

THINK GLOBALLY, ACT GLOBALLY:
THE LIMITS OF LOCAL CLIMATE POLICIES

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This Symposium has focused primarily on recent efforts by several states of the United States to regulate greenhouse gas (GHG) emissions. These state-level efforts include common law liability actions (such as public nuisance lawsuits) brought by several states against large GHG emitters.¹ They also include states' regulation of GHG emissions from mobile sources (such as California's 2002 law restricting carbon dioxide emissions from motor vehicles²) and from stationary sources (such as California's Global Warming Act of 2006,³ an emerging initiative of western states, and the Regional Greenhouse Gas Initiative (RGGI) of seven northeastern states⁴). They include efforts by states to force the federal government to act, such as the lawsuit in *Massachusetts v. EPA*,⁵ recently decided by the U.S. Supreme Court.⁶

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¹ *E.g.*, *Connecticut v. Am. Elec. Power Co.*, 406 F. Supp. 2d 265 (S.D.N.Y. 2005); *Complaint, California ex rel. Lockyer v. Gen. Motors Corp.*, No. 06-05755 (N.D. Cal. Sept. 20, 2006).

² CAL. HEALTH & SAFETY CODE § 43018.5 (West 2007).

³ California Global Warming Solutions Act of 2006, CAL. HEALTH & SAFETY CODE §§ 38500-38599 (West 2007).

⁴ Regional Greenhouse Gas Initiative [RGGI], <http://www.rggi.org> (last visited May 1, 2007). The states participating in the RGGI include Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York, and Vermont. *See id.*

⁵ 127 S. Ct. 1438, 1455, 1462 (2007) (finding in a 5-4 decision that Massachusetts does have standing to sue, and that the EPA does have statutory authority to regulate GHG emissions from motor vehicles as "air pollutants" under the Clean Air Act). In a related case, petitioners urge that the EPA has authority to regulate GHG emissions from stationary sources under the Clean Air Act; this case has been stayed in the D.C. Circuit pending the decision in *Massachusetts v. EPA*. *Coke Oven Envtl. Task Force v. EPA*, No. 06-1182 (D.C. Cir. June 23, 2006) (order granting motion to hold case in abeyance). It is important to note that these lawsuits could force the federal government to regulate and would thereby have a larger impact than policies adopted in the states themselves.

⁶ Other lawsuits are pending in the courts, including some by private plaintiffs seeking damages for Hurricane Katrina (in the district courts for the Southern District

The papers in this Symposium make many useful contributions. And the state-level actions reflect creative legal strategies intended to achieve a major environmental objective. In this brief Commentary, I will not seek to recapitulate the papers' insights nor to address each paper individually.

Instead, I will make one basic point: subnational state-level action is not the best way to combat global climate change. This is true even assuming that forestalling global climate change is of utmost importance,⁷ and even where the state-level policies are individually well designed. The basic point remains that local action is not well suited to regulating mobile global conduct yielding a global externality. In this Commentary I will argue that subnational state-level action, by itself, is of limited value, and may even yield perverse results; and, given that such state-level action is already occurring, I will suggest what its best uses may be in light of these limitations.

of Mississippi and the Southern District of Florida), some to force federal agencies to address climate change in their environmental impact statements under the National Environmental Policy Act, some under the Alien Tort Claims Act, at least one under the Endangered Species Act (brought by the Center for Biological Diversity, seeking the listing of polar bears as a threatened species, in response to which the U.S. Fish and Wildlife Service issued a proposed rule to list the polar bear as threatened, 72 Fed. Reg. 1064, 1064 (Jan. 9, 2007)), and one brought by the Inuit Circumpolar Conference in the Inter-American Commission on Human Rights on December 7, 2005, see Ctr. for Int'l Env'tl. Law, Inuit File Petition with Inter-American Commission on Human Rights, Claiming Global Warming Caused by United States Is Destroying Their Culture and Livelihoods, (Dec. 7, 2005), http://www.ciel.org/Climate/ICC_Petition_7Dec05.html. Further claims might be brought by corporate shareholders against their officers and directors for failure to safeguard corporate value against impending climate change policies. David Buente and Linda Malone noted many of these cases in their comments at this Symposium. A useful overview of the various legal actions brought by the states and others, as of late 2006, is provided in JUSTIN R. PIDOT, GEORGETOWN ENVTL. LAW & POLICY INST., GLOBAL WARMING IN THE COURTS: AN OVERVIEW OF CURRENT LITIGATION AND COMMON LEGAL ISSUES (2006), available at http://www.law.georgetown.edu/gelpi/current_research/documents/GWL_Report.pdf, and JUSTIN R. PIDOT, GEORGETOWN ENVTL. LAW & POLICY INST., GLOBAL WARMING IN THE COURTS: A LITIGATION UPDATE (2007), available at http://www.law.georgetown.edu/gelpi/current_research/documents/GWL_Update_3.13.07.pdf.

⁷ For the purpose of analyzing the state-level policies compared to alternative abatement policies, this Commentary takes as given the premise that global climate change is a serious risk that warrants preventive measures. I reviewed this evidence and the benefits and costs of climate policies in RICHARD B. STEWART & JONATHAN B. WIENER, RECONSTRUCTING CLIMATE POLICY: BEYOND KYOTO 18-25 (2003). For the latest IPCC statement on the science, see INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE [IPCC], WORKING GROUP I, CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS 2-18 (2007), available at http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_SPM.pdf.

The resort to state-level action is understandable, and perhaps predictable, given the U.S. government's decisions (so far) not to ratify the Kyoto Protocol⁸ and not to enact federal legislation regulating GHG emissions.⁹ It is nonetheless well understood that these state-level efforts, even those of large states such as California, will have little impact on global emissions and hence little impact on global climate. Moreover, the state-level actions must surmount numerous legal hurdles. Worse, state-level efforts could be not only ineffectual, but counterproductive, increasing net global emissions and undercutting a wider effort to constrain global emissions.

Nevertheless, if well-designed, state-level strategies could yield some significant results, including (i) the stimulation of technological innovation that could diffuse to other unregulated places; (ii) learning by experimentation with alternative policy designs; and (iii) raising the specter of a patchwork of inconsistent state regulations as a political gambit to motivate industry to support broader federal regulation.

⁸ The United States negotiated, signed and ratified the United Nations Framework Convention on Climate Change, May 29, 1992, 1994 U.N.T.S. 164, 37 I.L.M. 22 (entered into force Mar. 21, 1994) [hereinafter FCCC]. The United States negotiated and signed, but did not ratify, the Kyoto Protocol to the FCCC, Dec. 10, 1997, 37 I.L.M. 22 (entered into force Feb. 16, 2005). President Clinton did not submit the Kyoto Protocol to the Senate for ratification. In March 2001, President George W. Bush declared his decision to withdraw the United States from the Kyoto Protocol. See Andrew C. Revkin, *Bush's Shift Could Doom Air Pact, Some Say*, N.Y. TIMES, Mar. 17, 2001, at A7; David E. Sanger, *Bush Will Continue To Oppose Kyoto Pact on Global Warming*, N.Y. TIMES, June 12, 2001 at A1.

⁹ The McCain-Lieberman Climate Stewardship Act, S. 139 revised as S. Amend. 2028, 108th Cong. (2003), received forty-three affirmative votes (and fifty-five against) in the U.S. Senate on October 30, 2003, 149 CONG. REC. S13598 (2003), and thirty-eight affirmative votes in the Senate on June 23, 2005, 151 CONG. REC. S7029 (2005) (voted on as S. Amend. 826 to H.R. Res. 6, 109th Cong. (2005)). In June 2005, by a fifty-four to forty-three vote, 151 CONG. REC. S7037 (2005), the Senate adopted the Bingaman-Domenici "sense of the Senate" amendment, S. Amend. 866 to H.R. 6, 109th Cong. (2005), calling for federal regulation of GHGs, but did not enact legislation to implement such regulation. Several other Senators of both political parties have also introduced bills on climate policy, including Senators Carper, Feinstein, Hagel, Kerry, Snowe, Lugar, Biden, Sanders, and Boxer. No such bill has passed the House. For a list and summary of these and other climate policy bills in the U.S. Congress, see Pew Ctr. on Global Climate Change, *What's Being Done in Congress*, http://www.pewclimate.org/what_s_being_done/in_the_congress (last visited May 1, 2007) (discussing the 106th through 109th Congresses); Pew Ctr. on Global Climate Change, *Senate Greenhouse Cap-and-Trade Proposals in the 110th Congress*, <http://www.pewclimate.org/document.cfm?documentID=725> (last visited May 1, 2007) (discussing the 110th Congress).

“Think globally, act locally” is good advice for many problems, especially when interpreted not only spatially, but also conceptually as advice to adopt a systems analysis mental framework: consider the complex interconnected whole, and then do what you can to help out in your particular niche while avoiding adverse side effects on other domains.¹⁰ But “think globally, act locally” is not such good advice for protecting global public goods when the externalities arise from widespread and geographically moveable sources, and when local action would have a trivial effect or would merely shift those sources to other locales (potentially causing even greater harm). Because there is no global sovereign to institute global regulation, successful action will require cooperation by the major global actors—a diverse group of powerful national governments who will act only if they perceive their own net benefits to doing so and who are bound to a treaty only if they agree to join.¹¹ Action by each major national government depends on its confidence that other major countries will also act. The difficult policy challenge of climate change is thus to produce a global public good via the mutual consent of multiple heterogeneous actors. It requires us to “think globally, act globally.”

I. LEGAL OBSTACLES TO STATE-LEVEL ACTION

Before addressing the policy problems with subnational state-level actions to reduce GHG emissions, let me briefly mention the important legal hurdles they must overcome in the U.S. legal system. Common law liability actions (such as public nuisance claims) must pass several tests. They must prove causation, including general causation: do human GHG emissions cause global climate change, and especially the changes that injure the plaintiffs? Plaintiffs must also prove specific causation: did this defendant’s GHG emissions cause this plaintiff’s harm?¹² Proving causation in court and satisfying the tests for judicial admissibility of scientific expert testimony to prove causation may well be more difficult than persuading legislators or regulators to act based on uncertain model forecasts. Relatedly, the plaintiffs may need to show standing to sue (are their injuries too general? are they

¹⁰ This is the basic advice of *RISK VS. RISK: TRADEOFFS IN PROTECTING HEALTH AND THE ENVIRONMENT* (John D. Graham & Jonathan Baer Wiener eds., 1995).

¹¹ Jonathan B. Wiener, *Global Environmental Regulation: Instrument Choice in Legal Context*, 108 *YALE L.J.* 677, 683 (1999).

¹² With a globally mixing pollutant causing global impacts, some version of market share proportionate liability could be applicable.

redressable?),¹³ fend off preemption by the Clean Air Act, establish the elements of negligence, deflect the political question doctrine,¹⁴ and find a remedy for future injuries that the court will be willing to award.

Meanwhile, state regulation of GHG emissions may face a variety of legal obstacles, including challenges (i) under the Dormant Commerce Clause, especially if states attempt to regulate or tax emissions embedded in products (such as goods, services, and electricity) imported into the state from other states; (ii) under the Dormant Treaty Clause or more generally for interference with the foreign affairs power of the federal government, especially where U.S. states purport to enter into agreements with foreign countries such as Great Britain or the European Union;¹⁵ (iii) under theories of preemption by federal statutes such as the Clean Air Act; and (iv) under the Interstate Compacts Clause, in the cases of RGGI, western states, or other cooperative multistate programs.¹⁶

Even if these legal hurdles can be surmounted, there remains a high political hurdle for state-level actions: because GHGs mix globally and have global impacts, local abatement actions pose local costs, yet deliver essentially no local climate benefits. This in turn suggests that local actions will often be difficult to enact. Each state (or country) has an incentive to free ride on other states' (or countries') actions, enjoying the global benefits without bearing the local costs. The result is underinvestment in abatement, unless cooperation can be organized.¹⁷ Indeed, a "race to the bottom" is even more likely in the case of a globally mixing pollutant with no local impacts, because local decisions to relax regulations would reduce costs without incurring the local pollution harms associated with conventional pollutants.

Yet in fact we do see state-level actions being undertaken in the Northeast and in California, as well as action by the European Union

¹³ See *supra* note 5.

¹⁴ The court in *Connecticut v. American Electric Power Co.* based its dismissal on the political question doctrine. See 406 F. Supp. 2d 265, 273-74 (S.D.N.Y. 2005).

¹⁵ For discussion, see Note, *Foreign Affairs Preemption and State Regulation of Greenhouse Gas Emissions*, 119 HARV. L. REV. 1877 (2006).

¹⁶ U.S. CONST. art. I, § 10; see generally Claire Carothers, Note, *United We Stand: The Interstate Compact as a Tool for Effecting Climate Change*, 41 GA. L. REV. 229 (2006).

¹⁷ One study found that countries acting on their own would engage in only 4% of the GHG abatement that they would find worthwhile to undertake under a global cooperative regime. See William D. Nordhaus & Zili Yang, *A Regional Dynamic General-Equilibrium Model of Alternative Climate-Change Strategies*, 86 AM. ECON. REV. 741, 762 (1996).

despite U.S. withdrawal from the Kyoto Protocol. Such action may look worthwhile to those who think the costs are low, or favor emissions reductions regardless of the costs, or favor a state patchwork to motivate industry support for a federal (or global) regime, or perceive real costs but favor moving first in order to learn by doing, or perceive real costs but favor action that would impose higher costs on other states or industries (raising rivals' costs), or are governors or other high officials with broader political ambitions. The political coalitions in each state that help secure the enactment of GHG limitations may reflect the combination of ambitious leaders with so-called "Baptists and bootleggers"¹⁸ coalitions—environmentalists seeking to protect the climate, and industry segments (such as alternative energy sources) seeking to raise their rivals' costs.¹⁹

II. NORMATIVE DISADVANTAGES OF STATE-LEVEL ACTIONS

But even if these legal and political obstacles can be overcome (and it seems that they are being overcome to some degree, though challenges still await in California and in RGGI), there remains the normative question—whether these state-level actions are desirable.

No matter where they are emitted, GHGs mix globally in the atmosphere and have global impacts. The benefits of emissions abatement are therefore shared globally. Climate protection is a global public good, and the challenge is to produce this global public good via the consent of heterogeneous national actors. Subnational state-level actions will have a small impact on the global picture, and could even be perverse.

Each state of the United States—even California—contributes a small share of global GHG emissions. Certainly, no state could effectively control its own ambient level of carbon dioxide or other GHGs, because that ambient level is determined by the worldwide concentration of GHGs in the atmosphere. This shows, incidentally, why regulation of carbon dioxide under the National Ambient Air Quality Standards (NAAQS) and State Implementation Plans (SIPs) of Clean Air Act sections 109 and 110 would likely fail if carbon dioxide were listed as a "pollutant" by the EPA under section 108 of the Clean Air Act.

¹⁸ See Bruce Yandle, *Bootleggers and Baptists in the Market for Regulation*, in *THE POLITICAL ECONOMY OF GOVERNMENT REGULATION* 29, 33-36 (Jason F. Shogren ed., 1989).

¹⁹ See Jonathan Baert Wiener, *On the Political Economy of Global Environmental Regulation*, 87 *GEO. L.J.* 749, 760-61 (1999).

No SIP could, on its own, attain a serious NAAQS for GHGs without international cooperation. The problem is not whether carbon dioxide qualifies as a pollutant, but that state-based ambient standards are a mismatch with a globally mixing GHG.²⁰ Only international cooperation on emissions limitations can effectively reduce ambient concentrations.

Even the Kyoto Protocol is not sufficiently global, because it omits emissions limits on the world's largest sources—the United States and China, as well as Australia, India, Brazil, and others. When the Kyoto Protocol was negotiated in 1997, developing countries were forecast to surpass industrialized countries in carbon dioxide emissions by about 2030.²¹ Subsequent studies have moved that date ever closer—so much so that China is now forecast to surpass the United States in carbon dioxide emissions by 2009.²² The net effect of the Kyoto Protocol on global emissions and concentrations may thus be quite modest.

Subglobal action (and, a fortiori, subnational action) to reduce GHGs has several disadvantages. First, because the sources of GHGs are globally widespread, even ubiquitous, in every country and every sector of the economy, subglobal regulatory coverage fails to control important sources of pollutants. Second, it forfeits the greater cost savings obtainable in a larger allowance trading market encompassing more countries. Third, it raises the likelihood of market power being exercised by large players in the smaller allowance trading market. And, fourth, perhaps most important, it suffers from cross-border “leakage” of emissions: subglobal regulatory coverage encourages source activities to shift or “leak” to unregulated areas over time.

Leakage results from the movement of three levers: a price effect, a “slack off” effect, and a capital relocation effect. The price effect

²⁰ If the EPA must regulate GHGs under the NAAQS program of Clean Air Act section 109, one possible solution would be for states to decline to issue SIPs, or for the EPA to declare all such SIPs inadequate, and for the EPA to issue a national Federal Implementation Plan (FIP), adopting a national emissions control regime. Indeed, this could be a clever way to use the Clean Air Act to develop a national cap-and-trade policy by administrative action rather than by legislation. Meanwhile, federal emissions standards for motor vehicles, as sought by petitioners in *Massachusetts v. EPA*, 127 S. Ct. 1438, 1446 (2007), would not pose the problem of state-level ambient objectives to be attained by SIPs.

²¹ COUNCIL OF ECON. ADVISERS, ECONOMIC REPORT OF THE PRESIDENT 171 (1998).

²² INTERNATIONAL ENERGY AGENCY, WORLD ENERGY OUTLOOK 2006 (2006), available at <http://www.worldenergyoutlook.com/graphs/Slide4.gif>.

operates in the short term, without any relocation of industry. Consider action by only one country to limit GHG emissions, by conserving energy or protecting forests. Emissions abatement in Country A would reduce the demand for fossil fuels in Country A, lowering the world market price for such fuels and thereby increasing the quantity demanded in Country B (a country not regulating its emissions). Similarly, restricting forest clearing in Country A would restrict timber supply and raise the world market price for timber, inducing an increase in the quantity of timber harvested in Country B. Prices also affect trade in emissions-intensive products: as Country A restricts its emissions, the price of emissions-intensive goods produced within Country A will rise and the quantity will decrease. Unregulated producers in Country B will respond by increasing their production of these emissions-intensive goods, both for domestic consumption and for export to Country A. The magnitude of these effects depends on the price elasticities of the emissions-intensive activities (i.e., how much the activity levels change in response to price changes) and on the degree of integration of world markets for the relevant goods and services.

The “slack off” effect is a response to changing national net benefits. In the absence of a treaty, Country A might undertake some abatement, just to the point where its (small) domestic share of the global marginal benefits equals its domestic marginal costs of abatement. Country B would do likewise. But if Country A begins to abate its own emissions more aggressively, some additional global protection would be obtained, and the marginal benefit to Country B of its own abatement efforts would be diminished slightly (on the standard assumption of diminishing marginal benefits of protection), so that the domestically rational degree of abatement in Country B would fall. Hence, as some states emit less, other states rationally emit more.

Finally, in the longer term, restrictions on emissions in Country A could induce emissions-intensive industries to uproot and relocate facilities to unregulated Country B in order to produce their products at lower cost and export their products to world markets (including back to the regulated country). The extent of this relocation effect depends on the openness to trade and investment flows of the world economy, and on the marginal cost of the emissions constraint relative to the marginal cost of relocating.

I have illustrated these examples using hypothetical Countries A and B. The same analysis applies a fortiori to action by a single state of the United States. Indeed, states of the United States are likely to

be even more vulnerable to leakage than are many countries in the international arena. First, individual states are more fully integrated into the open trade of the national American market (as well as international markets) than are some countries. For example, for U.S. states, a major concern is that electricity supply would shift immediately and seamlessly from regulated in-state sources to unregulated out-of-state sources connected to the same shared electrical transmission grid. This type of leakage may not be as serious a concern for countries with their own delimited national electricity systems. Second, the Dormant Commerce Clause may place more stringent restrictions on U.S. states' efforts to restrict or tax emissions-intensive imports from other states than those imposed by GATT/WTO trade disciplines on countries' efforts to do the same internationally.

The total amount of leakage depends on the force of these three levers and on a fourth variable: the relative emissions per unit of economic activity in the regulated and unregulated places. Assume, for example, that reducing fuel use in Country A by two units induces an increase in fuel use in Country B of one unit (a leakage rate of 50%). But if that additional unit of fuel used in Country B results in more than twice as many (or twice as potent) GHG emissions as did the two units of fuel used in Country A, then the leakage rate could exceed 100%. (This might occur, for example, if Country B lets the fuel's more potent methane component escape to the atmosphere rather than fully combusting it into less-potent carbon dioxide as is done in Country A.) Or, if reducing timber harvesting in Country A by two units induces an increase in timber harvesting in Country B by one unit, but the carbon release per hectare harvested in Country B is more than twice that in Country A (for example, because loggers in B employ methods that cause greater collateral damage to the forest, or clear soils or tree types containing more carbon than in A), then the leakage rate would exceed 100%.

Depending on the magnitude and direction of these four factors, leakage could be large or small. In the 1990s, several studies produced a wide range of estimates, finding that under emissions limits imposed by the member states of the EU or the Organisation for Economic Co-operation and Development (OECD), leakage would offset at least 4%, and potentially more than 100%, of the emissions abatement achieved initially.²³ More recently, estimates for RGGI showed

²³ B.S. Fisher et al., *An Economic Assessment of Policy Instruments for Combatting Climate Change*, in IPCC, CLIMATE CHANGE 1995: ECONOMIC AND SOCIAL DIMENSIONS OF

60% to 90% leakage rates due to electricity imports alone.²⁴ States could potentially address this problem by finding ways to reduce the costs of emissions reductions (such as by adopting cap-and-trade systems) and by requiring electricity importers, just like electricity generators within the state, to hold allowances for the emissions associated with the electricity they sell (though this might raise a Dormant Commerce Clause issue, even if imposed evenhandedly on out-of-state and in-state producers).

As the world economy becomes increasingly open and integrated, the fluidity and immediacy of the price effect and the longer-term relocation effects will grow, exacerbating leakage.²⁵ In a recent study produced by the MIT Joint Program on Science and Policy Global Change—one of the world's leading academic research centers on climate policy—the international leakage rate ranged up to 130%.²⁶ Indeed, the acceleration of China's GHG emissions over the last decade could in part reflect the role of leakage from the EU and other areas regulating GHGs.

CLIMATE CHANGE 424-25 (James P. Bruce et al. eds., 1996) (reviewing numerous studies); Jean-Charles Hourcade et al., *A Review of Mitigation Cost Studies*, in CLIMATE CHANGE 1995: ECONOMIC AND SOCIAL DIMENSIONS OF CLIMATE CHANGE, *supra*, at 297, 341-43 (same). These studies differ in their sectoral coverage, representations of international trade flows, and levers of leakage considered; most omitted the possibility of higher GHG emissions per unit of resource use in the unregulated countries. Other surveys of leakage estimates in the 1990s include NICK MABEY ET AL., ARGUMENT IN THE GREENHOUSE: THE INTERNATIONAL ECONOMICS OF CONTROLLING GLOBAL WARMING 26, 266-302, 397-400 (1997); Stefan Felder & Thomas F. Rutherford, *Unilateral CO₂ Reductions and Carbon Leakage: The Consequences of International Trade in Oil and Basic Materials*, 25 J. ENVTL. ECON. & MGMT. 162, 175 (1993); John Pezzey, *Analysis of Unilateral CO₂ Control in the European Community and OECD*, ENERGY J., July 1992, at 159, 166.

²⁴ *The Magnificent Seven: States Take the Lead on Global Warming*, GRAPEVINE ONLINE, Jan. 17, 2006, <http://www.aceee.org/about/0601rggi.htm> ("Leakage is a big issue for RGGI—initial carbon-cap runs showed that leakage could offset 60-90% of RGGI's emission reductions, as power plants in nearby states increase their output to sell into the higher-priced RGGI power markets.").

²⁵ See Onno Kuik & Reyer Gerlagh, *Trade Liberalization and Carbon Leakage*, ENERGY J., July 2003, at 97, 98 ("[F]ree international trade may weaken the effectiveness of environmental regulations."). At present, the world trading system seems headed toward ever more openness and hence more mobile trade, capital, and labor. For a popular treatment of this prediction, see THOMAS L. FRIEDMAN, *THE WORLD IS FLAT* (2005).

²⁶ Mustafa H. Babiker, *Climate Change Policy, Market Structure, and Carbon Leakage*, 65 J. INT'L ECON. 421 (2005) (finding that in a multiregional computable general equilibrium model, significant relocation of energy-intensive industries away from the OECD may occur, depending on the type of market structure, with leakage rates as high as 130%, meaning that GHG control policies in the industrialized countries may actually lead to higher global emissions).

One effect of local emissions limitations, however, works in the opposite direction. Leakage may be less severe (and prior studies may overstate its magnitude) if enough new technology is generated in the regulating country (or state) and if this technology diffuses to sources in the unregulated countries (or states).²⁷ One study of endogenous technological change estimated that, with very high price elasticities, the technological innovation and diffusion effect can even outweigh the price-driven leakage effect so that net leakage from subglobal GHG regulation becomes negative—that is, regulation to reduce emissions in one country can induce net abatement and emissions reduction in unregulated countries.²⁸ Thus, the degree of net leakage is an empirical question and depends importantly on the type of technologies developed and diffused in response to emissions limitations.

Leakage has several undesirable consequences. First, leakage undermines the environmental effectiveness of the emissions limitations in the country (or state) taking action. If leakage exceeds 100%, the subglobal regime would actually increase global emissions. At the least, the cost-effectiveness of the regulatory regime must be assessed in terms of its net effect on global emissions, not just in terms of its effect in the regulating jurisdiction.

Second, even if leakage is actually unlikely, the mere fear of leakage and its adverse effects on competitiveness may be a political obstacle to subglobal action. Of special concern to national and state legislators is the fear that regulating GHG emissions may cause the loss of local jobs and the relocation of employment away from the regulated voting districts—a form of outsourcing driven by GHG limitations. The Byrd-Hagel Resolution, passed by a vote of ninety-five to zero in July 1997, announced the U.S. Senate's insistence on participation by developing countries in any future climate treaty, on the ground that American action to restrict GHG emissions could impair the U.S. economy while driving GHG-intensive activities and jobs abroad.²⁹

²⁷ Rolf Golombek & Michael Hoel, *Unilateral Emission Reductions and Cross-Country Technology Spillovers*, B.E. J. ECON. ANALYSIS & POL'Y, vol. 4, no. 2, art. 3, at 2 (2004), <http://www.bepress.com/bejeap/advances/vol4/iss2/art3>.

²⁸ Corrado Di Maria & Edwin van der Werf, *Carbon Leakage Revisited: Unilateral Climate Policy with Directed Technical Change* 15-16 (Fondazione Eni Enrico Mattei, Working Paper No. 94.2006, 2006), available at <http://ssrn.com/abstract=912461>.

²⁹ S. Res. 98, 105th Cong. (1997); see also 143 CONG. REC. 15,808 (1997) (recording the vote). For reports on the resolution's passage, see *Climate Change: Senate Approves Resolution To Require Binding Controls on Developing Nations*, 28 Env't Rep. (BNA) 621 (Aug. 1, 1997). Opined *The New York Times* a year later: "[T]he giant developing countries like India and China have yet to be brought on board. Until that

The day after the Kyoto Protocol was signed, the Clinton administration announced that it would not submit the treaty to the Senate for ratification until developing countries had agreed to accept emissions limitation responsibilities as well.³⁰ Fear of competition with China and India and of outsourcing of American jobs has only grown over the past decade, even as concern about climate change has also grown. It is undoubtedly the fear of leakage that has kept most state-level GHG emissions limitations only modestly stringent.

Third, leakage could also adversely influence the incentives of initially unregulated countries or states to join the regulatory regime later. As leakage proceeds over time, it shifts the regulated activity to the unregulated area (in our example above, to Country B), and thereby renders the unregulated economy even more emissions-intensive than it had been before the regulation began. This makes it ever harder to persuade an initial nonparticipant (here, Country B) to become a signatory to the treaty later.³¹ This may well be reflected in the accelerated forecasts of China surpassing the United States in carbon dioxide emissions, noted above,³² and the continuing reluctance of the United States, China, and others to adopt GHG emissions limitations.

In sum, because the sources of global environmental externalities are widespread and moveable, subglobal regulation can omit important sources today and induce leakage to unregulated areas tomorrow. Subglobal coverage can thus undermine or even reverse the environmental benefits of the regulation, increase its costs, discourage initial action, and discourage future accession by initial nonparticipants. Effective global environmental regulation will therefore require univer-

happens, Senate ratification is out of the question." Editorial, *Remember Global Warming?*, N.Y. TIMES, Nov. 11, 1998, at A26. After the Kyoto Protocol entered into force with ratifications by Canada, Japan, Russia, and European countries (thus reducing the concern about leakage and competitiveness losses to those countries), as evidence of the risks of unabated climate change mounted, and as the costs of a well-designed cap-and-trade system were shown to be low, the U.S. Senate became more receptive to enacting domestic cap-and-trade legislation. Forty-three senators voted in favor of the McCain-Lieberman Climate Stewardship Act of 2003 (though only thirty-eight voted for that bill in 2005), and several new bills addressing climate change were introduced in the 110th Congress. See *supra* note 9.

³⁰ John M. Broder, *Clinton Adamant on 3D World Role in Climate Accord*, N.Y. TIMES, Dec. 12, 1997, at A1.

³¹ See Richard Schmalensee, *Greenhouse Policy Architectures and Institutions*, in ECONOMICS AND POLICY ISSUES IN CLIMATE CHANGE 137, 146 (William D. Nordhaus ed., 1998).

³² See *supra* note 22 and accompanying text.

sal or nearly universal coverage of present and potential future source locations.³³

III. POSSIBLE PAYOFFS OF STATE-LEVEL ACTIONS

Nevertheless, if well-designed, subnational state-level strategies could yield some payoffs, including (i) stimulation of technological innovation that could diffuse to other unregulated places, (ii) learning by experimentation with alternative policy designs, and (iii) raising the specter of a patchwork of inconsistent state regulations as a political gambit to motivate industry to support broader federal regulation.

Regarding (i), the research on endogenous technological change cited above³⁴ suggests that national GHG emissions limitation policies might promote technological change—and foster diffusion of those low-cost, emissions-reducing technologies to other countries—such that the leakage effects could be reduced or even, possibly, outweighed. But it may be difficult or impossible for one U.S. state, even a state as large as California, to succeed with this strategy. Further, trade liberalization is crucial to the diffusion of emissions-reducing technologies, but as international trade becomes more open, GHG leakage also rises. And technology R&D programs (or spillover effects of endogenous innovation induced by local regulation) are unlikely to stimulate the diffusion and adoption of new technology unless they reduce its quality-adjusted price below the competing market prices for current technologies; otherwise there is no incentive for private firms to adopt the new technology. Thus, a combination of *both* new technological innovation in some countries, *and* restrictions on GHG emissions that make emitting more costly in all source countries, will probably be needed to yield both innovation and diffusion (adoption) of new technologies.³⁵

³³ See MABEY ET AL., *supra* note 23, at 28 (“As long as international obligations to reduce CO₂ emissions are limited to a few countries the problems of carbon leakage through energy market responses and industrial relocation will remain an obstacle to successful environmental protection.”); Henry D. Jacoby et al., *Kyoto’s Unfinished Business*, FOREIGN AFF., July-Aug. 1998, at 54, 60 (“[A] substantial reduction in global emissions will require something close to worldwide participation . . .”).

³⁴ See *supra* notes 27-28.

³⁵ “[T]echnology policy alone will not be able to cope adequately with the issue of global warming, since an incentive—for instance a carbon tax or emission limit—is necessary to induce technological change in the direction of developing and diffusing emission-saving technologies.” J.P.M. SIJM ET AL., SPILLOVERS OF CLIMATE POLICY: AN ASSESSMENT OF THE INCIDENCE OF CARBON LEAKAGE AND INDUCED TECHNOLOGICAL

Regarding (ii), the experience in differing state-level actions can be valuable in informing the design of federal and international policies. Design features of emissions trading systems can be compared across these experiments,³⁶ such as taxes versus cap-and-trade, how to allocate allowances (e.g., for free or by auction), how to monitor emissions and register trades, whether and how to cover all major GHGs, whether to give credit for offsets (in the United States or internationally), how to give credit for protecting and enhancing sinks such as forests (and afforestation versus conservation of existing forests), whether to give credit for early action, whether to adopt a “safety valve” upper price limit (and at what price), and other choices. The courts may also play a role in such policy development by authorizing the use of emissions trading and offsets markets as the remedies for public nuisance tort claims against GHG emitters.³⁷ But there are at least two important cautions about this approach. First, the value of the state experiments depends on their being set up to test policy alternatives, and it is not clear that such tests are being consciously planned (though perhaps they will emerge nonetheless). Second, the flip side of experimentation is that a proliferation of different GHG policies and allowance markets in different states—and across countries—may generate conflicting approaches and vested interests that are difficult to reconcile and mesh in a larger national or international regime. Differences across state policies may impede collaborative linking among states (such as RGGI or a group of western states), which the states would like to arrange in order to reduce leakage and expand their trading market. So whatever states do, there must be the latitude for a federal law, an interstate compact, or a treaty to revamp the system, and the expectation among parties that this may well occur. Ultimately, of course, we may learn from the states’ experiments that it is better *not* to adopt some policies.

Perhaps the state-level actions now being pursued will have payoff (iii) identified above,³⁸ in which a patchwork of inconsistent state regimes stimulates U.S. federal action to harmonize national regulation;

CHANGE DUE TO CO₂ ABATEMENT MEASURES 26 (2004), available at <http://www.mnp.nl/bibliotheek/rapporten/500036002.pdf>.

³⁶ See ROBERT W. HAHN, *THE ECONOMICS AND POLITICS OF CLIMATE CHANGE* 44-54 (1998) (advocating experimentation in institutional design).

³⁷ This helpful proposal is made by Kirsten H. Engel, *Harmonizing Regulatory and Litigation Approaches to Climate Change Mitigation: Incorporating Tradable Emissions Offsets into Common Law Remedies*, 155 U. PA. L. REV. ?? (2007).

³⁸ See *supra* text following note 33.

this in turn could lead to a broader global regime.³⁹ Such a patchwork strategy of inconsistent state actions could also reinforce the experimentation strategy (payoff (ii) noted above),⁴⁰ but would be at odds with collaborative linking among states to expand their trading market.

Describing this patchwork or domino effect in theory does not necessarily mean it will come to pass in reality. Scholars have pointed to the patchwork dynamic as the pathway explaining the federalization of state air pollution control laws in the Clean Air Act of 1970.⁴¹ But this dynamic depends on widespread and inconsistent actions being taken by the states in order to motivate industry to lobby in favor of a uniform federal policy. It is unclear whether enough U.S. states will undertake such actions to spur a federal lobbying campaign, though the recent move by several major corporations to espouse a national mandatory cap-and-trade system⁴² suggests that this dynamic may be at work. One may also question whether the 1970 Clean Air Act actually manifested this theory in action, because the theory implies that industry would support federal uniform emissions controls preempting state variation, which the 1970 Clean Air Act did not adopt for stationary sources.⁴³

IV. ACTING GLOBALLY

What, then, is the better path? “The *first-best policy* to reduce carbon leakage is to increase the size of the group of abating countries.”⁴⁴ This group need not include all countries, but it—or a set of simulta-

³⁹ See Kirsten H. Engel & Scott R. Saleska, *Subglobal Regulation of the Global Commons: The Case of Climate Change*, 32 *ECOLOGY L.Q.* 183, 223-26 (2005) (describing a “domino effect”).

⁴⁰ See *supra* text following note 33.

⁴¹ See E. Donald Elliott, Bruce A. Ackerman & John C. Millian, *Toward a Theory of Statutory Evolution: The Federalization of Environmental Law*, 1 *J.L. ECON. & ORG.* 313, 326-29 (1985).

⁴² See U.S. CLIMATE ACTION PARTNERSHIP, *A CALL FOR ACTION 7-10* (2007) available at <http://www.us-cap.org/ClimateReport.pdf> (outlining a proposal for a federal cap-and-trade program); *id.* at 12 (noting that the partnership includes Alcoa, BP, Duke Energy, and General Electric). This may also be a manifestation of a “Baptists and bootleggers” coalition. See *supra* notes 18-19 and accompanying text.

⁴³ For stationary sources, the Clean Air Act permits states to set more stringent ambient standards than the NAAQS, 42 U.S.C. § 7416 (2000), and it allows each state to design its own SIP containing the particular—and thus nonuniform—emissions standards imposed on industry to attain the NAAQS, 42 U.S.C. § 7410 (requiring states to prepare and submit emissions control plans).

⁴⁴ SIJM ET AL., *supra* note 35, at 25.

neous groups—needs to cover all major present and future emitters. I have been analyzing and advocating such an approach, involving major developing countries as well as major industrialized countries in a cap-and-trade system, comprehensively addressing all major GHGs and their sources and sinks, for the past seventeen years.⁴⁵ The recent spate of interest in subnational state-level litigation and regulation does not change my view of the superior merits of a comprehensive international regime.⁴⁶

That said, global action need not be truly universal. Including 200 countries in treaty talks increases the transaction costs of negotiating, and many of those countries have very little influence on emissions.⁴⁷ As long as all the major current and future emitters are covered, leakage is substantially prevented. The vast majority of global emissions—both current and future—could probably be addressed by a negotiation among the European Union, the United States, China, India, Russia, Japan, Canada, Australia, Brazil, and Indonesia, which amounts to ten major actors, many of which are already parties to other international groups such as the G8 and OECD. To be sure, other major future emitters should also be engaged, such as South Korea, Taiwan, South Africa, Mexico, Argentina, Chile, and countries with rapid deforestation. This list would also still be fewer than fifty countries. The key is to encompass potential recipients of leakage as well as current emitters.

And, global action need not be monolithic: there could be a plurilateral system of several groups of countries in several regimes. For example, a new regime involving the United States, China, India,

⁴⁵ Some of this work includes (in chronological order): Richard B. Stewart & Jonathan B. Wiener, *A Comprehensive Approach to Climate Change: Using the Market To Protect the Environment*, AM. ENTERPRISE, Nov.-Dec. 1990, at 75; Richard B. Stewart & Jonathan B. Wiener, *The Comprehensive Approach to Global Climate Policy: Issues of Design and Practicality*, 9 ARIZ. J. INT'L & COMP. L. 83 (1992); Wiener, *supra* note 11; Jonathan B. Wiener, *Something Borrowed for Something Blue: Legal Transplants and the Evolution of Global Environmental Law*, 27 ECOLOGY L.Q. 1295 (2001); Jonathan Baert Wiener, *Designing Global Climate Regulation*, in CLIMATE CHANGE POLICY: A SURVEY 151 (Stephen H. Schneider et al. eds., 2002); STEWART & WIENER, *supra* note 7.

⁴⁶ Nor do I think most of the authors in this Symposium would prefer the state-level approach. I think they are writing about it mainly for the understandable reasons that the lack of U.S. federal action impels alternative efforts, and that the state-level actions raise questions of U.S. domestic tort, administrative, and constitutional law on which U.S. law professors are well equipped to comment.

⁴⁷ This follows the insight of JAMES M. BUCHANAN & GORDON TULLOCK, *THE CALCULUS OF CONSENT* 113 (1962), that optimal jurisdiction size should expand until the added costs of decision making exceed the added benefits of internalizing extrajurisdictional externalities.

Brazil, South Korea, Mexico, and Australia could operate in parallel to the Kyoto regime for several years, offering the chance to test diversity in policy designs, and hence to learn from experimentation (although with the caveat about inconsistencies across regimes just noted).⁴⁸ Such a system could use an equitably structured cap-and-trade mechanism to engage participation by the major players.⁴⁹

Inescapably, the problem is how to produce a global public good, via national consent, among heterogeneous countries. The direct implication of this problem is that the successful policy architecture must be not only collectively rational (Kaldor-Hicks efficiency), it must also be individually rational for those countries joining the regime (actually Pareto improving)—joining must offer net benefits to each participating country over not joining.⁵⁰ Those benefits can include climate protection as well as national cobenefits in public health (e.g., from reducing other pollutants), biodiversity conservation, energy security, and reputation. Where national net benefits are not positive, some form of side payment will be needed to attract participation.

In other words, although a substantially global regime is needed to protect the global environment, countries have diverse interests, so some mechanism is needed to make cooperation attractive to the countries significantly influencing the outcome. For major developing countries whose priority is development—and who view climate change as being of low importance or even as benign—this means that climate policy must support their development goals, not impose obstacles or costs to their development. Moreover, China, India, and Brazil are emerging as new “great powers” in a transforming world order, and they will not be bullied (nor will the United States) into ac-

⁴⁸ See STEWART & WIENER, *supra* note 7, at 96-112, 132. The Asia-Pacific Partnership on Clean Development and Climate, begun in 2006 and including Australia, China, India, Japan, South Korea, and the United States, may make progress toward this kind of a regime, but at present it remains focused on technology research and not yet on a cap-and-trade system. See generally Asia-Pacific Partnership on Clean Development and Climate, <http://www.asiapacificpartnership.org> (last visited May 1, 2007); ASIA-PACIFIC PARTNERSHIP ON CLEAN DEVELOPMENT AND CLIMATE, PARTNERSHIP FOR ACTION 2006 (2006), <http://www.dfat.gov.au/environment/climate/ap6/apcdc-booklet-06.pdf>.

⁴⁹ See STEWART & WIENER, *supra* note 7, at 70-75 (discussing policies designed to include developing countries in a cap-and-trade system); Wiener, *supra* note 11, at 721-26 (same).

⁵⁰ See LLOYD GRUBER, RULING THE WORLD 27-30 (2000); Wiener, *supra* note 11, at 743-47.

cepting someone else's vision of the ideal climate regime.⁵¹ More likely, in my view, is that over the coming decades, a more multipolar geopolitical terrain will bring together a larger club of "great powers"—the United States, an organized Europe, a revived Russia, a surging China, India, Brazil, and perhaps a few others—in a complex web of multiplex relations, cooperating and jousting over trade, debt, national security, climate, and other issues.

As I have argued at length elsewhere,⁵² a system of international emissions allowance trading offers the best method to engage participation in a climate regime (global or plurilateral), while limiting the distortionary inefficiencies of the necessary transnational side payments by embedding those side payments in the allocation of allowances.⁵³ This will not be easy, but it is the best option for reaching a mutually attractive bargain with the major players. It would unleash the power of competitive markets to mobilize innovation and encourage the international diffusion of lower-emitting technologies. It would not be inexpensive, but it would be less costly than letting climate change continue unabated, or using direct government-to-government aid as a side payment, or imposing international carbon taxes (with some other method of transnational side payment), or spending government funds on pure technology research.

⁵¹ The postulates that major countries cannot be bullied regarding climate policy, and that WTO disciplines would preclude trade measures adopted to shield countries' subglobal emissions limitations against carbon leakage to unregulated countries (and thereby pressure those unregulated countries to act), may be tested if the U.N. Security Council treats climate change as an international security issue warranting coercive measures, and/or if some countries (e.g., European countries, or at least France) move ahead with imposing border tax adjustments (tariffs) on the embedded carbon content of imports of goods and services from countries not limiting their emissions (e.g., the United States and perhaps China). See Helena Spongberg, *Global Warming Wars: EU Takes on France's Carbon Tax Plan*, BUS. WEEK.COM, Dec. 18, 2006, http://www.businessweek.com/globalbiz/content/dec2006/gb20061218_681124.htm (reporting both the French border tax plan and the likely U.S. opposition to it). On the difficult trade law and economic aspects of such border tax measures, see Cinnamon Carlarne, *The Kyoto Protocol and the WTO: Reconciling Tensions Between Free Trade and Environmental Objectives*, 17 COLO. J. INT'L ENVTL. L. & POL'Y 45, 71-74 (2006), and Howard F. Chang, *An Economic Analysis of Trade Measures To Protect the Global Environment*, 83 GEO. L.J. 2131, 2154-60 (1995).

⁵² See generally STEWART & WIENER, *supra* note 7; Wiener, *supra* note 11.

⁵³ Linkages among the major issues just noted, such as climate, trade, and security, could also serve as in-kind side payments. And support for poor countries' adaptation to climate change will also be needed—helping societies become more resilient to the impacts of sea level rise, drought, storms, spreading ranges of diseases such as malaria, and other projected effects of climate change.

* * *

Subnational state-level actions may teach us some valuable lessons, but they are not the ideal solution to the global problem. Does that imply—in a world without U.S. national action, where climate change is an important risk warranting preventive measures—that the U.S. states should therefore do nothing? That is a hard case to make; but it also is hard to make the case that state-level action will accomplish much net benefit. At the very least, the states taking initial action, such as California and RGGI, need to reduce leakage, increase their coverage of emissions, and broaden their allowance trading markets by engaging other states, the U.S. federal government, and other countries in as broad a national and international regime as possible. But this ambition may be constrained by the legal obstacles to state-level action identified above, and by the states' desire to experiment with differing policy designs and to foster a patchwork of policies that motivate federal action. Subnational state-level action may thus be thwarted by its limited reach, legal obstacles, internal costs, external leakage, and conflicting objectives. To solve a global externality, it will take global thinking and global action.