Reenvisioning the Risk Bubble: Utilizing a System of Intra-Firm Risk Trading for Environmental Protection

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INTRODUCTION

Over the past thirty years, environmental regulation of industry in the United States has achieved remarkable success in reducing air¹ and water pollution,² and controlling the effects of hazardous waste.³ These successes have produced great benefits in terms of human and ecosystem health.⁴ However, the regulatory system continues to allow unacceptable levels of environmental degradation,⁵ levels that threaten the functioning of natural systems on which humans, plants, and animals rely. The current regime fails for two reasons. First, it is under-inclusive, both as to the types of harm (such as over-utilization of natural resources) and sources of harm (such as farms and the service sector) that it regulates. The current system also fails because it is inefficient.⁶ Most environmental regulation in the United States utilizes performance-based⁷ and technology-based⁸

1. Paul R. Portney, *Air Pollution Policy*, in PUBLIC POLICIES FOR ENVIRONMENTAL PROTECTION 77, 92-93 (Paul R. Portney & Robert N. Stavins eds., 2d ed. 2000).

2. A. Myrick Freeman III, *Water Pollution Policy*, in PUBLIC POLICIES FOR ENVIRONMENTAL PROTECTION, *supra* note 1, at 169, 189.

3. Hilary Sigman, *Hazardous Waste and Toxic Substances Policy*, in PUBLIC POLICIES FOR ENVIRONMENTAL PROTECTION, *supra* note 1, at 215.

4. See, e.g., Portney, *supra* note 1, at 105-09.

5. As just one brief example, pollution levels in some cases have actually increased in sum, even though they have decreased per unit of economic output. Michael E. Kraft & Norman J. Vig, *Environmental Policy from the 1970s to the Twenty-First Century*, in ENVIRONMENTAL POLICY: NEW DIRECTIONS FOR THE TWENTY-FIRST CENTURY 1, 21 (Norman J. Vig & Michael E. Kraft eds., 5th ed. 2003) (noting increase in emissions of nitrogen oxides from 1970 - 2000).

6. See, e.g., Freeman, *supra* note 2, at 189-95 (estimating that the costs of the Clean Water Act have outweighed the benefits).

7. A performance-based standard sets a goal for performance and then allows the regulated entity to choose how to meet the goal. For example, if a regulator requires a power plant to reduce sulfur dioxide emissions by ten tons, a performance-based standard allows the power plant to meet the goal by either using a cleaner energy source, or by choosing among various technologies that prevent emissions.

8. A technology-based standard requires the regulated entity to meet a performance goal by using a specific type of technology. For example, a regulator may require a power plant to reduce sulfur

standards.⁹ While either of these may potentially be an optimal regulatory tool under the right circumstances,¹⁰ in most cases they make environmental regulation unnecessarily expensive, thereby reducing its popularity and limiting the public's willingness and ability to pay to further reduce harm.

These are serious failings, and calls for reform have arisen from all sides.¹¹ The vast majority of proposed solutions can be organized into two broad categories. The first category seeks ways to increase the flexibility of the current regulatory process, recognizing that the broad strokes of command-and-control regulation frequently do not result in cost effective pollution reduction at the individual-firm level. The proposed reforms often seek greater input from businesses and allow firms to meet current standards using new and cheaper methods, or to demonstrate that they can reduce overall environmental harm in exchange for some kind of consideration from the regulatory authority (e.g., a simpler permitting process or leniency with regard to past violations).¹² Proposed reforms of this type generally allow businesses to choose whether to participate in the program, rather than mandating participation.¹³ The second category of proposed reforms advocates the use of market forces in environmental policy, primarily by means of pollution charges and tradable permits, and is thus also directed at increasing cost effectiveness.¹⁴

This Comment argues that while many of the proposed reforms are valuable additions to the regulatory toolbox, each has disadvantages that restrict its ability to address some of the problems of the current system. This Comment proposes another tool, a particular type of risk bubble, which offers unique advantages. Specifically, this Comment examines the potential advantages and disadvantages of the proposed type of risk bubble and how, when properly constructed, the risk bubble can help to fill some of the remaining gaps in environmental regulation.

dioxide emissions by ten tons, and then mandate that the power plant use only one of the potential technologies that prevent emissions.

9. These regulatory tools are often lumped together and referred to as "command-and-control" regulation.

10. See generally 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 (1999).

11. See, e.g., E. Donald Elliott, *Toward Ecological Law and Policy*, in THINKING ECOLOGICALLY: THE NEXT GENERATION OF ENVIRONMENTAL POLICY 170, 172 (Marian R. Chertow & Daniel C. Esty eds., 1997) (noting "strong and growing consensus" for reform).

12. See Daniel Press & Daniel A. Mazmanian, *Understanding the Transition to a Sustainable Economy*, in ENVIRONMENTAL POLICY: NEW DIRECTIONS FOR THE TWENTY-FIRST CENTURY, *supra* note 5, at 275, 275 (providing examples and noting goals of these proposals).

13. *Id.*

14. These tools are generally referred to as "market-based instruments." See, e.g., Robert N. Stavins, *Market-Based Environmental Policies*, in PUBLIC POLICIES FOR ENVIRONMENTAL PROTECTION, *supra* note 1, at 31.

The basic concept of a risk bubble is well established.¹⁵ The “bubble” refers to a fictional boundary drawn around a harm-creating facility or facilities. Regulations set the total allowable level of harm for the entire bubble. Facility owners may then trade between various sources within the “bubble” so long as they do not exceed the mandated total harm level. For example, increases in air pollution at one smokestack in a facility can be offset by decreases in air pollution at another smokestack within the “bubble.” The risk bubble may incorporate only one type of harm, or it may allow trading between multiple types of harm.

Perhaps because the risk bubble has almost exclusively been conceived of and analyzed as a tool for trading pollution emissions—rather than a broader range of environmental harms—or perhaps due to fears of the difficulty of comparing diverse types of environmental harms, some of the most important advantages of the risk bubble have gone unrecognized.¹⁶ In particular, the risk bubble has advantages over other systems when harms are difficult to monitor and when harms are created by the consumption of resources extracted outside of the United States’ jurisdiction. These advantages merit a serious look at a risk-bubble system that would allow trading between different types of environmental harm.

In order to provide a concrete example of these theoretical advantages, this Comment introduces and evaluates the most fully developed risk-bubble system currently at work in the United States. Created by the U.S. Green Building Council to certify environmentally responsible buildings, the Leadership in Energy and Environmental Design (LEED) Standards is a voluntary program that requires commercial builders to achieve a certain number of “points” in order to obtain certification. The points represent a combination of performance-based and technology-based standards. The standards range from energy and water conservation measures to land use and environmental health considerations. The total number of points available far exceeds the number of points required for certification, so builders may choose which points to obtain. LEED has established itself as the preeminent rating system for environmentally responsible commercial building. A number of federal, state, and local governmental entities have begun requiring LEED certification as a specification in their requests for proposals. While LEED is still a relatively new system, initial studies demonstrate the promise of a risk bubble regulating a wide range of different types of environmental harm.

This Comment begins in Part I by describing the under-inclusiveness of the current regulatory regime, as to both the types and sources of harm, and then touches on the problems this under-inclusiveness has created. It then goes on to address the inefficiency of the current system. Part II

15. See *infra* Part III.A.

16. See *infra* Part III.B.

examines the most commonly proposed solutions to these problems, including increasing the flexibility in the system, utilizing voluntary initiatives, such as environmental management systems, and implementing market-based tools, such as tradable emissions permits and pollution taxes. Part III introduces a less frequently proposed market-based tool, the risk bubble, argues that some of its unique advantages have been ignored and demonstrates how these advantages make it a more suitable alternative for filling gaps in the regulatory structure while achieving cost effectiveness. Part III also describes and evaluates the LEED Standards, the most fully developed, albeit voluntary, example of a risk bubble at work in the United States today. Finally, Part IV considers the potential design of a mandatory risk-bubble system.

I

FAILURES OF THE CURRENT STRUCTURE: UNDER-INCLUSIVENESS AND INEFFICIENCY

A. Traditional Environmental Regulation is Under-Inclusive

Over the past thirty years, the United States' environmental regulatory structure¹⁷ successfully reduced air¹⁸ and water pollution,¹⁹ and began to control the effects of hazardous waste,²⁰ producing great benefits in terms of human and ecosystem health.²¹ Yet significant environmental degradation continues to occur, in large part because environmental regulation in the United States remains vastly under-inclusive, both in the *types* of harm it regulates and in the *sources* of harm it regulates.

1. Many Types of Harm Remain Unaddressed

Direct regulation of businesses in the United States is primarily limited to controlling emissions of a limited number of pollutants into air and water from identifiable sources, and regulating certain hazardous wastes. Many other types of harm go unregulated.²² The primary examples are the

17. The primary laws governing pollution and hazardous substances are the Clean Water Act, 33 U.S.C. §§ 1251-1387 (2000); the Clean Air Act, 42 U.S.C. §§ 7401-7671 (2000); the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. §§ 9601-9675 (2000); and the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. §§ 6901-6992k (2000).

18. Portney, *supra* note 1, at 92-93.

19. Freeman, *supra* note 2, at 189.

20. Sigman, *supra* note 3, at 227.

21. Portney, *supra* note 1, at 100-05.

22. Of course, the mere fact that an activity creates environmental harm does not necessarily mean that it should be regulated. In order to maximize societal welfare, one should first ask whether the costs of the regulation will outweigh the benefits of the prevented harm. Although this determination will have to be made on a case-by-case basis, for many of these harms there can be significant regulation without costs exceeding benefits.

wide range of residuals²³ that remain outside regulatory control (most notably greenhouse gases), unsustainable usage of limited water and energy supplies, and loss of habitat from resource exploitation and construction. For example, when an office purchases paper, its demand for this resource carries with it the environmental harms of paper production: the cutting of trees (which destroys habitat and can, in some cases, threaten the existence of the cut species itself), the chemicals necessary to convert the trees into paper, the resources used and pollution created by transporting both the trees to the paper plant and the paper to its end consumer, and the resources needed to dispose of the paper once used. As another example, when an office uses electricity, it contributes to several types of environmental damage, including the habitat destruction resulting from the extraction of oil, the chemicals released in refining the oil, and the greenhouse gases emitted when the oil is burned. Yet the United States does not regulate the office's use of electricity or paper, and the regulation of the harm-producing activities involved in the creation and use of these goods is patchwork. For example, the United States regulates some of the chemicals released in refining, but not others.

The logging and habitat destruction in the examples above is regulated under a different framework. Rather than regulating the use of end products, like paper or electricity, the U.S. approach has traditionally been to regulate the use and extraction of resources from land and water, on public lands through natural resource law, and on private lands through land use planning. The National Forest Management Act is one example of this method: it regulates logging on public lands based in part on the damage it would do to habitats.²⁴ The Endangered Species Act is another example: it regulates behavior on both public and private land that would result in a "taking" of an endangered species and, thus, indirectly protects habitat to protect the species.²⁵

There are two problems with this type of regulation. First, it has not been consistently effective. In many cases, the resources that are supposed to be protected are instead sold off at unsustainable rates and subsidized prices.²⁶ This, however, is actually the less important critique. Well-designed public and private land use regulation has the potential to be

23. By residuals, I mean the sorts of chemicals that society typically considers to be "pollutants" and all the other wastes created in production and distribution, all of which must be disposed of somewhere.

24. 16 U.S.C. § 1604(g)(3)(E) (2000).

25. 16 U.S.C. § 1538(a)(1)(B) (2000).

26. There are serious questions as to the effectiveness of these regulations. The federal government sells water to farmers in the West at prices far below the government's cost of supplying the water. Freeman, *supra* note 2, at 218. It also sells rights to log federal forests at subsidized prices and grants massive subsidies to nonrenewable, greenhouse-gas-producing energy. Robert N. Stavins, *Market-Based Environmental Policies*, in *PUBLIC POLICIES FOR ENVIRONMENTAL PROTECTION*, *supra* note 1, at 31, 55.

a very effective regulatory method, by identifying and protecting the most important aspects of an ecosystem, while allowing sustainable usage of it.

The larger problem with regulating only the extraction of natural resources is that such regulation can only affect a particular jurisdiction's supply of resources. To the extent that there are supplies outside of the jurisdiction and the extraction of these supplies is not properly regulated in other jurisdictions, regulation of extraction in one jurisdiction merely shifts the site of the harm; it does not prevent it.²⁷ For example, if a business is unable to purchase timber in the United States, it will purchase it from the vast forests of Russia.²⁸ Even within the United States, the federal system does not allow for consistent regulation of all land, meaning that a business unable to develop land valuable for the health of an ecosystem in Oregon may be able to do so in California. This Comment does not suggest that the United States ought to be able to dominate the resource policy of another country, or that one state ought to be able to control another state's policy; therefore, the only method of reducing the harm caused by a U.S. company's consumption of resources extracted in another jurisdiction is to regulate the company's use.²⁹

2. *Many Sources of Harm Remain Unaddressed*

In addition to the wide range of unregulated types of harm, there are many unregulated sources of harm. Much of the reduction in air and water pollution achieved by the current system is a result of the regulation of large stationary point sources that can be easily monitored.³⁰ The current system has either ignored or proven ineffective at controlling emissions from diffuse sources (often referred to as "nonpoint" sources), whose emissions are burdensome to monitor.³¹ Runoff from farms is an acute example of this problem. Nonpoint source pollution accounts for 65-75% of pollution in the United States' most polluted waters.³² In some states, this

27. I am assuming, for argument's sake, that the price of importing resources from other jurisdictions is not significantly different from the price of resources purchased within one's own jurisdiction. If the price were significantly higher, it would reduce demand for the resource and thereby reduce harm.

28. See Oliver Bullough, Reuters, *Russia Forest Law to Raise Income, Greens Critical*, at <http://www.forests.org/articles/reader.asp?linkid=28962> (Feb. 2, 2004) (describing a proposed law that would increase the rights of private groups to exploit Russia's forests, discussing the substantial amount of illegal logging in Russia, and noting the vast size of the resource).

29. This type of regulation is little different from requiring any vehicle sold in the United States to have an airbag. The regulation has an impact on foreign auto producers, but it does not require any other nation to change its own airbag policy.

30. See Bradley C. Karkkainen, *Information as Environmental Regulation: TRI and Performance Benchmarking, Precursor to a New Paradigm?*, 89 GEO. L.J. 257, 264 (2001).

31. *Id.* at 264.

32. J.B. Ruhl, *Farms, Their Environmental Harms, and Environmental Law*, 27 ECOLOGY L.Q. 263, 288 (2000).

figure approaches 100%.³³ Farms are the major source of nonpoint water pollution.³⁴ While certain types of farm runoff were initially regulated under the Clean Water Act, Congress exempted farms when the EPA balked at the onerous task of regulating them under the Clean Water Act.³⁵ There have been few serious efforts at the regulation of farm runoff since.³⁶ The service sector is another example of under-regulation. Most environmental regulation has been designed with large, industrial point sources in mind, and this focus has frequently led to the exclusion of service businesses, which tend to be both smaller and more numerous.³⁷ At some point, further progress will require regulation of harms created by small, nonpoint sources, particularly those in the service and agricultural sectors.³⁸

3. *Problems Created by the Under-Inclusiveness of Traditional Environmental Regulation*

The mere fact that a source or type of harm is not regulated does not automatically mean that it ought to be. For certain harms, and past a certain point of regulation, the costs of harm reduction will exceed its benefits. Taking a broad view of the state of the environment, however, it is apparent that the United States, or any other nation, is a long way from reaching this point. A growing body of research supports the proposition that human activities are causing significant damage to the earth's ecosystems.³⁹ Healthy, functioning ecosystems and stable cycles provide invaluable and sometimes irreplaceable benefits, such as clean water, food, trees, fibers, and oxygen.⁴⁰ Whereas some early environmentalists were most concerned with the loss of nonrenewable resources,⁴¹ the weight of current scientific evidence indicates that it is not a lack of fuel or minerals that poses the

33. *Id.*

34. *Id.*

35. *Id.* at 288-89.

36. *Id.*

37. James Salzman, *Beyond the Smokestack: Environmental Protection in the Service Economy*, 47 UCLA L. REV. 411, 450, 454-56 (1999).

38. Richard B. Stewart, *A New Generation of Environmental Regulation?*, 29 CAP. UNIV. L. REV. 21, 28 (2001).

39. See, e.g., STANLEY WOOD ET AL., WORLD RESOURCES INSTITUTE, PILOT ANALYSIS OF GLOBAL ECOSYSTEMS: AGROECOSYSTEMS 2 (2000), http://sustag.wri.org/pubs_description.cfm?PubID=3053 (last modified Mar. 23, 2004).

40. See *id.*

41. The most famous example of this concern is *The Limits to Growth*, a report sponsored by the Club of Rome. DONELLA H. MEADOWS ET AL., *THE LIMITS TO GROWTH* (1972). The Club of Rome's report utilized a technique known as "systems dynamics" to, among other things, forecast human consumption of nonrenewable resources, such as coal and oil. The report concluded that, if current economic, social, and physical relationships prevailed, society will run out of most major nonrenewable resources within 100 years. The report has been substantially criticized since its introduction, often on the grounds that substitutes for these resources will be devised. See, e.g., HERMAN KAHN ET AL., *THE NEXT 200 YEARS: A SCENARIO FOR AMERICA AND THE WORLD* (Morrow 1976) (concluding that society will be substantially better off in 200 years than it is now).

most significant environmental threat to humanity; it is the damage human activities are doing to the ability of soil to support crops;⁴² to the ability of watersheds to provide clean water⁴³; to the ability of coral reefs to support fish;⁴⁴ and to the ability of the atmosphere to maintain the narrow band of temperatures in which most plants and animals are able to survive.⁴⁵ A substantial number of biologists believe that, without alteration of current trends, humanity will significantly alter or destroy almost every remaining natural ecosystem on earth within a few decades.⁴⁶ Loss of biodiversity is estimated to be occurring at a rapid pace⁴⁷ with unknown, but potentially devastating, consequences for natural systems.⁴⁸ Without the services these

42. A recent report by the World Resources Institute indicates that water scarcity and soil degradation has resulted in reduced crop productivity on 16% of agricultural land, and forecasts increasing threats to productivity from these and other problems. STANLEY WOOD ET AL., WORLD RESOURCES INSTITUTE, PILOT ANALYSIS OF GLOBAL ECOSYSTEMS: AGROECOSYSTEMS 3 (2000), http://sustag.wri.org/pubs_description.cfm?PubID=3053 (last modified Mar. 23, 2004).

43. For example, the ability of forests to protect watersheds has degraded as forest cover has declined and more forests have come under cultivation. EMILY MATHEWS ET AL., WORLD RESOURCES INSTITUTE, PILOT ANALYSIS OF GLOBAL ECOSYSTEMS: FOREST ECOSYSTEMS 7 (2000), http://forests.wri.org/pubs_description.cfm?PubID=3055 (last modified Mar. 23, 2004). As much as 50% of the world's wetlands, which store and clean water, as well as provide habitat, have been destroyed. Almost 40% of the world's population currently experiences severe water shortages. *Id.* at 3. See also, generally, CARMEN REVENGA ET AL., WORLD RESOURCES INSTITUTE, PILOT ANALYSIS OF GLOBAL ECOSYSTEMS: FRESHWATER SYSTEMS (2000), http://water.wri.org/pubs_description.cfm?PubID=3056 (last modified Mar. 23, 2004).

44. PAUL HAWKEN ET AL., NATURAL CAPITALISM 4 (1999).

45. WRI Warns of Worsening Warming as Climate Treaty Celebrates Tenth Year, at http://newsroom.wri.org/newsrelease_text.cfm?NewsReleaseID=277 (Mar. 11, 2004) (noting that "[d]ata from WRI's Climate Analysis Indicators Tool (CAIT) indicate greenhouse gas emissions such as carbon dioxide, rose 11 percent over the last decade, and are expected to grow another 50 percent by 2020"). There is now substantial scientific support for the phenomenon of global climate change, and the human contribution to this change, as set forth in the International Panel on Climate Change's Third Assessment Report, CLIMATE CHANGE 2001: SYNTHESIS REPORT, SUMMARY FOR POLICYMAKERS 7 (last modified July 15, 2004). Human effects on climate are due not just to combustion of fossil fuels, but also to deforestation, other land-use changes, and agriculture. *Id.* Potential effects of climate change range from altered rainfall patterns to increased temperatures, resulting in a loss of species and habitats, and the spread of pests and diseases. Norman J. Vig & Michael E. Kraft, *Towards Sustainable Development*, in ENVIRONMENTAL POLICY: NEW DIRECTIONS FOR THE TWENTY-FIRST CENTURY, *supra* note 5, at 394 (citing the THIRD REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (2001)). More drastically, some climate models predict that the Gulf Stream, which warms the North Atlantic, could be shut off, resulting—within as few as two to three years—in a new ice age in Europe and northeastern North America. Jim Lobe, One World U.S., *Damage from Warming Becoming 'Irreversible,' Says New Report*, at <http://www.oneworld.net/article/view/81556/1/> (Mar. 15, 2004).

46. *Ecosystem Services: Benefits Supplied to Human Societies by Natural Ecosystems*, in ISSUES IN ECOLOGY (Ecological Society of America, Washington, D.C.), Spring 1997, at 1, <http://www.esa.org/science/Issues/TextIssues/issue2.php> (last visited Apr. 8, 2004).

47. MATHEWS, *supra* note 43 (Biodiversity); REVENGA, *supra* note 43 (Executive Summary); Vig & Kraft, *supra* note 45, at 394. For example, more than 20% of the world's freshwater fish have either gone extinct or become threatened or endangered in the past few decades. REVENGA, *supra* note 43 (Biodiversity).

48. HAWKEN, *supra* note 44, at 151. Some impacts are relatively clear. Loss of biodiversity in fresh and saltwater ecosystems threatens aquatic food production, for example. LAURETTA BURKE ET AL., WORLD RESOURCES INSTITUTE, PILOT ANALYSIS OF GLOBAL ECOSYSTEMS: COASTAL ECOSYSTEMS

systems provide, human prosperity is at risk because substitutes for many of these services are either nonexistent or prohibitively costly.⁴⁹ In order to prevent the loss of or inefficient damage to these services and at the same time continue to grow economically, our production system must become vastly more efficient in its use of resources and creation of residuals.⁵⁰ In other words, given that this is unlikely to occur on its own,⁵¹ the government must act to fill the gaps created by the under-inclusiveness of the present regulatory regime.

B. Traditional Environmental Regulation is Inefficient

In addition to the under-inclusiveness of current environmental regulation, the cost effectiveness of the environmental regulation that does exist has frequently been called into question.⁵² This is in large part because

(2000), http://biodiv.wri.org/pubs_description.cfm?PubID=3054 (last modified Mar. 23, 2004); REVENGA, *supra* note 43 (Executive Summary).

49. HAWKEN, *supra* note 44, at 5. The exact level of protection necessary to resolve these problems is, of course, highly debatable. A number of scholars have advocated the quantification of these ecosystem services as a way of allowing society to determine when the costs of regulation equal the benefits. One oft-cited study found that the annual average value of ecosystem services was approximately \$33 trillion. Robert Costanza et al., *The Value of the World's Ecosystem Services and Natural Capital*, 387 NATURE 253, 259 (1997). While the methodology of any study of this type may be questioned, this exercise is worthwhile in that it provides society with a quantifiable response to the more easily quantifiable costs of regulation.

50. Stewart, *supra* note 38, at 29.

51. The reasons why the free market is unable to deal with this problem have been studied exhaustively and are generally related to the problem of externalities. As defined by Bernard Herber, "an [economic] *externality* may be viewed as either an economic gain or loss accruing to one or more 'recipient' agents as the result of an economic action 'initiated' by another agent—with the gain or loss *not* being reflected in price." BERNARD P. HERBER, MODERN PUBLIC FINANCE 36 (3d ed. 1975). For a concise summary of the market failures necessitating regulatory or market-based intervention, see NICHOLAS MERCURO ET AL., ECOLOGY, LAW AND ECONOMICS 3-18 (1994).

52. A regulation is cost effective if it allocates the responsibility for meeting the regulation among the regulated community such that the marginal cost of achieving a one-unit improvement is the same for the entire community. Differences in the marginal cost of improvement can arise both from differences in the marginal cost of implementing the regulation and from differences in the effects of improvement.

To illustrate the former, imagine that to clean up a river, two factories along the river must reduce emissions by fifty tons. The regulatory agency decides to have each factory reduce emissions by twenty-five tons. But suppose it costs Factory X \$10 to clean up the twenty-fifth ton, while it only costs Factory Y \$5 to do the same. If Factory X only had to clean up twenty-four tons, it would save \$10 on pollution control, whereas if Factory Y had to clean up twenty-six tons, it would only cost an additional \$5. The total cost to society of reducing pollution by fifty tons would be lowered by \$5. The total cost to society of reducing pollution by fifty tons could continue to be lowered by allocating cleanup responsibility to Factory Y until the cost to Factory Y of cleaning up the next ton is equal to the cost to Factory X to do the same.

To illustrate the principle that differences in the effects of pollution can affect the least-cost solution for emissions, imagine that a river has the following characteristics: the river supports a species of fish, A, that only live near the river's headwaters. Further downstream, there is another species of fish, B, which does not live at the headwaters. Imagine that Factory X sits at the headwaters, while Factory Y is further downstream, below the stock of endangered fish. It costs each factory \$10 to clean up each ton of pollution. Each factory is required to reduce pollution by twenty-five tons. The

virtually all environmental regulation in the United States utilizes either performance-based standards or technology-based standards. Performance-based standards require the regulated entity to meet a certain target, such as the emission of no more than one ton of pollutant X over a given period of time, while allowing the entity to use whatever means it desires to achieve the goal. Technology-based standards, as their name indicates, require regulated entities to use a specific technology. Since determining the best technology for each individual facility would be cost prohibitive, a regulator will determine the best technology for an industry sector.⁵³ Since the marginal cost of controlling harm will vary from facility to facility, the cost of abatement will fall heavily on some firms, while others will be able to reduce harm even below required levels at a lower cost.⁵⁴

Other problems decrease the cost effectiveness of technology-based standards. First, the technology chosen may be obsolete by the time the standard is promulgated.⁵⁵ Second, firms have little incentive to develop innovative pollution control technology since a technology-based standard will not allow them to use it.⁵⁶ Yet despite these shortcomings, technology-based standards remain popular⁵⁷ because they are the easiest tool for regulators to develop and implement.⁵⁸ It is much simpler for a regulator to identify the best available technology than to determine a performance standard, which will necessarily be defined by more complex concepts, such as human or environmental health.⁵⁹ It is also often much easier to monitor the implementation of a technology than to measure whether a regulated entity is meeting a performance standard.⁶⁰ For example, measuring the soil runoff from a farm into a river is a daunting, expensive task, but monitoring a farmer's use of cover crops to prevent runoff is comparatively easy.

Performance-based standards also allow a regulator to specify a particular amount of harm reduction while allowing businesses more

benefit to society of reducing the twenty-fifth ton of pollution near species A is \$25, while the benefit to society of reducing the twenty-fifth ton of pollution near species B is \$15. In the previous example, the dollar cost of a given level of benefit could be reduced by reallocation. In this example, the benefit of a given dollar cost can be increased by reallocation: shifting pollution to species B from species A until the marginal benefit of reducing pollution by another unit is the same for each species.

For a thorough discussion of this principle, see, for example, A. Myrick Freeman III, *Economics, Incentives, and Environmental Policy*, in ENVIRONMENTAL POLICY: NEW DIRECTIONS FOR THE TWENTY-FIRST CENTURY, *supra* note 5 at 201, 210.

53. Karkkainen, *supra* note 30, at 269.

54. *Id.*

55. *Id.*

56. *Id.*

57. *Id.* at 267-68.

58. Daniel J. Fiorino, *Toward a New System of Environmental Regulation: The Case for an Industry Sector Approach*, 26 ENVTL. L. 457, 478 (1996).

59. Karkkainen, *supra* note 30, at 267-68.

60. Fiorino, *supra* note 58, at 478.

flexibility in achieving regulatory goals than technology-based standards. Yet they still create cost-effectiveness concerns. Despite being allowed to choose the means of meeting the standard, facility X may still be able to meet the standard much more cheaply than facility Y, meaning that facility Y's standard is inefficiently strict, while facility X's is inefficiently lax.⁶¹ Performance-based standards also allow standard setters to pick a target for harm reduction based on human or ecosystem health, rather than on available technology; but making a health-based determination may be significantly more expensive for regulators.⁶² Additionally, regulators may feel pressure to avoid inadvertently bankrupting an industry by promulgating a health-based standard that proves to be so stringent that the industry cannot feasibly achieve it. Therefore, in practice, when setting a health-based standard, regulators may identify technologies that are available to regulated entities and factor the use of such technologies into their decisions.⁶³ Finally, the measurement costs of performance-based standards may be prohibitive. While monitoring methods for many pollutants have improved over the past few decades, monitoring, in many cases, is still quite expensive and imprecise.⁶⁴

The inefficiency of imposing uniform standards on individual businesses is not merely theoretical. Studies have shown that the costs of compliance with technology- and performance-based standards vary within an industry, thereby indicating that a single standard is inefficient.⁶⁵ Additionally, studies comparing command-and-control regulation with tradable emissions permit programs (which set an aggregate emissions target for an entire industry and allow firms to trade credits for emitting pollution) generally show substantially lower costs for tradable emissions programs.⁶⁶

Despite the drawbacks of technology- and performance-based standards, the primary lessons from the U.S. experience is that each regulatory tool has a unique set of advantages and disadvantages, and that the most cost effective tool for a particular problem may depend on the characteristics of the problem.⁶⁷ The well-known theory of "regulatory mismatch" asserts that some regulatory problems are a result of policymakers choosing tools that are ill adapted to the problem they wish to solve.⁶⁸ As Professor E. Donald Elliott notes, the inverse of this theory is that to achieve more effective regulation, policymakers must compare the

61. See *supra* note 52 and accompanying text.

62. Karkkainen, *supra* note 30, at 267-68.

63. *Id.* at 268.

64. Fiorino, *supra* note 58, at 478.

65. *Id.* at 32; Freeman, *supra* note 2, at 199; Portney, *supra* note 1, at 112-15.

66. Stavins, *supra* note 26, at 37.

67. See generally Cole & Grossman, *supra* note 10.

68. STEPHEN BREYER, REGULATION AND ITS REFORM 191 (1982).

strengths and weaknesses of each type of regulation to the problem at hand before choosing a tool.⁶⁹ For example, sometimes the expense of monitoring emissions may be so great that technology standards will be the most cost effective tool despite their inflexibility. Low monitoring costs, on the other hand, may provide support for the use of a tax. The avoidance of regulatory mismatch in choosing a tool to fill the gaps in U.S. environmental regulation is a theme to which I will return, but for the moment it is enough to observe that the limitations of technology- and performance-based standards as compared to other regulatory tools are relative, and not absolute.

In addition to the inefficiencies created by improper choices of regulatory instruments, a final concern is that it is inefficient to further regulate already-regulated sources and types of harms. First, it is possible that the costs of continuing to tighten standards for large point sources will outweigh the benefits.⁷⁰ At least one study has indicated that this threshold may already have been passed for the point source pollution reduction provisions of the Clean Water Act.⁷¹ Second, even if the benefits of continuing to tighten current regulations do outweigh the costs, it is possible that the government may be able to achieve *greater* benefits per dollar spent by choosing to regulate a previously unregulated harm.⁷² In terms frequently used by policymakers, it is possible that regulators have picked all the low-hanging fruit in the area of large point source polluters, and it is time to begin picking in a field where this fruit still exists.⁷³ Unfortunately, the current U.S. regulatory system is not structured to address this issue, dealing with each type and source of harm individually rather than comparing them.

II

ALTERNATIVES: ADVANTAGES AND DISADVANTAGES OF REGULATORY FLEXIBILITY AND MARKET-BASED PROGRAMS

In response to the problems posed by regulatory under-inclusiveness and inefficiency, commentators have proposed a wide range of solutions. These suggested reforms come in two broad categories. First, some proposals advocate tweaking the basic command-and-control regulatory

69. E. Donald Elliott, *Environmental Markets and Beyond: Three Modest Proposals for the Future of Environmental Law*, 29 CAP. U. L. REV. 245, 247 (2001).

70. Stewart, *supra* note 38, at 28.

71. See, e.g., Freeman, *supra* note 2, at 189-95 (estimating that the costs of the Clean Water Act have outweighed the benefits).

72. XENERGY, INC. & SERA ARCHITECTS, GREEN CITY BUILDINGS: APPLYING THE LEED RATING SYSTEM (2000) [hereinafter Portland Study]; see Stewart, *supra* note 38, at 33.

73. One of the additional benefits of focusing on a previously unregulated harm is that such areas generally do not require precise cost-benefit analyses. The difference between marginal costs and marginal benefits is likely to be large, allowing regulators a substantial margin of error as to the level of regulation and the time to gather more data to determine whether additional regulation is efficient.

structure by developing alternative environmental performance processes that lead to (but do not mandate) increased or more cost effective performance. Second, there are those that advocate harnessing the power of the market to achieve regulation that they argue is more cost effective than the command-and-control approach. This Part addresses a number of proposals from both categories, evaluates the strengths and weaknesses of each and concludes by considering whether these two approaches would be likely to resolve the problems discussed in Part I.

A. Voluntary Alternative Performance Initiatives

Congress, the EPA, nongovernmental organizations, and some individual businesses have experimented with voluntary alternative initiatives to either achieve or exceed compliance with current regulations. Although these alternative methods vary, common threads tie them together. First, though there are a few nonbinding performance targets, none of the methods bind companies to a given level of environmental performance. Second, all the programs either develop new processes for achieving environmental performance or change performance incentives. The intent is to change processes and incentives to improve environmental performance, lower performance costs, or both. Some also believe that new processes may alert businesses to environmentally beneficial actions that will also generate positive financial returns (creating what is known in the literature as a “win-win” outcome).⁷⁴

The following subsections identify and describe three categories of programs, summarize the results of studies measuring the outcomes of the programs, and analyze the role of these programs in remedying the problems of the prevailing environmental regulatory regime.

I. The Information-Based Approach

Through the creation of the Toxics Release Inventory (TRI),⁷⁵ and the passage of the Pollution Prevention Act (PPA),⁷⁶ Congress sought to stimulate pollution reduction by increasing the flow of information. The TRI requires companies that are within certain industrial sectors and that use “significant” amounts of at least one of over six hundred listed chemicals

74. The notion that there are many “win-win” opportunities to increase profitability and environmental protection simply awaiting better organizational structure and increased information to uncover them is very attractive. It has led the most optimistic proponents of this position to argue that perhaps there is really no conflict between business and the environment after all. One advocate has stated, “Only when industry mimics nature, where nothing is wasted, can it achieve the same levels of material productivity. The world of waste is a world of opportunity. . . . A world where new business will be created on an unprecedented scale.” GUNTER PAULI, *UPSIZING*, back cover (1998).

75. 42 U.S.C. § 11023 (2000).

76. *Id.* §§ 13101-13109 (2000).

to report annual releases and transfers of these chemicals to the EPA.⁷⁷ The EPA then releases the reports to the public. Each report states whether the chemicals were discharged, treated, recovered for energy, or recycled.⁷⁸ The PPA adds to the TRI by requiring that all TRI reports contain information on estimates of all chemical waste generated by a firm, regardless of whether that waste was released, treated, burned for energy, or recycled.⁷⁹ It also provides information about and technical assistance for pollution prevention to businesses.⁸⁰

Programs that merely provide information about environmental performance outcomes and methods allow polluters complete control over both the means and goals of pollution reduction, and therefore give them the flexibility to achieve least-cost solutions.⁸¹ The drawback is that the lack of mandatory standards or price incentives to act means that firms may not actually use the information to make improvements. Information does, nevertheless, provide its own unique incentives to act. Public dissemination of information provides citizen groups the opportunity to stimulate what has been called "regulation by embarrassment."⁸² Customers and investors may respond to the information by refusing to purchase products from or invest in "dirty" companies.⁸³ Likewise, a firm's competitors may seek to tarnish its reputation by reducing their own pollution levels.⁸⁴ States can also use the information (and have used the TRI) as the basis for further rulemaking and legislation, thus encouraging firms to avoid state action by undertaking their own reductions.⁸⁵ Finally, information that a firm has high pollution levels may affect its access to capital and labor, at least to the extent that a firm's business performance increases as its emissions decrease—a correlation for which there is some evidence.⁸⁶

There is empirical evidence that the TRI and PPA may have led to improved environmental performance. Under the TRI/PPA regime, overall chemical releases to the environment have dropped,⁸⁷ even though

77. *Id.* § 11023 (2000).

78. *Id.*

79. *Id.* § 13102(2),(3), 13107 (2000); UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, WHAT IS THE TOXICS RELEASE INVENTORY (TRI) PROGRAM, available at <http://www.epa.gov/tri/whatis.htm> (last modified June 14, 2004).

80. *Id.* § 13102(2),(3), 13107 (2000); UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, WHAT IS THE TOXICS RELEASE INVENTORY (TRI) PROGRAM, available at <http://www.epa.gov/tri/whatis.htm> (last modified June 14, 2004).

81. Karkkainen, *supra* note 30, at 293.

82. Press & Mazmanian, *supra* note 12, at 279. Public pressure on a business to increase pollution control can change that business's incentives to increase environmental performance by threatening the business's public reputation and (by implication) its profitability.

83. Karkkainen, *supra* note 30, at 293.

84. *Id.*

85. Press & Mazmanian, *supra* note 12, at 280.

86. *Id.* at 323-26.

87. *Id.* at 281 (citing EPA, 1999 TOXICS RELEASE INVENTORY PUBLIC DATA RELEASE).

industrial production and, therefore, opportunities for the release of chemicals, has increased.⁸⁸ While there has been a slight increase in the use of chemicals, this increase was not as large as the increase in production, indicating a decrease in the intensity of chemical use.⁸⁹

There are limitations to the information-based approach. First, while information may facilitate positive actions by firms, information-based tools do not provide any certainty in reducing harm by a given amount. Additionally, research into firm decision making indicates that even when a firm will reap financial benefit from regulatory investment, the firm will be more likely to make a regulatory investment mandated by law than a similar, but voluntary, investment.⁹⁰ This finding does not contradict the empirical research concluding that information-based regulation is capable of producing benefits. Instead, it likely implies that information-based regulation is just not capable of producing *as many* benefits. Finally, information about certain types of harms may be very expensive to accumulate, making information-based tools ineffective in such circumstances.⁹¹ These limitations suggest that information-based programs can fill an important, but restricted, role in improving environmental regulation. Specifically, information-based programs will likely be the best regulatory tool where costs of acquiring information are low, where some flexibility in the levels of environmental performance achieved is acceptable, and where it is questionable whether the benefits of more expensive forms of regulation will outweigh the costs. On the other hand, where certainty of outcome is particularly desirable, or where the benefits of more expensive but better-performing regulatory tools are highly likely to outweigh costs, other tools will be preferable.

2. *The Alternative Compliance Approach*

The EPA has also undertaken a number of initiatives that operate outside the traditional regulatory framework. While the programs vary in their details, they are all voluntary, and they generally allow producers flexibility in the means of achieving pollution reduction, in the hope that flexibility will reduce the costs of regulation. These programs are frequently categorized under the heading of "alternative compliance systems."⁹² Three of the most significant such initiatives are the 33/50 Program, Project XL, and the Common Sense Initiative.

88. *Id.* (citing U.S. CENSUS BUREAU, 2000 STATISTICAL ABSTRACT OF THE UNITED STATES, NO. 1238, INDUSTRIAL PRODUCTION INDEXES, BY INDUSTRY: 1990 TO 1999, <http://www.census.gov/prod/www/statistical-abstract-us.html> (last modified Feb. 14, 2001)).

89. *Id.* (citing EPA, 1999 TOXICS RELEASE INVENTORY PUBLIC DATA RELEASE).

90. Timothy F. Malloy, *Regulating by Incentives: Myths, Models, and Micromarkets*, 80 TEX. L. REV. 531, 538 (2002).

91. Karkkainen, *supra* note 30, at 273.

92. Elliott, *supra* note 11, at 183.

The 33/50 Program, initiated in 1991, challenged 8000 companies to enroll in a voluntary program to reduce releases of seventeen high-priority chemicals by 33% by 1992 and 50% by 1995.⁹³ The EPA allowed the companies to achieve this reduction by any appropriate means, but encouraged the companies to accomplish the goals by source reduction rather than end-of-pipe methods.⁹⁴ Thirteen hundred companies signed up for the 33/50 Program.⁹⁵ The results of the program were mixed. Although the EPA's 1996 TRI report showed that there had been a 60% reduction in the releases of these seventeen chemicals⁹⁶ and that 58% of the reduction was due to source reduction,⁹⁷ 26% of the total reductions were accomplished by nonparticipants and 40% of the reductions occurred before the program began.⁹⁸

Project XL is a more sweeping attempt at regulatory reform. The goal of Project XL, launched by the EPA in 1995, is to develop site-specific environmental plans for particular major industry facilities.⁹⁹ Under Project XL, the EPA is supposed to work with federal, state, and local governments, as well as representatives from the facility, in developing plans.¹⁰⁰ Plans are supposed to provide more flexible means to achieve emissions reduction.¹⁰¹ However, many commentators have questioned the program's effectiveness,¹⁰² and many of the original participants of the program have since backed out.¹⁰³ Among the problems that exist with Project XL are questions about whether the plans would survive a legal challenge,¹⁰⁴ the EPA's unwillingness or inability to live up to the program's promise of flexibility,¹⁰⁵ and the regulated community's fears about uncertain standards.¹⁰⁶

93. Press & Mazmanian, *supra* note 12, at 282.

94. *Id.*

95. *Id.* (citing EPA, 1995 TOXICS RELEASE INVENTORY PUBLIC DATA RELEASE).

96. *Id.* (citing EPA, 1996 TOXICS RELEASE INVENTORY PUBLIC DATA RELEASE).

97. *Id.* (citing EPA, 1995 TOXICS RELEASE INVENTORY PUBLIC DATA RELEASE).

98. *Id.* (citing U.S. GENERAL ACCOUNTING OFFICE, TOXIC SUBSTANCES: STATUS OF EPA'S EFFORTS TO REDUCE TOXIC RELEASES (1994)).

99. *Id.* at 283.

100. *Id.*

101. *Id.*

102. See, e.g., Press & Mazmanian, *supra* note 12, at 285-86; 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, 987 (1997).

103. Press & Mazmanian, *supra* note 12, at 285-86.

104. *Id.* at 286.

105. *Id.* at 282; Rena I. Steinzor, *Regulatory Reinvention and Project XL: Does the Emperor Have Any Clothes?*, 26 ENVTL. L. REP. 10527, 10527-28 (1996) (arguing that Project XL is damaging the reputation of industrial self-regulation and ultimately "undermining EPA efforts to control and prevent pollution").

106. Ruhl, *supra* note 102, at 987 (citing *3M Decides to Drop Out of Project XL Process After Disagreement Over Performance Guarantees*, 27 ENVTL. REP. 1045, 1046 (1996)) (stating that the conditions imposed by the EPA would fail to entrust 3M with the necessary responsibility and accountability and would instead be both restrictive and burdensome).

The EPA's Common Sense Initiative (CSI) is another attempt to move away from the restrictions of pollution permits and standards by focusing on specific industrial sectors rather than on individual media (air, water, and land). The CSI addresses environmental management practices in six selected industrial sectors.¹⁰⁷ The CSI process gathers together leaders within each industry and seeks ways to improve environmental performance by searching for opportunities that may cut across media and may not fit well under traditional regulation.¹⁰⁸ There is not yet enough evidence to properly evaluate whether this initiative has resulted in increased performance or reduced costs.¹⁰⁹

The EPA's move toward more flexible methods of achieving environmental performance is an encouraging response to some of the criticisms directed at the current regulatory regime. However, the EPA is limited in its flexibility by the legal requirements of the existing regime.¹¹⁰ This not only prevents it from offering more flexibility to producers as a way of lowering producers' costs, but also severely limits its ability to hold out flexibility or regulatory streamlining¹¹¹ as an incentive to go beyond current regulatory requirements. These two limitations suggest that a new statute, rather than EPA attempts to find flexibility within the current statutory scheme, will be required to achieve substantial increases in cost effectiveness and environmental performance.

3. *The Environmental Management Systems Approach*

Both nongovernmental organizations and some individual businesses¹¹² have responded to the current regulatory framework by developing systems that seek to make environmental considerations central to the

107. Alex Tynberg, *The Natural Step and Its Implications for a Sustainable Future*, 7 HASTINGS W.-NW. J. ENVTL. L. & POL'Y 73, 94 (2000) (citing Common Sense Initiative Council Federal Advisory Committee; Establishment, 59 Fed. Reg. 55, 117, 55,117 (Nov. 3, 1994)).

108. *Id.* at 94.

109. *Id.*

110. The EPA is ultimately a creature of statute and cannot exceed its statutory authority in creating regulatory programs. ZYGMUNT J.B. PLATER ET AL, ENVIRONMENTAL LAW AND POLICY: NATURE, LAW, AND SOCIETY 379 (2d ed. 1998). For a discussion of the limits of an agency's power to interpret a statute it administers, see *Chevron U.S.A., Inc. v. Natural Resources Defense Council*, 467 U.S. 837, 842-45 (1984).

111. The EPA has nonetheless made a few limited attempts to offer certain streamlining benefits, such as consolidating and reducing paperwork, particularly as part of Project XL. See JULIE HARLAN, WORLD RESOURCES INSTITUTE, ENVIRONMENTAL POLICIES IN THE NEW MILLENNIUM: INCENTIVE-BASED APPROACHES TO ENVIRONMENTAL MANAGEMENT AND ECOSYSTEM STEWARDSHIP 20 (2000). One incentive that some states have offered to encourage businesses to go beyond compliance is expedited consideration of permits that would ordinarily be more expensive and time-consuming to evaluate. Robert Stavins & Bradley Whitehead, *Market-Based Environmental Policies*, in THINKING ECOLOGICALLY: THE NEXT GENERATION OF ENVIRONMENTAL POLICY, *supra* note 11 at 105, 112-13.

112. One example of a system developed by an individual business is 3M's P3 program. U.S. CONGRESS, OFFICE OF TECHNOLOGY ASSESSMENT (OTA), INDUSTRY, TECHNOLOGY, AND THE ENVIRONMENT: COMPETITIVE CHALLENGES AND BUSINESS OPPORTUNITIES 234 (1994).

ways businesses make production decisions. The theory behind these systems, referred to as "environmental management systems" (EMS), is that a more environmentally-centered decision-making process will result in increased environmental performance, greater compliance with voluntary and mandatory environmental regulations, and potentially decreased costs of compliance.¹¹³ There is also hope that environmental management practices will lead to increased profitability.¹¹⁴

The primary example of environmental management is the International Standards Organization (ISO) 14001.¹¹⁵ Since it is likely to become the most adopted environmental management standard in the world,¹¹⁶ a closer look at this particular program is worthwhile.

In addition to providing a fully developed EMS that businesses may adopt, ISO 14001 has a certification program. If firms comply with the standards set by the ISO, they can use their ISO 14001 certification to encourage others to do business with them.¹¹⁷ The standards comprise five elements: (1) environmental policy: top-level management must set environmental policy, which at a minimum must include commitment to continual improvement, prevention of pollution, and compliance with all relevant environmental legislation and regulation¹¹⁸; (2) planning: the organization must identify the environmental "aspects" of the activities over which it has some control and that may lead to significant environmental impacts—these activities then become the focus of the remaining parts of the EMS, including target setting, programs and controls, and measurement; (3) implementation and operation: the organization must develop documented procedures for programs and controls, specifying individual roles and ensuring that appropriate resources are provided for implementation; (4) checking and corrective action: the organization must regularly monitor and measure its operations to track performance of the system relative to its own goals (including compliance with external

113. Tom Tibor & Ira Feldman, *ISO 14000: A Guide to the New Environmental Management Standards* 4 (1996).

114. As one commentator has stated about The Natural Step, one of the methods for focusing a business's decision making on environmental performance, "Through adoption of The Natural Step's framework and by implementing its policies, businesses can decrease their environmental liabilities, increase energy efficiencies, gain a competitive advantage, and improve their bottom line." Tynberg, *supra* note 107, at 74.

115. INTERNATIONAL ORGANIZATION FOR STANDARDIZATION, INTERNATIONAL STANDARDS ORGANIZATION 14001 (2002), <http://www.iso.org/iso/en/iso9000-14000/iso14000/iso14000index.html> (last visited Apr. 8, 2004).

116. Marc E. Gold, *ISO 14000: A New Global Business Benchmark*, 12 ENVTL. COMPLIANCE & LITIG. STRATEGY 1 (1995); Clifford Rechtschaffen, *Deterrence vs. Cooperation and the Evolving Theory of Environmental Enforcement*, 71 S. CAL. L. REV. 1181, 1258 (1998).

117. JASON MORRISON ET AL., PACIFIC INSTITUTE, *MANAGING A BETTER ENVIRONMENT: OPPORTUNITIES AND OBSTACLES FOR ISO 14001 IN PUBLIC POLICY AND COMMERCE* 31, 34 (2000).

118. It is important to note that ISO 14001 does not mandate any particular performance levels, other than compliance with relevant environmental laws and regulations. *Id.* at 46.

environmental regulation), and must have a plan for corrective action if goals are not being met; and (5) management review: results of performance tracking must be periodically reported to top-level management, which then assesses the need for changes to the policy or other EMS elements.¹¹⁹ The concept behind ISO 14001 is that of a feedback loop: corporations will set goals, plan for their implementation, implement, check results, and use the results to set new goals, with continuous progress being an ultimate goal.¹²⁰

A large number of companies worldwide have adopted ISO 14001 or similar environmental management practices. There are indications that businesses have performed well under these regimes. By paying more attention to the flow of materials within the organization, companies have been able to find "win-win" solutions.¹²¹ There is also evidence that companies have either decreased the payment of fines for noncompliance,¹²² or lowered costs of compliance,¹²³ as a result of pollution prevention. Firms have also generally found that they decrease their impact on the environment.¹²⁴

The results of these studies indicate that EMSs produce positive results and should be encouraged by policymakers. Nonetheless, there are fundamental problems with reliance on EMSs as a method of filling the gaps in environmental regulation. The foundation for the first of these problems can be found in the motivations that corporations have in developing EMSs. A number of studies have assessed these motivations and while their conclusions are not identical, several motivations rank consistently high. These include: improved public relations, achieving regulatory benefits, reducing costs, and improving financial performance.¹²⁵ Each of these motives, unsurprisingly, is tied to the ability to profit from an

119. *Id.* at 32.

120. *Id.* at 31.

121. See, e.g., HAWKEN, *supra* note 44, at 267 (demonstrating evidence both of "win-win" opportunities taken, and those that continue to be missed); U.S. CONGRESS, OTA, *supra* note 112, at 232 (providing evidence of pollution reduction techniques with rates of return exceeding non-environmental investment rates of return); Dennis L. Hjerresen et al., *Green Chemistry: Environment, Economics, and Competitiveness*, 9 CORP. ENVTL. STRATEGY 259, 264 (2002) (noting that Roche Colorado Corporation increased efficiency in raw material and solvent use, leading to 450 ton/year reduction in VOC emissions and 25% increase in production); Susan Summers Raines, *Implementing ISO 14001: An International Survey Assessing the Benefits of Certification*, 9 CORP. ENVTL. STRATEGY 418, 421 (2002) (a majority of respondents reported cost savings from energy use reduction and reduced waste disposal).

122. Raines, *supra* note 121, at 421.

123. U.S. CONGRESS, OTA, *supra* note 112, at 233-34.

124. Raines, *supra* note 121, at 421.

125. See CARY COGLIANESE & JENNIFER NASH, REGULATING FROM THE INSIDE: CAN ENVIRONMENTAL MANAGEMENT SYSTEMS ACHIEVE POLICY GOALS? (2002); David Morrow & Dennis Rondonelli, *Adopting Corporate Environmental Management Systems: Motivations and Results of ISO 14001 and EMAS Certification*, 20 EUR. MGMT. J. 159 (2002).

EMS.¹²⁶ Therefore, as the pollution prevention proposals engendered by EMSs become less and less profitable, they will be less and less likely to be undertaken.

If environmental harm could be reduced to an acceptable level solely by changes in business practices that also produced profits, an EMS that successfully identified these opportunities could remove the need for further environmental regulation. Unfortunately, this appears to be an unrealistic hypothesis. Studies indicate that "win-win" opportunities are not universal and that there are points beyond which pollution cannot be further reduced (even though pollution may still be substantial) without incurring additional costs. For example, a recent study of three large, sophisticated companies found that proposed pollution prevention projects at each were not in the companies' financial best interests.¹²⁷ Other studies have found that EMSs are unlikely to spur further improvements due to increasing costs and decreasing benefits.¹²⁸ There is also evidence that many EMSs are not financially self-sufficient and depend on decreasing the burdens of environmental regulation.¹²⁹

A second problematic limitation of EMSs has been revealed by research into firm decision-making practices. Studies have shown that firms will not always implement "win-win" opportunities even when they are identified. This is because firms have limited access to capital, and profiting from environmental improvement tends to receive a lower priority than profiting from the firm's core mission, even where the estimated return on investment is slightly higher for the environmental project than the core-mission project.¹³⁰ If firms are unwilling to undertake profitable environmental improvements, even the best-designed EMS will likely at most play a helpful, but insufficient, role in reducing environmental harm.

B. Market-Based Proposals

Market-based instruments are the category of policy tool frequently advocated as an alternative to standards. In a market-based system, the regulator determines the value of the harm or the level by which the harm should be reduced, and then either sets a price on continued pollution in the

126. While some surveys have indicated motivations such as "neighborliness," Raines, *supra* note 121, at 423, or "environmental improvement," Morrow & Rondonelli, *supra* note 125, at 159-71, as goals, these are either likely tied to other profit-driven motivations, such as improving public relations, or, if they arise from an "environmentalist" corporate culture, are likely to break down under severely unprofitable conditions. Personal communication with Patrick Healy, Fetzer Vineyards' Environmental Manager, in Hopland, Cal. (Oct. 12, 2001).

127. James Boyd, *The Barriers to Corporate Pollution Prevention: An Analysis of Three Cases, in IMPROVING REGULATION: CASES IN ENVIRONMENT, HEALTH, AND SAFETY* 95, 95-96 (Paul S. Fischbeck & R. Scott Farrow eds., 2001).

128. See generally COGLIANESE & NASH, *supra* note 125.

129. *Id.*

130. Malloy, *supra* note 90, at 538.

form of taxes or fees, or permits trading among sources of harm, allowing the market to determine the price.¹³¹ In theory, the regulated entity determines its most cost effective method for reducing pollution, reduces pollution up to the point where further reduction would cost more than the price of the pollution, and pays for any remaining pollution.¹³²

The arguments in favor of using market-based instruments are well known. The marginal cost of pollution control tends to vary between facilities and firms.¹³³ Therefore, applying the same standard to multiple facilities and firms can be unnecessarily expensive.¹³⁴ When regulators employ market-based instruments, however, firms only reduce pollution when it is cheaper than paying a tax or holding a permit. The aggregate amount of pollution is governed either by a cap on the number of pollution permits issued, or if the regulatory instrument is a tax, by the size of the tax. Therefore, market-based instruments encourage firms that can inexpensively reduce pollution to do so, while requiring firms that cannot efficiently reduce pollution to pay for the harm they cause.¹³⁵ This reduces the total societal cost of pollution reduction.

Market-based tools have other advantages over standards. Regulated entities are better situated to determine the most cost effective means of compliance than the government.¹³⁶ Additionally, taxes and some types of tradable permit systems should, at least theoretically, create incentives for firms to innovate, since finding ways to either reduce pollution or prevent the same amount of pollution at a lower cost will lower the expense of compliance.¹³⁷ In comparison, technology-based standards provide no incentive to either reduce pollution or find more cost effective ways of meeting the standard, and emissions-based standards provide no incentive for reducing pollution below the standard level.¹³⁸

Market-based systems, whether in the form of taxes or tradable permits have two primary drawbacks. First, they provide less certainty in the amount of pollution reduced. Taxes require neither a given entity to reduce pollution by any amount, nor a set emissions reduction for the system as a

131. Karkkainen, *supra* note 30, at 270.

132. *Id.*

133. *Id.*

134. For a more complete description of cost effectiveness see *supra* note 52 and accompanying text. Note, however, that it is theoretically possible for a standard system to be cost effective, and in practice, a well-designed standard system may come quite close to being as cost effective as a market-based program. Wallace E. Oates et al., *The Net Benefits of Incentive-Based Regulation: A Case Study of Environmental Standard Setting*, in WALLACE E. OATES, *THE ECONOMICS OF ENVIRONMENTAL REGULATION* 142, 148-51 (1996). The advantage of market-based tools in this regard is primarily due to the cost of determining the cost effective level of regulation. Regulated entities are in a far better position than governments to determine costs of compliance. Stewart, *supra* note 38, at 100.

135. U.S. CONGRESS, OTA, *supra* note 112, at 264-65.

136. Stewart, *supra* note 38, at 100.

137. Stavins, *supra* note 26, at 33.

138. *Id.* at 32-33.

whole. By not placing a cap on the emissions of any individual facility, undesirable concentrations of pollution (often referred to as "hot spots") can emerge if there is a geographic cluster of firms with high marginal costs of pollution abatement.¹³⁹ The lack of a system-wide cap can also create problems. Regulators set tax rates either using an assumption regarding the price of a given unit of harm, or using an assumption regarding the size of the tax necessary to achieve the desired reduction in emissions. If set at the price of the harm, the danger is that the damage curve of the harm is nonlinear, such that the emission of a unit of pollution beyond a certain threshold will create much larger harm than the emission of a unit of pollution below the threshold.¹⁴⁰ If regulated entities choose to pay the tax and exceed the pollution threshold, the tax will not cover the cost of the harm created. If, on the other hand, the tax is based on an assumption about the amount of emissions it will reduce, the danger is that regulators will have miscalculated, and the desired reduction will not be achieved. Tradable emissions permits, in comparison, set an aggregate pollution limit, thus avoiding the system-wide concern, but like taxes they do not require a given facility to reduce pollution by any set amount, thus creating the potential for hot spots.¹⁴¹ In contrast, since both technology-based and emissions standards can create local and system-wide certainty, they do not run the risk of hot spots.¹⁴²

A second problem common to taxes and tradable emissions permits is that, like performance-based standards, they require the ability to monitor levels of harm created, which may make their use inefficient in some areas that have thus far not been subject to much environmental regulation, such as farms and the service sector.

As perhaps suggested by the preceding discussion, taxes and tradable emissions permits are the two most frequently discussed market-based

139. It is possible to conceive of a tax system that might avoid hot spot problems. The tax rate could depend either upon the locality or upon the amount of ambient pollution. Stewart, *supra* note 38, at 101. In the case of the former, the tax system would become more complex. In the case of the latter, the tax rate would then depend not only on the actions of a given regulated entity, but also on the actions of all others contributing to ambient pollution, whether regulated or not. The disadvantage to such a system is that it would make tax planning highly uncertain, with the possibility that a firm might abstain from controlling pollution in the hopes that its neighbors might provide it with a free ride. While beyond the scope of this Comment, regulators would have to carefully consider the game theory and bargaining implications of this type of system.

140. A similar problem arises if the size of harm varies from locality to locality. If the tax or permit system does not take into account local variations, the optimal level of harm may not be achieved.

141. U.S. CONGRESS, OTA, *supra* note 112, at 285. Regulators could solve the hot spot problem created by tradable permits by creating a local pollution zone, limiting trades to other entities within the zone. Making the market for trades smaller might decrease the effectiveness of the market, however. Stewart, *supra* note 38, at 101.

142. Stewart, *supra* note 38, at 101. However, there is evidence that problems in standard setting may lead to hot spots in some circumstances. *Id.*

instruments.¹⁴³ Although each of these tools has the broad characteristics described above, their functions differ significantly enough as to make one more suitable than the other under a given set of circumstances.

I. Tradable Emissions Permits

Under a tradable emissions permit (also referred to as a “cap-and-trade”) system, the regulatory authority sets a limit (“cap”) on the total amount of allowable pollution and then allocates permits through free distribution or auction to regulated entities.¹⁴⁴ The sum total of all the permits in the system equals the total amount of allowable pollution.¹⁴⁵ The regulated entities are then allowed to trade permits among themselves. If the system functions correctly, firms with higher reduction costs will purchase pollution permits from those with lower costs.¹⁴⁶ Meanwhile, the cap provides certainty as to the total level of pollution emitted.¹⁴⁷

Tradable permit systems have been applied successfully in the context of air pollution. The Clean Air Act Amendments of 1990 required the use of a tradable permit system to govern sulfur dioxide emissions.¹⁴⁸ Studies have shown that the permit system has reduced compliance costs while providing equal or greater environmental benefits than the command-and-control system it replaced.¹⁴⁹ The sulfur dioxide program indicates that tradable permits have the potential for providing successful, cost effective environmental regulation.

Tradable permit systems do, however, have several limitations in addition to the hot spot and monitoring problems previously discussed. Unlike pollution taxes, a permit system requires a functioning market to be effective.¹⁵⁰ A functioning market must be of sufficient size to support trades.¹⁵¹ An effective market also requires that the supply and price of a commodity be reasonably predictable. If regulated entities fear that the government may capriciously alter that permit system by, for example, drastically reducing the number of permits available, they may tend to hoard their permits.¹⁵² Without trading, the permit system effectively

143. See, e.g., Freeman, *supra* note 52, at 201, 211-13 (discussing the use of taxes and tradable emissions permits); E. Donald Elliott & Gail Charnley, *Toward Bigger Bubbles: Why Interpollutant and Interrisk Trading are Good Ideas and How We Get There from Here*, 13 F. FOR APPLIED RES. & PUB. POL'Y 48 (1998) (discussing the use of risk bubbles).

144. TURNER ET AL., ENVIRONMENTAL ECONOMICS: AN ELEMENTARY INTRODUCTION 181 (1993).

145. *Id.*

146. *Id.* at 182.

147. Robert Stavins & Bradley Whitehead, *Market-Based Environmental Policies*, in THINKING ECOLOGICALLY: THE NEXT GENERATION OF ENVIRONMENTAL POLICY, *supra* note 11 at 105, 107.

148. Clean Air Act Amendments of 1990, Pub. L. No. 101-549, 104 Stat. 2584-634 (codified at 42 U.S.C. §§ 7651-7661f (2000)).

149. Stavins, *supra* note 26, at 37.

150. Karkkainen, *supra* note 30, at 278.

151. Stewart, *supra* note 38, at 103.

152. Karkkainen, *supra* note 30, at 278.

becomes a performance-based standard. This restriction on post hoc alteration potentially represents a serious limitation on the use of tradable permits. Given the uncertainty surrounding the size and effects of many environmental harms, particularly those outside the current scope of environmental regulation, the ability to tailor a regulatory system in the face of new information is an important asset.¹⁵³

Another problem with tradable permits is that, while the concept of capping pollution is politically acceptable, the concept of capping an input, such as aluminum, is not likely to be viable. As discussed above, overutilization of natural resources is one of the primary threats to functioning ecosystem services. In order to respond to this threat, a tradable permit system would have to determine the proper level of resource use: it would require determining the total amount of oil, wood, or steel that companies could use over a given time period. Given that some scholars have analogized command-and-control regulation to "Soviet-style central planning,"¹⁵⁴ a tradable permit system for natural resource usage would likely be even less popular.

These limitations prevent tradable permits from effectively reaching many of the problems not dealt with by the current regulatory system. A functioning market requires a critical mass of buyers and sellers. Therefore, where there are only a handful of regulated businesses within a given geographic area, as is the case with small, service-sector businesses, tradable permits would likely operate as performance-based standards. Likewise, the agricultural sector will likely remain unaddressed because of the monitoring problems associated with nonpoint source pollution such as agricultural runoff. Finally, permits will not affect the pollution caused by manufacturing plants outside the United States because directly limiting the amount of a given commodity a business can buy is politically unfeasible.

Despite these problems, tradable permits can provide significant benefits if they are applied in the right context. The sulfur dioxide program is a success because the tool is well suited to the problem. The market for sulfur dioxide permits is sufficiently large, the program has remained essentially unaltered, the permits deal with pollution (not consumption), and the potential for hot spots is low.¹⁵⁵ Where similar conditions exist, regulators will likely be able to achieve similar cost effectiveness benefits through use of a tradable permit scheme. In other cases, they must look to a different tool.

153. Even in the "successful" case of the sulfur dioxide trading program, subsequent advances in the understanding of the harms caused by sulfur dioxide pollution suggest an alteration should be made to the current cap. See Karkkainen, *supra* note 30, at 273-74.

154. Richard B. Stewart, *Economics, Environment, and the Limits of Legal Control*, 9 HARV. ENVTL. L. REV. 1, 6 (1985).

155. Stavins, *supra* note 26, at 37.

2. Taxes

A tax scheme places a charge on a given unit of harm. The tax may be placed on the harm itself (emission of a unit of pollution, or destruction of an acre of habitat), or upon some proxy for the harm such as the input, which may either create a unit of pollution (in the case of the burning of oil), or necessitate the destruction of habitat (in the case of drilling for oil).¹⁵⁶ In theory, regulated entities will respond to the tax by reducing the harm, or at least reducing their use of the proxy, to the point where it is cheaper to pay tax on the next unit of harm than to reduce it.¹⁵⁷

Taxes provide several benefits unavailable under a tradable permit system. While cost effectiveness benefits are similar under both systems, tax systems do not require a functioning trading market to realize these benefits. In addition, unlike tradable permits,¹⁵⁸ tax systems can convert decreases in a facility's cost of pollution control to actual pollution reduction without a change in government regulations. All other systems of regulation set a fixed cap on pollution, and while individual entities (or the system, in the case of tradable permits) may not exceed this cap, there is no incentive to reduce pollution below it. Tradable permits and performance-based standards allow regulated entities to save costs by taking advantage of reductions in the costs of pollution control, but the absence of a cost on the remaining pollution, in the case of emissions-based standards, or a corresponding increase in the price of permits, in the case of tradable permits, removes any incentive to further reduce pollution.¹⁵⁹

Taxes also have their limitations. While tradable permits give rise only to local uncertainty, taxes give rise to global uncertainty. With taxes, it is difficult to predict the amount and pace of pollution reductions.¹⁶⁰ For this reason, even some advocates of market-based instruments prefer standards when the potential harm from a given pollutant is high.¹⁶¹

Related to this problem, and to the theory that businesses under a tax regime will continue to reduce pollution as pollution control costs decline, research into the behavior of firms indicates that businesses are less likely to undertake pollution control investments when they are purely voluntary, even if the investment would save the business money.¹⁶² Because businesses have limited access to capital, they will tend to choose investment in

156. Stewart, *supra* note 38, at 112.

157. TURNER ET AL., *supra* note 144, at 166-67.

158. Karkkainen, *supra* note 30, at 279.

159. *Id.*

160. U.S. CONGRESS, OTA, *supra* note 112, at 286.

161. See DAVID PEARCE, *ECONOMICS AND ENVIRONMENT: ESSAYS ON ECOLOGICAL ECONOMICS AND SUSTAINABLE DEVELOPMENT* 65 (1998) (demonstrating that a cost-benefit method of determining optimal levels of pollution becomes irrelevant when pollutants accumulate over time, and standard setting should therefore be used).

162. Malloy, *supra* note 90, at 592-93.

the core functions of the business over investment in voluntary pollution control.¹⁶³ Where pollution control is mandatory, however, the stigma of violating a law increases the priority of pollution control investments.¹⁶⁴ Further, voluntary investments that require learning on the part of firm managers must compete for the managers' time.¹⁶⁵ Unless the tax system is simple, managers may be unwilling to spend the time running the numbers for all possible combinations of pollution control expenditures versus tax burdens.

Another disadvantage of taxes is that, while administrative agencies may change standards and tradable permit conditions, only Congress may change tax rates.¹⁶⁶ Given the lack of information regarding most environmental harms,¹⁶⁷ flexibility is crucial. The ability to alter a regulatory system as gaps in information are filled is a necessity. While altering administrative regulations can itself be a tortuous process, congressional action is even less likely, at least if it involves *raising* taxes. The development of the administrative state is due in large part to the fact that legislative decision making is a scarce resource. Consequently, the amount of time required to update a complex tax system on a regular basis makes creation of such a system impracticable.

Finally, taxes are not politically popular. Environmental groups view them as licenses to pollute.¹⁶⁸ Consumers resent them when the costs are passed on to them through increased prices.¹⁶⁹ Businesses fear the potential for increased compliance costs¹⁷⁰ because they would be forced to pay taxes in addition to the cost of compliance.¹⁷¹

As a result, with the exception of by-the-bag charges on disposal of household waste, environmental taxes have rarely been used in the United States. This also means that there is little empirical evidence by which to judge taxes. The few studies on by-the-bag charges are inconclusive, showing positive results in reducing wastes but no definite increase in efficiency.¹⁷²

Despite these concerns, taxes remain a persuasive alternative for many environmental harms. Without the concern of placing an outright limit on the use of resources, as might be necessary to address some harms with permits or standards, or the necessity of setting up a viable market for permit trades, taxes might seem to be the best alternative for addressing the

163. *Id.*

164. *Id.*

165. *Id.*

166. U.S. CONST. art. 1, § 7.

167. See Karkkainen, *supra* note 30, at 263-70.

168. Stavins, *supra* note 26, at 57.

169. *Id.* at 58.

170. *Id.* at 57-58.

171. U.S. CONGRESS, OTA, *supra* note 112, at 286.

172. Stavins, *supra* note 26, at 41.

under-inclusiveness and cost-ineffectiveness of the current regulatory regime. And, for some types of harms, this may well be the case.

Since each of the regulatory instruments addressed thus far shows promise for certain applications, but also has substantial limitations, the remainder of this Comment explores the application of a third kind of market-based instrument to the ills of environmental regulation.

III

REENVISIONING THE "RISK BUBBLE": THE LEED MODEL OF INTRA-FIRM, INTER-RISK TRADING

A. The Advantages and Disadvantages of a Risk Bubble

A "risk bubble" is an amorphous term that applies to a range of instruments that follow the basic theory of permit trading. Conceptually, the "bubble" refers to an imaginary dome surrounding a facility.¹⁷³ The regulator first determines which harms, or risks, within the bubble ought to be regulated. Next, the regulator sets a standard for the total amount of harm that can occur within the bubble from the regulated activities.¹⁷⁴ The facility may "trade" between sources of risk—increasing some while decreasing others—to achieve compliance with the overall standard. While, strictly speaking, the term "risk bubble" can apply to the typical one-pollutant, inter-facility risk trading that characterizes the typical tradable permit system,¹⁷⁵ the term more typically refers to trading emissions between point sources within a given facility. Furthermore, though risk bubbles have, in practice, generally been limited to trading between point sources of a single type of pollutant,¹⁷⁶ they can also be used to allow trading between point sources of multiple types of pollutants and between media.¹⁷⁷ In a multiple pollutant situation, the regulator must create a common index for comparing different risks in order to facilitate trades.¹⁷⁸ Because the single-pollutant type of risk bubble is similar in most respects to a tradable emissions permit program, and because of the unique advantages of the multi-risk version of the bubble, the following discussion uses the term "risk bubble" to describe a tool that allows trades between multiple risks within a single facility.

173. Stewart, *supra* note 38, at 116.

174. *Id.*

175. *Id.*

176. *See id.*

177. *See id.* A "medium" refers to the place—either air, water, or land—into which the pollution is emitted.

178. *Id.*

Most academic analysis and currently existing bubbles limit the definition of "risks" to the emission of pollution.¹⁷⁹ This definition can, however, be expanded to include such risks as locating a facility so that it causes destruction of habitat or wetlands, or the use of new paper as opposed to recycled paper. While in some cases these risks may be proxies for the true harm, United States jurisdictional limits may preclude regulators from directly controlling the harm, and the proxy therefore serves to reduce demand for the activity creating the harm. This expanded conception of risk is incorporated into the risk bubble proposed in Part IV.

Risk bubbles, in a broad, theoretical sense, have several well-recognized advantages and disadvantages. Yet perhaps because of the relatively greater scholarly attention given to taxes and tradable permits, or because of the relatively narrow conception of a risk bubble as involving only trades between reductions of pollution emissions, several advantages of risk bubbles, particularly in comparison to taxes and tradable permits, are less well understood. This section provides a more comprehensive look at the risk bubble's advantages and disadvantages, considering those previously discussed in the literature and those that have not yet been considered.

I. Advantages

As a market-based instrument, the risk bubble shares some of the advantages that tradable permits and taxes have over technology- and performance-based standards. First, a risk bubble allows firms to minimize their harm-reduction costs for a given limit on harm by choosing the lowest-cost standards, making it more cost effective than technology- or performance-based standards. Next, by not locking firms into one type of technology, it provides firms an ongoing incentive to develop or seek out lower-cost alternatives to meet the overall limit on harm. Finally, the ability to trade between varying types of harm reduction makes it easier for firms to change their production systems. Under a technology-based or performance-based system, if a firm's change in operations affects its regulated pollutant discharges such that they would violate a particular standard, the firm must apply for a new permit, creating costs for the firm and the regulatory agency.¹⁸⁰ Under a risk bubble, as with a tax or tradable permit system, as long as the firm could meet the overall limit on harm after changing its system, it could continue operating under its existing permit.¹⁸¹

179. See, e.g., Elliott & Chamley, *supra* note 143, at 48 (defining a risk bubble as including all "residuals" generated by a facility); Stewart, *supra* note 38, at 116 (same).

180. Stewart, *supra* note 38, at 117.

181. *Id.*

The risk bubble's unique characteristics also enable it to avoid some of the problematic disadvantages of tradable emissions permits and taxes. Unlike a tradable permit system, altering the value of risks in the bubble or the total level of harm allowed does not threaten its performance. As noted previously, facilities regulated by a tradable permit system might hold onto their permits rather than selling them if they fear that the government may decrease the number of permits in the system. If facilities do not trade when it is advantageous to do so, the system will not reach maximum efficiency. A risk bubble's cost effectiveness, however, depends not on external trades, but internal ones. Since these internal trades, by definition, do not involve the loss of a facility's pollution permits, a facility cannot "hoard" them by failing to make trades. In fact, facilities never have an incentive to delay making trades because they will always want to maximize their efficiency at any given point in time and for any given level of total harm allowed by the risk bubble.

A second advantage of a risk bubble over a tradable permit system is that the risk bubble does not set an absolute limit on any one type of pollution or resource. This makes it particularly useful for controlling the consumption of resources whose exploitation creates environmental harm, without actually placing a hard cap on their use. Rather, businesses would be able to trade between reducing use of one resource and reducing another kind of harm, as their cost structures demand, while still maintaining the same level of overall harm reduction. The almost insurmountable political barriers to placing a hard cap on a basic resource, such as oil, means that a tradable permit system is not a viable alternative to a risk bubble for this type of regulation.

The risk bubble also has some advantages over taxation. First, a risk bubble provides certainty as to the *total* amount of harm that will be reduced, both system-wide and facility-wide, even though the amount of a specific type of harm that will be reduced is uncertain. This quality allows regulators to set a marker for overall ecosystem health. Second, a risk bubble's requirement that facilities earn a specific number of points, combined with the stigma of administrative penalties for failing to meet the standard, may make it more effective at achieving actual pollution reduction. Research into firm decision making suggests that firms are more likely to undertake pollution control activities when regulators mandate change rather than merely provide incentives for it.¹⁸² According to Professor Timothy Malloy, this is particularly true of smaller firms (collectively, small businesses constitute one of the largest gaps in the current regulatory regime, which is primarily directed at large, point source polluters), who are unlikely to devote scarce resources to pollution taxes, but may respond more readily to the threat of being penalized for the violation

182. Malloy, *supra* note 90, at 538.

of a law.¹⁸³ Another advantage of a risk bubble over a tax system is that alterations to the bubble would not require legislative action. This makes a risk bubble more responsive to changes in knowledge regarding the sizes and types of environmental harm. Finally, and not insignificantly, the risk bubble does not have the political stigma associated with taxes, and therefore may be more feasible to implement.

The risk bubble has two additional advantages over other market-based and standards-based regulatory tools. The first, and most significant, advantage is that it is the most cost effective method of regulating sources of harm that are prohibitively expensive to monitor. As typically conceived, taxes and permit-trading systems require the ability to monitor outputs.¹⁸⁴ If cost effective monitoring technology does not exist, these systems become infeasible. This is the primary comparative advantage of a technology-based standard. Despite the tool's theoretical inefficiency, in the absence of feasible monitoring technology, it may be more cost effective than taxes and permit systems.¹⁸⁵

A risk bubble is also capable of regulating without monitoring because it can incorporate technology-based standards and it has the great advantage of being able to do so without incurring the inefficiency of technology-based standards.¹⁸⁶ By allowing trades between a wide range of technology-based and performance-based standards, a firm has the incentive to seek out the lowest-cost method of meeting the overall limit on harm. If one technology-based standard is too expensive, the firm can choose to meet another standard instead. Regulated entities would also have the continuing incentive to innovate and install lower-cost technology

183. *Id.* at 604.

184. When scholars discuss taxes and tradable permit systems, the usual unspoken assumption is that the "thing" being taxed or traded is a unit of pollution. *See, e.g.,* Elliott & Charnley, *supra* note 143, at 48; Stewart, *supra* note 38, at 116. In principle, though, this "thing" could be the failure to install a piece of technology. Thus, one could design a tax or permit system that provides incentives to install technology, and would not require monitoring; however, this would come at the costs of effectiveness and efficiency. A technology-based permit system would give firms the choice of holding a permit or installing a piece of technology. This system would be efficient in one sense: permit holders would continue trading until no firm could further reduce its costs, either by buying another permit or by installing the technology. It would still not be as cost effective (assuming the lack of monitoring costs) as a permit-trading system based on performance, however, because it prevents lowering costs by implementing alternative technologies.

A technology-based tax system would assess a flat fee for failing to install a piece of technology. This system would encounter the same problem as a technology-based permit system. It could also be less effective at reducing pollution. If some businesses found the cost of the technology more expensive than the fee, they would not install the technology, and the amount of pollution reduction would decrease. On the other hand, setting the fee sufficiently high to ensure that regulators achieve the target amount of pollution reduction could result in the costs of the system outweighing the benefits.

185. Cole & Grossman, *supra* note 10, at 904-05.

186. Note that the other primary rationale for utilizing a technology-based standard—fear of driving firms out of business if the performance-based standard is cost prohibitive—is less likely to apply here, since firms can simply opt out of any single cost-prohibitive standard.

to reduce overall regulatory costs. For example, a firm might shift from a technology-based standard to a different, performance-based standard by creating a new technology that could meet the performance-based standard at a lower cost than the firm was paying to meet the technology-based standard. Alternatively, a firm might move from a performance-based standard to a technology-based standard if, over time, or due to a change in the firm's production methods, the technology became cheaper for the firm to implement. The risk bubble's ability to cost effectively regulate sources of harm that are prohibitively expensive to monitor is one of its most important characteristics because of the sheer number of sources and types of harm that are infeasible to monitor.

Risk-bubble systems contain a related advantage in their ability to incorporate process-based standards. Process-based standards are like technology-based standards in that they mandate a specific type of action. They are distinct in that they regulate the decision-making or information-sharing processes of the business, rather than any particular environmental harm reduction. For example, they require businesses to consider environmental factors before making a particular decision, or to make public certain environmental information. Some process-based standards, such as Environmental Management Systems, and the Toxics Reporting Initiative, have had significant environmental benefits. They are often, however, exceedingly costly for businesses to adopt.¹⁸⁷ For this reason, it is preferable to use a market-based system to encourage businesses to adopt them rather than simply mandating their use. For the same reasons that a risk bubble is more effective than taxes or tradable permits at incorporating other technology-based standards, it would be more effective in incorporating process standards.

The risk bubble's other advantage over other forms of environmental regulation is that it simultaneously considers multiple harms. In order to work properly, the risk bubble must provide sufficient opportunities for a business to trade between harms. The simultaneous consideration of these harms should prevent companies from simply shifting pollution from one medium to another without actually reducing it, as is sometimes possible under the current regulatory regime. One could design a tax, permit-trading, or standards-based system to deal with this problem, but because a risk-bubble system requires the regulator to explicitly compare different types of harms, it is more likely to prompt consideration of this issue.

187. See Malloy, *supra* note 90, at 602-04 (discussing the benefits of using environmental cost accounting, but noting that its use may be cost prohibitive for some businesses); accord Fiorino, *supra* note 58, at 481 (noting that process standards often require technical, legal, and policy expertise).

2. Disadvantages

All regulatory tools have drawbacks, and the risk bubble is no exception. These limitations mean that other tools will be preferable in some circumstances, but, as the following section will demonstrate, the risk bubble's advantages make it the best tool to deal with many of the environmental problems that have frustrated regulators under the present regime. The first drawback is that the risk-bubble system requires accurate comparisons of multiple types of risk to achieve maximum effectiveness. Such comparisons can be difficult to achieve given society's very limited understanding of the degree of any individual environmental risk.¹⁸⁸ The degree of the risk may vary by location and may depend upon either the existing level of that risk in the environment, or the presence of other risks with which the new risk may interact synergistically.¹⁸⁹ Uncertainty creates the potential that trades between risks may not be equivalent, which is why some commentators have cautioned against the use of any kind of inter-risk trading.¹⁹⁰

Advocates of risk-bubble systems generally concede the existence of the problem but point out that it is a problem for all regulatory tools.¹⁹¹ Determinations of appropriate risk levels for individual pollutants and their relative stringency as compared to individually determined risk levels for other pollutants require an implicit comparison about the priority given to any single pollutant.¹⁹² These implicit comparisons are inevitable since regulatory resources are scarce. A number of authors have argued that society is much better off openly discussing comparative costs and benefits,¹⁹³ in part because the debate allows society to more accurately identify its priorities,¹⁹⁴ and in part because it creates an incentive to generate more information about costs and benefits.¹⁹⁵

This debate may really be a case of both sides being right. Explicit comparison should facilitate a better understanding of societal priorities; however, societal priorities may include removing certain risks from a risk-

188. Karkkainen, *supra* note 30, at 272.

189. For other risk variables see Stewart, *supra* note 38, at 119.

190. See Rena I. Steinzor, *Reinventing Environmental Regulation: The Dangerous Journey from Command to Self-Control*, 22 HARV. ENVTL. L. REV. 103, 190 (1998) (arguing against allowing polluters to change the "mix" of individual pollutants at will, because it would have an impact on the toxic effects of the emissions).

191. Elliott & Charnley, *supra* note 143, at 50-51; Stewart, *supra* note 38, at 118-19.

192. Stewart, *supra* note 38, at 119.

193. See, e.g., Shi-Ling Hsu, *Fairness Versus Efficiency in Environmental Law*, 31 ECOLOGY L.Q. 303, 309 (2004); Elliott and Charnley note that this will be impossible to do precisely, but argue that just because it is impossible to measure precisely does not mean that the measurements should not be made at all. Elliott & Charnley, *supra* note 143, at 50-51. It is worth adding that policymakers constantly make comparisons between risks when they decide whether to allocate pollution control resources to one risk or another.

194. See Elliott & Charnley, *supra* note 143, at 49.

195. Hsu, *supra* note 193, at 309; Stewart, *supra* note 38, at 119-20.

bubble system and dealing with them individually. This does not necessarily mean that the populace has failed to properly compare the risk to others; it may instead mean that society has considered the uncertainty surrounding the size of the harm and the likelihood that a company will address it within the risk-bubble system, and prioritized the certainty provided by standards. In other cases, the public may decide that it is better for a risk to be included in the bubble, but to approach it conservatively, offering what may appear to be a disproportionate number of points to reduce a given harm to increase the incentive for a firm to take action.¹⁹⁶ In other cases, the danger of hot spots and adverse interactions among harms may simply be too great until the harm curves and interactive effects of certain pollutants are better known. For this reason, a risk-bubble approach is unlikely to be all encompassing; rather, certain toxic pollutants will likely continue to be regulated under the current framework. This is a desirable result, provided that it is based on an explicit discussion of the costs and benefits involved.

A second disadvantage of a risk-bubble system is that, like all market-based instruments, the flexibility of the system creates the potential for hot spots where a risk's damage curve is non-linear.¹⁹⁷ In the case of a risk bubble, the uncertainty resides not in the amount of total harm that will be reduced, either system-wide or facility-wide, but in the amount of any individual harm that will be reduced. As discussed above, standards may continue to be a better tool where the potential for hot spots is high, while a risk bubble may be used in situations where the potential for hot spots is low. The alternative is to make the amount of credit that a facility receives for reducing a given harm dependent on the amount of ambient pollution.¹⁹⁸ This solution increases the complexity and the cost of the system, however, and whether it is justified by the elimination of hot spots is something that must be determined on a case-by-case basis. A last note on the problem of hot spots is that the risk bubble I propose will include many sources of harm that have gone previously unregulated. Most hot spots that these sources and types of harm could create in the near future (at least during the time necessary for testing the system) would already exist, and *any* regulation of these sources would be harm reducing.

A final potential drawback is that a risk-bubble system must include enough opportunities for trading that its cost effectiveness benefits can be realized. If the bubble is too narrowly defined, few opportunities for such trades will arise. For example, if the bubble is restricted to trades between a handful of point sources and only a couple of pollutants, there will be relatively few opportunities for cost reduction.

196. Stewart, *supra* note 38, at 119-20.

197. *Id.* at 120.

198. *Id.*

3. *Applying the Risk Bubble to Current Regulatory Problems*

The unique characteristics of the risk bubble system make it the best regulatory match for filling many of the gaps in the current regime. The risk bubble shares the cost effectiveness benefits of other market-based instruments while providing a solution to some of the biggest sources of under-inclusiveness in the U.S. regulatory scheme. For example, a risk bubble could cost effectively regulate sources of harm that are expensive to monitor, without incurring the inefficiencies of technology-based standards. It could therefore be the first truly viable regulatory tool for dealing with the many expensive-to-monitor environmental harms created by farms and the service sector.

For example, imagine a small service provider, such as a dry-cleaning business, that emits amounts of five types of pollution that are insignificant on their own, but when combined with the thousands of other similar service businesses creates a cumulatively significant environmental problem.¹⁹⁹ The government would like to reduce the harm created by these companies but cannot implement performance-based standards for these pollutants because the monitoring technology, while feasible for large corporations, is not for these businesses. The government could also require the implementation of a technology for the reduction of each individual pollutant. Each technology would meet, and in fact exceed, the government's goal for reducing that pollutant. The government is concerned, however, that depending upon the design of each business, some of the technologies could be sufficiently expensive to bankrupt some of the businesses. It is therefore reluctant to regulate. If the government can achieve its goals for cumulative harm reduction by allowing each business to install three or four of the five technologies, the advantage of a risk bubble is clear. The businesses can choose the cheapest three or four of the five technologies to implement, thereby reducing its costs and perhaps avoiding bankruptcy. What had previously been an unregulatable problem now becomes feasible. Ideally, regulators would provide more opportunities for trades, providing the businesses with more opportunities to reduce costs. Regulators could allow the businesses to substitute a reduction in electricity use, or water use, for example. Even in the basic scenario, however, the ability to trade between harms may mean the difference between a feasible and an infeasible regulatory scheme.

199. There are vast numbers of small sources of harm that create cumulatively significant impacts. In a paper discussing the regulatory problems created by the service sector, James Salzman notes that dentists' offices are responsible for over half the silver consumption in the United States each year because of their cumulatively enormous use of developing fluid, which contains trace amounts of silver, for x-rays. The vast majority of this silver is dumped down drains and ends up in watersheds and the ocean. This is but one example of many. Salzman notes that there are over 4.9 million U.S. businesses with nineteen employees or fewer, and most of these businesses are completely unregulated by environmental law. Salzman, *supra* note 37, at 455-56.

Farms would also benefit greatly from the use of a risk bubble. Like many service sector businesses, they have substantial problems that are expensive to monitor like soil degradation, erosion, and runoff to waterways.²⁰⁰ The number and diversity of farms²⁰¹ make the setting of nationwide, uniform standards impossible, and individual standards infeasible.²⁰² A risk bubble could alleviate some of this difficulty by allowing regulators to develop regionwide groupings of standards and allowing farmers to choose among them. Even within regions, farms would differ significantly on the basis of crop choice and production practices,²⁰³ but a risk bubble would allow farms flexibility in determining which standards are most cost effective for their particular situation.

Of course, many of the harms created by small businesses, and some created by farms, can be monitored in some fashion, which means that taxation becomes a viable regulatory option.²⁰⁴ Paper consumption, for example, could be cost effectively reduced by a tax on its purchase, and water consumption, which is metered, by a tax on its use. On the other hand, if taxes on these sources of harm prove politically infeasible, a risk bubble provides another cost effective regulatory option.

A risk bubble is also the most feasible method for regulating harms occurring outside of U.S. jurisdiction that are caused by domestic demand for resources. It could regulate firms' use of old-growth timber, for example, thereby preventing harm to old-growth forests throughout the world. It would act as a supplement to U.S. natural resources law, with the risk bubble regulating the harm created by resource consumption, and natural resources law prioritizing the sites where the remaining harm would occur. While a tax system could also cost effectively address these harms, taxation's lack of political viability needs to be treated as a real barrier to achieving a regulatory solution, and not just a failure of rationality on the part of Congress, businesses, environmentalists, and the general public. A risk bubble, by incorporating defined standards and an overall limit on environmental harm, and not requiring businesses to pay for residual harm, may prove to be politically more feasible.

Further, the risk bubble is the most feasible market-based tool for dealing with environmental problems where the size and likelihood of the harm is highly uncertain, and the regulations are therefore very likely to require adjustment as regulators acquire more information. The risk bubble is the most flexible of the market-based instruments because changes to a

200. Ruhl, *supra* note 32, at 277-79.

201. There are around 1.9 million farms in the United States. They vary based on a wide range of characteristics, including climate, availability of water, soil quality, proximity to metropolitan areas, surrounding land use, and a host of others. *Id.* at 329-30.

202. *Id.* at 329.

203. *Id.* at 330.

204. Salzman, *supra* note 37, at 458.

risk-bubble system do not need to be approved by Congress, unlike changes in tax rates, and do not interfere with the stability of a market, unlike changes in a permit-trading system. Finally, the unique challenge of a risk-bubble system—the difficulty of comparing different types of harms—may actually lead to a societally valuable explicit comparison of different types of risk.

This is not to say that the risk bubble is a one-size-fits-all solution. As noted, where significant fears of hot spots exist, the public may demand the certainty of performance-based or technology-based standards. The benefits of other systems, such as the ability of a tax system to incentivize continuing reductions in pollution, may make them more appropriate options in some cases. One should not ignore the problems of regulatory mismatch when advocating for a particular type of regulation. However, the benefits of the risk bubble have been too frequently overlooked in advocating other types of instruments. Like any other regulatory tool, the fuller recognition of a risk bubble's advantages and disadvantages can only improve environmental regulation.

The best way to evaluate a risk bubble's capacity to solve the problems of the current regulatory regime is to examine currently operating risk-bubble systems. Until recently, this evaluation has been difficult since risk bubbles in the United States have been narrowly defined.²⁰⁵ The original risk bubble, utilized under the Clean Air Act, changed the definition of a "source" of air pollution from a single emission point to an entire factory and then allowed trading of emission levels among emission points, as long as emissions from the factory as a whole did not increase.²⁰⁶ A study of the system estimated savings of between \$500 million and \$12 billion dollars over the emission-based standard approach. However, the program only allowed trades between the same type of pollutant.²⁰⁷ The EPA's voluntary Project XL is an example of a broader bubble, allowing firms to trade between pollutants and across media. One case study found that Project XL resulted in dramatic cost savings while improving overall environmental quality.²⁰⁸ However, questions surround Project XL's legality, and the EPA approves trading systems on an ad hoc, case-by-case basis, creating substantial uncertainty; as a result, it has suffered from low participation rates and has largely been unsuccessful.²⁰⁹

Fortunately, the recent use of a voluntary risk-bubble system by a nongovernmental organization has provided the opportunity for a real-world evaluation of the system. The following section introduces this

205. Elliott, *supra* note 11, at 180.

206. See *Chevron U.S.A., Inc. v. Natural Res. Def. Council, Inc.*, 467 U.S. 837, 839-40 (1984).

207. Elliott & Charnley, *supra* note 143, at 49.

208. See generally Amoco-U.S. E.P.A., Pollution Prevention Project, Yorktown, Virginia: Executive Summary (1992).

209. Stewart, *supra* note 38, at 67-68.

system, evaluates its operation, and uses it as a framework to discuss the possible implementation of a full-fledged, mandatory risk-bubble system.

B. The Risk Bubble Applied: An Introduction to LEED

In the mid-1990s, the United States Green Building Council (USGBC)²¹⁰ developed a set of voluntary standards for designing environmentally sound buildings.²¹¹ Referred to as the Leadership in Environmental and Energy Design (LEED) standards, the owners of buildings meeting the standards can advertise them as having received LEED certification.²¹² The standards require builders to meet a wide variety of performance goals in five categories: sustainable sites, water efficiency, energy and atmosphere, materials and resources, and indoor environmental quality.²¹³ These standards go far beyond typical air, water, and toxics regulation in several ways. They explicitly deal with the need for pollution prevention.²¹⁴ They focus on sources of pollution, rather than end-of-pipe solutions.²¹⁵ They recognize the need for increased efficiency in the use of materials and energy and the need to design in harmony with ecosystems.²¹⁶ Most of the standards included in LEED are performance based, rather than technology based, but there is a mixture of both types.²¹⁷ In short, they address many of the problems with traditional command-and-control regulation as defined in Part II of this Comment. However, they also go beyond merely reforming the *types* of things regulated to change the *framework* of regulation.

Rather than requiring builders to meet all of the standards, the LEED system merely requires that builders comply with a specified number of them.²¹⁸ Each standard is assigned a certain number of points (usually one point). Certification requires that builders receive a minimum number of points (there are also varying levels of certification, with each level up requiring more points).²¹⁹ There are a couple of required standards, but the

210. The USGBC is a nonprofit organization that has been described as “the nation’s foremost coalition of leaders from across the building industry working to promote buildings that are environmentally responsible, profitable, and healthy places to live and work.” David Eijadi et al., *Introducing Comparative Analysis to the LEED System: A Case for Rational and Regional Application* 2 (2000) (unpublished manuscript, on file with author).

211. UNITED STATES GREEN BUILDING COUNCIL, *LEED GREEN BUILDING RATING SYSTEM VERSION 2.1* (2003), <http://www.usgbc.org/leed> (last visited Aug. 23, 2004) [hereinafter *LEED STANDARDS*].

212. *Id.*

213. *Id.*

214. *Id.*

215. *Id.*

216. *Id.*

217. *Id.*; Eijadi, *supra* note 210, at 8.

218. *LEED STANDARDS*, *supra* note 211.

219. *Id.*

remainder are voluntary.²²⁰ The LEED system therefore meets the basic requirements of intra-firm (in this case, the building substitutes for the "firm") and inter-risk (since builders may choose from a menu of environmental standards) trading.

C. *Evaluating LEED*

Two studies have looked at the performance of the LEED system in practice. Both concluded that LEED provides a successful, cost effective method for dealing with a wide range of environmental harms engendered by building commercial structures. Both also provide suggestions for improving the system, some of which should be considered in designing a comprehensive risk-bubble system.

The first study was commissioned by the city of Portland, Oregon to determine the viability of requiring the incorporation of "green" building techniques into building construction. The authors noted several advantages of the LEED system. First, they found that its comprehensiveness encouraged the design of single solutions with multiple benefits and noted a non-LEED building where a simple change in roofing material could have achieved several LEED points at once.²²¹ In comparison, the construction industry has traditionally optimized each environmental characteristic separately and often considered only a few such characteristics. These traditional practices have sometimes led to lower environmental performance for the building.²²² Second, the study found that LEED's use of a single scorecard, divided into subcategories of standards, was particularly helpful.²²³ The division into subcategories allowed design teams to easily determine which measures could be substituted for one another and quickly indicated the expertise necessary to achieve certification.²²⁴ Third, the authors noted that the increasing use of performance-based standards (as opposed to technology-based standards) in the LEED system allowed for more innovative and lower-cost solutions.²²⁵ Finally, the study found that achieving LEED certification in some cases resulted in actual construction cost savings, either in initial cost, or in lifecycle cost, as compared to standard construction.²²⁶ This finding illustrates the benefits of regulating previously unregulated industry sectors or environmental harms. By shifting environmental regulatory resources to these new areas, it is possible to achieve greater benefits per regulatory dollar than by attempting to squeeze further reductions out of already stringently regulated sources.

220. *Id.*

221. Portland Study, *supra* note 72, at 3-28.

222. *Id.*

223. *Id.* at 6-10.

224. *Id.*

225. *Id.*

226. *Id.* at 3-26, 4-23, 5-22.

The second study is based upon the experiences of builders familiar with the process of building to meet LEED standards. The study found that LEED has been well received by local, state, and federal government entities, and has even been incorporated in the construction of buildings by private entities, despite its voluntary nature.²²⁷ The authors also found that designers maximize what they refer to as the “easy” points.²²⁸ It is not entirely apparent from the study whether “easy” points are low-cost points or standards with which the designers are most familiar. Given the learning costs associated with meeting an unfamiliar standard,²²⁹ it is probably a mixture of both. To the extent that “easy” points do correlate with low-cost points, the study provides some empirical support for the theory that regulated parties will act to minimize their total regulatory cost.

This study also provides an important suggestion for the improvement of LEED. Currently, the system is uniform nationwide. It does not take into account the fact that, depending upon the locality, risks will produce varying levels of harm. The authors of the report argue that this should be changed, pointing to the crucial need to give priority to water conservation credits in the Southwest, but the relative unimportance of water conservation in the water-abundant upper-Midwest.²³⁰ The authors are correct in this criticism. For a risk bubble to be most effective, it must make accurate estimations of harm, including bioregional variations, unless measuring the variations in question would be cost prohibitive. The study also calls for a more rigorous comparison of the relative values of the credits. As discussed above, the transparency with which competing environmental priorities are displayed in a risk bubble facilitates constructive criticism of this sort. In summary, both of these studies suggest that, although LEED has room for improvement, it has proven successful both in terms of environmental benefit and cost effectiveness, despite its voluntary nature.

227. Eijadi, *supra* note 210, at 2. Informal responses by builders utilizing the LEED system have also been positive. See, e.g., UNITED STATES NAVY, BACHELOR ENLISTED QUARTERS (BEQ 99) CASE STUDY (1999), at <http://www.epa.gov/opptintr/epp/pilot/navybeqcase.htm> (last modified May 24, 2004); WORLD BUSINESS COUNCIL FOR SUSTAINABLE DEVELOPMENT, CH2M HILL CASE STUDY, at <http://www.wbcd.org/plugins/DocSearch/details.asp?txtDocTitle=&txtDocText=ch2m&StrCharTextList=&StrCharValList=&strDocTypeList=I&DateStart=01.01.1753&DateEnd=31.12.9999&DocType=Case%20studies&URLBack=%2Fplugins%2FDocSearch%2Fresult%2Easp%3FtxtDocTitle%3D%26txtDocText%3Dch2m%26StrCharTextList%3D%26StrCharValList%3D%26strDocTypeList%3D1%26DateStart%3D01%2E01%2E1753%26DateEnd%3D31%2E12%2E9999%26DocType%3DCase+studies%26SortOrder%3Dpubdate+desc%2C+company+asc%26CurPage%3D1&ObjectId=611> (last visited Nov. 9, 2004). LEED's success does not result from setting a low bar. The Portland Study found that standard building practice is insufficient to meet even the lowest LEED standard, and that even building practices considered “cutting edge” were generally insufficient. PORTLAND STUDY, *supra* note 72, at 6-2.

228. Eijadi, *supra* note 210, at 3.

229. See Malloy, *supra* note 90, at 556.

230. Eijadi, *supra* note 210, at 8.

IV

CONSIDERATIONS IN THE DESIGN OF A RISK-BUBBLE SYSTEM

A fully implemented risk bubble must include several components. First, it requires an index in order to compare between harms and to determine when the required overall level of harm reduction has been achieved. Second, it must identify all the allowable harm-reducing activities and include enough activities to allow meaningful opportunities for trades. Next, it must include a method for administration. This will likely be some type of permit, verifying the activities currently undertaken by the business to achieve compliance and specifying the mechanism for informing the regulatory authority of trades between activities. Finally, the system requires a method of adjustment; regulators will want to refine the risk bubble when new information becomes available, demonstrating either that the original index makes inaccurate comparisons, or that the system as a whole is overly stringent, so that compliance costs exceed benefits, or overly lax. This Part explores each of these components in greater detail.

The first consideration in designing the system will be determining the appropriate index for trades. When comparing broadly varying risks, probably the best solution will be to assess the value of a risk in dollars, and then assign a point for a certain number of dollars of harm reduced. The principal objection to using money as an index is that it necessarily requires converting aesthetic, spiritual, and other difficult-to-quantify values into dollar figures, and that this simply should not be done,²³¹ or that doing so is inherently inaccurate.²³² However, the great advantage of using a monetary index is that it allows for comparison in easily recognizable terms, and, provided the method of calculation is transparent, encourages open debates about valuation.²³³ As discussed previously, this is preferable to the *de facto* setting of environmental priorities that occurs under the present system. These comparative value judgments must be made up front; otherwise, a risk bubble will suffer the fate of EPA's Project XL, which allowed trades only after the EPA made post hoc judgments about the comparative value of pollution reduction activities.²³⁴

The next major task in setting up a risk bubble is to determine which actions will receive points. The first point to consider in this discussion, also raised by one of the studies of LEED, is that the standards and point values used should vary according to bioregion, in order to capture the varying sensitivities of the different ecosystems to similar human actions.

231. Hsu, *supra* note 193, at 44.

232. Brian R. Binger et al., *The Use of Contingent Valuation Methodology in Natural Resource Damage Assessments: Legal Fact and Economic Fiction*, 89 Nw. U.L. Rev. 1029, 1030 (1995).

233. See Hsu, *supra* note 193, at 56 (demonstrating how use of cost-benefit analysis leads to greater transparency in decision making).

234. See Steinzor, *supra* note 190, at 135-36.

For example, companies in the arid West would receive more points for water efficiency improvements than companies in the upper-Midwest. Thus, regions could address bioregional problems while remaining within a comprehensive framework. Next, the system would also vary by industry. Industries create different types of harm, and the system must be tailored to recognize this fact. Otherwise, regulators run the risk that not enough actions will apply to a given industry to facilitate trading. Finally, in assigning points, regulators should use performance-based standards wherever possible. Technology-based standards should only be used in the cases of difficult-to-monitor emissions and process standards. This will ensure that enough incentives remain to continue to lower costs within the risk bubble.

Finally, regulators should keep an open mind as to what sorts of activities create environmental harm and benefit. For example, the risk bubble could encompass a firm's decision to report environmental indicators, to use an environmental management system, or to use environmental accounting principles. While these are each process, rather than performance, standards, each produces environmental benefits.²³⁵ Thus, including them as options for accumulating points under the system gives firms several nontraditional, though potentially beneficial, choices. Regulators could also apply the risk bubble to decisions related to a firm's supply chain. Retailers, for example, could get points for choosing to sell products that meet high environmental standards. If the retailer has sufficient leverage, awarding a point for this action would increase cost effectiveness by creating an incentive for harm reduction by those who can reduce it least expensively: the producers.²³⁶ To encourage innovation, a point could be awarded for the development and use of a new technology that performs at least as well as the current standard requires.²³⁷ Regulators might also borrow from the LEED system and require all firms to meet a minimum number of points, but offer certification awards for firms that voluntarily achieve a higher number of points. Firms that highly value their community reputations might have an incentive to exceed the performance of their competitors.²³⁸

After the points are determined, the next issue is ensuring compliance. In order to do this in a cost effective manner, a risk-bubble system should operate using a single permit. Current regulations require different permits for each regulated medium. This increases both the overall cost to the firms, who must navigate the permitting process multiple times, and the

235. See Malloy, *supra* note 90, at 602-04.

236. See Salzman, *supra* note 37, at 411 (demonstrating the advantages of using retailers to place pressure on producers).

237. LEED grants a point for this type of innovation, but requires that the innovation involve an area not currently covered by the program. See LEED STANDARDS, *supra* note 211.

238. See James Salzman, *Informing the Green Consumer: The Debate Over the Use and Abuse of Environmental Labels*, 1 J. INDUS. ECOLOGY 11 (1997) (discussing ecolabels).

amount of time expended to secure the necessary permits.²³⁹ The LEED certification process exemplifies an alternative, more efficient system. It results in a single document for all regulated mediums after evaluation by a single inspector.²⁴⁰ Sweden has attempted a similar single-permit style of regulation and found it to be more cost effective than multiple-permit systems.²⁴¹

Relatedly, regulators must recognize that industries and individual businesses vary in terms of their technical resources. By providing technical assistance to help smaller firms achieve cost effective compliance, regulators can both increase overall levels of compliance and avoid squandering some of the unique advantages of the risk-bubble system.²⁴² Implementation of the risk-bubble system should include technical support both to help firms follow compliance procedures and to identify low-cost strategies.

Finally, the system must provide for a method of adjustment. After the initial comparison ratios are set and the system has been in operation for some time, it will inevitably be necessary to adjust the ratios. If science determines that a given risk is actually more harmful than initially thought, then a reduction in that risk becomes more valuable to society. This leads to a corresponding increase in the point value for the activity, which should in turn encourage firms to decrease the activities that cause the risk. Conversely, if regulators discover that abating a particular harm is less valuable than previously thought, the standard would drop in point value. For example, assume that one point equals \$10,000 in abated harm. A 10% reduction in harm X is initially thought to abate \$10,000 in harm, and the 10% reduction therefore receives one point.²⁴³ Later, regulators learn that the 10% reduction in X actually abates \$20,000 in harm. The same 10% reduction would then become worth two points. As society's knowledge of environmental risks evolves, it will also become necessary to adjust the *total* amount of harm that a facility is abating. This alteration is made by simply increasing or decreasing the number of points necessary to achieve compliance.

The concerns identified here are merely the tip of the iceberg in risk-bubble design. They are offered to sketch the outline of a fully imple-

239. See Robert Stavins & Bradley Whitehead, *supra* note 111, at 112-13 (noting that expediting the permit application process for firms who choose to participate in new programs can encourage participation).

240. LEED STANDARDS, *supra* note 211.

241. Nigel Haigh & Frances Irwin, *What are the Options?*, in *INTEGRATED POLLUTION CONTROL IN EUROPE AND NORTH AMERICA* 31, 36-37 (Nigel Haigh & Frances Irwin eds., 1990).

242. See Fiorino, *supra* note 58, at 481 (discussing the relative inability of smaller firms to take advantage of flexible tools designed to lower compliance costs).

243. Note that there is no reason why abatement of a given harm should be restricted to one harm reduction and its corresponding point value. In the case above, if the harm curve were linear, regulators could offer a second point for a 20% reduction, three for a 30% reduction, and so on.

mented risk-bubble system. Because the full range of design concerns will depend upon the context in which a risk bubble is applied, a more detailed design analysis is beyond the scope of this paper. The overarching design concern, however, is that regulators must draw on the lessons learned from the last thirty years of environmental regulation and design the regulatory tool to match the problem they face.

CONCLUSION

The current environmental regulatory system in the United States has achieved many successes, but it continues to allow problematic degradation. It is under-inclusive in the types and sources of environmental harm it addresses and it is all too often not cost effective. The most commonly proposed alternatives to the standard command-and-control approach offer some promise, but have limitations that prevent them from being optimal tools for filling the gaps in the regulatory structure. This Comment demonstrates that a risk bubble that permits intra-firm trading between different types of environmental harms offers advantages that make it well-suited to address many of the current environmental regulatory structure's most challenging problems. This type of risk bubble has a unique ability to cost effectively regulate sources of harm that are prohibitively expensive to monitor. Its use could therefore offer a viable method of regulating farms and the service sector, which possess many such sources of harm. It also offers a politically more viable alternative to taxation in the regulation of harm created by U.S. business's use of natural resources where such use causes harm outside the United States. Finally, it can be adjusted more easily than either a tax system or a tradable permit system, making it particularly suitable to regulating harms whose size is presently uncertain. Although there is currently only one fully fledged example of this type of risk bubble, early studies show that it has borne out the theoretical advantages described by this Comment and therefore merits consideration as an alternative to the more commonly proposed environmental regulatory tools.