discount rates of 1%, 1.5% and 2%.

FG discuss the need to use a full probability distribution for climate sensitivity estimates rather than point estimates, due to the convexity of impacts for any given temperature increase (as temperature increases, damages become increasingly worse). An interesting parallel can be made with respect to the discount rate: it is also convex, with damage estimates increasingly higher the lower the discount rate. For example, an estimate of the SCC using a probabilistic 1% versus 3% discount rate, each with an equal chance of 50%, would yield an SCC of approximately $144,[9] compared to the deterministic value of $62 at the 2% midpoint. A similar calculation with 1% versus 5% yields approximately $135,[10] compared to a value of $21 at 3%. Both of these increase the $21 estimate by more than 6 fold.[11]

For comparison purposes, the Administration's central estimate SCC of $21/ton of CO_2 would imply total damages from today's emissions of roughly 1% of current US GDP ($21 x 7 billion tons annual emissions/$14 trillion). Assuming a central discount rate of 2% in the 1% to 3% intergenerational range translates to 3% of GDP ($62/ton of CO_2), a probabilistic discount rate between 1% and 3% yields 7.2% of GDP ($144/ton of CO_2), and a probabilistic discount rate between 1% and 5% translates to 6.8% of GDP ($135/ton of CO_2). Taking FG's estimate of 4% U.S. GDP mitigation cost, the discount rate alone flips the benefit-cost ratio from less than 1 to greater than 1.

One question that emerges from this discussion is whether a high discount rate could outweigh the effect of a more complete representation of damages as advocated for by FG. In this instance, the authors would need different criteria from benefit-cost analysis to make their case.

Yohe and Hope[12] conducted such an exercise, by comparing the effect of changing climate sensitivity assumptions and the shape of the damage function in PAGE09 with changing the discount rate. They found an increase in the SCC resulting from increasing expected damages of about $80, versus a $70 decrease from increasing the discount rate.[13]

B. *Equity Weighting*

FG's argument does not rely upon any moral obligation the United States might have to bear a larger mitigation burden than poor countries—in fact, it is explicitly distinct from it. But it is interesting to see what happens to the SCC if one tries to account for inequitable climate impacts. One common way to do this in benefit-cost analysis is through equity weighting, which assigns more weight to each additional dollar of damage incurred as income levels decline. An equivalent amount of damages will thus be valued more for a low income than high income region. The method reflects the economic concept of diminishing marginal utility of income, which stipulates that as income increases, the utility obtained from each additional dollar is less. With losses in income resulting from climate damages, the concept works in reverse.

Like discounting, equity weighting turns out to have a huge impact on the SCC. Johnson and Hope also re-ran the government's estimate using the most common equity weight in the economics literature (a value of 1 for the "elasticity of marginal utility"). They found that for the government's central estimate (at the 3 percent discount rate), the SCC could increase by as much as 11 fold.

C. *Risk Aversion*

Taking into account risk aversion in the standard benefit-cost framework can also increase the SCC significantly. In an exercise similar to the Yohe and Hope analysis discussed above, Anthoff, Tol, and Yohe[14] compared the effects of discounting versus risk aversion on the SCC. They found that, using market-based discount rates (which are substantially higher than social discount rates), adjusting for risk aversion increased the SCC from approximately $11/t$CO_2$ to $32/t$CO_2$.[15]

8. Laurie T. Johnson & Chris Hope, Natural Resources Defense Council, Revisiting the SCC Estimates Developed by the U.S. Government: The Effects of Intergenerational Discounting Methods and Regional Equity Weights (2010).
9. (.5 x $266) + (.5 x $21) ≈ $144.
10. (.5 x $266) + (.5*$4.7) ≈ $135.
11. *See* Hope, *supra* note 4. One of the models used by the government, PAGE2002, treats the discount rate probabilistically using a triangular distribution, but this feature was turned off for the U.S. government's estimated SCC by specifying a constant discount rate, consistent with the other two models used by the government (FUND and DICE).
12. Gary Yohe & Chris Hope, *Some Thoughts on the Value Added From a New Round of Climate Change Damage Estimates*, EPA/DOE Workshop on Improving the Assessment and Valuation of Climate Change Impacts for Policy and Regulatory Analysis: Research on Climate Change Impacts and Associated Economic Damages (2011), *available at* http://yosemite.epa.gov/ee/epa/eerm.nsf/vwAN/EE-0566-128.pdf/$file/EE-0566-128.pdf.
13. For details of the methodology the authors used to determine how much to change the assumptions, the reader is referred to the original paper. The calculations here are based upon adding the changes in the SCC resulting from the two changes made in the damage assumptions, as well as adding the changes resulting from increasing two components of the discount rate—the pure rate of time preference and the marginal elasticity of utility.
14. David Anthoff et al., *Risk Aversion, Time Preference, and the Social Cost of Carbon*. 4 Envtl. Res. Letters. 1–7, *available at* http://ideas.repec.org/p/esr/wpaper/wp252.html.
15. Converted from t/C in the original paper.

IV. Strategic Risk Management

Although the benefit-cost case the authors make is necessary in the policy debate, and the incorporation of low discount rates, equity weighting or risk aversion further increase the benefit-cost ratio of reducing emissions, we contend that the framework is not the most appropriate way to assess climate policy. The benefit-cost decision rule stipulates mitigating emissions up to the point where the marginal cost of reducing a ton of CO_2 is equal to the marginal benefit. This paradigm works well for analyzing policies with known and quantifiable impacts if technology is static (technically, cost-benefit analysis assures economically efficient policies under conditions of perfect information and invariant production possibility frontiers). For example, cost-benefit analysis may be a good way to decide whether a new baseball stadium deserves public subsidies, but we don't use cost-benefit analysis to make strategic foreign policy decisions, such as whether to side with the pro-democracy protesters or the Mubarak regime in Egypt.

With climate change, the conditions required for a sensible cost-benefit analysis don't hold. We don't know what the impacts will be. We don't know if, or how many, catastrophic outcomes will occur. And we don't know how to quantify the vast majority of impacts, especially "non-market" damages, such as the intrinsic value of species or ecosystems. (Perversely, economic models often cap damage estimates at the value of GDP, which excludes the very things missing from the models, non-quantified market and non-market damages—yet these damages could be orders of magnitude higher than GDP.)[16]

On the other side of the ledger, we don't know how much it will cost to reduce emissions, or even if there will be net costs or net benefits from emission reduction strategies, excluding avoided climate change damages. A key reason these costs are unknown is that economic models can't predict innovation, even though this is the primary engine of economic growth in advanced economies. For example, climate policies designed to reduce CO_2 emissions from automobiles stimulates innovation in electric vehicle technology, which also has economic and security benefits by reducing U.S. dependence on petroleum.

Under these conditions, benefit-cost analysis loses its ability to inform rational policy. In a sense, it is a distraction from what might more appropriately be viewed as a strategic decision to invest in carbon-reducing innovation and minimize the risk of catastrophic losses from climate disruption.

People's "revealed preferences" in insurance markets reflect the desire to avoid catastrophic losses even if it costs them more in insurance premiums than the expected value of the payout received. The best analogy is probably life insurance. Parents are willing to pay for policies with negative expected returns in order to protect their children from the low probability, but catastrophic, event of parental death. Risk and losses are reduced in a financial sense, but not all damages can be completely compensated.[17] While incorporating risk aversion within the benefit-cost framework as discussed above is a step in the right direction, it is still in a framework of maximizing expected returns rather than minimizing losses.

Even if economic models were changed to reflect the authors' concerns of missing damages and catastrophic risk, resulting increases in the SCC could be "undone" by making conservative discount rate assumptions, or still result in "too low" an expected damage due to low probabilities being assigned to bad outcomes, or an unwillingness by decisionmakers to equity weight or adjust for risk aversion, as was the case with the U.S. government's SCC.

The benefit-cost framework of expected damages versus benefits can still give the "wrong answer," because it asks the wrong question. Instead, the vast picture of uncertainty the authors paint, including the volume and magnitude of the potential damages they enumerate, suggests a risk management approach. They provide an impressive exposition of how Martin Weitzman so aptly describes the problem:

> There exists here a very long chain of tenuous inferences fraught with huge uncertainties in every link beginning with unknown base-case GHG emissions; then compounded by huge uncertainties about how available policies and policy levers transfer into actual GHG emissions; compounded by huge uncertainties about how GHG-flow emissions accumulate via the carbon cycle into GHG-stock concentrations; compounded by huge uncertainties about how and when GHG-stock concentrations translate into global mean temperature changes; compounded by huge uncertainties about how global mean temperature changes decompose into regional temperature and climate changes; compounded by huge uncertainties about how adaptations to, and mitigations of, climate-change damages are translated into utility changes—especially at a regional level; compounded by huge uncertainties about how future regional utility changes are aggregated—and then how they are discounted—to convert everything into expected-present-value global welfare changes. The result of this immense cascading of huge uncertainties is a reduced form of truly stupendous uncertainty about the aggregate expected-present-discounted utility impacts of catastrophic climate change, which mathematically is represented by a very spread out, very fat-tailed PDF [distribution] of what might be called "welfare sensitivity" . . . [with] the value of "welfare sensitivity" . . . effectively bounded only by some very big number representing

16. Many environmental goods could, in theory, be exchanged in markets but currently are not. They are therefore not reflected in GDP—which measures the monetary value of all goods and services exchanged in the economy. In addition, there are "non-market" environmental goods, which cannot be exchanged in private markets, such as the aesthetic value of clean air or the "existence" value of a species or ecosystem. Economists conduct surveys to estimate what people are willing to pay for market and non-market goods that are not bought and sold in markets. The number of these is very large, making GDP a poor estimate for wealth and welfare.

17. It is important to note that risk management does not address moral arguments with respect to poor countries and future generations unless the level of risk reduction chosen by the United States is the same as what those populations would choose.

something like the value of statistical civilization as we know it or maybe even the value of statistical life on Earth as we know it."[18]

The only sensible policy that emerges from this picture is one that reduces probabilities of catastrophic outcomes by strategically investing in a clean energy future.

18. Martin L. Weitzman, *On Modeling and Interpreting the Economics of Catastrophic Climate Change*, 91 Rev. Econ. & Stat. 5-6 (2009).

RESPONSE

A Response to *Climate Change and U.S. Interests*

by Kristen A. Sheeran Ph.D.

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Economic analysis occupies a central role in national debates over climate and energy policy. As the scientific consensus on climate change becomes clear and unambiguous, the case for inaction on climate change is increasingly argued on grounds that it will be too costly to initiate more than token initiatives. While many scientists advocate stringent emissions targets aimed at stabilizing atmospheric greenhouse gas concentrations during this century, recent economic models of climate change recommend a more cautious approach, involving only modest early actions to limit emissions with gradually increasing limits over time.[1] Freeman and Guzman provide an excellent reckoning of the "fatal flaws" in economic analyses of climate change impacts that explain the disconnect between climate science and economics.

There is a large and growing literature in economics that demonstrates rigorous economic support for immediate, large-scale policy responses to the climate crisis. Two years ago, colleagues and I at Economics for Equity and the Environment Network surveyed this literature and compiled an online reader's guide called the *Real Economics of Climate Change*.[2] This literature reflects a healthy debate within economics over the integrated assessment models (IAMs) that contribute much of the grist for the "climate winner argument" that Freeman and Guzman critique.

IAMs compare the expected costs of emissions reduction against the expected benefits of avoided climate change for the purpose of identifying the "optimal" policy response. If the models do a poor job translating the predictions of climate scientists into economic impacts, or if the models over-state the costs of reducing emissions, the models will recommend very modest emissions reduction (or none at all). Identifying the contestable assumptions and limitations of IAMs is an important part of debunking the climate winner argument.

On the surface, IAMs look very similar to the large-scale computer models that have helped build the scientific consensus around climate change and have a good reputation in the scientific community. Climate science models, however, are grounded in physical laws that are well-established both theoretically and empirically. Their extensive descriptions of the physical processes of climate change are testable either directly or indirectly through "backcasting" of historical climate data. In contrast, IAMs, like all economic models, are assumption driven.[3]

IAMs use the same discounted utility framework that underlies most economic analysis. They start from a particular understanding of human nature and preferences and seek to identify the choices that will maximize the satisfaction of those desires. Climate outcomes enter the analysis as factors that increase or decrease human satisfaction. The "optimal" target is not a safe or pre-determined climate stabilization level, but rather the maximum subjective satisfaction.[4]

Climate change poses significant challenges to the discounted utility framework. For one, it demands a comparison of mitigation costs in the present to the benefits of avoided climate change in the future. To compare welfare across generations, economists must decide how much additional weight to attach to present outcomes over future outcomes. When economists discount the future, the present value of the harms caused by future climate change can shrink to the point where it is hardly "worth" doing anything in the present to avoid climate change. The results of IAMs are highly sensitive to the choice of discount rate, but there is no "right" discount rate to use. The choice of discount rate reflects contestable assumptions about the future growth rate of the economy, the

1. *See, e.g.,* David L. Kelly & Charles C. Kolstad, Integrated Assessment Models for Climate Change Control, *in* International Yearbook of Environmental and Resource Economics 1999/2000: A Survey of Current Issues 171 (Henk Folmer & Thomas H. Tietenberg eds., 1999); Richard Tol, *The Social Cost of Carbon: Trends, Outliers, and Catastrophes, Economics*, 2 Open-Access, Open-Assessment E-Journal 1 (2008), *available at* http://www.economics-ejournal.org/economics/journalarticles/2008-25; Richard Tol, *Estimates of the Damage Costs of Climate Change Part II: Dynamic Estimates*, 21 Envtl. & Resource Econ. 135 (2002); Alan S. Manne, Perspective Paper 1.2., *in* Global Crises, Global Solutions 49-55 (Bjorn Lomborg ed., 2004); Robert Mendelsohn, Perspective Paper 1.1., *in* Global Crises, Global Solutions 44-48 (Bjorn Lomborg ed., 2004); William Nordhaus, A Question of Balance: Weighing the Options on Global Warming Policies (2008); William Nordhaus & Joseph Boyer, Warming the World (2000).
2. *See* Real Climate Economics, www.realclimateeconomics.org.
3. See Frank Ackerman et al., *Limitations of Integrated Assessment Models of Climate Change*, 95 Climatic Change 297 (2009), for further discussion.
4. *See id.*

opportunity cost of capital, and society's preference for present versus future outcomes.[5]

The discount rate dilemma is widely acknowledged, but often dismissed as simply a normative issue. Normative assumptions, however, can be just as important as the technical details. As one leading critique of IAMs states:

> A present generation that cares nothing about the fate of future generations will do nothing to preserve the stability of the Earth's climate, and no economic calculations can show otherwise. But whether and how much people care about the future can be represented in various ways—through the rate of subjective time preference in optimal growth models, through the weighting of different generations' welfare in overlapping generations models[6], through thought experiments in which the generations are able to transact with one another[7]—and the results, not unexpectedly, will reflect the depth and strength of the intergenerational ties.[8]

The second area where climate change poses problems for the discounted utility framework involves estimates of climate change impacts. IAMs rely heavily on future predictions about how human societies and natural systems will respond to carbon dioxide concentrations and temperatures that are outside of the range of human experience. To deal with uncertainty, these models typically focus on likely climate impacts based on extrapolation from limited data and case studies; this approach minimizes the importance of uncertain but potentially catastrophic climate impacts. The extreme events have the potential to cause the greatest human suffering and economic disruption. Freeman and Guzman explain how IAMs exclude whole categories of impacts that are difficult to quantify, interrelated, and stem from international spill-over effects.

Even if IAMs could give more inclusive treatment to a wider range of climate impacts, and could better account for low probability but potentially catastrophic climate events, they would still confront the unavoidable problem of assigning meaningful monetary values to human life, health, and natural ecosystems.[9] Inevitably, this entails value judgments. This means that even if IAMs could achieve greater precision in predicting climate impacts, they cannot match the rigor and scientific objectivity of their climate science counterparts.[10]

Compounding this problem is the fact that many IAMs include dubious benefits from warming temperatures in the short term. These benefits include things such as longer growing seasons, subjective preferences for warmer temperatures, increase in summer recreational activities, and declines in cold-related deaths. These benefits, even if they were to manifest, seem to be of a very different order of magnitude than the impacts to fresh waters supplies, food systems, public health, and ecosystems that scientists warn are possible if temperatures exceed 2 degrees Celsius.[11] At high enough discount rates, however, short-term benefits will outweigh climate change damages in the distant future. For example, Richard Tol's widely cited analysis of climate damages based on the FUND model projects that the world will actually be better off in economic terms from the first 3 degrees Celsius of warming.[12]

Third, climate economic modeling involves estimates of mitigation costs that misrepresent the dynamic, socially determined nature of technological change. Estimating mitigation costs in dollar terms is more straightforward, in principle, than measuring mitigation benefits. The adoption of energy-efficient equipment, appliances, industrial processes, and automobiles, as well as more widespread use of combined heat and power technologies, wind energy systems, solar panels, and other measures for reducing emissions all involve purchases of marketed goods and services whose attendant cash flows can be easily counted. The evolution of these technologies is uncertain, however, particularly over the long time periods involved in climate modeling. IAMs typically invoke pessimistic assumptions about the pace and direction and technological change that tend to overestimate the costs of achieving emissions reduction targets. These models typically do not account for the emissions reduction potential of energy efficiency improvements, learning-by-doing, and the positive role public policy can play in steering investment choices and promoting technological change. Instead, IAMs assume an annual rate of productivity improvement in energy use, which leads to a paradoxical result: if climate change is a long term crisis, and technological change will make it easier and cheaper to reduce emissions in the future, the "optimal" solution is to wait before addressing climate change.[13]

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5. *See id.*
6. Richard B. Howarth & Richard B. Norgaard, *Environmental Valuation Under Sustainable Development*, 82 Amer. Econ. Rev. 473 (1992); Richard B. Howarth, *Climate Change and Overlapping Generations,* 14 Cont. Econ. Policy 100 (1996).
7. Stephen J. DeCanio & Paul Niemann, *Equity Effects of Alternative Assignments of Global Environmental Rights,* 56 Ecological Econ. 546.
8. Ackerman et al., *supra* note 3.
9. See Frank Ackerman, Can We Afford the Future: The Economics of a Warming World (2009), for a lengthier discussion.
10. Ackerman et al., *supra* note 3.
11. Researchers have steadily decreased earlier estimates of potential near term benefits to agriculture from climate change. Any near term potential benefits from longer growing seasons and increased CO_2 fertilization are now expected to decline as temperatures rise steadily later in the century; as weeds, pests, and diseases flourish under the new climate conditions; and as the incidence of extreme weather events rises. Wolfram Schlenker & Michael J. Roberts, *Nonlinear Temperature Effects Indicate Severe Damages to U.S. Crop Yields Under Climate Change*, 106 Proc. Nat. Acad. Sci. 15594 (2009); William Cline, *Washington, DC: Center for Global Development & Peterson Institute for International Economics, Global Warming and Agriculture: Impact Estimates by Country* (2007), *available at* http://www.cgdev.org/content/publications/detail/14090.
12. *See* Frank Ackerman & Charles Munitz, E3 Network, Climate Damages in the Fund Model: A Disaggregated Analysis (2011), *available at* http://www.e3network.org/papers/Climate_Damages_in_FUND_Model_March2011.pdf; Interagency Working Group on Social Cost of Carbon, Appendix 15A. Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866, *in* U.S. Department of Energy, Final Rule Technical Support Document (TSD): Energy Efficiency Program for Commercial and Industrial Equipment: Small Electric Motors (2010), *available at* http://www1.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/smallmotors_tsd/sem_finalrule_appendix15a.pdf.
13. *See* Ackerman et al., *supra* note 3.

Can integrated assessment models be "fixed" to provide better estimates of the economic costs and benefits of avoiding climate change, or should we abandon the discounted utility framework entirely in favor of some alternative approach?

We know that IAMs that use lower discount rates and more fully account for impacts of climate change yield higher estimates of damages that seem more in-line with the predictions of climate science. The Stern Review, for example, represented a real advance over standard practice in economics by using a much lower discount rate and better methods for estimating the effects of uncertainty in many climate parameters. Yet even Stern's results, which were widely embraced by climate advocates and denounced by many economists, likely underestimated the damages from climate change.[14]

Recent economic research has proposed new ways of dealing with the uncertainties inherent to climate change.[15] The work of Martin Weitzman is path breaking in this regard. According to Weitzman, in a world with uncertain future outcomes, the best available estimate of the true probability distribution has fat tails. If people are risk-averse, as some evidence might suggest, the avoidance of losses from worst case scenarios dominates decision making.[16] As Weitzman argues, fine-tuning estimates of the most likely climate damages is less important that determining how bad and how likely the worst case scenarios of climate change really are. As Ackerman et al. state:

> There is little doubt that the 95th percentile, or 98th percentile, of possible adverse climate outcomes over the next century (to pick two arbitrary points out in the tail of the distribution) looks like the devastation of the planet in a science-fiction dystopia, not like a matter for carefully weighing costs and benefits.[17]

Though we may be able to improve integrated assessment modeling, we cannot escape entirely from the fundamental limitations of the discounted utility framework as applied to climate change. Stabilizing the earth's climate system is as much a scientific and moral issue as it is an economic issue. There are limits to applying cost-benefit analysis to climate change when the damages accrue to future generations and involve consequences for human lives and ecosystems that are virtually incalculable and uncertain. Precaution, risk assessment and risk management may be more appropriate frames for evaluating climate policy.

The appropriate role of economics in climate policy debates should not be to determine the optimal level of emissions reduction. Emissions goals should be informed by the best and latest scientific information and motivated by our moral obligations to future generations. The tools and insights of economics are then most appropriate to the complex and intellectually challenging tasks of determining least-cost strategies for achieving those targets, designing policies that effectively and with confidence meet those targets, identifying the potential economic impacts of failing to meet those targets and sharing responsibility fairly for the costs and implementation of that strategy. Economists should be more open and explicit about the viewpoints and values underlying their analyses. As Freeman and Guzman conclude, policy makers also need to be more fully aware of the significant limitations of climate economic models that give rise to the climate winner argument.

14. *See* Nicholas Stern et al., The Stern Review: The Economics of Climate Change 105 (2006); William D. Nordhaus, *A Review of The Stern Review on the Economics of Climate Change,* XLV J. Econ. Lit. 686 (2007). Stern's model assumes that adaptation will eliminate 100% of the impacts on the US from the first 3.6°F of warming. Not surprisingly, the *Stern Review* predicts that US damages from climate change by 2100 will be small, equivalent to roughly one-half of a percent of current U.S. GDP (roughly $140 billion) on an annual basis from now into the future. Frank Ackerman &Elizabeth Stanton, Natural Resource Defense Council, The Costs of Climate Change: What We'll Pay if Global Warming Continues Unchecked (2008) adapts the PAGE model used by the Stern analysis by removing adaptation efforts and including catastrophic risks. Using the revised PAGE model, they estimate that the annual costs to the US from climate change could reach 3.6% of U.S. GDP by 2100.
15. See Jon Gjerde et al., *Optimal Climate Policy Under the Possibility of a Catastrophe* 21 Resource & Energy Econ. 289 (1999); Graciela Chichilnisky, *An Axiomatic Approach to Choice Under Uncertainty With Catastrophic Risks*, 22 Resource & Energy Econ. 221 (2000); Darwin C. Hall, Richard J. Behl, *Integrating Economic Analysis and the Science of Climate Instability*, 57 Ecological Econ. 442 (2006); Partha Dasgupta, *Discounting Climate Change*, 37 J. Risk & Uncertainty 141 (2008), *available at* http://www.springerlink.com/content/633517qw4j526470/; Martin L. Weitzman, *A Review of the Stern Review on the Economics of Climate Change,* XLV J. Econ. Lit. 703 (2007); Martin L. Weitzman, *Subjective Expectations and Asset-Return Puzzles,* 97 Amer. Econ. Rev. 1102 (2007); Martin L. Weitzman, *On Modeling and Interpreting the Economics of Catastrophic Climate Change* (2008), *available at* http://www.economics.harvard.edu/faculty/weitzman/files/modeling.pdf, for examples.
16. For example, young couples that purchase life insurance can be said to be risk-averse. Homeowners rarely find a compelling reason to go without fire insurance, even when not required to by the terms of a mortgage. The probabilities in any given year of a home burning down or a healthy young person dying are measured in the tenths of one-percent, but the impacts, should the unlikely events occur, are substantial. This suggests that people routinely insure themselves against personal catastrophes that are less likely than worst-case climate catastrophes for the planet. See Ackerman et al., *supra* note 3, for a lengthier discussion.
17. Ackerman et al., *supra* note 3.

RESPONSE

Critiquing the Critique of the Climate Change Winner Argument

by Richard D. Morgenstern

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Developing a rational, globally efficient time path for pricing or controlling greenhouse gas (GHG) emissions presents daunting challenges to policy makers, with large scientific uncertainties, and the absence of consensus over the long term goals of climate policies. In their article *Climate Change and U.S. Interests*, Jody Freeman and Andrew Guzman (FG) attempt to debunk what they label the "climate change winner" argument, i.e., the notion that the United States is likely to fare relatively well in a warmer world, at least compared to most other nations, and is thus not rationally compelled to invest in expensive mitigation efforts that may largely accrue to the benefit of others. Focusing on the integrated assessment models (IAMs), FG argue that the models are "methodologically limited in ways that systematically skew toward an understatement of . . . [damages]."[1] Their conclusion: damage estimates derived from the IAMs are too low by an order or magnitude, not including a number of impact categories they are unable to quantify.

As is widely understood by natural scientists, lawyers, economists, and others concerned with climate policy, there are significant tensions between the estimation of economic damages from climate change and the limits of efforts to model the effects. Notwithstanding these tensions, I believe FG have unfairly attacked the IAMs and over interpreted the model results, with a focus on point estimates and neglect of the uncertainty inherent in any such calculations. FG identify six critical deficiencies in the IAMs' estimates:

- optimism about modest projected temperature rise;
- failure to account for the possibility of catastrophic loss under different future scenarios;
- omission of negative cross-sectoral impacts;
- exclusion of non-market costs;
- optimism about projected continued economic growth (which assumes productivity will be unaffected by climate change); and a
- failure to account for international spillovers.

For each claimed deficiency, FG offer their judgments on a preferred estimate of climate-induced damages. Yet, contrary to their claims, most of these issues have already been addressed in prior reviews and meta-analyses of the IAMs, with somewhat different results. Most of the other assessments find lower central estimates than FG, and they recognize greater uncertainty in the results.[2]

My comments focus on two issues: 1) the relative unimportance of damage estimates in the climate policy debate; and 2) the inherent difficulty of dealing with the uncertainties in both physical and monetary damages in a scientifically credible manner. Overall, I commend the authors for undertaking the effort to critique the centrist view on climate damages. Like FG, I do not see the climate change winner argument as particularly compelling. At the same time, I do not see their critique as a significant advance in the debate.

There are, in fact, two distinct analytic approaches to developing a rational response to global warming: cost-effectiveness or benefit cost analysis. The former assumes that policymakers have in mind a long run target for limiting the amount of projected climate change or atmospheric GHG accumulations, and focuses on what policy trajectory might achieve alternative goals at minimum economic cost, accounting for practical constraints, including incomplete international coordination. The latter approach, weighing the benefits and costs of slowing climate change, introduces the more contentious issues of damage assessment and valuation, including extreme or catastrophic climate risks. IAMs cross the traditional boundaries of individual academic disciplines and integrate knowledge from different fields into a single framework, including algorithms representing emissions/concentrations relationships, climate adjustment and sensitivity, damages from climate change inferred from a point estimate of total damages using functional form assumptions, and discount rates. While admirers see IAMs as powerful analytical tools,

1. Jody Freeman & Andrew Guzman, *Climate Change and U.S. Interests*, 41 ELR 10695 (Aug. 2011).

2. An exception is a recent paper by Frank Ackerman and Elizabeth A. Stanton that considers what they term the "morally offensive assumption to value human lives less in poor countries than in rich ones." *See* Frank Ackerman & Elizabeth A. Stanton, E3 Network The Social Cost of Carbon: A report for the Economics for Equity and Environment Network (2010), *available at* www.e3network.org.

detractors see them as black boxes, virtually incomprehensible to the outsider.

The good news is that the policy community has consistently supported cost-effectiveness as the relevant approach for addressing climate change. Every single legislative proposal advanced over the past several years, including the sole bill achieving a majority vote in Congress (H.R. 2454), has stated the goals in terms of a target greenhouse gas concentration or emissions levels. While policies are neither conceived nor framed in terms of the monetized benefits, I would not reject the benefit cost framework as applied to this issue. Rather, I see it as an evolving area of research not yet ready for prime time in the policy world.

The gross similarities in aggregate impacts predicted by the models mask huge inconsistencies across the studies, particularly regarding the relative importance of different damage categories. In fact, the FG paper is but one of several recent efforts to evaluate the damage literature, with a focus on the IAMs. A paper by Aldy et al. characterizes the representative estimates of damages from warming presumed to occur by around 2100 in the range of 1-2 percent of GDP for warming of 2.5 degrees C above pre-industrial levels, and on the order of 2-4 percent of GDP for warming of 4 degrees C.[3] The figure accompanying this article, from Aldy et al., displays the range of estimates from a set of widely discussed models. As shown, there are huge differences about the size of market and nonmarket damages, and the expected catastrophic risks. As the authors note, few studies tend to value damages from extreme warming scenarios "… given that so little is known about physical impacts of large temperature changes."[4] As exceptions to that observation, they point to two papers that put total damages at 10.2 -11.3 percent of GDP, for warming of 6–7.4 degrees C. However, they also point to the large inconsistencies in the relative importance of nonmarket impacts: in one study they account for about half of the overall damages, but are largely offset by the gains from leisure activities in another study.

A further analysis, which highlights some of the complexities of assessing the IAMs, is an exercise recently conducted by a federal Interagency Working Group (IWG), drawing on experts from the President's Council of Economic Advisors, the Environmental Protection Agency, the Department of Treasury, and more than half a dozen other executive branch agencies. The IWG analysis seeks to estimate the monetized damages associated with an incremental increase in carbon dioxide (CO_2) emissions in a given year, labeled the social cost of carbon. The stated purpose of the exercise is to provide a basis for agencies "to incorporate the social benefits of reducing . . . CO_2 emissions into cost-benefit analyses of regulatory actions that have small or 'marginal' impacts on cumulative emissions."[5]

In thinking about the different approaches adopted for assessing the uncertainty inherent in IAMs, choices must be made about the appropriate evaluative standard to be used. Arguably, different academic disciplines might embrace different approaches. In the fields of public policy and economics, an oft-cited standard is the one developed by the U.S. Office of Management and Budget (OMB) for regulatory analysis of very large federal regulations. In its Circular A-4, the OMB recommends that agencies:

> [assess] . . . the sources of uncertainty and the ways in which benefit and cost estimates may be affected under plausible assumptions . . . [apply] principles of full disclosure and transparency . . . [and] be credible, objective, realistic, and scientifically balanced.[6]

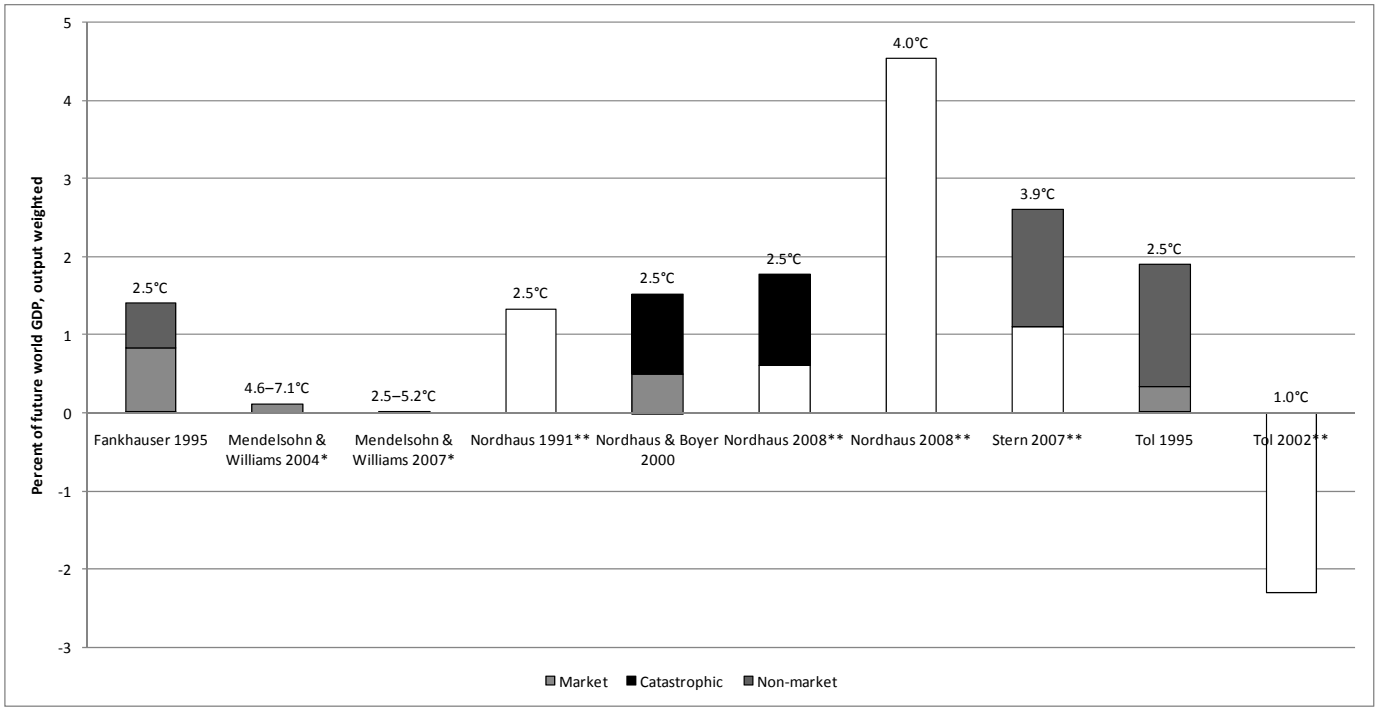
> [OMB also recommends] that data and models . . . [used] to analyze uncertainty should be fully identified . . . [and] the quality of the available data used . . . [should be discussed]. Inferences and assumptions used . . . should be identified, and . . . analytical choices should be explicitly evaluated and adequately justified. . . . [T]he strengths of your analysis . . . [should be delineated] . . . along with any uncertainties about its conclusions. Your presentation should also explain how your analytical choices have affected your results.[7]

With such an approach in mind, let me briefly consider the methods, imperfect as they are, used to develop the IWG's social cost of carbon.

The starting point for the IWG is a set of simulations conducted on three well-known IAMs: FUND, PAGE, and DICE. At the outset, the IWG acknowledges that "these representations are incomplete and highly uncertain. But given the paucity of data linking the physical impacts to economic damages, we were not able to identify a better way to translate changes in climate into net economic damages, short of launching our own research program."[8] The next step for the IWG is to conduct sensitivity analyses across a series of input parameters, including a number of those considered by FG: the discount rate, the growth in GDP, population, and emissions. For the climate sensitivity parameter, a key input into the IAMs, the IWG selects

3. Joseph E. Aldy et al., Resources for the Future, Designing Climate Mitigation Policy, Discussion Paper 08-16 (2009), *available at* http://rff.org/RFF/Documents/RFF-DP-08-16-REV.pdf.
4. *Id.* at 8.
5. Interagency Working Group on Social Cost of Carbon, Appendix 15A. Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866, *in* U.S. Department of Energy, Final Rule Technical Support Document (TSD): Energy Efficiency Program for Commercial and Industrial Equipment: Small Electric Motors (2010), *available at* http://www1.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/smallmotors_tsd/sem_finalrule_appendix15a.pdf.
6. Office of Management and Budget, Circular A-4 (2003), *available at* http://www.whitehouse.gov/omb/ circulars_a004_a-4/#a.
7. *Id.*
8. Interagency Working Group on Social Cost of Carbon, *supra* note 5, at 8.

Selected Estimates of Contemporaneous World GDP Damages From Global Warming Occurring Around 2100



Notes:

* Only market damages were estimated in these studies. And the above figure is the midpoint of a range of damage estimates.

** Damage categories are not precisely de-lineated in these studies.

Source: Aldy et al, *supra* note 3, at 47.

one specific value from the peer-reviewed literature, on the basis of explicit criteria and after consultation with relevant IPCC authors. Combining the alternative assumptions, the IWG develops a range of estimates: $5-$65 per ton of CO_2 reduced, with a central estimate of $21/ton in 2010 (2007$), rising over time to $16-$136 per ton, with a central estimate of $45 in 2050.

Even with this relatively wide range of estimates, the IWG endeavors to identify the limits of their analysis. Specifically, they note the incomplete treatment of both catastrophic and non-catastrophic damages, of adaptation and technical change, and risk aversion. As regards issues of catastrophic damages, they raise concerns about the extrapolation of climate damages to high levels of warming, the failure to incorporate inter-sectoral and inter-regional interactions, and the imperfect substitutability of environmental amenities.

In contrast to the IWG, or to the Aldy et al assessment, FG do not focus on the highly uncertain nature of the existing estimates, or the inconsistencies among the IAMs. Instead, they simply characterize the IAMs as generating GDP loss estimates of 0-3 percent and, then, proceed to consider the six issues they have identified as the cause of the presumed underestimates. Thus, a key difference between the FG approach, and those adopted by either the IWG or by Aldy et al, lies in the recognition and treatment of the uncertainty inherent in the estimates. Although none of the studies performs the formal Monte Carlo analyses recommended by OMB, the IWG clearly comes closest to the OMB approach with its extensive sensitivity analyses. The Aldy et al. paper provides some sensitivity analysis, albeit more limited than the IWG. Both the IWG and Aldy et al. present their results as a range, including a central estimate. FG focus on a single estimate, comparable in some respects to the IWG's central estimate.

In all the papers, some potential damages remain unquantified. In the case of the IWG, there is explicit consideration of key variables such as the climate sensitivity parameter, emissions growth, and others factors. Aldy et al. focus considerable attention on catastrophic damages, non-market impacts and the discount rate. Interestingly, they also discuss air capture and geo-engineering as possible policy options for mitigating extreme events. In contrast, FG do not conduct a sensitivity analysis of any kind. They use limited data to analyze uncertainty and fail to evaluate the analytical choices they have made or to delineate the strengths of their analysis along with the uncertainties about its conclusions. In effect, FG have substituted their scientific judgments for those of the integrated assessment modelers, with quite limited analytical support.

Unsurprisingly, the results of these analyses are quite different. FG adopt a central estimate that is an order of

magnitude larger than the conventional estimates of the IAMs. Aldy et al. do not explicitly identify a preferred central estimate. Implicitly, however, they seem to favor a relatively small increment above the conventional wisdom, largely to incorporate catastrophic risks. The IWG goes the furthest in its quantitative analysis and does include a range that spans an order of magnitude, although the central estimate is well below the upper bound. It also identifies a series of major limitations of current knowledge and calls for further research.[9]

So, where does all this lead? Clearly, the preference in the climate policy community is for cost-effectiveness as opposed to cost-benefit analysis. Nonetheless, there is an understandable desire to assess the existing cost-benefit literature. Given the relatively primitive state of knowledge of the physical impacts of climate change—and even more so for the monetized value of damages—there is plenty of room for debate.

Overall, FG have performed a useful service by laying out some of the issues that may give rise to underestimates by the IAMs and, particularly, in making the issues accessible to audiences not steeped in the subtleties of the climate sensitivity parameter, Monte Carlo analysis or similar complexities. At the same time, the IWG estimate of $21 of an incremental ton of CO_2 reduced in 2010, ranging up to $65 under some assumptions, and increasing steadily over time is hardly a sign that the United States is a climate change winner, as FG suggest. Especially with the rampant efforts underway to attack the underlying science of climate change, I believe it is important to embrace strong scientific methods when assessing the IAMs, even at the risk of understating somewhat the potential damages. It is better to be generally correct than precisely wrong.

9. Specifically, the IWG identifies five major limitations of current knowledge: Incomplete treatment of noncatastrophic damages; incomplete treatment of potential catastrophic damages; uncertainty in extrapolation of damages to high temperature; incomplete treatment of adaptation and technical change; and risk aversion.

RESPONSE

Review of Freeman and Guzman's *Climate Change and U.S. Interests*

by Jeffrey Hopkins

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Jody Freeman's and Andrew Guzman's article, *Climate Change and U.S. Interests*, was engaging and convincing in many aspects, though I am not sure that the parts that engaged and convinced me were the parts that Freeman and Guzman intended.[1] While I find their introductory premise flawed, these flaws are not fatal. Still, the material that follows must necessarily be updated and enhanced.

Freeman and Guzman start off by splitting the U.S. population into two groups: those that accept the science and those that don't. They characterize the United States as being a country where there is now widespread, if not universal, consensus that climate change is occurring. Data by Jon Krosnick at Stanford would support this view at the level of the general population[2]—there is broad support that the scientific case is fairly settled and less subject to variability over time than commonly believed. While this is the case on a very broad public acceptability level, there has been too much politicization and demonization in politics to call anything related to the acceptability of climate change science a consensus.

Freeman and Guzman set aside those who do not accept the science and, instead, focus on the people who accept the science but claim we should do nothing in the face of the threat (those who accept the science and advocate action are similarly ignored). They helpfully enumerate four mutually exclusive arguments used to justify non-action, including arguments that: (1) the United States comes out better (in fact, a *winner*) as a result of a changed climate; (2) action is *futile* because any emissions reductions we bring about are swamped by emissions increases of other countries; (3) action will lead to *leakage* resulting in industry-fleeing countries that act for countries that don't; and (4) it isn't *fair* for burdens to be disproportionately shared.

The authors focus exclusively on the climate change winner argument and say that their essay will have been successful if they dispose of it. Having never heard the argument before reading the paper, I initially suspected a straw doll, but would rather conclude that they have merely set themselves too low of a goal for this study. I would suggest that the authors expand their focus to more critical discussion areas. There are two promising areas—one could look either at the *futility* and the *fairness* arguments that have raged on for years or, alternatively, they could expand their focus to those who do not accept the science. (The *leakage* argument is a bit more nuanced than discussed in the paper, and it isn't fundamentally an argument against action but rather a proposal for a policy remedy—transition assistance—as part of a climate action policy.)

I recommend focusing on the underpinning of the arguments against the science. A chief argument of those who argue against action based on the science is due to the fact that the science is not settled. Freeman and Guzman point out at multiple points, in the middle sections of the paper, that uncertainty isn't the same as ignorance. They are absolutely correct here, but what is uncertainty and how do we treat it? The authors bring factors into the analysis of the case for action against climate change that are not settled, weigh and consider their effects, and make a rational choice on a course of action. Freeman and Guzman should additionally give policymakers some guidance on how to "think" about uncertainty, rather than allowing policymakers uncertain of the science to abstain from judgment altogether until all reasonable doubt is removed. It could be a very long time, and effectively too late, if we installed such a gateway on our decisionmaking.

Uncertainty is largely the focus of sections II (on leading scientific and economic models) and III (spillovers). I would collapse the arguments into a single thrust and overlay a framework of uncertainty analysis. The causal linkages and measurements of impacts are imprecise across both the atmospheric and economic modeling of climate impacts as well as the spillover effects related to the economy and national security. While the authors do an admirable job of alerting us to the problems of equating uncertainty with

Author's note: The views expressed within this paper are the author's and do not necessarily reflect those of any organizational affiliation.

1. Jody Freeman & Andrew Guzman, *Climate Change and U.S. Interests*, 41 ELR 10695 (Aug. 2011).
2. Jon A. Krosnick & Bo MacInnis, Frequent Viewers of Fox News Are Less Likely to Accept Scientists' Views of Global Warming (2010), *available at* http://woods.stanford.edu/docs/surveys/Global-Warming-Fox-News.pdf (indicating that despite significantly greater likelihood of being a climate skeptic, even heavy Fox News viewers do not as a group disagree with the views of mainstream scientists nor do they express little trust of scientists as a group).

ignorance, beyond saying that uncertainty is an important issue, they do little to guide us on how to characterize risk or make decisions in the face of it.

While the task of expanding their argument may appear daunting, I hope that the authors decide to take me up on it. There is some good news here as some of the linkages that they would like to formalize are also the subject of advances in modeling underway for the 5th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) due in 2013.[3] The Summary for Policy Makers will lead with a chapter that includes the treatment of uncertainty. For the first time, the standard integrated assessment models used to date will be joined with Earth Systems Models. Earth Systems Models will incorporate advances in our understanding of carbon cycle feedbacks, which will allow us to incorporate uncertainty and begin to trace impacts to their causes, especially at the regional scale.

These same advances in physical modeling are likewise increasingly being incorporated into economic models, including further advances in the approaches used by Nordhaus cited extensively in the paper. A useful update on the state of modeling was the subject of a November 2010 conference on improving the policy analysis of impacts from climate change.[4] The presentations therein are particularly useful.

Strictly, incorporation of uncertainty in analysis is only helpful to the extent this information can become incorporated into policy decisions. Formalizing uncertainty will improve the middle sections of the paper, where linkages and uncertainty are asserted to play a major role but their treatment is ad hoc, considerably.

Where Freeman and Guzman could really play a useful role is in treating this information within a risk management framework and, importantly, signaling risk and uncertainty straight up. Likewise, Freeman and Guzman should consider the helpful approach by Mabey, Gulledge, Finel and Silverthorne, which sets forth the ABC's of climate risk management.[5] Mabey et al. lay out the following proposal:

> **A=Aim to stay below 2° C.** Addressing this goal means, among other things, focusing on minimizing the costs of mitigation and, because the goal is aggressive, will require transformational technology as well as enabling infrastructure.
>
> **B=Build and budget for 3-4° C.** Under this goal, one would focus on the factors that Freeman and Guzman discuss and seek to add to the standard model, both economic and security-related factors. Risk of catastrophic, cross-sectoral, and non-market impacts are treated explicitly.
>
> **C=Contingency plan for 5-7° C.** Addressing this goal, feedbacks are even more pronounced and tipping points are tripped.

From a risk management perspective, the way to incorporate the evidence that Freeman and Guzman desperately want to uncover is to put in place a strategy that is robust across all three scenarios. This is because there is some likelihood that we will be facing any of them.

In sum, Freeman and Guzman fail to frame their discussion properly by aiming too low in taking on the 'climate change winner' argument and hoping to win this argument by insisting that impacts that are frequently bracketed and set aside are in fact real and should increase arguments in favor of determined and decisive climate action. The usefulness of including uncertain and often-bracketed impacts is, in fact, a much broader discussion and should be extended to the arguments made against the science itself. Freeman and Guzman ask us to treat these costs seriously, which is an entirely worthy goal. We need for them to go further and address 'how' exactly to think about the risk of climate change.

3. *See* Intergovernmental Panel on Climate Change, Agreed Reference Material for the IPCC Fifth Assessment Report, *available at* http://www.ipcc.ch/pdf/ar5/ar5-outline-compilation.pdf.
4. *See* National Center for Environmental Economics, Improving the Assessment and Valuation of Climate Change Impacts for Policy and Regulatory Analysis: Research on Climate Change Impacts and Associated Economic Damages, http://yosemite.epa.gov/ee/epa/eerm.nsf/vwRepNumLookup/EE-0566?OpenDocument (last visited Apr. 15, 2011).
5. Nick Mabey et al., Third Generation Environmentalism Ltd, Degrees of Risk: Defining a Risk Management Framework for Climate Security (2011), *available at* http://www.e3g.org/images/uploads/Degrees_of_Risk_Defining_a_Risk_Management_Framework_for_Climate_Security_Executive_Summary.pdf.

A Reply

by Jody Freeman and Andrew Guzman

We wish to begin with a note of thanks to Richard Morgenstern, Jeffrey Hopkins, Laurie Johnson, Daniel Lashof, and Kristen Sheeran for their comments on our article, *Climate Change and U.S. Interests*. The comments have helped our own thinking on the subject, and it is gratifying to know that our paper stimulated such thoughtful responses. In the few pages we have for our reply, we focus on the claims that are most important and in the greatest tension with our article.

The most critical of the comments is from Morgenstern, who advances two main objections. First, he dismisses the entire exercise of estimating the likely harms from climate change as relatively unimportant to the climate policy debate.[1] Second, he asserts that our critique is poorly done—we have mishandled the uncertainty inherent in calculating damages, "unfairly attacked" the relevant economic models, and "overinterpreted" their results.[2]

Morgenstern's first objection rests on the claim that cost-effectiveness analysis, rather than cost-benefit analysis, is the appropriate tool for addressing climate change, a point on which, he claims, the policy community agrees. Cost-effectiveness analysis, he explains, "assumes that policymakers have in mind a long run target for limiting the amount of projected climate change" and focuses on choosing among alternative implementation strategies. Cost-benefit analysis, which is the focus of our article, seeks to estimate the future economic harms from climate change and assess the benefits of alternative mitigation or adaptation strategies. By way of evidence that cost-benefit analysis is an inappropriate climate policy tool, Morgenstern notes that every legislative proposal advanced in Congress in recent years has stated its goals in terms of target greenhouse gas (GHG) concentration or emission levels, "with policies neither conceived nor framed in terms of monetized benefits."[3]

We see both cost-benefit and cost-effectiveness analysis as unavoidably necessary and important to climate policy debates. The legislative targets that Morgenstern says policymakers "have in mind" must come from somewhere. We take his point to be that legislators choose these targets through a political process rather than by conducting a formal economic analysis. While this may be true, that political process necessarily depends on an implicit or explicit evaluation of the relevant costs and benefits of alternative approaches. After all, one would only support legislation addressing climate change if one were persuaded that the anticipated harms from unmitigated emissions outweigh the costs of trying to curtail them.[4] In other words, policymakers somehow must conclude that the endeavor is worthwhile, which means comparing costs and benefits, however crudely.[5] In addition, choosing one emissions level over another inevitably requires policymakers to balance the harms associated with increased global GHG concentrations against the costs of trying to avoid them. Morgenstern elides this reality by simply positing that legislators have certain levels in mind, without explaining how they are chosen. We have no quarrel with the value of cost-effectiveness analysis as a useful mechanism for assessing alternative implementation strategies once a target is chosen. But our article focuses on the necessary prior step, which is the methodology for choosing the target. Because he cannot mean that legislative targets simply fall from the sky, we assume Morgenstern would agree that policymakers must go through a rough calculus to determine them. Our central point is that the costs of any given level of GHG emissions are likely to be much higher than suggested by most current estimates.

In any event, it seems peculiar for Morgenstern to claim that cost-benefit analysis "is not ready for prime time in the policy world," when it is actually being used in the policy world. Indeed, the Obama Administration's interagency working group (IWG) on the social cost of carbon (which Morgenstern invokes and whose methodology he praises) explicitly monetized the social cost of carbon by relying on the very same models that we use as a starting point in our analysis.[6] The output from the IWG process has con-

1. Richard D. Morgenstern, *Critiquing the Critique of the Climate Change Winner Argument,* 41 ELR 10720 (Aug. 2011).
2. *Id.*
3. *Id.* at 10721.
4. Clearly, Congress has thus far not been persuaded. American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. (2009).
5. One might argue that legislative targets can be determined without resort to cost-benefit analysis—that they are dictated by science, for example. But scientifically grounded recommendations about appropriate emissions targets are themselves necessarily based on an assessment of the relevant tradeoffs. If cost were irrelevant, surely the goal of climate policy would be to minimize risk to the greatest extent possible by selecting a target of zero increase in atmospheric GHG concentrations over today's levels. But of course cost does matter, and the choice of target (whether expressed as concentrations such as 450 or 550 ppm, goals such as 80 percent below 2005 levels by 2050, or as a commitment to no greater than 2 degrees Celsius rise in average global temperature by 2050) reflects that. We cannot decide what the target should be unless we have some understanding of the costs and benefits.
6. Interagency Working Group on Social Cost of Carbon, Appendix 15A. Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866, *in* U.S. Department of Energy, Final Rule

crete implications for policy. The estimates for the social cost of carbon it produced—including the central point estimate of $21 per ton—will now be reflected in executive agencies' cost-benefit calculations of the net social impact of their significant regulations, including for example, the Department of Energy's appliance efficiency standards, the Department of Transportation's fuel economy standards, and a host of air pollution regulations issued by the Environmental Protection Agency. If our critique of the prevailing economic models is right, it applies equally to the IWG's results. The upshot is that the estimated benefits of many government regulations will be too low because of a systematic downward bias. As a result, in some cases, agencies may ultimately set—or be asked by the Office of Information and Regulatory Affairs (OIRA) to set—lower regulatory standards than are otherwise justified.[7]

Moreover, in the face of ongoing disputes over the merits and demerits of Congress doing *anything* to address climate change, it seems plainly wrong to criticize our project by asserting the "relative unimportance" of cost-benefit analysis to climate policy. The debate over domestic climate legislation continues to turn on arguments about the relative costs and benefits to the United States of taking action.[8] Those who oppose domestic legislation may find it convenient to cite leading economic models showing limited negative impact on U.S. GDP from global climate change, or projections about increased agricultural productivity in the United States, to claim, essentially, that the United States will fare relatively well in a warming world, and that mitigation is not worth the costs. Although the argument against addressing GHG emissions comes in many forms—it would impose an energy tax[9]; it would kill jobs;[10] carbon is not a problem in need of regulation[11]—such claims, at bottom, must rest on a conclusion that the costs of climate change to the United States are insufficiently great to warrant Congress addressing it now.[12] It is thus important to debunk the intellectual and academic basis for such claims, which includes the damage estimates from the dominant economic models, which can easily be taken out of context.[13]

This leads us to Morgenstern's second critique, which engages our claims about the economic models of climate change, known as integrated assessment models or IAMs. As we explain in our article, and as scholars including Morgenstern generally acknowledge, these models make certain simplifying assumptions about how the world's climate system will affect the global economy, and those assumptions limit their ability to predict accurately the true social cost of greenhouse gas emissions.[14] The models

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Technical Support Document (TSD): Energy Efficiency Program for Commercial and Industrial Equipment: Small Electric Motors (2010), *available at* http://www1.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/smallmotors_tsd/sem_finalrule_appendix15a.pdf [hereinafter IWG SCC Report]. Led in 2009 by the Council of Economic Advisors and the Office of Regulatory Affairs within the Office of Management and Budget in the White House, this effort sought to develop a government-wide social cost of carbon to be incorporated by the agencies into their regulatory impact analyses (RIA). Exec. Order No. 12866, 3 C.F.R. 638 (1993), *reprinted as amended in* 5 U.S.C. §601 (2006). RIAs consist of a detailed cost-benefit analysis, which are required for all significant rules pursuant to Executive Order No. 12866. *See id.* §1(b)(6) at 639. The Executive Order requires that agency rules be cost justified. *See id*. §6(a)(3)(C), at 645. Although the Order does not specify that cost-benefit analysis be used as a decision rule for agency standard-setting (that is, it does not require agencies to use marginal cost analysis to set levels of stringency), the cost justification requirement in the Order would appear to allow OIRA to request that agencies do so unless a statute or court ruling specifies otherwise.

7. Even if many regulations will be affected by the social cost of carbon only on the margins, the potential for some regulations to come out differently remains.

8. And to the extent it does not, it is only because the debate has regressed to one over the validity of the climate science. *See* John M. Broder, *Waxman Angrily Assails G.O.P. "Science Deniers,"* N.Y. Times, Mar. 7, 2011, *available at* http://green.blogs.nytimes.com/2011/03/07/waxman-angrily-assails-g-o-p-science-deniers (quoting Rep. Henry Waxman's complaint of an "overwhelming disconnect between science and policy" in the Congress and his critique of Republican efforts to repeal the EPA's scientific finding that greenhouse gases endanger health and welfare); *see also* Wash. Post Staff, *Climate Change Skeptics Who Won the Senate,* Wash. Post, Nov. 3, 2010, *available at* http://www.washingtonpost.com/wp-srv/special/nation/senators-skeptic-climate-change/index.html.

9. *See, e.g.*, Susan Eckerly, Nat'l Fed. of Small Businesses, National Federation of Small Business's Letter to the Hill on Cap and Trade (H.R. 2454) (June 24, 2009), *at* http://www.nfib.com/issues-elections/issues-elections-item?cmsid=49408 (arguing that "now is not the time to impose an $846 billion energy tax on small business").

10. *See* Energy Tax Prevention Act of 2011, H.R. 910, 112th Cong. (2011) (introduced by Reps. Upton (R-Mich.) and Whitfield (R-Ky.)). Sponsors of the legislation have cited the "job crushing" effect of greenhouse gas regulation. See statements catalogued at http://epw.senate.gov/public/index.cfm?FuseAction=Minority.PressReleases&ContentRecord_id=7d62b087-802a-23ad-41e4-93481b22c4a8.

11. Fred Upton & Jim Phillips, *How Congress Can Stop the EPA's Power Grab*, Wall St. J., Dec. 28, 2010, *available at* http://online.wsj.com/article/SB10001424052748703929404576022070069905318.html; *see also* John. M. Broder, *Inhofe and Upton: Just Say No to the E.P.A.*, N.Y. Times, Mar. 3, 2011, *available at* http://green.blogs.nytimes.com/2011/03/03/inhofe-and-upton-just-say-no-to-the-e-p-a.

12. *See* Keith Yost, *Global Warming Not Worth the Fight*, MIT: The Tech Online, Oct. 15, 2010, *available at* http://tech.mit.edu/V130/N45/yost.html (arguing that the United States should do little if anything about climate change and citing to studies by William Nordhaus, Robert Mendelsohn, and Richard Tol suggesting the costs of mitigating climate change exceed the benefits for the United States). One might argue that Congress has already addressed the problem by authorizing EPA to regulate GHG emissions under the Clean Air Act. *See* Massachusetts v. EPA, 549 U.S. 497 (2007) (holding that EPA possesses regulatory authority over GHGs under the CAA). However, it is a widely shared view among policymakers and academics that the CAA is not an optimal tool for addressing climate change. *See* Brigham Daniels et al., *Regulating Climate: What Role for the Clean Air Act?* 39 ELR 10837, 10840 (Sept. 2009) ("Given that Congress crafted the CAA as a response to local and regional air pollution, it is not surprising that crafting a sensible climate policy for the CAA feels a bit like jamming a square peg into a round hole."). The view that the Clean Air Act is not the ideal vehicle for addressing climate change is also held by the Obama Administration. *See* Kim Chipman, *Clean Air Act Not Ideal to Regulate Carbon in U.S. Jackson Says*, Bloomberg, Apr. 26, 2011, http://www.bloomberg.com/news/2011-04-26/clean-air-act-not-ideal-to-regulate-carbon-jackson-says-1-.html.

13. *See, e.g.*, 153 Cong. Rec. S. 13505 (daily ed. Oct. 29, 2007) (statement of Sen. Inhofe) ("The [Nordhaus] study revealed that so-called global warming solutions would cost two or even three times the benefits they would theoretically achieve.").

14. A good overview of the models is provided in the U.S. government's interagency document on the social cost of carbon: "IAMs translate emissions

are constrained in their predictive capacity to the extent that they simplify complex scientific and economic processes, but also because they omit certain categories of impact due to a lack of data, uncertainty, or both. Some simplification is necessary to make predictions about how climactic changes might affect the global economy. As we say in our article, "These omissions are not anyone's fault, but rather, as many economists point out, result from the inherent limitations of economic modeling."[15]

The central point of our article is that the assumptions built into existing economic models systematically understate the likely economic effects of climate change by omitting categories of harm (including cross-sectoral impacts, national security threat multipliers, biodiversity losses, and catastrophic events). They are not bad models, but it would be bad policy to forget or ignore the assumptions used to create them, and to take the resulting damage estimates as if they represent the full range of harms.

Morgenstern points out that economists traditionally treat certain categories of harm as too difficult to monetize. The preferred method is to omit these costs from the damage calculations and discuss them separately, in prose, as limitations, unknowns, or uncertainties. To illustrate how this is done, Morgenstern cites the above-mentioned IWG process.[16] The IWG ultimately settled on four estimates for the social cost of carbon: $5, $21, $35, and $65 (in 2007 dollars). The first three values were calculated using discount rates of 5, 3 and 2.5 respectively. The IWG approach essentially averaged three IAMs and then applied three different discount rates. This produced three alternative cost-of-carbon estimates. The IWG generated the fourth value by averaging a high-damage estimate from each of the three IAMs and applying a moderate discount rate of 3%.[17]

The analysis released by the administration to support these estimates is conscientious. It acknowledges the limitations of the models, discusses the implications of these limitations,[18] and commits the government to revisit and revise the values as new information becomes available.[19] Moreover, acknowledging the uncertainties in regulatory impact analysis, the report stresses "the importance and value of considering the full range"[20] of estimates rather than a single value. Nevertheless, the government ultimately brackets all of the assumptions and limitations when taking the crucial step of monetizing the damage estimates,[21] addressing them only in discussion.[22]

When faced with costs that are difficult or impossible to estimate, the conventional strategy of the IAMs is to assume those costs away. (See Table 1 at the end of this Reply.) Studies that survey different IAMs, including the IWG process, and the Aldy, et. al. article cited by Morgenstern, generally accept the results of the IAMs (and try to average across them) and, so, they too neglect these hard-to-measure costs. By contrast—and this is what Morgenstern protests—our article sets out to confront head-on the downward biases present in IAMs. We think it is possible to come up with an estimate of these harms that is better than ignoring them altogether.

Morgenstern quite rightly points out that the IWG report acknowledges some of the factors omitted from the IAMs' damage estimates. These include several of the factors that we discuss in our paper.[23] Recognizing these omissions is important, but is not enough. Morgenstern himself proves our point. Even as he engages our concern over neglected factors, and argues that the best way to deal with them is to acknowledge the challenge of incorporating them, he ignores the necessary implication: that the estimates associated with this approach are biased downward. Morgenstern acknowledges the uncertainty associated with the IWG estimates, but says almost nothing about their bias.[24]

It should be self-evident that assigning a value of zero to catastrophic events, nonmarket costs, cross-sectoral impacts, productivity effects, economic spillovers, national security, migration, disease, and more will cause us to underestimate the effects of climate change. Rather than ignoring these effects, we assign many of them an economic value based on what we think are entirely plausible, though admittedly contestable, assumptions. We do not claim to have the correct numbers. Indeed, we make an exceedingly modest claim: our effort is simply better

into changes in atmospheric greenhouse concentrations, atmospheric concentrations into changes in temperature, and changes in temperature into economic damages. The emissions projections used in the models are based on specified socio-economic (GDP and population) pathways. These emissions are translated into concentrations using the carbon cycle built into each model, and concentrations are translated into warming based on each model's simplified representation of the climate and a key parameter, climate sensitivity. Each model uses a different approach to translate warming into damages. Finally, transforming the stream of economic damages over time into a single value requires judgments about how to discount them." *See* IWG SCC Report, *supra* note 6 at 6.

15. Jody Freeman & Andrew Guzman, *Climate Change and U.S. Interests*, 41 ELR 10695, 10696 (Aug. 2011).
16. Morgenstern, *supra* note 1 at 10721.
17. The $65 value represents "the higher- than-expected impacts from temperature change further out in the tails of the SCC distribution" using an SCC value for the 95th percentile at a 3 percent discount rate. The SCC estimates grow over time (e.g., the central value increases to $24 per ton of CO_2 in 2015 and $26 per ton of CO_2 in 2020). IWG SCC Report, *supra* note 6 at 1-2.
18. The report allocates 2 pages of 35 (or 51 including the appendix) to a discussion of the models' limitations and an additional 2.5 pages to further discussion of the catastrophic risk and damage functions, but also reiterates in several places the constraints of the models. IWG SCC Report, *supra* note 6 at 30-34.
19. The report openly acknowledges the difficulty of the exercise: "The interagency group offers the new SCC values with all due humility about the uncertainties embedded in them and with a sincere promise to continue work to improve them." IWG SCC Report, *supra* note 6 at 5.
20. IWG SCC Report, *supra* note 6 at 3.
21. IWG SCC Report, *supra* note 6 at 2 tbl. 15A.1.1
22. *See* IWG SCC Report, *supra* note 6, §15.A.4.
23. IWG SCC Report, *supra* note 6 at 30-31.
24. Morgenstern's response to our own paper similarly illustrates how the focus of discussion inevitably falls on quantitative estimates. In our article we generate numerical estimates of certain costs, but also identify and discuss costs for which we are unable to do so (see Table 2 at the end of this Reply). Yet the commentators say almost nothing about the latter, while focusing almost exclusively on the former. This reinforces how numerical estimates take center stage while factors that are not quantified are neglected. Even our own estimates might be faulted for incompletely capturing the true costs of climate change, although they are an improvement on the IAMs.

than allocating these categories a value of zero.[25] We concede that an approach like ours might be suspect if it were arbitrary—if, for example, one simply pulled numbers out of the air or inflated them without reason. We take pains to avoid this mistake. To ground our estimates, we state reasonable premises about the potential effects of climate change under different proposed scenarios (all intuitive; none obviously far-fetched) and proceed from there to calculate possible impacts on GDP. Moreover, our estimates are based on published research by serious scholars. We then tally up these impacts to produce a total projected effect on GDP that is considerably greater than the average projections of the dominant IAMs.

Morgenstern points to the IWG estimates on the social cost of carbon as an exemplary approach to uncertainty, and he finds our own approach wanting by comparison. We think this criticism unjustified. Our article repeatedly emphasizes the fact that our estimates are imprecise. In recognition of this fact, we provide a range of impacts for several of our estimates, including the total. Presenting a range of possible outcomes is very much in line with the approach in the IWG report. Moreover, realizing that our estimates are far larger than conventional estimates, and wishing to guard against the possibility that we have overstated some costs, we cut our total projected impact on GDP in half. Even using this conservative calculation, the numbers still show it to be clearly in the economic interest of the United States to invest more heavily in the mitigation of climate change, which is of course the policy conclusion of our article.

Perhaps Morgenstern's most fundamental and pointed critique, and the source of our greatest disagreement, is summed up in the final words of his comment: "It is better to be generally correct than precisely wrong."[26] First, we do not believe we are wrong when compared to the IWG process or IAMs in general. The relevant comparison is between our own estimates of hard-to-quantify harms (e.g., biodiversity losses) and risks that depend on complex interactions (e.g., growth and productivity losses) and those of the IAMs. We feel strongly that ignoring costs known to be significant is a worse approach than doing the best one can to estimate them. We believe, for this reason, that our results are superior for policy purposes than results that omit these costs from the damage estimates.

At bottom, this amounts to a methodological disagreement, which stems from a difference in normative view. The dominant perspective is that the existing economic models are good enough to be relied upon to make public policy, providing their assumptions and omissions are acknowledged. Yet the practical result is to relegate a broad range of effects to a discussion of the models' limitations and uncertainties, which in our view effectively makes them disappear. Our concern is that what counts, ultimately, are the numbers, and that qualifying discussions, no matter how sincere and nuanced, will be overlooked when IAMs are deployed for purposes of policymaking.[27]

To illustrate, we return to the Obama Administration's interagency process on the social cost of carbon. As Morgenstern notes, the government's approach was laudable in its seriousness, inclusiveness, and thoroughness. The report in several places cautions against overconfidence and stresses the limitations of current scientific and economic models. It candidly admits that these estimates are the best the government can do under current circumstances. Yet in the end, the process culminated in a range of specific point estimates that agencies must incorporate into their cost-benefit analyses, with $21 per ton of carbon serving as the central point estimate.

The range provided improves upon the government's past practice inasmuch as it seeks to harmonize inconsistent estimates used by different agencies[28]; adopts a "global" value to reflect damages worldwide, instead of limiting the analysis to domestic impacts[29]; and incorporates an upper estimate that attempts to account for the possibility of catastrophe.[30] None of this, however, makes the estimates *accurate*. Because of the systematic downward bias in the key IAMS on which the estimates rely (which nothing in the interagency group's process cured),[31] there is a strong, perhaps even overwhelming, likelihood that the estimates still understate the economic impact of global climate change to the United States.

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25. Richard Tol has described a number of omitted impacts, including many of the impacts we make an effort to monetize such as, "extreme climate scenarios, the very long term, biodiversity loss, the possible effects of climate change on economic development and even political violence" as "big unknowns." Richard Tol, Copenhagen Consensus on Climate, An Analysis of Mitigation as a Response to Climate Change 17 (2009), *available at* http://fixtheclimate.com/uploads/tx_templavoila/AP_Mitigation_Tol_v_3.0.pdf. He concludes that the probability of catastrophic events, "seems low" while acknowledging that our understanding of what might cause them is still quite poor, and that if they were to happen, "they do have the potential to happen relatively quickly, and if they did, the costs could be substantial." *Id.*
26. Morgenstern also says: "Freeman and Guzman have substituted their scientific judgments for those of the integrated assessment modelers, with quite limited analytical support." We think this critique unfounded. Like all authors, we exercised our own judgment (otherwise, why write anything?), but we provided extensive support for our analysis both by explaining our reasoning and citing to the scientific support for our claims. The persuasiveness of our argument is, perhaps, in the eye of the beholder, but we are entirely comfortable defending the rigor, method, and integrity of our article.
27. One response to this might be that we should have faith that policymakers will take the relevant nuance into account. But anyone with any experience in politics knows this to be a risky, and likely naïve, view. It would be strange to fault us for being cautious in this regard.
28. The report cites to a DOT regulation in 2008 that assumed a domestic SCC value of $7 per ton CO_2 (in 2006 dollars) for 2011 emission reductions; a DOE regulation in 2008 that adopted a domestic SCC range of $0 to $20 per ton CO_2 for 2007 emission reductions (in 2007 dollars); and EPA's 2008 Advance Notice of Proposed Rulemaking for Greenhouse Gases with preliminary SCC estimates of $68 and $40 per ton CO_2 for discount rates of approximately 2 percent and 3 percent, respectively (in 2006 dollars for 2007 emissions). IWG SCC Report, *supra* note 6 at 4.
29. IWG SCC Report, *supra* note 6 at 4.
30. Morgenstern approves of this effort to take into account catastrophic costs, but for reasons that are not clear to us, disapproves of our own similar effort.
31. The report reviews the three leading IAMS and then concludes: "We recognize that these representations are incomplete and highly uncertain. But given the paucity of data linking the physical impacts to economic damages, we were not able to identify a better way to translate changes in climate into net economic damages, short of launching our own research program." IWG SCC Report, *supra* note 6 at 9.

Moreover, there will be consequences if the agencies do not adopt the estimates from the IWG report. Their regulatory impact analyses might be rejected by OIRA, or subject to requests for modification. And as we have already noted, some of the ensuing regulations may be weaker, as a result, than they otherwise would be, were they informed by a cost estimate for carbon that reflected *some* value for the omitted categories of harm. Our point is this: in operationalizing the social cost of carbon for purposes of the regulatory review process under Executive Order 12866, what matters is that the agencies choose an acceptable number for their cost-benefit calculations. The agencies might discuss the range of values, but they know they will be "safe" if they adopt the central point estimate of $21. All of the nuance about the models' limitations might easily fall out.

Second, Morgenstern accuses us of failing to take account of the inherent uncertainty in our own analysis and in the problem more generally. We are, frankly, puzzled by Morgenstern's claim here, as we not only repeatedly emphasized the uncertainty and high variance of the estimates we were producing, but we also generated a range of estimates for many of the individual costs we examined and for the total costs of climate change.[32] Morgenstern asserts, for example, that, "[Freeman and Guzman] focus on a single estimate, comparable in some respects to the IWG's central estimate."[33] We are not sure what "single estimate" he refers to—our final estimate of harms is a range from 10.8% of GDP to 20% of GDP.[34]

Contrary to what Morgenstern suggests, we do not make a claim to precision. We recognize that the variance for our estimates is large, as it is for those produced by the IAMs. Again, we are happy to admit that our estimates are not the "correct" ones. Our claim is more modest than that. We believe that the harms we identify (which many others have also identified) have positive costs, and decisionmakers should do their best to account for these costs when making policy.

In sum, to the extent Morgenstern cites the interagency process on the social cost of carbon as improving upon IAMs, we think the example misplaced, since the process essentially adopted the IAMs as they are. To the extent Morgenstern commends how the interagency process handled the considerable uncertainty associated with making such estimates (bracketing it from the damage estimates on the theory that there is no way, at the present time, to do better), our response is to point out that this is precisely the treatment we are concerned about. To reiterate a point made emphatically in our article, our aim is not to "unfairly attack" the IAMs or the economists who have built them, but rather to incorporate more categories of harm so that our cost projections more completely, if still imperfectly, reflect the potential economic damage of climate change for the United States. The concern that motivated our article when we wrote it in 2008, and which motivates us still, is the potential for crucial nuance to get lost in translation from the academic to the policy world.

We take Johnson and Lashof's comment as complementary to our own. They broadly agree with our analysis and offer some additional insights with which we largely agree. For example, our article intentionally avoids any argument based on moral obligation, and Johnson and Lashof reasonably want to include such concerns. As they acknowledge, we leave these issues out of our article to emphasize the point that even under a self-interested analysis the case for action is strong.

Johnson and Lashof also discuss the impact of discount rates and risk aversion. We address discount rates briefly, acknowledging the debate over their role in estimating future impacts. It is an awkward fact that the choice of discount rate is enormously important yet nobody really knows how to determine the "proper" rate. As Johnson and Lashof illustrate in their discussion, changes to the discount rate in the IWG social cost of carbon calculation can dramatically change the conclusions. Again, we have no serious dispute. We also concur with Johnson and Lashof that catastrophic harms and risk aversion should be taken into account.

Our main disagreement with Johnson and Lashof, to the extent there is one, relates to the appropriateness of using cost-benefit analysis to estimate the harms from climate change. Kristen Sheeran advances a similar position so we discuss their points together. Like Morgenstern, these commentators think cost-benefit analysis an inappropriate tool for the task. Their primary discomfort seems to be with how cost-benefit analysis deals with uncertainty. When there is enough uncertainty, or perhaps enough uncertainty of a particular kind, the argument goes, "benefit-cost analysis loses its ability to inform rational policy."[35]

We have a strong suspicion that much of the disagreement here is semantic rather than real. Johnson and Lashof argue for a policy that "reduces probabilities of catastrophic outcomes by strategically investing in a clean energy future" while Sheeran calls for the use of "[p]recaution, risk assessment, and risk management." Much depends on what all of these terms mean, but we agree with many of the authors' substantive claims about the difficulties of monetizing a variety of relevant harms. We agree that sensible policy requires evaluating and balancing the consequences of alternative policy proposals. In making that assessment, it is appropriate and important to take into account the uncertainties involved, the intertemporal nature of the problem, the public's risk preferences, and equity, among other things. To do so, we must

32. We also cannot resist pointing out that when an IAM assigns a value of zero to a harm that we know will be greater than zero, that "estimate," in addition to having a downward bias, ignores the uncertainty associated with that particular cost.

33. "They use limited data to analyze uncertainty and fail to evaluate the analytical choices they have made or to delineate the strengths of their analysis along with the uncertainties about its conclusions. In effect, Freeman and Guzman have substituted their scientific judgment for those of the integrated assessment modelers, with quite limited analytical support." Morgenstern, *supra* note 1 at 10722.

34. Freeman & Guzman, *supra* note 15, at 10710.

35. Laurie T. Johnson & Daniel A. Lashof, *Comment on* Climate Change and U.S. Interests *by Freeman and Guzman*, 41 ELR 10712 (Aug. 2011).

confront difficult questions of how to value various harms. Nothing the commentators have written is inconsistent with this description. Our understanding of the difference between us and them is that we would call this undertaking a cost-benefit analysis and they would assign it a different name. Whatever it is called, we think we are talking about the same policymaking process.[36]

The final comment on our article is by Jeffrey Hopkins, who urges us to address issues that we purposely set to one side. He suggests, for example, that we examine the futility and fairness arguments in favor of U.S. action on climate change. We certainly agree that these are important topics, but as we noted in our article, they were not important for the point we wished to make. Hopkins similarly proposes a discussion of how policymakers should think about uncertainty and how policy should respond to it. This has some of the flavor of the precautionary principle suggestions from Johnson, Lashof, and Sheeran. We have no major quarrel with what Hopkins proposes, except to say that our article is long enough already, and if it succeeds in delivering the message that the future costs of climate change are substantially higher than is conventionally understood, we will consider our mission to have been accomplished. We share with Hopkins the hope that new research, whether by ourselves or others, will address the issues he raises.

When we wrote *Climate Change and U.S. Interests* in 2008, we fully expected to be overtaken by events. Congress appeared ready to pass legislation to address climate change by putting a price on carbon. Presidential candidate Barack Obama claimed it would be an administration priority. Yet now, in 2011, Congress seems even further away from this prospect than ever. The debate over climate science has intensified. EPA has begun to regulate GHG emissions under the Clean Air Act, and Congress is debating whether to strip the agency of its authority to do so. Clearly, Congress has determined that meaningful action at the federal level to address global climate change is not worth the costs. Thus, the main impetus for our article remains. We continue to believe that a more accurate tally of what the United States stands to lose from climate change is an important input into the public policy debate.

Table 1: Quantitative Adjustments to Conventional Estimates of Climate Change Impacts

Factors Considered	Conventional Estimates of Reduction in U.S. GDP (%)	Marginal Impact on Annual GDP (%)
Conventional IAM Estimate	0.5	0.5
Optimism About Temperature Rise	0	1
Asymmetry Around Point Estimates	0	0.5
Catastrophic Events	0	0.5-3
Nonmarket Costs	0	1.4-3.5*
Export Losses	0	1.5
SUB TOTAL	**0.5**	**5.4-10**
Growth and Productivity	0	Double Above Impacts
TOTAL	**0.5**	**10.8-20**

* This includes only biological costs.

Table 2: Qualitative Adjustments to Conventional Estimates of Climate Change Impacts

Factors Considered	Impacts and Examples
Cross-Sectoral Effects	If climate change affects energy prices, agriculture will be affected
Supply Shocks From Abroad	Energy prices
Global Financial Markets	Impact on American investments abroad; lending to fund current account deficit
National Security	Total cost of Iraq War = $3 trillion
Migration	Racial and ethnic tensions, undocumented immigration, human trafficking
Disease	Swine Flu, SARS, Avian Flu; U.S. cannot insulate itself from increases in incidence of disease

36. If, however, they mean that climate policy should be driven exclusively by a concern about minimizing the risk of catastrophic harms, with no regard for cost (which is not how we read their comments), we would part ways.

ARTICLE

Administrative Law, Filter Failure, and Information Capture

by Wendy E. Wagner

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There are no provisions in administrative law for regulating the flow of information entering or leaving the system, or for ensuring that regulatory participants can keep up with a rising tide of issues, details, and technicalities. Indeed, a number of doctrinal refinements, originally intended to ensure that executive branch decisions are made in the sunlight, inadvertently create incentives for participants to overwhelm the administrative system with complex information, causing many of the decisionmaking processes to remain, for all practical purposes, in the dark. As these agency decisions become increasingly obscure to all but the most well-informed insiders, administrative accountability is undermined as entire sectors of affected parties find they can no longer afford to participate in this expensive system. Pluralistic oversight, productive judicial review, and opportunities for intelligent agency decisionmaking are all put under significant strain in a system that refuses to manage—and indeed tends to encourage—excessive information. This Article first discusses how parties can capture the regulatory process using information that allows them to control or at least dominate regulatory outcomes (the information capture phenomenon). It then traces the problem back to a series of failures by Congress and the courts to require some filtering of the information flowing through the system (filter failure). Rather than filtering information, the incentives tilt in the opposite direction and encourage participants to err on the side of providing too much rather than too little information. Evidence is then offered to show how this uncontrolled and excessive information is taking a toll on the basic objectives of administrative governance. The Article closes with a series of unconventional but relatively straightforward reforms that offer some hope of bringing information capture under control.

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Editors' Note: Thomas Milch, Chair, Arnold & Porter, LLP, commented on this Article at the annual Environmental Law and Policy Annual Review conference in Washington, DC, on April 15, 2011. His comments can be heard on the audio recording of the conference at http://www.eli.org/Program_Areas/environmental_law_policy_review_conference.cfm.

I. The Basics of Information Capture and Filter Failure

In the early 1970s, legal visionaries like Joseph Sax, Lynton Caldwell, and Ralph Nader pressed for a system of rules that would give the public greater access to administrative decisions. Their battle against smoke-filled rooms populated only by well-heeled insiders bore fruit, and Congress adopted important reforms aimed at letting the sunshine in.

An explosion of laws followed, requiring open records, rigorous processes for advisory groups, access to congressional deliberations, and demands that agencies go the extra mile to include all interested participants and to take their views into consideration.[1] During this same time, the courts also stepped up their oversight of the agencies. Most notably, they expanded standing rules to enable public interest representatives to challenge agencies in court when agency rules diverge significantly from promises made by Congress.

But every successful reform movement has its unintended consequences. What few administrative architects anticipated from the new commitment to "sunlight" was that a dense cloud of detailed, technical, and voluminous information would move in to obscure the benefits of transparency. And because rulemaking processes are by their very nature blind to the risks of *excessive* information, committed as they are to the flow of information and expansive participation, a new phenomenon—called "information capture"—is taking hold.

In the regulatory context, information capture refers to the excessive use of information and related information costs as a means of gaining control over regulatory decisionmaking in informal rulemakings. A continuous barrage of letters, telephone calls, meetings, follow-up memoranda, formal comments, post-rule comments, peti-

1. Negotiated Rulemaking Act, 5 U.S.C. §§561–570.

tions for reconsideration, and notices of appeal from knowledgeable interest groups over the life cycle of a rulemaking can have a "machine-gun" effect on overstretched agency staff.[2] The law does not permit the agency to shield itself from this flood of information and focus on developing its own expert conception of the project. Instead, the agency is required by law to "consider" all of the input received.

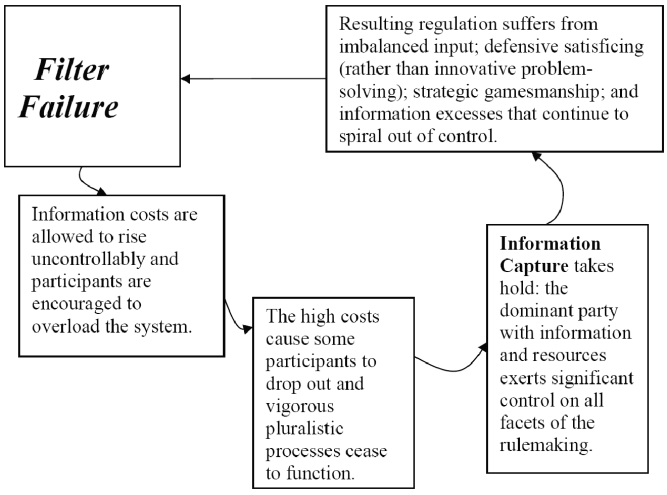
The root cause of information capture is not administrative law's commitment to open government and transparency, but rather its failure to require participants to self-process the information they load into the system, termed "filter failure" here.[3] In most social and legal settings, participants have meaningful incentives to process and hone the information they communicate. Most notably, they want to be sure that the desired message is communicated in an efficient and effective way. Many areas of law are also sensitive to the problem of information excess and even consciously require actors to filter information before the legal system will recognize it. Most court battles, at least at the appellate level, involve explicit limits on the pages, margins, and even font size of briefs; the time allocated for oral argument; and the number of pages of attachments. And trials before juries—however indirectly—require counsel to distill and abbreviate the key message for a group of lay persons with average attention spans and educational levels. Trial courts also impose a number of important filters on evidence to ensure that counsel, rather than the judicial system, bear the cost of processing this information prior to introducing the evidence at trial.[4]

But administrative law is different. A commitment to open government and full participation is understood to preclude limits or filters on information, and the administrative system operates on the working assumption that all information is welcome and will be fairly considered.[5] Indeed, the historic myth of agencies as experts may have locked the courts, Congress, and even the president into a kind of unrealistic expectation with regard to the unlimited capacity of agencies to resolve any question put to them.

Yet without filters, parties have little reason to economize on the information they submit to agencies. Participants are not held to any limits on the information they file, nor must they assume any of the costs the agency incurs in processing their voluminous filings.[6] Indeed, a variety of court rulings actually encourage regulatory participants to err on the side of providing far too much information, rather than too little. But as information costs rise, so do the costs of participation and this can affect the ability of some groups to continue to participate in the process and ultimately may cause thinly financed groups to exit for lack of resources.

In a participatory system already struggling against the odds to generate balanced engagement from a broad range of affected parties, filter failure is likely to be the last straw. Pluralistic processes integral to administrative governance threaten to break down and cease to function when an entire, critical sector of affected interests drops out due to the escalating costs of participation. Instead of presiding over vigorous conflicts between interest groups that draw out the most important issues and test the reliability of key facts, the agency may stand alone, bracing itself against a continuous barrage of information from an unopposed, highly engaged interest group. The agency will do its best to stay abreast of the information, but without pluralistic engagement by the opposition, which helps filter the issues, and without the support of procedural filters that impose some discipline on the filings of dominant participants, the agency may find itself fighting a losing battle. A system that puts the decisionmaker at the mercy of an unlimited flood of information from an unopposed group, which in turn can reinforce its filings by a credible threat of litigation, is captured by information. Figure 1 illustrates the dynamics of filter failure and information capture.

Figure 1: A Flowchart of Filter Failure and Information Capture



2. James M. Landis, Report on Regulatory Agencies to the President-Elect 51 (1960).
3. Clay Shirky coined the term "filter failure" at the September 2008 Web 2.0 Expo New York in his speech, *It's Not Information Overload. It's Filter Failure*, *available at* http://web2expo.blip.tv/file/1277460/.
4. *See, e.g.*, Fed. R. Evid. 403 (permitting exclusion of relevant evidence if its value is substantially outweighed by other dangers).
5. *See, e.g.*, Sheila Jasanoff, *Transparency in Public Science: Purposes, Reasons, Limits*, 69 Law & Contemp. Probs. 21, 21-22 (2006) (discussing the commitment to and gradual expansion of the public's right to access information underlying agency decisions).
6. The Freedom of Information Act is an exception to this general rule; it allows the agency to ask the requester to reimburse it for reasonable expenses incurred in responding to the information request. 5 U.S.C. §552, *available in* ELR Stat. Admin. Proc.

From the standpoint of a resourceful party, the ability to gain control of the rulemaking process through the use of excessive information may even be turned into a strategic advantage. Using technical terms and frames of reference that require a high level of background information and technical expertise, and relying heavily on "particularized knowledge and specialized conventions," these fully engaged stakeholders can deliberately hijack the proceedings. Aggressively gaming the system to raise the costs of participation ever higher will, in many cases, ensure the exclusion of public interest groups that lack the resources to continue to participate in the process. Doing so all but assures that the aggressor will enjoy an unrestricted playing field and the ability to control the public input through all phases of the rulemaking life cycle.

Even when agency staff can withstand the technical minutia coming at them at high speed and under tight time constraints, they face an administrative record that is badly lopsided, and threats of lawsuits against the substance of their regulation that come predominantly from only one sector (industry). This skewed pressure may not cause them to cave in to each and every unopposed comment and technical addendum, but it likely affects at least some of the choices incorporated into the final rule.[7] And when time is short, information capture becomes even more severe. Agency staff, even those who began their careers as true believers in their agency's mission, may find themselves relieved to have regulations written by industry because this ensures a quicker path toward a final, binding rule.[8]

Collective action theory already highlights the grim plight of public interest groups saddled with multiple handicaps in organizing and participating. The resultant underrepresentation of the diffuse public—at least relative to its actual stake in the issue—is a constant worry for political processes. Information capture adds a new worry to the collective action story.

The costs of organizing are no longer the only impediment that public interest representatives need to overcome; instead, inflated information costs, beyond what is justified or necessary, further drive up the cost of participation and simultaneously lower the payoff, at least to public interest groups that will find it increasingly difficult to translate the issues into tangible public benefits. In economic terms, as the costs go up and the payoff goes down, these thinly financed and salience-dependent groups that represent the public will drop out of the process.[9] Indeed, they may even drop out midway through the rulemaking after realizing that they can no longer justify their involvement to donors and other funders.

These rising information costs can take a variety of forms in the regulatory system. Communications bulging with undigested facts are the most common type of information excess and include redundancies and peripheral issues that must be culled out; discussions pitched at too specialized a level or demanding an unreasonable level of background information from the reader; and discussions delving into very intricate details, many of which are of trivial significance. All of these information excesses serve to inflate the participants' costs in processing the information. Secrecy and deception also impose unjustified information costs on other participants if they are not able to access the information cheaply or at all. Even thinly supported litigation threats and marginally meritorious lawsuits can increase information-related costs for recipients (that is, defendants) to unreasonable levels.

The results of this information capture resemble the outcomes expected from more traditional forms of capture, but the mechanisms through which industry capture occurs are actually quite different from and at odds with these early public choice models. Most versions of old-fashioned agency capture depend on wooing malleable agency staff and officials with contributions or promises of future employment.[10] Information capture, by contrast, thrives even in cases in which officials are principally opposed to the skewed outcomes that may result. The end result, however, is the same. In information capture, just as in old-fashioned capture, the stakeholders with relatively greater resources are able to dominate the outcomes and often do so free of oversight by onlookers—not because the deals have been struck through financial inducements, but because they are so technical and complicated that in practice they take place at an altitude that is out of the range of vision of the full set of normally engaged and affected parties.

II. How Administrative Law Enables Information Capture

The Administrative Procedure Act (APA)[11] and related open government statutes create the perfect substrate for the growth and nourishment of information capture. Administrative law instructs interest groups that if they plan to file comments that can be backed by legal challenge, then the comments need to cover the waterfront of their concerns and ideally do so in detail. At the same time, administrative law places no restrictions on the size, number, detail, or technicality of the issues that can be raised—the sky is the limit. As a result, parties can inadvertently or deliberately exert substantial control over the agency's agenda in the number, diversity, detail, and even

7. *See, e.g.*, Wendy E. Wagner et al., Air Toxics in the Boardroom: An Empirical Study of EPA's Hazardous Air Pollutants Rules 19-22 (Nov. 13, 2009) (unpublished manuscript, on file with the *Duke Law Journal*).
8. For examples of these informationally overloaded regulations, see Wendy E. Wagner, *Administrative Law, Filter Failure, and Information Capture*, 59 Duke L.J. 1321, 1347-51, 1378-96 (2010).
9. *See, e.g.*, Neil K. Komesar, Imperfect Alternatives: Choosing Institutions in Law, Economics, and Public Policy 8 (1994).
10. *See, e.g.*, Michael E. Levine & Jennifer L. Forrence, *Regulatory Capture, Public Interest, and the Public Agenda: Toward a Synthesis*, 6 J.L. Econ. & Org. 167, 178 (1990) ("'Capture' is the adoption by the regulator for self-regarding (private) reasons, such as enhancing electoral support or postregulatory compensation, of a policy which would not be ratified by an informed polity free of organization costs.").
11. Administrative Procedure Act, 5 U.S.C. §§551–559.

the framing of the multiple comments they lodge, as well as with the information they share earlier in the process. As long as the court reviews the agency's action based on an unlimited record that commenters have a hand in creating, information becomes almost akin to a choke collar that can be used at the whim of interest groups to control the agency's factual record and even its policymaking agenda.

Even worse, agencies themselves develop coping strategies that can aggravate the information capture problem. If the agency receives reams of unprocessed material from interest groups and is held responsible for synthesizing it, then the agency's own process is likely to mirror these information pathologies, if not exacerbate them. An enormous record of highly technical and somewhat extraneous comments that delve into tedious and often unnecessary detail will tend to be reflected in the agency's own rule in order to avoid accusations of insufficient attention to detail. Such an opaque rule may have the added benefit of being more likely to escape rigorous judicial scrutiny and may even discourage thinly financed parties from taking on the rule as a litigation project. Along these same lines, if the agency must respond to all comments yet cannot change the rule substantially without starting over, then the agency will engage interested parties much earlier in the process of developing the rule, even though this might defeat the idea of ensuring balanced and vigorous participation by a diverse set of interest groups. Even litigation threats at the conclusion of a rule may cause the agency to develop nontransparent coping mechanisms for adjusting rules after the fact, an exercise made easier when the rule generally escapes understanding by most onlookers.

In the abstract, courts would seem ideally suited to provide a reality check on Congress's unrealistic faith in the agency's ability to stay abreast of the avalanche of information that must be processed when developing a rule. But in APA case law, the courts have generally reinforced, and even expanded, the incentives for information excess and filter failure.[12]

The courts' first unhelpful contribution to administrative process is to relegate to obscurity the one provision Congress did make for requiring agencies to filter information. In the APA, the agency is required to provide a "*concise general statement* of their basis and purpose [for the rule]."[13] Despite the intent of the provision, courts hold an agency in violation of the "concise general statement" requirement only when the agency fails to provide enough information, not when it provides too much.[14] From this case law, Prof. Richard Pierce concludes that "[t]he courts have replaced the statutory adjectives, 'concise' and 'general' with the judicial adjectives 'detailed' and 'encyclopedic.'"[15]

The demise of the concise general statement is just the beginning of the trouble, however. Not only do the courts reject the need for filters on the agencies' communications (despite some congressional intent otherwise) but their opinions greatly exacerbate the risk of information excess and inaccessible rulemakings. By far the strongest incentive for agencies to actively load their rule and record with details and defensive statements is the hard look doctrine.[16] Adding to the litigation worries created by hard look review is the occasional demand by courts that the agency develop substantial evidence in support of its protective regulation.[17] The agency's only responsible course of action when faced with these doctrinal demands is to engage in defensive overkill when developing rules.

The incentives for information excess arising from judicial review affect not only the agencies but also the interest groups that participate in the rulemaking process. Case law sends a signal to these parties that is quite similar to that transmitted to the agencies; namely, to include in their comments highly specific, very detailed, extensively documented comments on every conceivable point of contention, and to back up their comments with the threat of litigation. Attorneys working primarily for industry stress that the most important task for their clients is to "build the best record" they can, observing that "[w]ritten comments are the single most effective technique" for doing so: "Make sure that you submit to the Agency *all* relevant information supporting your concerns in the rulemaking. This is the best way to convince the Agency to respond favorably to your concerns."[18] Because there are no limits to the information that agencies are expected to process, there is no need for these commenters to provide succinct statements of their complaints. Instead, they can leave the task of processing the information to the agencies.

Several unrelated doctrines further reinforce the incentives for stakeholders to use information as an offensive weapon in their dealings with agencies. First, the courts generally require that only parties that file comments during the notice-and-comment period can later be involved in litigation against the agency.[19] The courts' demand that parties exhaust their administrative remedies was originally conceived of as a way to save agency resources, both by avoiding "premature interruption" of the rulemaking process and by bringing the courts into the picture only as a last resort. But because the threat of litigation may be

12. *Cf.* Jerry L. Mashaw, Greed, Chaos, and Governance: Using Public Choice to Improve Public Law 126 (1999) ("It seems virtually undeniable that the major procedural developments in American administrative law from the Administrative Procedure Act to the present have been the work largely of the courts or of the chief executive.").
13. 5 U.S.C. §553(c) (emphasis added).
14. *See, e.g.*, Indep. U.S. Tanker Owners Comm. v. Dole, 809 F.2d 847, 854–55 (D.C. Cir. 1987) (holding that the Secretary of Transportation's statement of basis and purpose failed to provide an adequate account of how the rule served the Merchant Marine Act's objectives, and thus vacating the rule).
15. 1 Richard J. Pierce Jr., Administrative Law Treatise §7.4, at 596 (5th ed. 2010).
16. *Id.* at 593.
17. *See, e.g.,* Indus. Union Dep't, AFL-CIO v. Am. Petroleum Inst., 448 U.S. 607, 614, 10 ELR 20489 (1980).
18. Andrea Bear Field & Kathy E.B. Robb, *EPA Rulemakings: Views From Inside and Outside*, 5 Nat. Resources & Env't, Summer 1990, at 5, 9-10 (collecting the most important advice from the top attorneys interviewed for their report).
19. *See generally* McKart v. United States, 395 U.S. 185 (1969) (setting out the reasons for exhausting remedies first within the agency before raising the issue with the court).

the only, or at least the best, way for stakeholders to get the agency's attention during the rulemaking process, they have strong incentives to err on the side of including every plausible argument in their comments in order to lay the groundwork for future legal action. Additionally, and more worrisome from the standpoint of information excess, the courts have held that more general comments from affected parties—even if lodged in writing and on time—are usually not material enough to matter legally. To preserve issues for litigation, affected parties are thus best-advised to provide comments that are specific, detailed, and well-documented.[20] Finally, the courts have signaled that an agency ignores these material comments at its peril, but this creates a situation in which interested parties can overwhelm the rulemaking process when it is in their interest to do so. With no limits on the extent or nature of the information they can file, the temptation to drown the agency in criticisms and accompanying documentation is likely irresistible, at least for some resourceful interested parties. As the D.C. Circuit remarked in a case with a record that spanned more than 10,000 pages:

> [T]he record presented to us on appeal or petition for review is a sump in which the parties have deposited a sundry mass of materials that have neither passed through the filter of rules of evidence nor undergone the refining fire of adversarial presentation . . . The lack of discipline in such a record, coupled with its sheer mass . . . makes the record of information rulemaking a less than fertile ground for judicial review.[21]

A number of adverse consequences flow from this design of administrative process. The most obvious cost is the diminishment of pluralistic oversight of agency actions. Information costs not only increase the costs of participation substantially, particularly for groups that lack inside information, but the resulting clouding of the issues can simultaneously work to reduce the payoff or benefits of participation for these same groups. Second, because of the costs informational avalanches impose on agencies, they might resort to gathering information outside the established notice-and-comment process, thereby limiting transparency and reducing accountability in order to avoid the burdens of official responses to comments made through the more formal avenues. Third, because of the APA's structure and courts' interpretation of it, agencies engage in defensive rulemaking, which inhibits creativity and encourages satisficing. The final consequence is the difficulty of reversing informational failure once it occurs.

III. Reform

The problem of information capture runs deep in administrative law, and redressing it may involve a long process of experimentation. The reform proposals offered here approach the information capture from a range of vantage points in the hope of finding at least one entry point for sparking further discussion.

A. Reforms to Reinvigorate Pluralistic Engagement

1. Recalibrating Judicial Review

Given that the courts inadvertently create many of the incentives for regulatory participants to engage in information capture, correcting the standards for judicial review should be a top priority. The courts' current approach to judicial review, as discussed above, is to evaluate the agency's rule based on the information filed by interest groups in protest to the rule and to determine, as a substantive matter, whether the agency's response was arbitrary. Agencies risk being reversed if their final rule is considered inadequate in light of a significant comment raised on the proposal.

The proposal here shifts the courts' focus from substance to process and re-calibrates the courts' review—ranging from hard look to considerable deference—to the robustness of the pluralistic process.[22] Under this reform proposal, if a diverse and balanced group of affected parties is involved throughout the rulemaking, then the agency's rule would be afforded considerable deference from the court—a "[s]oft [g]lance" or something similar.[23] On the other hand, if one party dominates all phases of the rulemaking and then sues the agency for failing to make certain accommodations based on its comments, the court would have a strong presumption against the challenger. In this case, the court would afford the agency still more deference, along the lines of the clear error standard used in the appeal of fact from jury trials. By contrast, if a challenger was unable to engage in the rulemaking process because it lacked sufficient resources or specialized knowledge, but its members took a great interest in the consequences of the rule, then the court (almost like it treats parties proceeding pro se) would adopt a presumption in favor of the challenger's petition and afford the rule a hard look.

This participation-based standard for judicial review thus uses the courts to help level inherent participatory imbalances, rather than allowing the courts to aggravate these imbalances, however unwittingly. If the agency is not attentive to vigorous engagement by the full range

20. *See, e.g.*, Portland Cement Ass'n v. Ruckelshaus, 486 F.2d 375, 394, 3 ELR 20642 (D.C. Cir. 1973) (holding that a commenter cannot merely assert that a general mistake was made, but must provide specific evidence and argumentation as to the nature of that mistake and its implications).

21. Natural Res. Def. Council, Inc. v. SEC, 606 F.2d 1031, 1052, 9 ELR 20367 (D.C. Cir. 1979).

22. Professor Rubin's idea of breaking the ties between rulemaking and stakeholder comments helped generate some of this Article's recommendations. *See* Edward Rubin, *It's Time to Make the Administrative Procedure Act Administrative*, 89 Cornell L. Rev. 95, 157 (2003) (arguing that rulemaking should be dictated by "instrumental rationality, rather than ... public participation").

23. Thomas O. McGarity, *Professor Sunstein's Funny Math*, 90 Geo. L.J. 2341, 2371 (2002).

of affected parties, for example, it would risk a hard look review of its rule if one of the underrepresented groups decides to file a challenge. Even more importantly, the agencies would have incentives to reach out and engage groups that are likely to be underrepresented in the rulemaking process. Calibrating the judicial review standard to the level of pluralistic participation in the rulemaking process may even provide dominant stakeholders with some incentives to engage their adversaries in the substance of a rulemaking: If dominant stakeholders wish to threaten the agency with a credible risk of reversal by the courts (that is, a soft glance review standard rather than clear error), they would need their adversaries to be present at least during the notice-and-comment period.

This calibrated approach to judicial review is not a panacea. The courts will need a way to determine, with some consistency, when imbalance has occurred. The test also requires determining when the ratio between a dominant group and other affected parties is unacceptable. Even with relatively clear rules for determining imbalance and the corresponding standard for review, there will be inevitable variations in how courts employ the applicable soft glance or hard look tests, although these variations are likely to be more modest than the current, roulette-like variations in the courts' opinions. There are other possible problems with practical implementation of this proposal, such as strategic abuses, that will need to be anticipated and addressed.[24] One partial solution to stave off abuses may be to add a more rigorously enforced good faith requirement to the petition process.

Ultimately, if this revised approach to judicial review still seems sensible once the kinks are worked out, it could be implemented interstitially by the courts or, ideally, passed into law as an amendment to the APA. A congressional amendment would provide the clearest and most democratic way to usher in the new approach to judicial review, but this may be politically unrealistic. Incremental experimentation by the courts may ultimately be both more realistic and desirable since it gives the approach a test run before it becomes codified as law.

2. Government Ombudsmen

A more comprehensive, but also more costly, method to redress pluralistic imbalance would deploy government intermediaries—agency-selected ombudsmen, advocates, advisory groups or even administrative law judges (ALJs)—to stand in for significantly affected interests that might otherwise be underrepresented in rulemakings. Agency ombudsmen or advocates could scrutinize all rulemakings to ensure, for example, that the agency is considering not just the economic costs of standards but also the public health benefits, particularly with regard to vulnerable populations. If the interests of unrepresented groups (e.g., the diffuse public) are not adequately considered in the proposed rule stage, the advocate would be required to file comments and build a record for review that could be used by other regulatory participants in the course of judicial review. The concept of formal, government-provided advocates in these types of settings is not new. In fact, the proposal has some of the flavor of the Small Business Reform Act, which institutes a rather elaborate network to ensure that the interests of small businesses are adequately considered.[25]

Alternatively, rulemakings that are highly technical and suffer from imbalanced engagement during notice-and-comment could trigger an advisory review process in which an expert committee is assembled to review the rule to ensure that issues relevant to missing affected interests (for example, diffuse public benefits such as health protection) have been adequately considered in developing the rule.[26] As in current law, the agency would not be required to adopt the suggestions of advisory groups, but a record would be created that could be used as the basis for judicial review. The agency may even be required to respond to critical advisory group opinions or risk the chance of increased judicial scrutiny. The resulting record thus would not only provide an added hook for judicial review challenges brought by an underrepresented group but also should make the underlying issues more accessible to the broader political process.

3. Subsidizing Thinly Financed Groups

A less radical approach to increasing balanced engagement in at-risk rulemakings is to subsidize participation on specific rulemakings in which certain sets of interests, such as those representing the diffuse public, will be otherwise underrepresented. Alternatively, rewards could be offered to indirectly increase incentives for this same type of public-benefitting representation. For example, a monetary prize and positive publicity could be awarded to the author of the most meaningful public-benefitting set of comments on a complex rule, particularly if the party approaches the issues from the perspective of improving public health or environmental protection. There could even be law school or graduate student competitions not only for commenting on a rule but also for proposing compelling policy innovations. An interest group would then be permitted to challenge the rulemaking on behalf of the winning submitter if the agency ignores those comments, and would be entitled to reasonable attorney fees if the group substantially prevailed in the litigation. Through these mechanisms, interest groups and like-minded experts might find that the prospect of remuneration provides an incen-

24. These are outlined in the full article, Wagner, *supra* note 8, at 1411-13.

25. The Small Business Regulatory Enforcement Fairness Act of 1996, Pub. L. No. 104-121, 110 Stat. 857, was based in part on a concern that information excesses precluded smaller businesses from keeping up with bigger competitors in the provision of regulation. *See* §§202-203, 110 Stat. at 857-58. The Act, among other things, provides small businesses with an agency ombudsman and related advocates to help protect their interests.

26. *Cf.* 42 U.S.C. §7409(d)(2)(B)-(C), ELR Stat. CAA §109(d)(d)(B)-(C) (establishing that the Clean Air Scientific Advisory Committee (CASAC) should review the U.S. Environmental Protection Agency's (EPA's) ambient air quality standards at five-year intervals).

tive to engage in complex rulemakings that overcomes the disincentives of participation created by the information capture phenomenon.

4. Adding Information Filters

A final reform to reinvigorate more balanced engagement by all affected interests would encourage or even mandate flat restrictions on the information that participants can load into the rulemaking process. These restrictions could be quite simple—for example, imposing page and volume limits on the filings, much like the limits placed by appellate courts on appellants. Courts could play a supporting role by scrutinizing comments to ensure that the issues raised to the agency were clear and accessible and not obscured by dozens of detailed sub-issues. Participants might also be required to verify the reliability of the data presented and provide supporting analysis for critical assertions of fact. Establishing simple filters on the amount and type of these communications will not solve all problems—there will still be a temptation to fill comments with highly specialized and undigested information. Nonetheless, establishing these filters would be a good start. At the very least, the filters would force all participants to begin to control information excess at the margin.

B Bypassing the Pluralistic Model

Even if the previously recommended reforms are implemented, agencies are still likely to focus most of their attention on comments that present a credible risk of judicial review and, as a result, may have less time to develop creative and more comprehensive solutions to regulation. Rather than focusing its energies on developing public-oriented regulatory policy, the agency finds instead that it must devote most of its analysis to preparing rules that can withstand fierce attack from an aggressive group of affected interests and respond to the flood of information loaded into the system by these same groups.

Unlike the reforms presented in the previous Section, the proposal presented in this Section attempts to address the problems created by information capture not by reinforcing adversarial processes, but by circumventing them, at least at an early stage of policy development. Specifically, this policy-in-the-raw reform requires the agency to be largely, if not completely, insulated from stakeholders and political input during the embryonic stage of the development of its regulatory proposal. Although affected parties would become important later in refining and even rejecting the proposals developed during this period, they would become involved only after the agency has had the opportunity to frame and consider regulatory solutions free from their input and pressure.

Although the details are best left for a later discussion, the policy-in-the-raw proposal in broad strokes involves a two-step rule-development process. At the raw stage, a small team of highly regarded policy wonks from inside the agency would develop a pre-proposal. This team would start with the statutory mandate and sketch out a goal statement based on that text alone. It would then work—essentially in complete isolation—to develop a pre-proposal that best accomplishes that goal. Unlike the current approach to rulemaking, this policy-in-the-raw stage would be led by an agency team that is completely unconnected with and ideally not even aware of stakeholder pressures, litigation concerns, or other legal risks associated with the rulemaking. Its deliberations would be shielded from all stakeholder input, including friendly guidance from staff in the general counsel's office or from politically appointed officials. The team would also be free to approach the proposal in whatever way it sees fit. There would be no requirement that it use analytical tools like cost-benefit analysis, formal alternatives analyses, or other forms of impact assessment, although the team would be free to develop or use these analytic tools if it felt that doing so would be helpful and consistent with the statute's goal.

The pre-proposal developed by this team would be subject to peer review or, as appropriate, input from a Federal Advisory Committee Act (FACA) advisory group comprised of a mix of policy analysts and other specialists (but not stakeholders). The team would have the option of using the comments, suggestions, and questions raised during this review process to modify the pre-proposal, but it would be under no obligation to do so. Any modifications would be wholly at the agency team's discretion, and there would be no risk of judicial reprimand if the team chose to disregard suggestions made during this review.

The final pre-proposal, along with the comments of peer reviewers or the FACA committee, would be published on the Internet and available in hard copy. The preliminary proposal would be expected to be detailed and comprehensive, yet also accessible to regulatory experts who lack specialized knowledge about the issues addressed by the rule. The agency team members responsible for preparing the pre-proposal would operate much like academics—producing innovative yet effective proposals and enjoying reputational rewards based on the quality of their work.

Establishing an initial raw stage for regulatory policy development would counteract information capture in a number of subtle but important ways. First, the proposals developed as part of this process would likely be much more accessible to a wide group of affected parties than existing proposals. Second, policy-in-the-raw allows an agency team to innovate in ways that are decoupled from the participatory and litigation processes. This creates the opportunity for more candid and creative analysis. Finally, the raw period of policy development provides the agency with a litigation-free zone for conducting meaningful alternatives assessments on competing proposals.

C. Scrambling the Incentives of Regulated Parties Through Competition-Based Regulation

Rather than engage the missing interests more adversarially or impose filters on participants' regulatory communications, a final reform attempts to scramble the incentives of the most engaged and powerful interest groups and pit these otherwise like-minded interests against one another. Specifically, this proposal focuses on dividing and conquering those parties that have successfully used information capture in the past by creating competition among them.

Competition-based regulation is easiest to understand in the context of product licensing. In current product licensing, the U.S. Environmental Protection Agency (EPA) determines which products are not "unreasonably unsafe" (or the equivalent) through complex and generally unopposed processes that often involve only the manufacturers of the product at issue. Because these manufacturers may dominate the procedures, EPA's deliberations may not benefit from pluralistic oversight. As a result, there is a risk that the agency's decisions will diverge from both statutory goals and what rigorous factfinding might otherwise reveal due to information capture. The alternative here attempts to devise ways to encourage the regulated parties themselves to challenge licensing decisions that are too lenient. Specifically, the manufacturer of a green product could file a petition alleging that a competitor's product, which occupies the same market niche, is much more hazardous in a variety of ways and therefore should be regulated more stringently. The process would be initiated by a petition filed by the green company and would involve an adjudicatory hearing in which the manufacturers would battle each other on the facts. EPA would make a final decision on the merits and issue regulations accordingly.

One of this approach's key attributes is that it provides incentives for adversaries to dredge up useful information regarding optimal environmental solutions that might otherwise be lost in the mounds of undigested regulatory filings. By relying on manufacturers to root out information on inferior competitors, and providing a forum for establishing more stringent regulation of those competitors, the proposal unleashes energy that those outside the competitive process, including regulators, will have difficulty duplicating. An added benefit of this approach is that market forces will help triage the regulatory process. Competitive energy will focus on the worst products and processes (for example, those for which green alternatives have the greatest competitive edge). The striking similarity of this proposal with recent proposals for competition-based reform of the patent system—in which non-patent holders could file petitions to cancel a patent as invalid—attests to policymakers' increasing recognition of the valuable role market forces can serve in supporting regulatory decisions and processes.[27]

IV. Conclusion

Existing administrative processes suffer from too much rather than too little information. Other areas of law have developed rules that explicitly discourage parties from playing strategic games with information and encourage communications between participants to be productive and efficient. It is past time for the administrative system to take note and change its ways.

27. *See, e.g.*, Patent Reform Act of 2007, H.R. 1908, 110th Cong. §321 (2007) (providing that anyone "who is not the patent owner may file with the Office a petition for cancellation seeking to institute a post-grant review proceeding to cancel as unpatentable any claim of a patent").

RESPONSE

Comments on *Administrative Law, Filter Failure, and Information Capture*

by Howard A. Learner

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Professor Wagner presents a strong and provocative set of arguments on how information overload is creating barriers to public participation, obfuscating the most important information for decisionmaking, and capturing and clogging the administrative rulemaking process. The forest can, indeed, become obscured by the trees when it comes to effective, efficient, and fair administrative agency decisionmaking.

First, I generally agree with Professor Wagner's overall assessment of the information overload, filtering, and capture problems, although some tweaks should be considered. Second, I depart from some specific aspects of her framing of an administrative agency's responsibilities: the public agency's role is to affirmatively protect and advance the public's interest, not just be an umpire calling balls and strikes. Third, while some of her proposed reforms are promising for fuller exploration, some of the suggested cures might be as harmful as the diseases.

I. The "Desperately Seeking Data" Challenge: Information Overload That Deters Public Participation and Clogs and Distorts Administrative Decisionmaking

Professor Wagner hits the nail on the head: information overload and the too-often absence of filtering and separating the informational wheat from the chaff can capture and clog the process, unduly raise the price and deter public participation by less well-financed parties, and, ultimately, distort the administrative decisionmaking process. The most important, relevant and persuasive information should be highlighted and not get lost in the morass. As Professor Wagner explains:

> A number of important social policies may be adversely affected by administrative law's naïve presupposition that more information is better. Although this affinity for unbounded information may have originated in the middle of the last century when information was more scarce, in the electronic age, this undiscriminating approach to information is clearly outdated. Indeed, other institutions recognize that effective processing of information is a prerequisite to effective decisionmaking.[1]

That's right on target. The administrative law operating paradigm should shift from "more information is good" to "good information that is more persuasive." The weight of the evidence should not be principally measured by page and word count.

There's an analogy here to one of the Chicago's Neo-Futurist Theater Company's recurring productions: "Too Much Light Makes the Baby Go Blind."[2] We do need better illumination of key facts and salient issues for decisionmaking. However, that requires using better spotlights, rather than floodlights, to address what Professor Wagner identifies as "Filter Failure." Sunlight may be a powerful disinfectant, but staring into the sun for too long is not helpful.

The excessive doctrinal gobbledygook and alphabet-soup technical lingo in administrative agency proceedings likewise deters and impairs meaningful public participation. Rulemakings with tech-speak mumbo-jumbo are as inviting to public participation and engagement as are law review articles with 400 footnotes. In short, they become impenetrable mysticism except to an insiders' cabal.[3] The public entry costs for engagement are too high. As Professor Wagner explains: "Using technical terms and frames of reference that require a high level of background infor-

1. Wendy E. Wagner, *Administrative Law, Filter Failure, and Information Capture*, 59 Duke L.J. 1321, 1326-27 (2010).
2. *See* http://www.neofuturists.org/index.php?option=com_content&task=view&id=20&Itemid=45 (last visited July 7, 2011).
3. "Cabal"—a secret society—is often viewed as derived from Kabbalah, which are mystical interpretations of Jewish scriptures. http://en.wiktionary.org/wiki/cabal (last visited July 7, 2011).

mation and technical expertise, and relying heavily on 'particularized knowledge and specialized conventions,' these fully engaged stakeholders can deliberately hijack the proceedings."[4]

Inaccessible technical language becomes obfuscating or, at best, confusing. "Spontaneous combustion" at a nuclear plant should instead be plainly called a "fire." "Nuclear power units" become agency nomenclature for "nuclear power plants." Coal plant "emissions" are the regulatory term-of-art for what most people commonly call "pollution." The administrative agency, of course, cannot precisely specify what intervening parties and their attorneys write in their documents, but the administrative agencies can: first, speak for themselves in plainer language; and, second, provide guidance that encourages the parties to do so as well.

Professor Wagner points out: "To be a serious player in this game, a participant must enjoy convenient access to relevant information, a significant reserve of resources (mostly technical and legal), and high stakes and motivation. To win, a player need not convince his opponents of the merits of his case; he need only wear them down enough to cause them to throw in their towels and give in."[5]

That, of course, is just as true in courtroom litigation as in administrative proceedings. The entry costs are too high for most of the public's robust participation.

One countervailing force is that access to information is now much more readily accessible, cheaper and easier to obtain on the internet. For example, in many utility rate case proceedings in the 1980s and 1990s, consumer and environmental groups and governmental agency intervenors would typically file detailed discovery requests for Securities and Exchange Commission (SEC) filings by the utilities as well as other financial reports and analyst reports. Document production would often be slow and delayed, and utilities could drain intervenors' more limited resources with various objections and discovery battles. Today, much of that information is readily available on the internet, and a company's SEC 10-Q filings can be quickly obtained with a few keystrokes at the SEC's "Edgar" website.[6] This has a leveling impact on the respective abilities of parties with disparate resources to participate in administrative proceedings.

That offset having been recognized, Professor Wagner correctly identifies the problems and the corrosive and distorting impacts on fair administrative decisionmaking processes. Her point about courts' increasingly heavy applications of waiver, exhaustion of administrative remedies and other such access limiting doctrines rings very true: these approaches incentivize parties to paper the record and exacerbate information overload in the administrative process. Experienced litigators know that it's best to protect their clients' interests by "includ[ing] in their comments highly specific, very detailed, extensively documented comments on every conceivable point of contention, and to back up their comments with the threat of litigation."[7] Woe to the intervenor party—industry or public interest—that omits a plausible legal argument in its comments before an agency, but then seeks to raise that legal issue on appeal after it has reviewed the final agency order.

II. The Administrative Agency's Responsibility to Assert and Protect the Public Interest Is Even More Fundamental When the Process Is Distorted by "Filter Failure and Information Capture"

Professor Wagner's layered views of administrative agencies' public responsibilities are partly skewed. In part, Professor Wagner argues that the agency is deterred from reaching a fair and balanced decision when the pluralism of the participating groups is undermined by barrages of information and data submittals by well-financed business interests that impose undue information cost and time burdens "caus[ing] thinly financed groups to exit for lack of resources."[8] The public's interests suffer accordingly. That's correct.

In part, however, Professor Wagner also seems to view the administrative agency as an overwhelmed *arbiter* that should be seeking to reach a result that balances among the competing parties—although made more difficult by informational overload that deters public representation. The principal role of many regulatory agencies, such as the Federal Communications Commission, Federal Energy Regulatory Commission, and Consumer Products Safety Commission, is different: protecting and advancing the public's interests, not just be an umpire calling balls and strikes. A fair and balanced approach is vital. Recognize, though, that the regulated businesses have strong economic incentives to vigorously and effectively advocate their interests. The role of the public regulatory agency is instead to protect the public's interests, especially where monopoly or oligopoly businesses are involved and the public's opportunities to vote with their wallets in more competitive markets are limited.

In addition, the agencies need not necessarily be lambs without defenses against voracious wolves with sharp "information capture" teeth. Trial courts manage litigation with pre-trial orders focusing and limiting discovery

4. Wagner, *Administrative Law*, *supra* note 1, at 1333.
5. *Id.* at 1329.
6. *See* U.S. SEC, Filings & Forms, *at* http://www.sec.gov/edgar.shtml (last visited July 8, 2011).
7. Wagner, *Administrative Law*, *supra* note 1, at 1362.
8. *Id.* at 1332.

and various case management orders and rulings designed to focus information-gathering and decisionmaking on the most relevant issues. Administrative agencies can move further in adopting best practices for managing their rulemaking proceedings. There should be more training of key agency officials on what the agency's role is and how to fairly, efficiently and effectively manage rulemaking proceedings. Different agencies have different types of expertise, experiences and capabilities. Improved case management and training can help to mitigate some of the troublesome, real-world impacts that Professor Wagner correctly points out.

III. Some Observations on Professor Wagner's Specific Reform Proposals

Professor Wagner laudably proposes a buffet of proposed reforms—some of which she actively advocates (e.g., "recalibrating judicial review"[9]) and others that she characterizes as "policy-in-the-raw" ("bypassing the pluralistic model"[10]). Some gain more traction than others. Some can be torqued to greater benefit. Some are much less persuasive.

1. Better Case Management and Training Are the Predicate Reforms: First of all, better case management practices by administrative agencies and good training for key rulemaking personnel are very important initial improvements. Experienced litigation and regulatory attorneys can identify those court cases and administrative proceedings that were run effectively by judges and agency personnel who deployed effective case management tools, and they can also moan about the opposite.

Managing rulemaking proceedings effectively *is* a skill. The "science" of case management and training programs is becoming more robust. Better implementation across the wide range of federal and state administrative agencies conducting rulemaking processes is a key starting point. These reforms warrant more emphasis than Professor Wagner's paper provides.

2. Effective Advocates Find Ways to Mitigate Filter Failure and Information Capture by Focusing on the Most Important Issues and Building Coalitions to "Scramble the Incentives" and Realign the Players: Smart capable attorneys find ways to advocate effectively even on an unevenly-resourced playing field. One counterstrategy to information flooding by a well-financed party is for advocates to focus their own and the agency decisionmakers' attention on the most important, determinative points. Don't get lost in the haze and maze; get focused. Experienced appellate advocates almost never attempt to make more than three points at oral argument. Trial attorneys focus religiously on the storyline and evidence leading up to their closing argument. While a multifaceted and more open-ended rulemaking proceeding may have more moving parts—and concerns about building a strong record for appeal as well as waiver problems—that does not excuse failures to focus the most attention on the most important issues, information and structures. In short, what are the advocate's best, most persuasive arguments? Don't get sucked into responding to each and every point made by an opponent; don't follow every distracting tangent.

Public interest attorneys, who typically face more financial constraints, are often forced to "go for the jugular" and focus their participation out of necessity more so than bill-by-the-hour private attorneys with deeper-pocketed business clients. For certain businesses, the legal costs may be quite cheap compared to the regulatory compliance costs, and for their attorneys, the financial rewards often come with more hours and higher billings. (In some cases, today's more constrained legal market is modifying billing practices.)

Professor Wagner's final reform suggestion—"Scrambling the Incentives of Regulated Parties through Competition-Based Regulation"—plays out differently and more optimistically as effective advocates on various sides maneuver for success.[11] The rulemaking process is often more robust and pluralistic with shifting alliances and less traditional coalitions than Professor Wagner suggests. For example, effective public interest environmental and public health advocates have forged alliances with pollution control equipment manufacturers to advocate stronger mercury pollution reduction standards for coal plants. Nuclear plant owners and the natural gas industry, which economically compete with the coal industry, are now aligning with environmental and public health organizations to advocate for the U.S. Environmental Protection Agency to issues strong greenhouse gas and other pollution reduction standards for coal plants. When it comes to natural gas "fracking" regulations, by contrast, the shoe may be on the other foot.

The railroad industry may align with environmental groups on regulations involving cleaner engines and better pollution control equipment for trucks, and, conversely, the trucking industry may see public health groups as logical allies for regulations to reduce pollution from locomotives. The Clean Air Act's technology-forcing standards ("best available control technology" and "maximum available control technology") provide incentives for businesses with the next level of sophisticated pollution control equipment to devote considerable economic resources to litigate and advocate for stronger pollution control standards that expand their product markets and profit opportunities.

The point is that effective litigators and other policy advocates must be and are skilled at building coalitions that realign and scramble the forces before administrative agencies engaging in rulemaking processes. This repositioning can foster more of the participatory system, through which Professor Wagner seeks to "generate balanced engagement from a broad range of affected parties" sharing cost burdens and countering some of the very real

9. *Id.* at 1327.
10. *Id.* at 1422-23.
11. *Id.* at 1427.

information distortions and capture that she correctly identifies, recognizes and seeks to overcome.[12] Public interest attorneys, in particular, having limited resources, must be creative in designing strategies and building coalitions to make the regulatory proceedings more multilateral than resource-imbalanced bilateral in order to overcome information capture and succeed in advancing their interests. This is a variant of the "competition-based regulation" that Professor Wagner suggests.[13]

3. "Recalibrating Judicial Review" Is a Very Long-Term Strategy: Professor Wagner states that "correcting the standards for judicial review should be a top priority."[14] She contends that courts should give more deference to an agency's decision if there was a robust, pluralistic set of participants in the rulemaking development process. "On the other hand, if one party dominates all phases of the rulemaking and then sues the agency . . . the court would have a strong presumption against the challenger."[15]

While this proposal is intriguing, its implementation is very challenging as Professor Wagner acknowledges. First, how will the courts determine whether there was a participatory imbalance before the agency and what standard should be applied? Second, as Professor Wagner recognizes, the best way to accomplish this revamping of judicial review would be for Congress to enact an amendment to the Administrative Procedure Act, "but this may be politically unrealistic."[16] Third, it's likely to take many years for this judicial review approach to be "implemented interstitially by the courts or, ideally" enacted by Congress.[17] In the meantime, other steps can and should be taken.

4. Creating Government Ombudsmen and Subsidizing Thinly Financed Groups With Intervention Funding Can Build on States' Experiences: Professor Wagner proposes reforms to "redress pluralistic imbalance [by] deploy[ing] government . . . ombudsmen, advocates . . . to stand in for significantly affected interests that might otherwise be underrepresented in rulemakings"[18] and "subsidize participation on specific rulemakings in which certain sets of interests, such as those representing the diffuse public, will otherwise be underrepresented."[19] In fact, examples of these approaches have been in operation for many years.

The Public Utility Regulatory Policies Act of 1978[20] requires states to either provide for consumer intervention funding support[21] or an "alternative means" of representation for consumer interests[22] in utility rate cases and other state regulatory proceedings. State public utilities regulatory commissions in Michigan and Wisconsin, for example, have long-established intervention funding programs for consumer, environmental and other civic organizations to support attorney and expert witness expenses. Some states also have statutory provisions for attorneys' fee awards for court appeals in which administrative agencies' regulations are overturned. The Illinois Citizens Utility Board and Consumers' Counsel ombudsmen in Indiana, Iowa, Ohio and Pennsylvania provide an alternative approach. The State Attorneys General also often perform consumer representation roles before state public utilities regulatory commissions.

At the federal level, the new Consumer Financial Protection Agency/Bureau created by Congress in the 2010 Dodd-Frank financial reform law will potentially perform an analogous government ombudsmen role. Likewise, as Professor Wagner recognizes, the Small Business Regulatory Enforcement Fairness Act of 1996 provides small businesses with an agency ombudsman and related advocates to help protect their interests. There are Congressional proposals to establish an Office of Consumer Advocacy to represent consumers on rate and service issues involving electric and natural gas companies before the Federal Energy Regulatory Commission, as well as various ombudsmen in other areas. On the intervention fund side, the federal Equal Access to Justice Act provides fees to parties that prevail on appeals overturning agency actions in certain circumstances.

In short, there is considerable experience at the state level to build upon in further exploring Professor Wagner's government ombudsmen and intervention funding reforms to spur more public participation. There are also federal precedents from which lessons can be learned. Professor Wagner is on the right track here with a reform that advances a more robust and balanced participatory rulemaking process.

5. Attempting to Head Off Information Capture by Providing for Early Secretive Engagement of Agency Policy Wonks Is Unwise and Impractical: Professor Wagner proposes a "policy-in-the-raw" by which an agency would somehow start with "a small team of highly regarded policy wonks from inside the agency [to] develop a preproposal . . . . in complete isolation . . . completely unconnected with and ideally not even aware of stakeholder pressures, litigation concerns, or other legal risks associated with the rulemaking. Its deliberations would be shielded from all stakeholder input."[23] The only check on these mythical neutral, expert policy wonk Mandarins would be neutral peer reviewers or, "as appropriate, input from a Federal Advisory Committee (FACA) advisory group comprised of a mix of policy analysts and other specialists (but not stakeholders)."[24] The agency's policy wonk team would have complete discretion and be largely unaccountable.

12. *Id.* at 1332.
13. *Id.* at 1427.
14. *Id.* at 1406.
15. *Id.* at 1408.
16. *Id.* at 1413.
17. *Id.*
18. *Id.* at 1414.
19. *Id.* at 1416.
20. 46 U.S.C. §2601.
21. *Id.* §2632(a).
22. *Id.* §2632(b).
23. Wagner, *Administrative Law*, *supra* note 1, at 1423.
24. *Id.* at 1423-24.

Oh, come on. As "they say in Harlan County, there are no neutrals there."[25] This notion of an unaccountable, secretive, non-transparent group of supposedly neutral agency bureaucrats, advised only by some supposedly neutral "mix of [outside] policy analysts" making the key initial regulatory decisions would likely violate the Administrative Procedure Act, FACA, open government principles and common sense. For the outside policy analysts, please check who is paying their salaries, their consulting contracts and other relationships. Here, the proposed cure may well be worse than the disease. Professor Wagner's other proposed reforms have some challenges, but much more promise.

IV. Conclusion

Professor Wagner clearly identifies the severe, practical, modern-day challenges to fair and balanced administrative agency rulemaking processes that can be strategically manipulated, overwhelmed and captured by a deluge of information and filings by well-financed interests for whom the costs of extensive regulatory intervention is a mere fraction of the potential ultimate regulatory compliance costs. Moreover, this distorted process can squeeze out underfinanced public interest organizations, governmental parties and private businesses from fully participating in the proceedings. The problems are real and serious.

Agencies can deploy improved case management tools to help mitigate the problems, filter the information flow and advance better and more inclusive processes. Effective advocacy, including building coalitions that, in Professor Wagner's words, "scramble the incentives" can counter presumed dominating private interests. Some of Professor Wagner's other proposed reforms warrant further hard-nosed exploration, especially those that build on existing mechanisms. Professor Wagner is focusing attention on serious challenges to the integrity of administrative agencies' rulemaking processes, and her calls for positive solutions are well grounded.

25. *Which Side Are You On, adapted from the original* lyrics by Florence Reese, written in 1931 during a strike by the United Mine Workers of America in which her husband, Sam Reece, was an organizer in Harlan County, Kentucky.

ARTICLE

Enabling Investment in Environmental Sustainability

by Heather Hughes

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This Article proposes an "environmental practices money security interest" (EPMSI) that lawmakers could add to Uniform Commercial Code (UCC) Article 9.[1] The EPMSI would grant priority over earlier investors to financers whose extensions of credit enable debtors to invest in improving environmental impact.

An extensive conversation about creating incentives for commercial actors to take more responsibility for environmental harm is underway. Very few participants, however, identify commercial finance law as a potential site for developing these types of incentives.

Imagine a company that wants to renovate its manufacturing processes to reduce waste and utilize alternative fuels. Such renovation could require contracting with various experts, service providers, and engineers, as well as acquiring both tangible and intangible property. A company may want to undertake this type of improvement but be unable to do so because it lacks either internal funds or the capacity to issue low-risk debt to pay for the process. The company may lack the capacity to issue low-risk debt because an existing secured creditor has a floating lien on the company's assets and this creditor is unable or unwilling to fund the renovation process. The proposed EPMSI rules would create a collateral-security device that private parties could elect to use in this type of situation.

The EPMSI concept invokes difficult questions. Why rely exclusively on government subsidies such as tax credits and subsidized loans to induce investments in improved environmental impact when we could also enact commercial law devices that do so? At the same time, why disrupt secured creditors' priorities and risk a negative response in the credit market to address environmental concerns that should be left to regulation? The complete version of this Article delves more directly into these difficult tensions.[2] This version presents the EPMSI as concisely as possible.

The proposed EPMSI would put secured lenders in the position of either funding costs of improvements in environmental impact, or risking subordination to a financer who will. In some instances, engaging in environmental practices may yield very tangible returns for debtors; in others, the value of services may be harder to calculate or may be externalized. The EPMSI rules could allocate to secured parties the costs of creating environmental benefits that could accrue to society at large. An exception to first-in-time priority for EPMSI creditors would require a legislative determination that, when companies seek financing for environmental practices, they should have the capacity to issue high-priority debt.

The issue of creating costs that yield externalized benefits pervades thinking about responsibility for the environment. If costs are always imposed on the public because the public benefits, then private actors have no incentive to reduce the harm they inflict—short of civil or criminal liability. At the same time, if certain private actors bear costs the benefits of which are externalized, and they cannot do so and stay profitable, then this creates other costs to the public that we must consider.

Government subsidies for "green" investment allocate the costs of inducing such investment to the public. One could argue that a device like the EPMSI that allocates costs to private parties is not as desirable as public subsidies because secured lenders, if an EPMSI were enacted, would charge more for credit and lend less, passing costs on to companies in ways that hinder growth.

But even if we assume that creditors, to some extent, would lend less if states enacted EPMSI rules, this alone does not justify rejecting the EPMSI. It just complicates fundamental questions surrounding the EPMSI concept. What is better, maximum access to credit or the capacity to issue high-priority debt to fund improvements in environmental impact? Responding to imminent environmen-

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1. U.C.C. §9 (2005). Unless otherwise indicated, citations herein to the UCC are to the official text and comments of the American Law Institute (ALI) and the National Conference of Commissioners on Uniform State Laws (NCCUSL).

2. *See* Heather Hughes, *Enabling Investment in Environmental Sustainability*, 85 Ind. L.J. 597 (2010).

tal problems will be costly; failing to adequately respond would be much more costly.

Some may consider any proposal that would result in credit constriction to be bad or unjustified unless its benefits were proven to outweigh the costs associated with credit constriction. This type of proof is extremely difficult, if not impossible, to make. Questions about how best to induce desirable modes and levels of investment are precisely what this work hopes to invoke.

UCC Article 9 currently contains rules creating the purchase-money security interest (PMSI) for acquisition of goods, and the production-money security interest (PrMSI) for agricultural finance. The PMSI is included in UCC Article 9 in all states. The current PrMSI rules appear in appendix II to Article 9. Six jurisdictions have enacted these rules.[3] The PMSI and the PrMSI are "super-priority" security interests: so long as PMSI and PrMSI creditors comply with the relevant notice provisions of Article 9, they enjoy priority in advance of earlier secured claims.

States could draw on the PMSI and PrMSI rules to create an EPMSI. Generally speaking, interests that enjoy later-in-time priority present risk of dilution of earlier creditors' claims. Numerous scholars have observed that the tracing and identifiable collateral requirements that limit the scope of PMSIs temper this threat of dilution. In the case of the EPMSI, service providers and providers of assets other than goods may be EPMSI creditors. While environmental practices money collateral may include assets to which earlier creditors are looking for security, notice requirements and limitations on the scope of EPMSI collateral can contain the threat of dilution of earlier creditors' claims.

UCC Article 9 sets forth the order of priority in which various creditors take from an insolvent debtor's assets. Generally, these rules grant priority to secured over unsecured creditors. Secured creditors' priorities rank in the order in which each creditor came along—first in time, first in right.[4] However, some security interests enjoy later-in-time priority. These "super-priority" security interests enjoy an exception to the general rule to enable or facilitate the type of credit they involve. In essence, by permitting certain secured creditors to prevail over earlier secured creditors, the code, as Hideki Kanda and Saul Levmore put it, "compromises between the advantages and the disadvantages of 'new money.'"[5]

As we consider these advantages and disadvantages, two points about UCC Article 9 become important. First, legal scholars overstate the extent to which the purchase-money rules avoid dilution risk by limiting PMSI collateral to new goods. Second, scholars tend to overlook the existence of the production-money interest in agricultural finance in analyses of Article 9 and interests with later-in-time priority.

In a nutshell, conventional wisdom holds that the limitation of interests with later-in-time priority to new assets acquired with new value is key to the coexistence of floating liens and super-priority security interests. But this conventional wisdom about interests with later-in-time priority plays down both: (1) the reality that the purchase-money rules do present risk to earlier creditors, and (2) the existence of the production-money interest in agricultural finance (in which the later-in-time creditor's interest is not limited to new goods and their identifiable proceeds).

Much of the scholarly analysis of PMSI rules seems to assume an idealized form of purchase-money interest, rather than a reality in which purchase-money interests are risk altering. As with any type of credit, a debtor can use PMSI credit to acquire new equipment or inventory that takes the company's business in a new direction that ultimately hurts its creditors.

With respect to the PrMSI, perhaps scholars regard this device as an anomaly limited to agricultural finance. But the current PrMSI, along with its predecessor 9-312(2), disrupts the notion that we can explain the coexistence of first-in-time and later-in-time interests under Article 9 completely in reference to the PMSI's strict, asset-based nature. The existence of the PrMSI complicates the notion that Article 9's approach to priority is a coherent scheme in which interests with later-in-time priority are neatly contained to purchase-money situations in which debtors acquire new goods that are the later creditors' collateral.

My complete article discusses at greater length (i) theoretical understandings of later-in-time priority, the PMSI and PrMSI, (ii) the issue of costs of credit and imposing costs on secured creditors, and (iii) other basic questions that the EPMSI concept raises. These include the effects of negative pledge clauses, the possibility of debtor abuse of the EPMSI, and concerns about proposals to enact rules creating special priority for loans to enable whatever other objectives lawmakers may deem worthy of incentivizing. Again, the purpose here is just to present the EPMSI.

The structure of and policies behind the PMSI offer a framework for thinking about the proposed EPMSI. Similarly, the evolution under Article 9 of production-money interests in farm products provides insight into super-priority security interests that is useful to consider when contemplating an environmental-practices-money interest. The EPMSI concept, in important ways, both draws upon and departs from the models provided by these interests.

A PMSI arises when a secured party's extension of credit enables the debtor to acquire new goods such as inventory or equipment.[6] These rules enable a debtor to have some latitude in seeking new assets and new credit despite the presence of an existing secured creditor with substantial control over the debtor. Also, purchase-money credit can benefit the prior secured creditor because the debtor is get-

3. *See* Me Rev. Stat. Ann. tit. 9, §1324-A (Supp. 2008); Miss. Code Ann. §75-9-324A (2004); N.C. Gen. Stat. §25-9-324.1 (2003); W. Va. Code §46-9-324a (LexisNexis 2007); Wisc. Stat. Ann. §409.3245 (West 2003); Wyo. Stat. Ann. §34.1-9-324A (2009).

4. *See* U.C.C. §9-322 (2005).

5. Hideki Kanda & Saul Levmore, *Explaining Creditor Priorities*, 80 Va. L. Rev. 2103, 2105 (1994).

6. *See* U.C.C. §9-103.

ting assets on better terms than it otherwise could—assets that are not part of the collateral pool to which prior creditors were looking for security.

But debtors can apply PMSI credit in ways that (1) sink a debtor deeper into debt when it cannot pay all of its obligations, or (2) enable the debtor to acquire assets to move in a new direction that hurts the debtor's financial performance. Some scholars point out that because the PMSI creditor comes later in time, it has better, more current information with which to determine whether its loan is too risky. While this observation may be true, it does not change the fact that the PMSI rules present risk to earlier creditors.

On the environmental front, innovative processes and equipment that improve environmental impacts of doing business are proliferating. Many of these innovations are expensive and many are speculative in the sense that they are new and in the sense that it is unclear whether or not companies can internalize the benefits of investment in them. The range of investments that companies are seeking to improve environmental efficiency is broader than investments in new equipment or other goods.

As the PrMSI rules show, the notion that special priority rules should apply in certain contexts to service providers is not new. Currently only six states offer enhanced priority for holders of production-money interests, but before 2001, forty-five states and the District of Columbia enacted an earlier form of the PrMSI in old section 9-312(2).

There are several, major differences between PMSIs and PrMSIs. Some of these differences fuel the lack of consensus over model section 9-324A. In important ways, the proposed EPMSI has more in common with the production-money interest than with the more widely accepted purchase-money interest.

One significant difference is that the PMSI collateral constitutes new goods, while the collateral securing the PrMSI may be the same farm products to which a prior creditor is looking for its security. This can be the case, for example, when the PrMSI creditor provides services, seed, or fertilizer that is promptly used up in crop production. The proposed EPMSI would also differ from the PMSI in that EPMSI creditors may provide services (for example, to make facilities more energy efficient). The environmental-practices-money collateral, then, may include assets to which earlier creditors are looking for security.

Both the PrMSI rules and the proposed EPMSI rules limit the super-priority security interest to the extent of new value that the creditor provides. In the PrMSI context, this new value is supplies or services to yield new farm products. Though the PrMSI is not limited—like the PMSI—to new goods and their identifiable proceeds, there is a relationship between production-money credit provided and the farm products that the debtor then produces.

In the EPMSI context, a creditor that enables environmental practices may not, in many cases, assist the debtor in developing or acquiring discrete, new property. The new value an EPMSI creditor provides may create savings in energy or waste management costs, reduced liabilities under environmental regulations, new intellectual property, or enhanced good will, for example. In some instances the benefits of investment in environmental practices may be externalized entirely. Depending on tolerance for risk of dilution of earlier creditors' claims, EPMSI collateral could be as broad as all the debtor's personal property, or as narrow as, for example, specific intellectual property acquired with environmental practices money credit.

The purpose of presenting draft provisions 9-324B and 9-103B here is to make the EPMSI concept as concrete as possible. Notice and priority provisions could be drafted as follows:

> 9-324B. PRIORITY OF ENVIRONMENTAL PRACTICES MONEY SECURITY INTERESTS.
>
> (a) Except as otherwise provided in subsections (c), (d) and (e), if the requirements of subsection (b) are satisfied, a perfected environmental-practices-money security interest in environmental-practices-money collateral has priority over a conflicting security interest in the same collateral and, except as otherwise provided in Section 9-327, also has priority in their identifiable proceeds.
>
> (b) An environmental-practices-money security interest has priority under subsection (a) if:
>
> (1) the environmental-practices-money security interest is perfected by filing when the environmental-practices-money secured party first gives new value to enable the debtor to engage in environmental practices;
>
> (2) the environmental-practices-money secured party sends an authenticated notification to the holder of the conflicting security interest not less than 10 or more than 30 days before the environmental-practices-money secured party first gives new value to enable the debtor to engage in environmental practices if the holder had filed a financing statement before the date of the filing made by the environmental-practices-money secured party; and
>
> (3) the notification states that the environmental-practices-money secured party has or expects to acquire an environmental-practices-money security interest in the debtor's property and provides a description of the environmental-practices-money collateral.
>
> (c) Except as otherwise provided in subsection (d) or (e), if more than one security interest qualifies for priority in the same collateral under subsection (a), the security interests rank according to priority in time of filing under Section 9-322(a).
>
> (d) To the extent that a person holding a perfected security interest in environmental-practices-money collateral that is the subject of an environmental-practices-money security interest gives new value to enable the debtor to engage in environmental practices and the value is in fact so used, the security interests rank according to priority in time of filing under Section 9-322(a).

(e) To the extent that environmental-practices-money collateral is also purchase-money collateral [or production-money collateral], the notice and priority rules applicable to purchase-money security interests under Section 9-324 [or production-money security interests under Section 9-324A] shall govern.

There are two main challenges to defining the scope of an EPMSI. The first challenge is defining the range of credit extensions that would give rise to this type of interest. The second challenge is determining to what assets an EPMSI should attach, given that environmental-practices-money creditors may be providing services or other value and looking to the same assets as earlier creditors for security.

The most difficult provisions to craft are subsections defining "environmental practices" and "environmental-practices-money collateral." For purposes of an EPMSI, "environmental practices" should refer, speaking generally, to practices, processes, or projects that businesses undertake to improve the impacts that their activities have on natural resources. This is a broad and potentially amorphous category of undertakings. People commonly invoke the concept of "environmental sustainability" to refer to the goals of these kinds of practices. But defining environmental sustainability is complicated such that defining environmental practices as practices that improve environmental sustainability compounds the challenge.

Nonetheless legislatures, industry groups, international organizations, and others have engaged in defining the concepts of "environmental sustainability," "sustainable development," "renewable energy" and other similar concepts for purposes of lawmaking and for defining best practices.

One approach to defining "environmental practices" for EPMSI purposes is to draw from these efforts. A second approach is to cross reference existing statutory provisions that concern environmental impact. In any event, the task is to create a working definition that is concrete enough to define a particular type of extension of credit, yet broad enough to refer to this type of credit as it may arise in diverse contexts.

9-103B. ENVIRONMENTAL-PRACTICES-MONEY SECURITY INTEREST; APPLICATION OF PAYMENTS; BURDEN OF ESTABLISHING

(a) Definitions. In this section:

(1) "environmental-practices-money collateral" means [ALTERNATIVE 1: personal property that secures an environmental-practices-money obligation] [ALTERNATIVE 2: intellectual property acquired or developed with environmental-practices-money credit] [ALTERNATIVE 3: deposit accounts of the debtor containing cash derived from savings in energy costs];

(2) "environmental-practices-money obligation" means an obligation of an obligor incurred as all or part of the price of goods or services or for value given to enable a nonconsumer debtor to engage in environmental practices if the value is in fact so used; and

(3) "environmental practices" means [ALTERNATIVE 1: practices, processes, or projects undertaken to improve environmental impact or sustainability] [ALTERNATIVE 2: engagement of services or acquisition of personal property for the purpose of improving energy efficiency, reducing carbon emissions, increasing use of renewable energy, retaining ecosystem services, or minimizing loss of plant or animal habitat] [ALTERNATIVE 3: An investment is one in environmental practices if it improves the environmental impact of the debtor's activities. An investment does this if it reduces carbon emissions made by the debtor or caused by the debtor's products. An investment does not improve the environmental impact of the debtor's activities if it is not used to make a material change in the debtor's processes, practices, or property intended to improve the environmental impact of debtor's business.] [ALTERNATIVE 4: engagement of services or acquisition of property [that entitles the debtor to a tax benefit authorized pursuant to Colo. Rev. Stat. 31-20-101.3] *or* [to effectuate a "direct emissions reduction," "emissions reduction measure," or "market-based compliance mechanism" as defined in California Health and Safety Code §§ 38505(e), (f) and (k), respectively]].

[Subsections (b)–(d) track the language found in uniform section 9-324 and model section 9-324A.]

The first three alternatives in draft 9-103B(a)(3) above attempt substantive definitions. The safe-harbor provisions in Alternative 3 could be enacted along with the definitions in Alternatives One or Two.

Alternative One is obviously very broad, and it may be the least desirable of the proposed rules in terms of clarity. General definitions of sustainability tend to be stated very abstractly. They articulate general standards that, if breached, may result in liability. They are not necessarily designed to define a set of practices that result in sustainability. Conversely, the concrete definitions of environmental sustainability tend to be industry specific. These definitions are so detailed that they tend to be useful only for companies involved in the particular industry for which the standards are articulated.

Under these draft rules, an EPMSI creditor is required to give notice to earlier creditors before the EPMSI arises. Debtors and creditors need to be able to know whether they are creating an EPMSI in advance of the extension of credit that finances the qualifying practice.

Lawmakers could allow private actors to work out among themselves, to a large extent, what would constitute "environmental practices." If disputes arise, then courts would participate in the process of delineating what constitutes "environmental practices" for purposes of section 9-103B(a)(3). While clarity at the outset could be an issue (and lack of clarity itself has costs) this approach would create an expansive range of contexts in which private actors could utilize the EPMSI.

Alternative Two presents the same general considerations as Alternative One, except that it refers to a set of

concepts that is more specific than "environmental impact or sustainability." By reigning in the definition of "environmental practices," Alternative 2 clarifies the kinds of activities that could give rise to an interest with later-in-time priority, if they are undertaken with EPMSI credit. If a legislature finds clarity to be more important than creating a security device with broad applicability, more specific formulations that also contain substantive definitions of concepts like "renewable energy" or "reducing carbon emissions," could be appropriate.

Earlier creditors could contest EPMSI status upon receiving the notice required by proposed section 9-324B, leaving the debtor and the later-in-time creditor to work out whether they believe that the later-in-time credit will finance activities that are clearly within the contemplation of section 9-103B(a)(3). This approach raises the questions of (1) whether the rules should require an objection notice within a certain time after receipt of section 9-324B notice from the debtor, and (2) whether failure to object should constitute a waiver of rights in a priority dispute.

State legislatures could create a regulatory board that comments on, or certifies in response to inquiries, what constitutes "environmental practices." This approach has drawbacks, too, of course. If commercial actors needed to look to the state for a continually evolving definition of "environmental practices" for EPMSI purposes, that would create a lot of state involvement in commercial affairs. However, defining "environmental practices" entirely within the four corners of 9-103B could institutionalize the status quo. This institutionalization could codify a conception of environmental practices based on dominant practices today, when approaches to improving environmental impact are rapidly evolving.

One response here could be to use safe-harbor provisions that offer clear instructions to parties engaging in activities that currently fall squarely under "environmental practices," and yet leave open the possibility of new practices. Alternative Three in proposed section 9-103B(a)(3) presents an example of such a provision. A safe harbor could enable debtors and creditors to transact with certainty about the security interest's EPMSI status. At the same time, it would not prohibit debtors and investors with a greater appetite for risk from entering into transactions that they believe are EPMSI transactions, even though the investment at issue does not fall into previously contemplated categories of "green" investment.

Legislators could formulate 9-103B in an altogether different way as well—by cross-reference to existing statutory provisions. A majority of states in the United States have enacted legislation addressing the issue of climate change. These statutes include definitions of terms such as "renewable resource," "renewable energy," or "alternative fuel" that 9-103B(a)(3) could reference.

This approach may make EPMSI definitional provisions easier to draft, but the definitions cross-referenced may be broad, imprecise, or not drafted from a secured transactions perspective. These other statutory definitions may have been promulgated in a context in which a state agency exists to elucidate the meanings of terms, and definitions enacted in state climate change statutes may evolve over time or be elucidated by case law or regulation. In addition, this approach also may raise delegation of lawmaking issues.

In any event, the proposed Alternative Four in draft 9-103B(a)(3) contains two examples of how cross-referencing for purposes of defining "environmental practices" might be done. The Colorado code section referenced here authorizes governing bodies in the state to offer, notwithstanding any law to the contrary, incentives "in the form of a municipal property tax or sales tax credit or rebate, to a residential or commercial property owner who installs a renewable energy fixture on his or her residential or commercial property."[7] A "renewable energy fixture" means "any fixture, product, system, device, or interacting group of devices that produces energy . . . from renewable resources, including, but not limited to, photovoltaic systems, solar thermal systems, small wind systems, biomass systems, or geothermal systems."[8]

"Environmental practices" for purposes of an EPMSI could be defined as engagement of services or acquisition of property that entitles the debtor to a tax deduction authorized by these provisions. (A cross-reference to these Colorado provisions would require revisiting section 9-334 of the UCC regarding priority of interests in fixtures. Section 9-334(d) could be amended to include EPMSIs along with PMSIs as interests that, in accordance with section 9-334, can have priority in advance of an encumbrancer or owner of real property.)

Acquisition of goods—the actual solar panels or wind turbines, et cetera—in conjunction with an investment that would give rise to a tax benefit could be financed with purchase-money credit. The environmental-practices-money creditor, in this context, would be important to the extent that a debtor must invest in services or assets other than goods to make an investment in a "renewable-energy fixture." A creditor that both provides services and finances the acquisition of a renewable-energy fixture would have a purchase money interest in the fixture itself and an environmental-practices-money interest in the fixture and any other related environmental-practices-money collateral.

The California Global Warming Solutions Act of 2006[9] offers another example of state climate change legislation that EPMSI provisions could cross-reference. This Act authorizes the State Air Resources Board to promulgate regulations and programs to reduce greenhouse gas emissions. The State Air Resources board is "a state agency charged with monitoring and regulating sources of emissions of greenhouse gases that cause global warming in order to reduce emissions of greenhouse gases."[10]

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7. Colo. Rev. Stat. §31-20-101.3(1).
8. *Id.* §31-20-101.3(2).
9. Cal. Health & Safety Code §§38500–01, 38505, 38510, 38530, 38550–51, 38560–62, 38564–65, 3870–71,38580, 38590–99.
10. *Id.* §38510.

This board is authorized, among other things, to issue regulations creating "market-based compliance mechanisms" to reduce greenhouse gas emissions.[11] Under the statute, "market-based compliance mechanism" means either of the following:

(1) A system of market-based declining annual aggregate emissions limitations for sources or categories of sources that emit greenhouse gases.

(2) Greenhouse gas emissions exchanges, banking, credits, and other transactions, governed by rules and protocols established by the state board, that result in the same greenhouse gas emission reduction, over the same period, as direct compliance with a greenhouse gas emission limit or emission reduction measure adopted by the state board pursuant to this division.[12]

These provisions contemplate an emissions credit or trading system. For purposes of an EPMSI, "environmental practices" could be defined as engagement of services or acquisition of property to effectuate an emissions reduction or a market-based compliance mechanism within the meaning of the climate-change statute.

If California, for example, were to consider EPMSI rules that cross-reference this Global Warming Solutions Act, the result could be, essentially, a type of purchase-money interest in emissions credits or "carbon credits." This possibility raises the question of whether EPMSI rules should be geared towards funding compliance with existing requirements, or, on the other hand, facilitating funding for investments that companies might not otherwise make. Speaking hypothetically, if compliance with emissions caps were required by law, and the relevant emissions credit system in place permitted purchase of credits as a means of compliance, then EPMSI credit to facilitate such purchasing would allocate to secured parties costs that companies must incur anyway. At the same time, debtors, perhaps, could benefit from the capacity to issue low-risk debt to finance costs of compliance in situations where existing secured lenders will not do so. EPMSI credit could give companies access to a wider range of financers and a wider range of options for effectuating compliance. The appropriate scope and applicability of the EPMSI concept, in this regard, requires further contemplation and debate.

The scope of "environmental practices" and "environmental-practices-money collateral" affects the EPMSI provisions' potential to enable transactions that dilute earlier creditors' claims. At the broad end of the spectrum in terms of EPMSI collateral, EPMSI rules could create a later-in-time interest with priority in all personal property assets of the debtor.

But we can imagine broader and narrower versions of EPMSI. It is conceivable that EPMSI rules could limit EPMSI collateral to a segregated asset to which earlier creditors are not looking for security (hence, minimizing dilution risk).

Another device for limiting the threat of dilution of earlier creditors' claims is to provide notice to these creditors of an impending super-priority security interest. If an earlier creditor has notice that the debtor plans to grant an EPMSI, it can re-negotiate with the debtor, extend credit for environmental practices itself, or otherwise protect against the dilution threat.

Secured parties could respond to EPMSI rules with contract provisions prohibiting debtors from assigning new security interests. Promises by debtors not to grant to any other person a security interest in the assets assigned—negative pledge clauses—are common. Negative pledge clauses do not block creation of later security interests, but they are a strong deterrent. Many debtors would be unlikely to avail themselves of EPMSI credit if doing so constituted a default under their existing credit agreements.

States that want to enact EPMSI rules and also preserve debtors' capacity to utilize these rules despite negative pledge clauses could do so with statutory provisions that render ineffective contract provisions making assignment of an EPMSI an event of default. For example, North Carolina responds to this issue in the PrMSI context by enacting a nonuniform subsection (f) in its version of section 9-324A that makes ineffective contract provisions (1) prohibiting the creation of PrMSIs, or (2) making the creation of a PrMSI an event of default.[13]

Negative pledge clauses may pose a greater threat to the use of EPMSIs than they do to PMSIs and PrMSIs because EPMSIs would present, potentially, greater dilution risk. Whether secured creditors use these clauses, and debtors agree to them, would depend upon the particularities of new transactions.

As ideas emerge for financing investment in improved environmental sustainability, we should not overlook the UCC as a potential site for innovation. Ultimately, levels of commitment to mechanisms for private funding of improved environmental impact, and of tolerance for risk of dilution to secured creditors' positions, are for collective determination.

11. *Id.* §38570(a).
12. *Id.* §38505(k).
13. N.C. Gen. Stat. Ann. §25-9-324.1 (West 2003).

RECENT DEVELOPMENTS

In the Congress

"In the Congress" entries cover activities reported in the *Congressional Record* from June 1, 2011, through June 30, 2011. Entries are arranged by bill number, with Senate bills listed first. "In the Congress" covers all environment-related bills that are introduced, reported out of committee, passed by either house, or signed by the President. "In the Congress" also covers all environmental treaties ratified by the Senate. This material is updated monthly. For archived materials, visit http://www.elr.info/NewsAnalysis/archive.cfm.

Chamber Action

H.R. 2021 (CAA), which would amend the CAA regarding air pollution from outer continental shelf activities, was passed by the House. 157 Cong. Rec. H4378 (daily ed. June 22, 2011).

Committee Action

S. 710 (hazardous waste) was reported by the Committee on Environment and Public Works. 157 Cong. Rec. S3541 (daily ed. June 7, 2011). The bill would amend the Solid Waste Disposal Act to direct the Administrator of EPA to establish a hazardous waste electronic manifest system.

H.R. 872 (pesticides) was reported by the Committee on Transportation and Infrastructure. 157 Cong. Rec. S3970 (daily ed. June 21, 2011). The bill would amend FIFRA and the Federal Water Pollution Control Act to clarify congressional intent regarding the regulation of the use of pesticides in or near navigable waters.

H.R. 2021 (CAA) was reported by the Committee on Energy and Commerce. H. Rep. No. 112-108, 157 Cong. Rec. H4325 (daily ed. June 16, 2011). The bill would amend the CAA regarding air pollution from outer continental shelf activities.

H.R. 2354 (government) was reported by the Committee on Appropriations. H. Rep. No. 112-118, 157 Cong. Rec. H4573 (daily ed. June 24, 2011). The bill would make appropriations for energy and water development and related agencies for the fiscal year ending September 30, 2012.

Bills Introduced

S. 1144 (Wyden, D-Or.) (soda ash) would amend the Soda Ash Royalty Reduction Act of 2006 to extend the reduced royalty rate for soda ash. 157 Cong. Rec. S3947 (daily ed. June 6, 2011). The bill was referred to the Committee on Energy and Natural Resources.

S. 1149 (Wyden, D-Or.) (geothermal energy) would expand geothermal production. 157 Cong. Rec. S3541 (daily ed. June 7, 2011). The bill was referred to the Committee on Energy and Natural Resources.

S. 1150 (Casey, D-Pa.) (federal land) would establish the Susquehanna Gateway National Heritage Area in the state of Pennsylvania. 157 Cong. Rec. S3541 (daily ed. June 7, 2011). The bill was referred to the Committee on Energy and Natural Resources.

S. 1153 (Hatch, R-Utah) (federal land) would require the Secretary of the Interior to develop a multipurpose cadastre of federal land and identify inaccurate, duplicate, and out-of-date federal land inventories. 157 Cong. Rec. S3541 (daily ed. June 7, 2011). The bill was referred to the Committee on Energy and Natural Resources.

S. 1182 (Hatch, R-Utah) (federal land) would prohibit the further extension or establishment of national monuments in Utah except by express authorization of Congress. 157 Cong. Rec. S3727 (daily ed. June 13, 2011). The bill was referred to the Committee on Energy and Natural Resources.

S. 1183 (Collins, R-Me.) (mercury) would establish a national mercury monitoring program. 157 Cong. Rec. S3727 (daily ed. June 13, 2011). The bill was referred to the Committee on Environment and Public Works.

S. 1191 (Lieberman, I-Conn.) (federal land) would direct the Secretary of the Interior to carry out a study regarding the suitability and feasibility of establishing the Naugatuck River Valley National Heritage Area in Connecticut. 157 Cong. Rec. S3773 (daily ed. June 14, 2011). The bill was referred to the Committee on Energy and Natural Resources.

S. 1197 (Coats, R-Ind.) (water infrastructure) would provide for a feasibility study before carrying out any federal action relating to the Chicago Area Water System. 157 Cong. Rec. S3812 (daily ed. June 15, 2011). The bill was referred to the Committee on Environment and Public Works.

S. 1198 (Kerry, D-Mass.) (federal land) would reauthorize the Essex National Heritage Area. 157 Cong. Rec. S3812 (daily ed. June 15, 2011). The bill was referred to the Committee on Energy and Natural Resources.

S. 1201 (Lieberman, I-Conn.) (fish habitats) would conserve fish and

aquatic communities in the United States through partnerships that foster fish habitat conservation to improve the quality of life for the people of the United States. 157 Cong. Rec. S3812 (daily ed. June 15, 2011). The bill was referred to the Committee on Environment and Public Works.

S. 1204 (Udall, D-Colo.) (energy) would amend Title 10, U.S. Code, to reform U.S. Department of Defense energy policy. 157 Cong. Rec. S3813 (daily ed. June 15, 2011). The bill was referred to the Committee on Armed Services.

S. 1215 (Kerry, D-Mass.) (federal land) would provide for the exchange of land located in the Lowell National Historical Park. 157 Cong. Rec. S3891 (daily ed. June 16, 2011). The bill was referred to the Committee on Energy and Natural Resources.

S. 1224 (Bingaman, D-N.M.) (fisheries) would amend Pub. L. No. 106-392 to maintain annual base funding for the Upper Colorado and San Juan fish recovery program through fiscal year 2023. 157 Cong. Rec. S3891 (daily ed. June 16, 2011). The bill was referred to the Committee on Energy and Natural Resources.

S. 1226 (Murkowski, R-Alaska) (CAA) would amend the CAA to address air pollution from outer continental shelf activities. 157 Cong. Rec. S3891 (daily ed. June 16, 2011). The bill was referred to the Committee on Environment and Public Works.

S. 1249 (Udall, D-Colo.) (wildlife) would amend the Pittman-Robertson Wildlife Restoration Act to facilitate the establishment of additional or expanded public target ranges in certain states. 157 Cong. Rec. S4023 (daily ed. June 22, 2011). The bill was referred to the Committee on Environment and Public Works.

S. 1265 (Bingaman, D-N.M.) (land and water conservation) would amend the Land and Water Conservation Fund Act of 1965 to provide consistent and reliable authority for, and for the funding of, the land and water conservation fund to maximize the effectiveness of the fund for future generations. 157 Cong. Rec. S4075 (daily ed. June 23, 2011). The bill was referred to the Committee on Energy and Natural Resources.

S. 1266 (Carper, D-Del.) (river conservation) would direct the Secretary of the Interior to establish a program to build on and help coordinate funding for the restoration and protection efforts of the Four-State Delaware River Basin region. 157 Cong. Rec. S4075 (daily ed. June 23, 2011). The bill was referred to the Committee on Environment and Public Works.

S. 1270 (Whitehouse, D-R.I.) (e-waste) would prohibit the export from the United States of certain electronic waste. 157 Cong. Rec. S4076 (daily ed. June 23, 2011). The bill was referred to the Committee on Environment and Public Works.

S. 1277 (Cantwell, D-Wash.) (biodiesel) would amend the Internal Revenue Code of 1986 to modify the incentives for the production of biodiesel. 157 Cong. Rec. S4076 (daily ed. June 23, 2011). The bill was referred to the Committee on Finance.

S. 1292 (Toomey, R-Pa.) (EPA) would require the Administrator of EPA to consider the impact on employment levels and economic activity prior to issuing a regulation, policy statement, guidance document, endangerment finding, or other requirement; implementing any new or substantially altered program; or denying any permit. 157 Cong. Rec. S4225 (daily ed. June 29, 2011). The bill was referred to the Committee on Environment and Public Works.

S. 1296 (Whitehouse, D-R.I.) (coastal reef) would revise the boundaries of John H. Chafee Coastal Barrier Resources System Sachuest Point Unit RI-04P, Easton Beach Unit RI-05P, Almy Pond Unit RI-06, and Hazards Beach Unit RI-07 in the state of Rhode Island. 157 Cong. Rec. S4226 (daily ed. June 29, 2011). The bill was referred to the Committee on Environment and Public Works.

S. 1298 (Murkowski, R-Alaska) (federal land) would provide for the conveyance of certain property located in Anchorage, Alaska, from the United States to the Alaska Native Tribal Health Consortium. 157 Cong. Rec. S4226 (daily ed. June 29, 2011). The bill was referred to the Committee on Indian Affairs.

S. 1302 (Boxer, D-Cal.) (federal land) would authorize the Administrator of General Services to convey a parcel of real property in Tracy, California, to the city of Tracy. 157 Cong. Rec. S4226 (daily ed. June 29, 2011). The bill was referred to the Committee on Environment and Public Works.

H.R. 2060 (Walden, R-Or.) (rivers) would amend the Wild and Scenic Rivers Act to adjust the Crooked River boundary and provide water certainty for the city of Prineville, Oregon. 157 Cong. Rec. H3805 (daily ed. May 31, 2011). The bill was referred to the Committee on Natural Resources.

H.R. 2075 (Engel, D-N.Y.) (nuclear fuel) would require that spent nuclear fuel be stored in certified dry cask storage. 157 Cong. Rec. H3868 (daily ed. June 1, 2011). The bill was referred to the Committee on Energy and Commerce.

H.R. 2090 (Hultgren, R-Ill.) (energy) would seek to improve assessments of and research about energy-critical elements. 157 Cong. Rec. H3985 (daily ed. June 2, 2011). The bill was referred to the Committees on Science, Space, and Technology, Natural Resources, and Energy and Commerce.

H.R. 2095 (Matsui, D-Cal.) (energy conservations) would establish a grant program to assist retail power providers with the establishment and operation of energy conservation programs using targeted residential tree-planting. 157 Cong. Rec. H3985 (daily ed. June 2, 2011). The bill was referred to the Committee on Energy and Commerce.

H.R. 2110 (Bishop, D-N.Y.) (Long Island Sound) would amend the Federal Water Pollution Control Act to reauthorize and improve activities for the protection of the Long Island Sound Watershed. 157 Cong. Rec. H4034 (daily ed. June 3, 2011). The bill was referred to the Committee on Trans-

portation and Infrastructure and the Committee on the Budget.

H.R. 2111 (McDermott, D-Wash.) (ESA) would ensure that proper information-gathering and planning are undertaken to secure the preservation and recovery of the salmon and steelhead of the Columbia River Basin, and direct the Secretary of Commerce to seek scientific analysis of federal efforts to restore salmon and steelhead listed under the ESA. 157 Cong. Rec. H4034 (daily ed. June 3, 2011). The bill was referred to the Committees on Transportation and Infrastructure, Energy and Commerce, and Natural Resources.

H.R. 2147 (Bishop, R-Utah) (federal land) would prohibit the further extension or establishment of national monuments in Utah except by express authorization of Congress. 157 Cong. Rec. H4074 (daily ed. June 13, 2011). The bill was referred to the Committee on Natural Resources.

H.R. 2150 (Hastings, R-Wash.) (Alaska drilling) would amend the Naval Petroleum Reserves Production Act of 1976 to direct the Secretary of the Interior to lease oil and gas in the National Petroleum Reserve in Alaska, including at least one lease sale in the reserve each year in the period 2011 through 2021. 157 Cong. Rec. H4074 (daily ed. June 13, 2011). The bill was referred to the Committee on Natural Resources.

H.R. 2157 (McKeon, R-Cal.) (federal land) would facilitate a land exchange involving certain National Forest System lands in the Inyo National Forest. 157 Cong. Rec. H4075 (daily ed. June 13, 2011). The bill was referred to the Committee on Natural Resources.

H.R. 2170 (Hastings, R-Wash.) (renewable energy) would streamline federal review to facilitate renewable energy projects. 157 Cong. Rec. H4185 (daily ed. June 14, 2011). The bill was referred to the Committee on Natural Resources.

H.R. 2171 (Labrador, R-Idaho) (geothermal energy) would promote timely exploration for geothermal resources under existing geothermal leases. 157 Cong. Rec. H4185 (daily ed. June 14, 2011). The bill was referred to the Committee on Natural Resources.

H.R. 2172 (Noem, R-S.D.) (wind energy) would facilitate the development of wind energy resources on federal lands. 157 Cong. Rec. H4185 (daily ed. June 14, 2011). The bill was referred to the Committee on Natural Resources and the Committee on Agriculture.

H.R. 2173 (Wittman, R-Va.) (wind energy) would facilitate the development of offshore wind energy resources. 157 Cong. Rec. H4186 (daily ed. June 14, 2011). The bill was referred to the Committee on Natural Resources.

H.R. 2174 (DeLauro, D-Conn.) (federal land) would direct the Secretary of the Interior to carry out a study regarding the suitability and feasibility of establishing the Naugatuck River Valley National Heritage Area in Connecticut. 157 Cong. Rec. H4186 (daily ed. June 14, 2011). The bill was referred to the Committee on Natural Resources.

H.R. 2176 (Heinrich, D-N.M.) (BLM) would dedicate a portion of the rental fees from wind and solar energy projects on federal land under the jurisdiction of BLM for the administrative costs of processing applications for new wind and solar projects. 157 Cong. Rec. H4186 (daily ed. June 14, 2011). The bill was referred to the Committee on Natural Resources.

H.R. 2184 (Coffman, R-Colo.) (rare earth) would establish the Rare Earth Policy Task Force and direct the Secretary of the Interior to develop a plan to ensure the long-term supply of rare earth materials. 157 Cong. Rec. H4276-77 (daily ed. June 15, 2011). The bill was referred to the Committee on Natural Resources and the Committee on Science, Space, and Technology.

H.R. 2196 (Markey, D-Mass.) (renewable energy) would direct the president, using the Western Area Power Administration, to acquire renewable energy in amounts sufficient to ensure that, of the total amount of electric energy the federal government consumes during any fiscal year, certain minimum amounts shall be renewable energy. 157 Cong. Rec. H4277 (daily ed. June 15, 2011). The bill was referred to the Committee on Oversight and Government Reform, and in addition to the Committee on Natural Resources.

H.R. 2208 (McNerney, D-Cal.) (energy efficiency) would incorporate smart grid capability into the Energy Star Program, reduce peak electric demand, and reauthorize an energy efficiency public information program to include smart grid information. 157 Cong. Rec. H4326 (daily ed. June 16, 2011). The bill was referred to the Committee on Energy and Commerce.

H.R. 2209 (Benishek, R-Mich.) (forests) would replace the current Forest Service administrative appeals process with a predecisional administrative review process modeled after the successful approach used in the Healthy Forests Restoration Act of 2003. 157 Cong. Rec. H4326 (daily ed. June 16, 2011). The bill was referred to the Committee on Agriculture.

H.R. 2210 (Cohen, D-Tenn.) (wildlife) would amend Title 18, U.S. Code, to prohibit certain interstate conduct relating to exotic animals and certain computer-assisted remote hunting. 157 Cong. Rec. H4326 (daily ed. June 16, 2011). The bill was referred to the Committee on the Judiciary.

H.R. 2231 (Noem, R-S.D.) (ethanol) would amend the Internal Revenue Code of 1986 to terminate the ethanol tax credits. 157 Cong. Rec. H4327 (daily ed. June 16, 2011). The bill was referred to the Committee on Ways and Means and the Committee on the Budget.

H.R. 2238 (Schock, R-Ill.) (biodiesel) would amend the Internal Revenue Code of 1986 to modify the incentives for the production of biodiesel. 157 Cong. Rec. H4327 (daily ed. June 16, 2011). The bill was referred to the Committee on Ways and Means.

H.R. 2240 (Tsongas, D-Mass.) (federal land) would authorize the exchange of land or interest in land between Lowell National Historical Park and the city of Lowell in Massachusetts. 157 Cong. Rec. H4327 (daily ed. June 16, 2011). The bill was referred to the Committee on Natural Resources.

H.R. 2250 (Griffith, R-Va.) (EPA) would provide additional time for the Administrator of EPA to issue achievable standards for industrial, commercial, and institutional boilers, process heaters, and incinerators. 157 Cong. Rec. H4363 (daily ed. June 21, 2011). The bill was referred to the Committee on Energy and Commerce.

H.R. 2273 (McKinley, R-W. Va.) (coal beneficial use) would amend subtitle D of the Solid Waste Disposal Act to facilitate recovery and beneficial use, and provide for the proper management and disposal, of materials generated by the combustion of coal and other fossil fuels. 157 Cong. Rec. H4455 (daily ed. June 22, 2011). The bill was referred to the Committee on Energy and Commerce.

H.R. 2284 (Gene Green, D-Tex.) (e-waste) would prohibit the export from the United States of certain electronic waste. 157 Cong. Rec. H4456 (daily ed. June 22, 2011). The bill was referred to the Committee on Energy and Commerce and the Committee on Science, Space, and Technology.

H.R. 2304 (Wittman, R-Va.) (fisheries) would amend the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 to provide the necessary scientific information to properly implement annual catch limits. 157 Cong. Rec. H4457 (daily ed. June 22, 2011). The bill was referred to the Committee on Natural Resources.

H.R. 2307 (Herger, R-Cal.) (ethanol) repeal the tax credits for ethanol blenders and repeal the tariff on imported ethanol. 157 Cong. Rec. H4526 (daily ed. June 23, 2011). The bill was referred to the Committee on Ways and Means.

H.R. 2317 (Wu, D-Or.) (infrastructure) would promote green transportation infrastructure through research and development. 157 Cong. Rec. H4526 (daily ed. June 23, 2011). The bill was referred to the Committee on Science, Space, and Technology.

H.R. 2325 (Carney, D-Del.) (river conservation) would direct the Secretary of the Interior to establish a program to build on and help coordinate funding for restoration and protection efforts of the Four-State Delaware River Basin region. 157 Cong. Rec. H4526 (daily ed. June 23, 2011). The bill was referred to the Committee on Natural Resources and the Committee on Transportation and Infrastructure.

H.R. 2336 (Pingree, D-Me.) (rivers) would amend the Wild and Scenic Rivers Act to designate segments of the York River and associated tributaries for study for potential inclusion in the National Wild and Scenic Rivers System. 157 Cong. Rec. H4527 (daily ed. June 23, 2011). The bill was referred to the Committee on Natural Resources.

H.R. 2351 (Hastings, R-Wash.) (fisheries) would direct the Secretary of the Interior to continue stocking fish in certain lakes in the North Cascades National Park, Ross Lake National Recreation Area, and Lake Chelan National Recreation Area. 157 Cong. Rec. H4573 (daily ed. June 14, 2011). The bill was referred to the Committee on Natural Resources.

H.R. 2352 (Hastings, R-Wash.) (federal land) would authorize the Secretary of the Interior to adjust the boundary of the Stephen Mather Wilderness and the North Cascades National Park in order to allow the rebuilding of a road outside of the floodplain while ensuring that there is no net loss of acreage to the park or the wilderness. 157 Cong. Rec. H4573 (daily ed. June 14, 2011). The bill was referred to the Committee on Natural Resources.

H.R. 2360 (Landry, R-La.) (offshore drilling) would amend the Outer Continental Shelf Lands Act to extend the U.S. Constitution, laws, and jurisdiction of the United States to installations and devices attached to the seabed of the outer continental shelf for the production and support of production of energy from sources other than oil and gas. 157 Cong. Rec. H4573 (daily ed. June 14, 2011). The bill was referred to the Committee on Natural Resources.

H.R. 2367 (Pearce, R-N.M.) (transuranic waste) would provide for the safe disposal of federal government-owned transuranic waste. 157 Cong. Rec. H4574 (daily ed. June 14, 2011). The bill was referred to the Committee on Energy and Commerce and the Committee on Armed Services.

H.R. 2373 (Capps, D-Cal.) (aquaculture) would establish a regulatory system and research program for sustainable offshore aquaculture in the U.S. exclusive economic zone. 157 Cong. Rec. H4574 (daily ed. June 14, 2011). The bill was referred to the Committee on Natural Resources.

H.R. 2378 (Gene Green, D-Tex.) (federal land) would establish the Buffalo Bayou National Heritage Area in the state of Texas. 157 Cong. Rec. H4574 (daily ed. June 14, 2011). The bill was referred to the Committee on Natural Resources.

H.R. 2381 (Hastings, D-Fla.) (vegetation management) would amend Title 23, U.S. Code, to encourage and facilitate efforts by states and other transportation right-of-way managers to adopt integrated vegetation management practices, including enhancing plantings of native forbs and grasses that provide habitats for pollinators. 157 Cong. Rec. H4574 (daily ed. June 14, 2011). The bill was referred to the Committee on Transportation and Infrastructure.

H.R. 2386 (Markey, D-Mass.) (oil pollution) would amend the Oil Pollution Act of 1990 to facilitate the ability of persons affected by oil spills to seek judicial redress. 157 Cong. Rec. H4574 (daily ed. June 14, 2011). The bill was referred to the Committee on Transportation and Infrastructure.

H.R. 2389 (Gary Miller, R-Cal.) (transportation) would amend Title 23, U.S. Code, to modify the surface transportation project delivery pilot program to carry out a demonstration program using state environmental laws. 157 Cong. Rec. H4574 (daily ed. June 14, 2011). The bill was referred to the Committee on Transportation and Infrastructure.

H.R. 2391 (Paulsen, R-Mich.) (renewable electricity) would amend the Internal Revenue Code of 1986 to provide a renewable electricity integration credit. 157 Cong. Rec. H4574 (daily ed. June 14, 2011). The bill was re-

ferred to the Committee on Ways and Means and the Committee on Energy and Commerce.

H.R. 2396 (Sarbanes, D-Md.) (electronic waste) would authorize the Administrator of EPA to award grants for electronic device recycling research, development, and demonstration projects. 157 Cong. Rec. H4575 (daily ed. June 14, 2011). The bill was referred to the Committee on Science, Space, and Technology.

H.R. 2399 (Sensenbrenner, R-Wis.) (hybrid vehicles) would establish a research, development, demonstration, and commercial application program to promote research of appropriate technologies for heavy-duty plug-in hybrid vehicles. 157 Cong. Rec. H4575 (daily ed. June 14, 2011). The bill was referred to the Committee on Science, Space, and Technology.

H.R. 2401 (Sullivan, R-Okla.) (EPA) would require analyses of the cumulative and incremental impacts of certain rules and actions of EPA. 157 Cong. Rec. H4575 (daily ed. June 14, 2011). The bill was referred to the Committee on Energy and Commerce.

In the Courts

These entries summarize recent cases under the following categories: Air, Chemical Regulation, Energy, Hazardous & Solid Wastes/Substances, Land Use, Natural Resources, Radioactive Waste, Torts, Water, Wildlife, and Miscellaneous. The entries are arranged alphabetically by case name within each category. This material is updated monthly. For archived materials, visit http://www.elr.info/NewsAnalysis/archive.cfm.

AIR

American Electric Power Co. v. Connecticut, 41 ELR 20210 (U.S. June 20, 2011). The U.S. Supreme Court held that the CAA displaces any federal common-law right to seek abatement of carbon dioxide emissions from fossil fuel-fired power plants.

Jensen Family Farms, Inc. v. Monterey Bay Unified Air Pollution Control District, 41 ELR 20194 (9th Cir. May 27, 2011). The Ninth Circuit held that the CAA does not preempt a local air district's adoption and enforcement of rules regulating air emissions from diesel-powered engines.

CHEMICAL REGULATION

Chamber of Commerce v. Brown, 41 ELR 20201 (Cal. App. 1st Dist. June 6, 2011). A California appellate court held that the Office of Environmental Health Hazard Assessment may add chemicals to California's Proposition 65 list using the methodology set forth in *Cal. Health & Safety Code* §25249.8(a).

Genon Mid-Atlantic, LLC v. Montgomery County, Maryland, 41 ELR 20211 (4th Cir. June 20, 2011). The Fourth Circuit held that the Tax Injunction Act does not bar the owner of a power plant from challenging an excise tax on carbon dioxide emissions.

Medical Waste Institute v. Environmental Protection Agency, 41 ELR 20216 (D.C. Cir. June 24, 2011). The D.C. Circuit denied medical waste trade associations' petition for review challenging EPA's performance standards for new and existing hospital/medical/infectious waste incinerators.

Natural Resources Defense Council v. Jackson, 41 ELR 20213 (7th Cir. June 16, 2011). The Seventh Circuit denied environmental groups' petitions challenging EPA's approval of revisions to Wisconsin's new source review program.

Sierra Club v. Two Elk Generation Partners, Ltd., 41 ELR 20202 (10th Cir. May 31, 2011). The Tenth Circuit upheld the dismissal of an environmental group's CAA citizen suit against a power company alleging that it was attempting to build a coal-fired power plant with an invalid PSD permit.

ENERGY

Defenders of Wildlife v. Bureau of Ocean Energy Management, Regulation, and Enforcement, 41 ELR 20197 (S.D. Ala. May 23, 2011). A district court granted in part and denied in part the government's motion to dismiss an environmental group's claims that the Bureau of Ocean Energy Management, Regulation, and Enforcement failed to modify its policies and practices concerning offshore oil and gas leasing operations in the Gulf of Mexico as required by NEPA, the ESA, and the APA.

L.S. Starrett Co. v. Federal Energy Regulatory Commission, 41 ELR 20212 (1st Cir. June 15, 2011). The First Circuit upheld a FERC order requiring a precision tool and instrument manufacturer to seek licensing under §23(b) of the Federal Power Act before it can proceed with certain changes to a hydroelectric generating facility project on its property.

HAZARDOUS & SOLID WASTES/SUBSTANCES

House of Clean, Inc. v. St. Paul Fire and Marine Insurance Co., 41 ELR 20200 (D. Mass. May 27, 2011). A district court held that an insurer has no duty to defend or indemnify a dry cleaner for PCE pollution stemming from repeated flooding under the terms of its insurance policy.

Pakootas v. Teck Cominco Metals, Ltd., 41 ELR 20195 (9th Cir. June 1, 2011). The Ninth Circuit upheld the dismissal of individuals' citizen suit claim against a Canadian mining company seeking

civil penalties under CERCLA for the mining company's noncompliance with a unilateral administrative order.

Placer Mining Co. v. United States, 41 ELR 20198 (Fed. Cl. May 25, 2011). The Federal Claims court denied a mining company's motion and the government's cross-motion for summary judgment in a Fifth Amendment takings claim stemming from various CERCLA remediation actions taken at the mine.

Sears, Roebuck & Co. v. Williams Express, Inc., 41 ELR 20214 (D. Alaska June 8, 2011). A district court denied a defendant company's motion to dismiss a distribution center's claim for injunctive relief and damages under various causes of action based on environmental contamination on property managed by the defendant.

United States v. Reuland Electric Co., 41 ELR 20208 (C.D. Cal. June 8, 2011). A district court held that a consent decree settling an electric company's CERCLA liability with EPA and granting it contribution protection against additional CERCLA liability at an industrial site does not provide the company with contribution protection from a defense company's action seeking damages stemming from contamination at a water treatment plant.

Wells Fargo Bank NA v. Renz, 41 ELR 20209 (N.D. Cal. June 9, 2011). A district court granted in part and denied in part several motions and cross-motions for summary judgment in a cost recovery and contribution action stemming from contamination at a dry cleaning business.

LAND USE

Chawanakee Unified School District v. County of Madera, 41 ELR 20207 (Cal. App. 4th Dist. June 21, 2011). A California appellate court held that a county's approval of a development project violated the California Environmental Quality Act.

Downing/Salt Pond Partners, L.P. v. Rhode Island, 41 ELR 20191 (1st Cir. May 23, 2011). The First Circuit upheld the dismissal of a developer's federal takings claim against two state agencies for restricting its development of a coastal residential subdivision in Rhode Island.

NATURAL RESOURCES

Center for Sierra Nevada Conservation v. United States Forest Service, 41 ELR 20203 (E.D. Cal. May 26, 2011). A district court held that the U.S. Forest Service's Public Wheeled Motorized Travel Management Decision for the Eldorado National Forest violated the ESA and the National Forest Management Act.

Organized Village of Kake v. United States Department of Agriculture, 41 ELR 20196 (D. Alaska, May 24, 2011). A district court reinstated the roadless area conservation rule to the Tongass National Forest in southeast Alaska.

Performance Coal Co. v. Federal Mine Safety & Review Commission, 41 ELR 20205 (D.C. Cir. June 10, 2011). The D.C. Circuit set aside an order of the Federal Mine Safety and Health Review Commission denying a mining company's application for temporary relief from restrictions that the Mine Safety and Health Administration imposed on it in conjunction with its investigation of an explosion at one of its mines.

Sierra Forest Legacy v. Sherman, 41 ELR 20193 (9th Cir. May 26, 2011). The Ninth Circuit affirmed in part and vacated in part a lower court decision largely granting summary judgment in favor of the U.S. Forest Service on environmental groups' and California's NEPA and NFMA claims challenging the agency's 2004 Sierra Nevada forest plan amendment and a timber-harvesting project approved under that amendment.

RADIOACTIVE WASTE

Texas Instruments, Inc. v. United States, 41 ELR 20215 (Fed. Cl. June 13, 2011). The Federal Claims court denied the U.S. motion to dismiss a company's action to recover over $2 million in litigation expenses allegedly owed to it under the indemnification provisions of various contracts the company performed for the U.S. Atomic Energy Commission.

TORTS

Taylor Land Group, LLC v. BP Products North America, Inc., 41 ELR 20199 (Mich. Ct. App. May 26, 2011). A Michigan appellate court reversed the dismissal of a property owner's trespass claim against a prior owner of the site, but upheld the dismissal of the remaining tort and state-law claims stemming from the discovery of USTs on the site.

WATER

American Bottom Conservancy v. U.S. Army Corps of Engineers, 41 ELR 20206 (7th Cir. June 14, 2011). The Seventh Circuit held that an environmental group has standing to challenge a U.S. Army Corps of Engineers permit allowing 18.4 acres of wetlands in a state park to be destroyed to make way for a landfill.

WILDLIFE

Center for Biological Diversity v. Salazar, 41 ELR 20204 (D. Ariz. May 28, 2011). A district court held that the FWS' biological opinion for the U.S. Army's proposed ongoing and future operations at Fort Huachuca—a major military installation in southeastern Arizona—violates the ESA and is arbitrary and capricious.

MISCELLANEOUS

In re Chevron Corp., 41 ELR 20192 (3d Cir. May 25, 2011). The Third Circuit reversed a lower court order granting an oil company's application to engage in discovery for use in an environmental class action before an Ecuadorian court under 28 U.S.C. §1782(a).

In the Federal Agencies

These entries cover the period June 1, 2011, through June 30, 2011. Citations are to the *Federal Register* (FR). Entries below are organized by Final Rules, Proposed Rules, and Notices. Within each section, entries are further subdivided by subject matter area, with entries listed chronologically. This material is updated monthly. For archived materials, visit http://www.elr.info/NewsAnalysis/archive.cfm.

Final Rules

AIR

EPA amended the NESHAP for the plating and polishing area source category to exclude bench-scale activities. 76 FR 35744 (6/20/11).

EPA finalized an update to a portion of the outer continental shelf air regulations for Alaska. 76 FR 37274 (6/27/11).

EPA revised the performance standards for new stationary compression ignition internal combustion engines under CAA §111(b). 76 FR 37954 (6/28/11).

SIP Approvals: Alabama (Birmingham fine particulate matter nonattainment area) 76 FR 38023 (6/29/11). California (regional haze program and interstate transport plan) 76 FR 34608 (6/14/11); (regional haze program and interstate transport plan) 76 FR 34872 (6/15/11). Georgia (attainment of the 1997 annual average fine particulate matter (PM) NAAQS for the Macon nonattainment area) 76 FR 31858 (6/2/11); (attainment of the 1997 eight-hour ozone NAAQS for the Atlanta nonattainment area) 76 FR 36873 (6/23/11). Idaho (regional haze and best available retrofit technology requirements) 76 FR 33651 (6/9/11); (regional haze program and interstate transport plan) 76 FR 36329 (6/22/11). Illinois/Missouri (attainment of the 1997 eight-hour ozone NAAQS for the St. Louis (Mo.-Ill.) metropolitan nonattainment area) 76 FR 33647 (6/9/11). Oregon (interstate transport of pollution) 76 FR 33650 (6/9/11). Pennsylvania (control techniques guidelines for flat wood paneling surface coating processes) 76 FR 31856 (6/2/11); (quality assurance for the motor vehicle inspection and maintenance (I/M) program) 76 FR 32321 (6/6/11); (air pollution control rules and regulations for Allegheny County) 76 FR 34000 (6/10/11). South Carolina (PSD and nonattainment new source review requirements) 76 FR 36875 (6/23/11). Virginia (NAAQS for nitrogen dioxide (NO_2)) 76 FR 36326 (6/22/11).

ENERGY

DOE adopted energy conservation standards for residential furnaces and for residential central air conditioners and heat pumps. 76 FR 37408 (6/27/11).

DOE amended until no later than December 31, 2012, the compliance dates for manufacturers to submit certification reports for commercial refrigeration equipment; commercial heating, ventilating, air- conditioning equipment; commercial water heating equipment; and automatic commercial ice makers under the Energy Policy and Conservation Act of 1975. 76 FR 38287 (6/30/11).

HAZARDOUS & SOLID WASTE

EPA issued revised land disposal restriction treatment standards for hazardous wastes from the production of carbamates and carbamate commercial chemical products. 76 FR 34147 (6/13/11).

EPA gave final authorization to Minnesota's hazardous waste management program under RCRA. 76 FR 36879 (6/23/11).

EPA authorized revisions to Louisiana's hazardous waste program under RCRA. 76 FR 37021 (6/24/11).

MINING

OSM gave partial approval to an amendment to Wyoming's regulatory program under SMCRA concerning vegetation requirements and performance standards. 76 FR 34816 (6/14/11).

OSM approved, on an interim basis, an amendment to West Virginia's SMCRA program concerning permit fees and bonding rates. 76 FR 37996 (6/29/11).

WATER

EPA approved 11 alternative testing methods for use in measuring the levels of contaminants in drinking water. 76 FR 37014 (6/24/11).

The Bureau of Ocean Energy Management, Regulation, and Enforcement increased the maximum daily civil penalty assessment for OCSLA violations to $40,000 and the maximum daily civil penalty assessment for violations of its financial responsibility regulations to $30,000. 76 FR 38294 (6/30/11).

WILDLIFE

FWS reclassified the tulotoma snail from endangered to threatened under the ESA based on a review of its status. 76 FR 31866 (6/2/11).

FWS designated approximately 521.3 acres in Chaves County, New Mexico, and Pecos and Reeves Counties, Texas, as critical habitat for the Koster's springsnail, Noel's amphipod, Pecos assiminea, and Roswell springsnail. 76 FR 33036 (6/7/11).

FWS reinstated the Virginia northern flying squirrel as endangered under the ESA as the result of a ruling in *Friends*

of Blackwater v. Salazar, 1:09-cv-02122-EGS (D.D.C. Mar. 25, 2011). 76 FR 35349 (6/17/11).

FWS established a nonessential experimental population of bull trout in the Clackamas River and its tributaries in Clackamas and Multnomah Counties, Oregon. 76 FR 35979 (6/21/11).

FWS designated 25 acres in Taney County, Missouri, as critical habitat for the Tumbling Creek cavesnail. 76 FR 37663 (6/28/11).

Proposed Rules

AIR

EPA seeks public comment on draft guidance concerning the application of certain emission certification regulations to heavy-duty diesel engines using selective catalytic reduction systems. 76 FR 32886 (6/7/11).

EPA proposed to amend the NESHAP for the plating and polishing area source category to exclude bench-scale activities. 76 FR 35806 (6/20/11).

EPA proposed changes to the calculation and monitoring provisions of the Mandatory Greenhouse Gas Reporting Rule for large semiconductor manufacturing facilities. 76 FR 36472 (6/22/11).

EPA proposed to amend certain provisions related to best available monitoring methods in regulations for Petroleum and Natural Gas Systems of the Greenhouse Gas Reporting Rule. 76 FR 37300 (6/27/11).

SIP Proposals: Alabama/Georgia/Tennessee (attainment of the 1997 annual fine PM NAAQS for the Chattanooga and Macon nonattainment areas) 76 FR 31900 (6/2/11). California (volatile organic compound (VOC) emissions for the San Joaquin Valley unified air pollution control district and the Imperial County air pollution control district) 76 FR 32113 (6/3/11); (VOC emissions for the San Joaquin Valley unified air pollution control district) 76 FR 33181 (6/8/11); (VOCs for the San Joaquin Valley unified air pollution control district) 76 FR 35167 (6/16/11); (nitrogen oxide and particulate matter emissions from glass melting furnaces. 76 FR 37044 (6/24/11); (VOC and PM emissions from commercial charbroiling) 76 FR 38340 (6/30/11). District of Columbia (Washington, DC, area moderate 1997 eight-hour ozone nonattainment area) 76 FR 38334 (6/30/11). Georgia (attainment of the 1997 annual fine PM NAAQS for the Rome nonattainment area) 76 FR 31898 (6/2/11). Indiana (greenhouse gas (GHG) thresholds for PSD program) 76 FR 35380 (6/17/11). Indiana/Kentucky (attainment of the 1997 annual fine PM NAAQS for the Louisville nonattainment area) 76 FR 34935 (6/15/11). Maryland (Washington, DC, area moderate 1997 eight-hour ozone nonattainment area) 76 FR 38334 (6/30/11). Nevada (regional haze program) 76 FR 36450 (6/22/11). New Hampshire (GHG thresholds for PSD program) 76 FR 34630 (6/14/11). North Carolina (emission limitations from smokestacks) 76 FR 36468 (6/22/11). Ohio/Kentucky/Indiana (attainment of the 1997 annual average fine PM NAAQS for the tri-state Cincinnati-Hamilton nonattainment area) 76 FR 32110 (6/3/11). Pennsylvania (quality assurance for the motor vehicle I/M program; see above for direct final rule) 76 FR 32333 (6/6/11); (air pollution control rules and regulations for Allegheny County; see above for direct final rule) 76 FR 34020 (6/10/11); (nitrogen oxide emissions from glass melting furnaces) 76 FR 34021 (6/10/11). Tennessee (limited approval of regional haze requirements) 76 FR 33662 (6/9/11). Texas (permit renewal requirements) 76 FR 32333 (6/6/11). Virginia (NAAQS for NO_2; see above for direct final rule) 76 FR 36471 (6/22/11); (Washington, DC, area moderate 1997 eight-hour ozone nonattainment area) 76 FR 38334 (6/30/11).

ENERGY

DOE proposed energy conservation standards for residential furnaces and for residential central air conditioners and heat pumps; see above for direct final rule. 76 FR 37549 (6/27/11).

HAZARDOUS & SOLID WASTE

EPA proposed to revise land disposal restriction treatment standards for hazardous wastes from the production of carbamates and carbamate commercial chemical products; see above for direct final rule. 76 FR 34200 (6/13/11).

EPA proposed to authorize revisions to Louisiana's hazardous waste program under RCRA; see above for direct final rule. 76 FR 37048 (6/24/11).

MINING

OSM seeks public comment on a proposed amendment to Colorado's regulatory program under SMCRA concerning valid existing rights, ownership and control, and other regulatory issues. 76 FR 36039 (6/21/11).

OSM seeks public comment on a proposed amendment to Wyoming's regulatory program under SMCRA concerning noncoal mine waste, valid existing rights, and individual civil penalties. 76 FR 36040 (6/21/11).

TOXIC SUBSTANCES

EPA proposed to synchronize the expiration dates of EPA pesticide applicator certificates with the state or tribal applicator certificates on which they are based. 76 FR 37045 (6/24/11).

WILDLIFE

NOAA-Fisheries determined that listing Atlantic bluefin tuna as threatened or endangered under the ESA is not warranted. 76 FR 31556 (6/1/11).

FWS proposed to designate approximately 2,984 acres in Orange, Riverside, San Diego, and Ventura Counties, California, as critical habitat for the Riverside fairy shrimp. 76 FR 31686 (6/1/11).

FWS announced a 90-day finding on a petition to reclassify the Torghar Hills population of straight-horned markhor from endangered to threatened under

the ESA; the agency found that reclassification may be warranted and initiated a status review. 76 FR 31903 (6/2/11).

FWS proposed to revise take and take exemption regulations for the Utah prairie dog and seeks public comment on the special rule. 76 FR 31906 (6/2/11).

FWS announced a 90-day finding on a petition to list the golden-winged warbler as endangered or threatened under the ESA; the agency found that listing may be warranted and initiated a status review. 76 FR 31920 (6/2/11).

NOAA-Fisheries proposed to extend the current critical habitat and to designate six new areas for the Hawaiian monk seal in the northwestern Hawaiian Islands, except for areas critical to national security. 76 FR 32026 (6/2/11).

FWS announced a 12-month finding on a petition to list the striped newt as threatened under the ESA; the agency found that listing is warranted but precluded by higher priority actions. 76 FR 32911 (6/7/11).

FWS proposed to designate approximately 348 acres in San Diego County, California, as critical habitat for the listed willowy monardella and to delist the Jennifer's monardella subspecies. 76 FR 33880 (6/9/11).

FWS announced a 12-month finding on a petition to list Yellowstone sand verbena, Ross' bentgrass, precocious milkvetch, Fremont County rockcress, and Gibbens' beardtongue as threatened or endangered and to designate critical habitat under the ESA; the agency found that only listing Fremont County rockcress is warranted but precluded by higher priority actions. 76 FR 33924 (6/9/11).

NOAA-Fisheries extended ESA prohibitions to all activities impacting the listed Gulf of Maine distinct population segment of Atlantic sturgeon throughout its range, except for scientific research and rescue/salvage activities. 76 FR 34023 (6/10/11).

FWS announced a 90-day finding on a petition to list the Utah population of the Gila monster as an endangered or a threatened distinct population segment and to designate critical habitat under the ESA; the agency found that listing is not warranted. 76 FR 36049 (6/21/11).

FWS announced a revised 90-day finding on a petition to reclassify the Utah prairie dog from threatened to endangered under the ESA; the agency determined that reclassification is not warranted. 76 FR 36053 (6/21/11).

FWS announced its 12-month finding on a petition to list the Ozark chinquapin, a tree, as threatened or endangered under the ESA; the agency determined that listing is not warranted at this time. 76 FR 37706 (6/28/11).

FWS announced its 90-day finding on a petition to list the eastern small-footed bat and the northern long-eared bat as endangered or threatened under the ESA; the agency determined that listing may be warranted and has begun a status review of the two species. 76 FR 38095 (6/29/11).

FWS announced its 12-month finding on a petition to list a distinct population segment of the fisher in its U.S. Northern Rocky Range; the agency determined that listing is not warranted at this time. 76 FR 38504 (6/30/11).

Notices

AIR

EPA determined that California Air Resources Board amendments meet the requirements for a waiver of preemption for California's motor vehicle GHG emissions program. 76 FR 34693 (6/14/11).

EPA entered into a proposed consent decree in *WildEarth Guardians v. Jackson*, No. 4:11-cv-02205-SI (N.D. Cal.), that establishes deadlines for the Agency to take action on Arizona's SIP for the 1997 eight-hour ozone nonattainment area of Phoenix-Mesa. 76 FR 34982 (6/15/11).

EPA entered into a proposed consent decree in *WildEarth Guardians v. Jackson*, No. 1:11-cv-0001-CMA-MEH (D. Colo.), that establishes deadlines for the Agency to take action on SIPs for Colorado, North Dakota, and Wyoming and on FIPs for Colorado, Montana, North Dakota, and Wyoming, all concerning regional haze or excess emissions. 76 FR 34983 (6/15/11).

HAZARDOUS & SOLID WASTE

EPA entered into a proposed administrative settlement under CERCLA that requires the settling party to sell the Agawam Sportsman's Club Superfund site in Massachusetts and to distribute 90% of the proceeds to the United States for past response costs incurred at the site and 10% to the city of Agawam for property tax arrears. 76 FR 32202 (6/3/11).

EPA seeks public comment on a proposed purchaser agreement amendment under CERCLA that requires Blue Marlin Associates to conduct a vapor intrusion study at the Fischer & Porter Superfund site in Bucks County, Pennsylvania, and to take appropriate remedial measures, if necessary. 76 FR 34229 (6/13/11).

EPA entered into a settlement under CERCLA §122(h)(1) for reimbursement of past response costs incurred at the Caraleigh Phosphate and Fertilizer Works Superfund site in Raleigh, North Carolina. 76 FR 38389 (6/30/11).

OFFICE OF THE PRESIDENT

The president proclaimed June 2011 as Great Outdoors Month. 76 FR 32857 (6/7/11).

The president proclaimed June 2011 as National Oceans Month. 76 FR 33119 (6/7/11).

WILDLIFE

NOAA-Fisheries announced a 90-day finding on a petition to list goliath grouper as threatened or endangered under the ESA; the agency found that listing is not warranted. 76 FR 31592 (6/1/11).

DOJ NOTICES OF SETTLEMENT

United States v. Union Pacific Corp., No. 8:11-cv-00195 (D. Neb. June 1, 2011). Settling CERCLA defendants responsible for violations at the Omaha Lead Superfund site in Omaha, Nebraska, must pay $21,350,000 in U.S. response costs incurred at the site, must spend $3.15 million in community health education on the health risks of lead exposure, and must pay $100,000 to the DOI and $400,000 to the Nebraska Department of Environmental Quality. 76 FR 33364 (6/8/11).

United States v. Candle Development, LLC, No. 08-4086 (D.S.D. June 3, 2011). Settling CWA defendants that discharged pollutants into waters of the United States without a permit in Lincoln County, South Dakota, must pay a civil penalty and must restore the impacted areas and/or mitigate the damages. 76 FR 33784 (6/9/11).

United States v. United Nuclear Corp., No. CV 11-01060-PHX-NVW (D. Ariz. May 31, 2011). A settling CERCLA defendant responsible for violations at the Pine Mountain Mine Superfund site in the Tonto National Forest in Arizona must pay $800,000 in U.S. response costs incurred at the site. 76 FR 33784 (6/9/11).

United States v. Allied Metal Co., No. 11 C 3228 (N.D. Ill. May 16, 2011). A settling CAA defendant responsible for violations at its facility in Chicago, Illinois, must pay a $92,210 civil penalty; must permanently shut down its thermal chip dryer and remove it from its permit; must surrender all pollution credits for the dryer; must perform a $132,627 supplemental environmental project on Cook County municipal or school bus diesel vehicles; must perform a $132,627 supplemental environmental project along its Chicago River property; and must provide periodic reports on implementation of its obligations. 76 FR 34102 (6/10/11).

United States v. Polar Industries, Inc., No. 3:11-cv-00915 (D. Conn. June 7, 2011). A settling CAA defendant responsible for violations at its foam block manufacturing facility in Prospect, Connecticut, must pay a $102,000 civil penalty and must install controls at its plant to reduce VOC emissions. 76 FR 35238 (6/16/11).

United States v. Hecla Ltd., No. 96-0122-N-EJL (D. Idaho June 13, 2011). A settling CERCLA and CWA defendant responsible for violations at the Bunker Hill Mining and Metallurgical Complex Superfund site in the Coeur d'Alene Basin watershed in Idaho must pay $263.4 million, plus interest, in past and future response costs to the United States, the Coeur d'Alene Tribe, and Idaho and must coordinate future mining operations with EPA's cleanup activities in the Coeur d'Alene Basin. 76 FR 35470 (6/17/11).

United States v. Bunge North America, Inc., No. 2:06-cv-02209-MPM-DGB (C.D. Ill. June 14, 2011). Under a modified 2007 consent decree, a settling CAA defendant responsible for violations at its soybean and corn processing facility in Decatur, Indiana, must perform two substitute projects to reduce emissions in place of the original wastewater recovery project. 76 FR 35471 (6/17/11).

United States v. Swift Beef Co., No. 8:11-cv-216 (D. Neb. June 16. 2011). A settling CWA defendant responsible for violations at its beef processing plant in Grand Island, Nebraska, must pay a $1,300,000 civil penalty in response costs incurred by the United States and Nebraska and must undertake injunctive measures to prevent future violations. 76 FR 36577 (6/22/11).

United States v. Tecumseh Products Co., No. 1:03-cv-00401 (E.D. Wis. June 13, 2011). Settling CERCLA defendants must finance and perform the remainder of the remedial action at the Sheboygan River and Harbor Superfund site in Sheboygan County, Wisconsin, at an estimated cost of $12.6 million and must pay EPA's oversight costs. 76 FR 37152 (6/24/11).

United States v. Eddie's Service Station, No. 5:10-cv-6126 (E.D. Mo. June 20, 2011). Settling CWA defendants that discharged pollutants without a permit into waters of the United States must pay a civil penalty, must conduct a mitigation project, and must enter into several environmental covenants on the affected property. 76 FR 37153 (6/24/11).

In the State Agencies

The entries below cover state regulatory developments during the month of June 2011. The entries are arranged by state, and within each section, entries are further subdivided by subject matter area. For material previously reported, visit http://www.elr.info/State/stateupdate.cfm.

ALASKA

FISHERIES

The Board of Fisheries adopted 5 Alaska Admin. Code 28, dealing with Groundfish fisheries. The regulation went into effect June 25, 2011. See http://notes4.state.ak.us/pn/pubnotic.nsf/1604e191287514068925678500676 7f6/61abd824bf7f774a8925789d005ab929?OpenDocument.

CALIFORNIA

TOXIC SUBSTANCES

The Office of Environmental Health Hazard Assessment added imazalil to

the list of chemicals known to cause cancer for the purposes of Proposition 65. The listing took effect May 20, 2011. *See* http://www.oal.ca.gov/res/docs/pdf/notice/20z-2011.pdf (pp. 837-55)

IDAHO

AIR

The Department of Environmental Quality adopted the temporary Idaho Admin. Code r. 58.01.01, Rules for the Control of Air Pollution in Idaho. The rule alters crop burning rules to regulate smaller crop residue burns differently than large-scale high-fuel content burns. The rule took effect July 1, 2011. *See* http://adm.idaho.gov/adminrules/bulletin/bul/11bul/11jun.pdf (pp. 65-69).

WATER

The Department of Lands adopted the temporary Idaho Admin. Code r. 20.07.02, Rules Governing Oil and Gas Conservation in the State of Idaho. The rule sets standards for hydraulic fracturing to protect groundwater in water supply wells adjacent to extraction sites. *See* http://adm.idaho.gov/adminrules/bulletin/bul/11bul/11jun.pdf (pp. 30-34).

INDIANA

AIR

The Air Pollution Control Board amended 326 Ind. Admin. Code 2, concerning transition fees and permits. Changes took effect July 8, 2011. *See* http://www.in.gov/legislative/iac/20110608-IR-326070286PRA.xml.pdf.

The Air Pollution Control Board amended 326 Ind. Admin. Code 4.1, concerning open burning. Changes add types of burning allowed under the regulation, including burning for natural area and wildlife habitat maintenance and the burning of clean petroleum products for fire training. According to the public notice, the exemptions are not expected to increase the amount of open burning occurring in the state. Changes took effect July 8, 2011. *See* http://www.in.gov/legislative/iac/20110608-IR-326090362PRA.xml.pdf.

CLIMATE

The Air Pollution Control Board amended 326 Ind. Admin. Code 2.7.1, relating to the definition of "major source" under the tailoring rule. Changes took effect June 25, 2011. *See* http://www.in.gov/legislative/iac/20110622-IR-326110085FRA.xml.pdf.

WILDLIFE

The Natural Resources Commission amended 312 Ind. Admin. Code §9.5.4 to remove the four-toed salamander from, and add the plains leopard frog and mole salamander to, the list of endangered species of reptiles and amphibians. The rule took effect July 15, 2011. *See* http://www.in.gov/legislative/iac/20110615-IR-312110196PRA.xml.pdf.

MARYLAND

AIR

The Department of the Environment amended Md. Code Regs. 26.11.02, Permits, Approvals, and Registration, and added chapter 26.11.36, Distributed Generation. Among other changes, the amendments establish annual reporting requirements for curtailment service providers that negotiate contracts with facilities that operate on-site generators/engines and alter requirements relating to load-shaving units. The rule took effect June 13, 2011. *See* http://www.dsd.state.md.us/mdregister/3812.pdf (p. 708).

The Department of the Environment amended Md. Code Regs. 26.11.09, Control of Fuel-Burning Equipment, Stationary Internal Combustion Engines, and Certain Fuel-Burning Installations. Changes limit the burning of used oil to fuel-burning equipment that burns fuel oil, require a permit to construct or other authorization for fuel-burning equipment that will burn on-specification used oil if it has a rated heat input capacity of 50 million Btus or more, and require a permit to construct application for installations that propose to burn waste combustible fluid (WCF) or off-specification used oil and assure that the WCF is burned in an authorized installation. *See* http://www.dsd.state.md.us/mdregister/3812.pdf (p. 708).

NEBRASKA

AIR

The Department of Environmental Quality amended 129 Neb. Admin. Code §018.028, Nebraska Air Quality Regulations. Changes alter the dates of construction for which certain rules apply and add documents incorporated by reference. The rule took effect June 15, 2011. *See* http://www.sos.state.ne.us/rules-and-regs/regtrack/proposals/0000000000000924.pdf.

NEVADA

AIR

The State Environmental Commission proposed to amend Nev. Admin. Code 445B.3457, pertaining to Class II operating permits. Changes set specific standards for pollutant thresholds and alter the public comment process. *See* http://www.leg.state.nv.us/register/2011Register/R006-11I.pdf.

NEW JERSEY

WATER

The Department of Environmental Protection proposed to readopt N.J. Admin. Code §7:14C, Sludge Quality Assurance, with amendments. Among

other changes, the amendments would extend the analytical exemption in the existing rules to small generators with a permitted wastewater flow of less than or equal to 20,000 gallons per day. *See* http://www.lexisnexis.com/njoal/ (43 N.J.R. 1312(a)).

NEW MEXICO

AIR

The Environmental Improvement Board amended N.M. Admin. Code §20.2.74. Changes establish baseline dates for particulate matter, sulfur dioxide, and nitrogen dioxide, add to the definition of regulated new source pollutant, and alter the obligations of owners or operators of sources. The rule changes took effect June 3, 2011. *See* http://www.nmcpr.state.nm.us/nmregister/xxii/xxii10/20.2.74amend.htm.

The Environmental Improvement Board amended N.M. Admin. Code §20.2.79. Changes alter the definition of "regulated new source review pollutant," add a definition for "reasonable possibility," and add offset requirements. The rule changes took effect June 3, 2011. *See* http://www.nmcpr.state.nm.us/nmregister/xxii/xxii10/20.2.79amend.htm.

HAZARDOUS & SOLID WASTE

The Environmental Improvement Board proposed to amend N.M. Admin. Code §20.7.11, Liquid Waste Treatment and Disposal Fees. Changes pertain to the Board's biannual report for New Mexico. There will be a public hearing on August 1, 2011. *See* http://www.nmcpr.state.nm.us/nmregister/xxii/xxii10/Environotice2.htm.

NEW YORK

CLIMATE

The Department of Environmental Conservation amended N.Y. Comp. Codes R. & Regs. tit. 6, §§200, 201, and 231, pertaining to particulate matter. The change is an emergency rule to allow the Department to comply with federal new source review rules from 2008 and 2010. *See* http://www.dos.state.ny.us/info/register/2011/jun15/pdfs/rules.pdf (pp. 14-21).

NORTH CAROLINA

WATER

The Department of Environment and Natural amended 15A N.C. Admin. Code 02H.0126, Stormwater Discharges. Changes incorporate and supplement changes to federal regulations and are effective pending legislative review. *See* http://www.ncoah.com/rules/register/Volume25Issue23June162011.pdf (pp. 2480-512).

OKLAHOMA

WATER

The Department of Environmental Quality amended Okla. Admin. Code §252:611, General Water Quality. Changes, which establish fees for certifications required to be issued by the state, go into effect July 1, 2011. *See* http://www.oar.state.ok.us/register/Volume-28_Issue-19.htm#a272686.

The Department of Environmental Quality adopted Okla. Admin. Code §252:616.3, Industrial Wastewater Systems. Changes establish application fees for nondischarging industrial wastewater systems required to be permitted by the Department. The rule becomes effective July 1, 2011. *See* http://www.oar.state.ok.us/register/Volume-28_Issue-19.htm#a274954.

The Department of Environmental Quality adopted Okla. Admin. Code §252.621, Non-Industrial Flow-Through and Public Water Supply Lagoons Including Land Application. Changes reduce the maximum slope of a wastewater land application site from 10% to no more than 5%. The rule takes effect July 1, 2011. *See* http://www.oar.state.ok.us/register/Volume-28_Issue-19.htm#a281367.

The Department of Environmental Quality amended Okla. Admin. Code §252.656, Water Pollution Control Facility Construction Standards. Changes limit who is eligible to obtain a wastewater construction permit, make the requirements for variances from construction standards in this chapter consistent with the proposed variance requirements in Okla. Admin. Code §252:626 (Public Water Supply Construction Standards), and require disinfection from lagoon systems that discharge to "waters of the state" where beneficial use of the receiving water body is designated in Oklahoma's Water Quality Standards (Okla. Admin. Code §785:45) as either "Primary Body Contact Recreational" or "Public or Private Water Supply," in addition to other changes. *See* http://www.oar.state.ok.us/register/Volume-28_Issue-19.htm#a310280.

OREGON

LAND USE

The Department of Forestry proposed to amend Or. Admin. Code 629.035.0105 to adopt the 2011 Elliott State Forest Management Plan as an administrative rule. The last day for comment is August 1. *See* http://arcweb.sos.state.or.us/rules/June_2011_Bulletin.pdf (p. 9).

RHODE ISLAND

WATER

The Water Resources Board adopted Details for Regulation Water Use and Efficiency Rule for Major Public Water Suppliers. The rule establishes targets and methods for efficient water use for major public water suppliers and annual reporting requirements for major public water suppliers. The rule took effect June 14, 2011. *See* http://sos.ri.gov/

documents/archives/regdocs/released/pdf//WRB/6393.pdf.

TENNESSEE

AIR

The Environment and Conservation Agency amended Tenn. Admin. Code §1200.03.11, Hazardous Air Contaminants. Changes amend general provisions to add references to propylene carbonate and dimethyl carbonate. The rule takes effect on August 23, 2011. *See* http://state.tn.us/sos/rules_filings/05-08-11.pdf.

VIRGINIA

WATER

The State Water Control Board amended 9 Va. Admin. Code §25.20, Fees for Permits and Certificates. Changes affect Water Division permit application fees and biosolids land applications. *See* http://legis.state.va.us/codecomm/register/vol27/iss20/v27i20.pdf (p. 2245).

WASHINGTON

LAND USE

The Forest Practices Board amended Wash. Admin. Code §222, relating to forest biomass harvest, watershed analysis reviews, and the addition of threatened or endangered species habitat in the riparian open-space program. Changes took effect June 20, 2011. *See* http://apps.leg.wa.gov/documents/laws/wsr/2011/12/11-12-009.htm.

RECENT JOURNAL LITERATURE

"Recent Journal Literature" lists recently published law review and other legal periodical articles. Within subject-matter categories, entries are listed alphabetically by author or title. Articles are listed first, followed by comments, notes, symposia, surveys, and bibliographies.

For a complete list of all law review articles listed in the Journal Literature section of ELR*, visit our Cumulative Law Review Bibliography at http://www.elr.info/Indexes/clrb.cfm.*

Administrative Law

Learner, Howard A., *Comments on* Administrative Law, Filter Failure, and Information Capture, 41 ELR 10740 (Aug. 2011).

Wagner, Wendy E., *Administrative Law, Filter Failure, and Information Capture*, 41 ELR 10732 (Aug. 2011).

Agriculture

Pollans, Margot J., *Bundling Public and Private Goods: The Market for Sustainable Organics*, 85 N.Y.U. L. Rev. 621 (2010).

Quinn, Brian J.M. & Anh T.T. Vu, *Farmers, Middlemen, and the New Rule of Law Movement*, 30 B.C. Third World L.J. 273 (2010).

Schneider, Susan A., *A Reconsideration of Agricultural Law: A Call for the Law of Food, Farming, and Sustainability*, 34 Wm. & Mary Envtl. L. & Pol'y Rev. 935 (2010).

Climate Change

Byrne, J. Peter, *Rising Seas and Common Law Baselines: A Comment on Regulatory Takings Discourse Concerning Climate Change*, 11 Vt. J. Envtl. L. 625 (2010).

Freeman, Jody & Andrew Guzman, *Climate Change and U.S. Interests*, 41 ELR 10695 (Aug. 2011).

Freeman, Jody & Andrew Guzman, *A Reply*, 41 ELR 10726 (Aug. 2011).

Hopkins, Jeffrey, *Review of Freeman and Guzman's* Climate Change and U.S. Interests, 41 ELR 10724 (Aug. 2011).

Johnson, Laurie T. & Daniel A. Lashof, *Comment on* Climate Change and U.S. Interests *by Freeman and Guzman*, 41 ELR 10712 (Aug. 2011).

Morgenstern, Richard D., *Critiquing the Critique of the Climate Change Winner Argument*, 41 ELR 10720 (Aug. 2011).

Sheeran, Kristen A. Ph.D., *A Response to* Climate Change and U.S. Interests, 41 ELR 10717 (Aug. 2011).

Energy

Alvares-Verdugo, Milagros, *Will Climate Change Alter the NPT Political Balance? New Challenges for the Nonproliferation Regime*, 21 Eur. J. Int'l L. 205 (2010).

Hill, Michael, *NEPA at the Limits of Risk Assessment: Whether to Discuss a Potential Terrorist Attack on a Nuclear Power Plant Under the National Environmental Policy Act*, 78 Fordham L. Rev. 3007 (2010).

Hiorth, Megan, *Are Traditional Property Rights Receding With Renewable Energy on the Horizon?*, 62 Rutgers L. Rev. 527 (2010).

Joselson, Emily & Kevin Brown, *Propane Explosions in Snow Country: High Time to Abandon Ownership as the Touchstone of Liability*, 34 Vt. L. Rev. 633 (2010).

Kiernan, Paul M. et al., *International Energy and Natural Resources*, 44 Int'l Law. 367 (2010).

Papavizas, Constantine G. & Gerald A. Morrissey III, *Does the Jones Act Apply to Offshore Alternative Energy Projects?*, 34 Tul. Mar. L.J. 377 (2010).

Reeder, Laura C., *Creating a Legal Framework for Regulation of Natural Gas Extraction From the Marcellus Shale Formation*, 34 Wm. & Mary Envtl. L. & Pol'y Rev. 999 (2010).

Reitze, Arnold W. Jr., *Electric Power in a Carbon Constrained World*, 34 Wm. & Mary Envtl. L. & Pol'y Rev. 821 (2010).

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Cruden, John C., *Comment on* Environmental Enforcement in Dire Straits: There Is No Protection for Nothing and No Data for Free, 41 ELR 10686 (Aug. 2011).

Downes, David R. et al., *International Environmental Law*, 44 Int'l Law. 503 (2010).

Farrens, Thomas C., *Shrinking Ice, Growing Problems: Why We Must Act Now to Solve Emerging Problems Posed by an Ice-Free Arctic*, 19 Transnat'l L. & Contemp. Probs. 655 (2010).

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Francioni, Francesco, *International Human Rights in an Environmental Horizon*, 21 Eur. J. Int'l L. 41 (2010).

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Schaeffer, Eric V., *Measuring Enforcement's Value: One Step at a Time*, 41 ELR 10689 (Aug. 2011).

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Dranias, Nick, *The Local Liberty Charter: Restoring Grassroots Liberty to Restrain Cities Gone Wild*, 3 Phoenix L. Rev. 113 (2010).

Michael, Jeffrey A. & Raymond B. Palmquist, *Environmental Land Use Restriction and Property Values*, 11 Vt. J. Envtl. L. 437 (2010).

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Coldwell, Heather Ahlstrom, *Fee Simple Estate and Footholds in Fishing: The Australian High Court's Formalistic Interpretation of the Aboriginal Land Rights Act*, 19 Pac. Rim L. & Pol'y J. 303 (2010).

Knudsen, Sanne, *A Precautionary Tale: Assessing Ecological Damages After the* Exxon Valdez *Oil Spill*, 7 U. St. Thomas L.J. 95 (2009).

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Echeverria, John D., *Is Regulation of Water a Constitutional Taking?*, 11 Vt. J. Envtl. L. 579 (2010).

Green, Bryan A., *The Guarani Aquifer and International Groundwater Law: Advancing Towards a Legal Framework for the Management of a Transboundary Aquifer*, 13 U. Denv. Water L. Rev. 361 (2010).

Kwasniak, Arlene J., *Water Scarcity and Aquatic Sustainability: Moving Beyond Policy Limitations*, 13 U. Denv. Water L. Rev. 321 (2010).

Mendez, Tessa, *Thin Ice, Shifting Geopolitics: The Legal Implications of Arctic Ice Melt*, 38 Denv. J. Int'l L. & Pol'y 527 (2010).

Sakyi, Adrienne M., *Mitigation Banking: Is State Assumption of Permitting Authority More Effective?*, 34 Wm. & Mary Envtl. L. & Pol'y Rev. 1027 (2010).

Symposium, *Changing Currents: Perspectives on the State of Water Law and Policy in the 21st Century*, 23 Tul. Envtl. L.J. 253 (2010).

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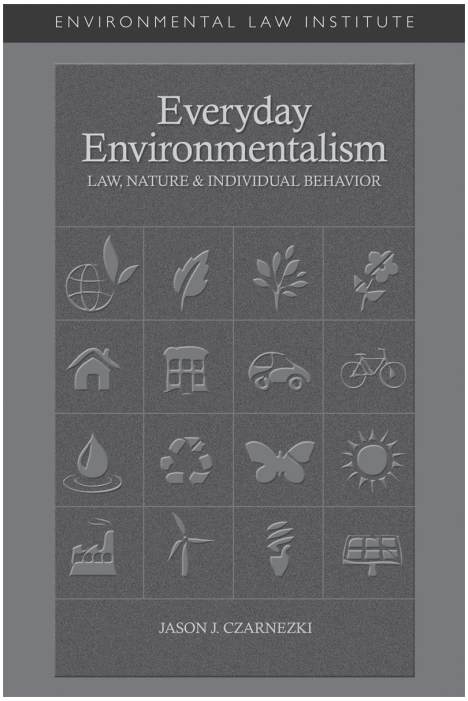

Jason J. Czarnezki is a Professor of Law in the Environmental Law Center at Vermont Law School, home to one of the nation's leading environmental and natural resources law and policy programs. Previously, Professor Czarnezki served as a law clerk to the Honorable D. Brock Hornby of the U.S. District Court for the District of Maine and as a law clerk for the Bureau of Legal Services at the Wisconsin Department of Natural Resources. Professor Czarnezki received his undergraduate and law degrees from the University of Chicago.

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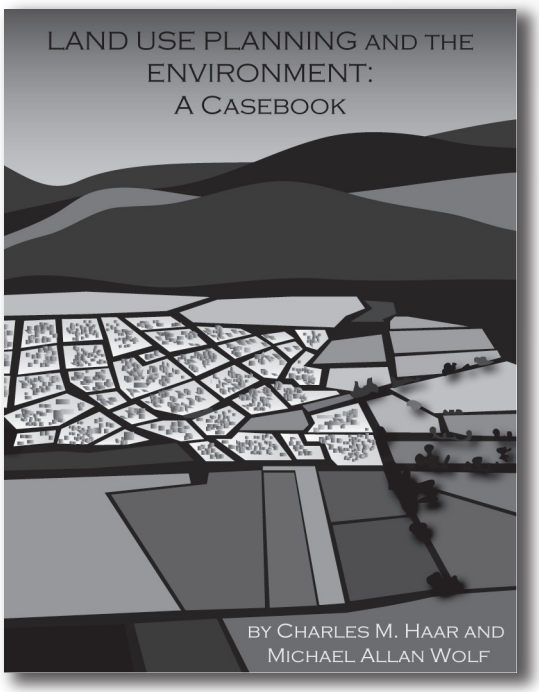

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Charles M. Haar, Brandeis Professor of Law, Harvard University, and visiting member, Institute for Advanced Study, Princeton, has been a leading scholar in land use planning, urban redevelopment, and environmental law for more than six decades. **Michael Allan Wolf** is the Richard E. Nelson Chair in Local Government Law at the University of Florida Levin College of Law. He is the general editor of Powell on Real Property, the leading treatise on the subject.

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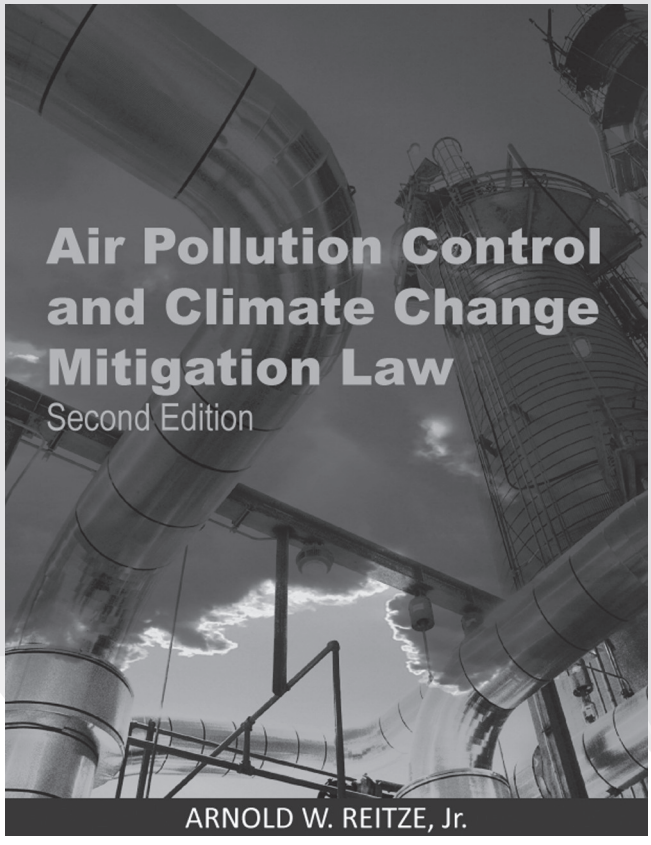

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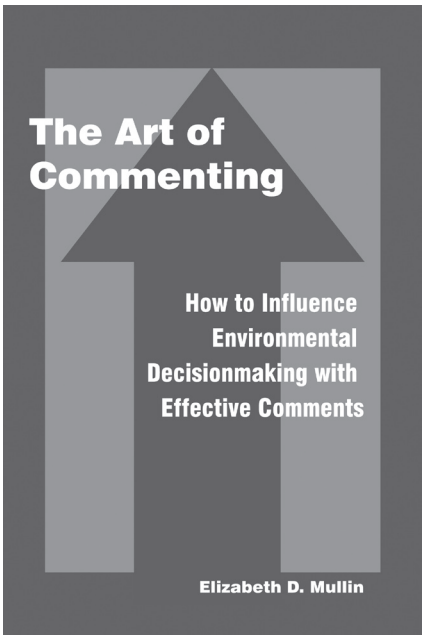

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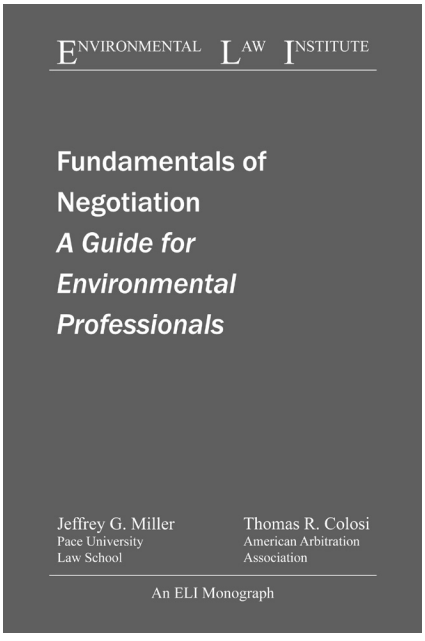

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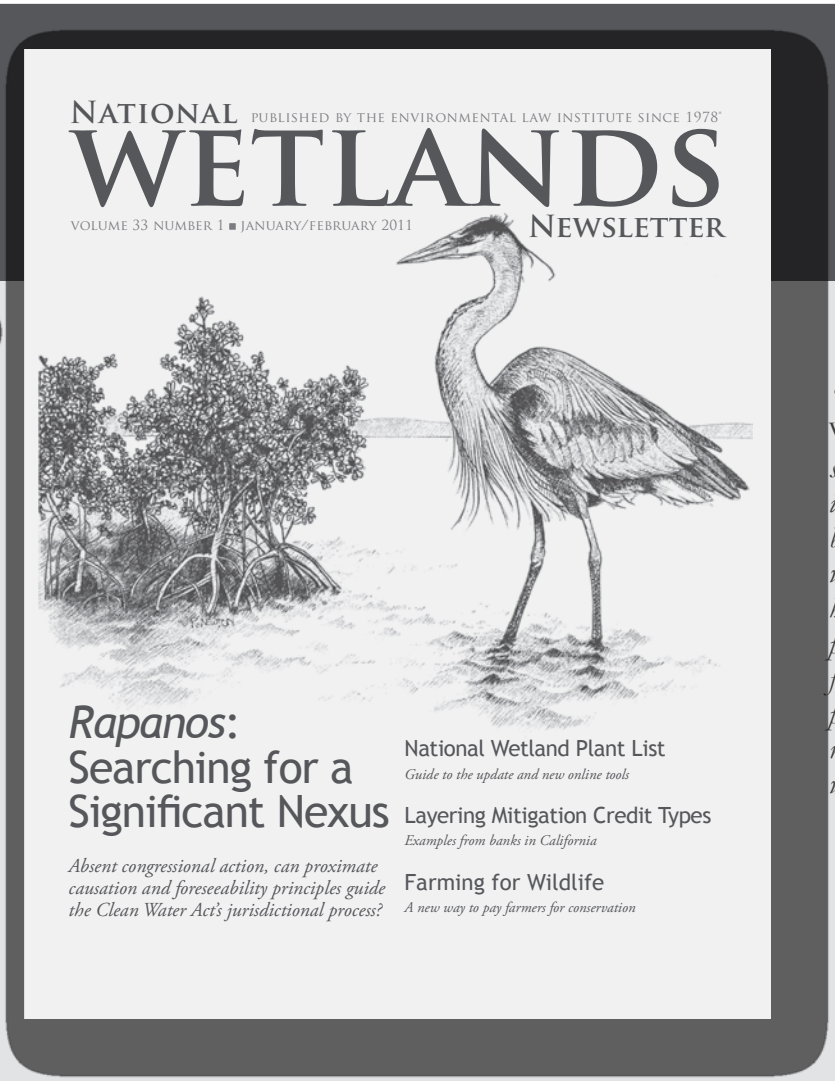

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