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This chapter focuses on the means of environmental regulation—the techniques regulators use to reduce pollution. It discusses traditional regulation (often called command-and-control regulation), the economic theory undergirding market-based environmental regulation, and increased use of market mechanisms. This treatment of market mechanisms will consider them in institutional context, showing how a multilevel governance system implements market mechanisms.

Traditional Regulation

Prior to 1970, common law courts played a leading role in addressing environmental problems in many countries. When pollution invaded property rights, property owners would ask judges to award damages and order pollution abatement, claiming that the pollution constituted a trespass—an invasion of property, or a nuisance—an unreasonable interference with the use and enjoyment of property.[1] Ironically, as environmental problems grew worse, common law adjudication of environmental disputes became less effective, because proving that a particular property owner had caused a significant harm became difficult when many different polluters contributed to an environmental problem.[2]

In the 1970s, developed country governments responded to growing environmental problems by enacting statutes creating environmental ministries and authorizing them to regulate significant pollution sources. Sometimes these statutes contained specific requirements for specific industries, but more often they authorized

[1] *See, e.g.*, Castles Auto & Truck Service v. Exxon, 16 Fed. Appx. 163 (4th Cir. 2001); Georgia v. Tennessee Copper, 206 U.S. 230 (1907); Fletcher v. Rylands, L.R. 3 H.L. 330 (1868); Alfred's Case, 77 Eng. Rep. 816 (1611).

[2] See Chris Schroeder, *Lost in the Translation: What Environmental Regulation Does that Tort Cannot Duplicate,* 41 WASHBURN L. J. 583 (2002); *see, e.g.*, Missouri v. Illinois, 200 U.S. 496 (1906).

environmental ministries to regulate polluters under general criteria established in a statute. Many of these statutes aimed to fully protect public health and the environment. But they often approached these lofty goals incrementally, relying heavily upon technology-based regulation. Under this technology-based approach, environmental ministries set regulatory requirements for particular industries or firms that reflect pollution reduction technologies' capabilities. The resulting technology-based regulations secured significant reductions in environmental hazards in spite of population and consumption increases, even though they often did not fully protect public health and the environment.

Most commentators refer to technology-based regulation as command and control regulation. This term suggests that environmental ministries regularly dictate technological choices to regulated firms. Technology-based regulation, however, offers some technological flexibility, when doing so is compatible with enforcement. Environmental regulators usually implement technology-based standards through performance standards, which require polluters to meet a particular pollution reduction target, rather than dictate use of a preferred technology. This approach gives polluters the freedom to choose any technology they like, as long as they meet the quantitative pollution level required by the regulator. For example, when the United States Environmental Protection Agency (EPA) established a New Source Performance Standard for sulfur dioxide emissions from coal-fired power plants, it required that plant operators either meet a pounds of sulfur dioxide per million British Thermal Units target or a percentage reduction requirement for sulfur dioxide emissions.[3] While EPA anticipated that most utilities would employ "scrubbers" to meet this target, this

[3] *See* Sierra Club v. Costle, 657 F.2d 298 (D.C. Cir. 1981)

performance standard allowed them to choose any type of scrubber or any other technology that would meet this target.[4]

In cases where monitoring of pollution levels was not feasible, however, environmental ministries often impose "work practice" standards— i.e. standards that dictate a particular technological approach.[5] For example, when EPA sought to regulate asbestos emissions stemming from building demolition, it recognized that measurement of these emissions would be impossible, so it required contractors to follow a specific set of procedures, such as wetting the asbestos, which would reduce emissions. Thus, traditional regulation relies heavily on technology-based rules implemented through a mixture of performance and work practice standards.

Traditional regulation often relies upon *uniform* performance standards, *i.e.* standards that require the same amount of pollution reduction from each plant in a regulated industry. Uniform standards allow regulators to address pollution from an entire category of pollution sources in a single proceeding and create a level playing field for competitors within an industry.

Commentators often invoke a dichotomy between command-and-control regulation and market mechanisms when discussing environmental regulation.[6] While this dichotomy provides a convenient shorthand, both traditional regulation and so-called market mechanisms create markets.[7] Traditional regulation requires polluters to reduce pollution. As a result, regulated firms respond to these regulations by purchasing

[4] *See* David M. Driesen, *Is Emissions Trading an Economic Incentive Program? Replacing the Command and Control/Economic Incentive Dichotomy,* 55 WASH. & LEE L. REV. 289, 300 (1998).
[5] *See, e.g.,* Adamo Wrecking Co. v. United States, 434 U.S. 275 (1978).
[6] *See* Driesen, *supra* note 4.
[7] *See* Samuel P. Hays, *The Future of Environmental Regulation,* 15 J.L. & COM. 549, 565-66 (1996).

pollution control devices and services, thus creating an environmental services market.[8] Conversely, we shall see that market mechanisms, like traditional regulation, generally depend on effective government decision-making for their success.

In the 1980s, governance philosophies began to shift around the world, especially in English speaking countries. President Reagan (US) and Prime Minister Thatcher (UK) glorified free markets and adopted policies reflecting skepticism of government regulation. They enjoyed intellectual support from a burgeoning law and economics movement. The law and economics movement tended to see free markets as a governance model and adopted economic efficiency, rather than full protection of public health and the environment, as a major goal. In the United States, companies hoping to escape the burdens of strict government regulation funded think tanks to spread the free market gospel. These think tanks supported pro-business government officials, like President Reagan, in their efforts to reform or eliminate regulation.

The rise of neoliberalism—the cultural exaltation of free markets—fueled criticism of traditional environmental regulation and a call for reform. Neoliberal critics referred to traditional regulation as "command and control" regulation, thus suggesting that it was overly prescriptive. Critics derided uniform standards as a "one-size-fits-all" approach, suggesting the need for greater flexibility. And many of them advocated two primary reforms— increased use of market mechanisms as the means of environmental regulation, this chapter's theme, and use of cost-benefit analysis as a check on environmental regulation's stringency, the topic of Chapter 15.

Economic Theory and Market Mechanisms

[8] *See* EBAN GOODSTEIN, THE TRADE-OFF MYTH: FACT AND FICTION ABOUT JOBS AND THE ENVIRONMENT 171 (1999).

By convention, the term "market mechanisms" refers primarily to pollution taxes and environmental benefit trading. This part will discuss the economic theory underlying these two approaches. It will then briefly address three other approaches sometimes discussed as market mechanisms – the offering of subsidies for low polluting technologies, the use of information to create incentives for environmental improvement and a more radical reform, and simple abandonment of regulation by environmental ministries in favor of voluntary regulation (which is covered more extensively elsewhere in this book).

Market-based approaches address an efficiency problem arising from the use of uniform standards. Pollution control costs usually vary significantly from plant to plant even within the same industry. This implies that an approach that shifted emission reductions from facilities with high pollution control costs to facilities with low pollution control costs could achieve any given industry-wide regulatory target at lower cost than a uniform standard would. Market-based mechanisms encourage this sort of shift thereby increasing the cost effectiveness of pollution control.

Economists often recommend that governments levy a tax on each pound of pollution emitted in order to create an incentive for cost effective pollution abatement. Once a government establishes a tax rate, polluters will presumably implement pollution reduction projects when such projects have marginal costs less than that of paying the tax. Conversely, polluters with pollution control options costing more than the tax rate presumably would choose to pay the tax and continue polluting. Thus, a pollution tax efficiently shifts reductions from high to low cost facilities.

This approach limits the cost of environmental protection, but makes environmental results somewhat unpredictable. Results will depend on voluntary responses by polluters to the tax. On the other hand, taxes place a cost on each unit of emissions, thereby creating a continuous incentive to reduce pollution. Also, taxes raise revenue, which can be used to subsidize environmental improvements or for other societal goals. Such taxes can be revenue neutral, if other taxes are reduced when a pollution tax is enacted. Unfortunately though, pollution taxes create a conflict between the goal of providing reliable finance to government and encouraging pollution abatement. Pollution abatement implies foregone tax revenue; significant tax revenue implies foregone emission reductions. On the other hand, some environmental taxation proponents claims that combining taxes on bads (pollution) with reduction of taxes on the good of wage income can yield a "double dividend," cleaning the environment and increasing employment simultaneously.

The literature usually credits the Canadian economist J. H. Dales with creating an alternative to the environmental taxation approach, environmental benefit trading.[9] Under an environmental benefit trading approach, the government establishes a performance standard for plants, just as in traditional regulation. But the government authorizes facility owners to forego the required environmental improvement if they pay somebody else to make extra improvements in their stead. Under this approach polluters with high marginal control costs will avoid making pollution reductions at their own facility and presumably pay for reductions elsewhere. Conversely, polluters with low marginal control costs will generate additional reductions to sell to those with high

[9] *See* J. H. DALES, POLLUTION, PROPERTY, AND PRICES (1968); *cf.* DANIEL COLE, POLLUTION & PROPERTY: COMPARING OWNERSHIP INSTITUTIONS FOR ENVIRONMENTAL PROTECTION x (2002).

marginal control costs. The shift of reductions to low cost facilities implies that private firms will achieve the government's chosen regulatory target at lower cost than would be possible under a uniform standards approach.

A well-designed environmental benefit trading provides more certainty about the quantity of reductions than a pollution tax. But this quantitative mechanism provides less certainty about cost than a pricing mechanism like a pollution tax.

This approach usually provides only limited incentives to reduce emissions. There is no incentive to make reductions once the regulators' limited goals have been achieved. This can be cured, however, by auctioning off, rather than giving away, pollution allowances. In the past, polluters' preferences for free allowances have prevented substantial auctioning of allowances. But recently some regulators have moved toward auctioning allowances in programs addressing global climate change.

Governments sometimes encourage environmental improvements by subsidizing them. Brazil, for example, has successfully employed subsidies as a key element of a successful strategy to develop a biofuels industry. And many countries in Europe employ feed-in tariffs, guarantees of artificially high prices, to encourage renewable energy, sometimes with great success.[10]

Just as a tax can help internalize an externalized cost, a subsidy can help internalize clean technology's environmental benefits, thereby having the same desirable economic effect. But special interests tend to grow up around subsidies and demand their continuation long after the rationale for them has vanished. Thus, governments around the world heavily subsidize fossil fuels, a mature and environmentally devastating

[10] *See* MIGUEL MENDONCA, FEED-IN TARIFFS: ACCELERATING THE DEPLOYMENT OF RENEWABLE ENERGY 43 (2007)

industry that probably should be heavily taxed rather than subsidized. Yet, governments have sometimes managed subsidies effectively. For example, Brazil has actually reduced its subsidies to its biofuel industry as the industry has become economically viable.

Most commentators treat efforts to use information to motivate private decisions favoring the environment as market mechanisms. The United States in the late 1980s enacted a "Right-to-Know" law requiring chemical companies and other large manufacturers to report their releases of toxic chemicals into the environment. The law required EPA to create a Toxics Release Inventory (TRI) to report the data to the public. Subsequently, many OECD countries enacted similar mandatory disclosure laws. When firms implementing this law sought, often for the first time, to fully characterize their releases of toxic chemicals into the environment they discovered more releases than they anticipated. Many firms responded to these revelations with voluntary efforts to reduce some of these releases. [11] We need more research into what motivated these decisions. The suggestion that the Right-to-Know Law constitutes a market mechanism implies that firms feared that high numbers in the TRI would trigger declining sales or stock prices. But it is at least possible that more general concerns about reputation in the community, fears of more stringent government regulation, or even genuine concern about their impact on the health of people working in or living near their facilities might have motivated them. These motivations might imply that reputational, regulatory, or moral incentives play a greater role than economic ones.

The European Union has spearheaded the use of eco-labels to inform consumers about the environmental attributes of products, in hopes of motivating consumers to make

[11] *See* Bradley C. Karkkainen, *Information as Environmental Regulation: TRI and Performance Benchmarking, Precursor to a New Paradigm*, 89 GEORGETOWN L. J. 257 (2001).

environmentally friendly purchasing decisions. A more modest and targeted program in the United States to label tuna caught in ways that do not endanger dolphins as "dolphin-safe" survived an attack before the World Trade Organization. Economists only hypothesize that free markets work optimally when market actors have perfect information, and recognize the pervasiveness of incomplete information. Informational strategies can partially remedy this market defect. In general, informing consumers and shareholders about the environmental attributes of products in hopes of motivating market actors to favor more environmentally friendly approaches constitutes another alternative or supplement to traditional regulation.

Economic theory does not support a more radical reform embraced by some free market champions and government officials, the simple abandonment of regulation. Economic theory in general recognizes that private transactions do not take into the costs pollution imposes on society—the harms to human health and the environment— into account. It characterizes these costs as "externalities," costs not internalized in market transactions. It therefore recognizes that some environmental regulation is justified. Still voluntary programs can work well where protecting the environment is profitable. So programs providing information to encourage greater energy efficiency among market actors have enjoyed significant successes. Environmentalists have also embraced voluntary programs when political factors make government regulation completely ineffective, as for example in efforts to conserve tropical rainforests through sustainable logging practices, which governments have found difficult to mandate and enforce. While the wholesale abandonment of regulation has not been popular with the public and

enjoys no support in economic theory, some radical neoliberals and government officials embrace it.

The Rise of Market Mechanisms

During the 1970s, government officials occasionally discussed market-based mechanisms and generally found them impractical. During the 1980s, however, the debate shifted as neoliberalism began its ascent. At the beginning of the decade market mechanisms enjoyed narrow, but somewhat powerful, support. That support primarily came from regulated industries and pro-business government officials in the United States. Many of these supporters regarded government regulation as too burdensome and saw market-based mechanisms as tools to reduce the burden in spite of public support for environmental regulation. Environmental lobbies saw these mechanisms primarily as methods of evading pollution control and tended to oppose them.

By the end of the 1980s, however, the debate had changed dramatically, at least in the United States. Environmental benefit trading by then had picked up the support of a wide variety of experts. The more technocratic environmental lobbies and consultancies, most notably the Environmental Defense Fund in the United States, embraced market mechanisms. Increasingly, the debate became focused not so much on the question of whether market-mechanisms were a plausible idea, but around the issues of how to design them properly and when to use them. Environmental taxation, however, enjoyed little support in the United States, the neoliberal ascent having increased hostility toward taxation generally.

In continental Europe, by contrast, significant support existed for environmental taxation in some countries, in keeping with the recommendations of many experts. Support for environmental benefit trading, however, developed later.

Governments have used ecological taxes, primarily in Europe. While some of these taxes are pure pollution taxes, which are levied on a dollar per ton of pollutant bases, most are more indirect. Examples of rather direct pollution taxes include Korea's tax on sulfur emissions and Swedish, Norwegian, Danish, and Czech taxes on fuel's sulfur content, which correlates with sulfur emissions. Indirect taxes, such as high taxes on petrol in Europe can serve environmental goals, as petrol causes many environmental problems. Singapore charges high taxes on automobiles, fees for vehicle entry into the city, and charges for rush hour driving to discourage congestion and the associated vehicular air pollution. London has recently adopted a broadly similar congestion pricing scheme and New York City tried to follow suit, but the New York State legislature has so far declined to allow New York City to emulate Singapore and London's environmental leadership. Relatively few countries have implemented sufficiently high pollution taxes to motivate substantial emission reductions. And many ecological taxes contain exemptions for high polluting industries, which greatly weakens their efficacy. Still, some taxes, such as France's water pollution tax, have proven effective.

Competitiveness concerns accompanying globalization have impeded more robust development of pollution taxes. The European Union, for example, considered a carbon tax in the early 1990s as a means of addressing global warming. But concerns about whether a carbon tax could adequately address competitiveness concerns without running afoul of World Trade Organization rules played a role in abandonment of community-

wide taxation as the primary means of addressing climate change. Still, several European countries, including Sweden, Denmark, and Germany, have subsequently adopted carbon taxes as part of their strategy to address global climate change.

Environmental benefit trading has become a much more widely used approach, primarily because of the United States' influence. The United States began experimenting with trading when it adopted project-based trading programs in the late 1970s. These programs treated facilities generating air emissions as if they were encased in a bubble, focusing on plant-wide emissions, rather than achieving pollution reduction targets at each smokestack or other pollution source within a facility. The bubble programs (as they were called) allowed polluters to increase pollution at some units within a facility, if they reduced pollution sufficiently at other units within the same facility.

The bubble programs produced large cost savings, but also a lot of evasion of emission reduction obligations.[12] They failed (environmentally speaking) largely because they allowed pollution sources that were not subject to caps or strict monitoring of pollution levels to produce and sell emission reduction credits. This approach gave rise to a host of problems. Polluters often claimed credit for reductions that would have occurred anyway, rather than additional reductions. These credits then would justify foregoing otherwise required new emission reductions. Thus, a planned emission

[12] *See* Driesen, *supra* note n. ____, notes 120-127 and accompanying text (reviewing evidence and refuting defenses of bubbles' integrity in the economics literature); CALIFORNIA AIR RESOURCES BOARD AND UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, PHASE III RULE EFFECTIVENESS STUDY OF THE AEROSPACE COATING INDUSTRY 4 (1990) (finding that almost all large sources operating under a bubble are not achieving required reductions); RICHARD A. LIROFF, REFORMING AIR POLLUTION REGULATION: THE TOIL AND TROUBLE OF EPA'S BUBBLE 62-67, 89-91(1986) (providing examples); David Doniger, *The Dark Side of the Bubble*, 4 ENVTL. F., July, 1985, 33, 34-35 (same); RICHARD A. LIROFF, AIR POLLUTION OFFSETS: TRADING, SELLING AND BANKING 22 (1980) (explaining that offsets can be a "meaningless paper game").

reduction would basically be lost. Similarly, facility owners would shut down uneconomic facilities and claim a credit for the emission reduction associated with ceasing operations. This phantom credit would live on, justifying foregoing new emission reduction obligations, even after the facility died. Shutdowns could easily lead to pollution increases at competing facilities, which could ramp up production to meet the demand the closed facility had previously met. Because no cap applied to the industry as a whole, the programs could not account for these demand shifts, which would in effect mean that, once again, bubbles lost planned emission reductions.

In 1990, however, the United States created a model program, the acid rain program.[13] Because of its excellent design it garnered the support of many environmental lobbies, including the Natural Resources Defense Council (NRDC), which in the past had been a technically sophisticated opponent of trading. This program capped the pollution levels of the major sources of sulfur dioxide, the principle pollutant responsible for acid rain, at levels representing a significant emission reduction. It also imposed stringent monitoring requirements and generally only allowed well-monitored capped sources to generate credits. This program produced significant pollution reduction at low cost and with exceptionally high compliance rates.

During the 1990s, international negotiations addressing global climate change became a forum for debate about market-based mechanisms. This debate occurred, because the United States, along with several of its closest allies, wanted environmental benefit trading incorporated in the climate change regime. The European Union greeted the idea of global environmental benefit trading with some skepticism, because of

[13] *See* Brennan Van Dyke, *Emissions Trading to Reduce Acid Deposition*, 100 YALE L. J. 2707 (1991); Nancy Kete, *The U.S. Acid Rain Allowance Trading System, in* OECD, CLIMATE CHANGE: DESIGNING A TRADABLE PERMIT SYSTEM 78-108 (1992)

concerns about the efficacy of international environmental benefit trading. Developing countries viewed trading as an effort by developed countries to simply evade their responsibility to reduce greenhouse gas emissions, and therefore as inequitable.[14]

In spite of this skepticism, the countries adopting the Kyoto Protocol to the Framework Convention on Climate Change (Kyoto Protocol) eventually agreed to a globalized environmental benefit trading approach.[15] Under the Kyoto Protocol, countries and their nationals can purchase credits generated abroad to help them meet national emission reduction targets established in the agreement. The European Union, perhaps surprisingly, has made this approach a centerpiece of its effort to comply with Kyoto targets even after the United States declined to ratify the Kyoto Protocol.

The European Union (EU) adopted a Directive creating the EU Emissions Trading Scheme (ETS). The ETS required national governments, subject to European Commission oversight, to limit the emissions of listed large industries. The ETS calls for two phases, requiring member countries to develop National Allocation Plans (NAPs) setting a cap for phase one and then making the caps stricter in phase two. The first NAPs allocated too many allowances to regulated sources, and therefore led to a failure to realize emission reductions and a collapse in the price of pollution reduction credits generated to sell into the market. As of this writing, the European Commission has disapproved most of the NAPs submitted for phase two, and the Commission and the member states are working on the issue of how much reduction the phase two NAPs should require.

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[14] *See generally* JOYEETA GUPTA, TH E CLIMATE CHANGE CONVENTION AND DEVELOPING COUNTRIES: FROM CONFLICT TO CONSENSUS (1997)

[15] *See* Kyoto Protocol to the Framework Convention on Climate Change. U.N. Doc. FCCC/AGBM/1997/Misc.1/Add.9 (1997), *reprinted without certain technical corrections in* 37 I.L.M. 22 (1998) [hereinafter Kyoto Protocol].

The EU also has adopted a "linking directive," which allows European countries and their nationals to purchase credits realized through emission reduction projects undertaken outside the EU. Thus, the ETS has become a hybrid program, combining elements of the cap-and-trade approach successfully employed in the United States to address acid rain with crediting from project-based mechanisms that have a lot in common with the failed bubble programs.

The Kyoto Protocol's Clean Development Mechanism (CDM) exemplifies the problematic nature of project-based trading. This mechanism allows project developers to earn pollution reduction credits through pollution reducing projects in developing countries, even though these countries are not subject to caps on their emissions. The Kyoto Protocol seeks to avoid the problems of the bubble programs by requiring that projects provide "additional" emission reductions.[16] But the CDM's Executive Board (the primary oversight body) has approved many projects where only a tiny fraction of project revenue comes from credit purchases. Under such circumstances, it is very likely that these projects would have been undertaken without the availability of pollution reduction credit.[17] Once the credit is approved and sold, however, the purchaser will use the credit to justify not making an otherwise required reduction. Thus, an emission reduction is lost and no additional emission reduction is realized to compensate for this loss. Recent research suggests that these project-based trades have produced a significant loss of emission reductions.[18] This subject, however, certainly requires additional

[16] *See* Axel Michaelowa, *Determination of Baselines and Additionality for the CDM: A Crucial Element of Credibility of the Climate Regime, in* CLIMATE CHANGE AND CARBON MARKETS: A HANDBOOK OF EMISSION REDUCTION METHODS (F. Yamin ed. 2005).
[17] *See* C Sutter & J.C. Parreño, *Does the Current Clean Development Mechanism Deliver its Sustainable Development Claim? An Analysis of Officially Registered CDM Projects*, 84 CLIMATIC CHANGE 75 (2007).
[18] *See* Larry Lohman, *Accounting, Organizations, and Society*, at 12 (2008) (forthcoming); MICHAEL WARA & DAVID G. VICTOR, A REALISTIC POLICY ON INTERNATIONAL CARBON OFFSETS, (Program on

research. In the past, follow-up studies have been too sporadic, but usually quite damning in the project-based context.

Another problem feared by a number of analysts involves so-called "hot air" credits undermining the achievements of the Kyoto Protocol. Countries formerly part of the Soviet Union, including Russia, assumed caps substantially higher than their current emission under the Kyoto Protocol. These higher caps reflected hard bargaining by Russia and the decline in emissions after 1990 that came about as an artifact of economic collapse in the former Soviet Union. These countries could, in principle, sell credits reflecting the difference between their current emissions and their cap to countries with real emission reduction obligations under the Kyoto Protocol. These countries, in turn, could completely forego any real effort to reduce emissions, achieving virtual compliance through purchase of phantom credits. So far, the possibility of credits becoming more valuable in the future and EU member states' concerns about their environmental credibility has limited the use of hot air credits. But this sort of problem may yet undermine the Kyoto Protocol's achievements, as member states approach their compliance deadlines and face hard choices between making real changes and buying their way out of their obligations. The main point is that a well designed trading program can succeed, but most trading programs afford multiple opportunities to evade compliance obligations in complicated ways that can sometimes escape public recognition.

Since the adoption of the EU ETS, the debate on market mechanisms has shifted markedly, especially within continental Europe. The debate focuses heavily on questions

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Energy and Sustainable Development Working Paper #74, 2008), *available at* http://pesd.stanford.edu/publications/a_realistic_policy_on_international_carbon_offsets/; Michael Wara, *Is the Global Carbon Market Working?* 445 NATURE 595 (2007).

of design and institutional architecture, and less on the question of whether trading is workable in an international context.

In the wake of the acid rain program's success, many countries adopted environmental trading approaches even apart from the climate change context and it became a dominant regulatory strategy within the United States. The use of tradable fishing quotas as a fishery management tool, for example, became common around the world.[19] Under this approach, regulators limit the allowable catch, just as they might without a trading program, in order to conserve a fishery. But they allow those who catch fewer fish than their quota permits to sell the unused portion of the quota to other fishermen, who can use the purchased allowances to justify exceeding their quota. These programs have generated controversy; as they are difficult to monitor and do not effectively address the problem of bycatch (catching too much fish not subject to the quota regime) or ecosystem effects.[20]

Regulatory scholars think of market-based mechanisms as examples of privatization, since both environmental taxation and environmental benefit trading provide greater scope for private choice than traditional regulation. Taxes allow private parties to decide whether to reduce environmental impacts at all; trading allows private parties to choose the location of reductions and the technology used. Both taxes and

[19] *See* Suzi Kerr, *Evaluation of the Cost Effectiveness of the New Zealand Individual Transferable Quota Fisheries Market, in* TRADABLE PERMITS: POLICY EVALUATION, DESIGN, AND REFORM (OECD 2004); M.D. Young, *The Design of Fishing-Right Systems-The NSW Experience,* 31 ECOLOGICAL ECONOMICS 305 (1999); W. Davidson, *Lessons from Twenty Years of Experience with Property Rights in the Dutch Fishery, in* THE DEFINITION AND ALLOCATION OF USE RIGHTS IN EUROPEAN FISHERIES: PROCEEDINGS OF A SECOND WORKSHOP HELD IN BREST, FRANCE, 5-7 MAY 1999 (A. Hatcher & K. Robinson eds. 1999); L.G. Anderson, *Privatizing Open Access Fisheries: Individual Transferable Quotas, in* THE HANDBOOK OF ENVIRONMENTAL ECONOMICS (D.W. Bromley ed. 1995); J.J.C. Ginter, *The Alaska Community Development Quota Fisheries Management Program,* 28 OCEAN & COASTAL MGM'T 147 (1995)

[20] *See* Tom Tietenberg, *Tradable Permits in Principle and Practice, in* MOVING TO MARKETS IN ENVIRONMENTAL REGULATION 71-75 (Jody Freeman & Charles D. Kolstad eds. 2007).

trading, however, depend heavily upon the efficacy of government decision-making, since governments must choose a sufficient tax rate or regulatory cap in order for market mechanisms to be effective.

Both forms of regulation also require effective government enforcement. A tax on each pound of emissions requires measurement of emissions. If the government lacks the capacity to adequately monitor taxed emissions, then polluters can evade their tax obligation by understating their emissions. Trading further complicates enforcement by requiring measurement of emission reductions in two places in order to verify that one party has complied with the terms of a trading program. When a polluter exceeds its allowance and relies on purchased allowances to make up the difference, it has only complied if the allowances purchased reflect the amount of pollution reduction claimed and the actual emissions at its facility exceed the limit by the proper amount and not more. This means regulators must verify both claimed debits and credits to know whether a facility has complied with a pollution reduction obligation through trading. Broad trading programs can multiply the number and types of credits requiring verification and therefore strain regulatory capacity, but narrower programs can be well monitored.

Thus, the acid rain program succeeded largely because the United States Congress imposed a cap demanding a large reduction in emissions and required state-of-the-art continuous emissions monitoring. By contrast, programs with less demanding emission limits underlying them or that allow credits from sources not subject to caps and strict monitoring requirements often fail. Trading offers private actors choice in the selection of reduction techniques and locations, which makes them attractive to regulated firms and

neoliberal governments. But they depend for their efficacy on effective government monitoring and enforcement.[21]

Unfortunately no purchaser of an emission reduction credit has any intrinsic reason to care about the quality of the service he is purchasing. If the credit is good enough for the regulator, it satisfies the buyer. Environmental benefit markets differ from more conventional markets in this respect. If you buy a pair of blue jeans, you do care about its quality, whether the government does or not. If they are not well made they will wear out. This intrinsic concern for quality acts as a force encouraging the producers of ordinary consumer goods to make goods of reasonably good quality. Poor quality emission credits, however, offer the cheapest and best compliance option, unless government regulators recognize their poor quality and disallow their use.[22]

Early trading proponents claimed that trading not only increases regulation's cost effectiveness, but also sparks more innovation than traditional regulation ever did.[23] This claim, in its simplest form at least, has fallen into disrepute.[24] Trading reduces incentives to innovate among polluters with high control costs (they can escape by purchasing credits), while increasing incentives for innovation at those with low costs (they can go

[21] *See* Douglas A. Kysar & Bernadette A. Meyler, *Like a Nation State,* 55 UCLA L. REV. 1, 12 (2008)
[22] *See* David M. Driesen, *Free Lunch or Cheap Fix?: The Emissions Trading Idea and the Climate Change Convention,* 26 BOST. COLL. ENVT'L AFF. L. REV. 1, 66-67 (1998).
[23] *See, e.g.,* Bruce A. Ackerman & Richard B. Stewart, *Reforming Environmental Law: The Democratic Case for Market Incentives,* 13 COLUM. J. ENVT'L L. 171, 183 (1988); Daniel J. Dudek & John Palmisano, *Emissions Trading: Why is this Thoroughbred Hobbled?,* 13 COLUM. J. ENVT'L L. 217, 234-235 (1988); Robert W. Hahn & Robert N. Stavins, *Incentive-Based Environmental Regulation: A New Era for an Old Idea,* 18 ECOLOGY L. Q. 1, 13 (1991); Adam B. Jeff *et al., Environmental Policy & Technological Change,* 22 ENVT'L & RES. ECON. 41, 51 (2002).
[24] *See* David M. Driesen, *Design, Trading, and Innovation, in* MOVING TO MARKETS IN ENVIRONMENTAL REGULATION: LESSONS FROM TWENTY YEARS OF EXPERIENCE (Jody Freeman & Charles D. Kolstad eds. 2007); Joel E. Bruneau, *A Note on Permits, Standards, and Technological Innovation,* 48 J. ENVT'L ECON. & MNGMT. 1192 (2004); Juan-Pablo Montero, *Permits, Standards, and Technological Innovation,* 44 J. ENVT'L ECON. & MNGMT. 23 (2002); Juan-Pablo Montero, 5 J. APPLIED ECON. 293 (2002).

"beyond compliance" in order to sell credits to the escapees).[25] Therefore, the innovation picture is complex.[26]

Trading eliminates any incentive to employ innovations costing more than the relatively low cost generated by the permit market.[27] This can eliminate incentives for the most technologically advanced innovations, which often prove expensive.[28] On the other hand, the increased flexibility trading provides can provide incentives to employ some types of low cost innovation that would be lacking in a less flexible system.

Careful empirical work on the acid rain trading program in the United States shows less innovation in the acid rain program than in the traditional regulatory program that preceded it.[29] The scholars reaching this conclusion have disagreed about whether trading may nevertheless have changed the type of innovation. A tension exists between maximizing short term cost effectiveness and maximizing long-term technological advancements that depend on initially expensive innovation. Emissions trading maximizes short term cost effectiveness, not necessarily long-term technological advancement.[30] We clearly need more and better research that seeks to compare emissions trading's track record in stimulating innovation with that of alternative approaches. Such research must take care to distinguish innovation, the introduction of new technology, from diffusion, the spread of old technology and carefully compare

[25] *See* Chuhlo Jung et al., *Incentives for Advanced Pollution Abatement Technology at the Industrial Level,: An Evaluation of Policy Alternatives*, 30 J. ENVTL. ECON. & MGMT. 95, 95 (1996); David A Malueg, *Emissions Credit Trading and the Incentive to Adopt New Pollution Abatement Technology*, 16 J. ENVT'L ECON. & MGMT. 52 (1987);
[26] *See* Robert P. Annex, *Stimulating Innovation in Green Technology: Policy Alternatives and Opportunities*, 44 AM. BEHAVIORAL SCIENTIST 188, 201 (2002)
[27] *See* David M. Driesen, *Does Innovation Encourage Innovation?*, 33 ENVT'L L. REP. (Envt'l L. Inst.) 10094, 10097 (2003).
[28] *See* David M. Driesen, *Sustainable Development and Market Liberalism's Shotgun Wedding: Emissions Trading Under the Kyoto Protocol*, 83 INDIANA L. J. 21, 49-51 (2008)
[29] *See* Margaret Taylor *et al.*, *Regulation as the Mother of Invention: The Case of SO_2 Control*, 27 L. & POL'Y 348 (2005);
[30] *See* Driesen, *supra* note 27, at 57.

trading and comparable non-trading approaches while accounting for other variables, such as stringency, that can influence innovation rates.[31]

Innovation can be important in advancing our capabilities to meet significant environmental challenges over time.[32] On the other hand, incremental change, which well designed trading programs encourage in a cost effective way, can sometimes prove useful.

We have some experience with special kinds of incentive mechanisms that may perform better than trading or taxes alone in spurring innovation.[33] One can use negative economic incentives to spur positive economic incentives.[34] An example comes from France's use of effluent fees to fund waste water treatment, with very good results. Systems that require a deposit on beverage containers and then pay for returned empty containers have spurred a lot of clean-up of litter, not an especially innovative response technologically, but one that suggests the power of combining positive and negative price incentives.[35] California has proposed a system where purchasers of high emission vehicles would pay a fee that would subsidize purchase of low emission vehicles.[36] Such feebate systems may powerfully influence innovation as they simultaneously punish polluters and reward cleanup. Germany has enacted a law requiring manufacturers to

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[31] *See* Driesen, *supra* note 23, at 454-56.
[32] *See generally* Richard Stewart, *Regulation, Innovation, and Administrative Law: A Conceptual Framework*, 69 CAL. L. REV. 1256 (1981); DAVID M. DRIESEN, THE ECONOMIC DYNAMICS OF ENVIRONMENTAL LAW (2003).
[33] *See* MIKAEL SKOU ANDERSEN, GOVERNANCE BY GREEN TAXES: MAKING POLLUTION PREVENTION PAY (1994).
[34] *See* Robert W Hahn, *Economic Prescriptions for Environmental Problems: How the Patient Followed the Doctor's Orders*, 3 J. ECON. PERSP. 95, 104-107 (1994)
[35] *See* PETER BOHM, DEPOSIT-REFUND SYSTEMS: THEORY AND APPLICATIONS TO ENVIRONMENTAL CONSERVATION AND CONSUMER POLICY (Resources for the Future, 1981).
[36] *See* CALIFORNIA AIR RESOURCES BOARD, DRAFT SCOPING PLAN: A FRAMEWORK FOR CHANGE (JUNE 2008 DISCUSSION DRAFT) 20-21, *available at http://www.arb.ca.gov/cc/scopingplan/document/draftscopingplan.htm;* Nathaniel Greene & Vanessa Ward, *Getting the Sticker Price Right: Incentives for Cleaner, More Efficient Vehicles* 12 PACE ENVT'L L. REV. 91, 94-97 (1994).

take back and properly dispose of packaging accompanying products. This approach creates a powerful incentive to minimize packaging by forcing an internalization of disposal costs, which usually have been externalized.

Environmental benefit trading also raises environmental justice issues in many contexts. Even in the United States, which has become almost religious in its devotion to trading approaches, the government has often recognized that trading of carcinogenic pollutants raises serious ethical issues. Under a trading approach, a polluter can leave its neighbors exposed to very high cancer risk if it pays somebody else far away to reduce emissions. This problem materialized in California when regulators allowed petroleum refiners in low income communities of color to escape pollution control obligations in exchange for payments for reductions in vehicle pollution. This left communities near the plant exposed to cancer risks that would have been significantly reduced in the absence of trading. This led to a lawsuit and a political uproar that derailed one of California's emissions trading programs.

Indifference to the location of reductions might be perfectly justifiable with respect to a globally mixed pollutant like carbon dioxide, but can seem unethical when pollutants' effects on particular communities depend on their location. But trading under the Kyoto Protocol has given rise to some less obvious equitable concerns. For example, a project capturing methane emissions from a landfill slated for closure in South Africa gave rise to fears that this remnant of apartheid would remain open because of revenue from the trading markets. Just as relentless pursuit of short term cost effectiveness does not necessarily coincide with long-term technological development, so may short term efficiency, in some cases, conflict with fairness.

Multilevel Trading

Instrument choice and implementation of the chosen instrument take place in the context of a proliferation of multilevel governance. At the same time, once governments select market mechanisms, the selection and the ideology underlying the selection, can influence governance structures.

The Kyoto Protocol offers perhaps the best vehicle for exploring the layering of governance levels. For choices about whether to use trading and how to implement it when it is used in this context involve numerous levels of government as well as novel private sector roles. This multiplicity, however, is not unique to the Kyoto Protocol. Rather, the Kyoto Protocol offers an especially intricate example of multileveled governance.

In the past, many international agreements have limited the pollution coming from the countries involved without specifying the mechanisms for limiting pollution.[37] It would be possible to craft a climate change agreement that established reduction targets for national governments, but said nothing about how they should achieve these targets. Such an approach would leave countries quite free to choose between traditional regulation, emissions trading, pollution taxes, and even voluntary approaches, as long as the countries met their internationally agreed upon goals.

The parties to the Kyoto Protocol, however, decided to address the instrument choice issue in the international agreement itself, rather than only on the national level. As a result, the Kyoto Protocol contains no less than three emissions trading programs, allowing developed countries, and often their regulated firms, to purchase credits from

[37] *See* David M. Driesen, *Choosing Environmental Instruments in a Transnational Context*, 27 ECOLOGY L. Q. 1, 18-19 (2000).

developing countries through the Clean Development Mechanism, from Eastern Europe and the former Soviet Union through the Joint Implementation Program, and from other developed countries with reduction obligations under the Kyoto Protocol. The big advantage of this global approach, however fragmented, is that it allows for international trading of emission reduction credits. The large market thus created will tend to produce greater cost savings than a smaller market would have.[38] At the same time, the use of international trading greatly increases the complexity of institutional challenges facing governments implementing the trading programs, which creates risks of lost emission reductions.

The Kyoto Protocol itself, however, does not operationalize any trading program. It simply creates a framework for these programs that would only come to life if implemented by nation states. This feature of the Kyoto Protocol is common to substantially all international environmental agreements; they all depend on national implementation, because there is no international bureaucracy capable of regulating private conduct directly.[39] Since most environmental harms stem from private production and consumption decisions, countries, or some other sub-global governmental unit, must enact regulatory programs in order to implement international agreements aimed at reducing environmental hazards.

The European Union assumed a leadership role in coordinating Europe's implementation of the Kyoto Protocol, while still leaving many substantial decisions to member states. Thus, the European Union as a whole, not each member state, chose to implement an emissions trading program. This choice in turn, reflected the global

[38] *See* Jonathan Baert Wiener, *Global Environmental Regulation: Instrument Choice in Legal Context*, 108 YALE L. J. 677, 717 (1999)
[39] *See* Driesen, *supra* note 36, at 15.

decision embodied in the Kyoto Protocol to favor trading. While the Kyoto Protocol did not require countries to use trading, its support for trading no doubt influenced the EU decision to adopt it.

While the EU as a whole made some important trading design decisions, it left the most important decision of all, the amount of reductions to require from facilities in the trading scheme, largely to member states.[40] Yet, the ETS does provide for European Commission review of the NAPs, and provides criteria under which the European Commission may disapprove of insufficiently ambitious NAPs, which the Commission has exercised. The decision to leave critical decisions about the stringency of caps primarily to member states left those states vulnerable to lobbying based on competitiveness concerns. This vulnerability contributed to weakness in the NAPs, especially with respect to highly competitive energy intensive industries, like aluminum smelting. The European Commission has recognized this problem and is considering having the EU set the cap for a third phase of trading envisioned after 2012.

Because the EU trading scheme links up with the "project-based mechanisms" (the Clean Development Mechanism and Joint Implementation programs that garner credits from individual projects), the integrity of the scheme depends upon effective oversight of claims of emission reduction credits earned around the world. The Kyoto Protocol has spawned a complex multi-level governance structure seeking to assure these credits' integrity.

[40] *See* Marisa Martin, *Trade Law Implications of Restricting Participation in the European Union's Emissions Trading Scheme*, 19 Georgetown International Environmental Law Review 437-474, 443-444 (2007).

At the international level, the Kyoto Protocol has created subsidiary bodies to exercise oversight and provide expert advice. The most prominent of these bodies is the CDM Executive Board, which approves methodologies for estimating emission reductions from various types of projects. It also must approve projects before project developers can sell credits in the international markets. Since this body cannot itself verify emission reductions on the ground in the developing countries where developers carry out CDM projects, Kyoto's architecture relies on national governments and private entity enforcement of the Kyoto Protocol as well. The Kyoto Protocol delegates decisions about whether projects contribute to "sustainable development" to host country governments, which may disapprove of projects, but these governments, with the notable exception of China, have rarely exercised serious oversight. Since developing countries often lack the capacity to monitor and verify emission reductions, the Kyoto Protocol privatizes that function, allowing "designated operational entities" to verify emission reductions. The CDM Executive Board must approve these entities. In practice though, these entities are usually consultant firms hired by the project developer. This means that conflicts of interest threaten the system's integrity.[41] Whether ultimately successful or not, international emissions trading under the Kyoto Protocol has spawned a complex architecture, with responsibilities shared among global international bodies (CDM Executive Board), regional international bodies (EU Commission), national governments, and private entities.

Because the United States' federal government has not implemented the Kyoto Protocol, subnational governmental bodies in that country initially took the lead in

[41] *See* Wara & Victor, *supra* note 18, at 19.

addressing climate change, including the initiation of emissions trading programs.[42] The first program, the Regional Greenhouse Gas Initiative (RGGI), consists of an agreement of governors of the northeastern states to require emission reductions from their electric utilities and allow trading to reduce the cost of these reductions.[43] This agreement not only offers an example of regional governance, it embodies multilevel governance within the region. The agreement creates a "Regional Organization" to perform central coordinating tasks, such as auctioning allowances.[44] Furthermore, the regional agreement resolves very important issues, such as the amount of reductions required, on the regional level.[45] But it leaves many important decisions, (e.g. how many of the allowances to auction, how to use revenue realized from the auction) to states within the region. California and other states also are currently moving toward implementing emissions trading schemes.[46]

Of course, all of this leads to coordination difficulties. The European Commission has been in contact with California and RGGI staff to discuss coordination issues. When the United States federal government enacts an emissions trading scheme, it will face an issue of how to coordinate its effort with the state programs already

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[42] *See* Kysar & Meyler, supra note 21, at 8-10; Kirsten H. Engel, *Mitigating Global Climate Change in the United States: A Regional Approach*, 14 N.Y.U. ENVTL. L. J. 54 (2005); BARRY RABE, STATEHOUSE AND GREENHOUSE: THE EMERGING POLITICS OF AMERICAN CLIMATE CHANGE POLICY (2004)

[43] *See* REGIONAL GREENHOUSE GAS INITIATIVE (RGGI), MEMORANDUM OF UNDERSTANDING (2005), available at http://www.rggi.org/ [hereinafter RGGI MOU]; Note, *The Compact Clause and the Regional Greenhouse Gas Initiative*, 120 HARV. L. REV. 1958, 1959-1960 (2007) (describing the political process establishing RGGI). These states are Maryland, Delaware, New Jersey, New York, Connecticut, Massachusetts, Rhode Island, Vermont, New Hampshire, and Maine.

[44] Id. § 4.

[45] Id. § 2(c).

[46] *See* MARKET ADVISORY COMMITTEE TO THE CAL. AIR RES. BD., RECOMMENDATIONS FOR DESIGNING A GREENHOUSE GAS CAP-AND-TRADE SYSTEM FOR CALIFORNIA (2007), *available at* http://www.climatechange,ca.gov/documents/2007-06-29_MAC_FINAL_REPORT.PDF; Western Climate Initiative, http://www.westernclimateinitiative.org; Midwest Greenhouse Gas Accord (Nov. 15, 2007), *available at* http://www.wisgov.state.wi.us/docview.asp?docid=12497.

underway. The European Union has already faced a similar issue arising from an early emissions trading program in the United Kingdom, which predated the EU ETS.

Those seeking to coordinate these programs will face the familiar issues regulators confront in an age of globalization and multilevel governance, albeit in a slightly different context. Many of those running these programs have accepted free trade principles at the heart of neoliberalism, and think that a well coordinated global market would be better than a series of national and sub-national markets. Such coordination can maximize the cost savings trading programs can deliver.[47] At the same time, such coordination may spark a race-to-the-bottom, as countries that restrict credit sales into their markets to make sure that they meet strict standards of environmental integrity may come under pressure to avoid interference with the global market in credits.[48] Already, most jurisdictions generating credits for sale in international markets exercise very little oversight, because of competitiveness concerns. If project developers cannot develop their preferred projects in one country, they can just go elsewhere.

Government bodies will face conflicting pressures. Lovers of free markets will clamor to reduce transaction costs that might impede trades.[49] But supporters of environmental integrity will insist on raising transaction costs to pay for the oversight needed to make sure that only environmentally sound projects generate credits.[50] Hence, international environmental benefit trading markets create problems similar to those associated with globalization more generally.

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[47] *See* Kysar &Meyler, *supra* note 21, at 14..
[48] *See generally* id. at 15-16 (describing how states must cope with the question of whether linkage with states operating a weaker trading program will dilute their own efforts).
[49] *See* David M. Driesen & Shubha Ghosh, *The Function of Transaction Costs: Rethinking Transaction Cost Minimization in a World of Friction*, 47 ARIZONA L. REV. 61, 79-82 (2005).
[50] *See* id. at 92-98.

Multilevel environmental governance and many of its complexities arise whether or not regulators employ market mechanisms. But when they choose market mechanisms that traverse national borders, they greatly complicate the governance challenges they face. And the neoliberalism that supports environmental benefit trading generally also supports the broadest possible trading markets. Environmental benefit trading offers terrific potential for cost reduction, but poses significant challenges for regulators, which grow exponentially when the mechanism is globalized.

Conclusion

Market-based instruments have become increasingly important as neoliberalism has advanced. While these instruments provide a cost effective way of realizing environmental improvements, they depend on government design and enforcement for their efficacy. Increasingly, designers of emissions trading programs in particular find themselves operating in a complex context of multilevel governance.