



**School of Law
University of California, Davis**

**400 Mrak Hall Drive
Davis, CA 95616
530.752.0243
<http://www.law.ucdavis.edu>**

UC Davis Legal Studies Research Paper Series

Research Paper No. 144
September 2008

**Of Babies and Bathwater: Why the Clean Air Act's Cooperative
Federalism Framework is Useful for Addressing Global Warming**

Holly Doremus
W. Michael Hanemann

This paper can be downloaded without charge from
The Social Science Research Network Electronic Paper Collection:
<http://ssrn.com/abstract=1155476>

OF BABIES AND BATHWATER: WHY THE CLEAN AIR ACT'S COOPERATIVE FEDERALISM FRAMEWORK IS USEFUL FOR ADDRESSING GLOBAL WARMING

Holly Doremus^{*}
W. Michael Hanemann^{**}

I. INTRODUCTION

Much attention is currently focused on carbon dioxide emission trading programs at the international, national, regional, and state levels as the instrument of choice for solving the global warming problem. We have no quarrel with the idea that cap-and-trade strategies should play a role in addressing greenhouse gas (GHG) emissions – trading is a politically palatable and cost-effective way to address some of the “low-hanging fruit” of GHG emissions. But enthusiasm for trading has become so pervasive that it threatens to drive out interest in other policy instruments. We do have a quarrel with that.

Trading is useful for addressing some, but by no means all, aspects of the greenhouse gas problem. Although trading has worked well for some air pollution problems, global climate change presents a much bigger challenge. Achieving emission reductions on a large enough scale and rapidly enough to prevent the most extreme manifestations of climate change will require substantial changes in behavior by a wide swath of actors – consumers as well as producers – in all economic sectors in high-emission nations such as the United States. It will also require notable technological advances. The changes needed are qualitatively different and more profound than those attained by past emission trading programs. Experience with those earlier programs suggests that emission trading alone is not likely to be sufficient to motivate those changes.

* Professor of Law, University of California, Berkeley, and University of California, Davis. Thanks to Kirsten Engel and David Adelman for the invitation to participate in this stimulating Symposium, and to Rena Steinzor and Daniel Farber for extraordinarily helpful comments on an earlier draft of this paper.

** Chancellor's Professor, Department of Agricultural and Resource Economics, University of California, Berkeley.

A cooperative federalism framework modeled on that of the Clean Air Act could help fill some of the gaps that a carbon emission trading strategy will inevitably leave. At least some of EPA's current reluctance to address greenhouse gas emissions through the Clean Air Act is due to the belief that the Act is not a good fit for the climate change problem. In some respects we agree with that assessment, but it risks throwing the baby out with the bathwater. The Clean Air Act has much to offer a nation committed to reducing its carbon footprint. In particular, applying key features of the Clean Air Act to the climate change problem can encourage behavioral change and technological innovation in a way that emission trading alone cannot.

Given this Symposium's focus on the respective roles of state and federal entities within the U.S. in responding to the threat of climate change, we concentrate here on the Clean Air Act's cooperative federalism structure. The nation's strategy for dealing with GHG emissions should employ a similar structure. The keystone for encouraging behavioral change (or reducing the GHG emissions tied to individual behavioral choices) should be a state emission inventory and emission reduction plan, modeled on the Clean Air Act's State Implementation Plan requirement. The states are in a better position than either the federal government or the market to address the individual behaviors responsible for a large proportion of the nation's GHG emissions; indeed, many states are already taking steps to do so. Federal climate change legislation should acknowledge the states' legal and political advantages, and leverage their enthusiasm. We realize that the Clean Air Act has not been a rousing success so far at changing individual behavior. Over the past four decades, vehicle miles traveled have continuously increased, offsetting technological improvements in tailpipe emissions, in large part because state and local authorities have resisted the hard political work of changing driving behaviors. Nonetheless, we view reforming and reinforcing existing state and local planning and implementation roles as a more promising strategy than beginning from the ground up with an entirely new framework or leaving everything to an emission market.

Beyond a state planning and implementation process, two aspects of the Clean Air Act could be borrowed to encourage technological innovation. First, EPA should be required to develop tailpipe GHG emission standards for mobile sources, with California allowed to adopt its own, more stringent, requirements. Second, federal technology-based standards should be developed for stationary sources, while allowing states or local governments to impose more stringent emission limitations as they see fit.

II. EMISSION TRADING: PAST, PRESENT AND FUTURE

The idea of marketable pollution allowances first gained currency in the 1960s and 70s, when a number of economists pointed out its theoretical efficiency advantages.¹ Soon, limited trading initiatives were being implemented in a variety of air pollution contexts. EPA endorsed the use of offsets, bubbles, banking, and netting²

1. See, e.g., John H. Dales, *Pollution, Property and Prices: An Essay in Policy-Making and Economics* (1968); W. David Montgomery, *Markets in Licenses and Efficient Pollution Control Programs*, 5 *J. Econ. Theory* 395 (1972); William J. Baumol & Wallace E. Oates, *The Theory of Environmental Policy* (1975).

2. For a brief explanation of those terms, see Inho Choi, *Global Climate Change*

to increase flexibility and reduce the costs of compliance with technology-based emission regulations applicable to new and modified stationary sources;³ allowed trading between refineries to cushion the costs of the phase-down of lead in gasoline, leading to more rapid reductions at lower cost;⁴ and developed a tradeable permit program to help the United States meet its obligations to reduce chlorofluorocarbon production under the Montreal Protocol.⁵

By the mid-1980s, legal academics were urging much broader use of the cap-and-trade strategy.⁶ In the 1990 Clean Air Act, advocates of pollution trading programs won a major victory. Congress required fossil-fuel-burning electric power plants, by far the largest sources of the emissions responsible for acid rain, to obtain allowances for every ton of SO₂ they emitted.⁷ The total number of allowances was capped and the cap was reduced over time to ensure the emissions reductions Congress deemed necessary.⁸ Allowances were made freely tradable, so that plants with lower emission-control costs could sell their excess allowances to others facing higher costs.

The acid rain trading program has been proclaimed “an enormous success,” at least from a cost-benefit perspective.⁹ SO₂ emissions have been reduced at a faster rate

and the Use of Economic Approaches: The Ideal Design Features of Domestic Greenhouse Gas Emissions Trading With an Analysis of the European Union's CO₂ Trading Directive and the Climate Stewardship Act, 45 NAT. RES. J. 865, 892 n.90 (2005).

3. Environmental Protection Agency, Emission Trading Policy Statement, General Principles for Creation, Banking and Use of Emission Reduction Credits, Final Policy, 51 Fed. Reg. 43,814, 43,830 (1986); Robert W. Hahn & Gordon L. Hester, *Where Did All the Markets Go? An Analysis of EPA's Emissions Trading Program*, 6 Yale J. Reg. 109 (1989). Like Hahn and Hester, a recent report from the Pew Center concludes that these trading programs have been little used because of burdensome administrative restrictions and accompanying high transaction costs. A. Denny Ellerman, Paul L. Joskow & David Harrison, Jr., Emissions Trading in the U.S.: Experience, Lessons, and Considerations for Greenhouse Gases 8-9 (Report Prepared for the Pew Center on Global Climate Change, May 2003).

4. See Regulation of Fuel and Fuel Additives, 47 Fed. Reg. 49,322 (1982); Regulation of Fuel and Fuel Additives: Gasoline Lead Content, 50 Fed. Reg. 9,386 (1985); Regulation of Fuel and Fuel Additives, Banking of Lead Rights, 50 Fed. Reg. 13,116 (1985); Robert W. Hahn, *Economic Prescriptions for Environmental Problems: How the Patient Followed the Doctor's Orders*, 3 J. Econ. Perspectives 95, 101-03 (1989); Ellerman et al., *supra* note [2], at 9-11.

5. Richard B. Stewart, *A New Generation of Environmental Regulation?*, 29 Capital U. L. Rev. 21, 110 (2001). There appears to have been little trading under this program. Robert N. Stavins, *Economic Incentives for Environmental Regulation*, in 2 *The New Palgrave Dictionary Of Economics And The Law* 6 (Peter Newman, ed., 1998), cited in Sangmin Shim, *Korea's Leading Role in Joining the Kyoto Protocol with the Flexibility Mechanisms as "Side Payments"*, 15 Geo. Int'l Envtl. L. Rev. 203, 208 (2003).

6. See Bruce A. Ackerman & Richard B. Stewart, *Reforming Environmental Law*, 37 Stan. L. Rev. 1333 (1985).

7. 42 U.S.C. §§ 7651 – 7651o.

8. 42 U.S.C. § 7651b(a), 7651d(a).

9. Richard B. Stewart, James L. Connaughton, and Lesley C. Foxhall, *Designing an International Greenhouse Gas Emissions Trading System*, Natural Resources & Env't, Winter 2001, at 160, 162.

and at considerably lower cost than expected.¹⁰ By 2005, SO₂ emissions from the power plants included in the program had fallen 35% from 1990 levels.¹¹ The program is generally regarded as a triumph of cost-effectiveness. One study estimates that the program will provide benefits worth \$122 million annually at a cost of about \$3 million annually when its reductions are fully implemented in 2010.¹² Another finds that pollution abatements under the acid rain trading program have cost 57% less than they would have if achieved through traditional regulation.¹³ Some of the savings, however, may not be due to emission trading. At roughly the same time that the acid rain program was initiated, low-sulfur coal became more widely available at lower cost, reducing the need to retrofit power plants with scrubbers.¹⁴ It is also worth noting that acid rain remains a serious problem. A 2001 study concluded that power plants must cut SO₂ emissions an additional 80% in order to allow sensitive waters and soils in the northeast to recover.¹⁵

The success of the acid rain program helped accelerate enthusiasm for emission trading. Today, as David Driesen puts it, EPA “rarely develops any pollution control program without including some form of environmental trading within it.”¹⁶ In 2005, for example, the Bush administration issued rules encouraging states to join a cap-and-trade program for SO₂ and NO_x,¹⁷ and attempted to create a trading program for mercury emissions from coal-fired power plants.¹⁸ While some academics have expressed doubts about the effectiveness, administrative costs, and equity

10. *Id.*; U.S. General Accounting Office, *Air Pollution: Allowance Trading Offers an Opportunity to Reduce Emissions At Less Cost* 37-41 (Dec. 1994); Byron Swift, *U.S. Emissions Trading: Myths, Realities, and Opportunities*, *Natural Resources & Env't*, Summer 2005, at 3, 5-6.

11. EPA, *Acid Rain Program, 2005 Progress Report 2* (October 2006).

12. Lauraine G. Chestnut and David M. Mills, *A Fresh Look at the Benefits and Costs of the U.S. Acid Rain Program*, 77 *Env'tl. Mgmt.* 252 (2005).

13. Ellerman et al., *supra* note [], at 15.

14. Curtis A. Moore, *The 1990 Clean Air Act Amendments: Failing the Acid Test*, 34 *Env'tl. L. Rep.* 10366, 10379 (2004).

15. See Kevin Krajick, *Long-Term Data Show Lingering Effects from Acid Rain*, 292 *Science* 195 (2001). See also Curtis A. Moore, *The 1990 Clean Air Act: Failing the Acid Test*, 34 *ENVTL. L. REP.* 10366, 10377 (2004) (noting that many lakes in New England and New York remain acidic and are likely to do so for decades).

16. David M. Driesen, *Trading and Its Limits*, 14 *Penn. St. Env'tl. L. Rev.* 169, 169 (2006). See also A. Denny Ellerman, Paul L. Joskow & David Harrison, Jr., *Emissions Trading in the U.S.: Experience, Lessons, and Considerations for Greenhouse Gases*, *Pew Center on Global Climate Change* iii (May 2003), available at http://www.pewclimate.org/global-warming-in-depth/all_reports/emissions_trading (“most major air quality improvement initiatives in the United States now include emissions trading as a component”).

17. EPA, *Rule to Reduce Interstate Transport of Fine Particulate Matter and Ozone (Clean Air Interstate Rule); Revisions to Acid Rain Program; Revisions to the NOx SIP Call*, 70 *Fed. Reg.* 25,162 (2005).

18. EPA, *Standards of Performance for New and Existing Stationary Sources: Electric Utility Steam Generating Units*, 70 *Fed. Reg.* 28606 (2005). The Clean Air Mercury Rule, as EPA called its trading system, was short-lived; it was struck down in *New Jersey v. EPA*, 517 F.3d 574 (D.C. Cir. 2008).

consequences of emission trading,¹⁹ trading strategies now dominate most discussions of air pollution policy. The question has shifted from whether trading should be used to how to design a trading program that will achieve environmental improvement while holding down costs.

Carbon dioxide emissions seem particularly well suited to a cap-and-trade approach. As Victor Flatt and Carol Rose, among others, have noted, CO₂ emissions are extraordinarily fungible, in time as well as in space. Carbon dioxide trades do not threaten to create hazardous pollution hot-spots, a problem that has caused environmentalists to resist some other trading proposals.²⁰ In addition, there are substantial differences in the costs of controlling emissions “among different economic sectors, different nations, or even different business units of the same company.”²¹ Finally, greenhouse gas emissions, because they are an inevitable product of fossil fuel consumption, can be estimated fairly reliably and inexpensively by using fuel consumption as a proxy.²² With this combination of features, carbon trading promises substantial cost savings without an environmental downside.²³

It should come as no surprise, then, that virtually every level of government to address, or talk about addressing, climate change has focused on greenhouse gas emission trading as a key strategy,²⁴ because it promises the least economic pain for a given level of environmental gain.²⁵ In a recently released report, for example, the House Committee on Energy and Commerce explains that cap-and-trade should be the cornerstone of any climate change program because it has the ability “to reduce greenhouse gas emissions to a specified level at the lowest possible overall cost to

19. See, e.g., David M. Driesen, *Trading and Its Limits*, 14 Penn. St. Envtl. L. Rev. 169 (2006); Lesley K. McAllister, *Beyond Playing “Banker”: The Role of the Regulatory Agency in Emissions Trading*, 59 Admin. L. Rev. 269 (2007); Alice Kaswan, *Environmental Justice and Domestic Climate Change Policy*, 38 Envtl. L. Rep. 10287 (2008).

20. See, e.g., Victor B. Flatt, *Taking the Legislative Temperature: Which Federal Climate Change Legislative Proposal is “Best”?*, 102 Nw. U. L. Rev. Colloquy 123, 136 (2007); Carol M. Rose, *Hot Spots in the Legislative Climate Change Proposals*, 102 Nw. L. Rev. Colloquy 189, 190 (2007). Of course, because CO₂ is primarily a product of fossil fuel combustion, typical major CO₂ sources also emit other more localized pollutants, so that trading could create hot spots of co-emitted pollutants. Kaswan, *supra* note [16] at 10298-301.

21. Richard B. Stewart, James L. Connaughton, & Lesley C. Foxhall, *Designing an International Greenhouse Gas Emissions Trading System*, Natural Resources & Env't, Winter 2001, at 160, 162.

22. Ellerman et al., *supra* note [], at 40-41.

23. Stewart and colleagues peg the potential savings at 80 percent or more of the costs of reducing emissions using traditional command and control regulation. *Id.*

24. As Lesley McAllister has put it, “cap and trade regulation is the regulatory instrument of choice in almost all policy initiatives to reduce greenhouse gas emissions at the regional, national, and international scales.” Lesley K. McAllister, *Beyond Playing “Banker”: The Role of the Regulatory Agency in Emissions Trading*, 59 Admin. L. Rev. 269, 271 (2007).

25. The emphasis on cap-and-trade is especially striking in light of a 2007 survey which concluded that Americans were considerably more supportive of regulatory standards than of cap-and-trade or emission taxes. Peter Aldhous, *Exclusive Global Warming Poll: The Buck Stops Here*, New Scientist, June 20, 2007, available at <http://environment.newscientist.com/article/mg19426091.500>.

society and to lower the cost for regulated entities.”²⁶ To date, all of the major federal proposals focus on cap-and-trade,²⁷ with the major differences being sector coverage and emission reduction targets. The only bill to advance beyond committee review relies almost entirely on cap-and-trade.²⁸ States are equally enthusiastic; three different regional partnerships are in the process of developing cap-and-trade systems.²⁹ Internationally, the European Union has a full-fledged trading market³⁰ designed to help it meet its Kyoto Protocol emission target. Two states in Australia (where, as in the United States, the federal government has been slow to act) have launched their own trading programs.³¹ The “G8+5,”³² which includes the world’s eight largest developed economies and the five largest developing nations, have agreed to work toward a global carbon market.³³

In sum, carbon trading is already the dominant global strategy for addressing climate change, and looks as though it may push everything else out of the picture at

26. Staff, U.S. House of Representatives, Committee on Energy and Commerce, *Climate Change Legislation Design White Paper: Getting the Most Greenhouse Gas Reductions for our Money 1* (May 2008), available at http://energycommerce.house.gov/Climate_Change/Climate%20Change%20White%20Paper-Cost%20Containment.052708.pdf. The White Paper acknowledges that “complementary measures” beyond cap-and-trade should be examined to see if they “might achieve economically beneficial or low-cost greenhouse gas reductions that might not be achieved solely through the cap-and-trade program.” *Id.* at 3.

27. Indeed, all the climate bills that had been introduced as of 2007 used either cap-and-trade or a carbon tax as their primary strategy. Victor B. Flatt, *Taking the Legislative Temperature: Which Federal Climate Change Legislative Proposal is “Best”?*, 102 Nw. U. L. Rev. Colloquy 123, 135 (2007). See also John C. Dernbach, *Harnessing Individual Behavior to Address Climate Change: Options for Congress*, 26 Va. Envtl. L. J. 107, 111-14 (2008) (describing the major bills).

28. S. 3036, 110th Cong., 2d Sess. (2008). This bill, a descendant of the Lieberman-Warner Climate Security Act introduced by Barbara Boxer (D-CA), was pulled from the Senate floor by the democratic leadership after they were unable to block a Republican filibuster. Juliet Eilperin, *Senate Leaders Pull Measure on Climate Change*, Wash. Post, June 7, 2008, at A3.

29. The Regional Greenhouse Gas Initiative involves northeastern and mid-Atlantic states, see Regional Greenhouse Gas Initiative, An Initiative of the Northeast and Mid-Atlantic States of the U.S., <http://www.rggi.org/>; a group of midwestern states have launched the Midwest Greenhouse Gas Reduction Program, Midwestern Governor’s Association, Midwestern Greenhouse Gas Accord 2007 (Nov. 15, 2007), available at <http://www.midwesternaccord.org/midwesterngreenhousegasreductionaccord.pdf>; and a group of western states and Canadian provinces have established the Western Climate Initiative, see Western Regional Climate Action Initiative (Feb. 26, 2007), available at <http://www.westernclimateinitiative.org/ewebeditpro/items/O104F12775.pdf>.

30. See European Commission, Environment, Emission Trading Scheme, <http://ec.europa.eu/environment/climat/emission.htm>

31. Rosemary Lyster, *Separating the Wheat from the Chaff: Regulating Greenhouse Gases in a Climate of Uncertainty*, University of Sydney, Sydney Law School, Legal Studies Research Paper No. 08/42 at 14 (April 2008), available at <http://ssrn.com/abstract=1120705>.

32. The G8 includes the world’s dominant developed economies: Canada, France, Germany, Italy, Japan, Russia, the United Kingdom and the United States. The “+5” are the five largest developing nations: Brazil, China, India, Mexico, and South Africa.

33. Catherine Brahic, *Leading Nations Find Agreement on Climate Change*, New Scientist, Feb. 16, 2007.

the U.S. federal level. While there has been considerable discussion of the specific design of carbon trading programs, including how allowances should be allocated and how emissions and offsets will be monitored,³⁴ there has been very little discussion of the ways in which a trading strategy may fall short of addressing the problem of global warming. We view that as a serious omission.³⁵

III. GAPS LEFT BY AN EMISSIONS TRADING STRATEGY

The global warming problem is unlike acid rain or the other air pollution problems for which trading strategies are generally regarded as having been successful. To put it simply, global warming is a much tougher nut to crack. Although the levels of emission cuts being called for vary, every formulation of the goal is intimidating. The science academies of the G8 +5 nations recently issued a joint statement urging government leaders to commit to reducing global emissions to half their current levels by 2050.³⁶ Others argue that even more extreme reductions, to 80% below 1990 levels by mid-century, are required to prevent dangerous climate change.³⁷ The numbers are staggering: global anthropogenic greenhouse gas emissions were about 49 billion metric tons of CO₂ equivalents per year in 2004, which is 24% more than the 1990 levels often taken as the baseline for comparisons.³⁸ Emissions in the

34. See, e.g., Stewart et al., *supra* note []; Gary C. Bryner, *Carbon Markets: Reducing Greenhouse Gas Emissions Through Emissions Trading*, 17 Tulane Env'tl. L. J. 267 (2004); Justin Kirk, *Creating an Emissions Trading System for Greenhouse Gases: Recommendations to the California Air Resources Board*, 26 Va. Env'tl. L. J. 547 (2008); Carol M. Rose, *From H₂O to CO₂: Lessons of Water Rights for Carbon Trading*, 50 Ariz. L. Rev. 91 (2008).

35. California regulators have recognized the need for more than a market-based approach. Mary Nichols, chair of the California Air Resources Board, the agency charged with implementing AB 32, the law that requires the state to reduce emissions to 1990 levels by 2020, has said that she expects about 60% of the cuts to come through targeted regulations, which may allow some compliance through trading, with the rest sought through a broader, economy-wide cap-and-trade approach. Debra Kahn, *California: More than Half of State's Emission Cuts to Be Achieved Through Regulation*, ClimateWire, May 14, 2008.

36. Joint Science Academies Statement: Climate Change Adaptation and the Transition to a Low Carbon Society, June 2008, available at <http://royalsociety.org/downloaddoc.asp?id=5450>. A group of more than 200 climate scientists endorsed the goal of reducing emissions 50% from 1990 levels at the U.N.'s Bali climate change conference in December, 2007. Narelle Towie, *Scientists Issue Declaration at Bali*, Nature News, Dec. 6, 2007, available at <http://www.nature.com/news/2007/071206/full/news.2007.361.html>. The leaders of the G8 nations agreed to that goal at their July 2008 meeting, but resisted calls to set a firm goal for reductions by 2020. Sheryl Gay Stolberg, *G-8 Leaders Pledge to Cut Emissions in Half by 2050*, N.Y. TIMES, July 9, 2008.

37. Martin Parry, Jean Palutikof, Clair Hanson & Jason Lowe, *Squaring Up to Reality*, 2 Nature Reports: Climate Change 68 (2008). The authors expect that this level of reduction would stabilize the global atmospheric concentration of CO₂ at between 400 and 470 ppm. If emissions are merely halved by 2050, they assert, there is a better than even chance that 1 billion people would be short of water by that point, and 2 billion could be in that situation by 2100. *Id.* at 69.

38. Intergovernmental Panel on Climate Change, Contribution of Working Group III to the Fourth Assessment Report, Summary for Policymakers 3-4 (2007), available at <http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-spm.pdf>.

United States have not increased as rapidly, but are still up 15% since 1990.³⁹ The State Department projects that U.S. emissions will continue to increase, and could be up as much as an additional 23% by 2020, depending on how aggressively current climate change policies are implemented.⁴⁰ Even to achieve the most modest proposed goals will require a Herculean effort, reducing current emissions by nearly two-thirds. If the more pessimistic scientists are right, emissions must be cut to one-tenth of current levels within 30 or 40 years..

Large as they are, these numbers may not seem intimidating in light of the acid rain experience. Between 1995 and 2006, SO₂ emissions from the electric utility sector were reduced by about 40%.⁴¹ But the acid rain problem could be addressed by changing fuels and adopting existing emission-control technologies. Such simple steps will not be enough to control global warming. At the moment, there is no effective technology for removing CO₂ from emissions. That means there are only two pathways available for reducing the severity of impending climate change: consuming dramatically less fossil fuel, or developing novel methods for capturing and sequestering greenhouse gases. Given the enormity of the challenge, we will surely need both drastic behavioral shifts and radical technological innovation. Neither is likely to be supplied by a carbon market alone.

To understand why emission trading is likely to be inadequate as the sole tool for controlling greenhouse gas emissions, it is necessary to start with a brief summary of the economic theory underlying emission trading. It turns out that the actual experience with emission trading differs in some significant ways from what the theory posits. Moreover, there are some important physical and economic differences between greenhouse gas emissions and the problems which have been tackled by emission trading in the past. Because of the differences, emission trading is not likely to succeed as comprehensively for greenhouse gases as it did for these other pollutants.

A. The Basics of Emission Trading

An emission trading system contains two components: caps on emissions by specified sources and the freedom for these entities to trade unused emission allowances. Both the caps and the trading system influence the outcome with respect to the extent of aggregate emissions reduction and the aggregate costs of that reduction.

The caps are, in principle, no different than what might be done under conventional, command-and-control regulation of air or water pollution. In practice, however, the two have worked somewhat differently. Some conventional pollution regulations have been framed around particular production or abatement technologies; although as a matter of law those regulations require only that polluters meet performance metrics achievable by the use of specified reference technologies, in

39. Energy Information Administration, Emissions of Greenhouse Gases Report, <http://www.eia.doe.gov/oiaf/1605/ggrpt/carbon.html#total>.

40. U.S. Dept. of State, U.S. Climate Action Report -- 2006 at 63 (July 2007), available at <http://www.state.gov/g/oes/rls/rpts/car/>.

41. EPA, Office of Air and Radiation, Clean Air Markets Division, Acid Rain and Related Programs, 2006 Progress Report 3 (undated), available at <http://www.epa.gov/airmarkets/progress/docs/2006-ARP-Report.pdf>.

practice they have strongly encouraged risk-averse polluters to adopt those reference technologies. By contrast, past market strategies have focused specifically on emissions. In practice, they have operated as purer performance standards than many regulations: they set an emission target and left it to producers to figure out for themselves how best to meet the target. A performance standard is the theoretically preferred regulatory approach because it is likely to promote emission reduction at minimum cost.⁴² The emission trading systems for SO₂ and lead succeeded in part because they adopted a performance cap, rather than because they allowed trading.⁴³

In addition, much depends on how the caps are set, meaning both who sets them (the point of regulation) and at what level. With respect to the level at which the caps were set, the acid rain program began with a firm declared intention to reduce aggregate emissions substantially – by over 50% compared to the level in the early 1980s. By contrast, in Phase 1 of the EU Emission Trading System (ETS), the allocations turned out to be overly generous, requiring relatively little emission reduction.⁴⁴ This is further evidence that the cap itself is sometimes the crucial component of an emission trading system.⁴⁵

With respect to the point of regulation, there is an important distinction between leaded gasoline, SO₂, or NO_x and greenhouse gases. With leaded gasoline, there was a single source, namely refineries; therefore, the caps were set on individual refineries. With SO₂ and NO_x, there were many different sources, but in both cases there was a single dominant source, electricity generation, which accounted for about two-thirds of all emissions. Hence, it was natural to focus regulation on electricity generation and to cap individual generating units. With greenhouse gases, by contrast, there are multiple pollutants and multiple sources. Carbon dioxide accounted for

42. An exception is when an emission limit based on a particular technology serves as a forcing element to bring into use a technology that would not otherwise be deployed, for example by making the technology more visible or salient than it would otherwise be.

43. Dallas Burtraw, *The SO₂ Emission Trading Program: Cost Savings Without Allowance Trades*, 14(2) *Contemp. Econ. Pol'y*, 79, 79 (1996), observed in the first year of SO₂ emission trading:

To date, relatively little allowance trading has taken place; however, the costs of compliance have been much less than anticipated. The purpose of this paper is to address the apparent paradox—that the allowance trading program may not require (very much) trading to be successful. Title IV represented two great steps forward in environmental regulation: first a move toward performance standards and second formal allowance trading. The first step has been sufficient to date for improving dynamic efficiency and achieving relative cost-effectiveness.

44. The same was true of the RECLAIM program in the South Coast Air Basin; when the program became operational in 1994, the emission caps in many cases exceeded the existing levels of emission. Hence, at first the program produced relatively little reduction in emissions. See Richard Toshiyuki Drury et al., *Pollution Trading and Environmental Injustice: Los Angeles' Failed Experiment in Air Quality Policy*, 9 *DUKE ENVTL. L. & POL'Y F.* 231, 263-64 (1999).

45. Acid rain allowances may have been cheap in part because they, too, were provided too generously. As noted above, see *supra* note [15], acid rain remains a problem in the northeast, and insufficient control of NO_x emissions has allowed it to become a problem in the west as well.

nearly 85% of the 7 billion metric tons of CO₂-equivalent greenhouse gas emissions in the United States in 2006; but methane, nitrous oxides, and other gases also contributed.⁴⁶ About 96% of the CO₂ came from the combustion of fossil fuels, with the rest from changes in land use (deforestation, etc). The methane came mainly from landfills and cows.⁴⁷ Electricity generation accounted for about one-third of all CO₂-equivalent emissions; the next largest source was transportation, which accounted for 27 percent.⁴⁸ Therefore, a regulatory strategy that just caps emissions from electricity generating units – such as the RGGI emission trading system in the northeastern states – is unlikely to provide the scale of greenhouse gas reduction required to address the problem of global warming.⁴⁹

Focusing just on CO₂ emissions from fossil fuels for simplicity, emission caps can be implemented in two distinct ways.⁵⁰ One approach involves what are known as *upstream* allocations, allowance requirements placed on CO₂ emissions at each point of entry of fossil fuels into the economy: coal, oil and natural gas production and import and, where appropriate, import of major products derived from the combustion of fossil fuels such as electricity. The other approach involves *downstream* allocations for major facilities that use fossil fuels throughout the economy: refineries, cement producers, aluminum producers, electricity generating units, etc.⁵¹ The downstream approach is similar to what was done with leaded gas, SO₂, and NO_x, but it involves a much larger and more heterogeneous set of regulated entities spanning multiple sectors of the economy rather than a single sector (refining or electricity generation), and therefore requires more complex and costly monitoring.

As indicated earlier, the other component of emission trading is the granting of permission for regulated entities to exceed their caps by obtaining emission permits to cover their excess emissions. From an economic perspective, this has two aspects: (1) the possibility of buying permits to cover excess emissions provides flexibility and

46. EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006 at 2-4 (Apr. 15, 2008), available at <http://www.epa.gov/climatechange/emissions/usinventoryreport.html>.

47. *Id.*

48. In California, electricity generation accounts for only one fifth of CO₂-equivalent emissions, and transportation for two fifths.

49. AB 32, California's Global Warming Solutions Act of 2006, Cal. Health & Safety Code §§ 38500-38599, requires an overall reduction of greenhouse gas emissions to 1990 levels by 2020, a 15% reduction from 2005 emissions and a 29% reduction from what would be expected in 2020 under a "business-as-usual" scenario. The EU has adopted a target for Phase 2 in 2020 of a 20% reduction below the Phase 1 level attained in 2008.

50. For a more complete explanation of "upstream" and "downstream" cap-and-trade approaches, see, e.g., John C. Dernbach & Seema Kakade, *Climate Change Law: An Introduction*, 29 ENERGY L.J. 1, 29 (2008).

51. The entities capped could also include those whose activities are conducive to the use of fossil fuels. For example, California's Pavley Bill, AB 1493, requires automakers to reduce greenhouse gas emissions from new cars beginning with model year 2009, with progressive reductions up to about 30% by model year 2016. The cap is applied to the aggregate emissions of new cars in each model year sold in California by each automaker. However, if an automaker would be in violation of the cap, the regulations permit it to come into compliance by securing an amount of emission reductions elsewhere in California in the amount of the violation, for example by purchasing emission permits in an emission market.

allows polluters to substitute cheaper emission reductions elsewhere for more expensive reductions in their own regulated facility, reducing the overall cost of reaching the reduction goal; and (2) trading creates a price signal that reverberates through the economy and provides an incentive for firms to identify cheaper ways to control pollution.

The flexibility/cost-reduction aspect of emission trading arises because polluters have different options for reducing emissions, which carry different costs. The cost differences can arise for a host of reasons – differences in location, climate, resource endowment, different vintages of capital embodying different technologies, differences in managerial ability, etc. The trades can be external or internal. External trades are what one conventionally imagines for an emissions market: arms-length trades between two separate parties, a seller and a buyer. Internal trades are exchanges which do not involve separate parties or do not involve arms-length trades. For example, an electricity generator with several boilers in the same plant would have faced separate emissions limits on each boiler under command-and-control regulation; emission trading offers the flexibility to swap emissions between boilers. Similarly, an electric company operating several power plants has the flexibility to switch emissions between plants. In fact, about half of the reduction in SO₂ emissions, at least until 2001, was due to internal rather than external trades.⁵² These internal trades do not necessarily generate a price that signals the scarcity value of emission reduction; the exchange may be done at the seller's cost. With external trades, by contrast, there is a clear price signal.

B. Why Past Performance Is No Guarantee of Future Success

The relative importance of the flexibility and price signal effects is an empirical question. For the acid rain program, analysis by Resources for the Future economist Dallas Burtraw⁵³ suggests that the flexibility effect for electricity generators was far more significant than the price signal experienced by consumers in motivating pollution reductions.⁵⁴ While trading proved to be tremendously effective in triggering a reduction of about 50% in SO₂ emissions at a cost of less than half of what was expected, one needs to understand (1) how the reduction in SO₂ emissions was accomplished, and (ii) the physical and engineering differences between SO₂ and greenhouse gas pollution.

Two groups of strategies were used to bring about the reduction in SO₂ emissions. With respect to existing power plants, the actions taken were: changing the dispatch order⁵⁵ to favor lower-emission plants (natural gas and nuclear instead of

52. **Ellerman and Dubroeuq, 2004**

53. **Burtraw, 2000, 2003**

54. The evidence with other examples of emission trading suggests a similar conclusion.

55. The “dispatch order” is the order in which different plants are called on to supply electricity. As the demand for power fluctuates, plants are brought on and taken off line. Plants higher in the dispatch order used more than those lower in the order. Advancing relatively low-carbon plants, therefore, reduces a utility's overall emissions. *See, e.g.*, U.S. Dept. of Energy, Energy Information Administration, Mitigating Greenhouse Gas Emissions: Voluntary Reporting 13 (Oct. 1997), available at <http://www.eia.doe.gov/oiaf/1605/archive/vr96rpt/home.htm> (explaining how changes in the

coal); modifying combustion by switching from high- to low-sulfur coal; and installing scrubbers to remove emissions post-combustion in some existing plants. Far fewer scrubbers were installed than had been anticipated; on the other hand, the switch to low-sulfur coal had not been anticipated. Also unanticipated were operating changes that made it possible to increase the utilization rates and removal efficiencies of scrubbers. With regard to new power plants, the action taken was to choose natural gas as the fuel source, especially combined-cycle natural gas, rather than oil or coal.⁵⁶ These strategies are noteworthy for what was *not* done. Conservation and demand management played *no* role in attaining the emission reduction. Switching from fossil fuel to renewables (wind, solar, geothermal, etc.) also played *no* role.

Furthermore, technological innovation played *no* role in the success of the acid rain market program. Proponents and opponents of pollution markets have long debated the extent to which such markets are likely to catalyze technological innovation. Market enthusiasts point out that, in theory, economic incentive systems including tradeable permit programs should encourage innovation because they allow firms to profit from the development of new strategies to reduce pollution.⁵⁷ Market skeptics counter that any incentives for innovation are a function only of the emission caps imposed, so that traditional command-and-control regulation is just as effective (or ineffective) as emission trading in spurring innovation.⁵⁸ The experience of the acid rain market shows that markets do not automatically spur innovation, and suggests that markets are most likely to be successful where little innovation is required.

To the extent that the reductions in acid-rain-causing emissions came from post-combustion removal of pollutants from emission streams, they relied on well-understood and mature technologies (flue gas scrubbers, etc.) that had been in use for over 20 years. Using natural gas instead of coal or oil was an even more mature technology. And, while there were some initial concerns about problems with slag if low-sulfur coal was used, these were quickly worked out by experimenting with the combustion process. There was some innovation in operating methods but not in technology: no significant modification of equipment occurred (other than scrubber installation) and there was no investment in the development of new technologies.⁵⁹ Indeed, it can be said that the cap-and-trade system worked extremely well because of the simplicity of the response it required of plant owners and operators, and because it required no technological innovation, with attendant cost and performance uncertainties.

dispatch order to give higher priority to renewable energy reduced GHG emissions for Southern California Edison).

56. Analogous strategies – a mix of modification of combustion and post-combustion removal of pollutant from the effluent stream – were used in the case of NOx.

57. See, e.g., Richard B. Stewart, *Controlling Environmental Risks Through Economic Incentives*, 13 Colum. J. Envtl. L. 153, 160 (1988).

58. David M. Dreisen, *Is Emissions Trading an Economic Incentive Program?: Replacing the Command and Control/Economic Incentive Dichotomy*, 55 Wash. & Lee L. Rev. 289, 325-27 (1998).

59. Indeed, **Taylor (2008)** shows that the pace of inventive activity in scrubber technology, as measured by new patents issued, actually declined when emission trading went into effect.

This experience does not bode well for the prospects of carbon markets. Controlling CO₂ emissions is fundamentally different than dealing with SO₂. For CO₂ there is no good analog for the strategies that succeeded in reducing SO₂ emissions. Fuel switching is not such an attractive option because there is no such thing as low-CO₂ coal.⁶⁰ Moreover, there is no such thing as an add-on post-combustion scrubber for CO₂. Several years ago, Jeff Rachlinski explained the key difference between global warming and other air pollution problems in the following terms:

Whereas most pollution consists of industry's unintended waste products, the carbon dioxide that is the primary cause of global warming is the unavoidable consequence of reducing complex hydrocarbons into simpler ones; production of carbon dioxide is the definition of combustion. Many types of pollution have been reduced simply by implementing more efficient combustion techniques. Industry can only significantly reduce the emission of carbon dioxide, however, by decreasing combustion itself.⁶¹

Today, the situation may have changed a little, but not much. Carbon capture and sequestration may be possible for new plants, but cannot practically be added on to existing plants.

Consequently, unlike the SO₂ and NO_x responsible for acid rain, the only way to significantly reduce CO₂ emissions from *existing* coal-fired plants is to operate them less. Hence, for CO₂ reduction the policy objective focuses more on *new* power plants and aims to influence their design rather than their operation. In particular, it is essential to ensure that, if new coal-fired plants are built, (1) they attain higher thermal efficiency than what is conventional now through technologies such as supercritical combustion or IGCC, and (2) they are designed from the beginning to be able to accommodate carbon capture and sequestration once that technology has been refined and becomes available. Otherwise, what is needed in the electricity sector is an emphasis on (1) conservation and energy efficiency, and (2) the use of renewable generation sources.

In short, with SO₂, the policy approach was to reduce emissions by modifying the functioning of the *existing* coal-fired fleet, and emission trading by power plant owners quickly attained this objective. The same strategy is unlikely to work for CO₂ because the existing power plants cannot do much to reduce their emissions. Compared to SO₂, dealing with CO₂ emissions calls for an entirely different strategy for electricity generation. The generating technologies that matter for addressing global warming -- high thermal efficiency coal combustion, carbon capture and sequestration, and renewable energy technologies such as solar, wind, wave, and geothermal -- are *not* mature. Technological innovation is needed, and there is no evidence from the past that trading can catalyze it.

Furthermore, while a strategy targeted narrowly at power plant owners worked very well for SO₂, it cannot be similarly effective for CO₂. This is because, while electricity generation accounted for about two-thirds of all SO₂ emissions, it

60. Carbon intensity can be reduced by co-firing coal with biomass, but that can be done only on a limited scale, and the logistics are complicated.

61. Jeffrey J. Rachlinski, *The Psychology of Global Climate Change*, 2000 U. ILL. L. REV. 299, 301.

accounts for a much smaller fraction of CO₂ emissions – as noted earlier, it accounts for only one-third of these emissions nationally in the US, and only one-fifth in California. An emission control strategy targeted at electric power plants alone will be grossly inadequate.

The need to control a much broader swath of the economy drastically changes the regulatory problem. In the US, emission trading worked quickly and effectively for SO₂ because of the simplicity of dealing with a small number of actors – the owners and operators of power plants – who constituted a narrow, and relatively homogeneous, section of the economy.⁶² This is not going to be possible for CO₂ or the other greenhouse gases.

Because of the need to control a broad swath of the economy – in fact, the need ultimately to decarbonize most of the economy – many economists have argued for an upstream CO₂ cap and trade system. They point out – correctly – that a downstream cap has two significant disadvantages: increased administrative complexity, and incomplete coverage. They argue that an upstream, economy-wide cap provides the greatest certainty of achieving a given economy-wide emissions target. This is certainly true in theory, though not, as we will argue, in practice. Moreover, they assert that nothing could possibly be gained by having a downstream cap since, if an upstream program and a downstream program achieve the same coverage, the distribution-of-cost impact is the same no matter which approach is used. Theoretically, this should be true – if a cap has the same impact on costs to downstream users regardless of the point of regulation, it should trigger precisely the same emission reduction efforts.

The flaw in the argument is that price does not always influence behavior in practice in the way it is supposed to do in theory. In the world of economic theories, firms are considered to act as a single, unitary decision maker, with a single objective, namely profit maximization. In real life, there are multiple decisionmakers and, quite possibly, multiple objectives. In a typical manufacturing establishment, there is a manager responsible for the purchase of energy services, a manager responsible for product design, and perhaps a manager in charge of product pricing, as well as a CEO. These people have different responsibilities, they face different incentives, and therefore they do not all respond to a given price signal in an identical manner. Consider an upstream cap on GHG emissions versus a downstream cap on, say, emissions associated with new model vehicles manufactured by General Motors, like the one California is trying to impose on automobile manufacturers.⁶³ The upstream

62. Approximately 800 regulated generating units were included in the acid rain trading program. Some of them were very small and operated fairly infrequently. Moreover, in many cases, one company owned multiple generating units. Probably only about 300 distinct decision-making entities were regulated by the program.

63. See Cal. Health & Safety Code § 43018.5 (requiring California Air Resources Board to adopt regulations to achieve the maximum feasible and cost-effective reduction of greenhouse gas emissions from motor vehicles); 13 Cal. Admin. Code 1961.1 (Air Resources Board regulations for model years 2009 and subsequent years). California's regulations have been the subject of considerable controversy, and have not yet taken effect. EPA has refused to grant California a waiver under the Clean Air Act to allow California to regulate, see EPA, California State Motor Vehicle Pollution Control Standards, 73 Fed. Reg. 12156 (Mar. 6, 2008), and automobile manufacturers have challenged the rules as preempted by the Energy Policy and

cap raises the price of gasoline, which affects both GM as a user of fuel, and also GM's customers; it potentially influences the type of vehicle customers want to buy, but its influence on GM will be indirect, mediated by customer decisions. The downstream cap affects GM more directly, because it limits what new model vehicles GM can sell. It is not necessarily the case that the same decision-makers within GM are mobilized to deal with the fall-out of the emissions cap in both cases, or that the same corporate response will emerge. Because the effect of a downstream cap is more direct, immediate, and certain, the CEO of GM is more likely to become personally engaged, and such a cap will likely have a more profound, and more rapid, impact on what cars GM designs and how it prices and markets them than will the upstream cap.⁶⁴

The point is that not all price signals are equally efficacious. They don't all have the same impact on behavior. For a price change – or any other incentive – to affect behavior, it has to be visible to the decision maker (e.g., the car owner, the car manufacturer, etc) and it has to be salient and meaningful enough to prompt a shift in behavior.

Certainly, there is no empirical evidence that the price signals disseminated by an upstream emission cap are always likely to trigger a downstream consumer response sufficient to reduce pollution emissions on a significant scale. With SO₂ trading, for example, although there was a 50% reduction in emissions over a relatively short period of time, this was not effectuated by price signals disseminated through the economy. In fact, the price of electricity did not substantially increase following the implementation of emission trading and there was no noticeable consumer response in terms of reduced energy consumption. The economic theory is that an emission cap raises the price of polluting products, sending a price signal to all downstream actors, who respond accordingly and reduce their use of fossil fuels. But this is *not* what actually happened with the SO₂, lead, CFC, or NO_x trading programs. In each of these cases, the producer directly regulated by the cap reformulated the product or production process in such a way as to generate a sufficient reduction in emissions at a modest cost. There was *no* price signal downstream to speak of, and there was essentially no behavior adjustment by the downstream customers.

Returning to greenhouse gases, we argued above that substantially reducing these emissions in the near future will require not merely a shift by producers from one production technology to another, because the requisite technologies do not yet exist, but rather a substantial change in energy consumption behavior throughout the economy and the development of major new energy technologies. It seems unlikely that all these changes can be effectuated by a carbon price alone.

Conservation Act, *see* Central Valley Chrysler-Jeep v. Goldstene, 592 F. Supp. 2d 1151 (E.D. Cal. 2007), Green Mountain Chrysler Plymouth Dodge Jeep v. Crombie, 508 F. Supp. 2d 295 (D. Vt. 2007) (both rejecting that claim).

64. Admittedly, General Motors has been visibly affected by the change in consumer buying habits for automobiles this spring and is now making what appears to be a strenuous effort to change its automobile lineup. But, this is in response to a doubling of gasoline prices. If there were an upstream cap on GHG emissions generating a current price of \$30 per ton of CO₂, say, this would translate into roughly a 30 cent increase in the price of gasoline. It is hard to see GM responding as much to *that* magnitude of price increase as it has responded to California's attempts to implement AB 1493.

C. *The Limits of Carbon Markets*

In the United States, a high proportion of greenhouse gas emissions are directly attributable to individual decisions about lifestyle and consumption. In 1997, EPA wrote on its global warming web site that individuals “can affect” nearly one-third of domestic emissions through choices about electricity use, waste production, and personal transportation.⁶⁵ Michael Vandenberg and Anne Steinemann provide more detail but come to the same conclusion: they assert that individuals in the United States directly accounted for the emission of nearly 13 trillion pounds of CO₂ in 2000.⁶⁶ That was roughly one-third of the nation’s total. More strikingly, it exceeded emissions from the entire U.S. industrial sector, and was greater than the total emissions from any other country except China.⁶⁷

A cap-and-trade program targeted at utilities, consumer fuel producers, and large industrial emitters, like the one proposed by the Climate Security Act (S. 3036), will not directly reach these behavioral emissions.⁶⁸ In theory, such a cap-and-trade program should indirectly affect individual decisions that increase greenhouse gas emissions by increasing the price of electricity and fuel. Behavioral change is not always so simple, however. People often face significant barriers to behavioral change even if that change would bring positive financial payoffs. The first barrier is lack of information. Many people simply are not aware of how much electricity the “vampires” in their homes consume, for example.⁶⁹ Even if people become aware of the financial implications of their choices, alternatives may be limited or unattractive. It is not easy to slay electricity vampires; our homes are not conveniently wired with switches that would turn the television, stereo, and computer equipment completely off at night. Power strips can perform that function, but at the cost of awkward groping at floor level. Equipment without remote control capability, which requires stand-by mode, may not be available. Under these circumstances, sending a price signal by

65. U.S. EPA, Global Warming, Emissions, <http://yosemite.epa.gov/oar/globalwarming.nsf/content/EmissionsIndividual.html>.

66. Michael P. Vandenberg & Anne C. Steinemann, *The Carbon-Neutral Individual*, 82 N.Y.U. L. Rev. 1673, 1690-94 (2007).

67. *Id.* at 1694-95.

68. Nordhaus and Danish estimate that a cap-and-trade program targeted at utilities and large industrial sources “could reach, at most, less than half of the nation’s CO₂ emissions.” Robert R. Nordhaus & Kyle W. Danish, *Assessing the Options for Designing a Mandatory U.S. Greenhouse Gas Reduction Program*, 32 B.C. Env’tl. Aff. L. Rev. 97, 128 (2005).

69. Vampires are devices that consume electricity even when they are not in use. Appliances which go into stand-by mode rather than being truly turned off, including computer routers, monitors, printers, televisions, stereo equipment, and even electric razors and toothbrushes, have proliferated in the American home. “[E]ven at vastly reduced power levels, millions of machines running all day, every day adds up to huge amounts of wasted energy.” Warren Swil, *The “Stand-By” Electricity Vampires*, Los Angeles Times, Oct. 9, 2007. “In the average home, 75% of the electricity used to power home electronics is consumed while the products are turned off.” U.S. Dept. of Energy, Energy Efficiency and Renewable Energy, Energy Savers: Tips on Saving Energy and Money at Home, http://www1.eere.energy.gov/consumer/tips/home_office.html. Together, the various electricity vampires in the typical American home may be responsible for as much as 20% of household electricity use. Energy Information Administration, Energy Kid’s Page, <http://www.eia.doe.gov/kids/classactivities/energyarticles.html>.

requiring that utilities buy allowances to cover their carbon emissions, raising the price of electricity for consumers, is not likely to change consumption behavior by itself. Combining a price signal with information about where the electricity used by a household is going, with the opportunity to buy more efficient products, or with easy ways to reduce electricity waste by products already in the home, though, could be much more effective.

Many other decisions with cumulatively significant climate change consequences are at least as difficult to change. Consider, for example, decisions about heating or air-conditioning use. The occupant of a drafty old home in New England is unlikely to turn the thermostat below a certain level as long as she can pay the fuel oil bills, just as the owner of a new house in Tucson is unlikely to stop air-conditioning just because the price of electricity rises. These are not unrealistic examples. Overall, energy use in buildings, including both direct fuel consumption and electricity use, accounts for 39 percent of U.S. carbon emissions.⁷⁰ Residential buildings are responsible for about half that amount, commercial buildings for the remainder.⁷¹

The same could be said of decisions about how many miles to drive. Some of those choices are purely discretionary, but many others are not. A couple who work in different towns without convenient access to public transportation cannot easily adjust their driving habits when the price of gas goes up. Transportation accounts for one-third of CO₂ emissions in the U.S., and its share is rising as vehicle miles traveled continue to increase,⁷² an almost inevitable result of the ways American communities are structured. The Department of Energy predicts that CO₂ emissions from cars will increase 40% by 2030 if the growth in vehicle miles traveled continues.⁷³

As these examples suggest, appliance efficiency measures, building codes and land use planning decisions can all strongly influence the greenhouse gas impacts of individual behavior. How these sorts of behavioral emission sources could be folded into a conventional carbon market is unclear; they would not be covered by any of the bills currently before the Congress. The manufacturers of appliances undoubtedly produce emissions in the manufacturing process; perhaps crediting manufacturers based on the expected reduction in energy use over the life of the appliance could create an incentive to produce more efficient products. But consumers would still have to be persuaded to buy the more efficient appliances. Home builders and buyers are responsible at some level for the global-warming effects of home design and subdivision layout, but buyers may have few choices and builders are unlikely to be large direct emitters, may be constrained by local zoning, and may not be around long enough for the outcomes of their decisions to become apparent.

70. Marilyn A. Brown, Frank Southworth & Andrea Sarzynski, *Shrinking the Carbon Footprint of Metropolitan America* 9 (May 2008), available at http://www.brookings.edu/~media/Files/rc/reports/2008/05_carbon_footprint_sarzynski/carbonfootprint_report.pdf.

71. *Id.* at 9-10.

72. Reid Ewing et al., *Growing Cooler: The Evidence on Urban Development and Climate Change* 10-11 (Oct. 2007), available at <http://sgusa.convio.net/site/DocServer/GrowingCooler9-18-07small.pdf?docID=4061>.

73. *Id.* at 12.

Still other emissions are poor candidates for trading because the accounting is difficult. To take one example, agricultural practices other than fuel consumption are responsible for about 6% of U.S. greenhouse gas emissions.⁷⁴ The chief culprits are ruminant livestock production and manure management, which together account for a third of the nation's methane emissions, and soil management and fertilizer application practices, which produce the bulk of nitrous oxide emissions.⁷⁵ Since these activities occur in the open air and don't involve fuel inputs which can be used as convenient proxies, their emissions cannot be monitored with the precision required for optimal trading markets.

IV. THE CLEAN AIR ACT PROVIDES A PROMISING FRAMEWORK FOR FILLING THE GAPS

The Clean Air Act is perhaps the most complex of the federal environmental laws, occupying nearly 300 pages of the U.S. Code.⁷⁶ Nonetheless, its basic structure is relatively simple to describe. For our purposes, we need only consider three major parts of the Act: 1) the determination and achievement of air quality standards; 2) the imposition of technology-based standards for mobile sources, most importantly cars and trucks; and 3) the identification of technology-based standards for stationary pollution sources. Moreover, it is not the details of those statutory elements that concern us here, but the different roles they assign to federal and state actors. The Clean Air Act's version of cooperative federalism, we assert, is not only sensible for the "conventional" air pollution problems Congress had before it in 1970, but surprisingly well suited to the somewhat different problem of global warming.

A. *The Structure of the Clean Air Act*

The Clean Air Act was the first modern federal environmental statute to employ a "cooperative federalism framework," assigning responsibilities for air pollution control to both federal and state authorities. That basic framework has remained unchanged since initial passage of the Act in 1970. The primary federal roles are setting national air quality standards, tailpipe emission standards, and new stationary source standards. The primary state role is deciding how to achieve the federal air quality standards. States also retain the authority to set additional limits on emissions from stationary sources, and California alone is permitted to adopt tighter tailpipe controls on mobile sources.

1. *Air Quality: Federal Standards, State Implementation*

The National Ambient Air Quality Standards ("NAAQS") are the heart of the Clean Air Act. Section 108 directs EPA to create a list of "criteria pollutants," defined as those air pollutants that are emitted from numerous or diverse sources and cause or contribute to air pollution that may reasonably be anticipated to endanger the public

74. EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006 at 6-1 (EPA 430-R-08-005, April 15, 2008), available at http://www.epa.gov/climatechange/emissions/downloads/08_CR.pdf.

75. *Id.*

76. Timothy Stoltzfus Jost, *Governing Medicare*, 51 Admin. L. Rev. 39, 65 (1999).

health or welfare.⁷⁷ For each pollutant in this category, EPA must set primary and secondary NAAQS, that is, air quality levels that must be achieved nationwide. Primary NAAQS are set at a level “requisite to protect the public health with an adequate margin of safety;”⁷⁸ while secondary NAAQS are set at a level sufficient to protect public welfare.⁷⁹ Costs may not be considered in setting the NAAQS.⁸⁰

Once EPA sets the NAAQS, states draft State Implementation Plans (SIPs) to achieve them.⁸¹ The SIP program leaves many key policy choices to the states, but also provides considerable federal oversight. In formulating the SIPs, states must provide opportunities for public participation.⁸² The process begins with a statewide inventory of emission sources, including both mobile and stationary sources.⁸³ If portions of the state exceed the NAAQS, the state must then determine the level of emission reduction necessary, a process that requires complex modeling for localized pollutants.⁸⁴ Next, the state decides what reductions to make and where to achieve the NAAQS. Finally, it decides on a suite of control measures, which may include a mix of regulations and incentives for voluntary measures,⁸⁵ that will deliver those reductions. To ensure that the plans will actually be carried out, the Clean Air Act requires that they include monitoring and enforcement programs,⁸⁶ and that the states demonstrate that they have adequate personnel, funding, and legal authority to put them into effect.⁸⁷ The completed SIP is submitted to EPA for approval.⁸⁸ Once approved it becomes enforceable as a matter of federal, as well as state, law.⁸⁹ Recognizing that both technology and knowledge are likely to advance over time, Congress required that states periodically revise their SIPs.⁹⁰

EPA must disapprove the SIP if it finds that the plan as written will not achieve the NAAQS. If the state fails to correct the problem, it becomes subject to

77. 42 U.S.C. § 7408(a).

78. 42 U.S.C. § 7409(b)(1).

79. 42 U.S.C. § 7409(b)(2).

80. *Whitman v. American Trucking Ass’ns*, 531 U.S. 457, 464-71 (2001).

81. 42 U.S.C. § 7410(a).

82. 42 U.S.C. § 7410(a)(1).

83. Such an inventory is statutorily required in areas where air quality does not meet the NAAQS standard. 42 U.S.C. § 7502(c)(3). EPA regulations also require inventories in attainment areas. 40 C.F.R. 51.114 (requiring that each plan contain a detailed inventory of emissions).

84. For descriptions of some of the complications of modeling the relationship between emissions and air quality, see James D. Fine and Dave Owen, *Technocracy and Democracy: Conflicts Between Models and Participation in Environmental Law and Planning*, 56 *Hastings L.J.* 901, 921-33 (2005). See also generally Thomas O. McGarity, *Missing Milestones: A Critical Look at the Clean Air Act’s VOC Emissions Reduction Program in Nonattainment Areas*, 18 *Va. Env’tl. L. J.* 41 (1999) (a case study of nonattainment air quality planning in Houston, noting many points of uncertainty and overoptimism in the models employed by state and federal regulators).

85. 42 U.S.C. § 7410(a)(2)(A).

86. 42 U.S.C. § 7410(a)(2)(B), (C).

87. 42 U.S.C. § 7410(a)(2)(E).

88. 42 U.S.C. § 7410(a)(1).

89. 42 U.S.C. § 7413.

90. 42 U.S.C. § 7410(a)(2)(H).

sanctions in the form of withdrawal of federal highway funding and the imposition of a two-for-one offset requirement as a condition of permitting any new stationary sources.⁹¹ If the state still fails to produce an adequate SIP, EPA is required to impose a Federal Implementation Plan.⁹²

Once a SIP is approved, federal agencies may not take, approve, or fund any activity that does not conform to the SIP.⁹³ More detailed requirements apply to transportation planning. EPA has issued detailed rules governing conformity analysis for federally-funded or approved highway projects in non-attainment areas.⁹⁴ “Before a new transportation plan can be approved or a new project can receive federal funding, a regional emissions analysis must demonstrate that the emissions projected from the plan or project are consistent with the emissions ceiling established by the SIP.”⁹⁵ The conformity requirement can force local transportation authorities to shift funding from highway expansion to transit, bicycle, and pedestrian facilities.⁹⁶

2. Mobile Sources: Federal Standards with a State Ratchet

The Clean Air Act directs EPA to prescribe standards for the emission from new motor vehicles of pollutants that “cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare.”⁹⁷ The standards are intended to be technology-forcing; they can be adopted before the technology they require is available, but they must provide adequate lead time to allow for its development.⁹⁸ In general, state regulation of tailpipe emissions is preempted.⁹⁹ The Act provides a limited exemption, however, for any state that had automobile emission standards in place prior to 1966,¹⁰⁰ a category that includes only California. EPA must waive federal preemption of California standards if the state’s standards are at least as protective of public health and welfare as the federal ones, the state needs its standards to address compelling and extraordinary conditions, and they provide enough lead time for development of the required technology.¹⁰¹ Once a waiver is granted, allowing

91. Although the plain language of the Clean Air Act makes sanctions mandatory for states which do not submit adequate SIPs, in reality the imposition of sanctions is quite rare. *See, e.g.*, Douglas R. Williams, *Cooperative Federalism and the Clean Air Act: A Defense of Federal Minimum Standards*, 20 St. L. U. Pub. L. Rev. 67, 91-95 (2001).

92. 42 U.S.C. § 7410(c).

93. 42 U.S.C. § 7506(c).

94. 40 C.F.R. Part 93.

95. James E. McCarthy, *Transportation Conformity Under the Clean Air Act: In Need of Reform?*, CRS Report for Congress 2 (updated Apr. 23, 2004), available at <http://www.cnie.org/NLE/CRSreports/04apr/RL32106.pdf>.

96. *See id.* at 6 (noting changes in Atlanta’s plans following a conformity lapse). The threat of losing billions of dollars of federal highway aid also prompted Georgia’s legislature to create a regional transportation agency with the power to veto local decisions. Michael R. Yarne, *Conformity as Catalyst: Environmental Defense Fund v. Environmental Protection Agency*, 27 Ecol. L. Q. 841, 844-45 (2000).

97. 42 U.S.C. § 7521(a)(1).

98. 42 U.S.C. § 7521(a)(2).

99. 42 U.S.C. § 7543(a).

100. 42 U.S.C. § 7543(b)(1).

101. *Id.*

California to adopt its own standards, other states with non-attainment areas may choose to opt in to California's mobile source regulations.¹⁰²

3. Stationary Sources: Federal Technology-Based Emission Limits

For the most part, the Clean Air Act leaves the states free to choose what regulations to apply to stationary sources, but new and modified sources are subject to minimum federal emission standards. EPA sets New Source Performance Standards for categories of sources, requiring that they achieve a level of emission control equal to that achievable by the best demonstrated available technology.¹⁰³ In addition, new or modified sources exceeding certain emission thresholds must undergo "New Source Review." States with approved SIPs conduct that review, which requires among other things that they establish emission control requirements on a case-by-case basis, subject to EPA oversight.¹⁰⁴ The states remain free to adopt tougher air quality standards, to impose more stringent emission limitations on federally-regulated sources, and to regulate sources that do not fall within the federal net.¹⁰⁵

B. Why the Cooperative Federalism Framework of the Clean Air Act is a Good Fit for Global Warming

EPA's general counsel opined in 1998 that the agency had authority to regulate greenhouse gas emissions as air pollutants under the Clean Air Act,¹⁰⁶ but the agency took no steps to do so. Five years later, a different general counsel working for a different administration offered a different interpretation, asserting that the Clean Air Act did not allow EPA to regulate greenhouse gases.¹⁰⁷ That conclusion rested on the view that the Clean Air Act's regulatory framework was ill-suited to the problem of global climate change. Some important politicians agree. Congressman John Dingell has said that regulation of greenhouse gases under the Clean Air Act would produce "a glorious mess,"¹⁰⁸ and President Bush has worried that applying the Clean Air Act (or

102. 42 U.S.C. § 7507.

103. 42 U.S.C. § 7411(a)(1).

104. In non-attainment areas, new sources must meet the lowest achievable emission rate, defined as the best emission performance achieved by a similar source nationwide. 42 U.S.C. § 7503(c). In attainment areas, they must meet a standard based on the best available control technology, defined as the maximum degree of emission reduction the permitting authority determines is achievable. 42 U.S.C. § 7479(3).

105. The Clean Air Act expressly preserves the authority of states and local governments to adopt more stringent standards for pollution control. 42 U.S.C. § 7416.

106. U.S. EPA, Memorandum from Jonathan Z. Cannon, General Counsel, to Carol Browner, Administrator, EPA's Authority to Regulate Pollutants Emitted by Electric Power Generation Sources (Apr. 10, 1998).

107. U.S. EPA, Memorandum from Robert E. Fabricant, General Counsel, to Marianne L. Horinko, Acting Administrator, EPA's Authority to Impose Mandatory Controls to Address Global Climate Change Under the Clean Air Act (Aug. 28, 2003) [hereinafter Fabricant Memo], available at http://www.epa.gov/airlinks/co2_general_counsel_opinion.pdf.

108. House Committee on Energy and Commerce, Subcommittee on Energy and Air Quality, Hearing on Strengths and Weaknesses of Regulating Greenhouse Gas Emissions Using Existing Clean Air Act Authorities (Apr. 10, 2008), webcast available at http://energycommerce.house.gov/cmte_mtgs/110-eaq-hrg.041008.CleanAirAct.shtml. Rep.

the Endangered Species Act or National Environmental Policy Act, for that matter) to global warming would cripple the economy.¹⁰⁹

We agree that it would be difficult to apply the current Clean Air Act directly to greenhouse gas emissions. Nonetheless, we believe that many aspects of the Clean Air Act, notably including its division of responsibilities between state and federal authorities, would serve the nation well in tackling global warming.

1. Air Quality Standards

The one conspicuous misfit between the present Clean Air Act and the global warming problem is the Act's reliance on national air quality standards. EPA's 2003 determination that it lacked the authority to regulate carbon dioxide emissions rested in large part on its conclusion that the NAAQS were not a useful way to address global warming.¹¹⁰ The general counsel wrote:

[U]nique and basic aspects of the presence of key GHGs in the atmosphere make the NAAQS system fundamentally ill-suited to addressing global climate change. Many GHGs reside in the earth's atmosphere for very long periods of time. CO₂ in particular has a residence time of roughly 50-200 years. This long lifetime along with atmospheric dynamics means that CO₂ is well mixed throughout the atmosphere, up to approximately the lower stratosphere. The result is a vast global atmospheric pool of CO₂ that is fairly consistent in concentration everywhere along the surface of the earth and vertically throughout this area of mixing.

. . . [A]ny CO₂ standard that might be established would in effect be a worldwide ambient air quality standard, not a national standard – the entire world would be either in compliance or out of compliance.

Such a situation would be inconsistent with a basic underlying premise of the CAA regime for implementation of a NAAQS—that actions taken by individual states and by EPA can generally bring all areas of the U.S. into attainment of a NAAQS. . . . The globally pervasive nature of CO₂ emissions and atmospheric concentrations presents a unique problem that fundamentally differs from the kind of environmental problem that the NAAQS system was intended to address and is capable of solving.¹¹¹

It is surely true that no state could on its own assure compliance with an air quality standard for CO₂. In that sense, the Clean Air Act is a poor fit for any global, or even regional, problem. Furthermore, the impacts of greenhouse gases on health and welfare are significantly different than those of the current criteria pollutants. Instead

Henry Waxman disagrees with Dingell's assessment. At the same hearing, he opined that in fact global warming could be addressed through the Clean Air Act.

109. George W. Bush, President Bush Discusses Climate Change, Apr. 16, 2008, transcript available at <http://www.whitehouse.gov/news/releases/2008/04/20080416-6.html>.

110. See Christopher T. Giovinzazzo, *Defending Overstatement: The Symbolic Clean Air Act and Carbon Dioxide*, 30 Harv. Envtl. L. Rev. 99, 151 ("EPA's contention that CO₂ is not a pollutant was founded entirely on EPA's policy judgment that CO₂ cannot be regulated successfully under the CAA.").

111. Fabricant memo, *supra* note [], at 7-8.

of direct effects on human life and ecosystems, carbon dioxide's impacts are largely indirect, mediated through changes in air and water temperatures due to increased retention of solar energy.

That so many people have looked to the Clean Air Act's acid rain program¹¹² as a model for dealing with greenhouse gases is no surprise. The effects of CO₂ in the atmosphere are even less direct and more independent of the geographic location of emission than the acid rain effects of SO₂. Surely the sense that the Clean Air Act cannot deal with such a delocalized pollution problem, together with the desire to solve the problem as painlessly as possible, has contributed significantly to the enthusiasm for cap-and-trade approaches.

We believe that it makes sense for Congress to identify the goals of greenhouse gas regulation outside the strictures of the air quality provisions of the Clean Air Act. Those provisions require that EPA set NAAQS at levels requisite to protect public health and welfare, without regard to costs.¹¹³ Given the difficulty of deciding what level of global warming is acceptable, the likelihood that we are already committed to a level of warming that will significantly affect public health and welfare,¹¹⁴ and the potentially high costs of reaching our greenhouse gas goals, it is probably essential that Congress take the lead in setting those goals.¹¹⁵

We also believe that an emission target makes more sense in this case than an atmospheric level target.¹¹⁶ As EPA has noted, the level of CO₂ in the atmosphere is essentially independent of the decisions of any individual state, and indeed it is at least somewhat independent of the decisions of all the U.S. states together.¹¹⁷ States should

112. 42 U.S.C. §§ 7651 to 7651o.

113. 42 U.S.C. § 7409(b).

114. Even if all anthropogenic greenhouse gas emissions were immediately halted, temperatures would be expected to rise over the next two decades. Less drastic or less rapid policy measures will mean more drastic temperature rise. Intergovernmental Panel on Climate Change, *Climate Change 2007 Synthesis Report: Summary for Policy Makers 7*, available at http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf.

115. Victor Flatt has detailed some of the current confusion and disagreement over targets, but notes that all the proposals currently under consideration in the Congress would set specific emission targets, rather than delegating that task to an administrative agency. Victor B. Flatt, *Taking the Legislative Temperature: Which Federal Climate Change Legislative Proposal is "Best"?*, 102 Nw. U. L. Rev. Colloquy 123, 126-35 (2007). Rob Glicksman agrees that Congress is the appropriate entity to set greenhouse gas emission reduction targets. Robert L. Glicksman, *Balancing Mandate and Discretion in the Institutional Design of Federal Climate Change Policy*, 102 Nw. U. L. Rev. Colloquy 196, 204 (2007).

116. Others have previously made this point. *See, e.g.*, McKinstry, Dernbach & Peterson, *supra* note [], at 6.

117. Although the Bush administration has emphasized the inability of the United States to solve the global warming problem on its own, the U.S. is not completely helpless. Until recently, the United States was the largest CO₂ emitter in the world. China has now taken that title, *see* Kathleen E. McLaughlin, *China: Report Says Country Has Already Overtaken U.S. as Leading Source of Carbon Emissions*, 38 Env't Rep. (BNA) 1429 (2007), but the United States remains responsible for as much as 20% of global emissions. According to one source, "U.S. emissions themselves are enough to ensure that the global CO₂ concentration continues to rise," because emissions within the United States exceed the rate at which CO₂ is cleared from the atmosphere. Christopher T. Giovinazzo, *Defending Overstatement: The Symbolic Clean Air Act*

not face sanctions, as they might under the NAAQS framework, for atmospheric CO₂ levels that are beyond their control.¹¹⁸ Nonetheless, that domestic emission reductions cannot assure attainment of the atmospheric goal need not be a barrier to regulation. The fight against global warming must proceed on a number of fronts. The 1970 Clean Air Act set emission limits for automobiles based on back-of-the-envelope calculations of the level of reduction in automobile emissions that would be needed, in concert with other reductions to be pursued under the NAAQS provisions, to achieve desired air quality levels.¹¹⁹ In much the same way, targets could be set for domestic emission reductions with the understanding that vigorous pursuit of an international successor to the Kyoto Protocol will also be necessary to ensure that climate goals are realized.

The Clean Air Act, then, is not quite the right tool for setting regulatory goals and determining acceptable emission levels for greenhouse gases. But the fact that the initial step under the NAAQS provisions does not seem to work for CO₂ should not blind us to the fact that in many ways the state planning and implementation framework used to achieve the NAAQS is an excellent fit for addressing global warming. It can engage the states as full partners in addressing the problem, leverage the work they are already doing, provide information needed to tackle aspects of the problem that are not well suited to markets, recognize local variation in challenges and opportunities, take advantage of the special political and practical abilities of the states to deal with behavioral emissions, and help states learn from one another's successes and failures. Federal climate legislation should adopt emission reduction goals applicable to the states¹²⁰ and require that states prepare and implement "climate implementation plans" modeled on the SIPs to achieve those goals.

Global warming is a daunting problem, one that will be far more difficult to solve than the "standard" pollution problems that gave rise to the Clean Air Act. Stabilizing the climate at an acceptable CO₂ level will take the concerted efforts of many nations, all levels of domestic government, and a committed citizenry.¹²¹ Others

and Carbon Dioxide, 30 Harv. Envtl. L. Rev. 99, 154-55 (2006). Although the United States cannot solve the problem on its own, in other words, its failure to act could make it impossible for the world to solve the problem.

118. Noting that Clean Air Act § 179B, 42 U.S.C. § 7509a, allows EPA to approve a SIP that does not assure attainment if the state shows that its failure to meet the NAAQS is due to emissions from outside the United States, one commentator has asserted that "the NAAQS system could work for CO₂: a CO₂ NAAQS would inspire substantial reductions in emissions without contorting the CAA's requirements beyond recognition or in ways categorically different from those always required by the statute's symbolic provisions." Giovinazzo, *supra* note []. Giovinazzo concedes, however, that it is unclear that § 179B would in fact protect states. We believe targeted greenhouse gas legislation is preferable to reliance on the standard Clean Air Act, but we agree that the Act as it stands can serve both as a prod toward congressional action and a backstop against continued inaction.

119. Frank P. Grad et al., *The Automobile and the Regulation of Its Impact on the Environment* 33-36 (1974).

120. How reductions should be allocated among the states is a problem beyond the scope of this paper.

121. See, e.g., Nicholas Lutsey & Daniel Sperling, *America's Bottom-Up Climate Change Mitigation Policy*, 36 Energy Pol'y 673, 674 (2008) ("[L]ower-level engagement is key to real, long-term progress. There must be a local commitment, down to individuals, to accomplish the type of economic and societal transformations that will be necessary to achieve

have argued – quite correctly – that federal greenhouse gas legislation should protect the ability of states to engage in their own climate change efforts.¹²² We would go further. For this problem, it is not enough to allow states to participate if and to the extent they choose to do so. Because global warming provides textbook temptations for a race to the bottom, emission goals should be set at the national level.¹²³ States should be free to adopt more stringent goals should they choose to do so,¹²⁴ just as they are currently free to impose air quality standards tougher than the federal NAAQS on themselves. Once federal minimum emission reduction goals are set, the states should play a primary role in implementing those goals. Federal legislation can and should affirmatively confer upon states the authority and the responsibility to play that role. Surprisingly, none of the current crop of greenhouse gas bills deals with the role of the states in any depth.¹²⁵ None would assign the states an important role, or even provide them with incentives to voluntarily assume such a role. There may be other models that would work, but the Clean Air Act's SIP program, while it surely could use some tweaking, provides a useful and readily available starting model for an appropriate state role.¹²⁶

very large reductions in carbon. The more engaged and the more powerful the commitment, the more likely it is that actual change will occur.”).

122. William Andreen et al., *Cooperative Federalism and Climate Change: Why Federal, State, and Local Governments Must Continue to Partner*, Center for Progressive Reform White Paper, May 29, 2008, available at <http://www.progressivereform.org/articles/federalismClimateChange.pdf>. It might seem unnecessary to argue the merits of giving states a role in dealing with climate change, given the long-established tradition in the United States of environmental regulatory partnerships, but the (Democratic) leaders of a key congressional committee have argued for strong preemption at least of motor vehicle emission standards. Staff, U.S. House of Representatives, Committee on Energy and Commerce, *Climate Change Legislation Design White Paper: Appropriate Roles for Different Levels of Government* (Feb. 25, 2008), available at http://energycommerce.house.gov/Climate_Change/white%20paper%20st-lcl%20roles%20final%202-22.pdf.

123. States should have a strong voice in the goal-setting process because they have much at stake. Many of them are acutely aware of their vulnerability to climate change, and can bring to federal attention the variety and extent of the threats they face.

124. Alice Kaswan, *A Cooperative Federalism Proposal for Climate Change Legislation: The Value of State Autonomy in a Federal System*, 85 *Denver U. L. Rev.* 791, 824 (2008).

125. Robert B. McKinstry, Jr., John C. Dernbach & Thomas D. Peterson, *Federal Climate Change Legislation as If the States Matter*, *Natural Resources & Env't*, Winter 2008, 3, 3-4; Alice Kaswan, *A Cooperative Federalism Proposal for Climate Change Legislation: The Value of State Autonomy in a Federal System*, 85 *Denver U. Law Rev.* 791, 816 (2008).

126. Although policymakers seem to have ignored the possibility that the Clean Air Act's SIP process could be useful for addressing greenhouse gas emissions, a some perceptive commentators have not. John Dernbach and Alice Kaswan, in particular, have pointed out how SIPs could be used as part of a comprehensive climate change strategy. Robert B. McKinstry, Jr., John C. Dernbach & Thomas D. Peterson, *Federal Climate Change Legislation as If the States Matter*, *Natural Resources & Env't*, Winter 2008, at 3, __; Thomas D. Peterson, Robert B. McKinstry, Jr. & John C. Dernbach, *Developing a Comprehensive Approach to Climate Change Policy in the United States that Fully Integrates Levels of Government and Economic Sectors*, 26 *Va. Env'tl. L. J.* 227, 265-68 (2008); Alice Kaswan, *A Cooperative Federalism Proposal for*

Global warming cries out for recognition of a strong state role in part because the states are well ahead of the federal government. Climate change is not a newly recognized problem. The physics of the greenhouse effect are well understood, and it was apparent by the 1970s that atmospheric CO₂ concentrations had increased since the industrial age.¹²⁷ The states may be late to the game of dealing with climate change, but not as late as the federal government. Today, “[e]very state in the country has adopted some kind of policy or law to deal with climate change.”¹²⁸ At least 33 states, and a large number of cities and counties, have drafted climate action plans for reducing greenhouse gas emissions.¹²⁹ Forty-two states have some form of greenhouse gas emissions inventory.¹³⁰ Seventeen states, and 284 cities outside those states, have set emission reduction targets.¹³¹ They are using a wide variety of approaches to try to reach those targets. According to one study, “states have undertaken well over 250 different types of policy actions” to mitigate climate change.¹³²

Not only are the states already addressing this problem, they are indispensable to any solution. John Dwyer pointed out in 1995 that the federal government needs the states’ resources and political capital to address the problem of conventional air pollution.¹³³ That remains true today for conventional pollution, and even more so for climate change. Furthermore, with nearly forty years of environmental federalism under their belts, many states are sophisticated

Climate Change Legislation: The Value of State Autonomy in a Federal System, 85 Denver U. L. Rev. 791, 834-38 (2008).

127. See SPENCER R. WEART, *THE DISCOVERY OF GLOBAL WARMING* 18, 142 (2003) Weart, at 18 (describing Charles Keeling’s famous graph of rising CO₂ levels on Mauna Loa, and the impression that graph made in 1966 on then-college student Al Gore).

128. Andreen et al., *supra* note [], at 4 (citing David Hodas, *State Initiatives*, in *Global Climate Change* 345 (Michael B. Gerrard, ed., 2007).

129. *Id.* (citing National Association of Clean Air Agencies, Conference on Defining the Role of States and Localities in Federal Global Warming Legislation, Discussion Paper #1, at 1 (Feb. 12-13, 2008)). See also Alice Kaswan, *The Domestic Response to Climate Change: What Role for Federal, State, and Litigation Initiatives*, 42 U.S.F. L. Rev. 39, 46-47 (2007) (noting the wide variety of regional, state, and local initiatives addressing greenhouse gas emissions); Kevin L. Doran, *U.S. Sub-Federal Climate Change Initiatives: An Irrational Means to a Rational End?*, 26 Va. Env’tl. L. J. 189, 209 (2008) (“As of mid-2007, some seventeen U.S. states [had] adopted time-bounded, quantitative targets for GHG emissions reductions.”). The Pew Center on Global Climate Change maintains an extensive list of state and regional initiatives. Pew Center on Global Climate Change, *What’s Being Done . . . In the States*, http://www.pewclimate.org/what_s_being_done/in_the_states.

130. Lutsey & Sperling, *supra* note [], at 675.

131. *Id.*

132. Robert B. McKinstry, Jr. & Thomas D. Peterson, *The Implications of the New “Old” Federalism in Climate Change: How to Function in a Global Marketplace When States Take the Lead*, 20 Pacific McGeorge Global Bus. & Dev’t L. J. 61, __ (2007).

133. John P. Dwyer, *The Practice of Federalism Under the Clean Air Act*, 54 Md. L. Rev. 1183, 1190, 1216-19 (1995). Even earlier, Paul Portney and his colleagues at Resources for the Future had noted that “state and local governments are responsible for the implementation, monitoring, and enforcement necessary for any national environmental law to succeed.” Paul R. Portney, Katherine N. Probst & Adam M. Finkel, *The EPA at “Thirty something”*, 21 Env’tl. L. 1461, 1472 (1991).

environmental players,¹³⁴ with as much or (particularly for this problem) more expertise than the EPA. Federal greenhouse legislation should take advantage of existing state efforts, and the energy behind them, as the foundation for an essential state role in addressing the climate change problem. Through a SIP-like state climate planning requirement, federal law could recognize the importance of state action, offer standard models without unduly restricting creativity, and provide seed funding to help build state and local capacity.¹³⁵

Although state action is decentralized, it is increasingly systematized. States are generally inventorying emissions, establishing registries, and using “consistent methods to prioritize similar [greenhouse gas] mitigation actions.”¹³⁶ Still, a federal mandate and guidance for state planning could have a number of benefits. First, it would draw in those states that have yet to seriously take up climate planning or mitigation.¹³⁷ Second, a more standardized set of state climate plans would produce information needed to tackle aspects of the climate change problem that are not well suited to markets. State climate inventories could highlight the possibilities and challenges of gains from reducing indirect and behavioral emissions. At the moment, there is very little reliable data at a local planning scale that ties greenhouse gas emissions to land uses, development patterns, and infrastructure choices.¹³⁸ A carefully framed planning mandate, supported by adequate guidance and federal funding, could address that need. Third, standardized state greenhouse gas inventories could tie into SIP development for other criteria pollutants, because greenhouse gases are frequently co-emitted with criteria pollutants. Finally, state planning obligations could be framed in such a way that they would include evaluation of the impacts of unavoidable warming, helping deal with the need to adapt to a warmer world.

Emphasizing state planning not only takes advantage of state resources and energies, it allows policy choices to respond to local variation in challenges and opportunities.¹³⁹ There is considerable variation in the ways that states contribute to

134. Nearly twenty years ago, Portney et al. described some state environmental agencies as “rival[ing] in size and sophistication the analogous national agencies in other Western industrial countries.” Portney et al., *supra* note [], at 1473. After eight years of conspicuous federal inaction on environmental problems, the environmental agencies of environmentally-protective states have become even more sophisticated and activist.

135. John Dernbach calls for federal funding to be tied to the level of progress states make in reducing energy consumption or greenhouse gas emissions. John C. Dernbach, *Harnessing Individual Behavior to Address Climate Change: Options for Congress*, 26 Va. Env'tl. L. J. 107, 157 (2008). That may well be appropriate after the first few years, but states should get guaranteed funding in the early years of the program to allow them to build their capabilities and launch efforts which may take some time to pay off.

136. Lutsey & Sperling, *supra* note [], at 676;

137. According to Lutsey and Sperling, that group still includes about half the states. 683

138. See Marilyn A. Brown, Frank Southworth & Andrea Sarzynski, *Shrinking the Carbon Footprint of Metropolitan America 13* (Metropolitan Policy Program at Brookings, May 2008), available at (“before researchers can appropriately study the impact of proposed federal policy changes – or even the experiences from state and local efforts – the nation needs a consistent set of emissions data for multiple periods and at a level of resolution and scale that can be tied to the activities, land uses, and the infrastructure networks of metropolitan areas.”).

139. As Professors David Adelman and Kirsten Engel point out in their contribution to

climate change, as well as in the relative economic costs and social disruption that would be associated with various emission reduction measures.¹⁴⁰ For example, a higher proportion of emissions in California are attributable to transportation than in many other states,¹⁴¹ because vehicle miles traveled per capita are high while winter heating needs are low. Even where emissions are traceable to a single general sector, such as electricity generation, the uses of electricity, and consequently the costs associated with reducing generation, can be very different. In California, the water use cycle, including conveyance, treatment, storage, and wastewater treatment and disposal, is the largest energy user, responsible for 19% of the state's electricity consumption, 30% of its non-power generation natural gas use, and the burning of 88 billion gallons of diesel fuel every year.¹⁴² Water conveyance from the wet northern portion of the state to the dry but populous south accounts for the largest proportion of that energy use.¹⁴³ Politically responsible decisionmakers in California, rather than utility company officers or federal bureaucrats, should decide whether those numbers suggest that promoting water conservation in southern California offers a prime opportunity to reduce greenhouse gas emissions, or whether electricity conservation should be sought in other sectors in order to protect the state's ability to move water to communities that need it. There is no objectively right or wrong answer to those sorts of questions. The point is that, just as for criteria pollutants, the details of how to reach a given level of greenhouse gas emission reduction can be enormously important to states and localities.¹⁴⁴ Those decisions, therefore, should be made locally to the extent feasible.

There is yet another reason to keep a substantial share of the responsibility for reducing greenhouse gas emissions at the state and local level: those governments have greater political and practical abilities than the federal government to deal with a substantial share of emissions, particularly those connected to individual behaviors. It is at best awkward, not to mention politically challenging, for any level of government to directly regulate the sorts of individual behaviors responsible for greenhouse gas

this volume, the diversity of approaches likely to be generated by a state planning and implementation mandate can provide useful incubators for innovation and technology diffusion. David E. Adelman and Kirsten H. Engel, *Reorienting State Climate Change Policies to Induce Technological Change*, 50 ARIZ. L. REV. ____, ___-___ (2008).

140. See, e.g., Ann E. Carlson, *Federalism, Preemption, and Greenhouse Gas Emissions*, 37 U.C. Davis L. Rev. 281, 290 (2003).

141. See Energy Information Administration, 2004 State Emissions by Sector (Million Metric Tons of Carbon Dioxide), available at www.eia.doe.gov/oiaf/1605/ggrpt/excel/tbl_statesector.xls; Ann E. Carlson, *Federalism, Preemption, and Greenhouse Gas Emissions*, 37 U.C. Davis L. Rev. 281, 291 (2003) (noting that California leads the country in vehicle miles traveled, that fifty-eight percent of the state's greenhouse gas emissions come from the transportation sector, and that those emissions increased faster than emissions from the energy sector in the 1990s).

142. Martha Krebs, California Energy Commission, *Water-Related Energy Use in California*, Testimony presented to the Assembly Committee on Water, Parks, and Wildlife (Feb. 20, 2007), available at <http://www.energy.ca.gov/2007publications/CEC-999-2007-008/CEC-999-2007-008.PDF>; Navigant Consulting, Inc., *Refining Estimates of Water-Related Energy Use in California*, Report to the California Energy Commission 5 (Dec. 2006).

143. Navigant Consulting, *supra* note [], at 2.

144. See Dwyer, *supra* note [], at 1198 (noting the importance of the details of allocating criteria pollutant emissions among sources to states and local governments).

emissions. Most behavioral changes will have to be voluntary, triggered by education, norm activation, or other catalysts.¹⁴⁵ Nonetheless, there is a clear role for government, and that role is best served at the state or local level. State and local governments have authority over key infrastructure choices that mediate behavioral decisions and the emission consequences of those decisions. They determine, among other things, patterns of development, building codes, and the availability of public transit. They can, although so far they have largely chosen not to, regulate farming practices, wetland draining, and the extraction of fossil fuels. These choices can have surprisingly large effects on greenhouse gas emissions. According to one recent study, for example, compact development patterns can reduce vehicle miles traveled, and the associated carbon emissions, by as much as 20-40%.¹⁴⁶ According to another, residential and commercial buildings account for one-third of U.S. carbon emissions.¹⁴⁷ Building codes, development patterns, and appliance efficiency requirements all strongly affect the carbon emissions associated with buildings, and all are subject to state control.¹⁴⁸ Development impact fees assessed on a sliding scale tied to the level of carbon emissions offer another potentially promising approach.¹⁴⁹ While all of these measures are primarily forward-looking, given the level of turnover and new development, they could have very strong effects on emissions by mid-century.¹⁵⁰ The key point is that states have open to them a wide variety of measures that could

145. Various approaches to catalyzing behavioral change have been suggested. Michael Vandenberg and Anne Steinemann call for providing public information about individual carbon footprints. Michael P. Vandenberg & Anne C. Steinemann, *The Carbon-Neutral Individual* 82 N.Y.U. L. Rev. 1673 (2007). John Dernbach emphasizes the role states might play through “individual or public engagement plans modeled on the SIPs.” John C. Dernbach, *Harnessing Individual Behavior to Address Climate Change: Options for Congress*, 26 Va. Envtl. L. J. 107, 157 (2008). Al Lin suggests a form of climate evangelism employing techniques that have been very successful in the evangelical Christian movement. Albert C. Lin, *Evangelizing Climate Change* (June 9, 2008), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1142919.

146. Ewing et al., *supra* note [], at 14.

147. Brown et al., *supra* note [], at 5.

148. States have strong authority over land use patterns and building codes. They are more limited with respect to product energy efficiency standards, but still have a significant role. States are free to set efficiency standards for appliances not subject to federal standards, but where federal standards apply states must get a waiver from the Department of Energy in order to impose more stringent requirements. Kaswan, *supra* note [], at 825; David Hodas, *State Initiatives*, in *Global Climate Change and U.S. Law* 343, 363 (Michael B. Gerrard, ed., 2007); Steven Nadel et al., *Leading the Way: Continued Opportunities for New State Appliance and Equipment Efficiency Standards* (Mar. 2006), available at <http://www.standardsasap.org/documents/a062.pdf>. Given the mobility of Americans and their belongings, as well as the ready availability of goods over the internet, strong federal product standards would likely be more effective as well as easier on manufacturers than a patchwork of state standards, but there are enough gaps in the current federal appliance efficiency program to leave plenty of room for state initiative and experimentation.

149. See Benjamin S. Kingsley, *Making It Easy to Be Green: Using Impact Fees to Encourage Green Building*, 83 N.Y.U. L. Rev. 532 (2008) (proposing the use of impact fees graduated on the basis of a variety of environmental impacts as a prod toward green building).

150. See Ewing et al., *supra* note [], at 18 (noting that according to one forecast, two thirds of the homes, offices and other developments that will be on the ground in 2050 have not yet been built).

reduce GHG emissions; a state inventory and planning requirement would force them to confront the challenge of GHG emissions while encouraging experimentation and allowing adjustment to local social and economic conditions.

Finally, a state climate planning mandate modeled on the SIP program could maximize the opportunity for states to learn from each other's successes and failures. The much-touted idea that devolving regulatory authority to the states allows them to play the role of laboratories of experimentation¹⁵¹ works only if someone is paying attention to and evaluating the various forays. Those states that are already active in climate change are making efforts to coordinate with one another.¹⁵² Coordination would be easier, however, if state plans were standardized by federal guidelines and made available through a federal climate clearinghouse. Applying the Clean Air Act's requirements for emissions monitoring, and adding requirements for regular updating of the state emissions inventory and climate implementation plan, would put EPA in a good position to undertake or commission comparative evaluation of the effectiveness of disparate state strategies.

While we are convinced that the SIP framework provides a useful model for addressing climate change, we are not blind to its limits. Noting that more than 130 million people in the United States live in areas that are not yet in compliance with the NAAQS, Professor Arnold Reitze has proclaimed the SIP approach to control of criteria pollutants a "failure."¹⁵³ The SIP program has suffered from three major flaws: first, EPA has consistently been late with needed regulations and guidance, and slow to review state submissions;¹⁵⁴ second, states have been able to manipulate the models used to demonstrate attainment;¹⁵⁵ and third, they have never been forced to confront the problem of increasing vehicle miles traveled.¹⁵⁶ The first will be a problem for a GHG program unless the President and Congress make the program a priority. The second should be significantly less problematic for global warming than for criteria pollutants, since evaluating compliance with GHG emission reduction goals would be much less sensitive to the kinds of highly uncertain modeling assumptions that plague assessment of compliance with the NAAQS for localized pollutants. The third will certainly be a significant problem for a state-centric approach to climate change mitigation. That does not mean that a program modeled on the SIP approach cannot work, but it does mean that such a program must be carefully designed. If Congress is serious about dealing with climate change, it must mandate that state plans explicitly address the effect of development and other decisions on vehicle miles traveled, and force states that are unwilling to cut back on driving to compensate with other emission reductions. It should also direct EPA to refine estimates of the effect of

151. *New State Ice Co. v. Liebman*, 285 U.S. 262, 311 (1932) (Brandeis, J., dissenting) ("It is one of the happy incidents of the federal system that a single courageous State may, if its citizens choose, serve as a laboratory; and try novel social and economic experiments without risk to the rest of the country.").

152. Lutsey and Sperling, *supra* note [], at ___.

153. Arnold W. Reitze, Jr., *Air Quality Protection Using State Implementation Plans – Thirty-Seven Years of Increasing Complexity*, 15 *Vill. Envtl. L. J.* 209, 357 (2004).

154. See McGarity, *supra* note [], at 89, 96-97.

155. See Reitze, *supra* note [], at 362-63; see also Fine & Owen, *supra* note []; McGarity, *supra* note [].

156. Reitze, *supra* note [], at 361-62; Dwyer, *supra* note [], at 1199-1208.

development patterns on greenhouse gas emissions, and to develop “best practices” recommendations for low-carbon land use planning. If the states are serious about dealing with climate change, as many of them now appear to be, they will pressure Congress to include such requirements in climate change legislation, and pressure EPA to enforce them. There is no question that the ability to change American driving habits will be a key test of any strategy for reducing carbon emissions.

2. Mobile Source Emission Controls

In 2003, EPA rejected a petition seeking federal regulation of greenhouse gas emissions under Title II of the Clean Air Act.¹⁵⁷ EPA relied principally on its conclusion that greenhouse gases could not be considered “air pollutants” subject to regulation under the Clean Air Act.¹⁵⁸ That position, subsequently rejected by the U.S. Supreme Court in *Massachusetts v. EPA*,¹⁵⁹ appears to have been driven by the agency’s discomfort with the idea of setting a NAAQS for CO₂.¹⁶⁰ EPA also argued that the Clean Air Act’s provisions for limiting tailpipe emissions from mobile sources should not be applied to CO₂ because “[a]t present, the only practical way to reduce tailpipe emissions of CO₂ is to improve fuel economy,”¹⁶¹ a task supposedly delegated by Congress exclusively to the Department of Transportation, which sets corporate average fuel economy standards under the Energy Policy and Conservation Act.¹⁶² That position, too, was rejected by the Supreme Court, which noted that EPA’s obligation to protect public health and welfare might overlap with DOT’s mandate to promote energy efficiency without any inconsistency.¹⁶³ It now appears that EPA must regulate CO₂ emissions from mobile sources, although the agency continues to drag its heels.¹⁶⁴

157. EPA, Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. 52,922 (Sept. 8, 2003).

158. *Id.* at 59,295-29; Fabricant Memo, *supra* note [].

159. ___ U.S. ___, 127 S. Ct. 1438 (2007).

160. If EPA conceded an obligation to regulate automobile emissions it would likely also have to designate CO₂ as a criteria pollutant, because the two legal standards are nearly identical. Compare 42 U.S.C. § 7521(a) (requiring that EPA issue motor vehicle emission standards for any air pollutants “which in his judgment cause or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare”) with 42 U.S.C. § 7408(a) (requiring that EPA list as a criteria air pollutants “each air pollutant – (A) emissions of which, in his judgment, cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare; [and] (B) the presence of which in the ambient air results from numerous or diverse mobile or stationary sources”).

161. 68 Fed. Reg. at 52,929.

162. 49 U.S.C. §§ 32901-32919.

163. *Massachusetts v. EPA*, 127 S.Ct. at 1462.

164. The narrow holding of *Massachusetts v. EPA* required only that EPA must either determine whether CO₂ emissions may reasonably be anticipated to endanger public health or welfare or offer a reasoned explanation of its refusal to decide that question. *Id.* at 1463. However, the opinion did not seem to leave much room for either a finding of no endangerment or a decision not to decide. More than a year after the Supreme Court’s decision, EPA has done nothing. After telling Congress in June 2007 that it would propose regulations by the end of the year, Statement of Stephen L. Johnson, EPA administrator, to House Select Committee on Energy Independence and Global Warming (June 8, 2007), EPA pulled back. In March 2008, Administrator Johnson announced that EPA would solicit public input on the effects of climate

In fact, there is no good reason not to regulate tailpipe emissions of greenhouse gases under the Clean Air Act.¹⁶⁵ Conceptually, it makes no difference whether emissions are controlled by improving fuel efficiency or by removing pollutants from the emissions stream. In either case, regulation may be necessary to ensure that lower-polluting vehicles make it to the market. And in either case, regulation under the Clean Air Act, with its requirement for sufficient lead time to allow compliance,¹⁶⁶ can push technological advancement without threatening the automobile industry.

Through a creative combination of federal and state authority, the Clean Air Act's mobile source provisions encourage technology forcing without threatening the chaos of fifty different sets of standards. Only California may regulate more stringently than EPA.¹⁶⁷ Other states with attainment problems may choose between California's and EPA's standards.¹⁶⁸ Sixteen states have adopted California's standards or are in the process of doing so.¹⁶⁹

Professor Ann Carlson concludes that by singling out California for special regulatory authority, the mobile source provisions of the Clean Air Act "may have enhanced environmental innovation."¹⁷⁰ California's unique air pollution problems and massive market power, perhaps coupled with the relative unimportance of the conventional automobile industry to its economy,¹⁷¹ have encouraged the state to adopt

change and regulation of greenhouse gas emissions from both stationary and mobile sources through an Advance Notice of Proposed Rulemaking. Letter from Stephen L. Johnson, EPA Administrator, to Henry Waxman, Chair, and Tom Davis, Ranking Member, Committee on Oversight and Government Reform (Mar. 27, 2008), available at <http://oversight.house.gov/documents/20080327170233.pdf>. By mid-June 2008, EPA has not issued such a notice. One year after the Supreme Court's decision in *Massachusetts v. EPA*, a coalition of states, cities, and environmental groups filed a mandamus petition seeking to force EPA to make an endangerment determination. Petition for Writ of Mandamus to Compel Compliance with Mandate, Commonwealth of Massachusetts v. U.S. Environmental Protection Agency, Docket No. 03-1361, D.C. Cir., available at http://ag.ca.gov/cms_attachments/press/pdfs/n1540_mandamus_petition_april_1_final.pdf; Press Release, Attorney General Martha Coakley Petitions Court to Require EPA to Comply with Court Order, Apr. 2, 2008, http://www.mass.gov/?pageID=cagopressrelease&L=1&L0=Home&sid=Cago&b=pressrelease&f=2008_04_02_epa_petition&csid=Cago.

165. See Lisa Heinzerling, *Climate Change and the Clean Air Act*, 42 U.S.F. L. Rev. 111, 133 (2007) ("Section 202 sets up a perfectly feasible framework for regulating emission of greenhouse gases from motor vehicles: the establishment of the same sort of technology-based limits that EPA has already set for other pollutants emitted by motor vehicles.").

166. 42 U.S.C. § 7521(a)(2).

167. 42 U.S.C. § 7543(b).

168. 42 U.S.C. § 7507.

169. Kelley M. Jancaitis, *Florida on the Coast of Climate Change: Responding to Rising Seas*, 31 *Environs Envtl. L. & Pol'y J.* 157, 175 (2008).

170. Ann E. Carlson, *Federalism, Preemption, and Greenhouse Gas Emissions*, 37 *U.C. Davis L. Rev.* 281, 285 (2003).

171. While California has little in the way of conventional automobile manufacturing, it has a high concentration of advanced automotive technology businesses. See *id.* at 315 (asserting that southern California is home to seventy-five advanced automobile technology centers, as well as other companies devoted to development of hydrogen-fueled vehicles).

emission controls more stringent than EPA's. Those controls, in turn, have acted as a kind of one-way ratchet. When California adopts and implements its regulations, the automobile industry must choose between withdrawing from the large California market or conceding that it can meet California's standards. In fact, California's standards have often led to tightening of the national standards, or persuaded manufacturers to make all their cars to California standards.¹⁷²

Federal greenhouse gas legislation should endorse the Clean Air Act's division of responsibilities for regulation of mobile sources, and should clear up the current confusion about how those provisions apply to greenhouse gas emissions. Congress should explicitly direct EPA to regulate greenhouse gas emissions from automobiles and other mobile sources.¹⁷³ It should also either mandate that EPA issue California a preemption waiver for its automobile greenhouse gas standards¹⁷⁴ or, better yet, adopt a blanket provision allowing California to adopt its own greenhouse gas standards so long as they are at least as stringent as the national standards.¹⁷⁵ Other states should be given the option of opting in to California's GHG standards, as many have already chosen to do.

3. *Technology-based Emission Limits for Stationary Sources*

Technology-based regulation of emissions from stationary sources is as sensible for greenhouse gases as it is for traditional criteria pollutants. The fact that there currently are no effective technologies for removing CO₂ at the smokestack need not deter technology-based regulation. Regulators could concentrate on processes and practices that reduce fuel use, and/or could seek to aggressively force the development of carbon sequestration technology.¹⁷⁶ Already, a series of lawsuits have been filed

172. David Adelman & Kirsten Engel, *Adaptive Federalism: The Case Against Reallocating Environmental Regulatory Authority*, Arizona Legal Studies Discussion Paper No. 07-23 at 45-46 (Sept. 2007), available at <http://ssrn.com/abstract=1016767>; National Research Council, State and Federal Standards for Mobile Source Emissions 3-4 (2006).

173. While EPA dithers about whether to regulate automobile emissions, California has filed petitions requesting that it also regulate greenhouse gas emissions from oceangoing vessels, airplanes, and offroad vehicles. Office of the Attorney General, State of California Department of Justice, Global Warming, Clean Air Act, <http://caag.state.ca.us/globalwarming/cleanairact.php>.

174. California Senator Barbara Boxer has introduced a bill to this effect. S. 2555, 110th Cong., 2d Sess. (2008).

175. Such a waiver provision would remove the Clean Air Act's requirement that California's standards be justified by the need to meet "compelling and extraordinary conditions." 42 U.S.C. § 7543(b)(1)(B). EPA relied on that requirement in rejecting California's waiver request for its greenhouse gas tailpipe standards. EPA, California State Motor Vehicle Pollution Control Standards; Notice of Decision Denying a Waiver of Clean Air Act Preemption for California's 2009 and Subsequent Model Year Greenhouse Gas Emission Standards for New Motor Vehicles, 73 Fed. Reg. 12,156 (Mar. 6, 2008). While California believes it has met the "compelling and extraordinary conditions" standard, that limitation is ill-suited to global climate change and should not be imposed on California's ability to experiment with greenhouse gas regulation.

176. Technology-based standards can bring about the implementation and spread of existing technologies more rapidly than a carbon market, especially if that market is hedged with a variety of cost-containment provisions as the Climate Security Act is. Joseph Romm, *Cleaning Up on Carbon*, 2 NATURE REPORTS: CLIMATE CHANGE, 85, 86 (2008).

demanding that EPA and the states regulate CO₂ emissions from new and modified sources under the New Source Review and New Source Performance Standards provisions of the Clean Air Act.¹⁷⁷ EPA is reportedly about to issue an Advance Notice of Proposed Rulemaking seeking comment on potential regulation of CO₂ emissions through New Source Performance Standards.¹⁷⁸

For much the same reasons that California should be free to regulate greenhouse gas emissions from mobile sources more strictly than EPA, all states should be permitted to adopt more stringent limits on stationary sources. Those limits could help the states meet their emission targets or free up emissions for other sectors. The concerns about uniformity that have limited the Clean Air Act to one state alternative for mobile sources do not apply to stationary sources. Nor is there any inconsistency in allowing states to impose additional regulations on stationary sources on top of a federal market strategy. The acid rain trading program, the poster child for market efforts, has been successfully layered on top of the SIP foundation. Federal SO₂ allowances are necessary but not sufficient to authorize emissions; sources subject to the trading program must also comply with all applicable state requirements.¹⁷⁹

4. Federal Enforceability

Finally, one other aspect of the Clean Air Act's approach to cooperative federalism merits inclusion in federal greenhouse gas legislation. As we mentioned above, once approved by EPA, state SIPs become enforceable as a matter of federal law.¹⁸⁰ That means that EPA can step in if a state drafts a strong plan but then ignores it. Because the Clean Air Act contains a broad citizen suit provision,¹⁸¹ citizens can enforce the plan if EPA does not. The possibility of outside enforcement action is likely to be crucial to the success of any climate regulation scheme, because state and federal politicians and bureaucrats will face strong temptations to endorse robust plans that seem to tackle the problem but allow powerful economic players to escape full implementation of such plans.¹⁸²

V. CONCLUSION

We understand both the appeal of carbon markets and the reluctance of EPA to turn to the Clean Air Act's regulatory mechanisms to control greenhouse gas emissions. Markets promise painless (or nearly painless) environmental improvement,

177. Kevin Haroff & Jacqueline Hartis, *Climate Change and the Courts: Litigating the Causes and Consequences of Global Warming*, NATURAL RESOURCES & ENV'T., Winter 2008, at 50; Kate Winston, *Georgia Court Ruling May Open Door for State, EPA CO₂ Rules*, INSIDE EPA, July 4, 2008.

178. Dawn Reeves & Doug Obey, *EPA's Draft ANPR Touts \$2 Trillion Benefit of Vehicle GHG Rules*, INSIDE EPA, June 26, 2008.

179. 42 U.S.C. § 7651b(f) ("Nothing in this section [setting up the acid rain trading program] relating to allowances shall be construed as affecting the application of, or compliance with, any other provision of this chapter to an affected unit or source, including the provisions related to applicable National Ambient Air Quality Standards and State implementation plans.").

180. 42 U.S.C. § 7413.

181. 42 U.S.C. § 7604.

182. See, e.g., John P. Dwyer, *The Pathology of Symbolic Legislation*, 17 Ecology L.Q. 233 (1990).

and carbon emissions seem particularly well suited to a market approach. Regulations have a reputation for being both economically painful and politically bruising, and their implementation has often been distressingly slow. In addition, the Clean Air Act looks, at first glance, like an uncomfortable fit for the global climate change problem.

Unfortunately, there is good reason to believe that carbon markets will not be adequate to the task of preventing disastrous global warming. It may be that no tools are up to that daunting task, but adding regulatory to market approaches at least offers some hope. Once it is acknowledged that regulation must be part of the solution, the Clean Air Act begins to look better. Although in its current form the Clean Air Act is by no means a perfect fit for the global warming problem, several elements of the Act's cooperative federalism structure should be included in any new federal climate change legislation. Global warming is a problem that calls for national goals, implemented by local authorities in ways that are responsive to local economic and social conditions. It requires individual behavioral change to a far great extent than historic air pollution problems; state and local governments have better access to policy levers connected to greenhouse gas-generating behaviors than the federal government does. Mitigating carbon emissions will also require faster and more innovative technological change than past air pollution problems; technology-forcing regulation with a state ratchet offers more promise than markets for catalyzing that sort of rapid technological evolution.

It is surprising that the Supreme Court's decision in *Massachusetts v. EPA*, which comes very close to saying that greenhouse gas regulation is required under the Clean Air Act as it currently stands, has not motivated greater attention to what the Clean Air Act can and cannot do about the global warming problem. Policymakers at both the state and federal level should treat the decision as a starting point for adapting the existing Act to a problem no one thinks it was well designed to solve. They should seek to maintain and even strengthen those aspects of the Act that are well suited to addressing global warming while they throw out those that are not. The price of explicitly exempting CO₂ emissions from the NAAQS requirement should be the adoption of a robust federal mandate for development and implementation of state greenhouse gas emission reduction plans, federal tailpipe emission standards that encourage California to adopt its own more stringent standards, and federal technology-based floors on stationary source emissions, appropriately tailored to the types of sources and amounts of emissions typical for CO₂.