National Environmental Policy During the Clinton Years

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ABSTRACT

We review major developments in national environmental policy during the Clinton Administration, defining environmental policy to include not only the statutes, regulations, and policies associated with reducing pollution, but also major issues of public lands management and species preservation. We adopt economic criteria for policy assessment — principally efficiency, cost-effectiveness, and distributional equity. While the paper is primarily descriptive, we highlight a set of five themes that emerge in the economics of national environmental policy over the past decade.

First, over the course of the decade, national environmental targets were made more stringent, and environmental quality improved. Most important among the new targets were the National Ambient Air Quality Standards (NAAQS) for ambient ozone and particulate matter, issued by EPA in July 1997, which could turn out to be one of the Clinton Administration's most enduring environmental legacies. Also, natural resource policy during the Clinton years was heavily weighted toward environmental protection. Environmental quality improved overall during the decade, continuing a trend that began in the 1970s, although improvements were much less than during the previous two decades.

Second, the use of benefit-cost analysis for assessing environmental regulation was controversial in the Clinton Administration, while economic efficiency emerged as a central goal of the regulatory reform movement in the Congress during the 1990s. When attention was given to increased efficiency, the locus of that attention during the Clinton years was the Congress in the case of environmental policies and the Administration in the case of natural resource policies. Ironically, the increased attention given to benefit-cost analysis may not have had a marked effect on the economic efficiency of environmental regulations.

Third, cost-effectiveness achieved a much more prominent position in public discourse regarding environmental policy during the 1990s. From the Bush Administration through the Clinton Administration, interest and activity regarding market-based instruments for environmental protection — particularly tradeable permit systems — continued to increase.

Fourth, the Clinton Administration put much greater emphasis than previous administrations on expanding the role of environmental information disclosure and voluntary programs. While such programs can provide cost-effective ways of reaching environmental policy goals, little is known about their actual costs or effectiveness.

Fifth and finally, the Environmental Protection Agency placed much less emphasis on economic analysis during the 1990s. EPA leadership was more hostile to economic analysis than it had been under the prior Bush Administration, and it made organizational changes to reflect this change in priorities.

Key Words: Air Quality Standards, benefit-cost analysis, voluntary programs

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LIST OF ACRONYMS

AEI	American Enterprise Institute for Public Policy Research
ANWR	Arctic National Wildlife Refuge
AUM	Animal Unit Month
BEA	Bureau of Economic Analysis, U.S. Department of Commerce
BTU	British Thermal Unit
CAA	Clean Air Act of 1970 and Amendments
CEA	Council of Economic Advisors
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980 and Amendments
CFC	Chlorofluorocarbon
CO	Carbon Monoxide
COP-2	Conference of the Parties (Second) to the U.N. Framework Convention on Climate Change
COP-3	Conference of the Parties (Third) to the U.N. Framework Convention on Climate Change
CSI	Common Sense Initiative, U.S. Environmental Protection Agency
CWA	Clean Water Act (Federal Water Pollution Control Act of 1972 and Amendments)
EEAC	Environmental Economics Advisory Committee, EPA Science Advisory Board
EIA	Energy Information Administration, U.S. Department of Energy
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act of 1973
FCCC	Framework Convention on Climate Change, United Nations
FFDCA	Federal Food, Drug and Cosmetics Act of 1938 and Amendments
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act of 1972 and Amendments
GAO	General Accounting Office
GDP	Gross Domestic Product
GNP	Gross National Product
IEESA	Integrated Environmental and Economic Satellite Accounts
IPCC	Intergovernmental Panel on Climate Change
MACT	Maximum Available Control Technology
MCL	Maximum Contaminant Level
NAAQS	National Ambient Air Quality Standard
NIPA	National Income and Product Accounts
NO_X	Nitrogen Oxides
NRC	National Research Council
OMB	Office of Management and Budget
OPPE	Office of Policy, Planning and Evaluation, U.S. Environmental Protection Agency
OTC	Ozone Transport Commission
PACE	Pollution Abatement Costs and Expenditures Survey
PM	Particulate Matter
RCRA	Resource Conservation and Recovery Act of 1976 and Amendments
RIA	Regulatory Impact Analysis
SBREFA	Small Business Regulatory Enforcement and Fairness Act
SDWA	Safe Drinking Water Act of 1974 and Amendments
SO_2	Sulfur Dioxide
TIRA	Truth-in-Regulating Act of 2000
TMDL	Total Maximum Daily Load
TRI	Toxics Release Inventory
TSCA	Toxic Substances Control Act of 1976 and Amendments
USFS	U.S. Forest Service
VOC	Volatile Organic Compound

NATIONAL ENVIRONMENTAL POLICY DURING THE CLINTON YEARS

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1. INTRODUCTION

We examine from an economic perspective major developments in national environmental policy during the two terms of the Clinton Administration, 1992 through 2000. We define environmental policy broadly to include not only the statutes, regulations, and policies associated with reducing environmental pollution, but also major issues of natural resource management. Issues that might fall within a comprehensive assessment of environmental and natural resource policy, but which are covered by other papers in this series, such as energy policy, are not included in our investigation.

Our analysis is primarily descriptive, although in some of the cases in which environmental policies have been analyzed from an economic perspective, we discuss those results. Moreover, the analysis is not exhaustive. While our choice of which policies and programs to discuss in depth has inevitably been somewhat arbitrary, we include the most important and the most prominent intersections of economics and environment over the decade. Finally, while we do mention a number of policies and programs administered by agencies other than the Environmental Protection Agency (EPA), rules promulgated by EPA comprise a substantial majority of total costs and benefits of Federal environmental regulation. We therefore discuss at length the use and acceptance of economics at EPA. Discussion of similar issues at the Departments of Energy, Agriculture, the Interior, and other agencies and institutions is beyond the scope of this study.

A fundamental issue that confronts our assessment is the choice of an appropriate basis of comparison for evaluating policy initiatives. It might appear reasonable to contrast first-term Clinton Administration initiatives with what might have been anticipated from a hypothetical second-term Bush Administration, but what would the appropriate counterfactual be for the second term of the Clinton years? The impossibility of providing a definitive answer to that

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question leads us to take a different approach, adopting economic criteria for policy assessment — principally efficiency, cost effectiveness, and distributional equity.[1]

Five themes emerge from our review of national environmental policy during the years of the Clinton Administration. First, *over the course of the decade, environmental targets were made more stringent, and environmental quality improved.* Most important among the new targets were the National Ambient Air Quality Standards (NAAQS) for ambient ozone and particulate matter, issued by EPA in July, 1997, which could turn out to be one of the Clinton Administration's most enduring environmental legacies, both in terms of potential benefits and potential costs. Natural resource policy during the Clinton years was heavily weighted toward environmental protection. The Administration proposed initiatives to reduce subsidies for private resource extraction on public lands. In addition, the U.S. Forest Service shifted priorities away from a focus on timber production to resource protection, placing 60 million acres of Federal forests off limits to road building. Clinton also designated more than 20 new national monuments, thus restricting the use of 6 million additional acres of Federal lands. Environmental quality improved overall during the decade, continuing a trend that started in the 1970s, although trends in water quality were less clear than trends in air quality. Environmental quality improvements were much less than during the previous two decades, not surprising given that the low-hanging fruit had already been picked.

Second, *the use of benefit-cost analysis for assessing environmental regulation was controversial in the Clinton Administration, while economic efficiency emerged as a central goal of the regulatory reform movement in the Congress during the 1990s*. Despite a series of supportive executive orders, economic efficiency appears not to have been accepted as a legitimate criterion for environmental policy during the Clinton years. In contrast, economic efficiency was a central goal of regulatory reform efforts in the Congress. Major amendments to the Safe Drinking Water Act were passed, containing the most stringent requirement for benefit-cost analysis of any environmental statute. Legislators were less successful at reforming other environmental statutes that had been criticized on efficiency grounds, but the Congress did pass a variety of cross-cutting regulatory reform initiatives, aimed at increasing the efficiency of environmental, health, and safety regulations.

It is interesting to note that when attention was given to increased efficiency, the locus of that attention during the Clinton years was the Congress in the case of environmental policies and the Administration in the case of natural resource policies. Ironically, the increased attention given to benefit-cost analysis may not have had a marked effect on the economic efficiency of environmental regulations. The evidence indicates that the overall benefits of air pollution regulation have exceeded its costs, but the picture is mixed when one examines specific air pollution regulations. In general, there appears to be a downward trend in aggregate net benefits

[1]We follow the standard definition of an *efficient* environmental policy as being one which involves a target — such as a 50 percent reduction in sulfur dioxide (SO_2) emissions — that maximizes the difference between social benefits and social costs, i.e. a target level at which marginal benefits and marginal costs are equated. By *cost-effective* policies, we refer to those which take (possibly inefficient) targets as given by the political process, but achieve those targets with policy instruments — such as a tradeable permit system in the SO_2 case — that minimize aggregate costs. Assessments of the distributional implications of environmental policies include analyses of the distribution of costs and benefits.

of such regulations over time, although there are important exceptions among individual regulations, like the new NAAQS for particulate matter.

Third, *cost-effectiveness achieved a much more prominent position in public discourse regarding environmental policy during the 1990s*. From the Bush Administration through the Clinton Administration, interest and activity regarding market-based instruments for environmental protection — particularly tradeable permit systems — continued to increase. The Administration promoted cost-effectiveness by supporting the implementation of existing market-based initiatives, including the sulfur dioxide allowance trading program, and by proposing new initiatives, exemplified by the strong U.S. support for tradeable permit programs for reducing greenhouse gas emissions. The performance of market-based instruments that have been implemented in the past two decades has been encouraging, including the leaded gasoline phasedown in the 1980s and the SO_2 allowance trading program in the 1990s.

Fourth, *the Clinton Administration put much greater emphasis than previous administrations on expanding the role of environmental information disclosure and voluntary programs*. EPA expanded the list of chemicals to be reported under the Toxics Release Inventory (TRI), lowered reporting thresholds, and launched a number of other information programs. EPA also initiated dozens of programs designed to encourage sources to reduce emissions on a voluntary basis, many under the "Common Sense Initiative." While such programs may potentially be cost-effective ways of reaching environmental policy goals, we know very little about their costs or their effectiveness.

Fifth and finally, *the Environmental Protection Agency reduced the role of economic analysis in decisionmaking during the 1990s*. During the Clinton years, the EPA was more hostile toward economic analysis than it had been during the prior Bush Administration, and EPA leadership made organizational changes to reflect this shift. When economics did play a role, economic analysis was more likely to be focused on increasing the cost-effectiveness of regulations than on weighing benefits against costs.

This paper is divided into five parts. In part 2, we analyze cross-cutting issues that stand out from the hundreds of statutes, regulations, and administrative decisions of the Clinton years, focusing separately on Congressional initiatives and those that had their primary origin within the Administration. In part 3, we review the most important national environmental policy developments from an economic perspective, and in part 4, we summarize performance, employing three metrics: environmental quality, cost-effectiveness, and efficiency. In part 5, we offer some conclusions.

2. CROSS-CUTTING ENVIRONMENTAL POLICY DEVELOPMENTS

A number of broad-based initiatives of the Clinton years — not linked with specific environmental problems — potentially had significant impacts on the conduct of environmental policy, including initiatives that were intended to affect (or could have affected) the efficiency, cost-effectiveness, or distributional equity of environmental policies and programs. Our examination of such cross-cutting initiatives considers them as either Executive or Congressional, although this division is not always clear-cut. It can be difficult to discern

whether an initiative began in the executive branch or the Congress, and any initiative that becomes law must have received the approval of both branches.[2]

2.1 Executive Initiatives

We consider cross-cutting executive branch initiatives under three categories: efficiency-enhancing initiatives; those targeted at distributional equity; and those that addressed cost effectiveness.

2.1.1 Efficiency and Environmental Regulation

[2]For example, in 1994, the Clinton Administration proposed Superfund reform that would give more weight to cleanup costs and greater consideration of future uses in site remedy selection (U.S. Council of Economic Advisers 1996). Legislation was proposed and considered by the 103rd, 104th, and 105th Congresses, but no Superfund reform bills were enacted. In 1995, the Administration proposed expediting pesticide registration and other reforms to the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), which were achieved in large part by legislation passed by the 104th Congress in 1996.

Since 1981, Federal regulatory agencies have been required to conduct economic analyses for regulations with expected annual costs greater than $100 million.[3] Throughout the Reagan and Bush Administrations, these Regulatory Impact Analyses (RIAs) were required under Reagan Executive Orders 12291 and 12498.[4] President George H. W. Bush also created a Council on Competitiveness, chaired by Vice President Quayle, which reviewed the impact on industry of selected regulations. Shortly after taking office in 1993, President Clinton abolished the Council on Competitiveness and revoked both of the Reagan orders, replacing them with Executive Order 12866, *Regulatory Planning and Review*, which requires benefit-cost analysis.[5]

The Clinton Executive Order (EO) on benefit-cost analysis was substantively and administratively similar to the Reagan orders, requiring benefit-cost analysis and cost-effectiveness analysis of major rules. It was qualitatively different in tone, however, signaling a less strict efficiency test, as well as a new emphasis on distributional concerns. While the Reagan orders required that benefits *outweigh* costs, the Clinton order required only that benefits *justify* costs. The Clinton EO allowed that: (1) not all regulatory benefits and costs can be monetized; and (2) non-monetary consequences should be influential in regulatory analysis (Viscusi 1996). The Clinton order also imposed a 90-day limit to the review process by the Office of Management and Budget (OMB), a process that had frequently extended for years under previous executive orders (Morgenstern 2000).

While attention to regulatory efficiency may have grown during the 1990s, it would be impossible to attribute this growth to the Clinton EO, or any other executive action. Regulatory reform was a major focus of the Congress in the 1990s, as we discuss below. In addition, regulatory impact analysis has continued to be required only for major rules, a small fraction of all rules issued by EPA and other agencies.

2.1.2 Incorporation of Distributional Concerns

During the 1990s, the regulatory review process acquired a new focus on distributional concerns. In addition to requiring RIAs, Clinton's EO 12866 instructs agencies to select regulatory approaches that maximize net benefits, *including distributive impacts and equity*, unless a statute requires another regulatory approach. The language of the EO implicitly

[3]The threshold is not indexed for inflation and has not been modified over time. Elsewhere in this paper, we refer to year 2000 dollars, unless we indicate otherwise.

[4]Executive Order (EO) 12291 required agencies to conduct a benefit-cost regulatory impact analysis for all proposed and final rules that were anticipated to have an effect on the national economy in excess of $100 million. Executive Order 12498 required, in addition, a risk assessment for all proposed and final environmental health and safety regulations. EO 12291 has been called the "foremost development in administrative law of the 1980s" (Morgenstern 1997b). The Reagan EOs were not the first presidential effort at regulatory efficiency, however. President Nixon required a "Quality of Life" review of selected regulations in 1971, and President Ford formalized this process in EO 11281 in 1974. President Carter's EO 12044 required analysis of proposed rules and centralized review by the Regulatory Analysis Review Group. It appears that President George W. Bush will continue the RIA requirements of Clinton's EO 12866 in some form (Card 2001).

[5]In discussing Clinton's EO 12866, many investigators also mention EO 12875, *Enhancing the Intergovernmental Partnership*, which limited "unfunded mandates". While EO 12875 was part of the Administration's regulatory reform agenda, it did not make reference to the efficiency or cost-effectiveness of environmental regulations.

includes equity in the objective function to be maximized, although it is not clear how equity should or can be "maximized." In practice, agencies have responded to the order by including a separate distributional impact analysis within RIAs.

In 1994, Executive Order 12898 formalized the President's stance on what was by then called "environmental justice," instructing each Federal agency to identify and address "disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." The Administration also supported the filing of environmentally-related claims under Title VI of the Civil Rights Act of 1964, which allows citizens to file complaints against EPA alleging discriminatory intent or effect based on race, color or national origin, resulting from the issuance of pollution control permits by state and local government agencies receiving EPA funds.[6]

2.1.3 Cost-Effectiveness and Environmental Regulation

Executive Order 12866 also mandated selection — when appropriate — of cost-effective regulatory alternatives, specifically user fees, marketable permits, and information programs. The use of market-based environmental policy instruments grew in the 1990s (Hahn 2000, U.S. Environmental Protection Agency 2001a). The proliferation of cap-and-trade programs through the implementation of the 1990 Clean Air Act Amendments is one example; the Administration's aggressive promotion of international market-based policy instruments for greenhouse gas emissions control (specifically, emissions trading) is another. Information programs, another type of potentially cost-effective market-based environmental policy instrument, received special emphasis at EPA during the Clinton years through expanded use of existing policies and creation of new ones. We cannot attribute Federal agencies' increased use of market-based instruments to the Clinton EO, because we have no appropriate counterfactual against which to measure this kind of progress.[7] In addition, despite the fact that market-based approaches have been applied frequently to new environmental regulations, the bulk of existing regulations were promulgated without regard to cost-effectiveness.

[6]EPA's approach to Title VI complaints, issued in February, 1998, complicated urban brownfields cleanup and was received poorly by the U.S. Conference of Mayors, suggesting that the means of the focus on distributional issues may have been at odds with its goals. See Browner, Carol M. (1998), "Letter to the U.S. Conference of Mayors Forum on Title VI in Detroit, Michigan" (July), available at http://www.epa.gov/swerosps/bf/html-doc/confmayo.htm.

[7]Although not discussed in this paper, state, regional, and international use of market-based environmental policy instruments also increased in the 1990s (Stavins 2001).

2.1.4 Political and Administrative Changes in the Use of Economic Analysis at EPA

We noted above the ambivalence of the major environmental statutes with respect to the role of economic analysis.[8] Such statutory ambivalence was accompanied during the Clinton years by a mixed record of political and administrative integration of economic analysis within EPA. Although EPA is constrained from using the economic efficiency criterion within certain dimensions of environmental policy, there is a good deal of flexibility in the extent to which economic analysis influences EPA processes and decisions. As a result, the use of economic analysis has varied substantially from one administration to another. This variance can be directly observed as changes in the channels through which economic advice reaches the Administrator and other decision makers, and indirectly as shifts in agency "culture" — broadly, the level of acceptance of economic advice as a valid contributor to Agency decision making.

2.1.4.1 Historic Role of Economics at EPA

The channels through which economic advice historically has reached the EPA Administrator have been threefold: (1) passive applied economic analysis; (2) economic guidance, benefit studies, and computable general equilibrium modeling; and (3) economic policy advising (Stavins 2000). The RIAs and Regulatory Flexibility Analyses mandated by Executive Order and legislation throughout the 1980s and 1990s fall within the first category, passive applied analysis. EPA routinely performs benefit-cost analyses of major rules, and limits most of its economic analyses to cost-effectiveness and distributional analyses, as required by statute. The second category includes studies and advice generated by the core economics staff at EPA, which has been housed in an assortment of administrative entities since 1980, as described in Table 1. The third category includes advising by economists internal and external to the Agency.

The background against which economic advice generated through these channels is evaluated is the culture of EPA, which historically has found the goal of economic efficiency tolerable, at best (Morgenstern 1997b). Aversion to economic analysis within EPA is not surprising, given: the agency mandate to protect human health and the environment through the Administration of the major statutes; the constraints on economic analysis inherent to many of those statutes; and the relatively thin representation of economists within most EPA offices, particularly at the level of the Senior Executive Service.[9] Despite their minority status, relative to lawyers, scientists, and engineers, EPA employs more economists working on environmental

[8]The term "major environmental statutes" in this paper refers to the following Federal laws (and all amendments thereto): the Clean Air Act (CAA); Federal Water Pollution Control Act (Clean Water Act, CWA); Toxic Substances Control Act (TSCA); Federal Insecticide, Fungicide and Rodenticide Act (FIFRA); Comprehensive Environmental Response, Compensation and Liability Act (CERCLA); Resource Conservation and Recovery Act (RCRA); and Safe Drinking Water Act (SDWA). The major statutes alternately "forbid, inhibit, tolerate, allow, invite, or require the use of economic analysis in environmental decision making" (Morgenstern 1997b). For an earlier treatment of the role of economic analysis in environmental regulation, see Fraas (1991).

[9]See Morgenstern (1997b). Of the 196 EPA Senior Executive Service members with graduate degrees in 1996, only four (2 percent) held graduate economics degrees; in contrast, almost one-third held law degrees, and one-fifth held graduate science degrees. Between 1996 and 2000, the percent of EPA employees with graduate degrees who held either masters or doctoral degrees in economics increased by 15 percent, compared to a 7.7 percent overall increase in EPA employees with graduate degrees (Morgenstern 2000).

issues than any other single institution (Morgenstern 1997b). The extent to which economic analysis influences regulatory policy, however, depends critically on Agency culture and on the extent to which the Administrator and others are receptive to such analysis. Without support within the Agency, economic analysis moving through the channels described will have little effect.

2.1.4.2 Changes in the Role of Economics at EPA During the 1990s

Significant changes in the role of economics at EPA, both in terms of channels of influence and the culture of acceptance, occurred during the 1990s: (1) during the Clinton years, economics had to "fight harder for its place at the table" than it had at EPA during the prior Bush Administration; and (2) when it did have a place at the table, economic analysis was more likely to be focused on increasing the cost-effectiveness of regulations than on weighing benefits against costs (Morgenstern 1997b, Nichols 1997).

Given the increase in requirements for and attention to benefit-cost analysis by Congress during the 1990s, EPA probably was required to perform more passive applied economic analysis during the 1990s than at any other time in its 30-year history. While these analyses satisfied internal and external requirements, they were not done to provide economic information to key Agency decision makers.

The organizational influence (and location) of the "economics policy shop" at EPA changed significantly during the Clinton years. When the Clinton Administration took office in 1992, the core economics staff at EPA was located within the Office of Policy, Planning, and Evaluation (OPPE), as it had been since at least 1980. OPPE reviewed all draft regulations and provided the Administrator with an independent economic perspective, which could be quite different from program office analyses.[10] Within weeks of the Clinton inauguration, however, this role was eliminated, and economic analyses were rarely forwarded to Administrator Carol Browner during her eight-year tenure. The substantive role of economic analysis in the development and review of EPA regulations was abandoned by the Agency in 1995, when the program offices, rather than the Administrator, became the "clients" of these analyses (Morgenstern 2000). In 1999, OPPE was eliminated , shifting the core economics staff to a new Office of Policy and Reinvention.

Policy advising by economists external to the Agency was active during the 1990s. Deputy Administrator Fred Hansen worked closely with the Environmental Economics Advisory Committee (EEAC) within EPA's Science Advisory Board to develop an aggressive mission statement for EEAC that focused on giving expert advice on broad issues of importance to the Agency, rather than simply carrying out end-of-pipe reviews of agency RIAs.[11] Projects executed by the EEAC during the 1990s included: (1) the first comprehensive review and revision in 15 years of EPA's Economic Analysis Guidelines; (2) a thorough review of EPA's methodology for valuing reductions in cancer-induced mortality; and (3) the reinstatement of the

[10]This practice was especially active under Administrator William Reilly, 1988-1992, who regularly sought the opinion of the economics staff.

[11]The Environmental Economics Advisory Committee was established by the Science Advisory Board in 1990.

Pollution Abatement Cost and Expenditure survey. External economists also served on the Advisory Council on Clean Air Act Compliance, required under the 1990 Clean Air Act (CAA) Amendments to provide technical and economic input on EPA's benefit-cost analyses of CAA impacts. The Council had a major impact on the identification of key research issues and the treatment of uncertainty in these analyses (Morgenstern 2000).

While most of the channels for economic policy analysis at EPA remained fairly active during the 1990s, the "cultural acceptance" of economic analysis of environmental regulations was almost certainly lowered (Morgenstern 1997b). Administrator Browner was skeptical, indeed dismissive of economics as an appropriate framework for environmental decisions. In her remarks in honor of the 30th anniversary of the first Earth Day, she commented on the establishment of the EPA, and recalled that "the nation committed itself to the task of eliminating pollution, to restoring our lands and waters to their uses, and to protecting public health without regard to cost. Let me repeat those last four words – *without regard to cost*" (Browner 2000). The Administrator went on to refer to the introduction of benefit-cost analysis into EPA regulations intended to protect public health as "poisoning the well".[12] The reduction in acceptance of economic analysis at EPA was likely influenced by Vice President Albert Gore, who was known to be deeply skeptical about the application of benefit-cost analysis to environmental policy (Gore 1992). Thus, while requirements for regulatory benefit-cost analysis expanded in the 1990s, policy makers' receptiveness to benefit-cost analysis at EPA declined significantly.

Efficiency analysis was much more controversial under Clinton's EPA than under the earlier Bush Administration, but EPA's interest in cost-effectiveness (in particular, the use of market-based instruments) and distributional analysis continued to grow. In the same Earth Day speech that was critical of benefit-cost analysis, Administrator Browner took pride in highlighting EPA's cost-effective regulatory measures and flexible approaches to pollution reduction (Browner 2000).

2.1.4.3 EPA and Reinventing Government

Although Administrator Browner announced the creation of EPA's Office of Reinvention in 1997, efforts to reform processes at EPA had been underway since the mid-1980s, when Administrator Lee Thomas asked the Agency to manage its resources and activities to: (1) account for relative risks; (2) recognize the cross-media nature of environmental problems; and (3) achieve measurable environmental results. Vice President Gore's National Performance Review Report and the Government Performance and Results Act of 1993 brought increased attention to these issues at EPA, and the agency launched the centerpiece of its "reinvention" program, the Common Sense Initiative (CSI) in 1994.[13]

[12]Although she referred to benefit-cost analysis, what Administrator Browner described was more like a strict benefit-cost test that would disallow rules unless quantified benefits outweighed costs. The influence of Administrator Browner's views on economic analysis was particularly important during the Clinton Administration, given her eight-year tenure in the position. The next-longest-serving EPA Administrators, William Reilly and Lee Thomas, each served four years.

[13]Other organizations and institutions may also have played a role in EPA's focus on reinvention. A 1995 National Academy of Public Administration report suggested reforms at EPA, including better use of risk and cost information to rank priorities. In 1996, the Center for Strategic and International Studies launched "Enterprise for

Each of the CSI goals can be considered within the umbrella of cost-effectiveness, but it is unclear whether the CSI improved the cost-effectiveness of environmental regulation in the 1990s. The CSI engaged six major industries in dialogue with EPA with the purpose of reducing compliance costs, introducing flexibility into regulatory instruments (in particular, moving toward regulation by industry, rather than by pollutant), and reducing costly litigation through stakeholder participation.[14] But in 1997, two GAO reports found that too many CSI resources had been spent on process issues, and too few on substance and tangible results. In addition, progress had been limited by the inability of the individual industry workgroups to reach consensus, especially on the most important issues, and the effort lacked results-oriented measures to assess progress. (U.S. General Accounting Office 1997a, 1997b)

In 1995, Vice President Gore and Administrator Browner announced a set of 25 specific reinvention reforms at EPA, in addition to CSI. One of these new programs was Project XL ("Excellence and Leadership"), which set a goal of 50 pilot projects allowing regulated firms to propose alternatives to existing command-and-control regulations that would attain higher levels of pollution control at lower cost. The National Environmental Performance Partnership System sought to give states greater flexibility in achieving environmental goals by allowing them to convert some types of categorical Federal grants into more flexible block grants. Criticisms of these and many other parts of EPA's reinvention program were similar to criticisms of CSI, but they included another important factor. The GAO report noted that EPA's effort could have only limited success in introducing cost-effective changes into processes like permitting and grant awards to the states, given that the major statutes regulate by environmental medium or by pollutant. Substantial progress would, therefore, depend on reform of the legislative framework for environmental protection, rather than process reforms within EPA. In addition, the GAO noted a lack of "buy in" among Agency staff accustomed to traditional medium-by-medium regulations.[15] The GAO report also noted confusion among stakeholders due to the large number of diffuse initiatives started under the banner of reinvention (U.S. General Accounting Office 1997a).[16]

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the Environment," an effort to build consensus for systematic environmental management reform. And the regulatory reform focus of the 104th Congress may also have prompted EPA to attempt to demonstrate reform efforts, in part to forestall Congressionally mandated changes (Copeland 1996).

[14]The participating industries were auto manufacturing, computers and electronics, iron and steel, metal finishing, petroleum refining, and printing.

[15]Agency staff may not have been the only ones reluctant to "buy into" this shift in regulatory focus — the public and environmental organizations were nervous, as well. A report in the *Boston Globe* criticized the New England regional EPA office for embracing the national movement to "combine enforcement with 'compliance assistance', a program whereby [EPA] tells companies what they should be doing and allows them to voluntarily fix pollution problems to avoid penalties". The journalist interviewed a number of EPA regional enforcement officials, who felt that the Agency's new collaborative approach meant that it had "become subservient to business, sending a dangerous message to polluters that penalties can be avoided." See Armstrong, David (1999), "U.S. Lagging on Prosecutions", *The Boston Globe* (16 November): A01.

[16]Appendix I of the GAO's broad report on EPA reinvention efforts lists all reinvention programs – the list is almost three pages long (U.S. General Accounting Office 1997a). Larger programs include the CSI, Project XL, permitting reform, and the National Environmental Performance Partnership System focused on EPA's relationship with the states.

2.1.4.4 Death and Resurrection of the PACE Survey

While the 103rd and 104th Congresses were increasing the efficiency and cost-effectiveness analysis responsibilities of Federal agencies, one vital source of information on the costs of environmental regulation was being disassembled. The U.S. Bureau of the Census conducted the annual Pollution Abatement Costs and Expenditures (PACE) survey from 1979 to 1994 but suspended it in 1995 for budgetary reasons.

The PACE database comprised operating and capital expenditures on pollution abatement from all manufacturing plants with more than 20 employees, selected electric and gas utilities, and some petroleum companies. Despite questions about the survey's comprehensiveness and reliability, it had been the primary data source of its kind for industry, government, and the research community. EPA itself used PACE data in many RIAs and in broad efficiency and cost-effectiveness analyses, including the *Cost of Clean*, the Section 812 retrospective benefit-cost analysis of the Clean Air Act, and sector-specific studies.

In 1998, the Environmental Economics Advisory Committee urged that the PACE survey be reinstated. Two months later, Assistant Administrator for Policy, Planning, and Evaluation David Gardiner announced EPA's support for reinstating the PACE program and pledged significant funding to make it happen, citing EEAC's arguments and support as critical to the decision (Gardiner 1999). With financial and technical support from EPA, the Bureau of the Census requested that OMB reinstate funds for PACE in February 2000, noting that the survey was "essential for monitoring impact of environmental programs on the U.S. economy and responsiveness to these programs" (U.S. Department of Commerce 2000). The survey was reinstated, with revisions, after a five-year hiatus.

2.2 Congressional Initiatives

Environmental regulation emerged as a major target of the Congressional regulatory reform effort of the 1990s. This is not surprising, given that EPA is the source of most of the major rules subjected to Regulatory Impact Analysis under the various benefit-cost Executive Orders, as measured by their estimated benefits and costs.[17] We discuss both comprehensive and specific regulatory reform proposals considered by the 103rd through 106th Congresses. Brief summaries of regulatory reform initiatives of the Congresses of the 1990s that would have influenced the application of efficiency, risk analysis, or cost-effectiveness criteria to environmental regulation are provided in Table 2.

[17]Fifty-four percent of the total annual regulatory benefits and 50 percent of the total annual regulatory costs identified by OMB in 1997 were attributed to environmental regulations (Dudley and Antonelli 1997, Office of Management and Budget 1997).

2.2.1 General Themes of Regulatory Reform Proposals

The 103rd Congress (1993-1995), the Clinton Administration's first legislative "partner," actively debated benefit-cost analysis and risk analysis as methods for informing environmental protection decisions (Blodgett 1995, Lee 1995). Three of the lightning rods for regulatory relief interests were "takings" issues or private property rights, unfunded mandates, and risk analysis, all of which are prominent aspects of environmental regulation (Lee 1995). With Democratic majorities in both houses, none of the 103rd Congress' initiatives (listed in Table 2) were enacted into law, or even offered for Presidential signature.

The regulatory reform movement gained momentum when the members of the 104th Congress (1995-1997) took their seats after the 1994 midterm election, in which the Republican Party gained control of both the Senate and the House of Representatives. Reform-oriented bills in 1995-1996 included mandates for benefit-cost analysis, maximum likelihood risk assessments (rather than upper bounds), and regulatory process reforms (Viscusi 1996). Under this last category, process reforms, Congress considered requiring regulatory agencies to: (1) prepare special plans and analyses; (2) report to Congress on priority-setting and/or benefit-cost analysis; (3) submit rules for peer review by panels of scientific experts; and (4) submit rules for judicial review.

2.2.2 Comprehensive Regulatory Reform: The Contract with America

Most of the 104th Congress' comprehensive regulatory reform proposals either failed to pass both Houses or were vetoed by President Clinton. The 1994 Contract with America's item 8, the "Job Creation and Wage Enhancement Act," did not pass as legislation. It would have made Reagan's Executive Order 12291 statutory, superseding the Clinton Executive Order — as well as the language in several other important statutes — and would have required that the benefits of regulations outweigh their costs.[18] Although these components of the Contract with America did not become law, the Contract itself was a major political event, symbolic of the shift in power in the Congress and a consequential public debate over regulatory reform, in which benefit-cost analysis was a central issue.

[18]Item 8 also focused on the reduction of so-called "unfunded mandates," and on strengthening the Regulatory Flexibility Act of 1980, which resulted in the Small Business Regulatory Enforcement Fairness Act of 1996 and the Unfunded Mandates Reform Act of 1995. There were many other unsuccessful attempts at regulatory reform legislation during the 104th Congress, including H.R.1022, "Risk Assessment and Cost-Benefit Act of 1995"; H.J.Res. 27 and 54, which proposed a Constitutional amendment to ban unfunded mandates; H.R. 47, "Regulatory Relief and Reform Act"; and H.R. 122 to establish a Regulatory Sunset Commission. Detailed discussion of these is beyond the scope of this study. We mention them only to emphasize the scope and depth of the 104th Congress' focus on regulatory reform.

2.2.3 Specific Regulatory Reform Proposals

The Small Business Regulatory Enforcement Fairness Act (SBREFA, P.L. 104-121) amended the 1980 Regulatory Flexibility Act. As one of the affected agencies, EPA must prepare a regulatory flexibility analysis of all rules with "significant economic impact" on a "substantial number" of small entities (businesses, non-profits, and small government organizations). These analyses, which must be reviewed by Congress, examine the type and number of small entities potentially subject to the rule, record-keeping and compliance requirements, and significant regulatory alternatives. The statute does not require formal benefit-cost analysis beyond that already required by environmental regulations and Executive Order; rather, it requires that EPA submit to Congress "a complete copy of the benefit-cost analysis of the rule, if any," along with the regulatory flexibility analysis. From an economic efficiency perspective, the focus on small entities makes little, if any sense, and the SBREFA requirements were viewed by EPA staff as little more than a time-consuming diversion from more important analyses and other activities.

Embedded within SBREFA, but for the most part unrelated to its other provisions, was the Congressional Review Act, which established a process of Congressional review and possible rejection of agency rules. Agencies must submit all new rules to the House and Senate leadership, in addition to the GAO. Within 15 days, GAO must provide a report on each major rule to the agency's authorizing committee, after which any member of Congress may introduce a "resolution of disapproval," which is treated as a bill in the House and somewhat differently in the Senate. Congress then has 60 session days in which to act on the measure; if the resolution of disapproval passes both houses, it must be signed by the President in order to lead to rejection of the given rule.[19]

In 1995, the 104th Congress enacted the Unfunded Mandates Reform Act (P.L. 1044), which requires quantitative assessment of benefits and comparison of benefits to costs for all proposed and final rules, including environmental regulations, with an expected cost to state, local and tribal governments, or to the private sector, greater than or equal to $100 million. In addition, the Act mandates that agencies choose the least-cost regulatory alternative, or explain why the least-cost alternative was not chosen, and that they submit rules to the GAO, which reports to appropriate Congressional committees on agency compliance with statutory and executive order requirements.

In late 1996, the 104th Congress attached a benefit-cost requirement to Section 645(a) of the Treasury, Postal Services and General Government Appropriations Act of 1997 (P.L. 104-208).[20] The Office of Management and Budget would be required to submit to Congress a report estimating the "total annual costs and benefits of Federal regulatory programs, including quantitative and non-quantitative measures." The legislation also required OMB to estimate individually the benefits and costs of rules with annual costs to the economy of $100 million or

[19]The Congressional Review Act was the basis for the George W. Bush Administration's overturning of the Occupational Safety and Health Administration's ergonomics rule in 2001. The CRA has not been used to reject any environmental regulations.

[20]This provision was typically referred to as "regulatory accounting."

more. Importantly, OMB also was required to recommend the reform or elimination of any regulation that appeared to be inefficient. This reporting requirement has remained in place, and reports were submitted in each year, 1997 through 2000.[21] The requirement has further centralized regulatory oversight in the hands of OMB, which already had been charged with reviewing the RIAs required by Executive Orders since 1981.

Although the benefit-cost and cost-effectiveness legislation promulgated by the 104th Congress had a limited effect on agency rule-making, Congressional regulatory reform efforts continued through the end of the Clinton Administration. The 105th and 106th Congresses considered establishing further checks on agency regulation. The Regulatory Improvement Act of 1999 (also known as the Thompson-Levin bill) would have allowed courts to remand or invalidate rules formulated by an agency that fails to perform sufficient benefit-cost analysis.[22] While this bill never became law, the 106th Congress did pass a major piece of regulatory reform legislation, the Truth in Regulating Act (TIRA), which was signed into law (P.L. 106-312) by President Clinton in October 2000. The TIRA established a three-year pilot project beginning in early 2001 in which GAO will review RIAs to evaluate agencies' benefit estimates, cost estimates, and analysis of alternative approaches, upon request by Congress.[23]

3. ECONOMICS AND SPECIFIC ENVIRONMENTAL POLICIES OF THE 1990s

One major challenge of summarizing the most important environmental policy developments of the 1990s from an economic perspective is that the subset of environmental policies for which efficiency and cost-effectiveness analyses exist is relatively small. In addition, many important environmental policy developments may not be important economic developments, and vice-versa. The set of specific policies we analyze is a mixture of the most important environmental developments, and the most important applications of economic analysis and market-based instruments to environmental policy. The intersection of these two sets is small.

We consider Clinton era statutes and regulations that focused on specific environmental problems under five principal categories: Congressional changes to individual environmental statutes (including the Safe Drinking Water Act amendments of 1996 and the Food Quality Protection Act of 1996); implementation of the Clean Air Act amendments of 1990 (including new national ambient air quality standards for ozone and particulates, SO_2 allowance trading,

[21]The continuation of this provision was proposed by the Regulatory Right-to-Know Act of 1999 (S. 59). Introduced as H.R. 1074 in the House, the bill would have required much more stringent analysis by OMB: an annual accounting statement of total costs and benefits of Federal regulations, including direct and indirect impacts on Federal, state, local and tribal government, the private sector, small business, wages, and economic growth.

[22]The Regulatory Improvement Act was proposed as S. 981 in 1997 and carried on with the same title into 1998. It was introduced in various versions in both Houses of Congress throughout 1997-1999, and took on the Thompson-Levin moniker in May 1999. A similar bill was introduced in the House in late 1999, but without the judicial review mandate.

[23]The initiation of GAO review under TIRA is contingent on appropriations. As of May 2001, funding had not been authorized.

new air toxics regulation, and the regional NO_x trading program); expansion of information-based regulatory programs; natural resource policy initiatives; and global climate change initiatives.

3.1 Congressional Changes to Individual Environmental Statutes

In addition to their attempts at cross-cutting regulatory reform, the Congresses of the Clinton years pursued efficiency and cost-effectiveness within environmental statutes themselves.[24] In general, the Congress was more successful during the 1990s at passing cross-cutting regulatory reform bills than it was at reforming individual environmental statutes, although important exceptions were the 1996 Safe Drinking Water Act (SDWA) amendments, and the partial reform of pesticide permitting under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and the Federal Food, Drug and Cosmetic Act (FFDCA). The 104th Congress also pursued efficiency-oriented reform of the Clean Water Act through the reauthorization process, but the effort failed in the Senate. All efforts to reform the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) failed, as did attempts to reform the Resource Conservation and Recovery Act (RCRA) and other statutes.

3.1.1 Safe Drinking Water Act Amendments of 1996

The 1996 SDWA Amendments (P.L. 104-182) included the most far-reaching requirement for economic analysis in any environmental statute. The Amendments focused EPA regulatory efforts on contaminants that pose the greatest health risks by: (1) requiring benefit-cost analysis of new rules; (2) removing the mandate that EPA regulate 25 new contaminants every three years; (3) allowing EPA to use cost information to adjust its "feasibility standards" for water system reduction of contaminants; and (4) requiring the Administrator to balance risks among contaminants to minimize the overall risk of adverse health effects (Tiemann 1999). While the Amendments require EPA to determine whether the benefits of each new drinking water maximum contaminant level (MCL) regulation justify the costs, they also allow the Agency to adopt more stringent standards than those that maximize net benefits, explaining the reasons for not selecting the efficient standard.[25]

The decisions made on MCLs since the SDWA Amendments have not placed great weight on the results of required benefit-cost analyses. Two major rules proposed since the 1996 Amendments are those regulating allowable levels of arsenic and radon in drinking water. The arsenic rule was finalized on January 22, 2001 but is under review by the George W. Bush Administration, while no final action was taken on radon.[26] EPA's benefit-cost analysis for the

[24]During the 1990s, the Congress also pursued reforms of non-environmental statutes that affect environmental regulation. For example, the Accountable Pipeline Safety and Partnership Act of 1996 (104th Congress) requires the Secretary of Transportation to issue pipeline safety regulations only upon justification that benefits exceed costs (Blodgett 1998). Discussion of these reforms is beyond the scope of this study, although some are listed in Table 2.

[25]See Safe Drinking Water Act §300g-1 (4)(C). The Amendments do not allow old standards to be subjected to an *ex-post* benefit-cost analysis.

[26]On March 20, 2001, EPA Administrator Christine Todd Whitman announced the Agency's intention to withdraw the pending arsenic standard in order to seek independent reviews of both the science behind the standard and the estimates of the benefits and costs of implementing the rule. In May, 2001, the Administrator announced that the

radon and arsenic MCLs can be interpreted as indicating that monetized costs exceed monetized benefits for both rules (by more than $50 million annually for radon and $30 million annually for arsenic). The Agency maintained, however, that benefits of both rules justify their costs when unquantified benefits are included (Burnett and Hahn 2001).[27] While this may be true, the fact that both the radon and arsenic rules result in net monetized costs has caused some to be skeptical of EPA's commitment to applying the SDWA Amendments' benefit-cost requirement. Moreover, these analyses did not consider cost-effective alternatives, such as limiting compliance to large public drinking water systems. The actual benefit-cost analyses themselves also suffer from methodological flaws, such as not discounting for latency in the case of arsenic-related human health effects.

There will be more rulemakings under the SDWA over the next decade–in 1998 EPA published a list of 50 chemical and ten microbiological contaminants that will be investigated for possible regulation. The impact of the SDWA Amendments' requirement for benefit-cost analysis in deciding both which drinking water contaminants to regulate and how to regulate them will be an important area for further research.

3.1.2 Food Quality Protection Act of 1996

The Food Quality Protection Act of 1996 (P.L. 104-170) amends both FIFRA and the FFDCA, removing pesticide residues on processed food from the group of Delaney "zero-risk standard" substances. The Delaney standard has long been a target of economic criticism. While the standard continues to apply to non-pesticide food additives, the Food Quality Protection Act of 1996 eliminated the distinction between pesticide residues on raw foods (which had been regulated under

FFDCA section 408) and processed foods (which had been regulated under FFDCA section 409 – the Delaney Clause). The Act also mandates that EPA coordinate pesticide regulation under FIFRA and FFDCA.[28]

3.1.3 Debates Over Changes to Superfund and Clean Water Act

Two of the environmental statutes most frequently criticized on efficiency and cost-effectiveness grounds — Superfund and the Clean Water Act (CWA) — remained relatively untouched by the Congress in the 1990s, despite its focus on regulatory reform. Superfund's

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National Academy of Sciences will review a range of possible arsenic standards, and that the effective date of the standard will be postponed until February 2002.

[27]See Environmental Protection Agency (1999a). EPA's cost and benefit figures for these rules were presented as annualized 1999 dollar values using a 7 percent discount rate. The AEI-Brookings Joint Center for Regulatory Analysis performed its own benefit-cost analysis of the arsenic rule, which concludes that in all likely scenarios the cost per life saved by the rule would never be less than $6.6 million, and that in its "most likely" scenario, cost per life saved was approximately $67 million. See Burnett and Hahn (2001).

[28]For example, once a pesticide registration is canceled under FIFRA, the food-use tolerance under FFDCA must be revoked within 180 days, rather than the average six year time frame noted in a 1994 GAO report (Schierow 1996, U.S. General Accounting Office 1994).

critics have focused on the low benefits for dollars spent (Viscusi 1992, Breyer 1993, Hamilton and Viscusi 1999). Reauthorization and reform were considered during the 105th Congress, but no legislation was passed. Rather than efficiency or cost-effectiveness, liability issues and the question of how to finance Superfund in the future were the major foci of legislative discussion of this statute in the late 1990s. The taxes that support the Superfund trust fund (primarily excise taxes on petroleum and specified chemical feedstocks and a corporate environmental income tax) expired in 1995 and have not been reinstated.[29]

During the 104th Congress, the House passed a comprehensive Clean Water Act reauthorization (H.R. 961) that would have been more flexible and less prescriptive than the current statute, but the Senate did not take up the bill.[30] No reauthorization legislation was considered in the 105th or 106th Congress, but the legislature did oppose non-point source water pollution control initiatives under Section 303(d).

Section 303(d) of the Clean Water Act requires states to establish a Total Maximum Daily Load (TMDL), something like a "pollution budget", for each water body that does not meet ambient water quality standards for its designated use, despite point source pollution control.[31] Until recently, EPA did little to enforce this part of the CWA, but state courts ordered the development of TMDLs in the 1990s in response to multiple lawsuits by environmental groups.[32]

EPA convened a Federal advisory committee to develop a consistent national TMDL program in 1996, proposed regulations to clarify and strengthen the TMDL program in August 1999, and issued a final rule in July 2000. The proposed and final rule generated controversy over the costs of state implementation of TMDLs and about their impact on agriculture and forestry. As a result, the 104th Congress attached a rider to an appropriations bill that prevents EPA from spending funds to implement the rule in FY2000 and FY2001. Should states be required to fully enforce TMDLs, the economic implications are likely to be very large — the most current list of impaired waters under Section 303(d), which would be subject to TMDL enforcement, includes almost 22,000 water bodies.

The TMDL program takes an ambient approach to water quality regulation and emphasizes watershed-level water quality trading over the traditional technology standards

[29]The revenues now flowing into the trust fund come from so-called "potentially responsible parties", interest on the fund's investments, fines, and penalties. House Ways and Means Chairman Bill Archer (R-TX) has made it known that no reinstatement of the Superfund taxes will be considered without major reforms of the statute's liability provisions and other features. See Reisch (2000).

[30]The 103rd Congress had considered similar legislation (H.R. 3948, S. 2093), but no floor action on CWA reauthorization was taken in either house.

[31]The TMDL should be set at a level necessary to attain the applicable water quality standard for the water body's designated use. Designated uses include recreational use, public water supply, and industrial water supply, for example, and each designated use has an applicable water quality standard.

[32]Through October 2000, environmental groups had filed 40 legal actions in 38 states. EPA is under court order or consent decree in many states to ensure that TMDLs are established either by the state or by EPA itself (U.S. Environmental Protection Agency, Office of Water 2000).

promulgated under the CWA's National Pollutant Discharge Elimination System permits. Both of these would be welcome changes to traditional water quality regulation from an economic perspective, but it is very difficult to link particular sources to ambient water quality. In addition, attaining the TMDL generally involves regulating non-point source pollution, given that point-source permitting has been insufficient to achieve compliance with water quality standards. Identification of the sources and pathways of pollution in compiling a TMDL requires a "kind of holistic accounting exercise" in which all permitted sources and land uses within a waterbody's drainage area are inventoried and allocated portions of the pollution budget (Boyd 2000).[33] In addition, while the theoretical economic gains from point-nonpoint source water quality trading could be substantial, the number of actual trades under the 15 current and past Federal and state water quality trading programs has been negligible (Boyd 2000, Stavins 2001).

From a cost-effectiveness standpoint, the focus on nonpoint sources is theoretically sound; there is no reason, *ex ante*, to impose further restrictions on point sources merely because the legal, technical, and institutional bases for regulating nonpoint sources are murky. Recognition is widespread that nonpoint sources of pollution are of greater concern, for most of the nation's impaired water bodies, than permitted point sources from which reductions have been achieved over 25 years (see Table 3). The potentially high costs of establishing, monitoring, and enforcing pollution budgets for non-point sources, however, may offset any gains we could expect to achieve from bringing the marginal abatement costs of point and non-point sources into closer alignment.

3.2 Implementation of the 1990 Clean Air Act Amendments

A substantial portion of air quality regulation during the 1990s had to do with implementation of the Clean Air Act Amendments of 1990. While the judiciary in the 1990s and subsequently upheld CAA statutory provisions preventing EPA from taking costs into account when setting the National Ambient Air Quality Standards, the 1990 Amendments addressed efficiency and cost-effectiveness of air quality regulations in a variety of ways.[34] First, the Amendments required a retrospective benefit-cost analysis of the 1970 CAA and its 1977 amendments, and biennial prospective analyses of the 1990 Amendments themselves. The results of these benefit-cost analyses are discussed in Section 4.3.1, where we consider the efficiency of the major environmental statutes.

In addition, although they did not allow for the consideration of costs in setting ambient standards, the Amendments occasionally provided the basis for implementation of cost-effective regulation. For example, under Title IV of the amendments, Congress directed EPA not to mandate specific pollution control technologies for sulfur dioxide (SO_2) emissions from power plants, while it required the agency to oversee SO_2 emissions reduction from these sources by nearly 50 percent over 10 years. The result was the SO_2 permit trading system. Not all

[33]In addition, data sources and modeling techniques can be standardized only to a very small degree, since each listed water body (lakes, river segments, ponds, estuaries) has unique hydrology, transport pathways, pollutant sources, weather patterns, etc. See Boyd (2000).

[34]See U.S. Supreme Court (2001a); the 2001 decision regarding the National Ambient Air Quality Standards is discussed further in section 3.2.4.

regulations promulgated under the 1990 CAA Amendments were equally as cost-effective, however. The Amendments explicitly required EPA to issue technology standards for 188 toxic air pollutants, perhaps one of the most expensive and least cost-effective components of the CAA (Portney 1990). Highlights of the implementation of the 1990 CAA Amendments, from an economic perspective, are discussed below.

3.2.1 Use of Market-Based Instruments in Clean Air Act Amendment Implementation

EPA provided averaging, banking, and trading opportunities for most of the new standards promulgated under the direction of the 1990 CAA Amendments, including those aimed at mobile sources. EPA's implementation of the reformulated gasoline provisions of Title II of the Amendments allowed refinery-level trading of oxygen, aromatics, and benzene content.[35] Title II also authorized EPA to regulate particulate matter, nitrogen oxide (NO_x), and other emissions from heavy-duty trucks. The resulting regulations were promulgated at the vehicle engine-manufacturing level, and allow averaging, banking, and trading.[36] The Tier 2 emissions standards for cars and light-duty trucks, issued in February 2000, allow vehicle manufacturers to average NO_x emissions throughout their fleets to meet the new national tailpipe standards. They also allow refiners and gasoline importers to average, bank, and trade gasoline sulfur content to meet new Tier 2 standards.[37]

With respect to stationary sources, the regional NO_x cap-and-trade program in the Northeast is another significant market-based policy instrument developed and implemented under the aegis of the 1990 Clean Air Act Amendments. Although the SO_2 trading program was created under the Bush Administration, implementation of Phase I and Phase II occurred during the 1990s and is one of the world's most frequently studied market-based instrument for environmental policy. These two programs are described below, as are two significant rulemakings that have been more heavily criticized from an economic perspective: the revised ambient air quality standards for ozone and particulate matter, and new regulations on toxic air pollutants.

3.2.2 Sulfur Dioxide Trading Phase I and Phase II

The tradeable permit system that regulates SO_2 emissions, the primary precursor of acid rain, was established under Title IV of the Clean Air Act Amendments of 1990. The system is intended to reduce SO_2 and NO_x emissions from 1980 levels by 10 million tons and 2 million

[35]The initial guidance for the reformulated gasoline trading programs was issued in October 1992, during the Bush Administration. Trading at the refinery level has been very active (U.S. Environmental Protection Agency 2001a).

[36]While a great deal of averaging and banking has taken place, only one trade was completed through 2000 (U.S. Environmental Protection Agency 2001a).

[37]The banking and trading allowances under the Tier 2 standard are limited. The average sulfur content cap drops annually between 2004 and 2006, and credits produced within that time frame have a limited life, while credits produced after the introduction of the strictest standard (2006) have unlimited life.

tons, respectively.[38] The first phase of SO_2 emissions reductions was started in 1995, with a second phase of reduction initiated in the year 2000.[39]

A robust market of bilateral SO_2 permit trading emerged in the 1990s, resulting in cost savings on the order of $1 billion annually, compared with the costs under some command-and-control regulatory alternatives (Carlson *et al.* 2000). Although the program had low levels of trading in its early years (Burtraw 1996), trading levels increased significantly over time (Schmalensee *et al*. 1998; Stavins 1998; Burtraw and Mansur 1999).

3.2.3 Regional NO_x Budget Program in the Northeast

Under EPA guidance, twelve northeastern states and the District of Columbia implemented a regional NO_x cap-and-trade system in 1999 to reduce compliance costs associated with the Ozone Transport Commission (OTC) regulations of the 1990 CAA Amendments.[40] Required reductions are based on targets established by the OTC and include emissions reductions by large stationary sources. The program is known as the Northeast Ozone Transport Region (Farrell *et al*. 1999).

EPA distributes NO_x allowances to each state, and states then allocate allowances to sources in their jurisdictions. Each source receives allowances equal to its restricted percentage of 1990 emissions, and sources must turn in one allowance for each ton of NO_x emitted over the ozone season. Sources may buy, sell, and bank allowances. Potential compliance cost savings of 40 to 47 percent have been estimated for the period 1999-2003, compared to a base case of continued command-and-control regulation without trading or banking (Farrell *et al*. 1999).

3.2.4 National Ambient Air Quality Standards for Ozone and Particulate Matter

EPA issued new, stricter National Ambient Air Quality Standards (NAAQS) for ozone and particulate matter in July 1997. The revised standards were immediately controversial; both the decision to tighten the standards and the quality of the research used to support the new standards came under fire. Table 4 lists EPA's estimated monetized benefits and costs for the revised ozone and particulate matter NAAQS. EPA's cost estimates for the ozone standard were singled out for criticism; some analysts found them to be too low by a considerable margin (Shogren 1998, Lutter 1999).

The regulated community challenged the new NAAQS in the courts, and the case reached the U.S. Supreme Court in October 2000. Under the Clean Air Act, EPA is required to set health-based standards for these pollutants and to ignore cost considerations in setting the

[38]For a description of the legislation, see Ferrall (1991).

[39]In Phase I, individual emissions limits were assigned to the 263 most SO_2-emissions intensive generating units at 110 plants operated by 61 electric utilities, and located largely at coal-fired power plants east of the Mississippi River. Under Phase II of the program, beginning January 1, 2000, almost all electric power generating units were brought within the system.

[40]Seven OTC states have also implemented state-level NO_x trading programs: New Jersey, Connecticut, Delaware, New York, Massachusetts, New Hampshire and Maine (Solomon 1999).

standards. More than 40 economists and the AEI-Brookings Joint Center for Regulatory Studies filed a brief *amici curiae* in the Supreme Court, suggesting that benefit-cost analysis should be considered in the setting of ambient air quality standards (AEI-Brookings Joint Center *et al*. 2000). The Supreme Court ruled unanimously in February 2001 that the CAA does not allow EPA to consider costs in setting NAAQS for the criteria pollutants, and that the statute's mandate that the NAAQS protect the public health with "an adequate margin of safety" allows an acceptable scope of discretion to EPA. The Court acknowledged that EPA and the states could continue to take costs into account in implementing the standards, which may serve as an impetus for cost-effective policy instruments.[41]

Given that monetized costs appear to outweigh monetized benefits by a significant margin, EPA has been under considerable pressure to revise the ozone standard despite the Court's decision on cost consideration.[42] The situation is different for particulate matter, where monetized benefits appear to outweigh monetized costs. In any case, the NAAQS represent a clear majority of all economic effects of environmental policy changes during the 1990s. Should the courts continue to uphold the standards and the statutes preventing cost considerations remain unchanged, the stricter NAAQS for ozone and particulate matter may be one of the Clinton Administration's most enduring environmental legacies, in terms of both potential benefits and costs.[43]

3.2.5 Maximum Available Control Technology for Air Toxics

The air toxics regulations necessitated under the 1990 CAA Amendments could be one of the most expensive and least cost-effective components of the Clean Air Act, depending on how they are implemented. The Amendments mandated that EPA issue standards for 188 toxic air pollutants, substances that are less common than the criteria pollutants for which NAAQS are promulgated, but nonetheless might pose threats to human health. Like the NAAQS, the statute's treatment of toxic air pollutants requires EPA to set standards so that resulting concentrations provide an "ample margin of safety" against human health effects. Unlike in the case of the NAAQS, however, the Administrator of EPA is directed to require the maximum degree of emissions reduction achievable, taking costs into consideration.

Although EPA is allowed to take costs into account when determining standards for hazardous air pollutants, the type of regulation required is a technology standard — Maximum Achievable Control Technology (MACT) — not a market-based approach. From 1992 through

[41]The Supreme Court decision was greeted with enthusiasm by EPA Administrator Christine Todd Whitman: "...Congress delegated to EPA the standard-setting function, and EPA carried it out appropriately" (U.S. Environmental Protection Agency 2001b).

[42]EPA has agreed to reconsider its analysis of ozone NAAQS benefits in at least one respect; the agency's initial analysis did not consider the possible damages associated with *decreases* in ground-level ozone, which leads to increases in some ultraviolet radiation (UV-B) exposure. These damages, which include increases in skin cancer and cataracts, could be comparable to the benefits associated with reductions in ground level ozone (Lutter and Wolz 1997).

[43]It remains to be seen whether some urban areas will be able to comply with the new ozone standards. One analyst estimates the costs to Los Angeles of meeting the ozone standard in 2010 will be about $15 billion in constant 2000 dollars, assuming a 5 percent decrease in current abatement costs due to technological change (Lutter 1999).

August 2000, EPA issued technology standards for 45 of these substances, covering 82 categories of industrial sources. While there are no estimates of the total monetized costs and benefits of this new set of technology standards for hazardous air pollutants, one analyst in 1990 estimated that when fully implemented, compliance costs would range from $7.9 to $13.2 billion per year, and benefits would range from $0 to $5.3 billion per year (Portney 1990).[44] The lower bound of zero on potential benefits is indicative of the considerable uncertainty over risks posed by these pollutants to human health. Some analysts have been particularly critical of EPA's very conservative estimates of risks to human health from air toxics in its promulgation of standards (Stroup 2000, Gray and Graham 1991).

3.3 Expansion of Information Programs

PA increased its use of information disclosure regulations, one form of market-based instrument for environmental policy, during the 1990s. The Toxics Release Inventory (TRI) was initiated in 1988 under the Emergency Planning and Community Right-to-Know Act Section 313 and requires firms to report on use, storage and release of hazardous chemicals. A 1993 Clinton executive order required TRI reporting by Federal facilities. In 1994, EPA added 286 new chemicals to the list requiring TRI reporting, nearly an 80 percent increase in the number of listed chemicals. In 1999, EPA lowered reporting thresholds for many persistent bioaccumulative toxic chemicals and added more of these chemicals to the TRI list.[45] The 104th Congress considered but did not enact legislation that would have restricted EPA's ability to require TRI reporting.[46]

Releases reported under TRI declined by 45 percent from 1988 to 1998, but it is unclear how much, if any, of that reduction can be attributed to the policy itself. There is some evidence that publicly available information about firms' TRI emissions, either in absolute terms or relative to some benchmarks, negatively affects stock prices (Hamilton 1995, Konar and Cohen 1997, Khanna *et al.* 1998). Other possible avenues through which the TRI may influence emissions are green consumerism, redirection of firms' attention toward measures that increase environmental performance while saving costs, and community pressure, but there is currently little solid evidence that any of these forces are at work with respect to the TRI (Snyder 2001).

In addition to the Toxics Release Inventory, EPA also focused on establishing new and expanding other existing information programs during the 1990s. In 1997, EPA expanded the existing Energy Star Buildings program, consolidating it with the newer Green Lights program.

[44]These figures were Portney's "educated guess" in 1990, based on George H. W. Bush Administration estimates and those of a 1990 consulting firm study. We have converted them to 2000 dollars, assuming that they were originally stated in 1990 dollars. See Portney (1990).

[45]The EPA under Clinton also continued the 33/50 program, started under the Bush Administration, which engaged TRI-reporting industries in achieving voluntary accelerated emissions reduction targets in exchange for public "certification" and its associated goodwill.

[46]The Clinton Administration announced another expansion of TRI on January 17, 2001, considerably lowering the threshold for reporting lead emissions. The previous standard required reporting by facilities that manufacture or process more than 25,000 pounds of lead annually, or that use more than 10,000 pounds annually. The new standard requires reporting by any facility that manufactures, processes, or uses more than 100 pounds annually. The Bush Administration announced its intention to uphold the new threshold on April 17, 2001.

In 1998, the Agency began requiring public water systems to issue annual Drinking Water Consumer Confidence Reports. In 2000, it posted automobile "pollution rankings" on the EPA web site, ranking vehicles based on hydrocarbon and NO_x tailpipe emissions. While these programs could, in theory, be cost-effective ways to reach environmental objectives, we cannot conclude from existing empirical evidence whether they are responsible for any portion of the trends in air and water quality in the 1990s. Not surprisingly, given the lack of evidence regarding the benefits of these programs, no formal benefit-cost analyses of TRI or any of the other programs mentioned above have been conducted.

3.4 Natural Resource Policy

From an economic perspective, five aspects of natural resource policy during the Clinton years stand out: the natural resource subsidy reductions included within the Administration's 1993 economic stimulus and deficit-reduction proposal; the shift in priorities of the U.S. Forest Service; Clinton's designation of almost 6 million new acres of Federal public lands under the 1906 Antiquities Act; changes to Federal wetlands policy and the Endangered Species Act; and attempts to introduce natural resource capital and environmental quality into the national income and product accounts.[47]

3.4.1 Natural Resources and the 1993 Clinton Budget Proposal

The Administration proposed a variety of policies related to natural resource subsidy reduction within its 1993 economic stimulus and deficit reduction proposal. First, it proposed increasing the baseline Federal grazing fee on public lands by almost 200 percent, resulting in a Senate filibuster on FY1994 Interior Appropriations during the 103rd Congress. The baseline Federal grazing fee had been calculated at only 56 to 83 percent of Federal costs per animal unit month in 1990 and was a much smaller percentage (perhaps 18 to 40 percent) of private market rates (Cody 1996). In theory, below-market fees for grazing livestock on public lands cause economic over-grazing. In practice, low fees have also been criticized from a budgetary perspective, since current fees do not cover the costs of Federal public range management.[48]

Similarly, below-cost timber sales from Federal lands theoretically lead to logging at greater-than-efficient rates. The Administration's 1993 proposal sought to phase out below-cost timber sales from Federal forests. By U.S. Forest Service (USFS) estimates, 77 of the 120 national forests showed net losses from timber sales over the period FY1989-FY1993, and 60

[47]Land use change emerged as an important issue during the 1990s and received substantial rhetorical attention from President Clinton and, in particular, Vice President Gore. While initiatives under this umbrella term could be considered as natural resource policy, most of the policies designed to address land use change, including those promoting "smart growth" and "livable communities" and limiting "urban sprawl" were related to transportation policy and other areas beyond the scope of this paper. Land use change is, therefore, omitted from our discussion.

[48]The baseline grazing fee for Federal lands in 1990 was $1.81 per animal unit month (AUM), while the various livestock grazing programs' cost to government of ranged from $2.18 to $3.24 per AUM. The fair market value of grazing on Federal land was last updated in 1986, and ranged from $4.68 to $10.26 per AUM for cattle and horses, varying by region (Cody 1996). (These figures have not been converted to constant dollars.) The Administration continued to lobby for fee increases, and the 104th Congress established a new fee formula that resulted in a small increase in the baseline fee, still many times lower than the average private market rate.

reported losses in every year over this period. The plan to reduce below-cost sales was eliminated from Clinton's final budget proposal, however, and a USFS draft plan to phase out below-cost sales on one-half of forest service lands over four years was not adopted by the Administration.

The 1993 deficit reduction plan also included a British Thermal Unit (BTU) tax, one of the first and most visible environmental initiatives of the Clinton presidency.[49] The proposal, which would have taxed essentially all fuels, faced stiff opposition in the first session of the 103rd Congress, but it narrowly passed the House. Recognizing that the proposal did not have enough votes in the Senate, the Administration removed the BTU tax from its budget proposal.[50] The Administration proposed another energy tax in 1997 as part of its climate change strategy, but faced similar opposition.

The Administration's focus on natural resource policy in the 1993 budget proposal also included introduction of royalties for hardrock mining on public lands governed under the 1872 General Mining Law, and increased fees for recreational use of Federal public lands (U.S. Council of Economic Advisers 1997).[51] The Congress opposed all of the natural resource initiatives in the 1993 Clinton proposal, with one exception – the 104th Congress established a framework for user fee demonstration projects within the National Park Service (P.L. 104-134).[52]

3.4.2 U.S. Forest Service Changes

While the Administration's proposed phasedown of below-cost timber sales failed, the Forest Service under Clinton underwent a substantial shift in priorities, emphasizing resource protection over timber production and extraction. In two speeches delivered in 1998 and 1999, USFS Chief Mike Dombeck summed up these changes in the agency's "Natural Resource Agenda for the 21st Century", emphasizing: (1) watershed protection; (2) sustainable forest system ecosystem management; (3) forest roads; and (4) recreation.[53] Prior to these statements, however, substantial changes had already been implemented.

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[49]The tax would have been imposed on coal, natural gas, liquid petroleum gases, nuclear electricity, hydroelectricity, and all imported electricity (almost 3 cents per million BTU); a higher tax (about 6 cents per million BTU) would have been imposed on refined petroleum products.

[50]The Senate later passed a much watered-down Transportation Fuels Tax in 1993, with revenues flowing to the General Fund. This was a retail tax on gasoline of less than 5 cents per gallon, paid by consumers.

[51]The Administration also supported electricity deregulation and agricultural subsidy reduction, but those initiatives are beyond the scope of this paper.

[52]During the 1990s, the Congress also opposed the application of market incentives to fisheries management. The Sustainable Fisheries Act of 1996 (P.L. 104-297) amended the Magnuson-Stevens Fishery Conservation and Management Act, imposing a four-year moratorium on new individual tradeable quota programs among the nation's eight regional fishery management councils and repealing one such program that had been created in 1995 (Buck 1996). The Act did not, however, repeal the other five existing ITQ programs.

[53]This change has not been driven exclusively by the Executive Branch. Congress has increasingly designated portions of National Forest lands for conservation, so that about 25 percent of national forests were being managed for conservation by 1994. The Endangered Species Act (ESA) has also played a role. The number of threatened and endangered species on National Forest system lands has risen from about 50 to almost 350 between 1973 and

The volume of timber sold from U.S. National Forests fell from about 11.5 billion board feet per year in 1987 to less than 4 billion board feet per year in 1997, a decrease of almost 70 percent (U.S. General Accounting Office 1999).[54] This was due, in part, to the increased costs to producers associated with the USFS shift to offering timber sales to improve forest health, rather than to provide wood fiber — most of the trees removed to reduce the risk of fire have little commercial value. In addition, the USFS 1992 policy reducing clear-cutting in national forests dramatically increased the costs of logging, especially in the Pacific Northwest, which experienced per-unit cost increases of 150 percent between 1980 and 1997 (U.S. General Accounting Office 1999). No efficiency estimate exists for this aggregate policy shift, and no analysis of the potentially substantial environmental and recreational benefits and economic costs has been undertaken.

The Forest Service also was the focus of the Clinton Administration's Roadless Initiative, hailed by environmentalists as one of the decade's most important environmental policy initiatives, but perhaps less important economically than the shift discussed above. President Clinton announced the Initiative in October 1999, instructing the USFS to develop regulations for long-term protection of inventoried roadless areas within the National Forest system. The USFS Roadless Rule, submitted to the *Federal Register* in January 2001, placed 58.5 million acres of unroaded Federal forest lands in 39 states off limits to new roadbuilding.[55]

The efficiency implications of this rule are unclear. Inventoried roadless areas comprise two percent of the U.S. landmass and 31 percent of the forest system landmass. They usually are characterized by rugged terrain and low-value timber or are considered ecologically sensitive, however, which may suggest relatively low costs to leaving in them in their current state and relatively high environmental benefits of preservation.[56] In addition, by Forest Service calculations, less than two-tenths of one percent of the U.S. timber harvest and less than four-tenths of one percent of U.S. oil and natural gas reserves will be affected by the roadless rule (Dombeck 2001). Any benefit-cost calculation would have to take into account the cost of maintaining forest system roads. USFS currently maintains a road system of more than 386,000 miles, and has a maintenance backlog in excess of $8 billion.

Also in January 2001, Forest Service Chief Mike Dombeck announced a new USFS policy directive on old-growth cutting. This was a substantial reversal of previous policy, which had promoted the cutting of the largest, oldest trees first. The Forest Service estimates that the

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1997, and the USFS is required by Section 7 of the ESA to give greater priority to species protection than other missions on such lands. See U.S. General Accounting Office (1999).

[54]Over this same period, the number of visitor days in National Forests increased from about 225,000 to almost 350,000, indicating an increase in recreational benefits (U.S. General Accounting Office 1999).

[55]President George W. Bush placed a 60-day "stay" on this and all Federal rules published in the *Federal Register* and not yet in effect as of January 20, 2001. The Bush administration announced on May 4, 2001 that it will allow the rule to take effect but will propose changes to the rule in June. Through May 2001, six lawsuits had been filed challenging the roadless rule. Plaintiffs include timber companies and industry associations, Boise County, various off-road vehicle groups, livestock companies, the Kootenai Tribe, and the states of Alaska, Idaho, and Utah.

[56]Clinton Forest Service Chief Mike Dombeck makes the point that these areas were the 58.5 million acres of Forest Reserves created between 1891 and 2000 that had remained roadless through 20 presidencies.

change could affect 20 percent of the U.S. timber harvest from national forests scheduled in the coming year, and as much as 50 percent in the forests of the Pacific Northwest.[57] The combined effect of these three policies – the change in priorities of the USFS, the Roadless Initiative, and the directive on old-growth cutting – is that significant portions of the system of National Forests are being managed more as national parks. This may well reflect a change in social preferences, but it appears to conflict with the System's statutory framework, which supports management for multiple use (Sedjo 2000). In addition, the distributional implications of the Forest System changes have made them very controversial in Western states, which bear much of the costs of the shift away from extractive use.

3.4.3 Designation of New National Monuments

One of the most visible natural resource policy developments of the 1990s was the Clinton Administration's designation of more than 20 new national monuments and expansion of three existing national monuments, under the 1906 Antiquities Act. The designations and expansions gave monument status to almost 6 million acres of Federal public lands, restricting uses relative to prior designations.[58] Clinton also created the largest protected area in U.S. history, the 84 million-acre Northwest Hawaiian Islands Coral Reef Ecosystem Reserve. During the 1990s, the Congress created one new national monument of 272,000 acres, and one national preserve (the Mojave Desert) of 1.6 million acres.

Taken together, Clinton's national monument designations constitute the largest withdrawal of U.S. Federal lands from commercial activity since President Jimmy Carter withdrew 56 million acres of Alaskan lands in 1978 (Vincent 1998). All but one of Clinton's designations were declared in the final year of his presidency, from January 2000 to January 2001. The unilateral, final-hour nature of the declarations raised scores of objections from Western legislators and property-rights activists.[59] The efficiency and cost-effectiveness aspects of these declarations have not been assessed; unlike rules issued by regulatory agencies, Presidential actions under the 1906 Antiquities Act are not subject to benefit-cost analysis

[57]This policy directive does not have the force of law, and can be overturned at will by the USFS Chief.

[58]A notable exception was the Arctic National Wildlife Refuge (ANWR). Clinton was lobbied heavily to declare the 1.5 million-acre coastal plain of ANWR a national monument, but did not make the designation. Environmental groups thought the designation would better protect the refuge from future oil and gas exploration, a possibility raised by several Congressional bills during the 1990s. The 1995 shutdown of the Federal government was due, in part to a budget legislation rider that would have allowed drilling in ANWR, which contributed to Clinton's veto. In contrast, the Clinton Administration opened 4.6 million acres of the National Petroleum Reserve - Alaska, 23 million acres situated between the Brooks Range and the Arctic Ocean, to oil and gas leasing during the 1990s. Clinton directed Interior Secretary Babbitt to initiate a planning process for the Reserve in 1997, and the Bureau of Land Management held an oil and gas lease sale for portions of the northeast corner of the Reserve in May 1999, despite the filing of a lawsuit by environmental groups in 1998.

[59]The George W. Bush Administration, however, has announced that it does not plan to overturn Clinton's monument designations but will seek to adjust the rules governing commercial activities within the monuments and also their boundaries.

requirements. The economic costs and benefits of many of these monument declarations are likely to be quite large and merit further study.[60]

3.4.4 Changes to Federal Wetlands Policy and the Endangered Species Act

Wetlands policy and the Endangered Species Act were major targets of property-rights activists and others in the regulatory reform movement during the 1990s. Congress did not succeed in passing any major changes to Federal wetlands regulation, although the executive branch did attempt some important administrative changes.

The Clinton Administration expanded wetlands permitting requirements to include excavation in 1993, a move that was overturned by the U.S. District Court for the District of Columbia in 1997. A U.S. Supreme Court decision in 2001 overturned the U.S. Army Corps of Engineers' 1986 "Migratory Bird Rule," which had allowed regulation of intrastate waters that provide habitat for migratory birds. These court decisions halted Administration attempts to augment the scope of Federal wetlands regulation. In 1998, the Army Corps greatly reduced the scope of nationwide permit 26, which authorizes discharges into non-tidal headwaters and isolated waters, a change that resulted in lawsuits by the development and commercial communities.[61] In addition, the Clinton Administration endorsed the concept of wetlands mitigation banking in 1993, a market-based policy instrument, resulting in EPA framework guidance issued in 1995.

Attempts to reauthorize the Endangered Species Act in the 1990s failed, but the Clinton Administration made some important administrative changes. It implemented three provisions that had been included within many of the unsuccessful Congressional reauthorization attempts and had broad bipartisan support. All of these sought to reverse one of the major economic criticisms of the ESA: that it discourages landowner efforts to improve species populations, since larger populations require expanded protections. First, voluntary "safe harbor" agreements guarantee that increases in species populations on private lands will not restrict future land use decisions. Second, the controversial "no surprises" rule guarantees that a landowner properly carrying out a habitat conservation plan will not experience further restrictions or costs without mutual consent. Third, "candidate conservation agreements" allow landowners to protect declining species that are not yet listed, in exchange for assurance that no additional measures will be required if the species is listed. The Administration also emphasized habitat conservation plans (HCPs) as a tool to manage endangered and threatened species on non-Federal lands.[62] HCPs are considerably more flexible than direct enforcement of the Act.

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[60]For example, the 1.7 million acre Grand Staircase-Escalante National Monument, declared in 1996, may hold low-sulfur coal reserves worth more than $200 billion (Vincent 1998). The Giant Sequoia National Monument, declared in 2000, receives more than 10 million recreational visits per year (White House 2000).

[61]The so-called "nationwide permits" which authorize landowners to proceed with specified categories of activities without obtaining individual permits, reducing regulatory burdens. The waters governed by permit 26 are often difficult to identify as wetlands because they may appear dry for much of the year and do not exhibit the vegetation characteristic of wetlands, but scientific evidence is mounting for their important function within aquatic ecosystems (Copeland 1999).

[62]Under Section 10 of the ESA, private landowners applying for an "incidental take" permit must submit a HCP, in which they agree to restrict some uses in the interest of species and habitat protection in exchange for the permit.

As with wetlands issues, timber subsidies, and other natural resource policy issues, the distributional implications of the ESA were the focus of much debate during the 1990s. Private landowners objected to use restrictions they believed amounted to *de facto* seizure of private property under the "takings clause" of the Fifth Amendment to the U.S. Constitution. From an economic perspective, the fact that private property owners may be expected to bear the costs of public goods provision is a significant distributional concern.

3.4.5 Green Accounting

Critics of the conventional National Income and Product Accounts (NIPA) have long recognized that the omission of a variety of non-market activities, such as household production, unpaid work, and the depletion of natural resource and environmental capital, distorts gross domestic product (GDP) as a measure of economic activity (Darmstadter 2000). The rationale for including natural resource depletion and environmental quality changes within the national accounts, "green accounting", is grounded in economic theory (Weitzman 1976, Solow 1992, Nordhaus and Kokkelenberg 1999), and the idea has received additional impetus in the United States from environmentalists.

Interest in green accounting in the United States was academic in nature until 1992, when the Department of Commerce's Bureau of Economic Analysis (BEA) began work on the issue. Following hearings by the Joint Economic Committee, the 103rd Congress appropriated funds to BEA specifically for this purpose. The Bureau produced the first official U.S. environmental accounts, the Integrated Environmental and Economic Satellite Accounts (IEESA), in 1994. BEA's initial effort accounted only for selected mineral commodities, including oil, gas, and coal (U.S. Department of Commerce Bureau of Economic Analysis 1994). Shortly after the BEA released the IEESA, however, Congress suspended BEA's work on environmental accounting, pending external review by a blue-ribbon panel convened by the National Research Council's (NRC) Committee on National Statistics.

The NRC panel's review, released in 1999, strongly supported BEA's efforts and endorsed further efforts to extend the NIPA system to include assets and production activities related to natural resources and the environment (Nordhaus and Kokkelenberg 1999).[63] It encouraged the BEA to include natural resource and environmental flows in satellite or supplemental accounts, rather than redefining the core NIPA. The panel also expressed concern that the United States may have fallen behind the ongoing efforts of other countries, due to the Congressional stop-work order in 1994, and recommended that Congress authorize and fund recommencement of work on natural resource and environmental accounts by the BEA. Through March 2001, Congress had not funded further work on the IEESA.[64]

More than 250 habitat conservation plans were completed between 1992 and 2000, compared to 14 between 1982 and 1992.

[63]The panel also supported incorporating other non-market activities that are not related to the environment. See Nordhaus and Kokkelenberg (1999).

[64]There is no sign in the *Congressional Record* or in the text of bills proposed during the 105th or 106th Congresses that additional funding for BEA's work on the IEESA has been considered. The issue may be tied up in "environmental politics" (Nordhaus 2001).

3.5 Global Climate Change

No environmental issue gained in national visibility and political attention more during the Clinton years than the threat of global climate change. We explore the implications of this political attention by reviewing the history of executive and legislative activities during the 1990s, highlighting the Clinton Administration's emphasis on cost-effectiveness considerations, in particular, the use of market-based instruments, both domestically and internationally.

In June, 1992, the United Nations Framework Convention on Climate Change (FCCC) was negotiated at the Conference on Environment and Development, the so-called "Earth Summit," held in Rio de Janeiro, Brazil. The Convention required signatories to "achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (United Nations 1992). Further, it established that because of the global-commons character of the problem, all nations must be engaged in the pursuit of a solution, although different countries could participate in different ways. This was the notion of "common but differentiated responsibilities." For industrialized countries, the specific challenge was to return greenhouse gas emissions "individually or jointly to their 1990 levels by the year 2000."

President George Bush signed the FCCC, and the U.S. Senate ratified the Convention in October 1992,[65] but the Bush Administration did not commit the United States to specific reductions. This changed with the new Administration. On Earth Day, April 21, 1993, President Bill Clinton committed the United States to reducing its emissions of greenhouse gases to 1990 levels by the year 2000, and ordered Federal agencies to establish a plan to achieve this goal.

In October, the Administration released its Climate Change Action Plan, which recommended 52 voluntary measures to meet the emissions goal. The nature of the initiatives in the plan are not unlike those that might have been expected from a second-term Bush Administration, with their emphasis on voluntary programs, government-industry cooperation, cost-effectiveness, use of market incentives, and minimal mandatory government intervention.[66] But, even if not different in substance, the Clinton Administration's Climate Action Plan differed greatly in tone from what had been Bush Administration policy. Not surprisingly, this complex set of voluntary initiatives had relatively little effect. By 1995, the U.S. acknowledged that it would fall short of its goals by at least 50 percent.

In an important departure from previous policy, in July 1996, at the second Conference of the Parties (COP-2) to the U.N. Framework Convention on Climate Change, meeting in Berlin, the chief of the U.S. delegation, Undersecretary of State for Global Affairs Timothy Wirth,

[65]By March 2001, 84 nations had signed and 33 countries had ratified or acceded to this agreement. See United Nations Framework Convention on Climate Change (2001), "Status of Signatories and Ratification of the Convention", Available at http://www.unfccc.int/resource/convkp.html.

[66]In 1993, the Administration established the U.S. Initiative on Joint Implementation under the Climate Change Action Plan. Joint implementation arrangements allow firms or other entities in one country to meet part of their greenhouse gas reduction commitments by financing mitigation in another country. The U.S. Initiative through 2000 had approved 26 arrangements whereby U.S. firms agreed to finance projects in 11 other countries.

issued a statement supporting legally binding targets and timetables for greenhouse gas emissions reductions for 34 industrialized countries (and no targets for the 154 other nations).[67]

This new approach of binding commitments for industrialized countries only, which came to be known as the "Berlin Mandate," caused substantial concern in the business community and in the U.S. Senate, leading to passage in July 1997, by a vote of 95 to 0, of Senate Resolution 98, subsequently known as the Byrd-Hagel Resolution. The resolution stated that the United States should not approve any agreement at the upcoming third Conference of the Parties (COP-3), to be held in Kyoto, Japan, that did not impose binding emission reduction targets on all nations.

Just five months after passage of the Byrd-Hagel Resolution, the nations of the world met at COP-3 in Kyoto, and what came to be known as the Kyoto Protocol on Climate Change was negotiated, following in the approach laid out by the Berlin Mandate and inconsistent with the (non-binding) Byrd-Hagel Resolution. The industrialized nations agreed to legally binding emission reductions, with the United States directed to reduce its emissions 7 percent below 1990 levels by the compliance period, 2008-2012.[68] The Clinton Administration, in particular Vice President Gore, enthusiastically supported the Kyoto Protocol, and the United States became the 60th signatory of the Protocol in November 1998. At the same time, however, because the Protocol clearly did not meet the Senate's stipulations as outlined in the Byrd-Hagel Resolution, the Administration made clear that it did not intend to submit the Protocol to the Senate for ratification.

In 1998, the U.S. Energy Information Administration (EIA) released its analysis of the potential costs of U.S. compliance with the Kyoto Protocol emissions targets, at the request of the House of Representatives Committee on Science. The report estimated a 4 percent reduction in annual GDP through 2010, compared to business-as-usual, a 53 percent increase in gasoline prices, and an 87 percent increase in average electricity prices. Note that these cost estimates assumed that the U.S. target would be met entirely by reducing U.S. carbon dioxide emissions, that is, with no offsets from carbon sequestration ("sinks") due to land-use changes, no reductions in other greenhouse gases, and no international emissions trading.

At about the same time, the U.S. government released another analysis, and one which yielded considerably lower cost estimates, mainly because of more generous assumptions on some of the factors mentioned above. In particular, the 1998 analysis by the Council of Economic Advisers (CEA) estimated costs on the order of 0.5 percent of annual GDP if flexible (market-based) policy instruments were employed. The CEA study also predicted no negative

[67]The position statement released at COP-2 also noted U.S. acceptance of the scientific findings on climate change summarized by the Intergovernmental Panel on Climate Change (IPCC) in its Second Assessment Report, released in 1995, and rejected uniform harmonized policies in favor of flexible policy instruments, including market-based instruments. See Morrissey (2000).

[68]Note that because of economic growth, it is anticipated that this 7 percent reduction would translate into approximately a 30 percent reduction below baseline emissions, i.e. what they would be in the absence of policy action.

effects on the U.S. trade deficit, relatively small increases in gasoline prices ($0.05 per gallon), and no significant effects on aggregate employment.[69]

It is important to note that a key component of the Clinton Administration's climate change policy was its strong and unwavering support for cost-effective approaches, including market-based instruments, in particular, tradeable permit mechanisms.[70] The Administration's formal proposal released in preparation for Kyoto called for domestic and international emissions trading, and international joint implementation. It was largely because of the efforts of the U.S. negotiating team that the Kyoto Protocol included significant provisions for international emissions trading and joint implementation projects among the industrialized nations, as well as what came to be known as the Clean Development Mechanism for offsets in developing countries.

Subsequently the United States proposed rules for international emissions trading in 1998, at preparatory talks for the Fourth Conference of the Parties. The U.S. proposal faced substantial opposition, most significantly from the European Union. No agreement was reached on emissions trading at the Fourth (1998), Fifth (1999), or Sixth (2000) Conference of the Parties. Indeed, at the Sixth Conference of the Parties, which met in The Hague in November, 2000, disagreements between the United States and the European Union on the role of carbon sequestration and emissions trading led to the breakdown of the talks. Thus, at the end of the Clinton Administration in January, 2001, there was less than full agreement among the countries of the world on the ultimate shape of the international agreement, no action towards ratification in the United States, and no significant domestic initiatives, other than the voluntary programs of the Administration's 1993 Climate Action Plan.[71]

[69]Note that both analyses were exclusively of the costs of addressing global climate change. Because of the considerable uncertainty regarding the nature and degree of damages due to anticipated climate change, there have been fewer analyses of the benefits of policy action. Nevertheless, there is now a growing literature of what have come to be known as integrated assessment models, which examine both sides of the ledger. The range of results from some of the best analyses indicate that relatively small taxes on the carbon content of fossil fuels would be warranted in the short run, to keep from rendering large parts of the capital stock prematurely obsolete while providing an "insurance policy," with gradually increasing carbon taxes over time. The earliest work was by Nordhaus (1977, 1982), and the literature is summarized by Kolstad and Toman (2000).

[70]The prior Bush Administration had taken a similar position. See, for example, Stewart and Wiener (1992).

[71]During the Presidential campaign, candidate George W. Bush stated that he recognized global climate change to be a serious problem but believed the Kyoto Protocol to be an inappropriate approach, largely because key developing countries are exempt from targets. In March, 2001, President Bush indicated unequivocally that the Administration did not intend to submit the Protocol to the Senate for ratification and believed that another approach to the problem was needed. See Pianin, Eric (2001), "U.S. Aims to Pull Out of Warming Treaty; 'No Interest' in Implementing Kyoto Pact, Whitman Says", *Washington Post* (28 March): A01; and Pianin, Eric and William Drozdiak (2000), "U.S. Angers Allies Over Climate Pact; Europeans Will Ask Bush to Reconsider", *Washington Post* (29 March): A01.

4. WHAT DO WE KNOW ABOUT EFFICIENCY, COST-EFFECTIVENESS, AND ENVIRONMENTAL QUALITY

Having reviewed both cross-cutting and specific environmental initiatives of the Clinton years, we summarize in this part of the paper what is known about the performance of environmental regulation, employing three metrics: environmental quality, cost-effectiveness, and efficiency.

4.1 Environmental Quality

The improvements in aggregate U.S. air quality since the 1970s have been summarized often in the literature. Most notably, between 1979 and 1998, concentrations of carbon monoxide fell by 58 percent, nitrogen dioxide by 25 percent, ambient ground-level ozone by 17 percent and sulfur dioxide by 53 percent (Portney 2000). Changes in aggregate emissions of the criteria air pollutants over the period 1970-1998 are listed in Table 5.

Improvements in ambient water quality have been less visible, but substantial nonetheless. Between 1974 and 1981, industrial and municipal biological oxygen demand loads in the U.S. decreased by 71 percent and 46 percent, respectively (Smith *et al*. 1987).[72] From 1975 to 1994, the share of measured water quality readings in violation of Federal standards for fecal coliform bacteria declined by 19 percent, for dissolved oxygen by more than 80 percent, and for total phosphorous by 20 percent (Freeman 2000).

But downward trends in emissions and upward trends in environmental quality or compliance are not sufficient evidence of the impact of environmental regulations. In order to assess individual regulations or aggregate statutes, we must compare actual emissions to what they would have been in the absence of the regulation. Although it is difficult to attribute marginal environmental quality improvements to Federal environmental regulations, it has been easier for some media than for others. Trends in air quality have been attributed to Federal regulations both by EPA itself (U.S. Environmental Protection Agency 1997, 1999), and by independent analyses (Freeman 1982, Portney 2000). The impacts of Federal legislation on water quality are much less clear. One study of the period 1972 to the mid-1990s estimates that increases in the number of U.S. river miles meeting water quality standards for swimming, fishing, and boating attributable to Federal water quality legislation were only 6.3 percent, 4.2 percent, and 2.8 percent, respectively, over the 18-year period (Bingham *et al*. 1998, Freeman 2001).[73]

These small changes in national compliance with standards are indicators of a substantial difference between air and water quality in the U.S. On average, water quality in the pre-

[72]These improvements, as well as many local improvements in dissolved oxygen might be attributed, in part, to increased wastewater treatment. Between 1970 and 1985, the fraction of U.S. residents served by wastewater treatment facilities increased from 42 to 74 percent (Boyd 2000).

[73]Improvements were assessed only for conventional water pollutants; almost no data are available with which to assess trends in toxic water pollutants over the past three decades (Freeman 2000). Boyd (2000) notes that Toxics Release Inventory data, available only since the late 1980s, show a decrease in toxic discharges to surface water of more than 50 percent between 1987 and 1990.

regulation period (in this case, before the Federal Water Pollution Control Act of 1972) was fairly good. Improvements, then, would be more appropriately analyzed regionally or locally, since the small national changes mask the fact that some local pollution problems have improved dramatically, while other areas already supported their designated water uses (Freeman 2001). In addition, improvements in water quality have been achieved largely through point source regulation. The non-point sources that are of principal concern have not been part of the regulatory strategy (see Table 3).

What about trends in air and water quality in the 1990s? Changes in average ambient concentrations of five major air pollutants between 1989 and 1998, the last year for which such aggregate data are currently available, are described in Table 6. Concentrations appear to have decreased significantly over the decade, although we should keep in mind the fact that emissions of most of the criteria pollutants declined much more dramatically over the twenty years prior to 1990, when the "low-hanging fruit" of air quality regulation was being harvested. Based on EPA modeling of trends in emissions with and without the Clean Air Act, the observed decreases in concentrations of these major air pollutants between 1990 and 2000 can "reasonably be attributed to" the Clean Air Act and its amendments (Freeman 2001). During the 1990s, emissions of VOC, NO_x and SO_2 are estimated to have fallen by about one-quarter, CO emissions by 15 percent, and particulate matter by about two percent (Table 7). Following the pattern of 30-year trends, trends in water quality over the past decade have been much more modest than trends in air quality, and in some cases (particularly nonpoint source pollution in the form of runoff from cities and agricultural areas) may have been negative (Freeman 2001).

4.2 The Cost of a Clean Environment

At the beginning of the decade of the 1990s, two general equilibrium analyses were carried out of the effects of environmental regulations on the U.S. economy (Hazilla and Kopp 1990, Jorgenson and Wilcoxen 1990), and an EPA assessment was developed on the costs of the major environmental regulations (U.S. Environmental Protection Agency 1991). Neither of the general equilibrium analyses attempted to quantify the benefits of environmental regulation, but both illustrated the fact that costs, correctly calculated, include more than the capital and operating costs of compliance (Table 8). The magnitude of the cost estimates ($977 billion from 1981 to 1990, according to Hazilla and Kopp) indicated that the long-run aggregate social costs of regulation are considerable.[74]

The 1991 EPA report, *Environmental Investments: The Cost of a Clean Environment*, was drafted in response to Section 312(a) of the Clean Air Act and Section 516(b) of the Clean Water Act. The report provided estimates of the direct costs of pollution control regulations in the United States from 1972 to 2000, including public-sector implementation and private-sector compliance.[75] No attempt was made to monetize the benefits of regulation, or even to establish a

[74]While only 13 business sectors in the United States made direct pollution control investments, all 36 sectors experienced increased costs and decreased output and labor productivity due to environmental regulation (Hazilla and Kopp 1990). Jorgenson and Wilcoxen (1990) estimate that environmental regulation reduces U.S. Gross National Product by about 2.6 percent per year. For additional analysis of the aggregate costs of regulation, see Hahn and Hird (1991).

[75]The cost estimates included expenditures related to: CAA; the Radon Gas and Indoor Air Quality Research Act of 1986; Radon Pollution Control Act of 1988; CWA; Marine Protection, Sanctuaries and Research Act; SDWA;

link between the environmental quality statistics generated and the regulations for which costs were calculated.[76] The report estimated annualized regulatory implementation and compliance costs of more than two percent of U.S. Gross National Product (GNP) in 1990.

No conclusions about economic efficiency can be drawn from these analyses because benefits were not monetized, but these studies focused attention on the rising costs of environmental regulation in absolute terms and as a fraction of GNP. In addition, a relatively recent literature in environmental economics has noted that the ultimate costs of any given environmental policy initiative depend on interactions between the new policy and existing regulations or tax policies. In particular, additional costs can arise from interactions between climate policies and pre-existing distortions in the economy, such as those due to taxes on labor (Goulder 1995). Some policy instruments, such as taxes and auctioned permits, generate revenues, which can be used by governments to reduce pre-existing taxes, thereby reducing what the overall costs of the policy would otherwise be.

4.3 What Do We Know About the Efficiency of Environmental Policies?

In writing environmental statutes, the Congress has sent decidedly mixed messages regarding the use of benefit-cost analysis to decide when and what to regulate and to choose among regulatory alternatives.[77] We would therefore expect the relative efficiency of the major environmental statutes to vary widely. Available analyses range from aggregate assessments of the costs and benefits of environmental regulation as a whole to assessments of individual rules.

4.3.1 Efficiency of the Major Environmental Statutes

Aggregate benefit-cost analysis of statutes is problematic for both technical and practical reasons. The establishment of an appropriate counterfactual is technically difficult – we need to establish what emissions would have been in the absence of the Clean Air Act, for example, to attribute emissions reductions over time to the Act. Practically, typical policy dilemmas do not involve creation and elimination of entire statutes, but rather marginal changes to individual regulations (which will be discussed later). Nonetheless, the few existing efficiency analyses of the major statutes are illuminating.

RCRA; CERCLA; TSCA; FIFRA; Energy Security Act; and Title III of the Superfund Amendments and Reauthorization Act.

[76]It did attempt to estimate counterfactual (without regulation) emissions of air pollutants and precursors from 1970 to 1988, and provided comparisons of these counterfactual statistics with actual emissions.

[77]The Flood Control Act of 1936 may include the first U.S. legislative mandate to use benefit-cost analysis: "The Federal government should improve or participate in the improvement of navigable waters or their tributaries, including watersheds thereof, if the benefits to whomsoever they may accrue are in excess of estimated costs." See National Center for Environmental Decision-Making Research (2000), "Cost-Benefit Analysis," available at http://www.ncedr.org/tools/othertools/costbenefit/module1.htm.. Several statutes have been interpreted to restrict the ability of regulators to consider benefits and costs, such as the RCRA and the Delaney Clause of the FFDCA. Others, including TSCA and FIFRA, explicitly order regulators to consider benefits and costs (Arrow *et al.* 1996). For a comprehensive review of the inclusion or exclusion of benefit-cost criteria from regulatory action under most major Federal environmental legislation, see Schierow (1994).

Two of the most important Federal environmental statutes, the Clean Air Act and the Clean Water Act, have been the subjects of benefit-cost analysis. Under Section 812 of the 1990 CAA Amendments, Congress required EPA to undertake: (1) a retrospective benefit-cost analysis of the 1970 CAA and its 1977 amendments; and (2) biennial prospective analyses of the 1990 Amendments. By EPA's calculations, the 1970 CAA and 1977 and 1990 amendments pass benefit-cost tests by very wide margins. The retrospective study, presented to Congress in 1997, estimated direct costs of CAA regulatory implementation and compliance from 1970 to 1990 to be $689 billion and direct benefits to be $29.3 trillion. In 1999, EPA presented its first prospective study (1990-2010) to Congress, with net benefits estimated for the period to be $672 billion[78]

These estimates are highly controversial. According to the retrospective analysis, benefits of the CAA from 1970 to 1990 exceeded costs by a factor of 42, a difference much greater than estimated by other studies (Freeman 1982, 2000). The estimates appear improbable. EPA's "best estimates" of net benefits of the CAA through 1990, $22 trillion, were estimated to be approximately equal to aggregate U.S. household net worth in that year (Lutter and Belzer 2000). Further, the number of annual avoided deaths attributed to the CAA was 10 percent of all annual deaths in the United States (Portney 2000). Others have criticized the retrospective and prospective studies on the grounds that they exclude the indirect costs of increased prices for goods and services due to the Act, exclude the costs of meeting some of the Act's costly provisions, and potentially exaggerate the risk-reduction benefits associated with particulate matter reduction, which account for more than 90 percent of the benefits estimated for the 1990 CAA Amendments (Lutter and Belzer 2000).[79]

On the other hand, what is perhaps most important is that the general finding that the benefits of air pollution regulation have exceeded its costs is well supported by other studies (Freeman 1982, Portney 2000). We understand less about how marginal benefits and costs of *specific* air pollution regulations have varied over time, though it appears many such regulations would not pass a benefit-cost test. In addition, there appears to be a downward trend in net benefits of air pollution regulation, indicated by the results of the retrospective and prospective studies and the individual efficiency analyses for recent rules (Morgenstern 2000, Freeman 2001).[80]

The Clean Water Act also has been analyzed in a benefit-cost framework, with considerably less favorable results. Estimates of annual benefits of the CWA range from $24.8

[78]The 90 percent confidence interval of net benefits ranged from - $26.4 billion (net cost) to + $1.8 trillion. The first prospective study estimated the benefits of selected ecological effects; the retrospective study did not. EPA's figures were calculated in constant 1990 dollars; these have been converted to 2000 dollars.

[79]Freeman (2001) emphasizes another aspect of EPA's analysis; while the stationary source regulations under the CAA appear to have benefits greatly exceeding costs, in aggregate, the mobile source regulations taken together appear to have substantial net costs.

[80]An important caveat is that the cited studies did not review recent regulations on particulate matter nor potential regulations affecting CO_2 emissions associated with global climate change, which may not conform to the observed downward trend in measured net benefits.

billion in 1985 (Freeman 1982) to $38.4 billion in 1990 (Carson and Mitchell 1993).[81] Cost estimates range from

$46.6 billion in 1985 to $59.7 billion in 1990 (U.S. Environmental Protection Agency 1991).[82] While subject to much uncertainty, a rough comparison of these estimates supports the conjecture that the CWA's overall costs outweigh its benefits (Freeman 2000). Estimates by others have shown that the incremental costs of specific CWA rules also exceed their benefits (Lyon and Farrow 1995).

It should not be surprising, perhaps, that the CWA measures up less favorably than the CAA in terms of economic efficiency. The stated goals of the Federal Water Pollution Control Act of 1972 were: (1) the attainment of fishable and swimmable waters by July 1, 1983; and (2) the elimination of *all* discharges of pollutants into navigable waters by 1985. While those deadlines were postponed, and a distinction made between organic pollutants and toxics by the 1977 Amendments, the CWA continues to emphasize a target of zero emissions and fails to distinguish among bodies of water with different uses. In addition, applications of market-based instruments have come more slowly to water pollution than to air pollution policy.

The other major Federal environmental statutes are more difficult to assess, because few, and in some cases, no aggregate benefit-cost studies have been carried out. FIFRA and TSCA are the two major statutes that explicitly allow benefit-cost considerations in rule making.[83] One of EPA's responsibilities under FIFRA is pesticide registration, which triggers a benefit-cost test that results in either cancellation, suspension, continuation of registration with restrictions, or unrestricted continuation. EPA *does* appear to take benefits and costs into account in these decisions, but its decisions from 1975 to 1989 imply a value per statistical cancer case among pesticide applicators of more than 580 times the implied value for consumers of pesticide residues on food (Cropper *et al.* 1992). While benefit-cost tests are applied under FIFRA, they do not appear to be applied consistently.

CERCLA, or Superfund, is a frequent target of critics on efficiency grounds. One particularly comprehensive assessment of the efficiency of Superfund considered a representative sample of 150 clean-up sites, and found mean remediation cost per cancer case avoided to be $3.6 million (Hamilton and Viscusi 1999). This mean cost estimate masks considerable variance, however, since both risks and costs are highly concentrated at a small

[81]The 90 percent confidence interval for the Carson and Mitchell (1993) estimate is $29 billion to $54 billion, and for the Freeman (1982) estimate is $9.1 billion to $44.3 billion. No CWA benefit estimates have included potential benefits to commercial fisheries and diversionary uses, indicating that true benefits may be somewhat higher than those cited above. Freeman (1982) does not include the benefits from control of toxic pollutants and heavy metals, which are both included in EPA's cost calculations. On the other hand, the counterfactual for many benefit calculations, including Carson and Mitchell (1993), is taken to be "no control", which may substantially overstate CWA benefits.

[82]All CWA cost and benefit figures are expressed in constant 2000 dollars.

[83]One reason that benefit-cost procedures were written into FIFRA and TSCA, while explicitly written out of other regulatory statutes, may be that these two statutes regulate commodities, rather than wastes (Morgenstern 1997c).

number of sites. About 70 percent of sites with nonzero cancer cases averted had costs per case averted greater than $100 million.[84]

The analysis of Superfund is illustrative because it shows how aggregate analyses of statutes or programs can obscure great differences in the net benefits of individual rules or activities. Within the CAA, for example, a handful of individual rules, like those governing lead in gasoline and reductions in fine particulate matter, are responsible for a substantial portion of the health benefits attributed to the statute. Counterbalancing the regulations that confer large net benefits are other regulations, such as the NAAQS governing ozone precursors, that do not pass a benefit-cost test. Economists generally agree on the need to look at the incremental impacts of such regulations for policy making, but only recently have they begun to devote substantial resources to this task.

4.3.2 Efficiency of Individual Rules

Since 1981, Federal agencies have been required to submit Regulatory Impact Analyses to OMB for all new rules expected to have aggregate costs of $100 million or greater. The increased visibility of benefits and costs that has resulted from the RIA process has led to greater scrutiny of the analyses and the rules that trigger them.

There are many examples of environmental rules for which RIAs have estimated positive net benefits, including the lead-in-gasoline rule (Nichols 1997) and the NAAQS for particulate matter (U.S. Office of Management and Budget 1998). Likewise, the estimated benefits of the SO_2 emissions trading program under Title IV of the 1990 CAA Amendments are greater than its estimated costs by an order of magnitude (Burtraw *et al.* 1998).

The requirements for Regulatory Impact Analysis, however, have not necessarily improved the efficiency of individual Federal environmental rules. One study compared the cost-per-life-saved of 33 individual risk-reducing rules (a mix of proposed and final rules) from Federal regulatory agencies, 15 of them from EPA (Viscusi 1992).[85] Of the EPA rules, only one had a cost-per-life-saved of less than $6.7 million. A more recent study that included twelve EPA rules, only two actually reduce risk, while the other ten could actually increase risk by reducing private expenditures on risk-reducing investments (Hahn *et al.* 2000b). Table 9 summarizes the cost of selected EPA regulations per statistical life saved.[86]

In the first eleven years of the RIA review process, the lowest cost-per-life-saved of any rule rejected by OMB was $142 million, indicating that OMB may have succeeded in eliminating only some of the most inefficient regulations (Viscusi 1996). In the first fifteen years of the review process, about two-thirds of the Federal government's approved

[84]These figures have been converted from constant 1993 dollars to 2000 dollars. They are substantially greater than reasonable estimates of willingness to pay numbers, which typically range from $4 to $9 million, in constant 2000 dollars (Viscusi 1992).

[85]Viscusi's statistics were drawn, in large part, from Morrall (1986) and updates to Morrall (1986) through unpublished communication.

[86]To the extent that there are important non-mortality benefits, these studies may be misleading, although Hahn *et al.* (2000a) tried to control for this by examining rules that focus on mortality benefits.

environmental quality regulations failed these statutory benefit-cost tests, using the government's own numbers (Hahn 2000). One example is the NAAQS for ozone, for which EPA submitted an RIA that listed $2.0 to $11.2 billion in monetized benefits and $12.7 billion in costs through 2010, assuming full attainment (U.S. Office of Management and Budget 1998).

In another study of a dozen proposed rules at EPA that required economic analysis, only four clearly passed a benefit-cost test performed by the agency itself (Morgenstern 1997a). On the other hand, the estimated benefits of just three of the rules studied exceeded the estimated cost of all twelve rules combined, reinforcing the fact that aggregate analysis of a group of rules can be misleading (Morgenstern 1997b). In all cases, economic analysis contributed to changes in rules that decreased costs, and in five cases to changes that increased benefits, demonstrating that RIAs can be used to improve cost-effectiveness, even if the standard to be set is not economically efficient.[87]

After agencies submit RIAs to OMB for review, interest groups can submit comments for the public record. In addition, in the last few years, independent groups have begun to submit formal comments that enter into the public dialogue as working papers and published articles. These efforts often target rules that appear to be inefficient or ineffective, particularly in cases where interest groups wish to the reduce the cost of the rule imposed on them. These analyses have helped identify important patterns in the economics of regulatory decision making.

First, economic analyses prepared by regulatory agencies frequently fail to provide sufficient information to make valid benefit-cost comparisons. Less than 30 percent of new environmental, health, and safety regulations from mid-1996 to mid-1999 quantified net benefits, and very few compared multiple regulatory alternatives (Hahn *et al.* 2000a). Second, in many cases, the environmental statutes, themselves, limit the extent to which RIAs could affect policy outcomes, by for example, forbidding the consideration of costs in decision making.

Third, the existence of a large public database of *ex-ante* estimates of the costs and benefits of environmental regulations has made it possible to begin comparing *ex-ante* and *ex-post* estimates, which may be the best way to gauge the quality of agencies' efficiency calculations. The first major study to attempt this reviewed more than two dozen major environmental and occupational safety regulations, and found that *ex ante* estimates of costs

[87]In some cases, environmental statutes necessitate that RIAs not be the primary decision factor in rulemaking (Caulkins and Sessions 1997, Rasmussen 1997, Anderson and Rykowski 1997). Barring legislative changes in these cases, use of RIAs to improve the cost-effectiveness of regulations may be the most that can be expected. In addition, many RIAs do not contain enough information to compare the cost-effectiveness of multiple regulatory alternatives, which, in general, prevents them from being useful cost-effectiveness tools. See Hahn *et al*. (2000a).

systematically exceeded actual costs, although when EPA regulations were considered in isolation, no evidence of systematic bias in either direction was found (Harrington *et al.* 2000).[88]

4.4 What Do We Know About the Cost Effectiveness of Environmental Policies?

It has frequently been pointed out that environmental laws are not cost-effective, often specifying specific technologies or uniform emissions limits, despite tremendous variation in firm abatement costs (Newell and Stavins 2001, Tietenberg 1990). While uniform standards may effectively limit emissions of pollutants, they typically exact relatively high costs in the process, by forcing some firms to resort to unduly expensive means of controlling pollution. For example, under current regulations the marginal cost of abating lead emissions ranges from $13 per ton in the non-metal products sector to $56,000 per ton in the food sector (Hartman *et al*. 1994, Morgenstern 2000).

Market-based approaches to environmental protection can be used to achieve the least-cost allocation of pollution reduction, even when the aggregate target is not efficient; thus, cost-effectiveness can be seen as a criterion quite separate from efficiency (Baumol and Oates 1971). Since the 1970s, the advantages of economic-incentive approaches to environmental regulation have received serious political attention, and there have been increasing numbers of applications in the United States and other countries (Stavins 2001).

[88]Another analysis of the chlorofluorocarbon (CFC) phaseout in the U.S. also indicates that EPA may underestimate costs *ex ante* (Hammitt 2000).

Analysts have compared the costs of some of the larger U.S. market-based environmental policies with those of alternative (hypothetical) command-and-control policies.[89] One survey of eight empirical studies of U.S. air pollution control found that the ratio of actual, aggregate costs of the conventional, command-and-control approach to the aggregate costs of least-cost benchmarks ranged from 1.07 for sulfate emissions in the Los Angeles area to 22.0 for hydrocarbon emissions at all domestic DuPont plants (Tietenberg 1985). One should not make too much of these numbers, however, since actual, command-and-control instruments are being compared with theoretical benchmarks of cost-effectiveness, i.e. what a perfectly functioning market-based instrument would achieve in theory. A fair comparison among policy instruments would involve either idealized versions of both market-based systems and likely alternatives; or realistic versions of both.

EPA's Emissions Trading Program, which started in 1974 as the "offset" policy and was codified in 1986, is one individual program for which cost savings have been estimated. The only comprehensive study of cost savings based on actual trades estimates that the program achieved savings of $1.6 to $21.5 billion over its first 14 years (Hahn and Hester 1989).

Another program that has been analyzed for cost-effectiveness is EPA's lead-in-gasoline rule, which allowed inter-refinery trading of lead credits beginning in 1982, and banking of credits in 1985. EPA estimates that trading and banking generated cost savings of 20 percent per year over alternative regulation through 1987, when the phasedown was complete (U.S. Environmental Protection Agency 1985). Although no other actual cost savings estimate exists, an independent analysis of the level of trading activity and the rate of the lead phasedown suggests that the program was indeed cost-effective (Kerr and Maré 1997).

The market-based policy instruments resulting from the 1990 CAA Amendments were discussed earlier. The market for tradeable SO_2 emission permits among U.S. electric utilities established under Title IV has the potential to save more than $280 million annually through Phase I (1995-2000), and more than $880 million annually during Phase II (after 2000), compared with a uniform emissions rate standard (Carlson *et al.* 2000).[90] The regional NO_x cap-and-trade system in the Northeast may generate compliance cost savings of 40 to 47 percent compared with continued command-and-control regulation of ozone precursors (Farrell *et al.* 1999).

One state-level market-based environmental program has also been analyzed in a cost-effectiveness framework. The South Coast Air Quality Management District, which is responsible for controlling emissions in a four-county area of southern California, launched a tradeable permit program in January 1994 to reduce NO_x and SO_2 emissions in the Los Angeles

[89]Like benefit-cost analysis, cost-effectiveness analysis is required by the 1993 Clinton EO 12866, which directs agencies to identify and assess alternative policies (with an emphasis on incentive-based mechanisms).

[90]These figures have been converted to constant 2000 dollars. Highlighting the difficulty of estimating cost savings compared with a hypothetical policy alternative, Carlson *et al.* (2000) also estimate actual cost savings during two program years, 1995 and 1996, and suggest that the allowance market has not realizes these potential "gains from trade" to date. The 1995 compliance costs measured by Carlson *et al.* (2000) actually exceeded their estimate for the command-and-control alternative.

area. While no analysis of actual cost savings has been performed, one prospective analysis predicted 42 percent cost savings annually over traditional regulation (Anderson 1997).

While these results are heartening for economists who advocate applying market-based instruments to environmental policy, they barely scratch the surface of environmental regulation as a whole. While agencies are required to perform cost-effectiveness analysis within RIAs, more than one-quarter of RIAs discuss no policy alternatives, and barely one-third of RIAs quantify the costs and benefits of alternative policies (Hahn *et al.* 2000a).

5. CONCLUSIONS

Looking back over the past decade of environmental policy, it is striking how much of it is independent of the identity of the particular administration. Much of this policy is determined by existing laws and regulations and by the political equilibrium among the courts, the Congress, the President, and the key departments and agencies in the Administration. Nevertheless, Congress and the Administration can and do make a significant difference. Here we identify five themes that emerge from our review of national environmental policy during the years of the Clinton Administration, and we comment briefly on the political context that may suggest how economics will evolve in environmental and resource policy in the years to come.

First, *environmental targets were made more stringent, and environmental quality improved significantly during the decade*. Most important among the new targets were the National Ambient Air Quality Standards for ambient ozone and particulate matter, issued by EPA in July, 1997. These could turn out to be one of the Clinton Administration's most enduring environmental legacies, both in terms of potential benefits and potential costs.

Natural resource policy during the Clinton years was heavily weighted toward environmental protection. A number of initiatives were proposed to reduce subsidies for private resource extraction on public lands, targeting below-market timber sales, grazing fees, and subsidized mining of non-renewable resources. More importantly, there was a significant shift in priorities at the U.S. Forest Service away from a focus on timber production to resource protection. One aspect of this was the Administration's proposal, in its last month, to place some 60 million acres of Federal forest land off limits to new road building. In addition, the Administration designated more than 20 new national monuments and expanded three others, thus restricting use of about 6 million acres of Federal lands.

Environmental quality improved overall during the decade, continuing a trend that started in the 1970s. Emissions of major air pollutants fell significantly, and these changes can be attributed, in part, to the Clean Air Act and its amendments. The decreases were much less than during the previous two decades, however, which is not surprising given that the low-hanging fruit had already been picked. Trends in water quality over the decade of the 1990s were less clear, and in some cases reflected increased pollution levels.

Second, *the use of benefit-cost analysis for assessing environmental regulation was controversial in the Clinton Administration, while economic efficiency emerged as a central goal of the regulatory reform movement in the Congress during the 1990s*. Despite a series of

supportive executive orders, there is little evidence that economic efficiency was accepted as a legitimate criterion for environmental policy during the Clinton years. The Administration's support for benefit-cost analysis in environmental, health, and safety decision-making was — with some exceptions — no more than modest. At the Environmental Protection Agency, there was significantly more opposition to the use of this analytical tool for decision-making.

In contrast, economic efficiency was a central goal of regulatory reform efforts in the Congress, especially after the Republican takeover in the 1994 midterm elections. Major amendments to the Safe Drinking Water Act were passed, containing the most stringent requirement for benefit-cost analysis of any environmental statute. Legislators were less successful at reforming other environmental statutes that had been criticized on efficiency grounds, but the Congress did pass a variety of cross-cutting regulatory reform initiatives, aimed at increasing the efficiency of environmental, health, and safety regulations.

When attention was given during the 1990s to increased efficiency, the locus of that attention during the Clinton years was the Congress in the case of environmental policies and the Administration in the case of natural resource policies. While Congress was generally supportive of the use of benefit-cost analysis for assessing environmental regulations, it did not offer support in the context of natural resource policies. When policy alternatives regarding efficient use of natural resources did emerge during the 1990s, they were proposed by the Clinton Administration.

Ironically, the increased attention given to benefit-cost analysis may not have had a marked effect on the economic efficiency of environmental regulations. The evidence indicates that the overall benefits of air pollution regulation have exceeded its costs, but the picture is mixed when one examines specific air pollution regulations. In general, there appears to be a downward trend in net benefits of such regulations over time. Furthermore, the Clean Water Act measures up much less favorably than the Clean Air Act in terms of economic efficiency.

Third, *cost-effectiveness achieved a much more prominent position in public discourse regarding environmental policy during the 1990s*. From the Bush Administration through the Clinton Administration, interest and activity regarding market-based instruments for environmental protection — particularly tradeable permit systems — continued to increase, while support for taxes was lukewarm. The Administration promoted cost-effectiveness by supporting the implementation of existing market-based initiatives, including the sulfur dioxide allowance trading program, and by proposing new initiatives, exemplified by the strong U.S. support for tradeable permit programs for reducing greenhouse gas emissions. The performance of market-based instruments that were implemented — from the 1980s through the 1990s — was encouraging, including the leaded gasoline phasedown in the 1980s and the SO_2 allowance trading program in the 1990s.

Fourth, *the Clinton Administration put much greater emphasis than previous administrations on expanding the role of environmental information disclosure and voluntary programs*. In 1994, EPA expanded the list of chemicals to be reported under the Toxics Release Inventory (TRI) by 80 percent; it lowered reporting thresholds, and later expanded the list again. In addition, EPA launched a number of other information programs, focusing on energy efficiency and contaminants in drinking water. While such programs can provide cost-effective

ways of reaching environmental policy goals, we know very little about their costs or their effectiveness. EPA also initiated dozens of programs designed to encourage sources to reduce emissions on a voluntary basis, many under the "Common Sense Initiative." These too have the potential to be cost-effective, but it is unclear whether the programs were actually successful.

Fifth and finally, *the Environmental Protection Agency reduced the role of economic analysis in decisionmaking during the 1990s*. During the Clinton years, the EPA was more hostile toward economic analysis than it had been during the prior Bush Administration, and EPA leadership made organizational changes to reflect this shift. When economics did play a role, economic analysis was more likely to be focused on increasing the cost-effectiveness of regulations than on weighing benefits against costs.

These five themes emerge within the broader political context of environmental policy. In simple terms, Democrats, supported by environmental advocacy groups, typically oppose benefit-cost analysis as a criterion for identifying environmental targets, because it is seen by many as a mechanism to reduce environmental protection efforts. Republicans, supported by business interests, usually support greater use of benefit-cost analysis for precisely the same reason. In the context of public lands and natural resource issues, the application of benefit-cost analysis typically implies limited resource use. Hence, we observe greater support from the Democrats to implement policies that could enhance efficiency in this case.

In contrast to efficient policies, cost-effective policies and thus market-based instruments are far easier for both Democrats and Republicans to endorse. If a goal is set, why not find the least costly way of achieving it? There are exceptions, of course, most notably when there are identifiable losers from particular policies.

Much can be explained by business-as-usual in Washington, but politics is only part of the explanation. Ideas also matter. The very notions of applying economic analysis in environmental and resources policy design and using economic instruments in policy implementation are becoming more widely accepted. We expect the future to bring more benefit-cost analysis, more risk analysis, more cost-effectiveness analysis, and more use of market-based policy instruments. Whether or not this analysis will improve policy is less clear, but we believe that environmental policies are likely to become more cost-effective over time, if only because policy makers and interest groups will have better information at their disposal. More broadly, the efficiency of environmental and resource policy in the future will depend, to some extent, on the ability of economists to convince the broader policy community of the value of this way of thinking about the world.

TABLE 1: EVOLUTION OF ORGANIZATION OF ECONOMIC ANALYSIS AT EPA

Applicable Years	Organizational Location of Core Economics Staff at EPA
1980-1983	Benefits Staff, Office of Policy Evaluation, Office of Policy and Resource Management
1983-1987	Benefits Branch, Office of Policy Analysis, Office of Policy, Planning and Evaluation
1987-1990	Economic Analysis Branch, Office of Policy Analysis, Office of Policy, Planning and Evaluation
1990-1996	Economic Analysis and Research Branch, Office of Policy Analysis, Office of Policy, Planning and Evaluation
1996-1999	Economy and Environment Division, Office of Economy and Environment, Office of Policy, Planning and Evaluation
1999-2000	Economic and Policy Analysis Division and Economy and Environment Division, Office of Economy and Environment, Office of Policy and Reinvention
2000-2001	National Center for Environmental Economics, Office of Policy, Economics and Innovation

SOURCE: U.S. Environmental Protection Agency, National Center for Environmental Economics World Wide Web site, available at http://www.epa.gov/economics/.

TABLE 2: SELECTED LEGISLATIVE EFFORTS TO REFORM ENVIRONMENTAL REGULATION, 1993-2000[a]

Congress	Legislation	Title/Definition and Intended Impact on Risk, Efficiency or Cost-effectiveness Criteria	Results

103rd (1993-1995)	H.R. 4771 / S. 993	Federal Mandate Accountability and Reform Act of 1994. Would have required CBO to estimate costs of Federal mandates to state, local and tribal governments, compelled agencies to analyze benefits and costs of new Federal mandates.[b]	Referred to committee in House and Senate, no floor action taken.
	H.R. 3948 / S. 2093	Water Quality Act of 1994 / Water Pollution Prevention and Control Act of 1994. Reauthorization legislation for Clean Water Act; considered making CWA more flexible, less prescriptive regarding non-point source regulation, municipal stormwater regulation, wetlands designation and permitting.	Reported in Senate, introduced in House, no floor action taken.
	H.R. 3800 / S. 1834	CERCLA reauthorization legislation. Would have required EPA to establish a national protocol for risk assessment.	Reported in both House and Senate, no floor action taken.
	H.R. 4329 / S. 2050	FIFRA Amendments of 1994. Would have directed EPA administrator to develop criteria for designation of "reduced risk pesticides", required coordination between USDA and EPA on environmental risk reduction.[c]	Referred to committee in House and Senate, no floor action taken.
	S. 171, Johnston amendment	Amendment to a bill to raise EPA to department status. Would have required EPA to analyze risks, costs, and benefits for proposed and final regulations.	Passed Senate, defeated in House.[e]
	H.R. 3392 / S. 2019	SDWA FY95 Authorization Bill / SDWA Amendments of 1994. S. 2019 would have required EPA to rank pollution sources based on risk.[d] H.R. 3392 would have required EPA to consider risk reduction benefits and costs in setting standards. Both would have eliminated 1986 requirement that EPA regulate 25 more contaminants every 3 years.	Passed Senate and House. No Conference Committee convened.
	H.R. 820	National Competitiveness Act of 1993. Would have required economic and employment impact statements for all rules posted in the *Federal Register*.	Passed House and Senate, expired in Conference Committee.
	H.R. 1994	Environmental Research, Development, and Demonstration Authorization Act of 1993. Would have established core research program on risk reduction.Environmental Technologies Act of 1994. Would have required Office of Science and Technology Policy to establish protocol for conducting and reporting risk assessments.	Passed House, expired in Senate Committee.
	H.R. 3870		Passed House, placed on calendar in Senate.
	H.R. 4306	Risk Assessment Improvement Act of 1994. Would have established EPA program to develop risk assessment guidelines, oversee implementation, require scientific peer review, etc.	Reported in House.

104th (1995-1997)	H.R. 9 / S. 343	Title III -- Job Creation and Wage Enhancement Act, Contract With America Item 8. Would have made Reagan E.O. 12291 statutory, superseding Clinton E.O. 12866. Both bills would have imposed a strict net-benefits test before a regulation could go forward.	Passed House, referred to committee in Senate.
	H.R. 2586	Debt Ceiling Limit Bill. Attached regulatory reform package (Comprehensive Regulatory Reform Act of 1995) would have broadened definition of "major rule" requiring RIA, expanded public review requirements, standardized regulatory risk assessment.	Passed House and Senate, vetoed by Clinton.
	H.R. 2099	Rider to FY 1996 VA-HUD Independent Agencies appropriations bill. The House approved 17 major riders that would have prohibited EPA from spending FY 1996 funds on a number of regulatory and enforcement activities.	Passed House and Senate, vetoed by Clinton.
	H.R. 3610	FY97 Omnibus Appropriations Bill. Rider directed OMB to submit regulatory accounting (benefit-cost) report to Congress for FY97. (This rider was attached in future years, as well.)	P.L. 104-208.
	H.R. 3136	Small Business Regulatory Enforcement Fairness Act of 1996. EPA must prepare regulatory flexibility analyses of bills with significant economic impact on small businesses and submit analyses to Congress.	P.L. 104-121.
	S. 1	Unfunded Mandates Reform Act of 1995. Requires quantitative assessment of benefits and comparison of benefits to costs for all major rules; mandates choice of least-cost regulatory alternative or explanation why least-cost alternative was not chosen.	P.L. 104-4.
	S. 1316	Safe Drinking Water Act Amendments of 1996. Requires EPA to determine whether the benefits of all new drinking water maximum contaminant levels (MCLs) justify the costs. Revokes mandate that EPA regulate 25 new contaminants every 3 years.Clean Water Act Amendments of 1995.	P.L. 104-182.
	H.R. 961	Would have made CWA less prescriptive, amending standards, regulatory requirements and wetlands dredge and fill permitting.	Passed House, no action taken in Senate.
	H.R. 1627	Food Quality Protection Act of 1996. Amends FIFRA and the Federal Food, Drug and Cosmetic Act. Removes pesticide residues on processed food from the list of Delaney "zero-risk standard" substances.	P.L. 104-170.
	S. 1505	Accountable Pipeline Safety and Partnership Act of 1996. Requires Secretary of Transportation to issue	P.L. 104-304.

		pipeline safety regulations only upon justification that benefits exceed costs.	
	S. 39 / H.R. 39	Magnuson Fishery Conservation and Management Act Reauthorization. Authorized collection of fees for limited fishery access programs. Prohibited the creation of new individual fishing quota programs through October 2000.	P.L. 104-297.
	H.R. 3019	Omnibus FY96 Appropriations Bill. Title III established demonstration project allowing increased fees for recreational use of Federal public lands.	P.L. 104-134
105th (1997-1999)	S. 981	Regulatory Improvement Act of 1997, 1998, 1999, or "Thompson-Levin bill". Would have broadened benefit-cost analysis requirements. Some versions would have allowed courts to remand or invalidate rules formulated by an agency that fails to perform sufficient benefit-cost analysis.	Reported in Senate.
	H.R. 2378 / S. 1023	FY98 Treasury and General Government Appropriations Act. Rider directed OMB to submit regulatory accounting (benefit-cost) report to Congress for FY98. (This rider was first attached in FY97.)	P.L. 105-61.
	S. 8 / H.R. 2727	Superfund Cleanup Acceleration Act of 1997, 1998.[f] Title IV would have revised risk assessment requirements, included "reasonableness of cost" within list of considerations to be balanced in selection of remedial action.	Reported in Senate, Approved in House Subcommittee.
106th (1999-2001)	S. 1198	Truth in Regulating Act (TIRA). Establishes a three-year pilot program under which individual agency RIAs are subject to independent evaluation by GAO, upon request by Congress.	P.L. 106-312.

[a]The legislative initiatives described in this table are those that would have had (or did have) an effect on environmental regulations' treatment of efficiency or cost-effectiveness criteria. For many of these initiatives, this aspect was not the main purpose, but only one of many stipulations or amendments.
[b]Many other measures in the 103rd Congress also called for CBO cost estimation and/or economic analysis of mandates, including S. 563, S. 648, S. 1592, S. 1604, and S. 1606 (Lee 1995).

[c]These two bills attempted to introduce into statute the Clinton Administration's Comprehensive Pesticide Proposal to Congress of April 1994.

[d]S. 2019 was a revised version of Senator Moynihan's S. 110.

[e]The House defeated the EPA department-status bill (H.R. 3425) because it did not allow floor consideration of a benefit-cost amendment like the Johnston amendment to S. 171.

[f]Many CERCLA reauthorization and reform bills were introduced in the 105th Congress, including S. 8, H.R. 2727, H.R. 3000, H.R. 2750, H.R. 3262, H.R. 3595, and S. 2180 (Reisch 1998). The two discussed here were the most seriously considered.

SOURCES: Blodgett (1998); Hahn (2000), especially Table IV; and Lee (1995); U.S. Library of Congress, *Thomas: Legislative Information on the Internet*, Database, Available at http://www.thomas.loc.gov.

TABLE 3: EPA RANKING OF SOURCES CONTRIBUTING TO WATER QUALITY IMPAIRMENT, 1996

Rank	Rivers	Lakes	Estuaries
1	Agriculture	Agriculture	Industrial discharges
2	Municipal point sources	Unspec. nonpoint sources	Urban runoff/storm sewers
3	Hydrologic modification	Atmospheric deposition	Municipal point sources
4	Habitat modification	Urban runoff/storm sewers	Upstream sources
5	Resource extraction	Municipal point sources	Agriculture

SOURCE: U.S. Environmental Protection Agency (1996), quoted in Boyd (2000).

TABLE 4: BENEFITS AND COSTS, REVISED NAAQS FOR OZONE AND PARTICULATE MATTER

National Ambient Air Quality Standard, 1997	Annual Monetized Benefits	Annual Monetized Costs
Ozone	$2.0 to $11.2 billion	$12.7 billion
Particulate Matter	$26.4 to $145 billion	$48.8 billion

SOURCE: U.S. Office of Management and Budget (1998), reporting EPA estimates from Regulatory Impact Analysis. EPA estimates were in constant 1990 dollars; those reported here are 2000 dollars. Cost and benefit estimates assume full attainment.

TABLE 5: U.S. EMISSIONS OF SEVEN MAJOR AIR POLLUTANTS, 1970-1998

Year	SO_2	NO_x	VOCs	CO	Lead	PM_{10}	$PM_{2.5}$
1970	100	100	100	100	100	N/A	N/A
1980	83	117	85	91	34	N/A	N/A
1989	75	114	73	82	3	100	N/A
1990	76	115	68	76	2	54	100
1991	74	116	68	78	2	53	97
1992	73	118	67	75	2	53	96
1993	72	119	67	76	2	50	92
1994	70	121	70	79	2	56	100
1995	62	119	67	72	2	48	90
1996	61	118	60	74	2	61	103
1997	63	119	61	73	2	63	107
1998	63	117	58	69	2	64	105

SOURCES: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards (2000a, 2000b).

Notes: Figures are indexed from EPA data, with 1970 aggregate U.S. emissions equal to 100 for all pollutants except PM_{10} (1989=100) and $PM_{2.5}$ (1990=100). Data for 1970 and 1980 drawn from U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards (2000a); data for 1989, 1991-1995 and 1997 drawn from U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards (2000b). Data for 1990, 1996 and 1998 appear in both reports. (Data for PM10 differ between the two reports -- for this pollutant, the 2000b data were used exclusively.) Data for particulate matter include only directly emitted PM. No figures are shown for PM_{10} and $PM_{2.5}$ in 1970 or 1980; while estimates exist, they do not include natural sources, agriculture, forestry, fugitive dust and other sources which together comprise almost 90 percent of directly emitted PM_{10} and almost 70 percent of directly emitted $PM_{2.5}$ in 1990.

TABLE 6: CHANGES IN AVERAGE AMBIENT CONCENTRATIONS, FIVE MAJOR AIR POLLUTANTS, 1989-1998

Pollutant	Ambient Concentration 1989	Ambient Concentration 1998	Percent Change, 1989-1998
CO	6.2 ppm	3.8 ppm	- 39%
Lead	0.09 ppm	0.04 ppm	-56%
NO_2	0.021 ppm	0.018 ppm	-14%
PM_{10}	31.7 $\mu g/m^3$	23.7 $\mu g/m^3$	-25%
SO_2	0.0087 ppm	0.0053 ppm	-39%

SOURCE: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards (2000b).

Notes: CO measured as arithmetic mean, 2nd maximum 8-hour concentration. Lead measured as arithmetic mean, maximum qtr. arithmetic mean. NO_2 measured as daily average arithmetic mean. PM_{10} and SO_2 measured as annual average arithmetic mean.

TABLE 7: SUMMARY OF NATIONAL ANNUAL EMISSIONS PROJECTIONS (THOUSANDS OF TONS)

Pollutant	1990 Base Year	2000 Pre-CAAA	2000 Post-CAAA	2000 % Change
VOC	22,715	24,410	17,874	-27%
NO_x	22,747	25,021	18,414	-26%
SO_2	22,361	24,008	18,013	-25%
CO	94,385	95,572	80,919	-15%
Primary PM_{10}	28,289	28,768	28,082	-2%
Primary $PM_{2.5}$	7,091	7,353	7,216	-2%

SOURCE: Table adapted from Freeman (2001), data obtained from U.S. Environmental Protection Agency (1999).

TABLE 8:
COMPONENT PARTS OF THE COSTS OF ENVIRONMENTAL REGULATION

Government Administration of Environmental Statutes and Regulations
- Monitoring
- Enforcement

Private Sector Compliance Expenditures
- Capital
- Operating

Other Direct Costs
- Legal and Other Transaction
- Shifted Management Focus
- Disrupted Production

General Equilibrium Effects
- Product Substitution
- Discouraged Investment
- Retarded Innovation

Transition Costs
- Unemployment
- Obsolete Capital

"Negative Costs"
- Natural Resource Inputs
- Worker Health
- Innovation Stimulation

SOURCE: Jaffe *et al.* 1995.

TABLE 9: COST OF SELECTED EPA REGULATIONS PER STATISTICAL LIFE SAVED

Environmental Protection Agency Regulation	Year	Net Cost per Discounted Statistical Life (millions of 2000$)
Toxicity characteristics to determine hazardous wastes	1990	-9,400
Underground storage tanks: technical requirements	1988	-400
Asbestos prohibitions: manufacture, importation, processing and distribution in commerce (total)	1989	21
National primary and secondary water regulations – Phase II: MCLs for 38 contaminants	1991	28
Hazardous waste management system – wood preservatives	1990	57
Sewage sludge use and disposal regulations, 40 CFR Part 503	1993	215
Land disposal restrictions for third third scheduled waste	1990	215
Hazardous waste management system: final solvents and dioxins land disposal restrictions rule	1986	226
Prohibition on land disposal of first third of scheduled wastes ("second sixth" proposal)	1988	452
Land disposal restrictions, Phase II: universal treatment standards and treatment standards for organic toxicity, characteristic wastes, and newly listed wastes	1994	1,030
Drinking water regulations, synthetic organic chemicals, Phase V	1992	10,800
Solid waste disposal facility criteria, 40 CFR Parts 257 and 258	1991	40,700

SOURCE: Adapted from Hahn *et al.* (2000b).

Notes: All values are millions of 2000 dollars annually; rules are ranked in order of decreasing cost-effectiveness. Net cost-effectiveness values are costs, less cost savings.

APPENDIX A. TABLES OF SELECTED FEDERAL ENVIRONMENTAL QUALITY INITIATIVES DURING THE 1990s

Table A1. Air Quality

Item	Description
National Ambient Air Quality Standards (NAAQS) for ozone and particulate matter	EPA issued new, stricter NAAQS for ozone and PM in 1997. The revised standards faced a court challenge from the regulated community. The U.S. Supreme Court ruled in February 2001 that the CAA does not allow EPA to consider costs in setting NAAQS for the criteria pollutants, and that the statute's mandate that the NAAQS protect the public health with "an adequate margin of safety" allows an acceptable scope of discretion to EPA.
Multi-state air quality management – NO_x	In 1998, EPA's NO_x State Implementation Plan Call required 22 states and D.C. to submit strategies to reduce NO_x emissions. In response, twelve Northeastern states and D.C. (the Northeast Ozone Transport Region) implemented a regional NO_x cap-and-trade system in 1999 to reduce emissions from large stationary sources.

1990 Clean Air Act Amendment implementation ***Sulfur dioxide allowance trading Phase I and II***	Title IV of the CAAA created the SO_2 trading program. Phase I began in 1995; 110 electric power-generating plants received emissions limits and were required to have permits to cover their emissions. Phase II began in 2000, incorporating most remaining plants. A robust market of bilateral permit trading emerged in the 1990s.
Maximum Achievable Control Technology for air toxics	The CAAA mandated that EPA issue "Maximum Achievable Control Technology" (MACT) standards for 188 toxic air pollutants. From 1992 through August 2000, EPA issued technology standards for 45 of these substances, covering 82 categories of industrial sources. Some emissions averaging is allowed for sources in the petroleum and hazardous organic chemical industries.2
Policy change, state taxes on regulated air pollutants	The CAAA allow states to tax regulated air pollutants to recover administrative costs, and areas in extreme non-compliance may charge higher rates. (Under this structure Los Angeles' SCAQMD has the highest permit fees in the U.S.)
Mobile sources	Title II of the CAAA imposed stricter controls on mobile air pollution sources as described below.
Reformulated gasoline	Since 1995, the nine worst ozone non-attainment areas have been required to sell cleaner-burning reformulated gasoline.1 EPA's implementation allows refinery-level trading of oxygen, aromatics and benzene content.
Tier 1 vehicle emissions standards	The CAAA set "Tier 1" exhaust emissions standards for CO, hydrocarbons, NO_x, and PM for cars and trucks beginning with model year 1994. The NO_x standard for cars was a 40% reduction over the 1981 standard.
Tier 2 emissions and gasoline content standards	The CAAA also required EPA to study the need for "Tier 2" standards. EPA reported to Congress in 1998 that stricter standards would be necessary to meet the new NAAQS for ozone and PM. The final Tier 2 rule, issued in 2000, will take effect in 2004. It introduces stricter NO_x standards and applies the same standards, for the first time, to cars, SUVs, and light-duty trucks. The rule also includes a substantial reduction in allowable sulfur content of gasoline. Vehicle manufacturers may average NO_x emissions throughout their fleets, and refiners may average, bank and trade gasoline sulfur content.
Heavy-duty truck and bus emissions and gasoline content standards	In 2000 EPA issued a Final Rule regarding new emissions standards for heavy-duty trucks and buses beginning in 2004. EPA's implementation allows trading among engine manufacturers of PM, NO_x and other emissions. EPA also proposed new standards for diesel fuel quality, beginning in 2006, which would cap diesel fuel sulfur content at 15 ppm from the current standard of 500 ppm.3
Low-Emission Vehicles	The CAAA required that low-emission vehicles be

SOURCES: Farrell et al. (1999); Mayer (1995); Stavins (2001); U.S. Environmental Protection Agency (2001a); U.S. Environmental Protection Agency (2000); U.S. Supreme Court (2001a).

Notes:
1. This has been one of the most contentious programs initiated by the CAAA, resulting in conflicts over ethanol content, potential health and environmental risks associated with MTBE, an oxygen-increasing additive, and the increase in relative competitiveness of gasoline imports.
2. The combination of a technology standard and emissions averaging works as follows. EPA establishes MACT requirements for different processes and clarifies the emissions reduction expected from application of the MACT. Regulated entities may then average emissions, so long as average emissions do not exceed the reduction expected from applying the MACT to all regulated plants or processes.
3. New EPA Administrator Christie Todd Whitman announced the agency's intention to uphold the stricter diesel fuel sulfur content standards in March 2001.
4. Categories of non-road engine equipment include lawn and garden, airport service, recreational, marine recreational, light commercial, industrial, construction, agricultural, and logging. Commercial marine vessels are also included.

Table A2. Water Quality

Item	Description
1996 Safe Drinking Water Act Amendments	The 1996 SDWA Amendments abolished the original statute's requirement that EPA regulate 25 new contaminants every three years, establishing a process for regulating contaminants based on health risk, occurrence, and opportunity for risk reduction. The Amendments require formal benefit-cost analysis of all new maximum contaminant levels (MCLs) issued by EPA, and they specifically direct EPA to take costs into consideration in setting MCLs.1

Debates over Clean Water Act (CWA) reform and reauthorization	During the 104th Congress, the House passed a comprehensive CWA reauthorization (H.R. 961) that would have been more flexible and less prescriptive, but the Senate did not take up the bill.4 No reauthorization legislation was considered in the 105th or 106th Congress. Instead, the legislature focused on opposing the initiatives under Section 303(d) and considering reforms to Section 404 treatment of wetlands, two focal points of CWA criticism described below.
Section 303(d) total maximum daily load (TMDL) designations for polluted water bodies	Section 303(d) of the Clean Water Act requires states to establish TMDLs for water bodies that do not meet ambient water quality standards for their designated use, despite point source pollution control.2 Until the early 1990s, EPA did little to enforce this part of the CWA, but in response to multiple lawsuits by environmental groups in the 1990s, state courts ordered the development of TMDLs.3 EPA convened a Federal advisory committee to develop a consistent national TMDL program in 1996, proposed regulations to clarify and strengthen the TMDL program in August 1999, and issued a final rule in July 2000. The proposed and final rule generated controversy over states' capacity to implement TMDLs and about their impact on agriculture and forestry. Congress subsequently attached a rider to an appropriations bill that prevents EPA from spending funds to implement the rule in FY2000 and FY2001.
Section 404 wetlands regulation	Section 404 of the Clean Water Act is the central Federal regulatory and permitting statute for wetlands. No major new wetlands legislation was enacted during the 1990s, despite the introduction of several bills. A number of important changes occurred during the decade, however. The Clinton Administration expanded wetlands permitting requirements to include excavation in 1993, a move that was overturned by the U.S. District Court for the District of Columbia in 1997. A U.S. Supreme Court decision in 2001 overturned the U.S. Army Corps of Engineers' 1986 "Migratory Bird Rule", which had allowed regulation of intrastate waters (including ponds) that provide habitat for migratory birds. In 1998, the Army Corps greatly reduced the scope of nationwide permit 26, which authorizes discharges into non-tidal headwaters and isolated waters, a change that resulted in lawsuits by the development and commercial communities.6 Finally, the Clinton Administration endorsed the concept of wetlands mitigation banking in 1993, resulting in EPA framework guidance issued in 1995.

Individual Water Resources Projects	Many large individual water resources projects, often funded through annual Water Resources Development Acts, were initiated during the 1990s. The most extensive of these is the Florida Everglades Restoration project, a 36-year, $7.8 billion Federal/state plan approved in 2000.

SOURCES: Tiemann (1999); U.S. Environmental Protection Agency, Office of Water (2000); Copeland (1997, 1999, 2000, 2001); U.S. Supreme Court (2001b); Zinn (1997)

Notes:

1. The SDWA Amendments also included significant broadening of the pollution prevention focus of the Act, through source water protection standards. They provided for increased state and Federal monitoring flexibility, especially for water systems serving 10,000 or fewer persons. Consistent with the 104th Congress' focus on reducing unfunded mandates, the Amendments created a new drinking water state revolving loan fund to help communities meet increasingly stringent drinking water quality mandates. The SDWA Amendments also required all public water systems to issue annual reports to customers, revealing data on contaminants in drinking water, system violations of MCLs, and other information.
2. The TMDL should be set at a level necessary to attain the applicable water quality standard for the water body's designated use. Designated uses include recreational use, public water supply, and industrial water supply, for example, and each designated use has an applicable water quality standard. Generally, attaining the TMDL involves regulating non-point source pollution, given that point-source permitting has been insufficient to achieve compliance with Federal standards for these water bodies.
3. Through October 2000, environmental groups had filed 40 legal actions in 38 states – EPA is under court order or consent decree in many states to ensure that TMDLs are established either by the state or by EPA itself (U.S. Environmental Protection Agency, Office of Water 2000).
4. The 103rd Congress had considered similar legislation (H.R. 3948, S. 2093), but no floor action on CWA reauthorization was taken in either house.
6. The so-called "nationwide permits" which authorize landowners to proceed with specified categories of activities without obtaining individual permits, reducing regulatory burden. The waters governed by permit 26 are often difficult to identify as wetlands because they may appear dry for much of the year and do not exhibit the vegetation characteristic of wetlands, but scientific evidence is mounting for their important function within aquatic ecosystems (Copeland 1999).

Table A3. Hazardous Waste and Toxics

Item	Description
Expansion of Toxics Release Inventory	The Toxics Release Inventory (TRI) was initiated in 1988 under the Emergency Planning and Community Right-to-Know Act Section 313 and requires firms to report on use, storage and release of hazardous chemicals. A 1993 Clinton executive order required TRI reporting by Federal facilities. In 1994, EPA added 286 new chemicals to the list requiring reporting in the Toxics Release Inventory (TRI), nearly an 80 percent increase in the number of listed chemicals. In 1999, EPA lowered reporting thresholds for many persistent bioaccumulative toxic chemicals and added more of these chemicals to the TRI list. The 104th Congress considered but did not enact legislation that would have restricted EPA's ability to require TRI reporting.
RCRA Corrective Action program	EPA regulations under RCRA's Corrective Action program were promulgated in 1990 and revised in 1996. The study, decisionmaking and cleanup phases defined by EPA closely resemble the Superfund process. In 1993, EPA released a total cost estimate for the RCRA Corrective Action program of $18.7 billion (in discounted 1992 dollars).
Debates over reform of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or Superfund)	Superfund reauthorization and reform were considered in many forms during the 105th Congress, but no legislation was passed. The taxes that support the Superfund trust fund (primarily excise taxes on petroleum and specified chemical feedstocks and a corporate environmental income tax) expired in 1995 and have not been reinstated.1
Securities and Exchange reporting requirements	In 1993, the Securities and Exchange Commission tightened reporting requirements of contingent liabilities under Superfund for publicly-held companies.

Brownfields Cleanup	EPA started the Brownfields Economic Redevelopment Initiative in 1993 to address sites contaminated by hazardous substances that do not warrant Superfund cleanup. The program was initiated administratively and was financed from Superfund appropriations until 1997, when appropriations legislation specified funding for brownfields activities. In 1996, the EPA Administrator removed 25,000 potential brownfields sites from Superfund's list of sites suspected of being contaminated by hazardous substances; the listing had prevented many of the sites from sale or development. As of January 2001, more than 300 brownfields assessment pilot projects had been initiated.2

SOURCES: Sigman (2000); Reisch (1998, 2000, 2001).

Notes:
1. The revenues now flowing into the trust fund come from so-called "potentially responsible parties", interest on the fund's investments, fines, and penalties. See Reisch (2000).
2. Many programs have been created by EPA and other Federal entities under the umbrella of brownfields development. See Reisch (2001) for descriptions.

Table A4. Solid Waste

Item	Description
Federal procurement requirements for recycled content	Issued in 1993, E.O. 12873 required Federal agencies to purchase recycled copier paper. Issued in 1998, E.O. 13101 strengthened these requirements. EPA designated an additional 19 recycled content product categories for procurement preferences in 1995, added 12 more categories in 1997, and proposed 19 more for addition in 1998.
Mercury-Containing and Rechargeable Battery Management Act of 1996 (Battery Act)	The Battery Act requires uniform labels indicating that nickel-cadmium and some lead-acid batteries must be recycled or disposed of properly. Manufacturers, distributors and other suppliers must provide proper disposal opportunities. The law also prohibits the use of some mercury-containing batteries, with the goal of phasing them out completely.
Solid Waste Landfill Criteria	Municipal solid waste landfill criteria were promulgated by EPA under RCRA Subtitle D in 1991. Non-municipal landfill criterial were promulgated in 1996. Various location, design, operating, monitoring and corrective action requirements became effective between 1993 and 1997.1
Proposed restrictions on waste transport	During the 1990s, Congress often considered restricting interstate waste transport. State and local governments' ability to designate disposal sites for privately-collected waste has been the subject of lawsuits; in 1994 the U.S. Supreme Court ruled that such "flow control" violates the Interstate Commerce Clause. At the time, 39 states and D.C. had enacted these laws.
Proposed national deposit-refund bills	The National Beverage Container Reuse and Recycling Act was proposed in the House in 1994 and would have introduced a 10-cent deposit on bottles and cans in states that did not recycle at least 70 percent of such containers. A similar bill was proposed in the Senate, but the advance deposit would have varied with recycled content.

SOURCES: Macauley and Walls (2000); McCarthy (2000).

Notes:
1. Air emissions from municipal solid waste landfills and incinerators are regulated under CAA Sections 111 and 129. Rules for landfills were promulgated in 1996, and rules for incinerators in 1991, with maximum achievable control technologies identified for some hazardous air pollutants in 1995 and 1997. See McCarthy (2000).

Table A5. Global Climate Change

Item	Description
U.N. Framework Convention on Climate Change	In June 1992, the U.N. Framework Convention on Climate Change was developed at the U.N. Conference on Environment and Development in Rio de Janeiro, Brazil. The U.S. was an early signatory under President George Bush, and the U.S. Senate ratified the convention in October 1992.
Climate Change Action Plan	In April 1993, President Clinton ordered Federal agencies to design a plan to stabilize U.S. greenhouse gas (GHG) emissions at 1990 levels by 2000. In October, the Administration released a U.S. Climate Change Action Plan suggesting 52 voluntary measures to meet this emissions goal.1
U.S. Initiative on Joint Implementation	The U.S. Initiative on Joint Implementation was established in 1993 under the Climate Change Action Plan. Joint Implementation arrangements allow entities in one country to partially meet their GHG reduction commitments by financing cost-effective mitigation in another country. The U.S. Initiative through 2000 had approved 26 arrangements whereby U.S. firms agreed to finance projects in 11 other countries.2
Willingness to accept legally-binding targets	In July 1996 at the second Conference of the Parties to the U.N. Framework Convention, the U.S. delegation released a position statement calling for "legally binding mid-term targets" for GHG emissions among parties to the Convention.3
Byrd-Hagel Resolution (S. Res. 98)	The 105th Congress unanimously approved S. Res. 98 in July 1997, stating that the U.S. should not approve any agreement at the upcoming third Conference of the Parties in Kyoto that did not impose binding GHG emission targets on all nations, and requested that the Administration estimate the costs of any protocol submitted for Senate approval.
Kyoto Protocol	The U.N. Kyoto Protocol on Climate Change was completed in December 1997. Most industrialized nations agreed to legally binding GHG emission reductions–the U.S. was to implement a 7% reduction below 1990 levels by 2012. The U.S. became the 60th signatory of the Protocol under President Bill Clinton in November 1998, despite the fact that the Protocol did not meet the Senate's approval stipulations, outlined in S. Res. 98.
Energy Information Administration study	In 1998, the U.S. Energy Information Administration produced a report analyzing the potential economic impacts of U.S. compliance with the Kyoto Protocol emissions targets, at the request of the House Committee on Science. The report

	estimated very high costs: a 4% reduction in annual GDP through 2010 compared to business-as-usual, a 53% gasoline price increase and an 87% average electricity price increase. Cost estimates assumed that the U.S. target would be met entirely by reducing U.S. carbon emissions, with no net offsets from sinks or other GHGs, and no emissions trading.
Council of Economic Advisors study	Also in 1998, the President's Council of Economic Advisors (CEA) produced an estimate of the costs to the U.S. of complying with the GHG emissions reduction target specified in the Kyoto Protocol. The CEA estimated costs on the order of 0.5% of annual GDP, if flexible (market-based) policy instruments were employed. The CEA study also predicted no negative effect on the U.S. trade deficit, small increases in gasoline prices ($0.05 per gallon), and no significant effect on aggregate employment.
U.S. advocacy for market-based instruments	A key component of the Clinton Administration's position on climate change policies was support for cost-effective approaches, including market-based instruments. The Administration's formal proposal released in preparation for Kyoto called for domestic and international emissions trading and international joint implementation. The U.S. proposed rules for international emissions trading in 1998, at preparatory talks for the fourth Conference of the Parties. The U.S. proposal faced substantial opposition, most significantly from the European Union. No agreement was reached on emissions trading at the fourth (1998), fifth (1999), or sixth (2000) Conference of the Parties.

SOURCES: Morrissey (2000); Shogren and Toman (2000); Parker and Blodgett (1999); U.S. Department of Energy, Energy Information Administration (1998).

Notes:
1. This Plan was substantially similar to that developed under the Bush Administration in 1992.
2. These are merely pilot projects, as the U.S. is not party to any binding agreement on GHG emissions.
3. The position statement released at COP-2 also noted U.S. acceptance of the scientific findings on climate change summarized by the Intergovernmental Panel on Climate Change (IPCC) in its second assessment released in 1995, and it rejected uniform "harmonized policies" in favor of flexible policy instruments (including market-based instruments). See Morrissey (2000).

APPENDIX B. SELECTED FEDERAL NATURAL RESOURCE POLICY INITIATIVES DURING THE 1990s

Table B1. Public Lands and Species Preservation

Item	Description
U.S. Forest Service (USFS) reforms	The U.S. Forest Service under Clinton underwent a substantial shift in priorities, emphasizing ecosystem management over timber production and extraction.
Shift to ecosystem management	In 1992, a USFS policy reduced the amount of timber harvested by clear-cutting in national forests. In two speeches delivered in 1998 and 1999, USFS Chief Mike Dombeck unveiled the agency's "Natural Resource Agenda for the 21st Century", emphasizing: (1) watershed protection; (2) sustainable forest system ecosystem management; (3) forest roads; and (4) recreation.
Roadless Initiative	President Clinton announced the Administration's Roadless Initiative in October 1999, instructing the USFS to develop regulations for long-term protection of inventoried roadless areas within the national forest system. The USFS Roadless Rule, submitted to the Federal Register in January 2001, placed 58.5 million acres of unroaded Federal forest lands in 39 states off limits to new roadbuilding.1
Policy on old-growth cutting	Also in January 2001, Forest Service Chief Dombeck announced a new USFS policy on old-growth cutting.2 This was a substantial reversal of previous policy, which promoted the cutting of the largest, oldest trees first. The Forest Service estimates that the change could affect 20 percent of the U.S. timber harvest from national forests scheduled in the coming year, and as much as 50 percent in the forests of the Pacific Northwest.
Reduction of subsidies for extractive resource uses on	In 1993, President Clinton announced plans to reduce subsidies for grazing, timber extraction, mining and water resources development on Federal lands as part of his deficit reduction plan. Within one month of this announcement, pressure from Western Senators led to the elimination of most disputed provisions from Clinton's overall budget proposal. Some of the initiatives continued in other forms, as described below.
Below-cost timber sales	While the plan to eliminate below-cost timber sales was eliminated from Clinton's final budget proposal, the USFS drafted a plan to phase out

Grazing fees ***Mining royalties and patents***	below-cost sales on one-half of forest service lands over four years. The proposal was made public in the *New York Times* and was explicitly rejected as Administration policy by Assistant Secretary of Agriculture James Lyons in Senate hearings. By USFS estimates, 77 of the 120 national forests showed net losses from timber sales over the period FY1989-FY1993, and 60 reported losses in every year over this period.3 The Administration pursued increases in fees for grazing livestock on public lands with more vigor, but not much more success. In 1993, the Administration proposed increasing the baseline Federal grazing fee by almost 200%, resulting in a Senate filibuster on FY1994 Interior Appropriations during the 103rd Congress. The Administration continued to lobby for fee increases, and the 104th Congress established a new fee formula that resulted in a small increase in the baseline fee. In 1993, the Administration proposed introducing royalties for hardrock mining on Federal lands. In the 103rd Congress, the House and Senate considered bills that would have required a royalties of 2 to 8 percent of gross income. Since 1994, Congress has enacted a series of one-year moratoriums on the issuance of new mining patents for hardrock minerals. Patents give mining claim holders title to surface and mineral rights on public lands, at a cost of $2.50-$5.00 per acre, under the 1872 Mining Law. The Law allows production of minerals on public lands without a patent, however, in which case claimants pay no fees to the Federal government.4
Designation of new wilderness areas, national monuments	One of the most visible natural resource policy developments of the 1990s was the Clinton Administration's designation of more than 20 new national monuments and expansion of three existing national monuments, under the 1906 Antiquities Act. The designations and expansions added almost 6 million acres to Federal public lands.5 Clinton also created the largest protected area in U.S. history, the 84 million acre Northwest Hawaiian Islands Coral Reef Ecosystem Reserve.6 During the 1990s, the Congress also created one new national monument of 272,000 acres, and one national preserve (the Mojave Desert) of 1.6 million acres.
Extension of moratorium on offshore oil leasing	In 1998, Clinton extended a moratorium on new offshore oil leasing in the U.S., which was originally established by President George Bush. The moratorium extends through 2012, and it permanently bars new leasing in national marine

	sanctuaries.
Conservation and Reinvestment Act (CARA)	A key component of the Clinton Administration's environmental policy agenda, CARA would have funded the Federal Land and Water Conservation Fund through permanent, rather than annual, appropriations. The bill received bipartisan support in the 105th and 106th Congresses and would have diverted $45 billion over 15 years from outer continental shelf oil and gas revenues to land and easement acquisition, wildlife protection and other natural resource activities. The House passed a version of the bill in the 106th Congress, but opposition from Western delegations prevented the Senate from taking any floor action (although the bill was approved in Committee).7

Changes to Endangered Species Act Implementation	Authorization for Federal spending under the Endangered Species Act of 1973 (ESA) expired in 1992. Prohibitions and requirements have remained in force, and Congress has appropriated annual funds to support ESA activities, but all attempts at reauthorization in the 1990s (including the most serious attempt during the 105th Congress) failed. Important administrative changes are described below.
Habitat conservation plans	The Clinton Administration heavily emphasized habitat conservation plans (HCPs) as a tool to manage endangered and threatened species on non-Federal lands. Under Section 10 of the ESA, private landowners applying for an "incidental take" permit must submit an HCP, in which they agree to restrict some uses in the interest of species and habitat protection in exchange for the permit. More than 250 habitat conservation plans were completed between 1992 and 2000, compared to 14 between 1982 and 1992. The plans are more flexible than direct enforcement of the Endangered Species Act.8
Incentives for Landowner Protection of Species	One major criticism has been that the ESA actually discourages landowner efforts to improve species populations, since larger populations require expanded protections. Three Clinton-era changes sought to reverse this. First, voluntary "safe harbor agreements" guarantee that increases in species populations on private lands will not restrict future land use decisions. Second, the controversial "no surprises rule" guarantees that a landowner properly carrying out an HCP will not experience further restrictions or costs without mutual consent.9 Third, "candidate conservation agreements" allow landowners to protect declining species that are not yet listed, in exchange for assurance that no additional measures will be

Critical habitat designation	required when or if the species is listed. Many of the Congressional reauthorization attempts sought to incorporate these provisions into the ESA. Under the ESA, the U.S. Fish and Wildlife Service (FWS) is required to establish critical habitat designations upon each species listing. The agency has long maintained that such designations are extremely costly and provide little species conservation benefit beyond the ESA's other provisions. In its 1999 budget request, the FWS put critical habitat designation last on its list of priorities, citing its inability to comply with existing demands in this area given budgetary constraints -- critical habitat has been designated for only 10 percent of listed species. FWS has been sued 13 times over this issue and lost every case. In the late 1990s, both the Clinton Administration and the Congress proposed limiting critical habitat designation required under the ESA; since no reauthorization was accomplished, the issue remains to be resolved.
Fisheries Management	The Sustainable Fisheries Act of 1996 (P.L. 104-297) amended the Magnuson-Stevens Fishery Conservation and Management Act, imposing a four-year moratorium on new individual tradeable quota programs among the nation's eight regional fishery management councils and repealing one such program that had been created in 1995. The Act did not, however, repeal the other five existing ITQ programs.

SOURCES: Booth (2001); Buck (1996); Buck and Corn (2001); Cody (1996); Dombeck (1998); Gorte (1994); Humphries and Vincent (2001); Vincent (1998); Zinn (2001).

Notes:
1. President George W. Bush placed a 60-day "stay" on this and all Federal rules published in the Federal Register and not yet in effect as of January 20, 2001. The Roadless Rule will take effect May 12, 2001, if it is kept in place by the current Administration and Congress.
2. The "policy directive" will not have the force of Federal law, and can be reversed by the new Forest Service Chief at will.
3. Net losses in Alaska's Tongass National Forest were the greatest – more than $13 million per year in FY1992 and FY1993. See Gorte (1994).
4. While it is difficult to estimate the fair market value of mineral-bearing lands, a 1989 GAO report reviewed 20 patents, estimating that Federal revenues totalled $4,500 from 1970-1989, on lands valued between $13.8 and $47.9 million. Of course, a direct comparison like this ignores the speculative nature of the mining industry and does not indicate what portion of the land value represents actual profits. See Gordon and Van Doren (1998).
5. This was the largest expansion of U.S. Federal lands since President Jimmy Carter withdrew 56 million acres of Alaskan lands in 1978, creating 15 new monuments and expanding two existing monuments. See Vincent (1998). All but one of Clinton's designations (Grand Staircase-Escalante National Monument) were declared in the final year of his presidency, from January 2000 to January 2001. A notable exception was the coastal plain of the Arctic National Wildlife Refuge which, despite heavy lobbying, was not declared a national monument. The 1995 shutdown of the Federal government was due, in part to a budget legislation rider that would have allowed oil and gas exploration in ANWR's coastal plain, which contributed to Clinton's veto. Similar legislation was considered during the 106th Congress.

6. The Northwest Hawaiian Island Coral Reef Ecosystem Reserve was seven times the size of the existing U.S. National Marine Sanctuary system at the time of the Hawaiian reserve's declaration.
7. The bill has been reintroduced in the 107th Congress; the George W. Bush Administration had not taken a position on CARA as of March 2001. See Zinn (2001).
8. These plans can be very expensive, however. The 17,000-acre Coachella Valley HCP to protect an endangered lizard in California cost $25 million; the Balcones Canyonlands HCP near Austin, Texas may cost $200 million. The plans are implemented with a combination of Federal, state, local and private funds, and may involve a mitigation fee assessed on development (the fee was $1,950 per acre for the Stephens' kangaroo rat HCP in southern California). See Beatley (1995).
9. Some changes can be carried out under this rule by the government, but at no cost to the landowner. No formal rule was issued when the "no surprises rule" was introduced in the early 1990s, and environmental groups sued the Interior Department, alleging inadequate species protection under existing law. The agency settled the case, but then issued a formal rule in 1998 establishing "no surprises" as regulation. See Buck and Corn (2001).

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