

NEW YORK UNIVERSITY LAW REVIEW

VOLUME 74

DECEMBER 1999

NUMBER 6

TOWARD OPTIMAL ENVIRONMENTAL GOVERNANCE

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Better environmental results depend less on fine tuning theories of environmental federalism than on improving regulatory performance. Simply put, how we regulate is more important than where we regulate. Current environmental policy efforts fall short for a number of reasons: technical and information shortcomings, "structural" or jurisdictional mismatches, and public choice distortions. In this Article, Professor Daniel Esty argues that a theory of optimal environmental governance must seek to address each of these sources of regulatory failure.

Improved results depend, in part, on developing a better capacity to delineate, exchange, and enforce environmental property rights. Because a property rights-based environmental regime will not always suffice, governmental intervention may be necessary to mitigate market failures and to improve social welfare. But such intervention may lead to regulatory failures of various types. A theory of optimal environmental governance must therefore seek to minimize the welfare losses from the full range of regulatory shortcomings through strategies that: (1) address problems at a range of geographic scales; (2) generate a mix of regulatory "competition" and "cooperation" both horizontally and vertically; (3) remedy information failures (an especially important category since policymaking today often falls short for lack of good data and because technological advances offer considerable promise in allowing us to fill analytic gaps in the future); and (4) promote an appropriate mix of public engagement and delegation in the policymaking process.

Finally, optimal environmental governance not only must minimize welfare losses from market and regulatory failures but also must attend to other virtues and sources of social welfare. The demands of better environmental performance must be balanced against other competing goals of communities such as justice, equity,

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and civic republicanism. This Article maps the current terrain and charts a path toward such optimal environmental governance.

Much of the recent debate about environmental governance and regulatory reform has centered on the question of where we should lodge authority to address environmental problems.¹ Some scholars, such as Henry Butler, Jonathan Macey, James Krier, and Richard Revesz, have argued for a substantial decentralization of environmental regulation.² Others, including Kirsten Engel, Susan Rose-Ackerman, and me, have suggested that a federal structure, spreading regulatory responsibilities across various levels of government, makes more sense.³ In this Article, I argue that, while the environmental federalism debate has political salience,⁴ improved environmental results require a significantly broader focus. Indeed, *how* we regulate is, in general, much more important than *where* we regulate.

I argue here for the development of a theory of optimal environmental governance that maximizes the social welfare delivered by our regulatory structures by minimizing the harms inflicted by market fail-

¹ See, e.g., Henry N. Butler & Jonathan R. Macey, Externalities and the Matching Principle: The Case for Reallocating Environmental Regulatory Authority, *Yale L. & Pol'y Rev.* and *Yale J. on Reg.* 23 (Symposium Issue 1996); Daniel C. Esty, Revitalizing Environmental Federalism, 95 *Mich. L. Rev.* 570 (1996); Richard L. Revesz, Rehabilitating Interstate Competition: Rethinking the "Race-to-the-Bottom" Rationale for Federal Environmental Regulation, 67 *N.Y.U. L. Rev.* 1210 (1992); Susan Rose-Ackerman, Does Federalism Matter? Political Choice in a Federal Republic, 89 *J. Pol. Econ.* 152 (1981); Richard B. Stewart, International Trade and Environment: Lessons from the Federal Experience, 49 *Wash. & Lee L. Rev.* 1329 (1992).

² See Butler & Macey, *supra* note 1; James E. Krier, The Irrational National Air Quality Standards: Macro- and Micro-Mistakes, 22 *UCLA L. Rev.* 323 (1974); Revesz, *supra* note 1.

³ See Susan Rose-Ackerman, Controlling Environmental Policy: The Limits of Public Law in Germany and the United States 37 (1995); Kirsten H. Engel, State Environmental Standard-Setting: Is There a "Race" and Is It "To the Bottom"?, 48 *Hastings L.J.* 271 (1997); Esty, *supra* note 1.

⁴ See William J. Clinton, Address Before a Joint Session of the Congress on the State of the Union, 1 *Pub. Papers* 75, 78-79 (Jan. 24, 1995) (calling for more delegation of environmental policy to states); Contract with America 133 (Ed Gillespie & Bob Schellhas eds., 1994) (proposing restrictions on unfunded mandates and other measures to shift regulatory primacy away from federal government); Newt Gingrich, To Renew America 9 (1995) (arguing for devolution of regulatory power to state and local governments); Robert L. Glicksman & Stephen B. Chapman, Regulatory Reform and (Breach of) the Contract with America: Improving Environmental Policy or Destroying Environmental Protection?, 5 *Kan. J.L. & Pub. Pol'y* 9, 18-27 (1996) (critiquing environmental legislation associated with Contract with America). The politicization of the federalism debate is also evident in the Unfunded Mandates Reform Act. See Rena I. Steinzor, Unfunded Environmental Mandates and the "New (New) Federalism": Devolution, Revolution, or Reform?, 81 *Minn. L. Rev.* 97 (1996) (examining implications of Unfunded Mandates Reform Act and proposing alternative basis for regulatory reform).

ures and the losses suffered as a result of regulatory failures, subject to constraints imposed by our desires for justice, liberty, equity, and other values. Maximizing social welfare demands that we pay attention to both the structure⁵ and the performance⁶ of the institutions that are put in place to assure appropriate pollution control and resource management.

More broadly, I argue that improved environmental outcomes depend on more than regulatory reform.⁷ Good results depend on aligning market forces with environmental goals *and* achieving better-functioning regulatory regimes. The starting point for efforts to move toward optimal environmental governance needs to be an emphasis on developing the rule of law in general and the capacity to delineate, exchange, and enforce environmental property rights in particular.⁸

⁵ The problems that arise from uninternalized externalities, pollution spillovers, and overexploitation of open access resources, leading to a tragedy of the commons, are well documented. The classic text characterizing environmental pollution as an uninternalized externality is William J. Baumol & Wallace E. Oates, *Economics, Environmental Policy, and the Quality of Life* 75-79 (1979); see also William J. Baumol & Wallace E. Oates, *The Theory of Environmental Policy* 14-35 (2d ed. 1988) [hereinafter Baumol & Oates, *Theory*] (defining and examining significant types of externalities). For the seminal article describing the tragedy of the commons, see Garrett Hardin, *The Tragedy of the Commons*, 162 *Science* 1243 (1968). Since the publication of Hardin's article, it has become commonplace to view environmental resource management as a commons problem. See, e.g., Carol M. Rose, *Rethinking Environmental Controls: Management Strategies for Common Resources*, 1991 *Duke L.J.* 1, 2-5.

⁶ The losses from subpar governmental performance come in many forms: decision-making based on inadequate information; slowness and inefficiency; special interest distortions; and regulatory "capture," whereby government intervention is contorted to serve narrow interests. See, e.g., J. Clarence Davies & Jan Mazurek, *Pollution Control in the United States: Evaluating the System* (1998) (arguing that environmental regulatory failure stems from fragmented systems of control, complexity of legislative provisions, ineffective administrative remedies, and scarcity of necessary information); Robert W. Hahn, *Achieving Real Regulatory Reform*, 1997 *U. Chi. Legal F.* 143, 143-46 (explaining that conventional regulatory approaches fail to take adequate account of economic costs and benefits).

⁷ Numerous "regulatory reform" efforts have recently been undertaken. See, e.g., Aspen Inst., *The Alternative Path: A Cleaner, Cheaper Way to Protect and Enhance the Environment* (1996); Stephen Breyer, *Breaking the Vicious Circle: Toward Effective Risk Regulation* (1993); Center for Strategic and Int'l Studies, *The Environmental Protection System in Transition: Toward a More Desirable Future* (1998); Debra S. Knopman, *Progressive Foundation, Second Generation—A New Strategy for Environmental Protection* (1996); National Env'tl. Policy Inst., *Reinventing the Vehicle for Environmental Management* (1995). But good environmental results require a broader understanding of what is needed to address pollution control and resource management issues. See Daniel C. Esty & Marian R. Chertow, *Thinking Ecologically: An Introduction*, in *Thinking Ecologically: The Next Generation of Environmental Policy* (Marian R. Chertow & Daniel C. Esty eds., 1997) [hereinafter *Thinking Ecologically*] (arguing for broad-based rethinking of environmental policy, not just regulatory reform).

⁸ While some of those promoting "property rights" in recent years have had an anti-environmental agenda, in fact, protection of property rights should be seen as an essential

Too often, little attention gets paid to the opportunities to design rules, systems, and institutions to reduce market failures, thereby eliminating the need for regulation.

Where, however, environmental property rights are not clear, the mechanisms for the transfer and vindication of these rights are not available and functioning, the transaction costs of enforcing and exchanging property rights are too high, or a market-driven system yields inequitable results, a property rights-based environmental regime may not be optimal. In these circumstances, governmental intervention may help to mitigate market failures and to improve social welfare.⁹ But traditional regulation has not worked well in many cases.¹⁰ Better regulatory tools and approaches are required.

Recrafting the government role in the environmental domain is by no means a simple project. Environmental programs underperform for various reasons, all of which need attention to some degree. A theory of optimal environmental governance must therefore seek to minimize the welfare losses from the full range of regulatory shortcomings: (1) administrative, technical, and informational policy failures, (2) structural (or jurisdictional) mismatches between the scale of an issue and the regulator's jurisdiction, and (3) public choice distortions.¹¹ In assessing these sources of regulatory failure, I argue that information failures are particularly important, both because policymaking today often falls short for lack of good data and necessary information but also because the dawn of the Information Age offers considerable promise in allowing us to fill analytic gaps in the future.

Of course, an overarching theory of optimal environmental governance not only must look to minimize welfare losses from market and regulatory failures but must also attend to other virtues and

element of sound environmental policy. See Carol M. Rose, *Property Rights and Responsibilities*, in *Thinking Ecologically*, *supra* note 7, at 49, 49 (discussing how "the safeguarding of property, far from conflicting with environmental protection, can be an extremely important vehicle to smooth these frictions").

⁹ See Charles Wolf, Jr., *Markets or Governments: Choosing Between Imperfect Alternatives* 155 (1993) ("If the preferred and predominant choice is in favor of the market, a significant role for the nonmarket . . . will and, for reasons relating to the pervasiveness and inevitability of market failures, *should* remain."); Robert V. Percival, *Regulatory Evolution and the Future of Environmental Policy*, 1997 U. Chi. Legal F. 159, 160 ("[T]he current regulatory infrastructure is neither as irrational nor as inefficient as its critics have claimed."); Paul R. Portney, *EPA and the Evolution of Federal Regulation*, in *Public Policies for Environmental Protection* 7, 11-12 (Paul R. Portney ed., 1990) (arguing that nonregulatory approaches are insufficient due to difficulties in defining rights, prohibitive transaction costs, and market imperfections).

¹⁰ See *supra* note 7 (listing studies that chronicle regulatory failures).

¹¹ See Esty, *supra* note 1, at 584-99 (developing taxonomy of policy failures and describing how these failures occur).

sources of social welfare.¹² The optimal level and type of governmental intervention require a comprehensive cost-benefit analysis that factors into the welfare calculus effects beyond the environmental domain, including impacts on economic growth and other potential gains or losses in material and nonmaterial well-being.¹³ Societal desires for freedom and autonomy for all individuals, a degree of equity across income groups, and justice, particularly the protection of property rights, must also be taken into account. The demands of better environmental performance must furthermore be balanced against other competing goals such as desires for the promotion of civic republicanism through popular participation in decisionmaking, close proximity of government to the citizenry, and an emphasis on the responsibilities of citizenship and the concomitant strengthening of communities.

This Article seeks to map this terrain and to clear a path toward optimal environmental governance. Part I outlines a theoretical taxonomy of environmental policy failures. I identify the various ways in which market failures arise in the environmental domain and explain the circumstances in which some governmental intervention is likely to be welfare enhancing. I also provide a structure for analyzing regulatory failures, spelling out the range of informational and administrative deficiencies, externalities and structural regulatory inadequacies, and public choice failures that can cause environmental policymaking to go awry.

¹² For the purposes of this Article, I argue that policy optimization must be seen as a nuanced utilitarianism combining efficiency and equity, recognizing a pluralism of interests and values both within the environmental domain and across realms. An "optimal" environmental governance structure would therefore seek to maximize social welfare broadly considered (i.e., factoring in not only all of the costs and benefits of environmental policy choices but also interconnected social welfare effects from other realms such as economic growth) subject to fundamental fairness and equity constraints, including the protection of property rights and the provision of sufficient resources to meet the basic needs of each citizen. The goal is to minimize the sum of the welfare losses inflicted by unabated pollution or suboptimal resource management and the costs of government intervention as well as any losses inflicted by this intervention, while attending to other recognized virtues and thus protecting property rights and ensuring that basic resources are fairly allocated. But see Carl F. Cranor, *Regulating Toxic Substances: A Philosophy of Science and the Law* 126 (1993) (rejecting welfare analysis and efficiency as focus, as well as, more broadly, utilitarianism in any form).

¹³ I recognize the limits of cost-benefit analyses and risk assessments but see no other option for rational policymaking. See Daniel C. Esty, *What's the Risk in Risk?*, 13 *Yale J. on Reg.* 603, 611-12 (1996) (book review); see also Daniel A. Farber, *Eco-pragmatism: Making Sensible Environmental Decisions in an Uncertain World* 6-11, 44-60 (1999) (explaining why cost-benefit analysis is useful if not definitive and why dichotomy between economics and value judgments is false).

Part II examines a set of environmental issues that are representative of the environmental policy challenge. While not all-encompassing, this set of issues indicates the complexity of environmental policymaking, the range of variables that must be simultaneously analyzed and maximized to produce improved policy outcomes, and the significant degree of uncertainty that is the hallmark of decisionmaking in the pollution control and resource management domain. The concrete examples set forth in this Part highlight the sweep of market and regulatory failures that must be addressed.

Part III matches the theoretical analysis of market and regulatory failures developed in Part I with the real world examples set out in Part II. I note, in particular, that market strategies seem likely to provide opportunities for environmental gain as our capacity to gather and use information improves. I also argue that not all regulatory failures are equally important. Obviously, in designing environmental governance structures, particular attention should be paid to those problems that result in the greatest welfare losses and thus provide the largest potential for improved performance.

Part IV identifies four core strategies for moving toward optimal environmental governance. First, I suggest that in a number of circumstances governments should seek to clarify environmental property rights and to strengthen (or create) systems for their exchange and enforcement. Second, I argue for a multi-tier governance structure that corresponds to the diversity of issues that must be addressed, reflects the need to draw upon information at various geographic scales, and addresses the fact that the "optimal environmental area" for regulation will vary from highly localized zones to a planet-wide sphere.

Third, I note that both the theoretical literature on governance and real world experience argue for regulatory strategies that draw on information from multiple sources and that are built around a system of checks and balances. Promoting vigorous and open debate over problem analysis and policy options is central to getting good results. I thus call for environmental governance mechanisms that promote regulatory *competition* and *cooperation* both horizontally (among governments and other entities at a given governance level) and vertically (between contributors to the environmental policy process at different governmental levels).

Fourth, I argue that sound environmental policymaking requires a balance of public engagement and delegation. There is an intrinsic value in having people make decisions for themselves and thus feeling that they have a stake in policy outcomes. Public involvement in the policy process can also help to ensure that there exists a broad-based

understanding of the decisions made and a serious commitment to implementing the policies adopted. But many environmental problems are highly technical and not well suited to popular decisionmaking.

Part IV's core is an attack on the prevailing theories of regulatory competition, which posit that the benefits of competition can be obtained through horizontally arrayed governmental entities competing against each other to attract companies, investors, or citizens.¹⁴ I argue that this view of regulatory competition is too thin. Optimal information generation depends on having a diversity of sources of data and analysis, and thus environmental governance requires multiple levels of activity and a diverse range of competitors. It also requires a transparent policymaking process in which the prevailing wisdom is subject to constant scrutiny and ongoing review.

Part V acknowledges that the pursuit of optimal environmental governance represents something of a Holy Grail and that no amount of tinkering with governance structures and procedures will yield a system that, in practice, maximizes social welfare. Numerous second order effects must be tracked, and many nonenvironmental tradeoffs must be factored into the policymaking process. The difficulties inherent in accommodating divergent environmental values, the complexities of undertaking cost-benefit calculations across incommensurate environmental issues, and the particular challenges entailed in finding a common metric to compare environmental and nonenvironmental sources of social welfare, especially when uncommodifiable values play a role, are real. Strategies that mitigate these inescapable tradeoffs, nevertheless, can often be found.

I conclude with a number of observations about the challenge of moving toward optimal environmental governance. First, the process is dynamic. Within one jurisdiction, the appropriate division of regulatory responsibilities likely will evolve over time. Primary responsibility for environmental decisions will often shift from centralized to

¹⁴ See William A. Fischel, *Fiscal and Environmental Considerations in the Location of Firms in Suburban Communities*, in *Fiscal Zoning and Land Use Controls* 119 (Edwin S. Mills & Wallace E. Oates eds., 1975) (suggesting that regulatory competition will be beneficial in land use context); Wallace E. Oates & Robert M. Schwab, *Economic Competition Among Jurisdictions: Efficiency Enhancing or Distortion Inducing?*, 35 *J. Pub. Econ.* 333 (1988) (arguing that local choices under majority rule can lead to optimal policies); Revesz, *supra* note 1 (challenging race-to-the-bottom argument as unsupported by existing models of interjurisdictional competition); Roberta Romano, *The Political Dynamics of Derivative Securities Regulation*, 14 *Yale J. on Reg.* 279 (1997) (describing persistence of regulatory competition in securities domain over time); Charles M. Tiebout, *A Pure Theory of Local Expenditures*, 64 *J. Pol. Econ.* 416 (1956) (arguing that competition among local governments will lead to optimal provision of public goods); Ralph K. Winter, Jr., *State Law, Shareholder Protection, and the Theory of the Corporation*, 6 *J. Legal Stud.* 251 (1977) (arguing that state regulation of securities is preferable to federal regulation).

more decentralized levels of government as lower level authorities develop greater regulatory capacity and more sophisticated environmental knowledge bases and information management systems. Thus, a more devolved regulatory structure makes sense in the United States today, whereas it might not have in the 1970s. Similarly, the structure of regulatory responsibilities and approaches that is right for one country may not be right for another, especially where there are differences in the level of economic development and in the sophistication of existing regulatory processes and other baseline variables.

More fundamentally, the regulatory revolution made possible by computers and modern information management systems has not yet been fully realized. In fact, the potential for a more information-rich system of environmental protection has just begun to be tapped. Given the complexity and diversity of the environmental problems, the optimal environmental governance structure will, moreover, be isomorphically complex and diverse. No regulatory "silver bullet" or other simple solution to the complex environmental problems of the modern age exists.¹⁵ Context and circumstances matter significantly. But our rapidly improving capacity to manage large data sets and significant degrees of complexity, as well as to develop systems that "learn" from past experience, offers the promise of better regulatory performance in the not-too-distant future.¹⁶

Moving toward optimal environmental governance thus requires a multipronged effort to reduce market failures as well as to develop systems that minimize regulatory failures and the resulting welfare losses. Significant interactions and interdependencies exist in identifying governance structures and patterns of regulatory conduct that will mitigate public choice distortions, structural or jurisdictional failures, and information inadequacies and inefficiencies. In some cases, advancing on one set of harms may exacerbate another set of problems. In other cases, improvements in one area will provide parallel opportunities for gains in another.

Solving equations with many variables is never easy. But the human capacity for ever more refined thinking and progress is great. We must not, in any case, shy away from the challenge. The alterna-

¹⁵ Cf. W. Michael Reisman, *Sovereignty and Human Rights in Contemporary International Law*, 84 *Am. J. Int'l L.* 866, 876 (1990) (describing complexity of human rights considerations and burden of assessing them).

¹⁶ See Eric W. Orts, *Reflexive Environmental Law*, 89 *Nw. U. L. Rev.* 1227, 1253-57 (1995) (introducing theory of "reflexive" environmental law that engenders learning and system improvements over time); J.B. Ruhl, *Thinking of Environmental Law as a Complex Adaptive System: How to Clean Up the Environment by Making a Mess of Environmental Law*, 34 *Hous. L. Rev.* 933 (1997) (applying complexity theory to environmental law).

tive is the status quo of haphazard and unsystematic environmental policymaking on less than rigorous analytic foundations. This Article seeks to nudge forward both the academic debate over how best to protect the environment and the real world implementation of environmental protection programs.

I

THE ENVIRONMENTAL CHALLENGE

Moving toward optimal environmental governance requires some sense of the nature of the environmental "problem." In fact, environmental protection is not a single problem but a complex set of pollution control and resource management issues. The diversity of these concerns represents a central element of the governance challenge. Nevertheless, certain underlying causes of environmental problems can be identified which, in turn, can help us to isolate what sort of solutions are required and thus what types of regulatory structures and programs might be beneficial.

A. *Market Failures*

Economic theory suggests that a free market will produce an efficient and welfare-maximizing level of resource use, production, consumption, and environmental protection if the prices of resources, goods, and services capture all of the social costs and benefits of their use. Where, however, private costs, which are the basis for market decisions, deviate from social ones, market failures occur, resulting in allocative inefficiency in general and suboptimal resource consumption or pollution levels in particular. Thus, every bit of air pollution shot out of a smokestack represents a problem, as does each harmful gallon of water pollution ejected from an effluent pipe or load of waste leaching toxics onto a neighbor's property.¹⁷

All too often, prices in the marketplace do not capture the social costs (or benefits) of pollution (or pollution control) or the scarcity value of common resources. As a result, both companies and individuals shift environmental costs that they generate onto others or society at large. These externalities must be internalized if the market is

¹⁷ Norms against unreasonable and uncompensated pollution harms and in support of the security of property run very deep. See Restatement (Second) of Torts §§ 821A-822 (1979) (defining public and private nuisances and their liabilities); Carol M. Rose, *A Dozen Propositions on Private Property, Public Rights, and the New Takings Legislation*, 53 Wash. & Lee L. Rev. 265, 265-67, 272-76 (1996) (discussing "property rights" movement with respect to reconciliation between public and private rights).

to produce efficient outcomes.¹⁸ In addition to these economic efficiency considerations, fundamental fairness and the protection of property also require that polluters pay for or abate their own emissions¹⁹ and that resource users not take more than a fair share of open access stocks.

Some market failures can be addressed by appropriately allocating, enforcing, and vindicating the relevant environmental property rights.²⁰ Particularly in cases where the issue is management of a scarce resource, clarifying who has a right to access and enforcing limits to claims on the resource will often enhance environmental results. Declining fish stocks represents a classic tragedy of the commons, which may be amenable to a property rights response.²¹ Each individual fishing boat has an incentive to land as many fish as possible. But when every vessel pursues the same self interest without constraint under circumstances where fish stocks are finite, the resource will be

¹⁸ See Baumol & Oates, Theory, *supra* note 5, at 21-23 (suggesting imposition of "Pigouvian tax" to internalize external costs created by polluters); Harold Demsetz, Toward a Theory of Property Rights, 57 Am. Econ. Rev. 347, 348-49 (1967) (arguing that property rights should be arranged so as to internalize as many externalities as possible).

¹⁹ This is the core element of justice embodied in the law of torts. See Restatement (Second) of Torts §§ 821B-822; see also Frank I. Michelman, Property, Utility, and Fairness: Comments on the Ethical Foundations of "Just Compensation" Law, 80 Harv. L. Rev. 1165, 1218-22 (1967) (analyzing compensation through lens of John Rawls's theory of justice).

²⁰ A great deal of interest has sprung up in recent years regarding the potential for "free market" environmental protection. See Terry L. Anderson & Donald R. Leal, Free Market Environmentalism 92-94 (1991) (predicting fewer governmental costs, better information, and solutions to evaluative problems using free market environmentalism); Taking the Environment Seriously (Roger E. Meiners & Bruce Yandle eds., 1993) (presenting ten papers that integrate free market environmentalism into solutions for various problems); Bruce Yandle, Common Sense and Common Law for the Environment: Creating Wealth in Hummingbird Economies 170-75 (1997) (summarizing likely effects of markets on environmental issues); Terry L. Anderson, Enviro-Capitalism vs. Enviro-Socialism, 4 Kan. J.L. & Pub. Pol'y 35 (1995) (advocating use of free market environmentalism to provide effective incentives); Richard L. Stroup & Jane S. Shaw, Environmental Harms from Federal Government Policy, in Taking the Environment Seriously, *supra*, at 51, 69-70 (advocating less governmental management and control of environmental quality). On a basic level, the only "governance" required would be a basic legal system of tort, contract, property, and criminal law. See, e.g., James L. Huffman, Markets, Regulation, and Environmental Protection, 55 Mont. L. Rev. 425, 433-34 (1994) (stating that market functions and liabilities rely on common law); Norman W. Spaulding III, Commodification and Its Discontents: Environmentalism and the Promise of Market Incentives, 16 Stan. Envtl. L.J. 292, 306-07 (1997) (describing free market environmentalists' support of private law mechanisms).

²¹ Hardin himself reflected on the problem of fisheries. He wrote: "Professing to believe in the 'inexhaustible resources of the oceans,' [the Maritime nations] bring species after species of fish and whales closer to extinction." Hardin, *supra* note 5, at 1245. For discussions of proposals to create tradable fishing rights, see, e.g., Neal D. Black, Balancing the Advantages of Individual Transferable Quotas Against Their Redistributive Effects: The Case of *Alliance Against IFQs v. Brown*, 9 Geo. Int'l Envtl. L. Rev. 727, 729-43 (1997).

overexploited. Fishing beyond reproduction and replacement rates occurs and, eventually, fish stocks become depleted, causing a collapse of the fisheries. If, on the other hand, the fish were owned and the right to take fish were controlled, the owners would have an incentive to manage the resource sustainably with an eye toward keeping their resource optimally productive over time.²² Short of establishing exclusive ownership, allocating permits (property rights) for a set fish catch can ameliorate the resource overexploitation and thus reduce the scope of the market failure.

Similarly, if people suffering respiratory distress because of air pollution could identify the sources of the emissions affecting them, measure the harm inflicted upon them, and negotiate with the polluter for compensation (or costlessly win damages in a tort case), no market failure would exist. The polluters would reduce emissions to optimal levels (where the cost of further abatement would exceed the benefits). Pollution victims would be fully and individually compensated for their losses. This environmental rights-based outcome would be superior to regulation, which often fails to calibrate the level of the externality with any degree of precision and thus imposes corrective measures designed to internalize the harm (controls or charges) that either over- or undercorrect. Furthermore, under most regulatory schemes, polluters get permits—a license to pollute—for free.²³ Even if permit fees are required, the money almost always goes into the general government coffers.²⁴ Thus, while the community as a whole collects “damages,” individuals are not compensated based on the harms they have suffered. Those who suffer above-average harm are not adequately compensated.

At least theoretically, market “enhancement” promises efficiency and equity gains. A rights-based pollution control system would promote careful tracking and analysis of environmental harms (to determine the scope and value of any rights infringement), require polluters to pay for the damages they inflict (internalizing the externality), and compensate victims appropriately on an individual basis.²⁵

²² See discussion *infra* Part II.E.

²³ See Rena I. Steinzor, *Reinventing Environmental Regulation: The Dangerous Journey from Command to Self-Control*, 22 Harv. Envtl. L. Rev. 103, 115 & n.39 (1998) (noting that existing regulatory structures do not charge any fees for permits).

²⁴ See, e.g., Robert N. Stavins, *Policy Instruments for Climate Change: How Can National Governments Address a Global Problem?*, 1997 U. Chi. Legal F. 293, 306 (describing revenues that result from environmental taxes and tradable permit auctions).

²⁵ Regulatory regimes could be made to be equally precise in their assessments of who is suffering damages, how much value to place on the harm, and who should pay compensation to victims. But today’s regulatory approaches are expressly designed to short-circuit these calculations as a way to reduce transaction costs. Indeed, to reduce transaction costs,

The individualization of such an environmental regime is attractive. It promises to make every citizen more systematically conscious of his or her role as an environmental actor and more focused on what is required to carry out this role in an appropriate and just manner.

While theoretically attractive, markets cannot, in the real world, solve all environmental problems. Too often, neither the identity of the property entitlement holder nor the boundary of the property right is clear. How many fish can a fisherman land before he overfishes? Does the factory have a right to emit or do the neighbors have a right to pure air?

Moreover, structures to establish the value of environmental property rights and to enable their purchase and sale frequently do not exist. How much should the polluting factory's neighbor claim as damages? What is the measure of harm when wetlands are destroyed or a buildup of greenhouse gases creates a risk of climate change? A lack of knowledge about the existence, size, scope, and value of a harm frequently prevents those suffering environmental losses from recovering either through negotiated compensation or legal action. Better data and information, especially on the fate and transport of pollution as well as the epidemiological and ecological costs inflicted by emissions, is therefore a prerequisite to broader reliance on the market as an answer to environmental problems.²⁶

Even if ownership were clear and property rights values were easy to ascertain, market-based environmental protection still might falter for lack of the requisite exchange mechanisms. In many places, functioning markets supported by tort and contract law do not exist. In Eastern Europe, Russia, China, and many parts of Africa, legal systems are not well-enough established to anchor a regime based on the exchange and enforcement of property rights.²⁷

the government makes a rough calculation of the harm externalized and imposes controls or collects fees in the name of society generally, without trying to work out precisely who suffered harms (and without giving individuals compensation). But properly structured market approaches can help to generate the decentralized information that is needed to charge polluters and compensate victims fully and fairly.

²⁶ Ironically, some of the strongest advocates for market-based environmentalism in the political world seem to have missed this point and have recently fought for reduced investment in the information and analysis needed to underpin market responses to pollution harms and resource management issues. See Zachary Coile, *Think Tank Sunk: Congress Says Its Office of Technology Assessment Is Redundant*, S.F. Examiner, Nov. 20, 1995, at B1 (describing 1995 elimination of the Office of Technology Assessment); Larry Witham, *Scientists Lament Federal Budget Cuts, Say Funds Are Key to Research Success*, Wash. Times, Dec. 30, 1995, at A4 (discussing recent cuts in congressional funding for science and research).

²⁷ See Daniel C. Esty, *Environmental Protection During the Transition to a Market Economy*, in *Economies in Transition: Asia and Eastern Europe* 357, 361-62 (Wing Thye

Even in countries that have well-defined markets and rules of law, transaction costs may still be high, leaving a pure rights-based environmental regime vulnerable to market failures. In all too many cases, individual losses are smaller than the transaction costs of bringing a legal action for the vindication of environmental rights, meaning that harms go unrecompensed. Thus, almost everywhere systems would need to be created to bring down the cost of vindicating property rights (thereby ensuring that individuals are able to protect themselves from pollution spillovers or the unauthorized capture of resources by others) and to facilitate negotiation among parties for the exchange of environmental property rights.²⁸

In sum, while helpful in some circumstances, an enhanced market for environmental rights cannot be seen as a panacea.²⁹ Ownership of the relevant property rights often is not clear, the value of the rights in question cannot easily be ascertained, and attempts to exchange or vindicate environmental rights are costly.³⁰ While technological breakthroughs may help to address these issues and to make environmental markets function more efficiently in the future, we are still some distance from a Coasian world of no or low transaction costs in the environmental property rights marketplace.³¹

Woo et al. eds., 1997) (describing flawed regulatory systems in former Soviet Union and other Communist countries).

²⁸ Perhaps housetop emissions monitors could be installed to measure harms and track down their sources, and an environmental rights clearinghouse might enable claims to be made and processed quickly and cheaply. Where rights cannot now be vindicated easily and at low cost, efforts would be required to strengthen and streamline the tort law structure to reduce legal transaction costs and to enable plaintiffs, who might individually be damaged very little by a particular pollution problem but who collectively may be significantly harmed, to band together.

²⁹ See Guido Calabresi, *The Pointlessness of Pareto: Carrying Coase Further*, 100 Yale L.J. 1211, 1215-17 (1991) (detailing limitations of transaction cost analysis using Pareto test); Robert L. Rabin, *Environmental Liability and the Tort System*, 24 Hous. L. Rev. 27, 29-33 (1987) (discussing inescapable problems of identification, boundaries, and sources of environmental pollution).

³⁰ Some transaction costs are irreducible and market structures do not address other social goals such as equity. Moreover, bargaining may be inhibited by some parties holding out, free riding, or otherwise behaving strategically in ways that drive up negotiating costs. See Ian Ayers & Eric Talley, *Solomonic Bargaining: Dividing a Legal Entitlement to Facilitate Coasean Trade*, 104 Yale L.J. 1027, 1029-30 (1995) (spelling out bargaining obstacles); Richard A. Epstein, *Holdouts, Externalities, and the Single Owner: One More Salute to Ronald Coase*, 36 J.L. & Econ. 553, 582-84 (1993) (illustrating strategic behavior under general average contribution leading to higher costs).

³¹ The cost of gathering, storing, analyzing, and using information is falling rapidly, making markets possible where they did not exist previously and improving their performance where they were previously "thin." See Hamish McRae, *The World in 2020: Power, Culture and Prosperity* 172-77 (1994) (describing falling costs of communication and information as result of "information revolution").

Moreover, where resources are inherently open access or common, such as the air or the oceans, a resolution of the environmental problem based on an improved regime of property rights will almost certainly be insufficient.³² Some sort of external governmental intervention to promote collective action and to overcome the prisoners' dilemma dynamic that leads to a tragedy of the commons is needed. Likewise, if nonrenewable resources are at issue or the pollution harm in question has a long ecological lifetime, an invigorated property rights regime may not fully address issues of intergenerational equity and thus may not ameliorate the risk of misallocation of resources and market failure. In these circumstances, regulation may be required to reduce allocative inefficiency and welfare losses. Similarly, intervention may be justified if the initial allocation of rights is deemed to be inequitable or if individuals are not roughly equal in their capacities to bargain successfully.

B. Regulatory Failures

Government intervention to fix market failures may enhance social welfare, but these efforts may also go off kilter, resulting in suboptimal environmental outcomes.³³ The scope for missteps is wide. Governments may not have the information necessary to intervene appropriately to internalize externalities, or they may lack the incentive structures needed to regulate efficiently. Governmental decisions may also be skewed by structural failures that arise because policymakers systematically exclude from their regulatory cost-benefit calculus some of those who are either causing or suffering harms or those who might be affected by government action. Regulatory efforts may, furthermore, be distorted by public choice failures. Sometimes governmental outcomes are manipulated by outright corruption of the decisionmakers. More often, special interest influence on the decisionmaking process causes policy choices not to reflect the true will of the people.³⁴

³² Note, however, that market reinforcement strategies maybe still have a role to play. Acid rain, caused by SO₂ and NO_x emissions into the air, has been reduced significantly in the United States through an emissions allowance allocation and trading regime. See Lily N. Chinn, Comment, Can the Market Be Fair and Efficient? An Environmental Justice Critique of Emissions Trading, 26 Ecology L.Q. 80, 88-95 (1999) (describing theory and practice of tradable permits); *infra* Part II.D.

³³ Governmental failure is the focus of much of the work in modern positive political theory. See Jerry L. Mashaw, Greed, Chaos, and Governance: Using Public Choice to Improve Public Law 10-29 (1997) (discussing public choice failures that pervade governmental processes).

³⁴ Note that the "special interest" may be the polluters who seek to block regulation. But the problem may also be "capture" of the regulatory process by some subset of the

A growing literature analyzes the ways that governmental environmental performance falls short, producing both unsuccessful efforts to mitigate market failures and new sources of welfare loss to the regulated community or society in general.³⁵ In analyzing these failure scenarios, three core categories emerge: (1) information and administrative shortcomings, (2) externalities and structural regulatory inadequacies, and (3) public choice failures.

1. Information and Administrative Shortcomings

Determining what is going wrong when environmental problems arise is not easy. Pollution is often hard to perceive. Who can see the ozone layer thinning or recognize the brain damage caused by lead exposure? Even if a source of harm is identified, specific harm causers are difficult to track down. Who released the chlorofluorocarbons (CFCs) that caused the Antarctic Ozone hole? From where did the lead in the air come? Even if a specific source of harm is identified, the amount of damage inflicted will often be hard to measure. How do we add up the injuries caused by a smoke-belching power plant? The combination of harms from multiple sources may be difficult to disentangle. The possibility, moreover, that various kinds of harms intermingle to create cumulative effects that are worse (or synergistic effects that are less harmful) than the individual pollution effects further complicates the analysis. Each separate chemical also has its own dose-response impact on humans and on other species and ecological resources, making efforts to obtain "perfect" or "full" information rather daunting. While risk-benefit and cost-benefit methodologies can help to place a value on environmental harms, these tools are limited and constrained by the fact that, to some extent, the valuation question is inescapably political.³⁶

Some degree of uncertainty plagues many areas of government activity, but few face the pervasive information inadequacies that are

regulated industry who would benefit from certain government-imposed restrictions, by those with a "solution" to sell, or by environmental advocates who seek to burden polluters with costs as a matter of moral indignation, no matter how large or small the benefits obtained.

³⁵ See, e.g., Marc K. Landy et al., *The Environmental Protection Agency: Asking the Wrong Questions* 238-41 (1990) (offering explanation for EPA failures during Reagan years); Richard L. Revesz, *Federalism and Interstate Environmental Externalities*, 144 U. Pa. L. Rev. 2341, 2360-74 (1996) (critiquing federal environmental laws concerning interstate spillovers).

³⁶ See Mark Sagoff, *We Have Met the Enemy and He Is Us or Conflict and Contradiction in Environmental Law*, 12 *Env'tl. L.* 283, 286-97 (1982) (arguing that values shape results of cost-benefit analyses); Peter H. Schuck, *Multi-Culturalism Redux: Science, Law, and Politics*, 11 *Yale L. & Pol'y Rev.* 1, 15-16 (1993) (arguing that science is "contingent" and "socially constructed").

found in the environmental realm.³⁷ In addition to the difficulties outlined above, further complexities derive from our limited understanding about what policy options might be available to mitigate these harms and to lower the direct costs of pollution as well as the costs from the unintended and unforeseen consequences of government intervention. Furthermore, when one risk becomes the focus of regulatory action, countervailing risks may be worsened.³⁸ Thus, information inadequacies represent a significant element of the environmental regulatory challenge.³⁹

In addition to a lack of data and technical capacity, regulatory bodies may operate inefficiently or ineffectively.⁴⁰ Bureaucracies in general and government entities in particular frequently lack incentives to act otherwise.⁴¹ Governments face constant agent-principal incentive problems.⁴² Regulators may optimize their own circum-

³⁷ See Alyson C. Flournoy, *Legislating Inaction: Asking the Wrong Questions in Protective Environmental Decisionmaking*, 15 Harv. Envtl. L. Rev. 327, 333-38 (1991) (discussing nature and extent of scientific uncertainty in environmental decisionmaking); Sheila Jasanoff, *Contingent Knowledge: Implications for Implementation and Compliance*, in *Engaging Countries: Strengthening Compliance with International Environmental Accords* 63 (Edith Brown Weiss & Harold K. Jacobson eds., 1998) [hereinafter *Engaging Countries*] (discussing problems with using science and technology in environmental analysis).

³⁸ See John D. Graham & Jonathan Baert Wiener, *Confronting Risk Tradeoffs*, in *Risk Versus Risk: Tradeoffs in Protecting Health and the Environment* 1, 10-12 (John D. Graham & Jonathan Baert Wiener eds., 1995) (providing numerous examples of regulation exacerbating countervailing risks).

³⁹ Moreover, as A. Mitchell Polinsky argues, information deficits tend to drive regulation away from more efficient property rules and toward less precise liability rules. See A. Mitchell Polinsky, *Resolving Nuisance Disputes: The Simple Economics of Injunctive and Damage Remedies*, 32 Stan. L. Rev. 1075, 1100-02 (1980); see also Carol M. Rose, *The Shadow of The Cathedral*, 106 Yale L.J. 2175, 2191 (1997) ("Liability rules . . . economize on information.").

⁴⁰ See, e.g., Breyer, *supra* note 7, at 10-29 (detailing institutional problems hindering regulatory efforts); Richard J. Lazarus, *The Tragedy of Distrust in the Implementation of Federal Environmental Law*, 54 Law & Contemp. Probs. 311, 321-47 (1991) (describing regulatory failure of EPA). But cf. Susan Rose-Ackerman, *American Administrative Law Under Siege: Is Germany a Model?*, 107 Harv. L. Rev. 1279, 1279 (1994) ("Although reform is needed, many critics have overstated their case. The most popular reform proposals would destroy much of value in the American system . . . Bureaucratic policymaking is an inevitable consequence of the complexity of problems facing the modern state."). See generally Cass R. Sunstein, *Problems with Rules*, 83 Cal. L. Rev. 953, 971-75, 992-94 (1995) (discussing information costs in decisionmaking under different systems of rules).

⁴¹ It is my experience that many, even most, government environment officials work hard, but some do not. It is more difficult in the public sector than in the private sector to discipline slack performance and to reward superior results. See James Q. Wilson, *Bureaucracy: What Government Agencies Do and Why They Do It* 117-20, 197 (1989) (arguing that in public sector, it is difficult to assess performance and to distribute rewards and penalties once assessment is made).

⁴² See Mashaw, *supra* note 33, at 121-22 (describing in principal-agent terms problems of delegated regulation).

stances, choosing to go home early for example, rather than perform their assignments with full diligence. Thus, even when decisions have been made on an adequate base of information, regulatory mistakes may still arise or costs may escalate because the data analysis underlying the decisionmaking process was not done as efficiently as it could have been.

2. *Externalities and Structural Inadequacies*

In addition to the problem of inadequate information, regulation may not remedy market failures due to a misalignment between the jurisdiction of the regulators and the scope of the problem at hand.⁴³ Regulators may overlook some of the costs of pollution or resource mismanagement because the harms fall on outsiders. Or they may ignore some of the benefits of intervention because the gains would accrue to those beyond their zone of authority. The voices omitted from the regulatory cost-benefit calculus may be outside the *temporal* view of the regulating authorities as well as beyond their *spatial* scope. Thus, uninternalized externalities may persist within a single jurisdiction, across political jurisdictions, or intertemporally. Distinguishing among these cases is important because they represent different forms of regulatory failure and therefore require distinct policy responses.

At the outset, it is useful to separate regular externalities (*intra-jurisdictional*) from what have been called *super* externalities (*inter-jurisdictional*).⁴⁴ Regular externalities arise where social and private costs diverge within a political jurisdiction and the government fails to correct the situation. The underlying problem may be an information or technical failure. Regulators may fail to act because they did not see or could not measure the harm or because they did not understand its seriousness. If government authorities recognize but ignore a pollution problem, letting harmful emissions go unabated, the issue may reflect an administrative failure due to a lax bureaucracy. The decision to overlook a problem may also be intentional. In these circum-

⁴³ The understanding that optimal regulatory structures must include all the potential victims and cost bearers of a harm has been understood and accepted for decades. See Baumol & Oates, *Theory*, supra note 5, at 293-94 (discussing optimality in heterogeneous setting); Mancur Olson, Jr., *The Logic of Collective Action: Public Goods and the Theory of Groups* 46-48 (1965) (discussing costs of providing collective goods); Richard B. Stewart, *Pyramids of Sacrifice? Problems of Federalism in Mandating State Implementation of National Environmental Policy*, 86 *Yale L.J.* 1196, 1215-16 (1977) (explaining that unless all potential cost bearers are under one jurisdiction, spillover effects will lead to suboptimal environmental effects).

⁴⁴ See André Dua & Daniel C. Esty, *Sustaining the Asia Pacific Miracle: Environmental Protection and Economic Integration* 59-60 (1997) (explaining concept of "super externalities").

stances, where the regulators choose to respond to the needs of a subset of their constituents rather than the public interest generally, the harm can be traced to a public choice failure.

Whatever the cause, so long as the uninternalized externalities are limited to the geographic scope of a single regulatory authority, the policy problem—getting the producer or consumer to pay the full freight for his or her environmental harms—arises from either technical or political shortcomings, not from a structural failure in the regulatory architecture. More importantly, a welfare-maximizing government has an incentive to try to fix the problem.

In other cases, however, the externality crosses political boundaries, spilling over into other states or countries or into the global commons, beyond the jurisdiction of any nation. These super externalities represent a more intractable policy problem. Even when there are no information failures or public choice distortions, an individual jurisdiction has little incentive to regulate transboundary harms optimally (as viewed from an overarching perspective).⁴⁵ If the smoke blows downwind beyond your borders, why spend your own constituents' money to remedy somebody else's problem? Interjurisdictional collaboration is required and is often difficult to achieve under these prisoners' dilemma circumstances.⁴⁶ To the extent that an issue crosses not just internal (state, county, or municipal) boundaries but also international borders, the collective action problem will be exacerbated.⁴⁷

In the case of climate change, for instance, the harmful greenhouse gas emissions blanket the Earth. The harm from anywhere affects everywhere. If a country unilaterally imposes emissions controls, it bears the full cost of the actions undertaken but will only receive a tiny portion of the benefits; the balance accrues to everyone else in the world. The incentive to free ride on the environmental interventions of others is overwhelming.⁴⁸

As I will discuss in the next Part, in some circumstances reciprocity between neighboring jurisdictions will make cooperation achievable.

⁴⁵ See *id.* at 59-63 (discussing collective action problems at international scale).

⁴⁶ The classic text on this point is Olson, *supra* note 43.

⁴⁷ See, e.g., Richard N. Gardner, *Negotiating Survival: Four Priorities After Rio 5-14* (1992) (discussing difficulties with international-scale environmental regulations); Robert O. Keohane, *After Hegemony: Cooperation and Discord in the World Political Economy* 77 (1984) (stating that "[c]ontemporary international relations are beset by dilemmas of collective action").

⁴⁸ See Richard N. Cooper, *Environment and Resource Policies for the World Economy* 60-61, 83 (1994) (discussing free rider problems in international environmental policy context); see also discussion *infra* Part II.F.

ble in response to transboundary problems.⁴⁹ The United States has taken action to reduce its sulfur dioxide emissions that cause acid rain in Canada at least in part because the United States wanted Canadian cooperation on other issues such as reducing toxic emissions into the Great Lakes. The problems that arise in the absence of reciprocal harms can be seen in the example of the northeastern states of the United States, which have had a hard time getting their midwestern neighbors to reduce particulates and the smog-causing ozone that move downwind. Because the prevailing winds blow west to east, Ohio has little reason to heed the complaints of Connecticut.⁵⁰ In the absence of other shared environmental resources that create a sense of reciprocity (or some other basis for community mindedness), the collective action problem—the difficulty of getting an agreement on mutual forbearance and emissions control—becomes nearly insurmountable.

Such interjurisdictional problems present a serious structural challenge and generally can only be addressed by authorities acting from a more overarching perspective, bringing within the ambit of the regulatory calculus all cost bearers and beneficiaries.⁵¹ Cross-border harms are especially hard to handle in the international environmental policy context. Agreements between jurisdictions to set and enforce pollution standards cooperatively from a comprehensive viewpoint are often not in place. Differences in language, political traditions, values, and institutions make the transaction costs that must be borne to foster successful international collaboration even higher than in the domestic domain.⁵² Because a robust structure of international law is lacking and one country's judicial system may not enforce judgments made in another, parties are limited in their ability to enforce international agreements. Thus, rights holders in a "victim" jurisdiction may

⁴⁹ See Note, *To Form a More Perfect Union?: Federalism and Informal Interstate Cooperation*, 102 Harv. L. Rev. 842, 847-50 (1989) (arguing reciprocity solves collective action problems).

⁵⁰ See Paul R. Portney, *Air Pollution Policy*, in *Public Policies for Environmental Protection*, supra note 9, at 27, 86 (describing distribution of costs and benefits for acid rain controls that burden midwestern states, while mainly benefiting eastern states).

⁵¹ See Baumol & Oates, *Theory*, supra note 5, at 278-83 (describing necessary steps for addressing transnational pollution); Esty, supra note 1, at 587-92 (discussing "structural mismatches"); Stewart, supra note 43, at 1211-16 (explaining benefits of centralized environmental regulation).

⁵² See Harold K. Jacobson & Edith Brown Weiss, *A Framework for Analysis*, in *Engaging Countries*, supra note 37, at 1, 1-12 (discussing compliance with international environmental accords).

well have a hard time getting the upwind or upriver emitters to control their pollution.⁵³

Many environmental harms only become apparent over time, as certain critical thresholds are exceeded or as conditions become more crowded.⁵⁴ When resource management or pollution problems stretch across time, obtaining optimal environmental results can be further complicated for reasons that are similar to the difficulties that arise when problems stretch across space. Activities that seem not to have caused harm in the past may one day produce serious and apparently sudden environmental damage. Because the time delays for some environmental problems will stretch out over decades or even centuries, the optimal allocation of rights to pollute and responsibilities for the cleanup may be hard to determine. Future citizens, most notably, are not around to participate in the decisionmaking process nor are their views on the optimal level of environmental intervention easy to discern.⁵⁵

The prospect of intertemporal resource misallocations is heightened by the tendency of politicians to take a short term perspective. For politicians, the next election looms large. They have what econo-

⁵³ Another nuance to the externality problem derives from the fact that welfare losses may arise not only from physical pollution spillovers but also from transboundary economic impacts or psychological effects. An economic externality occurs when jurisdiction A sets its environmental standards at a suboptimally low level, inducing competing jurisdiction B to lower its standards or risk the loss of jobs and factories moving to the lower cost jurisdiction. This "race toward the bottom" in regulatory stringency inflicts potentially serious welfare losses. See Esty, *supra* note 1, at 627-37 (explaining why and when economic externalities might arise). But see Revesz, *supra* note 1, at 1222 n.34 (arguing that economic externalities resulting from relaxed pollution standards in one state are "pecuniary" and not "real"). Similarly, when Americans complain that Brazil is doing too little to protect the rain forest, while there may be no physical spillover nor even any economic externality, the sadness felt by many people in the United States represents a real welfare loss—and a measurable psychological spillover. See Esty, *supra* note 1, at 638-48 (discussing concept of psychological spillover).

⁵⁴ Greenhouse gases, for instance, persist in the atmosphere for hundreds of years and the impact on the climate will only be apparent fifty or one hundred years hence. See A.R. Ravishankara et al., *Atmospheric Lifetimes of Long-Lived Halogenated Species*, 259 *Science* 194, 194 (1993) (noting that some greenhouse gases have lifetimes of over two thousand years); Owen Davies, *Air Repair*, *Omni*, June 1993, at 62, 94 (noting that chloroflourocarbons stay in air for up to one hundred years).

⁵⁵ An optimal environmental governance structure must therefore induce us to think systematically about the interests of future generations and to assess the possibility that current decisionmakers are underattending to the rights of our progeny. See Edith Brown Weiss, *In Fairness to Future Generations: International Law, Common Patrimony, and Intergenerational Equity* 17-46 (1989) (arguing that legal structures must incorporate interests of future generations and giving set of principles for that incorporation). Intergenerational equity represents an area of great controversy, however. See Derek Parfit, *Reasons and Persons* 356-65 (1984) (arguing against intergenerational duty based on traditional moral reasoning).

mists call a high "discount rate."⁵⁶ Thus, they put little value on harms (or benefits) that will accrue in the future, beyond the two to four years that remain in their own term of office. Of course, the public may discount the future as well.⁵⁷ In short, the further problems stretch beyond the time horizon of a generation or two, the greater the difficulties of getting present decisionmakers to attend to them.

3. *Public Choice Failures*

Even if informational gaps or structural mismatches did not cause regulatory failures, public choice distortions would, in many cases, lead to suboptimal results. Special interest groups often try to use the regulatory process to advance their own economic position. As a result, environmental policymakers frequently do not have the public interest fully (and only) in mind when they make policy decisions.

Deviation from the public will may be a function of undue influence exerted by the regulated industry (either resource users or polluters).⁵⁸ In some cases, polluters will seek to duck responsibility for the harms they are causing so as to save money. In other cases, "rent-seeking" economic interests may intervene in the political process to structure regulations in ways that deliver benefits to them. For example, the multibillion-dollar toxic waste cleanup industry has helped to stall Superfund reform, fearing the demise or reduction of its site remediation gravy train.⁵⁹ Likewise, the campaign contributions of California's farmers have meant that water is delivered to the farms of the Central Valley at deep discounts from market prices and in

⁵⁶ Dispute over the proper discount rates to apply to environmental problems runs deep. See, e.g., Nancy Birdsall & Andrew Steer, *Act Now on Global Warming—But Don't Cook the Books*, *Fin. & Dev.*, Mar. 1993, at 6 (arguing against special discount rate for environmental issues); William R. Cline, *Give Greenhouse Abatement a Fair Chance*, *Fin. & Dev.*, Mar. 1993, at 3 (arguing for lower than usual discount rate for long-term environmental policy analysis).

⁵⁷ One might think that people would care about the well-being of their children and grandchildren. But "bequest" motives actually appear to be rather weak. See, e.g., Christopher Lasch, *The Culture of Narcissism: American Life in an Age of Diminishing Expectations* 5 (1978) (noting that people live for themselves rather than for "predecessors or posterity"); Jed Rubenfeld, *The Moment and the Millennium*, 66 *Geo. Wash. L. Rev.* 1085, 1090-92 (1998) (describing focus of society to live in present without contemplating future).

⁵⁸ See Nathaniel O. Keohane et al., *The Choice of Regulatory Instruments in Environmental Policy*, 22 *Harv. Envtl. L. Rev.* 313, 347-53 (1998) (arguing that environmental regulations reflect industry preferences); B. Peter Pashigian, *Environmental Regulation: Whose Self-Interests Are Being Protected?*, 23 *Econ. Inquiry* 551, 573-79 (1985) (using voting analysis to show impacts of special interests on environmental policy).

⁵⁹ See Marc K. Landy & Mary Hague, *The Coalition for Waste: Private Interests and Superfund*, in *Environmental Politics: Public Costs, Private Rewards* 67, 77-78 (Michael S. Greve & Fred L. Smith, Jr. eds., 1992) (noting that lobbying of waste disposal industry makes Superfund reform extremely difficult).

volumes that frequently leave coastal cities parched and the flora and fauna of the San Francisco Bay Delta desperately short of water.⁶⁰ In egregious cases, the regulatory process may be "captured" by narrow interests. At the behest of friends in the coal industry, for example, West Virginia Senator Robert Byrd contorted the 1977 Clean Air Act into a mechanism to protect Appalachian coal mines rather than to control the burning of highly polluting eastern soft coal.⁶¹

Special interests may also have disproportionate influence because there is no voice speaking on behalf of the diffuse public.⁶² Asymmetries in incentives to participate in the political process have been thoroughly documented.⁶³ Where pollution control is the central issue, each victim generally has too small a stake in the outcome (being one of tens of millions, for instance, who bear the harm of breathing the air that is dirtied by coal burning) to be motivated to defend his or her interest.⁶⁴ However, the polluters, facing potentially significant costs to be imposed on a concentrated group of companies, have a clear incentive to work the political process.⁶⁵

Undue influence comes in many forms. It may entail "expert" material submitted to regulators, or it may be free meals or trips for

⁶⁰ See Deborah Moore & Zach Willey, *Water in the American West: Institutional Evolution and Environmental Restoration in the 21st Century*, 62 U. Colo. L. Rev. 775, 783 (1991) (referring to California State Water Resources Control Board as "captive regulator"); Scott M. Rennie, Comment, *Selenium in San Joaquin Valley Agricultural Drainage: A Major Toxic Threat to Fish and Wildlife Inadequately Addressed by the Central Valley Project Improvement Act*, 27 Pac. L.J. 303, 309-10 (1996) (discussing detrimental effects of water diversions on Delta farmland and Delta ecosystem).

⁶¹ See Bruce A. Ackerman & William T. Hassler, *Clean Coal/Dirty Air* 29-35 (1981) (explaining how Appalachian coal interests affected legislative coalition building around 1977 Clean Air Act).

⁶² Dan Farber notes that with such severe collective action problems it becomes hard to explain how we have any environmental law at all. See Daniel A. Farber, *Politics and Procedure in Environmental Law*, 8 J.L. Econ. & Org. 59, 60-61 (1992); see also William N. Eskridge, Jr., *Politics Without Romance: Implications of Public Choice Theory for Statutory Interpretation*, 74 Va. L. Rev. 275, 285-90 (1988) (arguing that direct interest groups often subvert public good for private gain).

⁶³ See, e.g., James M. Buchanan & Gordon Tullock, *The Calculus of Consent* 286-89 (1962) (describing how individuals have differing incentives for participating in political process); Bruce A. Ackerman, *Beyond Carolene Products*, 98 Harv. L. Rev. 713, 723-26 (1985) (arguing that small, close-knit groups can more easily mobilize their members than large or diffuse groups).

⁶⁴ See Einer R. Elhauge, *Does Interest Group Theory Justify More Intrusive Judicial Review?*, 101 Yale L.J. 31, 39 (1991) (groups with diffuse stake in issue tend to be under-represented in political decisionmaking).

⁶⁵ A separate literature has emerged to explain how this asymmetry can be overcome. See Peter H. Schuck, *Against (and for) Madison: An Essay in Praise of Factions*, 15 Yale L. & Pol'y Rev. 553 (1997) (defending role of special interest groups in political process); see also Farber, *supra* note 62, at 66-67 (positing that environmental successes are function of "republican moments").

key legislators to beach or ski resorts. In some cases and in some jurisdictions, outright payoffs corrupt the decision process.⁶⁶

Capture may also occur from the environmental side.⁶⁷ Many people perceive the Marine Mammal Protection Act,⁶⁸ which requires the United States to impose sanctions on other countries whose fishing practices do not meet specific U.S. conservation standards, to be an example of an environmentalist policymaking distortion. A small cadre of animal rights groups made use of the political process to get their whale and dolphin protection agenda adopted. They carefully focused the debate on a set of charismatic mammals and obscured the costs inflicted by their actions—the prospect of reciprocal trade barriers imposed on U.S. exports—to blunt opposition.⁶⁹

Other public choice distortions are more subtle. Some public choice failures arise because of quirks in voting procedures or because most voting systems do not register the intensity of preferences.⁷⁰ In

⁶⁶ See Brad Knickerbocker, *Hopes of Ecological Bliss Elude the Former Soviet Bloc*, *Christian Sci. Monitor*, Mar. 16, 1994, at 6 (describing how corruption has undermined environmental enforcement and policymaking). In other cases, a ruling elite's desire to hang on to power will result in policy decisions that track this goal rather than the environmental interests of the citizenry. China, with severe pollution problems that the government leadership largely ignores, represents a classic example of this problem. See Dua & Esty, *supra* note 44, at 70-71 (reviewing how unrepresentative government in China leads to sub-par environmental results); Elizabeth Economy, *Chinese Policy-making and Global Climate Change: Two-Front Diplomacy and the International Community*, in *The Internalization of Environmental Protection* 19 (Miranda A. Schreurs & Elizabeth Economy eds., 1997) (discussing how China's political system negatively impacts its environmental policies).

⁶⁷ A number of commentators have observed that NIMBYism ("Not In My Back Yard") often represents political manipulation of local land use decisions by powerful interests. See, e.g., Kent E. Portney, *Siting Hazardous Waste Treatment Facilities* 10-16 (1991) (describing NIMBY syndrome and its impact on democratic process); James T. Hamilton, *Missing the Mark(et) in Siting Hazardous Waste Facilities*, 1 *Duke Env'tl. L. & Pol'y F.* 11 (1991) (arguing that neighborhoods' abilities to organize is significant factor in siting of hazardous waste facilities); Daniel Mazmanian & David Morell, *The "NIMBY" Syndrome: Facility Siting and the Failure of Democratic Discourse*, in *Environmental Policy in the 1990s: Toward a New Agenda* 125, 126-27 (Norman J. Vig & Michael E. Kraft eds., 1990) [hereinafter *Environmental Policy in the 1990s*] (describing causes of NIMBY syndrome).

⁶⁸ Marine Mammal Protection Act of 1972, 16 U.S.C. § 1361 (1994).

⁶⁹ See Alison Raina Ferrante, *The Dolphin/Tuna Controversy and Environmental Issues: Will the World Trade Organization's "Arbitration Court" and the International Court of Justice's Chamber for Environmental Matters Assist the United States and the World in Furthering Environmental Goals?*, 5 *J. Transnat'l L. & Pol'y* 279, 287-93 (1996) (detailing international legal problems that resulted from U.S. Mammal Protection Act); Richard W. Parker, *The Use and Abuse of Trade Leverage to Protect the Global Commons: What We Can Learn from the Tuna-Dolphin Conflict*, 12 *Geo. Int'l Env't'l L. Rev.* (forthcoming 1999) (describing "tuna-dolphin" conflict and evolution of Marine Mammal Protection Act).

⁷⁰ See, e.g., Kenneth J. Arrow, *Social Choice and Individual Values* 27 (2d ed. 1963) (demonstrating that some voting methods allow irrelevant candidates to skew election re-

many decision processes, parties that act strategically (e.g., by holding out at a critical juncture or by refusing to go along with a commitment of others to collective action) can undermine public decisionmaking processes.⁷¹

Ultimately, well-organized groups get heard. Interests backed by money get an audience. Political activists have a voice. Less well-organized, funded, or sophisticated interests will not have comparable influence. Systematic diminution or exclusion of less politically powerful groups from the decision process can be seen as an issue of environmental justice and thus is a particularly important type of public choice failure.⁷²

C. Value Disputes and Welfare Losses Beyond the Realm of Regulatory Failure

To some extent, problems that appear to be environmental policy failures reflect differences in values that play out in the environmental governance process. When the year-round residents of the Adirondacks believe they have been shortchanged by state-imposed limits on development, what underlies their complaint is a dispute over how much value to place on pristine lakes versus the jobs, recreational benefits, and economic gains from more hotels and jet ski rentals.⁷³ This sort of tradeoff, along with questions such as how much value to place on a pretty view or on saving a human life, are not issues of governance but rather of values.

sults and help determine outcome); Herbert Hovenkamp, *Legislation, Well-Being and Public Choice*, 57 U. Chi. L. Rev. 63, 75 (1990) (providing example of how minority viewpoint may have plurality of support at higher levels of aggregate voting). But there is little evidence that these voting anomalies are a major issue in the environmental domain.

⁷¹ See Epstein, *supra* note 30, at 582-84 (describing effects of strategic behavior on provision of collective goods).

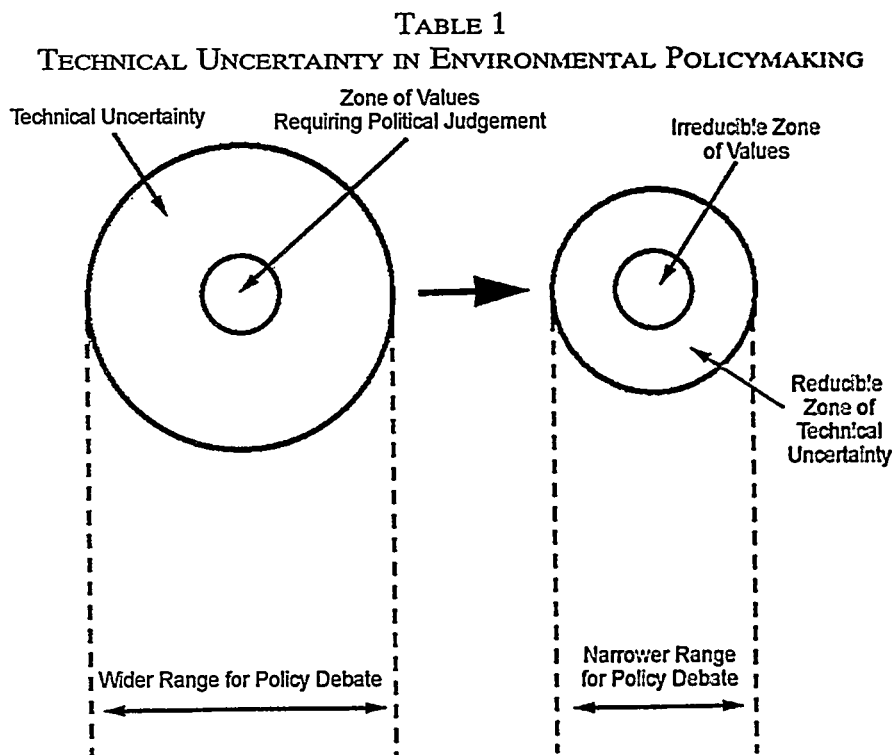
⁷² See Vicki Been, *Locally Undesirable Land Uses in Minority Neighborhoods: Disproportionate Siting or Market Dynamics?*, 103 Yale L.J. 1383, 1398-1406 (1994) (discussing power politics in environmental decisionmaking); Sheila Foster, *Justice from the Ground Up: Distributive Inequities, Grassroots Resistance, and the Transformative Politics of the Environmental Justice Movement*, 86 Cal. L. Rev. 775, 788-91 (1998) (explaining that environmental justice addresses both distributive outcomes and exclusion from decisionmaking processes).

⁷³ See Tom Kenworthy, *Adirondack Park at 100 Years Old: Public, Private Pressures Converge*, Wash. Post, May 23, 1992, at A3 (describing Adirondack Park as "a magnificent refuge of mountains, lakes, rivers and woodlands [that] today stands at a crossroads, a case study in the collision between environmental and aesthetic values, property rights and lean state budgets"); Joel Stashenko, *Stalled Economy Blamed on State, Environmentalists: Residents Complain of Insensitivity by Government, Hostility by Advocacy Groups*, Buff. News, Jan. 2, 1998, at 3A, available in Dialog, File No. 733 (describing struggle between conservationists and development interests).

Applying values and evaluation is quintessentially a political matter. It is important to reiterate that there can be no truly optimal environmental governance because resource management as well as public health and ecological protection involve to some degree measuring the unmeasurable and comparing the incomparable. Optimizing one set of virtues will often entail compromising on other values. Many environmental problems have at their core questions over which people do not—and need not—agree. At this level, the policy process is art, not science.

While inescapably political to some extent, the environmental policymaking process can be sharpened through improved governance. Indeed, a well-functioning regulatory system will generate information and analysis to inform decisionmakers, isolate the value judgments that must be made, highlight the assumptions on which decisions might turn, and tee up the critical political questions for decision in a fair and unbiased way. By reducing the zone of technical uncertainty, better decisionmaking structures and procedures narrow the range of policy disputes.

Ultimately, however, competing visions of the “good” that policy should achieve and the fact that even scientific or technical calcula-



tions have a values-driven dimension make pursuit of a singular optimal policy an elusive goal.⁷⁴

As I will discuss in detail below, the difficulties that arise in trading off environmental values against other values render the concept of social welfare-maximizing policy even more slippery.⁷⁵ When some political leaders argue for devolution of environmental decisionmaking, for example, they may be stressing the importance of citizen involvement in decisionmaking as a virtue even at the expense of technically improved environmental analysis. In effect, they are saying that whatever welfare losses arise from suboptimal environmental policy decisions are more than compensated for by the citizenship benefits or other gains obtained by moving decisionmaking closer to the public.

Optimal environmental governance requires attention to all of these issues simultaneously. Some observers may balk at the complexity of trying to optimize across so many variables, including a number of seemingly incommensurate ones. But, of course, this is exactly what policymakers do today, albeit in a rather crude, obscure, and unsystematic manner. The challenge is to make this optimization more careful, transparent, thoughtful, and coherent.

II

ENVIRONMENTAL PROBLEMS

Environmental problems come in many shapes and sizes. That such a wide range of pollution control and resource management issues fall under the environmental rubric magnifies the difficulty of establishing optimal governance structures and procedures. Hopes for a single legal or regulatory approach that would be adequate and responsive to this full spectrum of issues are misplaced.⁷⁶ The search for

⁷⁴ See Howard Latin, *Good Science, Bad Regulation, and Toxic Risk Assessment*, 5 *Yale J. on Reg.* 89, 95-126 (1988) (discussing EPA's attempts to ground regulation on scientific risk assessment); Schuck, *supra* note 36, at 17-21 (describing biases and prejudices that affect scientists).

⁷⁵ Across individuals, values will differ. Even within one individual, an inconsistent set of core goals and values—a clean environment, economic growth, equity, justice, etc.—will often exist and be in some tension with advances in one dimension coming at the expense of another. The paradigmatic statement of this conflict is in Isaiah Berlin, *Two Concepts of Liberty*, in *The Proper Study of Mankind* 190, 197-98 (Henry Hardy & Roger Hausheer eds., 1997).

⁷⁶ Richard Epstein argues against complexity and for a system of simple rules. See Richard A. Epstein, *Simple Rules for a Complex World* (1995) (arguing that complexity has serious social side effects). But see Louis Kaplow, *A Model of the Optimal Complexity of Legal Rules*, 11 *J.L. Econ. & Org.* 150, 161 (1995) ("To talk of minimizing complexity in this context is misguided. . . . [C]osts and benefits of complexity are not automatic."); Eric W. Orts, *Simple Rules and the Perils of Reductionist Legal Thought*, 75 *B.U. L. Rev.*

simple solutions in a complex world can be distracting and even destructive.⁷⁷ The pluralism of human values and the diversity of the environmental challenge—indeed, *challenges*—must be accepted and embraced.

In this Part, I describe six different environmental problems that, while not comprehensive in any regard, do offer a sense of the spectrum of resource management and pollution control issues to which our governance structures must respond. By analyzing these issues carefully and developing an understanding of how and why welfare losses arise from them, I believe that some traction can be obtained in moving toward optimal environmental governance.

A. *Protected Areas*

Providing for the identification, acquisition, and maintenance of public spaces is a central aspect of environmental policy. The range of activities that go on within these common areas—at the neighborhood, town, state, national, and international levels—further demonstrates the diversity and complexity of the challenges facing environmental policymakers.

Parks are at constant risk from the classic resource management problem: overexploitation.⁷⁸ Although the problem of too many cows on the green in a New England village no longer seems pressing, the need to allocate time on municipal basketball or tennis courts or the difficulty of accommodating the number of campers who want to pitch tents in Yosemite National Park remain very real.

Peace is often restored by creating property rights. Permission is granted to use a court or tent site for a specified date and a fixed amount of time. In some cases, the permit (property right) is granted for free on a first-come first-served or lottery basis. In other cases, a fee is paid for the right. In either event, tensions over scarce park resources can be quite easily resolved by the creation of a property rights regime.⁷⁹

1441, 1443 (1995) (reviewing Richard A. Epstein, *Simple Rules for a Complex World* (1995)) (arguing that Epstein “commits a serious error in presuming simple rules are more desirable than complex ones”).

⁷⁷ Regulatory reform efforts that oversimplify the environmental governance challenge may be politically attractive and certainly are alluring to the media, but oversimplification does little to move the policy process forward.

⁷⁸ See Hardin, *supra* note 5, at 1244-45 (describing collective action problem that leads to “tragedy of the commons”).

⁷⁹ There may still be equity questions that must be addressed. Do only those who have money to buy permits get to use the park? And vindication of the right may be problematic as anyone who has waited to occupy a tennis or basketball court knows.

In addition to problems of allocating space, parks often face tensions over competing preferences about how to use the commons. Should a local field be kept undeveloped as open space or converted into a new set of baseball diamonds to accommodate additional ballplayers? Should the decision change if wetlands must be filled to create the ballpark? Should the pristine lakes of the Adirondacks be protected from development or opened up to summer jet skiers and winter snowmobilers? Should the Grand Canyon be accessible only to those willing and able to hike down its steep trails or should there be accommodation made for those that prefer to travel by mule or who need wheelchair access? Must the hikers accept a certain degree of mule dung or should the mule drivers be required to clean up after themselves? And should those who are hiking or riding on mules be forced to hear the buzz of sightseeing planes flying above or should clear and quiet skies be deemed an essential element of the Grand Canyon experience?

To some extent, information failures underlie these disputes. If we really knew the value of the resource—for example, the benefit that open space or wetlands provides as a home of flora and fauna, a flood plain, a habitat for endangered species, and as an aesthetic and recreational asset to the community—and could compare this value to alternative uses such as the recreational benefits (and potential commercial gains) of the ball fields, the scope of the dispute might be narrower. Some investment in better environmental data and cost-benefit analysis will thus facilitate decisionmaking.

These disputes can also be understood, in part, as issues of externalities. One person's activities in the park intrude on the enjoyment of the facilities by others. To the extent externalities are the problem, Arthur Pigou long ago taught us a solution: Tax the difference between private and social costs.⁸⁰ Selling camping permits, by which the costs that campers impose on the park are internalized, yields more efficient and reasonably effective resource management results. If jet skiers and snowmobilers had to pay by the decibel for their activities, they would generate less noise. And the funds collected could finance a system of physical separation of the disputing parties, such as the acquisition of some lands to be set aside for the enjoyment of those who want to hear nothing more than the glide of a cross-country ski or canoe. Putting a price on the harm, in this case noise, would, moreover, induce the manufacturers of these vehicles to find technological advances to make them quieter.

⁸⁰ See A.C. Pigou, *The Economics of Welfare* 172-203 (4th ed. 1948).

Part of the dispute in this case is, however, a boundary problem. At what point does the noise from a jet ski move from reasonable to unreasonable—from an acceptable element of the give-and-take of life to being a nuisance? These questions involve judgment calls and are really a matter of community standards.⁸¹

Where such judgments are required, divergent values come into play. For example, what are the benefits of keeping the Adirondacks wild? This question raises inescapably political issues involving aesthetic preferences and deep ethical issues concerning the value of nature.⁸² The difficulty of answering these questions can be multiplied when we add in an intertemporal dimension, specifically the possibility that future generations might answer the same inquiries differently.⁸³

While some of the difficulties in managing parks derive from value clashes that good governance cannot mitigate, other concerns arise from governmental decisionmaking tainted by special interest manipulation. Timber companies that enjoy subsidized access (through Forest Service road building and other programs) to national forests or ranchers who graze their cattle on government lands at below-market rates have drawn the ire of fiscal conservatives and conservationists alike.⁸⁴ The granting of special favors to narrow interests raises serious public choice questions.

In other cases, a fault line emerges between a local community that seeks economic growth through resource exploitation, such as those who inhabit many of the depressed towns of the Adirondacks who would like to rent out jet skis and snowmobiles, and a broader community, such as the full set of New York residents, who might prefer to see the Adirondack Park protected in a more pristine form.⁸⁵ New York State's decision to limit development in the Adirondacks has, in fact, drawn loud criticism from the locals, who decry elitist en-

⁸¹ See Robert C. Ellickson, *Alternatives to Zoning: Covenants, Nuisance Rules and Fines As Land Use Controls*, 40 U. Chi. L. Rev. 681, 729 (1973) (arguing that boundaries of externalities are set by community norms).

⁸² See Holmes Rolston III, *Environmental Ethics: Values in and Duties to the Natural World*, in *Ecology, Economics, Ethics: The Broken Circle* 73, 86-96 (F. Herbert Bormann & Stephen R. Kellert eds., 1991) (describing ethical aspects of conservation).

⁸³ See *supra* note 55.

⁸⁴ See Ronald J. Rychlak, *Changing the Face of Environmentalism*, 8 *Fordham Envtl. L.J.* 115, 118 (1996):

Environmentalists and fiscal conservatives have recently been coming together on several issues, the most prominent ones being opposition to agricultural subsidies and corporate welfare. This new alliance has been dubbed the Green Scissors coalition, and there are other signs of agreement between these forces which are often at odds with one another.

⁸⁵ See *supra* note 73.

vironmental politics.⁸⁶ Their political supporters (or at least the academics among them) see the development restrictions as yet another example of overcentralization and therefore a public choice failure. They argue that permitting larger jurisdictions (i.e., New York State) to dictate outcomes to smaller ones (particular Adirondack towns or counties) represents the overriding of community preferences by state level decisionmakers and is thus an "internality."⁸⁷ Whether this decisionmaking process is really a regulatory failure depends on how one defines the scope of the resource and the community that "owns" the resource. If the resource (i.e., the park) is deemed to be local, the "matching principle"⁸⁸ has been violated. But, given that the Adirondack Park is owned by the State of New York, decisionmaking at the state level seems hard to dispute. Thus, complaints from smaller scale jurisdictions may be vociferous, but in this case, they do not necessarily represent a structural failure in governance.⁸⁹

B. Toxic Waste Site Cleanup

Handling polluted land has become a major environmental policy challenge in the United States. Superfund sites, in particular, represent a tangled mix of market and regulatory failures.⁹⁰ At some sites, chemical plumes spread underground, contaminating the water supplies of neighbors. For decades, these externalities went unattended. Getting the polluters to pay for the harms they have caused makes

⁸⁶ See James Dao, *Blazing a Power Trail in the Adirondacks*, N.Y. Times, June 24, 1993, at B1 (discussing political battles in Adirondacks).

⁸⁷ On the concept of internalities, see Mancur Olson, Jr., *The Principle of "Fiscal Equivalence": The Division of Responsibilities Among Different Levels of Government*, 59 Am. Econ. Rev. 479, 482 (1969) (observing that "internalities" exist when public good reaches only subset of population in jurisdiction). As Olson notes, "[i]n a situation of this type and a democratic political system with voting by majority rule, the provision of a collective good for a local area will hurt more people than it helps, even if Pareto optimality would have required that the collective good be provided." *Id.*; see also Esty, *supra* note 1, at 587-97 (discussing "internalities" as category of structural governance failure).

⁸⁸ The "matching principle" argues for governance and the provision of public goods by authorities at a geographic scale that encompasses substantially all cost bearers and beneficiaries of the policy in question, but no broader. See Olson, *supra* note 43, at 48, 53-57 (arguing that optimal investment in collective goods requires political boundaries coterminous with scope of good); Butler & Macey, *supra* note 1, at 23, 25-26 (defining and advocating matching principle).

⁸⁹ It could be argued that this case represents a public choice failure of another sort. Specifically, it might well be the case that the Adirondack Park management decision process fails to take account of intensity of preferences—and thus millions of New Yorkers who live at a great distance from the park and never use it nevertheless outvote the thousands who live in or near the resource and whose lives are in substantial ways shaped by the management decisions.

⁹⁰ See *Analyzing Superfund: Economics, Science, and Law* (Richard L. Revesz & Richard B. Stewart eds., 1995) (reviewing policy problems in Superfund program).

sense as a matter of efficiency (internalizing externalities) and justice (those who cause harms should pay). But government efforts to fix the market failures underlying hazardous waste sites have gone badly off track and, in fact, have created even deeper problems.⁹¹

The incentives created by Superfund's liability rules, imposing joint and several liability as well as strict liability for owners both past and present, have resulted in stunted environmental cleanups and site abandonment rather than reuse of older industrial facilities.⁹² Former factory sites, whether actually contaminated or not, are now shunned by developers, bankers, mortgage lenders, and insurance companies due to fears of potential liability for cleanup costs. These so-called "brownfields" have become dead zones, while new economic activity shifts to undeveloped land or "greenfields" where toxic risks are perceived to be much lower.

To some extent, the policy failure can be seen as a question of clouded property rights and a disrupted market. Those engaged in redevelopment of former industrial facilities, fearing that they might be, in effect, buying responsibility for cleaning up past toxic wastes, deeply discount the value of both contaminated and potentially contaminated sites.⁹³ The extended reach of the Superfund liability provisions adds to the uncertainty. By confusing the picture over who has what rights and obligations, the Superfund statute drives up transaction costs, which involve scientific and economic assessments of the potential toxic waste harms as well as legal determinations about responsibility for cleanup costs at the time of any resource transfer. The potential exposure to staggering costs creates a huge incentive to fight in court rather than to pay up and clean up.

The poor results—abandoned sites, slow cleanups, and huge legal bills—can also be seen as a function of regulatory failures arising from information and technical gaps. Until recently, both federal and state environmental officials often demanded that contaminated sites be cleaned up to a very high standard (to the point where children could eat the dirt), driving the value of many properties below zero because cleanup costs exceeded the probable sale price of the cleaned-up

⁹¹ See, e.g., W. Kip Viscusi, *Regulating the Regulators*, 63 U. Chi. L. Rev. 1423, 1436 (1996) (estimating that Superfund program is so inefficient that four billion dollars is spent per cancer case avoided).

⁹² For a discussion of the negative effects of joint and several liability, see generally Roger C. Dower, *Hazardous Wastes*, in *Public Policies for Environmental Protection*, supra note 9, at 151, 185 (arguing that chance of total liability may cause firms to avoid disclosing information on contributions to waste sites and to resist entering into agreements to clean up sites).

⁹³ See *id.* at 183-87 (delineating extensive costs to corporations in owning contaminated site).

property.⁹⁴ The challenge of answering the "how clean is clean" question and getting the appropriate degree of cleanup undertaken has been complicated by a serious lack of ecological and epidemiological information about who is hurt by these sites, by how much, and what can be done about it. A number of notorious, if relatively isolated, cases where cleanup costs skyrocketed into the tens of millions of dollars have made every Superfund site, whether designated by federal or state law, a source of crushing risk and doubtful economic viability.⁹⁵

CERCLA⁹⁶ also has perverse information-generation incentives. In particular, companies often find it advantageous *not* to know whether their properties are contaminated because having the data would trigger reporting and cleanup obligations (and costs).

The inaction of Congress in the face of a dysfunctional Superfund program suggests the presence of public choice failures as well. The interplay and byplay of interests has resulted in a regulatory reform stalemate.⁹⁷ Many companies are lobbying for "fair" treatment, which would, not coincidentally, reduce their liabilities.⁹⁸ Other observers see this lobbying as a distortion of the policy process and an attempt by the corporations to dodge their responsibilities.⁹⁹ Many environmental groups and leaders are pushing to retain Superfund's liability rules to ensure that the costs of cleanup fall on corporate polluters as

⁹⁴ See, e.g., Erin M. Sheridan, *How Clean is Clean: Standards for Remedial Actions at Hazardous Waste Sites Under CERCLA*, 6 *Stan. Envtl. L.J.* 9, 13-21 (1986-87) (describing regulatory excesses caused by lack of clear standards in CERCLA).

⁹⁵ In general, it is argued that liability incentives "go too far, too fast" with a net result that includes "unexpected outcomes and unanticipated costs." Dower, *supra* note 92, at 184. In 1994, for example, the projected average cost of the cleanup of a site on the National Priorities List was \$40 million, with costs soaring as high as \$500 million. See Steven P. Ferrey, *Allocation and Uncertainty in the Age of Superfund: A Critique of the Redistribution of CERCLA Liability*, 3 *N.Y.U. Envtl. L.J.* 36, 37 (1994).

⁹⁶ Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. § 9601 (1994).

⁹⁷ See Michael E. Kraft, *Environmental Gridlock: Searching for Consensus in Congress*, in *Environmental Policy in the 1990s*, *supra* note 67, at 103, 111-18 (reviewing congressional environmental policy gridlock).

⁹⁸ See *Superfund: Insurance Group Backs Treasury Proposal, Is Willing to Pay \$300 Million Annual Share*, 24 *Env't Rep.* 1175, 1176 (1993) (citing letters to White House written by business, insurance, and certain municipal groups asking for elimination of retroactive liability).

⁹⁹ See *id.* (citing letter to White House from American Communities for Cleanup Equity, the Environmental Defense Fund (EDF), Friends of the Earth, Municipal Waste Management Association, National Association of Counties, National School Boards Association, National Association of Towns and Townships, Natural Resources Defense Council, Sierra Club, and U.S. Conference of Mayors that criticized proposal to replace Superfund's retroactive liability provisions with tax program as "polluter amnesty program").

opposed to the general public.¹⁰⁰ But some observers question this rationale and wonder whether the environmental advocates are being punitive.¹⁰¹

It quickly becomes very unclear where the public's interest ends and where special interests begin. A number of congressional leaders and their staffs appear ambivalent about Superfund reform, perhaps fearing diminishment of their power or reduced media attention if reform efforts were to succeed.¹⁰² But perhaps they are really defending the public's interest. Government officials in the EPA and the state counterpart agencies seem hesitant about restructuring Superfund, in part because they want to maintain their budgets, staffs, and influence.¹⁰³ But perhaps *they* are really defending the public's interest. The multibillion dollar cleanup industry balks at the prospect of a smaller market for its services.¹⁰⁴ But perhaps their lobbying is just a counterweight to the political influence of the polluters. The Superfund bar has helped to obscure the path toward reform, perhaps fearing the loss of the tens of millions of dollars in legal fees paid each year in litigation over Superfund liability.¹⁰⁵ But maybe the attorneys are promoting truth and justice. This confusion has created political deadlock and less than satisfactory environmental results.

Superfund's sorry history and present difficulties may also be traceable, in part, to divergent values among the participants in the

¹⁰⁰ See *id.* In addition, courts generally have interpreted CERCLA broadly in an effort to impose liability on polluters. See, e.g., *United States v. Northeastern Pharm. & Chem. Co.*, 810 F.2d 726, 734 (8th Cir. 1986) ("Congress acted in a rational manner in imposing liability for the cost of cleaning up such sites upon those parties who created and profited from the sites."); *United States v. Reilly Tar & Chem. Corp.*, 546 F. Supp. 1100, 1112 (D. Minn. 1982) ("Congress intended that those responsible for problems caused by the disposal of chemical poisons bear the costs and responsibility for remedying the harmful conditions they created. To give effect to these congressional concerns, CERCLA should be given a broad and liberal construction.").

¹⁰¹ Many of the environmental laws of the United States, developed in the 1970s and early 1980s, are built on the premise that pollution is immoral and should be entirely stopped. More recent thinking has tended to downplay the moral overtones and to emphasize the economic inefficiency of uncontrolled pollution. See *Esty & Chertow*, *supra* note 7, at 3, 4-6 (arguing for less confrontational, more cooperative policies).

¹⁰² See *supra* note 97.

¹⁰³ See Margo D. Beller, *Superfund Reform Bill Draws Fire from Both Sides of Liability Issue*, *J. Com.*, Oct. 30, 1995, at 15A (highlighting EPA complaints about Superfund reform measure); Karen MacPherson, *Fuming over Pollution Bill*, *Pitt. Post-Gazette*, Mar. 6, 1998, at A14 (outlining views of EPA chief Carol Browner on Superfund reform).

¹⁰⁴ See *Landy & Hague*, *supra* note 59, at 78-81 (describing lobbying efforts by Hazardous Waste Treatment Council to "ensure a long-term, continual proliferation of Superfund sites").

¹⁰⁵ See Michael B. Gerrard, *Demons and Angels in Hazardous Waste Regulation: Are Justice, Efficiency, and Democracy Reconcilable?*, 92 *Nw. U. L. Rev.* 706, 725 (1998) ("CERCLA has spawned a thousand tales of anguish.").

policy debate. For some actors, particularly traditional environmental activists, the liability provisions of the law cannot be compromised, as these rules represent the moral backbone of Superfund.¹⁰⁶ Other participants see the same provisions as punitive and dated, not to mention an obstacle to fast and efficient cleanup of abandoned waste sites.¹⁰⁷ How much value to place on the ecological risk from contaminated sites—threats to birds, animals, etc.—is also a matter of contention.

C. *River and Stream Pollution*

Water quality across the United States deteriorated considerably over the first six decades of this century because there was little done to control waste flows into rivers and streams.¹⁰⁸ For much of this period, water pollution was seen as the necessary price of industrialization and economic advancement. As just one example, a Monongahela River thick with toxic chemicals and heavy metals was accepted as a fair trade for Pittsburgh's progress.¹⁰⁹

Even today, decades after it has become clear that emissions into public waterways are neither necessary nor acceptable, pollution of rivers and streams remains a serious problem.¹¹⁰ A central reason for the slow progress can be traced to a lack of information.¹¹¹ It is often hard to identify the source of water pollution. It is also difficult to establish just how much harm a particular emitter is causing, especially when the harms come from diffuse "nonpoint" sources¹¹² rather

¹⁰⁶ See *supra* note 99.

¹⁰⁷ See Gerrard, *supra* note 105, at 724-25 (reviewing CERCLA's "counterintuitive" liability system which many consider "inherently unjust").

¹⁰⁸ For a brief history of water pollution in the United States, see Robert V. Percival et al., *Environmental Regulation: Law, Science, and Policy* 873-75 (1992).

¹⁰⁹ See John P. Hoerr, *And the Wolf Finally Came: The Decline of the American Steel Industry 189-91* (1988) (describing environmental costs of steel industry to town of McKeesport generally and Monongahela River in particular).

¹¹⁰ See Drew Caputo, *A Job Half Finished: The Clean Water Act After 25 Years*, 27 *Envtl. L. Rep.* 10,574, 10,577-78 (1997) (noting that pollution of America's waters remains unacceptably high, even after significant improvements); A. Myrick Freeman III, *Water Pollution Policy*, in *Public Policies for Environmental Protection*, *supra* note 9, at 97, 110-21 (summarizing several studies and concluding that there has not been dramatic improvement in water quality since passage of Clean Water Act in 1972).

¹¹¹ Even when information is collected, the data sets are often incomplete. The EPA's biennial National Water Quality Inventory covers only 17% of rivers and streams and 42% of other water bodies. See Michael E. Kraft & Norman J. Vig, *Environmental Policy from the Seventies to the Nineties: Continuity and Change*, in *Environmental Policy in the 1990s*, *supra* note 67, at 3, 20-21 (discussing data and information gaps).

¹¹² "Point" sources of water pollution are identifiable sources, such as effluent pipes from factories or sewage treatment plants. "Nonpoint" emissions arise from more diffuse sources, such as agricultural runoff, storm water overflows, and runoff from roads and yards.

than readily identifiable big factories. Other information gaps further complicate water pollution control efforts. How quickly do various pollutants break down? Which chemicals are bioaccumulative? Are there interactions among pollutants that intensify the harm? How serious are the impacts on human, animal, or plant life and health from a particular set of exposures? How do we gauge the public health and ecological impacts of water pollution when every chemical has a distinct dose-response function? Beyond the problems of identification and measurement of harms, additional questions of data analysis arise.¹¹³ Epidemiological and ecological analyses cannot provide precise answers about who will be harmed and by how much. Putting a price on the harms inflicted is also not easy. Risk assessments and cost-benefit analyses in this area are still rather crude, and the methodologies for refining them are just beginning to be understood.¹¹⁴ There are, moreover, a range of policy responses and technological options from which environmental policymakers might choose, but policymakers often lack the analytic foundation to make their choices in a systematic, welfare-maximizing way.

Limited knowledge has resulted in a water pollution regulatory structure that virtually ignores the harms from nonpoint sources such as farming, road runoff, backyard pesticide and fertilizer applications, and other hard-to-pin-down emitters.¹¹⁵ The current regulatory approach lacks incentives for those who are closest to the harms—the polluters and their victim-neighbors who share a particular water-course—to develop the information needed for a more effective policy response.

The technical complexity of addressing water pollution is heightened by a difficult collective action problem. Upstream jurisdictions tend to pay little attention to the harms that their factories, farms, and households cause downstream.¹¹⁶ Unlike air pollution, where there

¹¹³ See, e.g., Baruch Fischhoff et al., *Acceptable Risk*, in *Foundations of Environmental Law and Policy* 80, 80-81 (Richard L. Revesz ed., 1997) (explaining that environmental decisionmaking involves interrelated steps of risk assessment and assessment of other data).

¹¹⁴ See James K. Hammitt, *Data, Risk, and Science: Foundations for Analysis*, in *Thinking Ecologically*, supra note 7, at 150, 152-57 (discussing different methods of environmental analysis and stating that “[w]hatever analytic framework is employed, the complexity of environmental issues and limitations in the science base ensure that the consequences of alternative policies can be predicted only with substantial uncertainty”).

¹¹⁵ See, e.g., Percival, supra note 108, at 1254 (describing difficulty of regulating nonpoint sources).

¹¹⁶ See Thomas Bernauer, *Managing International Rivers*, in *Global Governance: Drawing Insights from the Environmental Experience* 155, 162-65 (Oran R. Young ed., 1997) (describing environmental conflicts that can emerge between upstream countries and downstream countries).

may be some reciprocity across jurisdictions when the wind blows from the west on some days and from the east on other days, rivers and streams always flow in one direction. Absent governmental intervention at an overarching level, upstream polluters have limited incentives to pay attention to the complaints of downstream victims. This pattern of costs and benefits translates into persistent structural regulatory failure.

Efforts to address water pollution suffer, in addition, from significant special interest manipulation. Polluters are generally organized and relatively concentrated, while the victims of water pollution are small, numerous, and hard to organize. This asymmetry of interest in participating in the political process skews government decisions about how much pollution control to require.¹¹⁷ The failure to address the agricultural sources of water pollution provides an especially vivid example of public choice failure. Politically active and powerful, farm interests have succeeded in shaping the political debate in ways that have allowed farmers to duck responsibility for field runoff, irrigation return flows, and animal waste contamination.¹¹⁸

Once again, part of the perceived policy failure can be traced to differences in values. Disputes persist over how much society benefits from investments in eliminating pollutants from particular water sources.¹¹⁹ Does "clean" water mean that it is swimmable? Fishable? Drinkable? How clean a river should be is ultimately a political question. Science and good technical analysis can guide us toward an answer, but there is no algorithm that will yield a precise answer.

D. Acid Rain

The acidification of rivers, streams, lakes, and land from emissions of sulfur dioxide and oxides of nitrogen represents a significant problem in many parts of the world, including the United States.¹²⁰ Acid rain can be seen both as an example of a regulatory failure and

¹¹⁷ Clearly, many environmental issues remain unaddressed. The question is why any have been taken on, given the asymmetries present. See Mashaw, *supra* note 33, at 33 (noting that "[a]ccording to interest group theory, groups representing such diffuse interests as those 'concerned about the environment' should never form," but that such groups have nevertheless "grown, prospered, and had influence").

¹¹⁸ See C. Ford Runge, *Environmental Protection from Farm to Market*, in *Thinking Ecologically*, *supra* note 7, at 200, 200-03 (arguing that little in way of environmental protection has been asked of America's farmers).

¹¹⁹ See, e.g., Jay Jochnowitz, *GE, Feds Spar over Study of PCBs in River*, *Times Union* (Albany), Mar. 19, 1999, at B9 (describing EPA's dispute with General Electric Company over extent of its responsibility for PCBs in Hudson River).

¹²⁰ See Percival, *supra* note 108, at 820-25 (describing acid rain problem in United States).

as a case where the clarification of property rights has led to improved regulatory results.

If every source of SO₂ and NO_x could be identified, the loadings from each source measured, and the downwind harm calculated with some degree of precision, the information failures that make a pure market-based response to acid rain impossible today could be overcome. Of course, the vast dispersion of the harms across millions of people and tens of millions of acres, both publicly and privately held, makes the aggregation of harms in a coherent and low-cost manner hard to achieve. Thus, some degree of governmental intervention to address acid rain seems inescapable.

Beyond limited information, efforts to control acid rain have been plagued by a number of other regulatory failures. Notably, much of the harm travels beyond the jurisdictions where the emissions are released (in large measure, coal-burning power plants and other major coal-powered facilities in the Midwest).¹²¹ This mismatch between the scope of the harms and the source of the emissions results in serious structural failures in state-level environmental governance. In particular, the midwestern states underattend to the acid rain problem, reflecting the fact that, from their own perspective, the costs of mitigating the problem look high and the benefits to be obtained within their own territory appear relatively low.

In the political arena, the acid rain generators have exercised influence to ensure that they are not burdened with heavy pollution control costs. Indeed, the 1977 Clean Air Act promoted the burning of high sulfur coal; this statute is now regarded as a paradigmatic example of public choice failure.¹²² The structure of the acid rain problem—with highly concentrated polluters and widely dispersed victims—represents a classic example of the asymmetry of interests that results in a high degree of susceptibility to public choice failure.

The Clean Air Act of 1990¹²³ considerably advanced the U.S. response to acid rain with a sophisticated system of tradable emissions allowances. By creating a market in pollution (and emission control),

¹²¹ See Paul Barton, *Ill Winds or Smoke Screen? Northeast Blames Midwest for Its Air-Pollution Woes*, *Cin. Enquirer*, Jan. 19, 1998, at A1 (describing friction between northeastern states and midwestern industry over acid rain and ozone transfer); see also Michael Kranish, *The Politics of Pollution*, *Boston Globe*, Feb. 8, 1998, Magazine, at 16, available in 1998 WL 9116401 (discussing effects of 1990 Clean Air Act on acid rainfall in New England, caused largely by coal-burning power plants in Midwest).

¹²² See Ackerman & Hassler, *supra* note 61, at 59-78 (criticizing Clean Air Act of 1977). But note that the Clean Air Act of 1990, amending the Clean Air Act of 1977, redirected the regulatory focus. See Clean Air Act Amendments of 1990, Pub. L. No. 101-549, 104 Stat. 2399 (codified in scattered sections of 29, 42 U.S.C.).

¹²³ Pub. L. No. 101-549, 104 Stat. 2399 (codified in scattered sections of 29, 42 U.S.C.).

the 1990 Clean Air Act established incentives for the generation of information (particularly on the level of emissions and the costs of control) on a highly disaggregated basis, making possible a much more refined and cost-effective regulatory strategy and encouraging action by those in a position to reduce SO₂ and NO_x emissions at the lowest cost.¹²⁴

While not a pure market response, the acid rain trading scheme creates a hybrid structure that harnesses market forces in the service of environmental gain. The ability to allocate responsibility for emissions reductions, and to permit those who "overfulfill" their obligations to sell their excess permits to those who are having a hard time reducing emissions at a reasonable cost, lowers the overall societal cost of pollution control. The shift to a market approach appears to have smoked out and eliminated some (but not all) of the special interest distortion that plagued the 1977 Clean Air Act.¹²⁵ In particular, greater clarity about the sources of the acid rain problem has not only helped to facilitate the creation of a market for rights, but also to sharpen the political focus on those causing the harm, thereby making it more difficult for a special interest-dominated outcome to emerge from the political debate over how to respond to acid rain. Thus, the information that became available has served to illuminate the policy problem, and the transparency that resulted has been an important factor in reducing the previously existing public choice failure.

Modern information technologies made this policy advance possible, improving the efficacy and efficiency of the regulatory system. In particular, "real time" monitors (operating 365 days per year, 24 hours a day) are now in the smokestacks of major power plants, allowing regulators to track quite precisely the emissions that represent precursors to acid rain.¹²⁶ In effect, the data that the sensors provide ensure that there is an adequate base of information to clarify who has property rights in the acid rain marketplace, and to facilitate trading of these rights.

¹²⁴ See 42 U.S.C. § 7651 (1994); Paul L. Joskow & Richard Schmalensee, *The Political Economy of Market-Based Environmental Policy: The U.S. Acid Rain Program*, 41 J.L. & Econ. 37, 40-43 (1998) (briefly explaining 1990 Clean Air Act); Adam J. Rosenberg, Note, *Emissions Credit Futures Contracts on the Chicago Board of Trade: Regional and Rational Challenges to the Right to Pollute*, 13 Va. Env'tl. L.J. 501, 503-10 (1994) (describing pollution trading plan and its benefits).

¹²⁵ The 1990 Act provides extra SO₂ allowances for the dirtiest midwestern utilities. See 42 U.S.C. § 7651c(e) (1994).

¹²⁶ See Barbara Durr, *Deals Set Up Trade in Pollution Permits*, *Fin. Times*, May 13, 1992, at 4 (describing U.S. tradable permits system); John Medearis, *Skies Finally Clearing for Pollution Control Firm*, *L.A. Times*, Oct. 24, 1989, at 9A (describing firm that manufactures stack monitors).

E. Fisheries

Fish stocks around the world are rapidly becoming depleted. Recent studies estimate that nearly all of the world's fisheries are overfished and at risk of collapse.¹²⁷ Despite widespread media coverage and extensive policy discussions about declining fisheries, international collaboration in response to this resource crisis has been limited.

Fishing represents a classic open access resource management problem; the failure to manage fisheries properly leads directly to a tragedy of the commons.¹²⁸ Each fishing nation, indeed each fishing boat, has an incentive to land as many fish as possible. But when every country and every boat does the same, stocks are depleted, and everyone's capacity to make a living diminishes. While mutual forbearance so as to ensure that fish stocks are maintained at a sustainable level makes eminent sense, the fear that others will not adhere to the "collective action" bargain keeps each fisherman at work hauling in as many fish as quickly as he or she can.

This policy failure can be directly traced to the lack of a functioning marketplace and confusion over who holds the relevant property rights. If every fish were owned, the policy challenge would be greatly diminished. Those holding rights to particular stocks would have an incentive to manage them for long-term yield, or in environmental language, sustainably.¹²⁹ Those taking fish without appropriate permits would not only have violated the environmental rights of others, but would have committed theft, opening themselves up to prosecution and to actions for damages. The difficulty of keeping track of particular fish in the vast ocean makes a pure property rights regime difficult to manage. Nevertheless, there is a growing capacity to track schools of fish (via satellites), to calculate sustainable yields (based on rapidly improving fish knowledge bases and modeling techniques), and to monitor the number of fish landed (tracked by linked computer databases).¹³⁰ These gains in information technologies, when applied

¹²⁷ See United Nations Food & Agric. Org., *The State of World Fisheries and Aquaculture* 39-40 (1996) (analyzing exploitation of fisheries); Ann Platt McGinn, *Promoting Sustainable Fisheries*, in *State of the World 1998: A Worldwatch Institute Report on Progress Toward a Sustainable Society* 59, 60-63 (Linda Starke ed., 1998) (describing crisis in world's fisheries).

¹²⁸ See Hardin, *supra* note 5, at 1245 (presenting overfishing of oceans as example of "tragedy of the commons").

¹²⁹ See World Comm'n on Env't and Dev., *Our Common Future* 265-69 (1987) (noting importance of comprehensive fisheries management system among nations).

¹³⁰ See Gareth Porter, *Fisheries Subsidies, Overfishing and Trade* 27 (United Nations Environment Programme, Environment and Trade Series Paper #16, UNEP/98/8, 1998) (describing technological changes making it easier to track fish).

in the fisheries context, could advance a market-based response to the issue of fisheries depletion. Advanced information technologies make possible not only the clarification, at least to some degree, of who owns what property rights, but also facilitate the exchange of these rights among fishermen.

Fisheries represent a classic case where an improved environmental outcome can be achieved by delineating rights. Such a regime, however, still requires a degree of government support. In particular, recognized authorities must calculate the level of fish that can be taken, allocate the permits, enforce the limits established, and reinforce the market that is created to trade the permits. This means that governments must provide legal structures to ensure that those with property rights are able to vindicate them, and that those who wish to exchange rights can do so with confidence and at reasonable transaction costs. A fully functioning tradable permits system in fish would require international collaboration, both in the delineation and in the enforcement of property rights. The multijurisdictional collective action problem that would arise might be insurmountable. But the fisheries case is made easier by real reciprocity. The degree of interdependence among fishermen, even across national boundaries, is palpable.

Both Iceland and New Zealand have adopted systems of individual transferable quotas for selected species.¹³¹ In Quebec, lobster stocks have revived after the introduction of a new permit system limiting the number of licenses.¹³²

As in other cases, the fisheries depletion challenge cannot be completely resolved by well-informed environmental governance. Divergent values cannot be escaped. Poor countries with many mouths to feed may argue for taking more fish now, no matter that high yields now put longer-term sustainability at risk.

¹³¹ See *id.* at 29 (noting that New Zealand, Australia, Canada, and Iceland have introduced individual tradable quotas into some of their fisheries); Ian N. Clark et al., *The Development and Implementation of New Zealand's ITQ Management System*, in *Rights Based Fishing* 117, 130-40 (Philip A. Neher et al. eds., 1989) (describing New Zealand's transferable quota system); Mark Trumbull, *Fisheries Crisis Stretches Across the Globe*, *Christian Sci. Monitor*, July 6, 1994, at 8 (noting adoption of individual transferable quota system for fishermen in Iceland and New Zealand).

¹³² See David Johnston, *Fishing for a Fortune*, *Gazette (Montreal)*, Aug. 8, 1992, at B3 (describing increase in lobster stocks after government stopped issuing new commercial fishing permits, so that permits were only bought and sold privately).

F. Climate Change

Climate change represents the ultimate degree of complexity and difficulty in environmental protection.¹³³ The harms—a buildup of greenhouse gases in the atmosphere potentially causing global warming, increased intensity of windstorms and other extreme weather events, changes in rainfall patterns, and sea level rise—can be traced to the activities of virtually every industrial facility, vehicle, and individual on the planet.¹³⁴ This makes the information challenge in sorting out who is responsible for the problem quite considerable indeed. The additional fact that almost every person on the planet as well as every ecological resource is susceptible to harm to one degree or another adds to the policy challenge. Uncertainty over the exact mechanism by which various types of emissions might lead to climate change and an incomplete understanding of various countervailing forces (such as clouds and ocean currents) that might mitigate a buildup of greenhouse gases add to the causal complexity in this policy area. In addition, a significant part of the harm appears likely to emerge only at a relatively distant point in the future, multiplying the opportunities for information-based policy failure.

Since it is difficult to determine the causes of the climate change problem, who (and what) suffers harms, and the size of the losses to the various actors, full reliance on a market-based exchange of property rights in the climate change domain seems unlikely to be a sufficient answer to this policy conundrum.¹³⁵ In addition, because greenhouse gas emissions blanket the earth and their impact may persist in the atmosphere for centuries, there exists a significant issue of omitted voices and intergenerational equity.¹³⁶

¹³³ Former Undersecretary for Global Affairs Timothy Wirth referred to climate change policy efforts as “the most difficult negotiation anyone has tried to do on a brand new topic.” Michael A. Lev, *Forecast for Global-Warming Pact is Cloudy, Maybe Stormy*, Chi. Trib., Nov. 10, 1997, at 6; see also Daniel Bodansky, *The United Nations Framework Convention on Climate Change: A Commentary*, 18 *Yale J. Int’l L.* 451, 455-57, 475-78 (1993) (giving overview of complex issues surrounding regulatory response to climate change); John W. Firor & Paul R. Portney, *The Global Climate*, in *Current Issues in Natural Resource Policy* 179, 199-207 (Paul R. Portney ed., 1982) (detailing complexities of climate change issue).

¹³⁴ See Intergovernmental Panel on Climate Change, *Climate Change 1995: The Science of Climate Change* 59-60 (J.T. Houghton et al. eds., 1996) (reviewing range of sources of greenhouse gas emissions).

¹³⁵ See, e.g., Jonathan Baert Wiener, *Global Environmental Regulation: Instrument Choice in Legal Context*, 108 *Yale L.J.* 677, 798-800 (1999) (arguing that regulatory structures must be carefully tailored to fit the surrounding legal structures); Raymond J. Kopp et al., *Climate Change Policy After Kyoto*, *Resources*, Winter 1998, at 4, 4-6 (describing prospect for success of Kyoto Protocol).

¹³⁶ See, e.g., James C. Wood, *Intergenerational Equity and Climate Change*, 8 *Geo. Int’l Envtl. L. Rev.* 293, 327 (1996) (discussing intergenerational fairness in climate change).

The broad (global) geographic spread of greenhouse gas emissions also creates a massive degree of structural failure since regulatory authority lies at the national scale.¹³⁷ From the perspective of any single government, the benefits to be obtained by controlling emissions within the jurisdiction look relatively small (the harm spreads across the globe and over time), while the costs of controlling those sources are very large (and fully borne within the jurisdiction). Thus, from the point of view of a welfare-maximizing government, the rational response to climate change appears to be to do nothing. The only way to change the lose-lose Nash equilibrium¹³⁸ in this prisoners' dilemma and to achieve constructive collective action is by making clear that there is reciprocity.¹³⁹ But while every nation faces a parallel problem of emissions flowing across its borders from others, all countries are not affected equally, nor do all governments place comparable value on addressing climate change.¹⁴⁰

Within countries, moreover, differential impacts may also be acute. Some very large and powerful industries (e.g., energy companies and car makers) might be significant losers if the world were to commit to a dramatic reduction in greenhouse gas emissions, especially if the mechanism adopted to achieve this reduction were a major cutback in the burning of fossil fuels. Those who perceive themselves as probable "losers" from action on climate change have thus been motivated to fight in the political arena against more aggressive policies.¹⁴¹ In dealing with climate change, public choice failures seem likely to compound the problems that arise from the number of scien-

¹³⁷ See Cooper, *supra* note 48, at 41-49 (describing problem of global warming and role played by decisionmakers at national levels).

¹³⁸ The "Nash equilibrium" arises when the dominant strategy of each player in a two person prisoners' dilemma game results in both parties ending up worse off than they need to be. See generally John F. Nash, Jr., *The Bargaining Problem*, 18 *Econometrica* 155 (1950).

¹³⁹ For discussion of the need for reciprocity to overcome the prisoners' dilemma, see Clare Langley-Hawthorne, *An International Market for Transferable Gas Emission Permits to Promote Climate Change*, 9 *Fordham Envtl. L.J.* 261, 297-98 (1998).

¹⁴⁰ The countries of the South often have other more pressing priorities, and they object to bearing the costs of what they perceive to be a problem created by the nations of the North. See Daniel C. Esty & Robert Mendelsohn, *Moving from National to International Environmental Policy*, 31 *Pol'y Sci.* 225, 229-31 (1998) (highlighting complexity introduced into international environmental policymaking by diverging values of different nations); Tariq Osman Hyder, *Climate Negotiations: The North/South Perspective*, in *Confronting Climate Change: Risks, Implications and Responses* 323, 325-26 (Irving M. Mintzer ed., 1992) (describing impact that economic factors have on developing world's perspective on climate change).

¹⁴¹ See Ross Gelbspan, *The Heat Is On: The High Stakes Battle over Earth's Threatened Climate* 33-49 (1997) (documenting propaganda campaign waged by American coal and oil companies against more aggressive climate change policies).

tific uncertainties, a lack of a functioning marketplace, disagreement over who holds property rights, and the significant obstacles posed by the structure of the problem (concentrated costs and highly diffuse benefits) and the lack of an adequate informational base on which to construct a successful regulatory policy.

The climate change challenge also reflects a very significant degree of values divergence. In some highly industrialized countries (Scandinavia and other parts of northern Europe, for example) concern about global warming, increased severity of storms, sea level rise, and changes in rainfall patterns are taken very seriously, and there appears to be some political will to implement policies that would reduce the risk of the harm.¹⁴² In other industrialized countries, such as the United States, there does not yet appear to be a consensus on the severity of the problem or on a serious policy response.¹⁴³ In the developing world, most countries currently seem unwilling or unable to address the problem.¹⁴⁴ For some nations, their disinterest reflects a belief that the buildup of greenhouse gases represents a problem caused by the industrialized countries and that efforts to address the problem should lie with the developed world. For others, the lack of interest in taking action arises from a judgment about the relative importance of this environmental problem compared to other more pressing issues such as the need to provide fresh drinking water to burgeoning populations and to find ways to dispose of sewage and toxic waste.¹⁴⁵ In many of the mega-cities of the developing world, acute harms from air pollution seem much more threatening to public health than the long-term risks posed by climate change.

The fact that countries vary in their stages of development and therefore see different priorities within the environmental domain and across other policy issues adds to the difficulty of achieving an optimal

¹⁴² See Richard C. Hottelet, *The Great Global Dilemma*, *Christian Sci. Monitor*, July 2, 1997, at 19 (noting that several northern European nations voluntarily adopted stringent controls on greenhouse gas emissions); Frank McDonald, *Ireland Faces Tough Test After Greenhouse Gas Deal*, *Irish Times*, July 6, 1998, at 4 (describing several European nations' adoption of stricter emissions standards than provided for in Kyoto Agreement).

¹⁴³ See Brad Knickerbocker, *Global Warming Confusion*, *Christian Sci. Monitor*, Sept. 24, 1997, at 1 (describing public confusion in climate change debate); Victor Volland, *Scientists Oppose Quick-Fix for Global Warming*, *St. Louis Post-Dispatch*, Mar. 24, 1999, at B3 (reporting that conference of climate change experts was uncertain about policy responses to global warming).

¹⁴⁴ See Paul G. Harris, *Common but Differentiated Responsibility: The Kyoto Protocol and the United States*, 7 *N.Y.U. Envtl. L.J.* 27, 30-35 (1999) (tracking positions of developing countries through history of international global climate change negotiations).

¹⁴⁵ See Joyeeta Gupta, *The Climate Change Convention and Developing Countries: From Conflict to Consensus?* 52-57 (1997) (explaining why climate change is not priority in developing countries' domestic policies).

policy response. But as with other issues analyzed above, while the divergence in values cannot be gainsaid, the potential for effective policy would be greatly enhanced if the more tractable information shortcomings, structural failures, and public choice distortions were addressed.

III

MARKET AND REGULATORY FAILURES IN PERSPECTIVE

In this Part, I trace the market and regulatory failures identified in the examples above to the theoretical taxonomy developed in Part I. I argue that strengthened markets in environmental rights could reduce, but not eliminate, the burden on our regulatory system. I further connect the existing weaknesses in park management, toxic waste cleanup, water pollution control, acid rain abatement, fisheries management, and climate change policy to: (1) informational and administrative shortcomings, (2) jurisdictional mismatches resulting in structural governance failures, and (3) public choice distortions. I also weigh the relative importance of these various regulatory failures.

Data gaps and informational inadequacies appear to be the largest source of regulatory failure and an area of immense potential for improvement. Jurisdictional mismatches between the scope of public goods and the reach of the governmental authorities are the source of some further regulatory problems. These structural failures can often be rectified relatively easily. Public choice failures are quite significant and relatively difficult to fix but can also be diminished through appropriate policy interventions.

A. Potential for Greater Reliance on Markets

It is axiomatic that where a functioning market in environmental rights exists, regulatory intervention will not be necessary.¹⁴⁶ Given the capacity to avoid all of the potential "downstream" failures—misidentification of problems, misunderstanding of causal linkages, poor or sparse data, inadequate fate and transport analysis, weak epidemiological or ecological studies, mistaken risk assessments, faulty policy design, sloppy cost-benefit calculations, substandard implementation,

¹⁴⁶ More accurately, intervention to achieve efficiency goals will not be needed. But this is not to say that government will not be necessary. There would remain an important role for government to play in providing a structure of law to support the exchange of property rights and to ensure their vindication where one party has encroached on the environmental rights of another. Equity issues, moreover, may still justify government action. See, e.g., Calabresi, *supra* note 29, at 1215 (arguing that distributional issues cannot be avoided).

and lax enforcement¹⁴⁷—that occur once regulatory intervention is deemed necessary, the returns from the creation of functioning markets in environmental property rights will be high.

As the examples in Part II make clear—from the policy tangle of Superfund, to the near-total failure of our nonpoint source water pollution control efforts, to the maddening complexity of climate change—numerous obstacles hinder prospects for more expansive market-based environmental protection. The lack of adequate information needed to make the trading of environmental property rights work stands out in particular. Perfect competition, economists tell us, requires perfect information. Of course, perfect information is never available, especially in the environmental realm which is so fraught with uncertainty. But establishing an adequate base of information to support some semblance of a market appears achievable in many instances. Investments in better information on the sources, sizes, effects, and “prices” of environmental harms could dramatically expand the number of situations where a property rights-based approach to pollution control and resource management would be viable, and would also make possible the broader application of market-oriented regulatory tools.

Emphasizing better functioning environmental property rights markets has many virtues.¹⁴⁸ Notably, the information gathering and processing burden, which currently falls on the government, can be shifted, at least in part, to private parties.¹⁴⁹ As the acid rain problems of the 1990 Clean Air Act demonstrate, creating markets in environmental rights gives those who wish to buy or sell rights an incentive to create the information needed to make the market work. If factories were required to acquire the right to pollute from their victims, they would have a very real incentive to analyze rigorously the harms they

¹⁴⁷ See Esty, *supra* note 1, at 586-87 & n.48 (reviewing litany of potential regulatory failures).

¹⁴⁸ See Carol M. Rose, *The Several Futures of Property: Of Cyberspace and Folk Tales, Emissions Trades and Ecosystems*, 83 Minn. L. Rev. 129, 130-32 (1998) (reviewing benefits of clear property rights).

¹⁴⁹ Proposition 65, California's toxic chemicals notification law, effected a similar “burden shift” to the polluters with significant success. See David Roe, *An Incentive-Conscious Approach to Toxic Chemical Controls*, 3 Econ. Dev. Q., 179, 179-82 (1989) (describing legal strategy of California's Proposition 65 to use marketplace incentives to achieve health goals). The value of imposing liability on the party with the best access to risk information has long been understood. See, e.g., Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*, 85 Harv. L. Rev. 1089, 1096-97 (1972) (arguing that efficiency requires that costs be put on party best able to make cost-benefit calculation); Steven Shavell, *Liability for Harm Versus Regulation of Safety*, 13 J. Legal Stud. 357, 359 (1984) (arguing for liability rules rather than regulation where private parties are in better position to assess risks than government).

were causing so as to avoid sky-high damage claims. Not only would emitters have reasons to measure, analyze, and evaluate their impacts on others, they would face a constant incentive to look for ways to reduce their emissions and thus their exposure to claims for compensation. Victims would also have an incentive to study the injuries they were suffering so as to be able to calculate how much to demand in compensation or in exchange for their rights.

Because the market tends to decentralize the information gathering and valuation process, allowing for more finely tuned data collection and analysis, individuals would almost certainly be compensated on a basis that more closely reflects their individual losses. Nonbureaucratic information gathering might also prove to be cheaper and more efficient.¹⁵⁰ Just as businesses now exist to provide consumers with advice on where to get the best deal on life insurance or the lowest mortgage rates, one can also imagine that services would emerge to help individuals to understand their potential claims. By disseminating technical information, such as ecological and epidemiological studies, these services might help to alleviate any diseconomies of scale that would arise from decentralized data analysis.

Information is, in any case, becoming ever cheaper to gather, sift, analyze, and use.¹⁵¹ The information gaps and failures that plague us now will systematically (if slowly) recede over time.¹⁵² In effect, as

¹⁵⁰ See E. Donald Elliott & Gail Charnley, *Toward Bigger Bubbles: Why Interpollutant and Interrisk Trading Are Good Ideas and How We Get There from Here*, *F. for Applied Res. & Pub. Pol'y*, Winter 1998, at 48 ("It is much more efficient for the government to set up a market and police its operation than to plan and administer each individual exchange.").

¹⁵¹ See Bill Gates et al., *The Road Ahead* 112-19 (1995) (describing recent and future advances in information technology).

¹⁵² It is also worth noting that improved information technologies will generally reduce the misuse of resources and the levels of waste and pollution. In effect, information and advanced technologies substitute for scarce resources. For example, Monsanto's bioengineered crops require less water and reduced pesticide applications thereby protecting river water quantity and quality. See Robert Streyer, *Cotton Firms Eyeing China*, *St. Louis Post-Dispatch*, June 2, 1996, at 1E (describing potential for Monsanto's bioengineered seeds to increase yields in China). Similarly, Honeywell's computer-controlled thermostats make possible more refined heating and cooling of homes (tracking when people are not at home or sleeping), thereby reducing fossil fuel consumption and the resulting pollution. See William R. Greer, *The Electronic Home: A New Thermostat You Set and Forget*, *N.Y. Times*, Sept. 4, 1986, at C2 (describing new technology that automatically adjusts itself thereby saving energy). Computer-guided saws are allowing lumber mills to get more board feet out of every tree that is cut, extending the reach of forest resources. See Sue Doerfler, *Erecting Walls: Preformed Panels Save Time*, *Waste in Building*, *Ariz. Republic*, July 11, 1998, at AH1 (describing efficiency of computer-operated saws). Likewise, the capacity to put onboard sensors in every automobile engine that will trigger an alarm when the engine is out of tune and emissions exceed a certain tolerance (Mercedes has already developed such a capacity with the added feature of having the sensor signal to the Mercedes dealer that a problem has arisen) allows us to substitute

the cost of information falls, so do transaction costs, bringing us closer to the day when a Coasian world of informed, low-cost exchanges of rights becomes possible.¹⁵³ As a result, it may well be possible in the not-too-distant future to substitute market controls for regulatory restrictions in response to an expanded number of pollution and resource management issues.¹⁵⁴ Where information failures can be overcome, a shift toward market-based environmental protection thus offers the promise of more efficient and equitable results. The potential gains across a variety of pollution control and resource management challenges look significant, justifying considerable policy focus on improved data, information, and analysis.

B. Regulatory Gains from Better Information

Rapidly advancing computer technologies and information systems, as well as general gains in ecological knowledge, make the possibility of creating better functioning markets an important element of any environmental policy future. Even if we do not advance far enough in closing data gaps to move out of a regulatory mode altogether and into pure market-based environmental controls, better information can reduce policy failures and permit a shift toward more efficient and effective market mechanism-based regulatory tools.

For example, toxic waste sites would pose a less vexing policy problem if the threatened harms from leaching chemicals were more easily tracked and better quantified. Water pollution from dirt, oils, pesticides, and fertilizers may all be traceable in the future, making nonpoint source pollution control in rivers and streams much easier. Advances based on improved data and information management seem especially applicable to reversing the depletion of fisheries and the sustainable management of other tangible natural resources.¹⁵⁵ Dividing up a resource and giving the owners responsibility for managing the assets relieves the government of a significant burden. Even the challenge of mitigating climate change would undoubtedly be facilitated by information gains that clarified the size, scale, timing, and origins of the problem. In particular, a much greater capacity to track

more nuanced pollution controls for today's rather crude environmental equipment. See Stan Davis & Christopher Meyer, *Blur: The Speed of Change in the Connected Economy* 41-42 (1998) (describing Mercedes's development).

¹⁵³ More realistically, we appear headed for a Calabresian world where the relative superiority of property rules over liability rules will emerge as transaction costs fall. See Calabresi & Melamed, *supra* note 149, at 1108-10 (asserting that liability rules apply when valuation costs are too expensive).

¹⁵⁴ See Rose, *supra* note 148, at 138 (arguing that costs of establishing property regimes are not static but change with technology).

¹⁵⁵ See *supra* Part II.E.

who is emitting what and to estimate how much harm they are causing and to whom would permit a more refined policy response.

From a regulatory reform perspective, improved analytic foundations for policymaking are enormously important. While structural failures and public choice failures are substantial, considerable evidence suggests that the most sweeping and serious flaws in our environmental decision processes arise from data gaps and technical shortcomings.¹⁵⁶

Structural failures and public choice distortions may lead policymakers to set the wrong standard, spend too much or too little money on a particular problem, or allow rents to accrue to special interests. These problems, however, rarely cause policies to be directionally wrong. Information errors do.¹⁵⁷ To the extent that data and technical problems can lead to a focus on the wrong issues or to massive miscalculations as to the size, scope, and magnitude of a harm, they have the capacity to cause much greater distortions to the environmental policy outcome than other failures. Information errors, moreover, have a tendency to cascade through the regulatory system causing errors at each downstream stage of the decision process. The accumulation of miscalculations and other mistakes multiplies over time. The potential gain from investing in improving our information and knowledge base in the environmental policy process is therefore significant.¹⁵⁸

Better information and the capacity to manipulate vast quantities of data into usable knowledge is possible in many areas. Scientific advances have started to give us a much clearer picture of the fate and transport of pollution. Advances in sensors, and thus the capacity to detect and trace emissions, will increasingly make the causal links between sources and harms easier to track.¹⁵⁹ Vastly expanded computer computational capacity and refined modeling and simulation techniques (such as neural net analysis) will sharpen understanding of

¹⁵⁶ See Terry Davies, *Critically Evaluating America's Pollution Control System*, Resources, Winter 1998, at 17 (reviewing shortcomings in U.S. pollution control policy). See generally *Economic Analyses at EPA: Assessing Regulatory Impact* (Richard D. Morgenstern ed., 1997) (providing case studies showing pervasiveness of data gaps).

¹⁵⁷ See Davies & Mazurek, *supra* note 6, at 29-30, 105, 112-21 (chronicling technical regulatory failures in many environmental areas); Landy et al., *supra* note 35, at 313 (discussing EPA technical regulatory failures).

¹⁵⁸ See Farber, *supra* note 13, at 5-6 (reviewing uncertainties that make good environmental policymaking difficult).

¹⁵⁹ See, e.g., Martha Brannigan, CAT Scan May Soon "Map" Air Pollution, *Wall St. J.*, Nov. 10, 1994, at B7 (describing use of CAT scan technology to track pollution); Scientific Sleuths Hope to Track Pollutants to Their Sources, *N.Y. Times*, Feb. 4, 1996, at 18 (describing plan by MIT researchers to track pollutants by unique molecular characteristics).

pollution impacts. These analytic gains have application as part of the response to many environmental problems.

Even where a complete shift to a full-scale property rights-based environmental protection system would not be feasible or advisable, investments in improved data and information will yield dividends. Indeed, better information would also go a long way toward mitigating existing regulatory failures, which would help to facilitate a shift toward more efficient and effective incentive-based policy interventions. This logic argues for putting better data, knowledge, and analytic rigor at the center of the environmental policy agenda. Controversies over park management, Superfund cleanups, water pollution control, acid rain, fisheries, and climate change could all be reduced through better information and more solid analytic foundations for policymaking.

C. Overcoming Structural Failures

Structural failures that arise when the scope of the regulating jurisdiction does not match the scale of an environmental problem have received a great deal of attention in recent environmental policy debates.¹⁶⁰ And some number of regulatory failures can be traced to jurisdictional mismatches. There is no doubt, for example, that part of the problem with the Superfund program derives from trying to answer the question of "how clean is clean?" at the federal rather than the local level. Likewise, progress on acid rain would likely never have been made as long as the issue were left to state level initiative; the overarching federal perspective (and even an international viewpoint) was needed to provoke action.

Some observers have argued that the U.S. environmental policy structure has become systematically overcentralized.¹⁶¹ The call for a sweeping presumption for devolution cannot, however, be justified.¹⁶² In fact, some current policy failures, such as climate change, reflect problems where the scope of the harm exceeds the reach of the existing regulatory jurisdictions. The logic of multi-tier governance appears to have carried the day.¹⁶³

¹⁶⁰ See *supra* note 1 (reviewing recent environmental federalism debate).

¹⁶¹ See Gingrich, *supra* note 4, at 101-08, 193-200 (arguing that government generally and environmental regulation in particular are too centralized); Revesz, *supra* note 1, at 1244-47 (arguing that federal environmental regulation is often unjustified).

¹⁶² See Charles E. David & James P. Lester, *Federalism and Environmental Policy*, in *Environmental Politics and Policy: Theories and Evidence* 57, 57-59 (James P. Lester ed., 1989) (discussing problems with decentralization).

¹⁶³ See Esty, *supra* note 1, at 652 ("[T]he diversity of environmental problems we face demands a range of regulatory response strategies and levels of governmental activity."); Wallace E. Oates, *Thinking About Environmental Federalism*, *Resources*, Winter 1998, at

Moreover, while much ink has been spilled in the debate over environmental federalism, there is little evidence that violations of the "matching principle" and regulation at the wrong scale represent anything other than a small part of the environmental policy problem. As a theoretical matter, where externalities exist, they often can be relatively easily addressed through partial devolution of decisionmaking. In practice, such an allocation (or reallocation) of primary regulatory responsibility has occurred in several areas. Parks, for example, come in various sizes, corresponding to various needs. Few tennis courts are managed at the state or federal level; supervision is, quite properly, lodged at the local level. The failure to take local information seriously in the context of Superfund cleanups has been in part addressed by the EPA's emphasis on "place-based" cleanup standards.¹⁶⁴ The control over drinking water programs has similarly shifted toward state and local officials.¹⁶⁵

It must not be forgotten that many decisions that are best made at the local or state level will benefit from some information, especially technical data, that is more efficiently gathered at a national level.¹⁶⁶ In the Superfund context, for instance, the need for some understanding of how much harm can be anticipated from particular chemicals at various levels of concentration represents a scientific question susceptible to significant economies of scale. The technical dimension of optimal regulation and the need to ground all policy choices on a sound analytic foundation argues for an ongoing federal role.¹⁶⁷ The shape of this support for local and state decisionmaking

14 ("[T]here are important roles for nearly all levels of government in environmental protection."); Revesz, *supra* note 35, at 2346 (acknowledging need for federal as well as state regulation).

¹⁶⁴ See Pamela Hill, *Emerging Policy and Legal Directions at EPA*, 33 *New Eng. L. Rev.* 625, 627-32 (1999) (describing EPA's plans for increased public involvement through "place-based" regulation).

¹⁶⁵ More broadly, structural failures arising from externalities do not appear to be a serious source of environmental policy failure. In the few cases where centralized authorities were recognized to have been dictating policy on local-scale issues to state or local officials, such as EPA's municipal landfill rules under RCRA and the drinking water standards under the Safe Drinking Water Act (SDWA), the errors have been corrected. See Denise Scheberle, *Federalism and Environmental Policy: Trust and the Politics of Implementation* 44-84 (1997) (describing history and implementation of programs for safe drinking water); William E. Cox, *Evolution of the Safe Drinking Water Act: A Search for Effective Quality Assurance Strategies and Workable Concepts of Federalism*, 21 *Wm. & Mary Envtl. L. & Pol'y Rev.* 69, 134-36 (1997) (describing increased flexibility and decisionmaking power accorded to states under 1996 Amendments to SDWA).

¹⁶⁶ See Esty, *supra* note 1, at 614-17 (arguing that much of data necessary for optimal regulation is most effectively gained centrally).

¹⁶⁷ See *id.* at 622-23 (proposing creation of "National Institute for the Environment" to act as centralized data gathering and analysis mechanism).

should, however, be refined. A National Institute for the Environment that can answer these sorts of questions might better facilitate devolved decisionmaking than the current EPA structure of policy control.¹⁶⁸

Interjurisdictional externalities represent a more serious form of structural failure from both a theoretical and empirical perspective. Wherever a pollution harm or resource management problem spills across political boundaries, the risk of a governance failure rises. Suboptimal results will persist if the structure and nature of the particular problem promote free riding, holdouts, or other strategic behavior. Where reciprocity exists between or among jurisdictions and the number of parties involved is relatively low (and thus the transaction costs of working out a collaborative arrangement are not too high), there is a prospect of overcoming the prisoners' dilemma dynamic and developing a mechanism to internalize the externalities and achieve a relatively efficient environmental result. In a number of watersheds, for example, multiple jurisdictions have agreed on pollution reduction programs.¹⁶⁹

For environmental problems that are confined to a single national jurisdiction, structural failure is not a particularly intractable issue. Divergent interests (a lack of reciprocity) or values, bargaining complexities, and a lack of information will make cooperation difficult, but not impossible.

Successful collaboration becomes more remote when multiple nations are involved, due to the differences in culture, traditions, geography, preferences, and values that must be taken into account. Nevertheless, where countries share borders there may be some degree of recognized interdependence that will make possible negotiated outcomes on a reasonably fair and efficient basis.¹⁷⁰ The 1990 U.S.-Canada acid rain treaty¹⁷¹ demonstrates this potential.

As a simple rule, the harder a problem is to see and the broader the spread of the harm across space or time, the more likely it is that

¹⁶⁸ See Committee for the Nat'l Inst. for the Env't, *A Proposal for a National Institute for the Environment: Need, Rationale, and Structure* 27-29 (1993) (explaining need for new environmental agency).

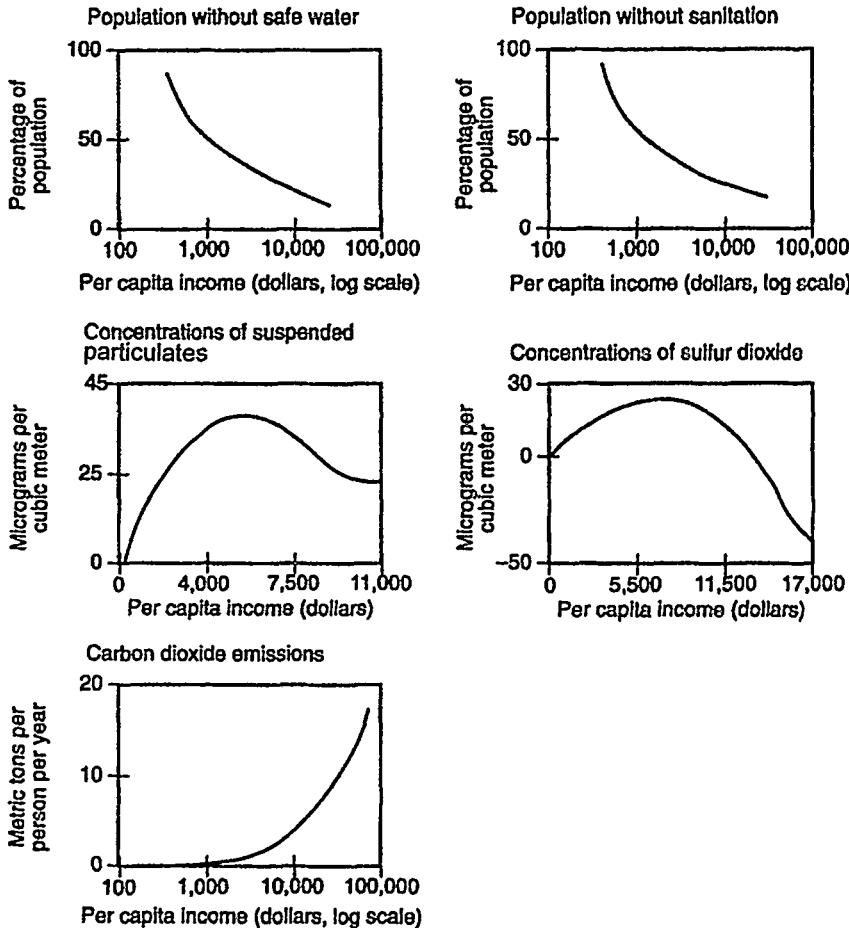
¹⁶⁹ See generally Robert W. Adler, *Integrated Approaches to Water Pollution: Lessons from the Clean Air Act*, 23 *Harv. Envtl. L. Rev.* 203, 204-05 (1999) (describing efforts to coordinate watershed regulation between jurisdictions).

¹⁷⁰ See Dua & Esty, *supra* note 44, at 95-117 (arguing for regional environmental programs); *Institutions for the Earth: Sources of Effective International Environmental Protection* (Peter M. Haas et al. eds., 1993) (giving examples of successful regional collaboration); Elinor Ostrom, *Governing the Commons: The Evolution of Institutions for Collective Action* 210-14 (1990) (discussing ways to overcome collective action problem in international domain).

¹⁷¹ Agreement on Air Quality, Mar. 13, 1991, U.S.-Can., T.I.A.S. No. 11783.

externalities will *not* be internalized and that an appropriate degree of collective action will *not* be achieved.¹⁷² Climate change, with its worldwide scope and multicentury time horizon, represents the outer pole on this scale. The ongoing difficulties in implementing the Kyoto Protocol seem to corroborate this theoretical prediction.

TABLE 2
POLLUTION ABATEMENT CURVES¹⁷³



In some transboundary cases, collaborative agreements can be reached, mitigating the difficulty of a mismatch between the scope of the environmental issue and the jurisdiction of the regulating author-

¹⁷² See Dua & Esty, *supra* note 44, at 72-77 (discussing how transboundary harms lead to structural failures).

¹⁷³ Reprinted from *id.* at 74.

ity, if not eliminating it altogether.¹⁷⁴ Although compliance is not perfect, the Montreal Protocol has slowed the growth rates of ozone-depleting chemicals, providing hope that ozone levels will recover in the next century.¹⁷⁵ In many circumstances, therefore, the question of *who* will regulate appears to be overemphasized. Questions about *how* to approach difficult environmental policy decisions also matter.

D. Public Choice Failures

Scholars broadly recognize the capacity of special interests to shape outcomes through campaign contributions, preferred access to key decisionmakers, and investments in self-serving "scientific" analysis and other technical information aimed at influencing political debates.¹⁷⁶ Asymmetries of interest and activity in the political realm between concentrated and organized polluters and the dispersed and difficult-to-organize general public are inherent in the environmental domain.¹⁷⁷

Public choice failures are present in almost all environmental policy processes. Persistent intra-jurisdictional uninternalized externalities, including nonpoint source water pollution or acid rain (prior to the 1990 Clean Air Act), can often be traced to asymmetries in the political process between concentrated and particularized interests and the diffuse general public interest.¹⁷⁸ Special interests seem particularly adept at winning preferential treatment in situations in which other failures, especially information gaps, make the policy picture

¹⁷⁴ See generally Engaging Countries, *supra* note 37 (discussing international environmental collaboration efforts).

¹⁷⁵ See Duncan Brack, International Trade and the Montreal Protocol 26-37 (1996) (discussing relative success of global agreement to protect ozone layer).

¹⁷⁶ Some policy interventions aim to shift the overall level of societal commitment to environmental protection. In other cases, rent seeking will motivate special interest lobbying and the policy intervention will advance the interests of a particular region, industry, or firm. See Keohane et al., *supra* note 58, at 348-51 (discussing circumstances under which firms prefer regulation); Pashigian, *supra* note 58 (arguing that self-interest explains regional differences in supporting policy to prevent environmental degradation).

¹⁷⁷ See Ackerman, *supra* note 63, at 723-26 (discussing advantages concentrated interests have over diffuse ones); Roger G. Noll, Economic Perspectives on the Politics of Regulation, in 2 Handbook of Industrial Organization 1253, 1265 (Richard Schmalensee & Robert D. Willig eds., 1989) (examining organized political participation and identifying implication that heterogeneous groups with relatively small per capita stakes are disadvantaged relative to small, homogeneous groups with large per capita stakes).

¹⁷⁸ See J. Clarence Davies III, The Politics of Pollution 96-97 (1970) (reviewing influence of special interest groups on U.S. environmental policy); Richard B. Stewart, The Reformation of American Administrative Law, 88 Harv. L. Rev. 1667, 1684-87, 1713-15 (1975) (explaining imbalance between industry orientation and protection of general public interests in agency policies); Peter H. Schuck, The Politics of Regulation, 90 Yale L.J. 702, 703 (1981) (book review) (describing ability of firms to manipulate legislative process to disadvantage of consumers).

murky. The public choice failures stymieing Superfund reform (exacerbated by significant information failures) and complicating climate change policymaking (marked by serious structural and information hurdles) illustrate this phenomenon.

Where governments lack democratic foundations, massive environmental policy failures are more likely to occur. China's severe air pollution, including notable problems with acid rain, can be seen, at least in part, as a function of a political system that gives little weight to the will of the people.¹⁷⁹ The political processes in more democratic nations are sometimes not much better. Louisiana's eagerness to bring chemical plants to the banks of the Mississippi River from Baton Rouge to New Orleans, despite the threats of toxic exposure and the expressed contrary wishes of those who live most immediately adjacent to the facilities in "Cancer Alley,"¹⁸⁰ represents a similar form of public choice failure.

Theoretical analysis and empirical studies suggest that public choice failures are a major reason why environmental policies underperform.¹⁸¹ Almost any government action creates winners and losers, and contending interests will vie to end up on the positive side of the ledger. But the complexity and opacity of many environmental issues and the public's difficulty in perceiving its own interest make the risk of special interest manipulation much more severe in the environmental realm than in other fields of regulation or government activity.¹⁸² Simply put, the average citizen knows if he or she is getting adequate roads or schools and even has a sense of whether the government regulation of banks seems appropriate. In many environmental circumstances, however, no comparable basis for judging the

¹⁷⁹ See William P. Alford & Yuanyuan Shen, *Limits of the Law in Addressing China's Environmental Dilemma*, 16 *Stan. Envtl. L.J.* 125, 145-48 (1997) (arguing that China could more effectively protect environment by increasing role of citizenry in government).

¹⁸⁰ See Beverly H. Wright et al., *Coping with Poisons in Cancer Alley*, in *Unequal Protection: Environmental Justice and Communities of Color* 110, 112-20 (Robert D. Bullard ed., 1994) (describing threat of toxins in "Cancer Alley"). See generally Eileen Gauna, *The Environmental Justice Misfit: Public Participation and the Paradigm Paradox*, 17 *Stan. Envtl. L.J.* 3 (1998) (discussing failure of environmental decisionmaking to take into account those communities that are most at risk from environmental dangers).

¹⁸¹ See, e.g., Ackerman & Hassler, *supra* note 61, at 54-58 (describing congressional mishandling of environmental issues); *Environmental Politics*, *supra* note 59 (presenting seven case studies that show that purpose and effect of environmental policy often serve narrow political and economic objectives rather than environmental objectives); Peter P. Swire, *The Race to Laxity and the Race to Undesirability: Explaining Failures in Competition Among Jurisdictions in Environmental Law*, *Yale L. & Pol'y Rev.* and *Yale J. on Reg.* 67, 100-03 (Symposium Issue 1996) (arguing that influence of interest groups and other public choice failures prevent optimal environmental regulation).

¹⁸² See Esty, *supra* note 1, at 631-32 (noting invisibility, technical intensity, and time lags of many environmental harms).

adequacy of outcomes exists. Does the government standard for residue of the pesticide allidochlor on corn at a level of 0.05 parts per million protect human health? Are particulate levels in the air of 15 micrograms per cubic meter safe? Should radionuclides in drinking water be eliminated? The public has no way to judge. In this non-transparent world, the threats of special interest manipulation and public choice failures are very real and often very large.

IV

OPTIMAL ENVIRONMENTAL GOVERNANCE STRATEGIES

Environmental governance structures and programs should mitigate and minimize both market and regulatory failures and, in so doing, maximize the social welfare gains from governmental intervention in the environmental domain. A number of core strategies can be identified as part of the process of optimizing environmental results: (1) enhancing the market for environmental rights; (2) establishing a multi-tier governance structure that permits regulation to occur at a level that most closely matches the Optimal Environmental Area (OEA);¹⁸³ (3) enriching the intellectual underpinnings for policymaking through greater transparency and a mix of regulatory competition as well as cooperation; and (4) facilitating a balance between public engagement in environmental decisionmaking and delegation of such decisionmaking to experts.

Each of these core strategies addresses one or more of the sources of environmental policy failure identified above. The argument for enhanced markets goes straight to the failures that plague efforts to facilitate the exchange of environmental rights. Identifying the OEA for regulation attempts to mitigate structural failures that arise when the regulator's jurisdiction does not encompass all of the cost bearers or beneficiaries of governmental intervention. A more refined mix of competition and cooperation among environmental policy actors and a more transparent policy process will bolster efforts to address both information shortcomings and public choice failures. A combined strategy of targeted public engagement in and delegation of decisionmaking to designated experts on technical issues will help to overcome the problems that arise from uninformed public decisionmaking. A greater emphasis on transparency and invigorated public oversight of the policy process would also help to reveal special interest manipulation.

¹⁸³ The Optimal Environmental Area (OEA) is the area in which a regulator's jurisdiction encompasses all of the cost bearers and beneficiaries of governmental intervention.

A. Market Enhancement

Market exchanges of environmental rights are constrained in some circumstances by the lack of an appropriate legal regime to clarify the ownership of environmental rights, prevent theft of or infringement on privately held resources, and facilitate the buying and selling of these rights.¹⁸⁴ Efforts to make the market in environmental rights more robust—thereby obviating the need for regulation or, at least, facilitating a shift toward market-based regulatory strategies—offer great promise. Strengthening the market will often entail reinforcing the rule of law and sometimes even creating a functioning legal system.

Within the United States, we take for granted the presence of legal processes and rules. Structures exist at the local, state, and federal levels to provide adjudication of disputes, including ones over property rights.¹⁸⁵ But mechanisms aimed at specific environmental issues and the property rights that underlie them often need to be developed. For instance, it was the Chicago Board of Trade that actually made the 1990 Clean Air Act's emissions allowance trading system work by launching a trading pit in acid rain allowances.¹⁸⁶ In many countries and in the international environmental domain, however, the legal rules and procedures needed to support markets and to protect property rights are not well developed.

Certain issues and problems will be more susceptible to a rights-based response than others. Property rights seem easier to clarify, for instance, when the issue involves management of a tangible resource and when the number of parties involved in the division of the resource is small.¹⁸⁷ Organizing a sign-up system for tennis court time in a municipal park is generally not problematic. The more ethereal the resource in question, the more difficult it will be to set up a property rights regime. Thus, while some success has been achieved in dividing up rights to fish, there has been great difficulty in developing a prop-

¹⁸⁴ See generally Richard A. Epstein, *A Clear View of The Cathedral: The Dominance of Property Rules*, 106 Yale L.J. 2091, 2096-2105 (1997) (explaining advantages of property regime in protecting entitlements). But cf. Louis Kaplow & Steven Shavell, *Property Rules Versus Liability Rules: An Economic Analysis*, 109 Harv. L. Rev. 713, 732-37 (1996) (explaining why liability rules may be superior to property rules).

¹⁸⁵ See, e.g., John J. Cound et al., *Civil Procedure: Cases and Materials* 4-6 (7th ed. 1997) (describing various levels of jurisdiction in U.S. court system).

¹⁸⁶ See Robert Stavins & Bradley Whitehead, *Market-Based Environmental Policies*, in *Thinking Ecologically*, supra note 7, at 105, 107-08 (describing structure of acid rain allowance trading system).

¹⁸⁷ The rule of "small numbers" has long been understood. See R.H. Coase, *The Problem of Social Cost*, 3 J.L. & Econ. 1, 2-8 (1960) (arguing that regardless of whether polluters or pollutees hold property rights, an efficient level of emissions can be negotiated if transaction costs are low).

erty rights response to climate change, which would entail entitlements to the hard-to-see, hard-to-divide-up atmosphere. Likewise, the larger the number of people who are involved, the more difficult property rights allocation and enforcement become. Fisheries agreements within one country or among neighboring countries, therefore, are easier to negotiate and to sustain than rights allocations in the open ocean. Even when a resource cannot easily be segregated into property entitlements, an element of the problem is often susceptible to a property rights enhancement. Rights to the air are not easily demarcated and would be hard to enforce, but rights to emit certain amounts of SO₂ and NO_x can be delimited and controlled.

Hope for better results in response to a range of persistent environmental problems at the local, state, national, and international levels depends on enhancing the functioning of markets and harnessing market forces to environmental goals. For instance, lifting the liability cloud that hangs over the titles of abandoned toxic waste sites by reforming the Superfund program represents the most critical step that could be taken to address the brownfields problem.¹⁸⁸ Similarly, privately funded open space, purchased in the private marketplace and protected through local land trusts, represents the cutting edge of progress in conservation across the United States.¹⁸⁹

Even where a fully functioning market is not likely to evolve anytime soon, improved environmental results can be obtained by enhancing market forces to some degree. Nonpoint source pollution of rivers, for instance, would get more attention if "loadings" allowances¹⁹⁰ were issued for pesticides and fertilizers and if responsibilities for reducing these pollutants were made clear (i.e., if who holds the property rights were spelled out).¹⁹¹ Likewise, while the atmosphere cannot be privatized (nor would we want it to be), greenhouse gas emissions can be made a tradable item. Climate change policy progress would be much more likely if governments established

¹⁸⁸ See *supra* Part II.B.

¹⁸⁹ See John A. McVickar, *Land Trusts: A Growing Conservation Institution*, 21 *Vt. B.J. & L. Dig.* 33 (1995) (describing history and growing importance of land trusts for conservation purposes).

¹⁹⁰ A "loadings" allowance system would allocate a total amount of pollution permitted to be discharged and then allow the parties holding the allowances to buy and sell the right to discharge.

¹⁹¹ For a discussion of nonpoint source trading, see generally Esther Bartfeld, *Point-Nonpoint Source Trading: Looking Beyond Potential Cost Savings*, 23 *Env'tl. L.* 43, 82-89 (1993). The article also discusses two point-nonpoint emissions trading programs on the Dillon River in Colorado and the Tar-Pamlico River Basin in North Carolina. See *id.* at 83-89.

a system of property rights and developed and enforced a market to permit exchange of these rights.

The difficulty of establishing and protecting property rights in the international domain is, of course, more difficult than within a single nation. China currently pours acid rain into Japan and Korea with impunity.¹⁹² Absent a structure to enforce their right not to be acidified, Japan and Korea are reduced to pleading with China for better results or to donating emissions control equipment to Chinese powerplants and other facilities.¹⁹³ Likewise, an international response to fisheries depletion has been hindered by a lack of market structures to facilitate the exchange of fish landing rights. In countries that have used these mechanisms, such as Iceland and New Zealand, there has been progress in restoring fish stocks to sustainable levels.¹⁹⁴ Developing these structures at the international level will require a stronger international environmental regime.¹⁹⁵

Differences in values, a lack of trust, and refusals to acknowledge a softening of national sovereignty also complicate the task of sharing natural resources on an international scale.¹⁹⁶ Rules that are widely accepted domestically break down in their international application. For example, the concept of cost internalization as embodied in the Polluter Pays Principle¹⁹⁷—the central rule of domestic environmental regimes the world over—gets little respect in the international realm.¹⁹⁸ Perhaps the Polluter Pays Principle, which derives from the property rights protections of nuisance law, has never taken root in

¹⁹² See Shigenori Matsuura, *China's Air Pollution and Japan's Response to It*, 7 *Int'l Env'tl. Aff.* 235, 235 (1995) (noting that China is responsible for half of acid rain-causing pollution in Japan).

¹⁹³ See Peter Evans, *Japan's Green Aid*, 21 *China Bus. Rev.* 39, 40-43 (1994) (detailing Japan's pollution control assistance to China).

¹⁹⁴ See *supra* note 131 and accompanying text.

¹⁹⁵ See Daniel C. Esty, *The Case for a Global Environmental Organization*, in *Managing the World Economy: Fifty Years After Bretton Woods* 287, 290-93 (Peter B. Kenen ed., 1994) (spelling out weaknesses in existing international environmental regime).

¹⁹⁶ See Andrew Hurrell & Benedict Kingsbury, *The International Politics of the Environment: An Introduction*, in *The International Politics of the Environment: Actors, Interests and Institutions* 1, 6-8, 22-23 (Andrew Hurrell & Benedict Kingsbury eds., 1992) (discussing obstacles that international system poses to environmental management and highlighting limited ability of agreements to overcome those obstacles).

¹⁹⁷ Developed by the Organization for Economic Cooperation and Development, the Polluter Pays Principle is widely cited as a core element of sound environmental policy. See United Nations Conference on Environment and Development, *Rio Declaration on Environment and Development*, at 5, U.N. Doc. A/CONF. 151/5 (1992) (stating that national authorities should promote internalization of environmental costs, taking into account principle that polluter should bear cost of pollution).

¹⁹⁸ See Daniel Bodansky, *Customary (and Not So Customary) International Environmental Law*, 3 *Ind. J. Global Legal Stud.* 105, 110-11 (1995) (observing that transboundary pollution generally goes unconstrained in international realm). But see *Trail Smelter Case*,

the international domain because there has been no basic international legal structure nor any system of enforcement. In a world without law, behavior tends to degrade toward a Hobbesian principle of "might makes right." Further, countries historically have considered transboundary environmental harms not to be very significant and therefore not worth addressing. Alternatively, countries may have perceived transboundary environmental harms to be roughly reciprocal, making investment in a system of intervention and allocation of responsibilities not worth the cost.¹⁹⁹ Finally, the countries that have had the greatest capacity to shape international environmental norms, notably the United States, have concluded that their own self-interest was best served by weak adherence to the Polluter Pays Principle and an operative legal rule that lets pollution harms be borne by those upon whom they fall.

The lack of international environmental legal structures not only makes the ownership and enforcement of property rights difficult but also limits the opportunities for market-based exchanges of these rights. For example, policy analysts have argued, nearly unanimously, that the problem of climate change would benefit from an emissions trading system, similar to that used within the United States to reduce acid rain.²⁰⁰ But the inadequate international environmental legal structure centered on the dysfunctional United Nations Environment Programme (UNEP) makes setting up such a trading mechanism a difficult task.²⁰¹ Discussions have evolved toward a Clean Development Mechanism, which would, in effect, allow a transfer of rights and obligations between developed and developing countries in return for financial and technical rewards.²⁰² Other climate change analysts envision a broader market for emissions trading.²⁰³ Whatever the form

3 R.I.A.A. 1905, 1933 (1941) (describing international arbitration award resulting in enforcement of Polluter Pays Principle).

¹⁹⁹ See Rose, *supra* note 5, at 9, 16-18 (reviewing circumstances that might make "do-nothing" or nonintervention strategy preferred option).

²⁰⁰ See *supra* Part II.D.

²⁰¹ See Geoffrey Palmer, *New Ways to Make International Environmental Law*, 86 *Am. J. Int'l L.* 259, 263 (1992) (noting that United Nations Environment Programme (UNEP) has provided no effective legal framework for dealing with environmental degradation). See generally Daniel C. Esty, *Greening the GATT: Trade, Environment, and the Future* 77-78 (1994) (reviewing reasons for weakness of international environmental regime); Mark Allan Gray, *The United Nations Environment Programme: An Assessment*, 20 *Env'tl. L.* 291, 297-315 (1990) (evaluating UNEP's limitations and contributions).

²⁰² See Kyoto Protocol to the United Nations Framework Convention on Climate Change, opened for signature Mar. 16, 1998, art. 3(12), 37 *I.L.M.* 22, 32-43.

²⁰³ See Robert W. Hahn & Robert N. Stavins, *Incentive-Based Environmental Regulation: A New Era from an Old Idea?* 18 *Ecology L.Q.* 1, 8-10 (1991) (discussing allocative efficiencies of unregulated trade in permits); Richard B. Stewart & Jonathan B. Wiener, *The Comprehensive Approach to Global Climate Policy: Issues of Design and Practicality*,

greenhouse gas emissions allowance trading takes, investments will have to be made in designing structures to facilitate exchanges and setting up mechanisms to enforce the deals that get done.²⁰⁴

B. Multi-tier Governance and Optimal Environmental Areas

The economic theory underlying the need for a “matching principle” between the scope of the regulatory jurisdiction and the physical footprint of the public good or problem at hand is well established.²⁰⁵ The fact that environmental protection involves problems at various levels makes necessary a multi-tier regulatory structure with appropriate entities at the local, state, federal, and international levels.²⁰⁶ As noted earlier,²⁰⁷ to be structurally sound and to deliver efficient (and fair) results, the regulatory calculus must include all of the potential cost bearers and beneficiaries of governmental intervention (or nonintervention). For each particular issue there exists an OEA that corresponds to the geographic scope of the costs and benefits of the public good or policy at hand.²⁰⁸ Primary regulatory responsibility should be assigned to authorities at the level that most closely corresponds to this OEA.

Allocating responsibility over environmental issues to the appropriate jurisdictional level of government means, primarily, identifying the physical scope of the harm or resource in question and, secondarily, determining if administrative efficiency or economic and psychological spillovers justify governmental action at another scale. The OEA for the governance of a particular problem will vary from a highly localized zone to the entire planet. When the impacts are geo-

9 Ariz. J. Int'l Comp. L. 83, 103-04 (1992) (arguing that, for optimal results, businesses or governments should be allowed to invest in greenhouse gas reduction anywhere in world).

²⁰⁴ See Daniel C. Esty, *Breaking Protocol*, World Link, Nov.-Dec. 1998, at 10, 11 (spelling out international structure and procedures required to make greenhouse gas emissions control system work).

²⁰⁵ See Baumol & Oates, *Theory*, supra note 5, at 158 (arguing that, from purely economic view, standards for pollution that does not travel across jurisdictions should be set locally); Olson, supra note 87, at 480-83 (discussing economic logic for avoiding externalities and internalities).

²⁰⁶ The need to focus on relative institutional competence is well understood. See Henry M. Hart, Jr. & Albert M. Sacks, *The Legal Process: Basic Problems in the Making and Application of Law* 102-07 (William N. Eskridge, Jr. & Philip P. Frickey eds., 1994) (arguing that purpose of institutional procedures is to facilitate and advance community support in development of citizens); see also Esty, supra note 1, at 652-53 (summarizing argument for multi-tier structure of environmental governance).

²⁰⁷ See supra note 88.

²⁰⁸ The concept of an OEA builds on the theoretical work done in a parallel policy area to develop “optimum currency areas.” See Robert Mundell, *A Theory of Optimum Currency Areas*, 51 Am. Econ. Rev. 657, 660-64 (1961) (articulating theoretical bases for identifying optimal currency area).

graphically concentrated, such as the management of a small watershed, regulation should be left to local or state officials.²⁰⁹ Larger-scale problems, such as acid rain, must be addressed by regional or federal authorities to ensure a structurally sound regulatory decision process. Problems of worldwide scope, such as the potential for climate change, must be addressed at the global scale.²¹⁰

One can argue that the lack of a functioning governance structure at the global scale makes a worldwide climate change policy response infeasible. Indeed, there are reasons to expect higher transaction costs at the international scale.²¹¹ Falling back to national-scale intervention, however, invites free riding, holdouts, and inefficient spending of limited resources—and thus structural regulatory failure. At least from a theoretical viewpoint, inherently global problems demand concerted worldwide action.

Defining the OEA is necessary not only to avoid structural failures of the regulatory regime arising from externalities but also to mitigate the welfare losses caused by the internalities that arise when the regulating jurisdiction is too large. To the extent that the environmental decisionmaking is too centralized, resulting in decisions that are suboptimal for a subset of the jurisdiction, the policy response should be to heed the OEA and reassign primary regulatory responsibility. The disconnect between the will of the subset of the population and the larger-scale jurisdiction that is making decisions against this will can be eliminated by identifying a smaller-scale decisionmaking body to take over the environmental policy problem.

The opportunity for partial devolution is especially significant in the environmental realm. In fact, in many cases, it will make sense to divide regulatory responsibilities, which entail a number of functions, between or among levels of government. Environmental efforts

²⁰⁹ See William Goldfarb, *Watershed Management: Slogan or Solution?*, 21 B.C. Envtl. Aff. L. Rev. 483, 497-504 (1994) (arguing that optimal watershed management must give regulatory authority to proper level of government); William E. Taylor & Mark Gerath, *The Watershed Protection Approach: Is the Promise About to Be Realized?*, Nat. Resources & Env't, Fall 1996, at 16, 17-19 (explaining benefits of watershed-based approach to regulation).

²¹⁰ See Daniel C. Esty, *Stepping Up to the Global Environmental Challenge*, 8 Fordham Envtl. L.J. 103, 104-13 (1996) (explaining necessity of global-scale policymaking); see also Martin J. LaLonde, Note, *The Role of Risk Analysis in the 1992 Framework Convention on Climate Change*, 15 Mich. J. Int'l L. 215, 217-18 (1993) (arguing that global-scale problems such as climate change are unique and demand new and systematic solutions).

²¹¹ See *supra* text accompanying notes 170-71; see also Kenneth J. Arrow, *The Limits of Organization* 39-43 (1974) (discussing transaction costs in communication and dissemination of information); Richard B. Norgaard & Darwin C. Hall, *Environmental Amenity Rights, Transaction Costs, and Technological Change*, 1 J. Envtl. Econ. & Mgmt. 251 (looking at transaction costs in environmental context).

aimed at protecting rivers and surface water supplies, for example, require some measure of highly technical analysis of the various pollutants that might be present and the degree of harm they represent. These scientific and risk assessment activities can be most efficiently undertaken at a centralized level; the information developed then can be shared broadly with state and local jurisdictions.²¹² In applying this scientific knowledge to the circumstances of a particular community, however, it makes more sense to rely on a decentralized policy regime. Partial devolution, in this case, allows local decisionmakers to determine for themselves how to trade off the benefits of a cleaner water supply against other investments in public health that might be available to them, such as providing better prenatal health care.²¹³ Decentralized implementation also helps to ensure that the information that is localized (e.g., where pollutants are coming from) can efficiently be factored into the policymaking process.

As noted in Part III, Superfund represents another policy problem that is amenable to shared responsibility. Federal authorities are better positioned to develop technical information on the harms posed by chemicals efficiently than are local authorities, given the significant scale economies in analysis. But on-the-ground information about a particular site and its likely future use makes local information critical. Partial devolution, resulting in shared governance, is thus necessary for effective results.

C. Competition and Cooperation

Optimal environmental governance requires not only market enhancement and proper jurisdictional allocations but also open and vigorous debate fueled by good data and careful analysis. The requisite information and analytic rigor is best generated by a mix of competition and cooperation—"regulatory co-opetition"—among government entities and between government and nongovernmental organizations (NGOs).²¹⁴ Where lax bureaucratic behavior detracts from environmental progress, competition can create pressures on

²¹² See Steinzor, *supra* note 4, at 168-71 (describing benefits of centralized data gathering and analysis in terms of economies of scale).

²¹³ Local control must be balanced with state regulation to protect both local and regional interests. See, e.g., Michael C. Finnegan, *New York City's Watershed Agreement: A Lesson in Sharing Responsibility*, 14 *Pace Env'tl. L. Rev.* 577, 625-43 (1997) (discussing agreement achieving this balance in New York).

²¹⁴ The benefit of structures that simultaneously promote both cooperation and competition is now understood. See Adam M. Brandenburger & Barry J. Nalebuff, *Co-opetition* (1996) (arguing that competitors will sometimes need to cooperate and showing how this can occur); see also Saul Levmore, *Competition and Cooperation*, 97 *Mich. L. Rev.* 216, 220-25 (1998) (reviewing circumstances where cooperation and competition coincide).

regulating entities to perform their duties more efficiently. Competition can also bring more information into the policy process as contending entities vie for attention and influence over the direction of policies. But cooperation may also be both necessary and welfare enhancing when technical incapacity or other information failures hamper performance.²¹⁵ A degree of competition combined with a measure of cooperation will, furthermore, be helpful in mitigating public choice failures by intensifying the scrutiny of decisionmaking officials and providing points of comparison about what sorts of results can be expected from government.

1. *Competition*

Environmental policymaking stands to benefit from expanded "regulatory competition."²¹⁶ However, traditional Tieboutian models of such competition—horizontally arrayed jurisdictions providing alternative mixes of taxes and services, thereby creating a competitive market in "locational rights"—represent far too limited a mechanism for exerting real competitive pressure. A more focused and effective form of regulatory competition is possible, based on a structure of both vertical and horizontal pressures for effective and efficient delivery of government services in general and environmental policymaking in particular.

a. Vertical Competition. The benefits of checks and balances from a multi-tier structure of governance are well established in the literature of federalism.²¹⁷ Dividing power among local, state, and federal authorities has a hoary tradition.²¹⁸ At least part of the logic for this division of power is that, if decision processes at one level of

²¹⁵ See Jody Freeman, *Collaborative Governance in the Administrative State*, 34 UCLA L. Rev. 1, 33-66 (1997) (reviewing elements of collaborative approaches to problem solving in decisionmaking processes of EPA and OSHA).

²¹⁶ See Alvin K. Klevorick, *The Race to the Bottom in a Federal System: Lessons from the World of Trade Policy*, Yale L. & Pol'y Rev. and Yale J. on Reg. 177, 177 (Symposium Issue 1996) (identifying cases where regulatory competition will enhance social welfare and those where it will not); James E. Krier, *On the Topology of Uniform Environmental Standards in a Federal System—And Why It Matters*, 54 Md. L. Rev. 1226, 1236-37 (1995) (rebutting argument that interregional competition for industry will incur lower pollution regulation); Revesz, *supra* note 1, at 1233-35 (explaining logic for welfare gains from environmental policymaking competition).

²¹⁷ See Akhil Reed Amar, *Of Sovereignty and Federalism*, 96 Yale L.J. 1425, 1492-1519 (1987) (discussing advantages of federalism); Herbert Wechsler, *The Political Safeguards of Federalism: The Role of the States in the Composition and Selection of the National Government*, 54 Colum. L. Rev. 543, 546-47 (1954) (describing benefits of multilayered government).

²¹⁸ See, e.g., 5 *The Writings of James Madison* 22-27 (Gaillard Hunt ed., 1904) (developing logic of federal governance structure).

government are suboptimal or distorted, these shortcomings can be highlighted and perhaps even corrected by a parallel decisionmaking process operating at a higher or lower level of government. For instance, if state environmental regulators overlook the polluting activities of a particular factory (perhaps because its owners have made significant campaign contributions to the governor), the presence of local officials who demand action or of regulatory oversight from federal authorities can ensure that appropriate environmental protection policies are pursued.²¹⁹ A system of checks and balances thus makes the misuse of political power in favor of selected groups harder to sustain.

Enhanced regulatory competition also helps to address the pervasive uncertainty that plagues environmental policymaking by creating incentives for the generation of data and analysis. Policies constructed on the basis of multiple perspectives permit decisionmakers to triangulate on the "truth." Issues misunderstood at one level may be better analyzed at another. Thus, the quality of decisions about toxic waste sites, where the risk of exposure to certain hazardous chemicals was not fully appreciated locally, improves with federal knowledge about the harms. Where, however, the policy shortcomings derive from lack of federal understanding about the future use of a particular parcel, the infusion of local knowledge will improve outcomes. Under circumstances of vertical competition, the federal authorities have an incentive to bring to bear information that others might not have and local officials are motivated to shape the outcome in ways that reflect their knowledge base.

The benefits of competition between governmental levels support the creation of additional governance structures above the nation-state. The Organization for Economic Cooperation and Development (OECD), the Paris-based intergovernmental think tank comprised of the twenty-nine most industrialized countries in the world, provides a measure of competitive pressure in this regard. Portuguese environment officials report that the only time that they can get their Finance Ministry interested in paying for improved environmental programs is when they can cite OECD guidelines that call for the action.²²⁰ More

²¹⁹ See Transcript of William D. Ruckelshaus' Remarks: EPA National Compliance and Enforcement Conference, *Envtl. F.*, Apr. 1984, at 14, 16-17 ("Our primary responsibility is not to get along with the states, it is to ensure compliance. . . . Unless [the states] have a gorilla in the closet they can't do the job. And the gorilla is EPA."). See generally Robert V. Percival, *Environmental Federalism: Historical Roots and Contemporary Models*, 54 *Md. L. Rev.* 1141, 1146-71 (1995) (discussing history of environmental federalism).

²²⁰ See Interview with Jorge Abreu Simones, Chief of Staff, Portuguese Secretary of State for the Environment and Natural Resources, in Lisbon, Portugal (Feb. 25, 1993).

broadly, the OECD's periodic reviews of its member countries' environmental performance provide benchmarks for national environmental policymakers.²²¹ By holding a nation's regulatory structure up to scrutiny, international organizations can sharpen the national governance process and improve policy results.

A better developed international environmental regime might provide even stronger vertical competitive pressures. It would be useful, for example, to have international officials as well as national officials designing climate change response strategies so that countries such as the United States would have a wider spectrum of policy options to consider.²²² Unfortunately, UNEP's weakness has meant that there is little international oversight and feedback for many countries in the world. One of the strongest arguments in favor of creating a Global Environment Organization (GEO)²²³ derives, therefore, from the opportunity to improve national environmental policymaking through the presence of overarching authorities that can provide critical independent perspectives on national environmental performance.²²⁴

b. Horizontal Competition. The benefits of government-versus-government competition in the environmental realm have been the subject of ongoing academic debate.²²⁵ To the extent that some degree of welfare loss from environmental regulation derives from bureaucratic inefficiencies, horizontal competitive pressure will likely be beneficial. New York officials may perform better knowing that New Jersey is seeking to lure away its industry, in part, through a promise of more streamlined regulation. In some cases, therefore, traditional regulatory competition—horizontally arrayed jurisdictions competing against each other and creating a market in “locational rights” that allows industries (and citizens) to play one regulating authority against another—will yield improved policy outcomes.²²⁶

²²¹ See OECD, *Guiding the Transition to Sustainable Development: A Critical Role for the OECD* (1997) [hereinafter *Critical Role*] (Report of the High-Level Advisory Group on the Environment to the Secretary-General of the Organization for Economic Cooperation and Development).

²²² See LaLonde, *supra* note 210, at 217-18 (describing need for global solutions to climate change).

²²³ See Esty, *supra* note 195, at 289-98 (detailing benefits of proposed Global Environment Organization (GEO) in combating externalities, promoting shared learning, and reducing “political drag” of current system).

²²⁴ See Dua & Esty, *supra* note 44, at 99-107 (explaining value of international environmental programs as mechanism for bolstering national policymaking).

²²⁵ See *supra* note 1.

²²⁶ See William W. Bratton & Joseph A. McCahery, *The New Economics of Jurisdictional Competition: Devolutionary Federalism in a Second-Best World*, 86 *Geo. L.J.* 201,

In the environmental domain, however, the likelihood of obtaining welfare gains from state-versus-state or country-versus-country competition seems limited. The market for "locational rights" is often rather attenuated.²²⁷ In too many cases, governments simply do not feel competitive pressure from other governments. In other cases, the existence of some degree of transboundary pollution spillovers or of public choice distortions in the regulatory process makes the outcome of the competition welfare reducing rather than welfare enhancing. In fact, competition in the presence of such market imperfections can lead governments to set suboptimal policies, triggering a "race toward the bottom" as competing governments set their policies defensively and strategically rather than picking their own optimal policy mix.²²⁸

Even when government-versus-government regulatory competition does not pose a risk of unleashing the "race toward the bottom" dynamic, it may be that governments are not the best competitors. Rather, regulatory competition between government departments in the same jurisdiction and between governments and NGOs is likely to engender greater pressure for improved efficiency than state-versus-state competition.

In the policy process the most fierce competition is often among competing departments within governments. In the United States, for example, the EPA and the Department of Energy compete vigorously over the design of climate change strategies.²²⁹ These two governmental entities come at the greenhouse gas emissions problem from very different starting points and with quite different bureaucratic strengths. Likewise, at the international level, it is useful to have UNEP and the United Nations Conference on Trade and Development competing with the World Trade Organization (WTO) to de-

260-65 (1997) (discussing benefits and importance of regulatory competition); Paul G. Mahoney, *The Exchange as Regulator*, 83 *Va. L. Rev.* 1453, 1454-55 (1997) (sketching benefits of regulatory competition).

²²⁷ See Esty, *supra* note 1, at 629-34 (explaining why market for locational rights may not function properly).

²²⁸ See Stewart, *supra* note 43, at 1211-12 (explaining incentives for individual jurisdictions to set environmental standards lower than would centralized regulator); see also Esty, *supra* note 1, at 630-34 (noting that government policymakers do not act under conditions of perfect competition); Revesz, *supra* note 1, at 1243 (noting that "[a] state's failure to act in an economically rational manner" may lead to races toward bottom).

²²⁹ See Samuel Pyeatt Menefee, "Half Seas Over": The Impact of Sea Level Rise on International Law and Policy, 9 *UCLA J. Envtl. L. & Pol'y* 175, 184-85 (1991) (discussing differing attitudes and regulatory approaches of EPA and DOE to climate change).

velop strategies for integrating environmental policy considerations into the global trading system.²³⁰

In addition, there exists a substantial opportunity to sharpen government regulatory performance by unleashing NGOs to act as intellectual competitors in the policymaking domain.²³¹ Indeed, in the intellectual marketplace, it is often NGOs who most aggressively offer alternative data or information, competing analyses, and new policy options.²³² NGOs are entrepreneurial and shift resources toward new issues quickly. NGOs also operate in a fiercely competitive marketplace for media and public attention as well as fundraising resources. These pressures create a very strong incentive to come up with creative solutions to environmental problems and to "sell" solutions in the appropriate governmental arena.²³³ The work of the Environmental Defense Fund (EDF) to develop the tradable SO₂ permit system that is now embodied in the 1990 Clean Air Act provides an example of NGO-based policy ideas beating the government competition and winning approval.²³⁴ The current work of EDF on emissions trading structures that might be applicable in the climate change context demonstrates the ongoing vitality of NGO competition as a mechanism for improving environmental governance.²³⁵

2. Cooperation

A serious response to information failures and regulatory incapacity also depends upon a certain degree of both vertical and horizontal cooperation among governmental entities and between governments and NGOs. A significant number of policy failures arise

²³⁰ See generally Esty, *supra* note 201, at 73-86 (advocating focus on GATT to inform creation of Global Environmental Organization to mediate between free trade and environmental interests).

²³¹ See Daniel C. Esty, *Non-Governmental Organizations at the World Trade Organization: Cooperation, Competition, or Exclusion*, 1 J. Int'l Econ. L. 123, 135-37 (1998) (discussing benefits of nongovernmental organizations (NGOs) as competitors).

²³² See *id.* at 136 (explaining why NGOs often "outcompete" governments).

²³³ The recent demise of Greenpeace, which shut all of its U.S. regional offices last year, demonstrates these competitive pressures in action. See generally *id.* at 142 (explaining intellectual market discipline NGOs face).

²³⁴ See Michael H. Levin & Barry S. Elman, *The Case for Environmental Incentives*, *Env'tl. F.*, Jan.-Feb. 1990, at 7, 8 (noting "key role" EDF played in environmental legislation).

²³⁵ See, e.g., Daniel J. Dudek et al., *More Clean Air for the Buck: Lessons from the U.S. Acid Rain Emissions Trading Program* (1997) (presenting compilation of results of U.S. acid rain emissions trading program, put together by EDF staff members); Environmental Defense Fund, *Emissions Budgets: Building an Effective International Greenhouse Gas Control System* (1997) (presenting EDF's recommendations for emissions budget and trading system for greenhouse gasses).

from a lack of solid analytic bases for policymaking.²³⁶ Policy knowledge is in many respects a public good that can be shared at no cost to the provider and which will be underprovided absent collaborative efforts. Some aspects of environmental governance, moreover, show significant economies of scale. It does not make sense, for example, for government authorities at every level of decisionmaking to replicate each other's scientific or analytic work. When the federal government determines the safe level of a pesticide residue, this information can be disseminated both to the fifty states below and to other countries in the international domain. Such information sharing permits a more streamlined regulatory process and reduced expenditures on data collection and analysis.

Within the United States, this need for a more efficient environmental governance structure supports the creation of a National Institute for the Environment.²³⁷ Such a centralized environmental information and analysis organization would be positioned to perform or commission scientific studies and other analytic work and then could provide the underlying data, information, risk analyses, epidemiological and ecological studies, cost-benefit calculations, and policy options to state and local regulators. While in some cases, competing federal and state analyses would be useful, in most circumstances, intergovernmental competition on technical issues is likely to consume resources without yielding commensurate benefits. Social welfare is more likely to be maximized by concentrating research resources in a smaller number of technically competent hands and relying upon information sharing to ensure that all of the jurisdictions that must make regulatory decisions have an adequate foundation for their policymaking processes.

To the extent that some regulatory decisions will be made at the national level, it is important that there be vibrant regulatory authorities at the state and local level to carry out the policies set above. Cooperation in establishing and enforcing standards as well as in evaluating and refining environmental programs will yield considerable

²³⁶ A lack of capacity is especially likely to be a problem in environmental policymaking on international matters. See Abram Chayes & Antonia Handler Chayes, *The New Sovereignty: Compliance with International Regulatory Agreements* 10, 13-15 (1995) (arguing that lack of state capacity is one of three factors that limits treaty compliance). But it is also an issue when authority is delegated to state or local government. See Environmental Protection Agency, *Report of the Task Force to Enhance State Capacity: Strengthening Environmental Management in the United States* 5-6 (1993) (describing need for enhanced regulatory capacity in states).

²³⁷ See Committee for the Nat'l Inst. for the Env't, *supra* note 168, at 30-36 (setting out details of proposed National Institute for the Environment).

benefits.²³⁸ Similarly, to the extent that some environmental decisions are likely to evolve toward global-scale decisionmaking processes, national authorities must be carefully linked with the relevant international bodies to ensure on-the-ground implementation of the policies set at a worldwide scale.²³⁹

NGOs, operating cooperatively with governments, can contribute significantly to optimizing the functioning of policymaking processes at more distant levels of government.²⁴⁰ In fact, one of the central benefits of open decisionmaking procedures within governmental bodies is the opportunity to ensure that NGOs can participate and serve as conduits for the flow of information. Specifically, NGOs provide a mechanism for communicating the viewpoints of distant local publics to centralized decisionmakers. In the recent WTO "shrimp-turtle" case, for example, NGOs helped to make the dispute settlement panel aware of the environmental interest, both as a matter of scientific fact and as a matter of public sentiment, in protecting the endangered sea turtles that were dying in the nets of Thai shrimp fishermen.²⁴¹ Such NGO linkages also permit decisions made at a high level (particularly the international level) to be transmitted and explained to the disaggregated public.²⁴²

One might argue that governments should facilitate the communication required. In many cases, however, NGOs invest more re-

²³⁸ See Stephen M. Johnson, *The Brownfields Action Agenda: A Model for Future Federal/State Cooperation in the Quest for Environmental Justice?*, 37 Santa Clara L. Rev. 85, 114-15 (1996) (praising Brownfields Action Agenda as model for future cooperation); Philip F. Schuster, II & Roger F. Dierking, *Future Prospects for Mining and Public Land Management: The Federal "Retention-Disposal" Policy Enters the Twenty-First Century*, 26 *Env'tl. L.* 489, 561 (1996) (noting benefits of federal-state cooperation in environmental land management).

²³⁹ See Abram Chayes et al., *Managing Compliance: A Comparative Perspective*, in *Engaging Countries*, *supra* note 37, at 39, 49-50 (arguing for cooperative approach to international regulation); Royal C. Gardner, *Taking the Principle of Just Compensation Abroad: Private Property Rights, National Sovereignty, and the Cost of Environmental Protection*, 65 *U. Cin. L. Rev.* 539, 592 (1997) (arguing that successful environmental governance must take cognizance of national sovereignty and work through negotiation and cooperation).

²⁴⁰ See Esty, *supra* note 231, at 129-35 (discussing role of NGOs as "connective tissue" between World Trade Organization (WTO) and citizens around world).

²⁴¹ See, e.g., World Wide Fund for Nature Supplementary Amicus Curiae Brief to WTO Shrimp-Turtle Dispute (1998) (arguing for reversal of WTO's decision in Shrimp-Turtle dispute). See generally Panel on United States-Import Prohibition of Certain Shrimp and Shrimp Products, Report, May 15, 1998 <<http://www.wto.org/wto/ddf/ep/public.html>>.

²⁴² See Thomas Princen & Matthias Finger, *Environmental NGOs in World Politics: Linking the Local and the Global* 34-36 (1994) (describing advantages of NGOs over national governments); Anthony Bebbington & John Farrington, *Governments, NGOs and Agricultural Development: Perspectives on Changing Inter-Organisational Relationships*, 29 *J. Dev. Stud.* 199, 206-08 (1993) (describing capacity of agricultural NGOs for analysis and dissemination).

sources and carry out better dissemination procedures than governments.²⁴³ The diversity of NGOs furthermore permits more carefully tailored connections between people with certain interests and decisionmaking processes in which their concerns will play out.²⁴⁴ An individual who cares, for instance, about the environmental decisions being made at the WTO would find out a great deal more by reading newsletters from the World Wildlife Fund than communiques from the Office of the U.S. Trade Representative.

Horizontal cooperation among jurisdictions is also important for optimal environmental governance. Within the United States, there are many opportunities for states to work together in response to common environmental problems.²⁴⁵ The benefits of "benchmarking" and the value of disseminating "best practices" are well known in the business world.²⁴⁶ Information exchange is equally as central to good environmental management. Indeed, the sharing of information and policy experience is one of the ways that jurisdictions can move quickly and efficiently toward better environmental outcomes.

The same logic applies at the international level. Technical assistance from countries with more sophisticated environmental regulatory structures to those with less sophisticated systems is an important aspect of the effort to improve environmental decisionmaking globally.²⁴⁷ To date, too little money has been invested in systematic

²⁴³ See Ann Marie Clark, *Non-Governmental Organizations and Their Influence on International Society*, 48 J. Int'l Aff. 507, 518-21 (1995) (discussing sharing of information between NGOs); Paul Ghils, *International Civil Society: International Non-Governmental Organizations in the International System*, 44 Int'l Soc. Sci. J. 417, 421-24 (1992) (describing role of NGOs as shapers of opinion).

²⁴⁴ See, e.g., Philippe J. Sands & Albert P. Bedecarré, *Convention on International Trade in Endangered Species: The Role of Public Interest Non-Governmental Organizations in Ensuring the Effective Enforcement of the Ivory Trade Ban*, 17 B.C. Env'tl. Aff. L. Rev. 799, 801 (1990) (discussing administrative role of NGOs in ivory ban); see also World Wildlife Fund, *International Wildlife Trade: A CITES Sourcebook* 6-7 (Ginette Hemley ed., 1994) (reviewing role of NGOs in making Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) work).

²⁴⁵ See, e.g., Brett B. Coffee, *Environmental Marketing After Association of National Advertisers v. Lungren*: Still Searching for an Improved Regulatory Framework, 6 Fordham Env'tl. L.J. 297, 302-03 (1995) (discussing task force recommendations for greater information sharing among state attorneys general on environmental issues).

²⁴⁶ Identifying the approaches that others use ("benchmarking") and using as a goal the "best practices" uncovered is a standard business tool. See W.H. Weiss, *Benchmarking: Key to Being the Best*, Supervision, Mar. 1996, at 14, 14 (explaining term).

²⁴⁷ See Environmental Protection Agency, *Improving Technology Diffusion for Environmental Protection* 5-6 (1992) (setting forth environmental benefits of worldwide diffusion of environmental technologies); David A. Wirth, *Legitimacy, Accountability, and Partnership: A Model for Advocacy on Third World Environmental Issues*, 100 Yale L.J. 2645, 2649-55 (1991) (discussing need for partnership between developed and developing nations).

structures for data and information exchange at the international level. Some work in this area has been done by the OECD, with constructive results.²⁴⁸ But the OECD membership is comprised entirely of the most developed countries in the world, who least need the information exchange that is provided. The current international mechanisms to provide North-South data, technology, and policy transfers are not functioning particularly well.²⁴⁹ Thus, optimal environmental governance, particularly at the international level, requires a greater investment in institutional mechanisms to facilitate information flow and more transparent decisionmaking processes to make information accessible to all of the relevant actors, governmental and nongovernmental, who might contribute to the thinking about how to respond to problems.

D. Public Engagement and Delegation

The combination of a functioning legal system, a multi-tier regulatory structure designed to correspond to various OEAs, and the creation of an appropriate mix of competitive and cooperative pressures across governmental bodies and nongovernmental entities will go a good distance toward addressing the regulatory failures identified in Parts I and II. But none of these strategies will do much to address the limitations of the human capacity for environmental decisionmaking or the tendency of politicians and the public to disregard intertemporal pollution and resource impacts.

An appropriate response to these difficulties is much more difficult to define, in part because the regulatory failures arise from human psychological and intellectual limitations.²⁵⁰ Nevertheless, one can improve environmental decisionmaking processes through better environmental education of both the public and decisionmaking officials, leading to fuller political dialogues.²⁵¹ More effective environ-

²⁴⁸ See Critical Role, *supra* note 221, at 36-39 (describing OECD's efforts toward information exchange).

²⁴⁹ See Anne Gallagher, The "New" Montreal Protocol and the Future of International Law for Protection of the Global Environment, 14 *Hous. J. Int'l L.* 267, 347-48 (1992) (arguing that UNEP's past weaknesses, lack of authority, control, and resources will continue to hinder its future work); Gray, *supra* note 201, at 308-15 (describing UNEP's fundamental weaknesses).

²⁵⁰ For a review of psychological limitations to good decisionmaking, see Symposium, The Legal Implications of Psychology: Human Behavior, Behavioral Economics, and the Law, 51 *Vand. L. Rev.* 1495 (1998).

²⁵¹ See Bruce A. Williams & Albert R. Matheny, Democracy, Dialogue, and Environmental Disputes: The Contested Languages of Social Regulation 52 (1995) (arguing for "equal access to usable information"). See generally Daniel A. Farber & Philip P. Frickey, Law and Public Choice: A Critical Introduction (1991) (developing "neo-Madisonian" theory of democratic governance).

mental leadership from governmental quarters and NGOs might also generate better outcomes.²⁵²

More public involvement in environmental decisionmaking is, however, both difficult to engender and not necessarily constructive.²⁵³ Public participation is often uninformed.²⁵⁴ Some commentators argue that public participation in environmental decisionmaking is needed to improve the legitimacy of the process even if "technical accuracy" is not advanced.²⁵⁵ The problem with this line of argument is that the gain in legitimacy may be small and the loss in accuracy may be large.

As Supreme Court Justice Stephen Breyer argues, the key to environmental policy success is authoritativeness.²⁵⁶ Justice Breyer further notes that the chaos of uninformed public involvement is not democracy,²⁵⁷ and the fact is that the public is not involved.²⁵⁸ Most of the public, most of the time, rationally chooses not to engage in the details of environmental policymaking. We should not, therefore, establish pollution control or resource management decisionmaking systems that rely, counterfactually, on an assumption of deep citizen interest or involvement. Instead, we should push for a system that generates good data and the most complete scientific and technical information possible, within an institutionalized structure of countervailing expert analysis and careful oversight by both political leaders

²⁵² How much delegation of regulatory decisionmaking is optimal has been debated. See, e.g., Theodore J. Lowi, *The End of Liberalism: The Second Republic of the United States* 93-94, 126 (2d ed. 1979) (arguing against delegation to agencies); Peter H. Aranson et al., *A Theory of Legislative Delegation*, 68 *Cornell L. Rev.* 1, 37-67 (1982) (providing public choice arguments against delegation); Mashaw, *supra* note 33, at 120-29 (making case for delegation to expert agencies).

²⁵³ For a good review of the "public versus experts" problem, see Gerrard, *supra* note 105, at 734-38.

²⁵⁴ See, e.g., Jonathan Baert Wiener & John D. Graham, *Resolving Risk Tradeoffs*, in *Risk Versus Risk*, *supra* note 38, at 226, 228-42 (identifying numerous sources of confusion in analyzing risks); see also Breyer, *supra* note 7, at 10-29 (illustrating inefficiencies of public participation in environmental decisionmaking).

²⁵⁵ See Clayton P. Gillette & James E. Krier, *Risk, Courts, and Agencies*, 138 *U. Pa. L. Rev.* 1027, 1104-05 (1990) (describing emergence of viewpoint that those placed at risk should participate in decisionmaking in order to enhance legitimacy).

²⁵⁶ See Breyer, *supra* note 7, at 59-72 (calling for creation of administrative group within executive branch that would build coherent risk-regulating system). See generally Cass R. Sunstein, *Legal Interference with Private Preferences*, 53 *U. Chi. L. Rev.* 1129, 1138-40 (1986) (supporting limited "paternalism" in policymaking).

²⁵⁷ See Breyer, *supra* note 7, at 73-75 (arguing that more effective regulation through executive branch would enhance democracy).

²⁵⁸ Grassroots environmentalists such as Mark Dowie argue that it is a core "right of citizens to participate in environmental decision making." Mark Dowie, *Losing Ground: American Environmentalism at the Close of the Twentieth Century* 135 (1995). But if the vast majority choose not to exercise the right, the system degrades into one based on interest groups.

and the public. In moving toward such an approach to risk management, we do not give up public participation in the environmental policy process. The public role is, however, channeled to engage citizens on terms that match their degree of environmental interest.

Vigorous intellectual competition and information exchange among governmental and nongovernmental experts offers a better basis for legitimacy. Pollution control and resource management decision processes should nevertheless be transparent and all of the assumptions on which the analysis turns should be spelled out and justified. The outcomes generated should be made public, widely disseminated, and subject to both formal oversight by elected officials and to informal review on an ongoing basis by any group or individual who has data and information on the issues at hand.

Such an approach accepts and works with the fact that the public's interest in environmental policy goes to "first order" questions such as: Is the air breathable? Is the water clean enough to drink? The politicians people elect are the ones who must make sure that the correct governance processes exist and the correct environmental agency appointees are in place to translate the public's broad ecological and public health goals into detailed "second order" environmental laws, regulations, guidelines, and other commands. If the politicians fail to meet public expectations in this domain, they should face the public's wrath at the ballot box.

I confess that none of the strategies outlined here may do much to address intergenerational equity issues—a tenacious source of policy failure.²⁵⁹ Getting politicians (and citizens) to pay attention to intertemporal policy impacts may be more a function of spiritual leadership than better secular education or heavier reliance on expert opinion. The prospect of getting environmental decisionmakers to give proper weight to issues of intergenerational equity is a moral and philosophical matter that lies largely outside the realm of environmental policymaking.

V

COUNTERVAILING PROBLEMS AND RESPONSES

In optimizing any one dimension of the system necessary for good environmental decisionmaking, there exists a risk that other dimensions of the optimal environmental governance structure will be

²⁵⁹ For an alternative approach based on an extension of Breyer's call for an elite regulatory corps, see Bradford C. Mank, *Protecting the Environment for Future Generations: A Proposal for a "Republican" Superagency*, 5 N.Y.U. *Envtl. L.J.* 444, 447, 488-514 (1996) (explaining how elite "superagency" might serve to protect interests of future generations).

negatively affected. For example, in moving some regulatory decisions to higher governmental levels to respond to a problem of transboundary externalities and the welfare losses that arise from jurisdictional mismatches and structural governance failures, one suffers a countervailing welfare loss in representativeness as the decision-making process shifts to a more distant level of government. There are, however, a number of strategies available to minimize these knock-on effects and to further refine the opportunity for system-wide optimization of environmental governance.

A. *Unnecessary Investments in Governance*

In some circumstances, notably when resources are abundant, the investment in legal structures to protect property rights and to facilitate their exchange will be unnecessary.²⁶⁰ Simply put, the benefits of managing abundant resources will not justify the costs.²⁶¹ In these cases, it makes sense to hold off on investing in legal systems in general and in environmental governance procedures in particular until the prospect of scarcity suggests that the welfare gains from having a system will justify the costs of creating and operating a structure of rules and procedures. Thus, for example, where fish are plentiful relative to the take by fishermen, it makes no sense to develop an elaborate tradable allowances regime. The costs and burdens of such a structure are only justified in the face of resource depletion.

B. *Suboptimal Environmental Areas*

Every environmental harm and resource has a unique geographic footprint, defined by the reach of the relevant physical, economic, and psychological externalities. This diversity of issues implies an almost infinite number of OEAs and corresponding optimal jurisdictional responses.²⁶² But the administrative costs of maintaining an increasingly large number of regulatory structures will quickly overwhelm any ad-

²⁶⁰ But note that structures may need to be developed before a scarcity threshold is reached. See James Cameron & Juli Abouchar, *The Precautionary Principle: A Fundamental Principle of Law and Policy for the Protection of the Global Environment*, 14 B.C. Int'l & Comp. L. Rev. 1, 21-27 (1991) (defining "precautionary principle" and advocating application of principle to address environmental harms before they become dangerous); Daniel Bodansky, *Scientific Uncertainty and the Precautionary Principle*, Environment, Sept. 1991, at 4, 4-5 (explaining preventative role of "precautionary principle").

²⁶¹ See Rose, *supra* note 5, at 14-19 (spelling out advantages of various environmental strategies, including doing nothing if resource is not scarce).

²⁶² In proposing a theory of optimal currency areas, Robert Mundell had to contend with a very similar problem, since a parallel principle suggests a separate currency for each discrete economic region in every country. See Mundell, *supra* note 208, at 660 (recognizing optimum currency area as region, rather than nation).

vantages that accrue to regulating at the precisely optimal scale. Moreover, too many rules and regulatory structures, attempting to address every conceivable issue, produce chaos rather than effective results.²⁶³

Theoretically, defining the optimal number of regulatory jurisdictions presents a problem similar to the question of the optimal specificity of regulations.²⁶⁴ The solution requires a balancing of welfare gains from precision in the geographic scope of regulation against the need to minimize the administrative costs of multiple layers of regulatory activity. The theoretical attraction of defining an OEA for each environmental problem must therefore be tempered in practice and limited to a fixed number of regulatory jurisdictions. Domestically, most countries have found it useful to have two (local and national) or three (local, state/provincial, and national) levels of environmental policy activity. Internationally, similar benefits would likely emerge from having two (regional and global) and sometimes three (small regional, larger regional, and global) primary tiers of environmental policymaking.

The argument for expanded global environmental governance is analytically powerful in a world where some harms span the planet, and thus only a world-scale response will be structurally adequate. As a practical matter, however, the leap from national to international policymaking is a big one. The level of trust and of shared values creating the spirit of community necessary for democracy to function is often absent in the international arena. In fact, until we have a deeper level of global politics²⁶⁵ that builds a sense of international citizenship, with all of the attendant mutual obligations and rights, the prospect for optimal *international* environmental governance will remain stunted.

A second problem with the OEA theory, even as applied at the national scale, arises from the fact that optimal regulation of any single issue entails a variety of activities some of which are likely to benefit from being more centralized and others of which are likely to be optimized through more decentralized structures. Determining the

²⁶³ See Epstein, *supra* note 76, at 30-32 (arguing against elaborate rules because of their direct and indirect administrative costs). But see Peter H. Schuck, *Legal Complexity: Some Causes, Consequences, and Cures*, 42 *Duke L.J.* 1, 8 (1992) (arguing that complex rules sometimes produce fairer and more refined results).

²⁶⁴ See generally Colin S. Diver, *The Optimal Precision of Administrative Rules*, 93 *Yale L.J.* 65 (1983) (exploring concept of regulatory precision); Isaac Ehrlich & Richard A. Posner, *An Economic Analysis of Legal Rulemaking*, 3 *J. Legal Stud.* 257 (1974) (analyzing optimal specificity of system of rules).

²⁶⁵ See Michael Walzer, *Spheres of Justice: A Defense of Pluralism and Equality* 28-30 (1983) (stressing that shared politics is what creates sense of community).

level of threat to human health from radionuclides in drinking water is best done at higher governmental levels that can afford the expensive scientific and analytic work required. But deciding how much money to invest in removing radionuclides from a particular water system requires numerous tradeoffs based on local financial and ecological conditions and is therefore better undertaken by state or local authorities. Thus, while the OEA concept helps to define the optimal primary regulatory level, the system as a whole will function best if governmental entities at various levels are all available to contribute to the policy process.²⁶⁶

Similarly, a push to devolve environmental decisionmaking to local authorities may be useful as a way of minimizing internalities and improving the affected public's connection to environmental decisions, but it will often create a risk that complex policy determinations will end up being made by officials whose technical capacity is limited.²⁶⁷ Thus, devolution in combination with the creation of effective central environmental technical support systems, is likely to produce better results than devolution alone.

Likewise, when the OEA dictates greater centralization because of the broad scope of an environmental harm, matching large scale governance with the creation of new structures to support information flow back and forth to the now more distant public will produce better results. This might entail increased government investments in keeping citizens informed or expanded roles for NGOs, which often can serve as a systematic link between decisionmakers at a centralized level and the dispersed public.²⁶⁸

C. Competition and Cooperation

Creating the multi-tier structure necessary for optimal vertical and horizontal "regulatory co-opetition" might produce a thick web of entities contending for limited resources and policymaker attention. There is, unfortunately, no simple formula that can be relied upon to determine the optimal level or mix of entities and activities. More-

²⁶⁶ We may fall back to a model of "cooperative federalism," albeit more refined than current approaches. See Percival, *supra* note 219, at 1174-75 (describing cooperative federalism); Joshua D. Sarnoff, *Cooperative Federalism, the Delegation of Federal Power, and the Constitution*, 39 *Ariz. L. Rev.* 205, 212-22 (1997) (describing constitutional basis and current practice of cooperative federalism).

²⁶⁷ As a general matter, more centralized authorities have more resources, both financial and technical, and are thus better able to do more rigorous scientific and economic analyses.

²⁶⁸ See Esty, *supra* note 231, at 131-35 (explaining "linking" potential of NGOs in WTO context); see also Princen & Finger, *supra* note 242, at 38-41 (describing NGOs as link between international organizations and local concerns).

over, it is clear that some participants in the process of checks and balances will not be well positioned to play their roles effectively. Considerable criticism, for instance, has been aimed at the environmental decisionmaking of courts.²⁶⁹ Optimal structures must therefore emerge through a process of trial and error that ultimately advances structures for promoting cooperation alongside a set of procedures that balance the benefits of competition among multiple actors against the need for streamlined decisionmaking.²⁷⁰

Some policy analysts are sure to take issue with the emphasis on NGOs both as a source of competition for governments and as a means of connecting governments and the public. In particular, some commentators believe that NGOs act as special interest advocates and thus tend to distort decisionmaking processes rather than enhance them.²⁷¹ The key to avoiding this downside to an NGO role in the policymaking process lies in the establishment of administrative law, rules, and procedures that channel and regulate NGO participation in governance.²⁷² Disclosure of who is being contacted on what issues and limitations on the benefits that politicians and regulators can accept from special interest entities would help to minimize the risk of special interest manipulation and ensure that NGO involvement in the policymaking process is constructive.²⁷³

²⁶⁹ See Rochelle C. Dreyfuss, *Forums of the Future: The Role of Specialized Courts in Resolving Business Disputes*, 61 *Brook. L. Rev.* 1, 42-43 (1995) (discussing judicial tendency to favor business interests over environmental interests, or "race to the bottom"); Kenneth M. Murchison, *Environmental Law in Australia and the United States: A Comparative Overview*, 22 *B.C. Envtl. Aff. L. Rev.* 503, 543-45 (1995) (discussing U.S. judicial deference towards agencies in environmental realm).

²⁷⁰ See, e.g., Charles W. Powers & Marian R. Chertow, *Industrial Ecology: Overcoming Policy Fragmentation*, in *Thinking Ecologically*, *supra* note 7, at 19, 30-32 (arguing for trial and error regulatory reform).

²⁷¹ See Philip M. Nichols, *Extension of Standing in World Trade Organization Disputes to Nongovernment Parties*, 17 *U. Pa. J. Int'l Econ. L.* 295, 318-19 (1996) (arguing that expanding standing of special interest NGOs can cause inequity); Peter J. Spiro, *New Global Potentates: Nongovernmental Organizations and the "Unregulated" Marketplace*, 18 *Cardozo L. Rev.* 957, 962-69 (1996) (discussing advantages and disadvantages of institutionalizing role of NGOs in decisionmaking, especially at international level); Arvind Subramanian, *Trade Measures for Environment: A Nearly Empty Box?*, 15 *World Econ.* 135, 148-49 (1992) (reviewing risk of capture of trading system by special interests).

²⁷² Significant lobbying, conflict of interest, financial disclosure, and campaign finance limitations exist within some countries to address these risks. See, e.g., ABA, *Election Law Committee Panel Discussion: Revolutionizing Campaign Finance—An Appraisal of Proposed Reforms*, 13 *J.L. & Pol.* 163, 164-65, 189 (1997) (discussing campaign finance limitations). The WTO, in fact, "directs governments to impose various disciplines on NGOs." Steve Charnovitz, *A Critical Guide to the WTO's Report on Trade and Environment*, 14 *Ariz. J. Int'l & Comp. L.* 341, 367 (1997).

²⁷³ See Esty, *supra* note 231, at 146 (explaining why informal ex parte contacts rather than formal NGO communications represent real risk of policy manipulation and how disclosure rules might address issue).

The need for more robust administrative law and lobbying controls is especially acute in the international domain. There exists, for example, an emerging system of international governance centered in the WTO, but the administrative rules and procedures of this body and other international organizations have not kept pace with their evolving responsibilities and the need for more formal administrative law.²⁷⁴

D. Nonenvironmental Tradeoffs

Environmental "success" will sometimes conflict with other social goals. Investing in an optimal environmental governance structure may limit the resources available for other public goods, such as improved health care, crime fighting, or education. Similarly, effective environmental procedures may not take full cognizance of other social values such as justice or equity. If all the fish are owned by the rich, a property rights-based allocation system may be efficient, but it will not be just. Optimal environmental governance must therefore be understood to be both relative and contextual. A theory of optimal governance defines a theoretical goal and a process, but does not offer a definitive answer to every policy question.

CONCLUSION

Improved environmental policy outcomes that produce greater social welfare while respecting property rights can be achieved by various improvements in governmental (and nongovernmental) structures and functions. Emphasis must be placed not only on who governs but also on how decisions are made and implemented. The key to good environmental results is better institutional performance as well as refined structures.

Even before taking up the issue of environmental governance, ensuring that there exists a legal system that delineates and enforces property rights over environmental resources can provide an important foundation for improved pollution control and resource management. In some cases, the creation of a legal structure must begin with a focus on defining property rights. Other cases require setting up mechanisms to ensure that these rights can be vindicated when they have been infringed upon or to promote the efficient purchase and sale of these rights. Advances in information technologies and policy understanding will likely expand the number of environmental issues

²⁷⁴ See John Jackson, *Reflections on Constitutional Changes to the Global Trading System*, 72 Chi.-Kent L. Rev. 511, 517-18 (1996) (analyzing WTO struggles with participation and transparency); Spiro, *supra* note 271, at 966-67 (arguing for "process legitimacy").

amenable to property rights-based fixes. But ongoing limitations to a fully functioning market in environmental rights will mean that in many circumstances the goal must be enhanced capacity to use market-based regulatory tools.

To the extent that property rights-based solutions to environmental problems fail to move us sufficiently down the road toward optimal environmental outcomes, we must pay attention to improving the performance of our governance structure for pollution and resource issues. The diversity of environmental policy problems (which span a variety of geographic scales) and the range of regulatory activities that must be undertaken (which vary widely with respect to the diseconomies or economies of scale they present) argues for a multi-tier environmental governance structure. The jurisdictional question of defining the scope of the primary regulatory authority turns on the need to encompass within the regulatory calculus all of the potential cost bearers and beneficiaries of governmental intervention.²⁷⁵ While every problem is likely to have a unique OEA, the prospect of burgeoning administrative costs suggests that the multi-tier regulatory structure must be limited to a finite number of layers. Two or three levels of regulatory activity within the nation-state and two or three more levels in the international domain seem likely to be advantageous.²⁷⁶ Partial devolution of authority from more centralized government officials to decentralized entities can help to prevent the political tensions and costs that arise when a subset of the population has views that diverge from the larger political jurisdiction of which it is a part.

Optimal environmental governance also requires increased information flows and greater analytic rigor—and thus an appropriate mix of competitive pressures and support for regulatory collaboration. The checks and balances that are likely to be part of an optimal environmental governance structure include both alternative environmental decisionmaking processes at multiple levels of government (vertical checks) and an array of competing institutional actors (horizontal checks), including other governmental bodies and NGOs. This more wide-ranging approach to regulatory competition can help to minimize the administrative inefficiencies of bureaucratic activity and to spur environmental policy creativity without triggering the risk of a welfare-reducing race toward the bottom. A degree of intergovernmental and public and private sector cooperation is also necessary to

²⁷⁵ "All" should be understood to permit the exclusion of parties affected in a *de minimus* way at the fringes.

²⁷⁶ See Schuck, *supra* note 263, at 18 (arguing that in our increasingly interdependent world, "a denser, more intricate legal system may be both inevitable and desirable").

ensure that information gaps and regulatory incapacity do not become a major obstacle to good environmental governance. Thus, the ultimate goal must be a model of "regulatory co-opetition."

The public's disengagement from day-to-day environmental decisionmaking must be acknowledged and accepted. The limited public interest in pollution control and resource management policymaking processes should be channeled into oversight mechanisms that allow for a crosscheck on expert decisions. To the extent that shortcomings in the environmental policymaking process can be traced to human intellectual or psychological limitations, the solutions must be found outside of any theory of environmental governance. Public education, leadership, and spiritual development will prove to be more efficacious in this domain than refinement of regulatory processes.

Ultimately, no universally applicable optimal environmental governance structure can be defined. The right structure and policy mix will evolve over time. As decentralized authorities (e.g., U.S. state-level departments of environmental protection) gain greater regulatory capacity, they can take on a larger share of environmental policy determination and implementation. Likewise, as countries move up the development ladder, opportunities will emerge to build the systems needed for property rights-based approaches to pollution control and resource management, or for more advanced regulatory strategies. More generally, as the potential of the Information Age is realized, the opportunity to shift environmental policy toward more refined and individually tailored approaches looms large.

Better environmental results depend less on fine tuning theories of environmental federalism than on improving regulatory performance. In this respect, both the governance structure and the functioning of the policymaking process matter.