

# NEXT GENERATION ENVIRONMENTAL LAW: A RESPONSE TO RICHARD STEWART

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## I. INTRODUCTION

Richard Stewart's paper, *A New Generation of Environmental Regulation?*, provides a comprehensive and insightful tour of U.S. environmental regulatory history.<sup>1</sup> Professor Stewart also surveys a range of new approaches to environmental law that have been brought forward under the auspices of regulatory reform efforts over the last several decades.<sup>2</sup> He discusses in considerable detail how these "second generation" tools work and the contexts in which particular strategies are likely to be successful.<sup>3</sup> He delves into a number of the reasons why regulatory reform efforts have not succeeded in recent years and closes with a set of interesting views on how to encourage movement toward a more refined environmental regulatory structure.<sup>4</sup>

Much of what Professor Stewart suggests makes eminent sense. I will focus, therefore, on two areas where I think the Stewart analysis can be broadened and deepened, perhaps leading to a more optimistic result than Stewart's conclusion about the prospect for an improved structure of environmental law and better ecological and public health results over time. In particular, I believe that Professor Stewart overlooks the transformative power of the "information" revolution.

## II. POINTS OF AGREEMENT

Professor Stewart makes the case for environmental regulatory reform in a sweeping and convincing fashion. He notes that our current system both over-regulates and under-regulates.<sup>5</sup> Furthermore, it delivers less in

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<sup>1</sup> Richard Stewart, *A New Generation of Environmental Regulation?* 29 *CAP. U. L. REV.* 21 (2001).

<sup>2</sup> *See id.* at 38–94.

<sup>3</sup> *See id.* at 38–94.

<sup>4</sup> *See id.* at 27–38, 151–82.

<sup>5</sup> *See id.* at 28.

the way of results for more money than is necessary.<sup>6</sup> The inefficiency of the existing environmental policy structure has resulted in tremendous burdens on both the regulated community and society in general.<sup>7</sup> Increasingly, this neglect of economic costs and policy choices has become a source of real strain. Stewart argues (and I agree) that the fact that many parts of the system defy any sense of decision-analysis rationality represents a significant threat to the long-term public commitment to environmental protection.<sup>8</sup> Indeed, one of the clear conclusions from the "Next Generation" Environmental Policy Reform Project I organized at Yale Law School was that the public broadly supports environmental protection but wishes to see a good return on the investments made in pollution control and natural resource management.<sup>9</sup> Thus, the durability of environmental programs depends critically on the regulatory regime delivering good value for the money put into it.

Professor Stewart also observes (correctly in my opinion) that what constitutes the optimal environmental governance structure will evolve over time.<sup>10</sup> Circumstances change, and so too must environmental protection strategies. In the early stages of development when regulatory capacity is low, command-and-control regimes may well be optimal insofar as they can be constructed in ways that minimize the administrative burden on the government. As jurisdictions move along the regulatory learning curve, they will often find that more sophisticated and nuanced approaches to environmental challenges will be possible, yielding improvements in both effectiveness and efficiency.<sup>11</sup>

Although Professor Stewart does not stress the point, his wide-ranging discussion of the many environmental policy tools and strategies that have

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<sup>6</sup> See *id.* at 30–31.

<sup>7</sup> See Donald E. Elliot, *Quality Environmental TQM: Anatomy of a Pollution Control Program that Works!*, 92 MICH. L. REV. 1840, 1846–48 (1994) (listing the inefficiencies and social costs inherent to traditional "government standard setting").

<sup>8</sup> See Stewart, *supra* note 1, at 30.

<sup>9</sup> For this finding and other elements of the multi-year Yale study, see THINKING ECOLOGICALLY: THE NEXT GENERATION OF ENVIRONMENTAL POLICY (Marian R. Chertow & Daniel C. Esty eds., 1997) [hereinafter THINKING ECOLOGICALLY].

<sup>10</sup> See also Daniel C. Esty, *Toward Optimal Environmental Governance*, 74 N.Y.U. L. REV. 1495, 1501–02 (1999) (observing that moving toward optimal environmental governance is a dynamic process that may involve passing through several stages over time) [hereinafter Esty, *Environmental Governance*]; Daniel C. Esty & Marian R. Chertow, *Thinking Ecologically: An Introduction*, in THINKING ECOLOGICALLY, *supra* note 9, at 4–5 (discussing the need for a generational perspective on environmental policy and recognizing that the programs which may have been appropriate in the past will often not be the most useful today or in the future).

<sup>11</sup> See Esty, *Environmental Governance*, *supra* note 10, at 1501–02.

been used or considered makes clear that optimal regulatory systems will include multi-pronged strategies relying on different types of regulatory tools.<sup>12</sup> The diversity of ecological and public health challenges that fall under the environmental rubric makes an equally diverse regulatory response an absolute necessity.<sup>13</sup>

“A New Generation of Environmental Regulation?” also walks through both the theory and practice of environmental fees and taxes, trade in pollution “residuals” through systems of defined quotas or allowances, transferable development rights, risk bubbles, and other market mechanisms designed to address environmental problems. Stewart effectively highlights the limitations of the traditional command-and-control approaches, and he provides a series of useful case studies that demonstrate the potential gain from economic incentive approaches.<sup>14</sup>

One of the hallmarks of the environmental domain is its complexity and the high degree of uncertainty that plagues regulators.<sup>15</sup> As our knowledge base expands, there are constant opportunities to refine and improve our regulatory systems. Stewart emphasizes, in this context, the value of “reflexive law.”<sup>16</sup> I share his enthusiasm for environmental regulatory approaches that are iterative and adaptive. In the face of great uncertainty, learning from experience and engaging in a process of “continuous improvement” is essential. In addition, there exists a great potential to use the regulatory regime to engender broader cultural changes in attitudes towards the environment.<sup>17</sup> To the extent that environmental values are inculcated in societal norms, the need to design robust

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<sup>12</sup> See Stewart, *supra* note 1.

<sup>13</sup> See E. Donald Elliott, *Foreword: A New Style of Ecological Thinking in Environmental Law*, 26 WAKE FOREST L. REV. 1, 16–19 (1991) (noting a healthy legal system must be as diverse as a healthy ecosystem).

<sup>14</sup> See Stewart, *supra* note 1, at 34.

<sup>15</sup> See J. CLARENCE DAVIES & JAN MAZUREK, *POLLUTION CONTROL IN THE UNITED STATES: EVALUATING THE SYSTEM* 29–30 (1998) (noting that scientific uncertainty induces the EPA and Congress to use economic, political, administrative, or technological criteria in policymaking); Alyson C. Flournoy, *Legislating Inaction: Asking the Wrong Questions in Protective Environmental Decisionmaking*, 15 HARV. ENVTL. L. REV. 327, 333–38 (1991) (describing the types of and the extent of scientific uncertainties that environmental regulators face).

<sup>16</sup> See Eric W. Orts, *Reflexive Environmental Law*, 89 NW. U. L. REV. 1227, 1252–57 (1995) (outlining a theory of reflexive environmental law that emphasizes learning and improvement throughout the life of regulatory regimes); see also Esty, *Environmental Governance*, *supra* note 10, at 1502.

<sup>17</sup> See E. Donald Elliott, *Law and Biology: The New Synthesis?*, 41 ST. LOUIS U. L.J. 595, 602 (1997) (describing “copying and transmission” of cultural norms through statutory law).

enforcement procedures will be reduced. Individual or business instincts will converge with environmental goals.

### III. THE POLITICAL ECONOMY OF ENVIRONMENTAL REGULATION

Professor Stewart's discussion of next generation environmental regulation begins with a review of a number of efforts to increase the rationality and flexibility of the existing regulatory system. He analyzes in some detail the various efforts that have been launched in recent years to emphasize a combination of cost/benefit analysis and risk/benefit calculations as a foundation for regulatory decisionmaking.<sup>18</sup> He also walks through several less overt but no less important bureaucratic accommodations that have served to soften the hard edges of environmental law—providing what Farber calls “slippage”<sup>19</sup> and what others have simply suggested is “common sense.”<sup>20</sup> Professor Stewart also surveys a number of recent attempts to “contract” around rigidities in the current regulatory system.<sup>21</sup> Describing these initiatives—habitat conservation plans, brownfields redevelopment efforts, the EPA's XL (Excellence and Leadership) Program, supplemental environmental projects in EPA enforcement actions, and wetlands mitigation and banking<sup>22</sup>—as “formalized” slippage, Stewart understates the potential of these regulatory innovations. In fact, I think that a good bit more can be

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<sup>18</sup> See Stewart, *supra* note 1, at 39–54. See also DANIEL A. FARBER, *ECO-PRAGMATISM: MAKING SENSIBLE ENVIRONMENTAL DECISIONS IN AN UNCERTAIN WORLD* 47–60 (1999) [hereinafter *ECO-PRAGMATISM*] (arguing that while cost-benefit analyses are not the ideal means of making environmental policy, they are useful starting points); Daniel A. Farber & Paul A. Hemmersbaugh, *The Shadow of the Future: Discount Rates, Later Generations, and the Environment*, 46 *VAND. L. REV.* 267, 272–77 (1993) (explaining critically the role of cost-benefit analysis in environmental policymaking); Jay Michaelson, *Rethinking Regulatory Reform: Toxics, Politics, and Ethics*, 105 *YALE L.J.* 1891, 1911–25 (1996) (critiquing the EPA's cost-benefit risk assessment in policymaking).

<sup>19</sup> See generally Daniel A. Farber, *Taking Slippage Seriously: Noncompliance and Creative Compliance in Environmental Law*, 23 *HARV. ENVTL. L. REV.* 297 (1999) (discussing the concept of slippage).

<sup>20</sup> To learn about the EPA's “Common Sense Initiative,” see their Web site at <http://www.epa.gov/commonsense>.

<sup>21</sup> For an up-to-date review of the potential gains from and limitations of environmental contracting, see *ENVIRONMENTAL CONTRACTS: COMPARATIVE APPROACHES TO REGULATORY INNOVATIONS IN THE US AND EUROPE* (Kurt Deketelaere & Eric Orts eds., forthcoming 2000).

<sup>22</sup> See Dennis D. Hirsch, *Bill and Al's XL-Ent Adventure: An Analysis of the EPA's Legal Authority to Implement the Clinton Administration's Project XL*, 1998 *U. ILL. L. REV.* 129, 130–46 (1998) (describing Project XL); see generally Walter E. Mugdan, *EPA's Role in Brownfields Redevelopment*, SE55 *ALI-ABA* 75, (Feb. 9, 2000).

done with environmental contracts in the future, as I will discuss below.<sup>23</sup>

What is most interesting about Stewart's analysis of the various efforts to improve the rationality of the current system is his discussion of why these innovations have met with such limited success. Stewart observes that in many cases the initiatives have been launched without solid statutory foundations.<sup>24</sup> The EPA's XL Program, for example, has clearly been stymied by a fear that any flexibility provided by the EPA would, in effect, be "extra-legal," and therefore vulnerable to collateral attack by other parties who might not share EPA's sense of the benefits to be gained through an XL contract.<sup>25</sup> Similarly, Stewart notes, the prospect of judicial review has undermined a number of attempts to promote greater cost/benefit and risk analyses in the regulatory process.<sup>26</sup> For example, the possibility that inadequate cost/benefit calculations by the EPA might be subject to legal challenge by regulated industries has struck fear in the hearts of environmentalists. I think that Stewart has correctly identified the narrow issue of fear (in some cases from the industry side and in other cases from the environmental side) created by new opportunities for judicial review, but he fails to make a perhaps more important, broader point. Notably, the "legalism," or perhaps more pejoratively the legalistic nature of American environmental law, has become a major drag on the process of evolution toward more efficient and effective regulatory structures.<sup>27</sup> In part this litigious tradition is a function of American culture.<sup>28</sup> But the stasis produced by fear of legal attack derives as well

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<sup>23</sup> See also B. John Ovink, *Sustainable Development and the Use of Covenants in Environmental Legislation*, 4 U. MIAMI Y.B. INT'L L. 207, 227-33 (1995) (describing the advantages derived from the Dutch Environmental Management Act, which, in part, gives a statutory basis to environmental covenants between the central government and the private sector); Susan Ridgley, *Environmental Protection Agreements in Japan and the United States*, 5 PAC. RIM L. & POL'Y J. 639, 649-52 (1996) (describing how Japan has used environmental contracts to fill gaps in regulatory authority, to assign collective responsibility, and to manage transboundary pollution).

<sup>24</sup> See Stewart, *supra* note 1, at 61-63.

<sup>25</sup> See Thomas E. Caballero, *Project XL: Making it Legal, Making it Work*, 17 STAN. ENVTL. L.J. 399, 412-38 (1998) (describing Project XL's legal problems and recommending that the EPA propose a statute to give it legal authority to implement Project XL); Hirsch, *supra* note 22, at 146-72 (outlining the problematic implementation of Project XL and suggesting that the agency use "implied waiver authority" to implement it).

<sup>26</sup> See Stewart, *supra* note 1, at 68, 83-84.

<sup>27</sup> See Richard B. Stewart, *Environmental Regulation and International Competitiveness*, 102 YALE L.J. 2039, 2045 (1993) (noting "the U.S. should seek to reduce the excessive costs and burdens imposed by its exceptionally rigid, legalistic system of environmental law and administration").

<sup>28</sup> See generally David M. O'Brien, "The Imperial Judiciary:" *Of Paper Tigers and* (continued)

from the particular history of environmental law, which built on the "civil rights" model of landmark legislation that established new social goals that were in turn enforced by confrontational nongovernmental organizations pressing test cases.<sup>29</sup> This model of social change has had its day, but must be seen now as potentially counterproductive.<sup>30</sup>

Another reason that these regulatory reform efforts have made little progress can be traced to the fact that there has been a great deal more emphasis placed on tabulating costs than on carefully calculating the benefits of regulatory interventions. Although good economists know how to handle non-market values and other uncertainties that arise in the process of doing cost/benefit analyses,<sup>31</sup> many tend to dismiss what cannot be seen or quantified as unworthy of being recognized explicitly. Rather than working to refine cost/benefit and risk/benefit methodologies, however, environmental advocates have broadly taken to condemning these tools altogether.<sup>32</sup> Unfortunately, this leaves the environmental community with little in the way of a rational alternative for policymaking.

Other environmental advocates have taken the opposite tack. Instead of dismissing cost/benefit analyses, they have sought to torque the results.<sup>33</sup> While the regulated community will often exaggerate the costs of a proposed regulatory program,<sup>34</sup> understating industry's capacity for

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*Socio-Legal Indicators*, 2 J.L. & POL. 1, 1-10 (1985).

<sup>29</sup> See Gerald Torres, *Changing the Way Government Views Environmental Justice*, 9 ST. JOHN'S J. LEGAL COMMENT. 543, 545 (1994) ("The argument is that we observe these identifiable communities being disadvantaged by being made to carry a greater environmental burden than other communities. That distribution of burdens offends the constitutional principal of equality or the principal of equality that is found in the applicable civil rights statutes.").

<sup>30</sup> See generally Richard B. Stewart, *Environmental Quality as a National Good in a Federal State*, 1997 U. CHI. LEGAL F. 199 (1997) (arguing that differences in environmental protection across localities are not only legally permissible but desirable insofar as different localities have different endowments).

<sup>31</sup> See Guido Calabresi, *The Pointlessness of Pareto: Carrying Coase Further*, 100 YALE L.J. 1211, 1214 (1991) (explaining that market and non-market approaches interrelate in several significant ways).

<sup>32</sup> See generally Daniel C. Esty, *What's the Risk in Risk?*, 13 YALE J. ON REG. 603 (1996).

<sup>33</sup> For example, see the description of the Natural Resource Defense Council's controversial risk assessment on the use of the pesticide ALAR on apples in Timur Kuran & Cass R. Sunstein, *Availability Cascades and Risk Regulation*, 51 STAN. L. REV. 683, 698-702 (1999).

<sup>34</sup> See Richard D. Morgenstern & Marc K. Landy, *Economic Analysis: Benefits, Costs, Implications*, in *ECONOMIC ANALYSES AT THE EPA: ASSESSING REGULATORY IMPACT* (continued)

innovation and adaptation, some environmentalists have generated sloppy studies that wildly inflate the benefits of regulatory intervention, using dubious methodologies, such as contingent valuation, to make a political point.<sup>35</sup>

In reviewing the limitations of environmental agreements, Stewart notes that legitimate concerns about proposed regulatory reforms have been raised. He suggests that there are important questions that must be answered about who participates in the environmental policy process, what information is brought to bear, how rules are crafted, and what monitoring and compliance mechanisms are put in place.<sup>36</sup> Stewart acknowledges that some of the opposition to the “first generation and a half” regulatory reform strategies has emerged because of the efforts of certain political forces to launch a “blanket override” of the current environmental regime.<sup>37</sup> But he glides too quickly past the fact that a number of regulatory reform initiatives have had hidden *deregulatory* agendas embedded within them. In some cases, the deregulation advocates legitimately seek greater efficiency and economic growth.<sup>38</sup> But in other cases, the deregulation thrust appears to have been engendered by a desire to advance certain special interests within the regulatory context.<sup>39</sup> The Small Business Regulatory Enforcement Fairness Act<sup>40</sup> stands out as one example. Exempting small businesses from environmental requirements may make for good politics, but it does not improve the rationality of regulatory results. To the contrary, this act and others that have advantaged small businesses tend to perpetuate a

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462 (Richard D. Morgenstern ed., 1997) (noting interested parties may use statements about costs out of context to lobby against new regulations).

<sup>35</sup> See Donald J. Boudreaux, Roger E. Meiners & Todd J. Zywicki, *Talk is Cheap: The Existence Value Fallacy*, 29 ENVTL. L. 765, 780–83 (1999) (arguing the non-simultaneous nature of contingent valuation surveys that ask non-experts to consecutively price natural resources—e.g., Yellowstone Park, the Costa Rican rain forests—prompts respondents to overvalue resources, because they cannot consider the values of the individual resources relative to each other).

<sup>36</sup> See Stewart, *supra* note 1, at 38–94.

<sup>37</sup> *Id.* at 47.

<sup>38</sup> See Michael Evan Stern & Margaret M. Mlynczak Stern, *A Critical Overview of the Economic and Environmental Consequences of the Deregulation of the U.S. Electric Power Industry*, 4 ENVTL. LAW. 79, 101–04 (1997) (describing the theoretical justifications for deregulation).

<sup>39</sup> See SUSAN ROSE-ACKERMAN, *Pollution and Federalism*, in CONTROLLING ENVIRONMENTAL POLICY: THE LIMITS OF PUBLIC LAW IN GERMANY AND THE UNITED STATES 137–56 (1995) (arguing that the Reagan era devolution initiatives really represented deregulation in support of business interests).

<sup>40</sup> 5 U.S.C. § 601 (1996).

system that focuses attention only on the “big dirties.”<sup>41</sup> But we know today that a good bit of the residual environmental harm that our nation faces is a function of individually small but cumulatively large emitters, including small business such as bakeries, dry cleaners, and gas stations.<sup>42</sup>

Professor Stewart’s discussion of economic incentive systems again provides an excellent survey of the various market mechanisms that are available to pursue environmental goals. He assesses with great care the strengths and weaknesses of these tools and strategies, providing important insights on the contexts in which particular mechanisms are likely to be most effective.<sup>43</sup>

Stewart’s analysis of the reasons why economic incentive-based systems have penetrated so little into the environmental regulatory regime over the last twenty-five years is also illuminating. He notes that in too many cases, incentive strategies have been ineffective.<sup>44</sup> For example, environmental taxes have often been set at levels too low to change behavior.<sup>45</sup> He recognizes that competitiveness fears have often led jurisdictions to tread lightly in the market mechanism realm for fear of disadvantaging their own industries in increasingly competitive inter-jurisdictional markets. Stewart also observes that any change in policy creates losers and winners and that the losers often have a considerable incentive to resist new regulatory approaches.<sup>46</sup> In the environmental realm, ironically, the potential “losers” in a new system represent a set of rather odd bedfellows: businesses whose current emissions are “permitted” and not fully paid for through cost-internalizing market mechanisms; environmental groups who are invested in campaigns that depend on the current portfolio of problems to attract public support; agency bureaucrats whose skill sets and relative power derives from the current structure of harms and regulatory approaches; and congressional committee members and staffs whose capacity to generate media attention and public interest is

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41 See Esty & Chertow, *supra* note 10, at 2 (commenting that the next generation of environmental regulation must not overlook the thousands of small businesses that collectively produce large amounts of pollution).

42 See *id.*

43 See Stewart, *supra* note 1, at 99–134.

44 See *id.* at 117.

45 See Nathaniel O. Keohane, Richard L. Revesz & Robert N. Stavins, *The Choice of Regulatory Instruments in Environmental Policy*, 22 HARV. ENVTL. L. REV. 313, 367 n.16 (1998) (noting that European Pigouvian taxes have been too low to reduce pollution).

46 See E. Donald Elliott et al., *Toward a Theory of Statutory Evolution: The Federalization of Environmental Law*, 1 J.L. ECON. & ORG. 313 (1985) (highlighting the asymmetries between cost-bearers and beneficiaries of environmental regulation).

a function of their established expertise within the existing system.<sup>47</sup>

Stewart notes that the politics of environmental reform are further complicated by the regressiveness of many cost-internalizing policies. The prospect of shifting from “hidden” environmental costs in a command-and-control system to explicit pollution fees in a market-driven mechanism also runs afoul of the “no-new-taxes” mantra that dominates the thinking of America’s political class. The fear of change and the discounting of the benefits of anything new add to the difficulty of moving beyond the status quo.<sup>48</sup> Stewart also observes that the potential complexity of market approaches to environmental regulation serves as a significant deterrent to change. Moreover, the transition costs that would have to be incurred in establishing a new regulatory regime provide an additional obstacle.

To the Stewart list of “political economy” problems that regulatory reform efforts must overcome, I would add several additional items. First, the political logic of under-regulation is often overwhelming, and may be the reason why the current system, despite its recognized poor performance, persists.<sup>49</sup> Notably, to the extent that the current command-and-control structure does little to address inter-jurisdictional spillovers of pollution harms, the system provides a systemic bias toward under-regulation.<sup>50</sup> In addition, politicians have high discount rates, giving little, if any, weight to costs or benefits that occur after the next election cycle.<sup>51</sup> Thus, they are very happy to have regulatory systems that impose a minimum of burdens today even if this generates costs that must be borne at some point in the future in the form of unaddressed environmental harms.

Second, Stewart underattends to two critical dimensions of the environmental challenge: uncertainty<sup>52</sup> and the inescapable clash of

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<sup>47</sup> See generally Todd J. Zywicki, *Environmental Externalities and Political Externalities: The Political Economy of Environmental Regulation and Reform*, 73 TUL. L. REV. 845 (1999) (arguing that diverse groups including industries, environmental interest groups, politicians, regulators, and lawyers, have incentives to prefer the status quo command-and-control regime to decentralized alternatives).

<sup>48</sup> See Farber & Hemmersbaugh, *supra* note 18, at 277–87 (explaining the concept of discounting and the difficulty of choosing the optimum social discount rate).

<sup>49</sup> See Kirsten H. Engel, *Environmental Standard-Setting: Is There a “Race” and is It “To the Bottom”?*, 48 HASTINGS L.J. 271, 297–305 (1997) (explaining the theoretical bases for under-regulation).

<sup>50</sup> See WILLIAM J. BAUMOL & WALLACE E. OATES, *THE THEORY OF ENVIRONMENTAL POLICY* 14–35 (2d ed. 1988) (defining and discussing uninternalized externalities).

<sup>51</sup> See generally Daniel C. Esty, *Revitalizing Environmental Federalism*, 95 MICH. L. REV. 570 (1996).

<sup>52</sup> See Flournoy, *supra* note 15.

values in the regulatory domain.<sup>53</sup> The high degree of uncertainty in environmental decisionmaking—the sources of harm, the fate and transport of pollutants, ecological and epidemiological effects of particular exposures, the scale of the injuries, and the lack of clarity about options—all contribute to a powerful bias towards inertia. To some extent, environmental problems depend on critical value assumptions that are quintessentially political.<sup>54</sup> How much value to place on a human life or a pretty view cannot be determined in any scientifically authoritative manner. As a result, some of the disputes that have stymied reform efforts really are reflective of underlying debates over environmental values.<sup>55</sup>

Stewart also pays little attention to the structural bias of our political system in favor of the status quo. The political science literature is rich with discussions of the difficulty of bringing about change within the American political system and the concomitant ease with which blocking coalitions can be assembled.<sup>56</sup> The tendency towards inaction is exacerbated by the fact that, as Stewart notes, much of the change has the flavor of movements towards Kaldor-Hicks efficiency but not Pareto optimality.<sup>57</sup> Thus, while the winners gain more than the losers lose, *everyone* is *not* better off as a result of reform.<sup>58</sup> And there has been too little emphasis on finding ways to ensure that the winners compensate the losers and therefore facilitate evolution of the system.<sup>59</sup>

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<sup>53</sup> See Esty, *Environmental Governance*, *supra* note 10, at 1547–79 (noting public choice failures in the environmental regulatory domain); Richard B. Stewart, *The Reformation of American Administrative Law*, 88 HARV. L. REV. 1667, 1684–87, 1713–15 (1975) (noting asymmetries between industry goals and regulatory agencies' protection of public interests).

<sup>54</sup> See Howard Latin, *Good Science, Bad Regulation, and Toxic Risk Assessment*, 5 YALE J. ON REG. 89, 134–47 (1988) (arguing the EPA should augment scientific with social policy judgments); Mark Sageoff, *The Principles of Federal Pollution Control Law*, 71 MINN. L. REV. 19, 24–44 (1986) (describing several moral bases for environmental regulation); Peter H. Schuck & Robert E. Litan, *Regulatory Reform in the Third World: The Case of Peru*, 4 YALE J. ON REG. 51, 77 (noting that reformers often wrongly assume a culture's values mirror their own).

<sup>55</sup> See Esty, *Environmental Governance*, *supra* note 10, at 1518–20.

<sup>56</sup> See, e.g., Douglas W. Rae, *Political Democracy as a Property of Political Institutions*, 65 AM. POL. SCI. REV. 111, 115 (1971) (formally demonstrating how “veto groups” lead to undemocratic results).

<sup>57</sup> See Jules L. Coleman, *The Normative Basis of Economic Analysis: A Critical Review of Richard Posner's The Economics of Justice*, 34 STAN. L. REV. 1105, 1106–12 (1982) (book review) (describing the difficulties in justifying Kaldor-Hicks efficiency).

<sup>58</sup> See Calabresi, *supra* note 31, at 1222–23 (discussing the gap between Kaldor-Hicks and Pareto superiority).

<sup>59</sup> See Carol M. Rose, *Property Rights and Responsibilities*, in THINKING (continued)

There are, however, some examples where the skids of environmental reform have been greased to positive effect. Most notably, the 1990 Clean Air Act acid rain control program not only shifted the regulatory model to a tradable allowance system, but it also provided “bonus allowances” for Ohio, Indiana, and Illinois, where the “losers” from the new system were heavily concentrated.<sup>60</sup> Similarly, Carol Rose suggests that more liberal compensation for regulatory takings might facilitate enhanced environmental standards in ways that environmentalists are hesitant to recognize.<sup>61</sup> Getting the winners to compensate the losers in the environmental domain has proven to be especially complicated because the “losers” are often polluting entities whose moral standing is low in the minds of some elements of society.<sup>62</sup> Environmentalists, for instance, ask; “Why should bad actors be compensated for stopping their socially harmful activities? Isn’t this,” they ask, “like requiring society to compensate smokers who are now forced to huddle outside the doorways of buildings in order to enjoy their vice?”

#### IV. THE UNREALIZED OPPORTUNITY: INFORMATION STRATEGIES

The problems identified above in moving towards more effective and efficient environmental approaches can be addressed by greater emphasis on information and knowledge development within the regulatory system, a realm in which our capacity is rapidly growing. Professor Stewart touches lightly on market-based information strategies, but he then dismisses these approaches as unworkable as a foundation for a new generation of environmental law. He argues that too often information that is both accurate and concise cannot be provided to consumers.<sup>63</sup> He adds that the market evidence suggests that consumers will not pay a premium for environmentally superior products.<sup>64</sup> Similarly, he concludes that most investors pay little attention to environmental performance as a predictor of economic success.<sup>65</sup> Finally, he argues that it would be normatively inappropriate to set environmental goals through

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ECOLOGICALLY, *supra* note 9, at 54–55 (describing the transition costs that new environmental regulations impose).

<sup>60</sup> See Thomas W. Merrill, *Golden Rules for Transboundary Pollution*, 46 DUKE L.J. 931, 981–82 (1997) (noting that the 1990 amendments to the Clean Air Act were the key to bypassing a historical reluctance to increase regulation among Midwestern Congressmen).

<sup>61</sup> See Carol M. Rose, *Property Rights and Responsibilities*, in THINKING ECOLOGICALLY, *supra* note 9, at 53–57.

<sup>62</sup> See *id.*

<sup>63</sup> See Stewart, *supra* note 1, at 95.

<sup>64</sup> See *id.*

<sup>65</sup> See *id.*

the marketplace on the basis of an aggregation of individual market preferences.<sup>66</sup>

I believe that Stewart has misjudged the transformative potential of the "Information Age." I see three fundamental ways in which the expanded capacity for information management and our growing knowledge base will permit us to move towards improved environmental results at ever lower costs.

#### A. *Reducing Direct Regulatory Costs*

There are a number of cases, as Stewart acknowledges, where information-driven regulatory strategies have yielded success.<sup>67</sup> EPA's Toxic Release Inventory (TRI) mandates that certain businesses provide data on their emissions to the land, air, and water.<sup>68</sup> Although there is no substantive requirement that these emissions be reduced, the mere fact that companies have to report their pollution levels to the public—not to mention the considerable media and public attention that the annual release of TRI data generates—has led to a focus by many corporations on finding ways to eliminate toxics from their production processes.<sup>69</sup> Similarly, California's Proposition 65, which mandates labeling of products that present a threat of carcinogenicity or reproductive harm, has resulted in the transformation of a vast number of products that once contained harmful chemicals.<sup>70</sup> Driven by the California requirements, lead has been removed from the solder that seals tuna fish cans. "White-Out" corrective fluid has been reformulated to eliminate a chlorinate solvent, which is a potent carcinogen.<sup>71</sup> The list of actions taken to avoid Prop 65 liability or the posting of a warning label is very long.<sup>72</sup>

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66 See *id.*

67 See *id.* at 139–40.

68 See David J. Abell, *Emergency Planning and Community Right to Know: The Toxics Release Inventory*, 47 SMU L. REV. 581, 582–83 (providing a statutory overview of the TRI).

69 See *id.* at 588–90 (describing the successes of the TRI).

70 See Michael Barsa, *California's Proposition 65 and the Limits of Information Economics*, 49 STAN. L. REV. 1223, 1239–42 (1997) (proposing a "consciousness-raising" paradigm for evaluating Proposition 65 and explaining the incentives businesses have to clean up their production processes).

71 See Clifford Rechtschaffen, *The Warning Game: Evaluating Warnings Under California's Proposition 65*, 23 ECOLOGY L.Q. 303, 341–48 (1996) (noting this reformulation and the reformulations of other consumer products, including reducing lead in ceramic plates, removing toluene from nail polishes, and removing lead from submersible water pumps).

72 For a discussion of the marketplace's reaction to Proposition 65, see David Roe, *An Incentive-Conscious Approach to Toxic Chemical Controls*, 3 ECON. DEV. Q. 179  
(continued)

The value of putting information into the hands of decision makers has also been demonstrated by the EPA's Green Lights Program.<sup>73</sup> The potential for improved energy efficiency (and therefore reduced pollution from power generation) in lighting has been understood for decades. But in the early 1990s, the EPA found a way to get corporations and other institutions in society to act on this information. Through its "Green Lights" program, the EPA engaged corporate *executives* in the challenge of reducing greenhouse gas emissions by drawing the attention of top management to lighting practices. The EPA transformed the decision about what kind of light bulbs to use and how often to change them from a decentralized matter left to facilities managers and janitors into an issue of high corporate strategy to which senior executives paid attention. As a result, thousands of corporations have transitioned from incandescent bulbs to more energy-efficient fluorescent ones.<sup>74</sup>

The potential for regulation based on enriched information and better data foundations far exceeds these preliminary results. Consumers are also a focus of these information strategies. In a small number of countries, eco-labels now steer green-conscious consumers to environmentally superior products.<sup>75</sup> In the United States, eco-labels have yet to catch on. With the ever-falling cost of information, it will increasingly become possible for consumers to get information on the environmental impact of the products they are considering purchasing.<sup>76</sup> As the search costs for environmental information go down, the number of consumers willing to take environmental variables on board as part of their decision process will go up. The Internet also promises to reduce information and search costs, including costs in generating and distributing environmental information.<sup>77</sup>

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(1989).

<sup>73</sup> See EPA, GREEN LIGHTS: AN ENLIGHTENED APPROACH TO ENERGY EFFICIENCY AND POLLUTION PREVENTION (1993).

<sup>74</sup> For more information on the EPA's Green Lights Program, see their Web site at <http://www.epa.gov/greenlights>.

<sup>75</sup> See JAMES SALZMAN, ENVIRONMENTAL LABELING IN OECD COUNTRIES 28-31, 43-70 (1991) (discussing the effectiveness and inner workings of existing eco-label regimes).

<sup>76</sup> For example, see the Web sites of Natural Logic at <http://www.natlogic.com> and Environment Support Solutions at <http://www.environ.com> for lists of environmentally friendly vendors and products.

<sup>77</sup> See Peter S. Menell, *Structuring a Market-Oriented Federal Eco-information Policy*, 54 MD. L. REV. 1435, 1439 (1995) (noting that the US government has not adopted a comprehensive labeling plan but that some private groups have sponsored small-scale labeling initiatives); see also James Salzman, *Informing the Green Consumer: The Debate Over the Use and Abuse of Environmental Labels*, 1 J. IND. ECOL. 11 (1997).

### B. *Information-Driven Improvements in Economic Incentive Systems*

Most economic incentive approaches to regulation build on the possibility of harnessing market forces to an environmental goal.<sup>78</sup> Environmental taxes work because pollution externalities are internalized, forcing producers or consumers to pay attention to the environmental costs they are inflicting on society-at-large.<sup>79</sup> Emissions trading regimes function because the allowances established create an incentive for efforts to reduce emissions at every level of pollution releases.<sup>80</sup> In both cases, the chance to drive environmental outcomes through market forces depends significantly on the degree of information available. For Pigouvian<sup>81</sup> taxes to work, there must be a calculation made as to how high the fees should be set. To be fully appropriate, this policy approach demands a significant degree of knowledge about the environmental harm being addressed and some important calculations about how to value this harm. To the extent that we are moving into an era that will be more data-rich than today, we should be better positioned to construct cost-internalizing taxes. Likewise, a tradable permit “market” depends on buyers and sellers having a degree of information about how much it will cost to meet control obligations without trades—and some degree of information about the availability and cost of permits as an alternative to undertaking pollution mitigation activities.<sup>82</sup>

Risk “bubbles” also depend on a greater degree of information than is generally currently available.<sup>83</sup> If we are to permit facilities to reduce

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<sup>78</sup> See Keohane, Revesz & Stavins, *supra* note 45, at 314 (“At least in theory, market-based instruments minimize the aggregate cost of achieving a given level of environmental protection, and provide dynamic incentives for the adoption and diffusion of cheaper and better control technologies.”); Norman W. Spaulding III, *Commodification and Its Discontents: Environmentalism and the Promise of Market Incentives*, 16 STAN. ENVTL. L.J. 293, 294 (1997) (“Market-based approaches may make possible faster and more tangible environmental rewards.”).

<sup>79</sup> See Jurgen G. Backhaus, *The Law and Economics of Environmental Taxation: When Should the Ecotax Kick In?* 19 INT’L REV. L. & ECON. 117 (1999) (describing how environmental taxes differ from classical revenue taxes).

<sup>80</sup> See David M. Driesen, *Is Emissions Trading an Economic Incentive Program?: Replacing the Command and Control/Economic Incentive Dichotomy*, 55 WASH. & LEE L. REV. 289, 325 (1998) (discussing in detail how emissions trading regimes work).

<sup>81</sup> A.C. PIGOU, *THE ECONOMICS OF WELFARE* 172–203 (4th ed. 1948).

<sup>82</sup> See Daniel H. Cole & Peter Z. Grossman, *When is Command-and-Control Efficient? Institutions, Technology, and the Comparative Efficiency of Alternative Regulatory Regimes for Environmental Protection*, 1999 WIS. L. REV. 887, 895–97 (describing an ideal world in which tradable permits would be completely efficient).

<sup>83</sup> See generally E. Donald Elliott & Gail Charnley, *Toward Bigger Bubbles: Why* (continued)

risks across the array of harms that are present, we must have a clear picture of the pollutants that are being emitted and the risks that they pose. We must also have some knowledge about the fate and transport of the various chemicals or metals and how these might be affected. Historically, the level of information that would be necessary to create a risk bubble system that is effective might well seem overwhelming.<sup>84</sup> In particular, the degree of real-time monitoring that would have been required to ensure that the system was not being manipulated would have seemed like an insurmountable obstacle. Today, however, with advanced pollution detection and tracking equipment, the technical dimension of the risk bubble problem is becoming increasingly tractable.<sup>85</sup>

Better information also supports reflexive environmental law. Over time, as we are able to move towards a regulatory regime that imposes more complete cost internalization on industry, the value to companies of undertaking their own environmental management systems (the European Union's EMAS or ISO 14000) will increase.<sup>86</sup> Currently, companies have little incentive to go "beyond compliance" because they are taking on burdens that are costly, whereas their competitors may be emitting waste out of smoke stacks or effluent pipes without bearing the full cost for the harm they inflict on society.<sup>87</sup> If a company knows that its competitors will not be able to get away with cost externalization, they will not fear a competitive disadvantage from being environmentally well-behaved. Thus, we can expect that the number of companies participating in environmental management systems and finding value in being certified under a regime such as ISO 14000 will grow over time.<sup>88</sup> Similarly, the link in the minds of the investment community between good environmental management and good economic performance is likely to

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*Interpollutant and Interrisk Trading Are Good Ideas and How We Get There from Here*, F. APPLIED RES. & PUB. POL'Y 48, (Winter 1998) (addressing and rejecting objections to regulatory bubbles that cite the impossibility of measuring and comparing different environmental risk reductions).

<sup>84</sup> See *id.* at 50 (noting that determining the optimal size of risk bubbles requires accurately monitoring many intangible variables).

<sup>85</sup> See *id.* at 51 (describing the "easy cases" where implementing bubbles would be efficient).

<sup>86</sup> See Dick Hortensius & Mark Barthel, *Beyond 14001: An Introduction to the ISO 14000 Series*, in ISO 14000 AND BEYOND (Christopher Sheldon ed., 1997).

<sup>87</sup> See Daniel C. Esty & Michael E. Porter, *Industrial Ecology and Competitiveness*, 2 J. INDUS. ECOLOGY 35, 35 (1998) (noting polluting companies may have a competitive advantage if a regulatory regime leaves costs uninternalized).

<sup>88</sup> See Amy Pesapane, *ISO 14000 and Environmental Cost Accounting: The Gateway to the Global Market*, 29 LAW & POL'Y INT'L BUS. 501, 528-30 (1998) (describing why companies will participate in ISO 14000).

become clearer as information becomes available to demonstrate this link and, more importantly, as more sophisticated regulatory approaches ensure that firms that are emitting waste are called to account for their cost externalization.<sup>89</sup>

Another way that improved information will transform the regulatory process and facilitate economic incentive systems is by making reliance on environmental property rights more feasible.<sup>90</sup> Professor Stewart dismisses “free-market environmentalism” as unrealistic and dependent on extreme optimism.<sup>91</sup> If, however, the holders of environmental rights had full information about the value of their resources, and the transaction costs of negotiating the purchase and sale of these rights were negligible, then a free market for environmental resources would produce efficient, welfare-maximizing and just outcomes. While pollution would not be eliminated, there would be no uninternalized environmental harms. Thus, we would find ourselves, at least in theory, with optimal levels of pollution. The level of information about harms, causal effects, epidemiological and ecological impacts, and options for adaptation and mitigation would clearly need to be very high to ensure a fully-functioning, free market approach to the environment. Nevertheless, as the level of information and knowledge rises—as it seems certain to do over the coming decades—the degree to which the market for environmental rights can become a more significant element of our environmental protection system is likely to grow.<sup>92</sup> And while the movement toward a Coasian world of bargaining over environmental rights and performance remains limited as an answer to environmental challenges, the capacity to manage complex information means that the assumption that such a system only works when there are “small numbers” may be relaxed to some degree.<sup>93</sup>

More fundamentally, an information-rich environmental realm would help to address or even to eliminate some of the obstacles that have held back progress on second generation approaches to environmental law.

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<sup>89</sup> One major effort that links success in business with good environmental stewardship is the Dow Jones Sustainability Group Index, available at <http://www.sustainability-index.com> (last visited Dec. 18, 2000); see also Andrew King & S. Baerwald, *Using the Court of Public Opinion to Encourage Better Business Decisions*, in *BETTER ENVIRONMENTAL DECISIONS: STRATEGIES FOR GOVERNMENT, BUSINESS, AND COMMUNITIES* (K. Sextos et al., eds. 1998) (arguing that better environmental stewardship on the part of businesses could improve their public esteem).

<sup>90</sup> See Esty, *Environmental Governance*, *supra* note 10, at 1541–43 (examining regulatory gains from better information).

<sup>91</sup> See Stewart, *supra* note 1, at 167–69.

<sup>92</sup> See Esty, *Environmental Governance*, *supra* note 10, at 1506.

<sup>93</sup> See generally R.H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1 (1960).

Improved modeling of environmental behavior will facilitate, in particular, more refined and effective market mechanisms. For example, as our knowledge base grows, we are likely to be more successful in setting tax rates that more precisely internalize environmental harms. Similarly, to the extent that the Internet and other information technologies lower the cost of contracting around environmental rigidities, the price of regulatory reform drops. Likewise, as the Internet creates new markets, we may see a range of economic incentive approaches—particularly small-scale allowance trading schemes—that previously were thought to be too difficult to carry out in practice.

While environmental policy interventions are still likely to create winners and losers, the public choice failures that currently plague environmental debates in Congress and within our state legislatures may also be reduced in the Information Age that lies ahead.<sup>94</sup> Specifically, the degree to which special interests will be able to manipulate the political and regulatory process without being noticed is likely to diminish. The vast array of information about who is exercising influence over policymaking and increased capacity to track the political activity of lobbyists and other special interest peddlers will narrow the zone of regulatory manipulation.

More broadly, improved environmental technologies will provide a capacity for sophisticated and low-cost monitoring that makes economic incentive systems more attractive. The 1990 Clean Air Act's<sup>95</sup> acid rain trading program would not have been conceivable without twenty-four hour a day, seven-day a week smokestack monitoring of emissions.<sup>96</sup> In the future, our capacity to track a variety of emissions—from toxic releases to vehicle emissions to greenhouse gases—will become much more refined.<sup>97</sup> With more information on who is causing what harms, society will be able to implement environmental tax regimes with a degree of sophistication and confidence that is currently not available. More information would also facilitate regulatory approaches such as wetlands banking and mitigation that depend on careful tracking of environmental

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<sup>94</sup> See Esty, *Environmental Governance*, *supra* note 10, at 1548–49 (noting that the opacity of environmental regulations precludes the public from judging regulatory success and enables interest groups to exert undue influence).

<sup>95</sup> 42 U.S.C. § 7401 (1990).

<sup>96</sup> See Cole & Grossman, *supra* note 82, at 921–22 (noting smokestack monitoring technology made implementing the Clean Air Act possible).

<sup>97</sup> The scientific literature is rich with examples of monitoring technologies. See, e.g., E.J. Hinst et al., *SPADE H<sub>2</sub>O Measurements and the Seasonal Cycle of Stratospheric Water Vapor*, 21 *GEOPHYSICAL RESEARCH LETTERS* 2559 (1994); C.R. Webster et al., *Quantum Cascade Laser Measurements of Stratospheric Methane (CH<sub>4</sub>) and Nitrous Oxide (N<sub>2</sub>O)*, *APPLIED OPTICS* (submitted December 1999).

burdens and the success of “alternative” performance. With good information on what kinds of wetlands are being harmed, for instance, and data on where mitigation can be undertaken, the public could have much greater confidence in a regulatory approach that relies on off-site wetlands protection and creation.

Perhaps more critically, GIS mapping of wetlands (and endangered species habitats) will soon make it possible to have a complete picture of environmentally sensitive areas available for the public.<sup>98</sup> Before developers eye (and purchase) a parcel of land, they will be able to check whether they will face future environmental difficulties. This information will mean many fewer wetlands “surprises” and a much higher degree of predictability about what projects will be approved.<sup>99</sup>

Fundamentally, our capacity to manage ever-increasing amounts of information and data makes managing complex systems less burdensome and more cost-effective. Errors of over-simplification, which plague our environmental regulatory system today, could be dramatically reduced. In addition, an improved technical and scientific knowledge base will narrow the zone of uncertainty in which political judgment about environmental policy goals and strategies is required. By reducing the scope of what is “art” (as opposed to science) in environmental debates, we will be able to narrow the range over which political judgment must be exercised.<sup>100</sup> In doing so, we will reduce the depth of the current political divide that makes today’s environmental politics so polarized.

Information strategies will not fix all of the problems that stymie movement toward greater use of next generation environmental policy tools. There will remain a political challenge arising from the fact that many of our environmentally-unsound policies (such as less-than-full-price gasoline or cheap food made possible by subsidized agriculture) provide the limited degree of support for the poor within the American context.<sup>101</sup> To undo these income-redistributing subsidies in support of environmental rigor would be regressive. Of course, with enough political

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<sup>98</sup> See Dennis D. Murphy, *Fulfilling the Promise: Reconsidering and Reforming the California Endangered Species Act*, 35 NAT. RESOURCES J. 735, 767 (1995) (noting GIS mapping will help identify gaps in protection networks).

<sup>99</sup> Note that comprehensive information about wetlands and endangered species will make *reasonable* investment-backed expectations about developing ecologically sensitive areas a thing of the past. See *Lucas v. South Carolina Coastal Council*, 505 U.S. 1003 (1992); *Loveladies Property Owners Ass’n v. Raab*, 430 F.Supp. 276 (D.N.J. 1975), *aff’d*, 547 F.2d 1162 (3<sup>d</sup> Cir. 1976).

<sup>100</sup> For a table illustrating this point, see Esty, *Environmental Governance*, *supra* note 10, at 1519.

<sup>101</sup> See Richard J. Lazarus, *Fairness in Environmental Law*, 27 ENVTL. L. 705, 725–26 (1997) (noting the regressive tendencies of environmental law).

will, one could execute a tax shift that permits full cost internalization of environmental harms while providing targeted tax relief through carefully constructed fiscal policies.

But even with a more information-rich policy realm, irrational fears of revenue neutral tax shifts will be hard to overcome. While there are many ways to rebate the funds that might be generated from cost-internalizing environmental fees, skepticism about whether the government would actually give back as much money as it takes in remains rampant.<sup>102</sup> Almost certainly, those who receive the rebates would not be the same ones who are paying increased fees because of their emissions, making such redistributive policies vulnerable to attack by those who find themselves worse off.

The core political economy problems of the environmental realm are also hard to redress simply through improved information. The structure of cost-bearers and beneficiaries in the environmental domain is such that the polluters are often concentrated and have much to gain by intervening in the political process to preserve a policy system that does not fully internalize environmental harms.<sup>103</sup> The beneficiaries of market mechanisms, the vast public that currently bears a small degree of burden from uninternalized harms, are very hard to motivate in the political arena. Nevertheless, the Information Age may reduce the degree of public choice failure as people are educated about the asymmetry of interests in the environmental realm and disclosure strategies make clear who is influencing the political process.<sup>104</sup>

The transition costs of moving from the current system to one that is much more market-oriented will also be impossible to eliminate. But if the costs of training and education go down due to the presence of new tools such as the Internet, the transition period can be reduced and the process of getting people up to speed on the new approaches can be streamlined. The “network effects” which lock people into the current regime can be broken down to the extent that more people are aware of the benefits of new regulatory approaches and become comfortable with them.<sup>105</sup>

The high discount rates of the political class in the United States (and everywhere else for that matter) will also be hard to change. So long as

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<sup>102</sup> See GREEN LEDGERS: CASE STUDIES IN CORPORATE ENVIRONMENTAL ACCOUNTING (Daryl Ditz et al. eds., 1995).

<sup>103</sup> See Bruce A. Ackerman, *Beyond Carolene Products*, 98 HARV. L. REV. 713, 727–28 (1985) (discussing the congressional influence of special interests).

<sup>104</sup> See Esty, *Environmental Governance*, *supra* note 10, at 1547–49.

<sup>105</sup> For discussions of “network effects” see Paul A. David, *Clio and the Economics of QWERTY*, 97 AM. ECON. ASS’N. PAPERS & PROC. 332 (1985); Steve Lohr, *Business Often Goes to the Swift, Not the Best*, N.Y. TIMES, Aug. 6, 1995, §4, at 3.

politicians are elected for fixed-year terms, they have a strong incentive to ensure that the burdens imposed on taxpayers during their term of office are minimized, and they have a big incentive not to address problems that will impose costs over time, especially if the issue can be ignored with little negative impact in the short run.<sup>106</sup> But while the spreading of burdens to those in the future who are not currently around to complain will be hard to mitigate, a richer flow of information that makes clear when harms are being spread temporally as well as spatially can help to reduce the policy failures that arise from spillovers of pollution onto omitted voices and the parallel mismanagement of common resources.<sup>107</sup>

### C. *Transformative Nature of the Environmental Challenge*

The Information Age and the rapid advances that are occurring in science promise to transform the nature of our environmental challenge. To the extent that a high degree of uncertainty plagues good environmental policymaking, the prospect of better data, clearer environmental indicators, and more sophisticated cost-benefit and risk analyses, makes the promise of a higher degree of rationality in addressing environmental challenges a reasonable bet. Increasingly, it will not be just governmental decision makers who are positioned to make better choices; the business community and individuals in their roles as environmental actors will also be better positioned to understand and ultimately to reduce the harms they inflict on society in the coming years.

More profoundly, in a number of instances information may be substituted for activities that cause pollution or the squandering of scarce resources. For example, as microchip-driven thermostats replace traditional heating and cooling controls (which are either on or off), furnaces and air conditioners will only be triggered into operation when people are present and in need of cooling or heating.<sup>108</sup> In effect, the more sophisticated thermostat substitutes information for energy, thereby reducing the amount of fuel that is burned and the pollution that is generated. The now-controversial subject of genetically modified organisms provides another area of great environmental promise. If the full potential of genetically modified crops were to be realized, crops might be able to be grown with much less in the way of fertilizers and nutrients, and perhaps even with less water.<sup>109</sup> Again, information in the

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<sup>106</sup> See Esty, *Environmental Governance*, *supra* note 10, at 1514 (discussing politicians' "high discount rate").

<sup>107</sup> See RISK VERSUS RISK: TRADEOFFS IN PROTECTING HEALTH AND THE ENVIRONMENT (John D. Graham & Jonathan B. Wiener eds., 1995).

<sup>108</sup> Honeywell Inc. has growing markets in programmable thermostats. See their Web site for details at <http://www.honeywell.com/yourhome>.

<sup>109</sup> See Daniel C. Esty, *Trade Storms*, WORLD LINK, May-June 2000, at 12-3.

form of genetic interventions facilitates a reduction in environmental damage.

A more information-rich world would also permit greater "individualization" of environmental policy. Currently, because individual susceptibility to pollution exposures varies, we over-regulate with regard to some individuals and under-regulate with regard to others. The enormous administrative costs of carrying out environmental policies and regulatory decisionmaking drives us to use gross averages.<sup>110</sup> With future improvements in science, monitoring and tracking equipment, and data-gathering and manipulation capacities, environmental policies will be more finely tailored. We may at some point be able to track individual increments of harm being emitted from a smokestack or effluent pipe to specific individuals who suffer harms. This level of detail would permit not only a much more efficient regulatory system of cost internalization, but also a much fairer system where individuals are compensated for the harms they actually suffer instead of the average rate of injury for the community as a whole.

The Internet and other information technologies that are just emerging will also facilitate the processes of industrial ecology.<sup>111</sup> Increasingly, waste streams from one industry will be available to others for whom these flows might be useful as inputs to their own production processes. While there are limits to how far these flows can be optimized and loops closed, there is a great deal of potential industrial symbiosis that is currently not cost effective due to high search costs and the lack of markets to facilitate the requisite exchanges. The Internet makes possible the creation of new markets in these products with low transaction costs.<sup>112</sup> Thus, companies which are today paying to have their waste taken away may soon find that they can give their by-products away at cost to someone who will re-use them, or perhaps even charge for their waste streams, having identified someone who has a need for the very materials that they are trying to unload.

More generally, the Information Age permits systemic thinking. There will be a much greater capacity in the world at large and the regulatory community in particular for careful risk analysis and for benefit-benefit comparisons. To the extent that the trade-offs among

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<sup>110</sup> See Isaac Ehrlich & Richard A. Posner, *An Economic Analysis of Rulemaking*, 3 J. LEGAL STUD. 257, 262 (1974); Colin S. Diver, *The Optimal Precision of Administrative Rules*, 93 YALE L.J. 65, 74 (1983).

<sup>111</sup> See THOMAS E. GRAEDEL & B.R. ALLENBY, INDUSTRIAL ECOLOGY 110-14 (1995) (describing the industrial ecology flow cycle, through which one firm's waste may be recycled into another firm's raw material to avoid the problems of waste disposal).

<sup>112</sup> See BILL GATES, THE ROAD AHEAD 18 (1995) (noting that the Internet virtually eliminates the need for face-to-face communication).

environmental opportunities and challenges are better understood, improved natural resource management and pollution control outcomes are likely.

Improved tracking and information systems would also facilitate movement to more careful environmental stewardship on the part of environmental industry. In effect, information makes environmental harms more visible, and it is clear that the public and the corporate world respond much more quickly and effectively to challenges that are plain to see.

## V. CONCLUSION

Professor Stewart has provided us with an extraordinary retrospective on the modern American system of environmental regulation. His paper offers a series of insights on how we might move to a second generation of environmental law. But I believe that the Second Generation's day has already come and gone. We must think immediately how to get to the Next Generation of environmental law and policy, facilitated by the enormous growth in our knowledge and capacity made available by the Information Age.