

7.1. INTRODUCTION

For the purposes of this report, subsidies of interest involve government financial support of activities believed to be environmentally friendly. Types of subsidies described in this report include not only grants, low-interest loans, and favorable tax treatment, but also procurement mandates for products believed to have environmental advantages.

Research and development, information dissemination, and other services provided by government below their true cost could also be considered subsidies. However, such services are too varied and numerous to be included in this report.

Subsidies are often funded by charges on environmentally harmful products or activities such as emissions charges or product charges. Advance disposal fees, for example, provide revenues to subsidize the proper disposal of products after their use. Although it could be argued that such disposal activities are not truly subsidized by government if they are funded entirely by fees on the product paid by industry or consumers, this Section includes such mechanisms for the purposes of discussion.

Given the variety of subsidies used in environmental management at all levels of government, this Section does not attempt to cover the topic comprehensively. Its purpose is instead to provide an overview with illustrative examples of the types of subsidies and how they have been used to address specific environmental problems.

The following areas are considered: pollution prevention and control, the cleanup of contaminated industrial sites, farming and land preservation, consumer product waste management, citizen monitoring of environmental regulations, alternative fuels and low-emitting vehicles, and municipal wastewater treatment. The section then concludes with a discussion of subsidies that have had the unintended effect of promoting environmentally harmful activities.

Table 7-1 summarizes various subsidy instruments, most of which are discussed in this Section. The second column concerning who pays for the various subsidies does not attempt to assess distributional impact or the question of whether costs of subsidies are passed on to other businesses or consumers in some way. Information on funding sources other than general revenues is included in parentheses where available. Whether the recipients in column three pass on the subsidy benefits to customers or others is also not assessed. Environmental subsidies have also been used extensively outside the U.S. Information on these subsidies is provided in Section 9.

Table 7-1: THE USE OF SUBSIDIES IN U.S. ENVIRONMENTAL PROTECTION

Subsidy Instrument	Who Pays?	Recipients
Grants		
Brownfields development grants	EPA, states	Communities, property owners
Cost-sharing for land conservation	Federal government	Property owners
Conservation easements	Federal, state, and local governments (Land transfer taxes)	Property owners
Environmental violation reporting rewards	States of New Jersey, California	Individuals and organizations
Waste management and recycling grants	Federal, state, and local governments (ADFs, waste taxes)	Public and private organizations
Unit-based waste collection or reuse payments	State governments (ADFs, waste taxes)	Businesses
Unit-based payments for alternative fuel vehicle use	Federal government	Public bus systems and small businesses
Municipal sewage treatment plant construction grants (replaced by loans)	Federal and state governments	Communities
Loans		
Pollution control loans	State governments	Small businesses
Brownfields development loans	State governments (waste taxes)	Property owners
Recycling business loans	State governments (ADFs, waste taxes)	Businesses
Municipal sewage treatment plant construction loans (replaced previous grant program)	Federal and state governments	Communities

Subsidy Instrument	Who Pays?	Recipients
Tax benefits		
Pollution control property	State governments	Private organizations
Louisiana environmental score-card deduction	State of Louisiana	Businesses
Brownfields development	State governments	Property owners
Land use credits	State governments	Property owners
Recycling benefits	State governments	Businesses
Credits for ethanol and compressed natural gas	Federal and state governments	Alternative fuel manufacturers
Credits for alternative fuel vehicles and equipment	Federal and state governments	Alternative fuel vehicle purchasers
Renewable electricity generation credits	Federal government	Businesses
Electric vehicle credits	Federal government	Businesses or organizations
Interest exemption of pollution control investment debt	Federal government	Businesses or organizations
Procurement mandates		
Public procurement of recycled products	Federal, state, and local governments	Recycled products manufacturers
Public procurement of alternative fuel vehicles	Federal, state, and local governments	AFV manufacturers
Recycled content requirements	Private organizations	Recycled products manufacturers
AFV use mandates	Private organizations	AFV manufacturers
Miscellaneous		
Reduced fines in return for supplemental environmental projects	Federal and state governments	Businesses

Subsidy Instrument	Who Pays?	Recipients
Relaxed regulatory requirements (eg. ethanol RVP waiver)	Federal, state, and local governments	Various organizations
Research & development; public education (technical assistance to participants in voluntary programs)	Federal, state, and local governments	Various organizations

7.2. POLLUTION PREVENTION AND CONTROL

This subsection discusses the use of tax benefits and loans to promote pollution prevention and control. It also discusses an EPA program under which fines for environmental violations are reduced in exchange for pollution prevention and control activities.

7.2.1. Tax Benefits

Numerous states offer favorable tax treatment for pollution control property to promote the construction and installation of such property. In most states with such tax incentives, the equipment must have pollution control as its primary purpose. Equipment with other purposes in many states receives tax benefits on a prorated basis. Some states also require environmental regulators to certify equipment eligible for tax breaks.

The benefits usually apply to property or sales/use taxes but can apply to income tax in a smaller number of states. Air and water pollution equipment are most commonly subject to benefits. However, New York offers a property tax exemption for industrial waste treatment facilities, and Ohio offers benefits for noise abatement equipment. Tax exemptions for production machinery and products directly used in manufacturing also apply to pollution control equipment in many cases.¹

In Texas, for example, a constitutional amendment approved by voters in 1993 provided for exemptions of certain pollution control property from property taxes. The purpose of the amendment was to ensure that investments made to comply with environmental mandates did not raise businesses' property tax payments. The exemptions applied only to "devices, equipment, methods, or land used to prevent, monitor, control, or reduce air, water, or land pollution" purchased in 1994 to "meet or exceed state, federal, or local laws, rules, and regulations." The vast majority of exemption requests were for equipment used to comply with Clean Air Act requirements. The total value of the property for which businesses applied for exemptions was \$1.2 billion. A state official estimated that the applications would lead to tax revenue reductions of \$26.6 million.

One problem with such tax benefits is that they can erode state or local tax bases. In Texas, for example, the \$26.6 million revenue shortfall is expected to affect mainly school

districts but also cities and counties. One tax district appraiser predicted that homeowners would make up the shortfall.²

The incentive effect of such preferential tax treatment is difficult to assess, in part because of the simultaneous presence of other policies that affect behavior. If the benefits are offered merely to subsidize compliance with regulations, the regulations themselves probably have a stronger incentive effect than the benefits. However, the favorable tax treatment could provide an incentive to exceed requirements.

7.2.2. Louisiana Environmental Scorecard³

Louisiana's environmental scorecard program, which was in effect from October 1990 to January 1992, linked tax exemptions for companies to their environmental performance. The State's Departments of Economic Development and Environmental Quality built the scoring system into an existing 10 Year Industrial Property Tax Exemption (IPTPE). In contrast to the previous practice of awarding 100% exemptions for local property taxes, new equipment, and other capital expenditures, the scoring system set companies at a base exemption of 50% and rated their environmental behavior to determine how much of the remaining 50% they could obtain.

Companies earned points based on their environmental violation record and the amount of emissions they generated per employee. Table 7-2 shows how these factors influenced point totals. The values in the second column of table 2 were multiplied by coefficients ranging from 1 for violations in the past year to 0 for violations 6 years or older. In column 3, one job was equivalent to \$25,000 of payroll. After the Department of Environmental Quality had assigned a preliminary score to an exemption request, a company that received fewer than 100 points could raise its score by developing an emissions reduction plan. Other criteria, such as recycling activities and job creation for high unemployment areas, could also influence point totals.

Data suggest that this program had a significant incentive effect. Final scores during the year of existence of the program averaged 94.9, significantly higher than preliminary scores. Twelve companies submitted emission reduction plans for bonus points worth \$7,030,249 in tax exemptions. This amount is slightly greater than the \$5.2 million of exemptions recovered by the state through the system. Since the system was built into an existing exemption, administrative costs were reasonably low. It also gave the state the opportunity to use the exemption carrot to promote not only economic but also environmental health.

Industry, however, opposed the program, perhaps in part because it attached conditions to what had previously been an unconditional tax exemption (IPTPE). It was industry's opposition that led the governor to terminate the program in 1992.

Table 7-2: POINTS AWARDED AND SUBTRACTED UNDER LOUISIANA SCORECARD SYSTEM

Violation fine	Points subtracted from 25	Pounds of emissions per job	Points Awarded
\$0-\$3,000	1	0-500	25
\$3,001-\$10,000	5	501-1,000	20
\$10,001-\$25,000	10	1,001-2,500	15
Over \$25,000	15	2,501-5,000	10
Criminal or felony violations	20	5,001-10,000	5

Source: Environmental Law Institute (August 1993), p. 119.

7.2.3. Supplemental Environmental Projects

Supplemental environmental projects (SEPs) are "settlements negotiated by EPA and an environmental law violator in which the company agrees to do an alternative environmental project in return for an agency agreement to lower the proposed penalty." Although such projects have existed since the early 1980s, they have increased in the 1990s and are now included in as much as one in ten enforcement actions. More than 200 were approved in 1992. In the first six months of 1992, one EPA official estimated, EPA negotiated 164 SEPs worth approximately \$23 million. In 1995, 348 SEPs valued at \$104 million were negotiated.⁴

Most SEPs have been pollution prevention activities and involved violations in the Toxic Substances Control Act (TCSA) or the Emergency Planning and Community Right-To-Know Act (EPCRA), but SEPs have also been negotiated for violations of other laws. In New England, for example, a sand blasting and paint company had its EPCRA fines reduced from \$50,000 to \$14,000 by agreeing to hire an environmental auditor and launch a five-year pollution reduction program. In Nebraska, a \$5,000 fine for a Federal Insecticide, Fungicide, and Rodenticide Act violation (supplying restricted-use pesticide to an uncertified user) was reduced to \$2,000 when the violating company agreed to install concrete containment dikes around its pesticide storage tanks and a shower/eye wash. The measures under the SEP were estimated to cost \$7,496. In a RCRA case involving improper characterization of waste streams, leakage of hazardous wastes from a sewer, and operation of an unpermitted incinerator, Eastman Kodak will have its penalty reduced by up to \$3 million in return for investing \$12 million in six SEPs expected to reduce hazardous wastes at its Kodak Park facility by 2.3 million pounds by the year 2001. In a CWA case, the City and Country of Honolulu agreed to spend \$30 million on SEPs for treating and reusing wastewater and sludge.⁵ Fines have also been reduced in cases for

early compliance with existing environmental laws.

The advantage of SEPs for EPA is that fines that would be paid to the Treasury are instead used for environmental protection activities and that the cost of these activities usually exceeds the negotiated reduction in the fine. Estimates of the ratio of the cost of the SEP to the reduction in the fine range from 2:1 to 6:1. At the state level, on the other hand, SEPs have proven much less popular, in part because most states rely on fine revenues to fund environmental activities.

Despite the high SEP-fine reduction ratio, SEPs can offer violators potential advantages associated with improved environmental performance, including positive publicity, reductions in waste management costs, and early preparedness for increasingly stringent regulations. Another advantage is that unlike a fine, a SEP involves business expenditures that lower taxes. Since all SEPs are voluntarily agreed to by violators, the SEP mechanism appears to have a significant incentive impact.⁶

7.2.4. Loans and Tax-exempt Bonds

The federal government exempts from taxation interest on debt issued by state or local governments to finance pollution-control or waste disposal facilities. This exemption cost the government an estimated \$625 million in 1995.⁷

Although it is beyond the scope of this report to describe all state financing programs, several mechanisms used in California are discussed here. The California Pollution Control Financing Authority (CPCFA) issues tax-exempt bonds to provide low-interest loans of \$1,000,000 to \$20,000,000 to small businesses for pollution control and solid waste recovery projects. (Loans in excess of \$20 million are provided under a similar program for larger businesses.) Repayment periods are usually longer than those of conventional bank loans. Proceeds from bonds issued by CPCFA on behalf of businesses are deposited into a fund held by the bond trustee. The borrower uses these funds for the project, making periodic repayments according to the terms of the loan agreement.

For example, about \$1 million in tax-exempt bonds were issued to finance a dry ash waste recovery investment at the Eel River Sawmills' electricity generating facility. The equipment purchased through this financing reprocesses ash waste through the electrical generating facility, thereby reducing the amount of ash waste landfilled per day by 60%, from 24 tons to 10 tons.⁸

In addition to these tax-exempt bond programs, CPCFA formerly offered CLEAN (California Loans for Environmental Assistance Now) loans for pollution control investments. Under this program, CPCFA issued bonds and lent proceeds at interest rates about 2% higher than bond rates. CPCFA hoped to repackage and sell these loans to raise more capital but was unable to do so. In three years, 38 loans ranging from \$30,000 to \$500,000 were issued totaling approximately \$3 million. Since CLEAN's subsidized

interest rates attracted a number of businesses that could have obtained loans from commercial banks, it ended up financing many pollution control investments that would have been undertaken without the program. Moreover, CPCFA's loan disbursing process was slow, its loan marketing poor, and its administrative costs high. The program cost about \$1.40 for every \$1 lent.⁹

To address these problems, CLEAN was replaced by the California Capital Access Program (CalCAP), under which CPCFA sets up loan portfolio "insurance" to encourage banks to lend to small businesses. CPCFA matches the sum of premiums paid by the borrower and the lender into a loss reserve account for the lender. In case of default, the account covers losses. The maximum loan amount is \$2.5 million, because the maximum premium CPCFA can pay is \$100,000 per loan¹⁰. As a result of improved marketing and loan disbursing procedures and the leveraging of reserve funds under CalCAP, \$160 million has been lent in two years compared with only \$3 million in 3 years under CLEAN. Under CalCAP, every dollar contributed by CPCFA has resulted in \$23 lent.¹¹

7.3. BROWNFIELDS PROGRAMS

Various measures have been taken to subsidize the development of brownfields, or contaminated industrial sites that pose a relatively low risk to the environment compared to the most heavily polluted Superfund sites. One reason for the adoption of incentive measures in this area is that the Superfund program, with its command-and-control approach to site cleanup, has progressed much more slowly than originally projected, largely because of litigation surrounding responsibility for cleanups.

One important type of incentive in brownfields development is the limitation of liability for those who agree to undertake remediation activities at such sites. This liability-based incentive is discussed in Section 8. This Section briefly discusses the use of subsidies (grants, loans, and tax benefits) in brownfields programs.

7.3.1. EPA Pilot Project Grants

Under EPA's Brownfields Economic Redevelopment Initiative, whose goal is "to empower states, communities and other agents of economic redevelopment to work together in a timely manner to prevent, assess, safely clean up, and sustainably reuse" lightly contaminated areas,¹² EPA has selected and sponsored 60 pilot projects with funding of up to \$200,000 per project. States, counties, communities, and tribes have been awarded grants to fund a variety of activities related to brownfields development, including identifying and assessing sites and promoting them to potential developers. Detroit, for example, received a grant to fund initiatives to combine empowerment zone activities with case studies of assessment, cleanup, and redevelopment and the preparation of a manual on brownfields development. Lowell, Massachusetts was awarded a grant to fund site rankings and assessments, conduct a comprehensive brownfields education program, and develop sustainable brownfields development funding sources.

EPA intends to use the results of these pilot projects to design a national program.¹³

(EPA brownfields site: earth1.epa.gov/swerosps/bf/answers.htm#5.)

7.3.2. Tax Incentives and Loans

New Jersey offers both tax benefits and loans to encourage brownfields development. Under the Environmental Opportunity Zone Act, which entered into effect in January 1996, developers of contaminated sites can receive a 10-year property tax exemption if they remediate the site in accordance with state standards and return it to commercial or industrial use. Loans for cleanups are funded by a dedicated 5% portion of the state Hazardous Discharge Site Remediation Fund. To qualify for the tax benefits and loans, the contaminated land must be on the state's list of hazardous discharge sites, be vacant or underused, and need cleanup because of an actual or potential pollution discharge. The sites must also be located in environmental opportunity zones designated by state municipalities. The property tax exemption gradually decreases from 100% in the first year of development to zero in the tenth year.¹⁴

Pennsylvania's Land Recycling and Environmental Remediation Standards Act established an Industrial Sites Cleanup Fund of up to \$15 million to provide low-interest loans to help property owners clean up pollution that they did not cause. Grants are available to finance activities by local governments and economic development agencies. These funds can cover up to 75% of cleanup costs. The Industrial Sites Environmental Assessment Act allows the Department of Commerce to make grants to municipalities and other local authorities, nonprofit economic development agencies, and similar organizations to fund environmental assessments of industrial sites in distressed communities. Up to \$2 million is provided annually for such funding.¹⁵ As of the end of 1995, 25 letters of intent (the first step in the application process) had been submitted for grants and loans to conduct assessments and remediation projects. At least four grants, one loan, and one combination grant/loan have been approved for a total value of \$1.62 million.¹⁶

(Pennsylvania brownfields information: www.dep.state.pa.us/dep/deputate/airwaste/wm/landrecy)

In 1995, Delaware added credits for brownfields development to its Blue Collar Jobs Tax Credit program.¹⁷ Minnesota and Ohio offer loans to fund cleanups, and Ohio also provides tax incentives. Arizona and Tennessee pay for cleanup of orphan shares at sites containing wastes from more than one source.¹⁸

On the federal level, the Clinton Administration released a proposal in March 1996 that would allow cleanup costs in designated brownfields areas to be fully deductible the year in which they are incurred. This seven-year, \$2 billion plan could result in the development of approximately 30,000 contaminated sites.¹⁹

7.4. FARMING AND LAND PRESERVATION

Among the types of subsidies used in farming and land preservation are grants, loans, and tax benefits offered in exchange for improved conservation practices as well as payments to landowners to either take land out of cultivation or manage it in a certain manner. As shown in table 7-3, numerous subsidy programs have been implemented in agricultural land preservation policy.

**Table 7-3: U.S. DEPARTMENT OF AGRICULTURE CONSERVATION
SUBSIDY PROGRAMS²⁰**

Program, Amount ²¹	Purpose	Areas	Financial assistance
Agricultural Conservation Program \$628.2 million	Prevent soil loss and water pollution and conserve water, forest, and wildlife	All states and territories	Up to 75% of total activity cost; maximum \$3,500 per person per year
Colorado River Basin Salinity Control Program \$46.9 million	Install conservation practices to reduce salinity of Colorado River	7 states	Up to 70% of total activity cost
Emergency Conservation Program \$134.9 million	Repair agricultural land damaged by natural disasters and conserve water during drought	All states and territories	Up to 64% of cost; maximum \$200,000 per person per disaster
Forestry Incentives Program \$44.4 million	Plant trees and improve timber stands to increase supplies from nonindustrial private forests	All states and Puerto Rico	Up to 65% of total activity cost; maximum \$10,000 per person per year
Great Plains Conservation Program \$91.5 million	Solve soil and water problems on farms and ranches in the Great Plains	556 counties in 10 states	Up to 80% of total activity cost; maximum \$35,000 per agreement
Rural Clean Water Program None	Control agricultural nonpoint source pollution	22 states	Up to 75% of total activity cost; maximum \$50,000 per person

Program, Amount ²¹	Purpose	Areas	Financial assistance
Small Watershed Program \$547.0 million	Support activities in watersheds under 25,000 acres to prevent flooding, reduce erosion, and improve water quality	37 states and Puerto Rico	Up to 50% of construction cost; maximum \$100,000 per person over life of program
Soil and Water Conservation Loan Program \$1.5 million	Provide loans to develop, conserve, and make proper use of farm and ranch lands	All states	Up to \$50,000, reimbursable within 40 years
Stewardship Incentive Program \$54.8 million	Enhance management of nonindustrial private forest lands to increase timber supply and improve wildlife habitat and recreation	All states and territories	Up to 75% of total activity cost; maximum \$10,000 per person per year
Water Quality Incentives Projects \$55.3 million	Support farm practices or systems to reduce agricultural water pollution	All states and territories	Payment of up to \$25 per acre (maximum \$3,500 per person per year) plus cost-sharing up to \$1,500 per person per contract
Conservation Reserve Program \$6,676.4 million	Conserve and improve soil and water resources by renting land to retire from production and to establish 10-year conservation cover	All states and territories	Up to 50% of cost of erosion control measures plus annual rents up to \$50,000 per person
Emergency Wetland Reserve Program \$39.2 million	Restore wetland functions on flooded cropland	8 states	75%-100% of restoration costs plus market value to buy easement

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Program, Amount ²¹	Purpose	Areas	Financial assistance
Farm Debt Cancellation-Conservation Easements Program None	Protect lands under federal farm loan by buying an easement	All states and territories	Full or partial debt cancellation (maximum 33% of principal for current borrowers)
Forest Legacy Program \$28.4 million	Protect environmentally important nonindustrial private forests	18 states and 1 territory	Market value to buy conservation easement
Integrated Farm Management Program Option None	Support use of resource-conserving cropping practices	All states and territories	Annual price support for acres planted to conserving uses
Water Bank Program \$45.2 million	Conserve water and protect and enhance migratory waterfowl habitat	13 states	Up to 75% of total activity cost; maximum \$3,500 per participant per year; annual rents
Wetlands Reserve Program \$206.3 million	Restore and protect agricultural wetlands	10 states	Market value easements; 50-75% of restoration costs
Programs Adopted Under 1996 Farm Bill			
Environmental Quality Incentive Program \$1,330 million	Promote environmental and conservation improvements on farmland	TBD	Cost-sharing and easement terms to be determined
Farmland Protection Program \$35 million	Protect prime and unique farmland	TBD	Conservation easements

Program, Amount ²¹	Purpose	Areas	Financial assistance
Conservation Farm Option \$197.5 million	Promote soil, water, wetlands, and habitat conservation measures	TBD	Payments
Wildlife Habitat Incentives Program \$50 million	Promote management practices to improve wildlife habitat	TBD	Cost-sharing

Sources: GAO (April 1995); USDA (April 1996).

Most of this subsection is devoted to USDA land conservation subsidy programs, including cross-compliance provisions linking farm program support benefits to environmental performance and new programs created under the 1996 Farm Bill. The subsection concludes with a discussion of selected state subsidy schemes, including purchasable development rights programs to prevent the conversion of agricultural lands to alternative uses.

7.4.1. Conservation Reserve Program

Established by the Food Security Act of 1985 (also known as the 1985 Farm Bill), the Conservation Reserve Program (CRP) seeks to protect soil and water resources by taking land out of cultivation. Participating farmers receive annual payments of up to \$50,000 per person to put land in the Conservation Reserve for 10 to 15 years. Applications to participate in this program must include conservation plans (usually requiring the planting of grass cover). The federal government pays not only annual rents so that the land is not cultivated but also half the cost of the erosion control plan measures.

Since landowners have offered more acres than the CRP can afford, they bid for enrollment. For the first nine signups (through August 1989), bids had to be at or below the "maximum acceptable rental rate" for a given area. Problems with this approach were that it did not actively target environmentally sensitive cropland and that farmers gradually increased their awareness of maximum rates and set their bids accordingly, often resulting in rental payments in excess of market value.²²

As a result of the 1990 Farm Bill, which shifted the emphasis of the CRP to water quality, the bidding system was changed beginning with the 10th signup in May 1991. Bids less than or equal to the market rental rate for comparable land in a given area are evaluated using an Environmental Benefits Index (EBI), which includes the following

seven factors: surface water quality improvement, ground water quality improvement, preservation of soil productivity, conservation compliance assistance, encouragement of tree planting, and whether the proposed parcel is in a Water Quality Initiative area or conservation priority area. The EBI is compared with the bid amount to decide whether to enroll the parcel.

In financial terms, the CRP is USDA's largest conservation program, accounting for about 77% of its conservation appropriations for FY 1992-95. As of August 1992, 36.4 million acres had been placed in the CRP, nearly 10% of total U.S. cropland estimated at 395 million acres. No funds were appropriated for enrollment for FY 1993-95. The first nine enrollments were mainly in the Great Plains and Mountains states, but the emphasis on water quality goals introduced by the 1990 Farm Bill led to increased concentrations in the Midwest and Great Lakes regions in subsequent enrollments. With 4.2 million acres, Texas had the most enrollment. As shown in Table 7-4, for the first 12 enrollments, annual CRP rental payments averaged \$50 per acre.²³

Table 7-4: CRP ACREAGE AND RENTAL PAYMENTS FOR FIRST 12 ENROLLMENTS

Region	Acres	Annual rental payments (millions)	Rental payments per acre
Appalachia	1,158,124	\$62.5	\$53.97
Corn Belt	5,603,333	\$416.1	\$74.26
Delta	1,248,403	\$55.3	\$44.31
Great Lakes	3,008,337	\$176.5	\$58.68
Mountain	6,687,264	\$265.3	\$39.67
Northeast	226,411	\$13.4	\$59.29
Northern Plains	9,664,110	\$444.5	\$46.00
Pacific	1,791,182	\$88.8	\$42.71
Southeast	1,692,580	\$72.3	\$42.71
Southern Plains	5,342,989	\$214.7	\$40.18
Total	36,422,733	\$1,809.4	\$49.69

Source: GAO (February 1995), p. 13.

In 1990, when 33.9 million acres were enrolled, USDA estimated the net social benefits

of CRP at \$4.2-\$9.0 billion over the life of the program. Table 7-5 shows the estimated amounts of different types of social costs and benefits.²⁴

Table 7-5: PROJECTED SOCIAL BENEFITS AND COSTS OF CRP
(in billions of dollars)

Benefit	Value
Increases in net farm income	\$2.1-\$6.3
Value of future timber	\$3.3
Preservation of soil productivity	\$0.6-\$1.7
Improved surface water quality	\$1.3-\$4.2
Lower damages due to windblown dust	\$0.3-\$0.9
Wildlife enhancements	\$1.9-\$3.1
Total benefits	\$9.5-\$19.5
Cost	
Higher consumer food costs	\$2.9-\$7.8
Vegetative cover on CRP land	\$2.4
USDA technical assistance	\$0.1
Total costs	\$5.4-\$10.3
Net benefit	\$4.2-\$9

Source: USDA (December 1994), pp. 180-1.

Statistics on the first nine enrollments indicate annual soil erosion reductions of 700,000 tons, an average of 19 tons per acre. This represents a 22% reduction in cropland erosion compared with prior conditions.

One criticism of the CRP is that it could be more cost-effective by concentrating enrollment on land that is more environmentally sensitive. By concentrating on enrolling buffer zones instead of entire fields, a GAO study claimed, only about 6 million acres would need to be enrolled to protect surface water, groundwater, air, and soil. However, wildlife habitat protection would require significantly more acreage.²⁵

The 1996 Farm Bill addressed this criticism in reauthorizing the CRP through 2002. While maintaining the maximum number of acres to be enrolled at 36.4 million, the new bill also allows contract holders to terminate contracts entered into prior to 1995, provided the contract has been in effect for at least 5 years and the land in question is not of high

environmental value. The USDA Secretary was given authority to agree to future early terminations. The possibility for such terminations is intended to give USDA the opportunity to refocus enrollment on land that is more environmentally sensitive.

7.4.2. Wetlands Reserve Program

Under the Wetlands Reserve Program, which was created by the 1990 Food, Agriculture, Conservation and Trade Act (i.e., the 1990 Farm Bill), farmed wetlands and agricultural land converted from wetlands as well as buffer zones and some riparian areas are eligible for 30-year or permanent easements. Participants in this program are required to implement conservation plans approved by the Natural Resources Conservation Service and the Fish and Wildlife Service. Agricultural activities on enrolled land must be compatible with wetlands protection. Participants receive a lump sum for permanent easements or ten equal payments for 30-year easements. Payment amounts are limited to the loss of market value of the land as a result of the easement. In addition to paying for easements, the government shares in the cost of approved conservation measures.

As shown in Table 7-6, the number of acres for which bids were made was roughly five times the acreage enrolled in WRP during the first enrollment. In 1994, WRP was expanded to several other states.²⁶

Table 7-6: WRP FIRST ENROLLMENT (1992)

State	Bid offers (thousand acres)	Enrolled (thousand acres)	Total cost (\$000)	Cost per acre (\$)
California	34.3	6.0	10,768	1,787
Iowa	27.9	5.1	5,951	1,168
Louisiana	69.9	14.1	9,882	702
Minnesota	13.1	0.7	764	1,082
Mississippi	65.0	14.9	10,764	723
Missouri	14.6	2.7	2,753	1,032
New York	0.5	0.1	212	2,934
North Carolina	15.3	4.7	3,675	780
Wisconsin	8.5	1.6	1,287	782
Total	249.1	49.9	46,057	923

Source: USDA (December 1994), p. 194.

The 1996 Farm Bill reauthorized WRP through 2002 while capping total enrollment at 975,000 acres. Beginning October 1996, land is to be 33% permanent easements, 33% 30-year easements or less, and 33% wetland restoration agreements with cost sharing. 75,000 acres of land in less than permanent easements must be placed in the program before additional permanent easements are placed. The Bill provides cost-sharing assistance to landowners of 75%-100% for permanent easements and 50%-75% for 30-year easements and restoration cost-share agreements.

7.4.3. Agricultural Conservation Program

Initiated in 1936, the Agricultural Conservation Program (ACP) offers cost-sharing and technical support to farmers who adopt approved land conservation practices. Up to \$3,500 is provided annually under 10-year agreements. As noted below, the ACP is one of several programs being replaced by the Environmental Quality Incentive Program under the terms of the 1996 Farm Bill.

One ACP activity, Integrated Crop Management (ICM), provides cost-sharing assistance of 75% (usually \$7-\$20 per acre depending on the type of field) for practices to increase the efficiency of fertilizer and pesticide use. An analysis of the first year of the program as implemented in selected areas showed that ICM resulted in a 16%-32% fall in nitrogen fertilizer application on crops such as corn, wheat, and cotton, but that use of other fertilizers and insecticides remained generally unaffected.²⁷

7.4.4. Compliance Provisions

Introduced in the 1985 Farm Bill, compliance provisions require farmers to implement approved conservation plans on highly erodible land and refrain from draining wetlands to be eligible for farm support programs such as price support loans, federal crop insurance, and disaster payments. Considering the large amounts of support at stake, compliance provisions are likely to have a strong incentive effect.

7.4.5. Highly Erodible Land Conservation Compliance and "Sodbuster"

Under the highly erodible land conservation compliance provision, farmers are required to develop and implement approved conservation plans for designated "highly erodible" land farmed between 1981 and 1985 to ensure support eligibility. The plans typically entail adjustments in farming practices and rotations and could include measures such as the maintenance of crop residues on fields in winter, contour ploughing, minimum tillage, and shelter belts. The sodbuster provision is similar except that it applies to highly erodible land not farmed between 1981 and 1985 and is more stringent in that it requires the adoption of a conservation system that reduces erosion to a level above which long-term soil productivity may be depleted.²⁸

This cross-compliance rule appears to have a strong incentive effect. Plan implementa-

tion costs are estimated at \$7-\$17 per acre depending on the region, whereas a loss in farm support benefits would cost farmers between \$37 and \$62 per acre.²⁹

As shown in table 7-7, the estimated net benefit of the conservation compliance provision varies substantially across regions. Air quality benefits in the table are limited to household wind damage. Although the estimates show costs exceeding benefits in the Northern Plains, the benefits might exceed costs if air quality benefits were more broadly defined.³⁰

Table 7-7: BENEFITS AND COSTS OF CONSERVATION COMPLIANCE

Region	Per-acre benefit from:			Per-acre cost to:		Net economic benefits	Benefit/cost ratio
	Water quality	Air quality	Productivity	Producers	Federal government		
Northeast	35.63	0	0.16	3.57	3.43	28.80	5.12
Lake States	21.99	0	0.12	0.32	3.43	18.37	5.90
Corn Belt	15.61	0	0.25	8.90	3.43	3.53	1.29
Northern Plains	3.47	3.00	0.19	3.35	3.43	-0.11	0.96
Appalachia	23.58	0	0.24	3.51	3.43	16.89	3.43
Southeast	25.63	0	0.12	8.18	3.43	14.15	2.22
Delta	35.50	0	0.12	1.97	3.43	30.22	6.60
Southern Plains	5.26	4.63	0.33	2.34	3.43	4.45	1.77
Mountain	5.10	4.01	0.15	0.20	3.43	5.63	2.55
Pacific	31.83	1.09	0.14	2.23	3.43	27.40	5.85
Entire US	13.81	1.93	0.21	3.78	3.43	8.74	2.21

Source: USDA (December 1994), p. 186.

7.4.6. Swampbuster Program

Under the swampbuster program, support program benefits are denied to farmers who plant crops on wetlands converted after 1985 or who drain or otherwise convert designated wetlands. Conversion is allowed if its impact on the hydrological and biological value of the wetland is limited or if the farmer restores wetlands of equivalent value.

The 1996 Farm Bill made several changes to swampbuster provisions which according

to USDA "will give farmers more flexibility in complying with wetland conservation requirements while protecting natural resources."³¹ The bill expands wetland mitigation areas and options, allowing mitigation through restoration, enhancement, or creation, provided that wetland functions and values are maintained and stipulating that conversion activities authorized by a Clean Water Act permit will be accepted for Farm Bill purposes if adequately mitigated. The bill also establishes a mitigation banking pilot program. (See Section 6 for information on mitigation banking.)

7.4.7. Acreage Reduction Program

Under the Acreage Reduction Program, farmers are required to set aside farmland to remain eligible for price supports. The amounts of land to be set aside depend on overall crop supplies. Although this program is intended more to limit crop supplies than to preserve farmland, it promotes land conservation.

Table 7-8 presents some of the effects of USDA conservation programs. The Water Quality Program activities consist mostly of educational and technical assistance but also include some financial assistance. Monetary values of some of these impacts have been estimated. For example, the benefits of salt reduction under the Colorado River Salinity Control Program have been estimated at \$61 annually per ton.³²

7.4.8. Subsidy Programs Created under 1996 Farm Bill³³

In addition to modifying several existing programs in ways that USDA believes will simplify them and enhance their efficiency and flexibility, the 1996 Farm Bill created a number of new programs. The largest of these (in funding) is the Environmental Quality Incentives Program. Others include the Farmland Protection Program, Conservation Farm Option, and Wildlife Habitat Incentives Program.

7.4.9. Environmental Quality Incentive Program

As shown in table 7-3, USDA has implemented a large number of conservation programs. A 1995 GAO study stressed the need to consolidate these programs, stating that "they frequently promote identical resource conservation purposes, use similar financial incentives, serve the same population, and finance the application of the same set of technical practices." The study asserted that program overlap made it more difficult for farmers to identify and apply for financial and technical assistance and increased the administrative burden on USDA.³⁴

Table 7-8: IMPACTS OF CONSERVATION PROGRAMS ON EROSION AND CHEMICAL USE, FY 1988-93³⁵

Impact and Program	1988	1989	1990	1991	1992	1993
Erosion reductions	Million tons					
Conservation Reserve Program	514	596	644	654	672	692
Conservation compliance	0	0	0	NA	236	458
Agricultural Conservation Program	40	34	33	34	30	29
Conservation Technical Assistance and Great Plains Conservation Program	463	353	353	282	298	321
Annual Acreage Reduction Program	107	62	55	60	39	46
	Million lbs.					
Nitrogen application reduced by Water Quality Program	NA	NA	NA	0.9	8.9	NA
Phosphorus application reduced by Water Quality Program	NA	NA	NA	1.7	38.5	NA
	1,000 lbs. active ingredient					
Pesticide load reduced by Water Quality Program	NA	NA	NA	8.1	5.9	NA
	1,000 tons					
Salt load reduced by Colorado River Salinity Control Program	62	75	92	105	127	163

Source: USDA (December 1994), p. 168

The Environmental Quality Incentive Program (EQIP) is intended to replace the Agricultural Conservation, Colorado River Basin Salinity Control, Water Quality Incentives, and Great Plains Conservation Programs, all of which are scheduled for phaseout by the end of 1996. EQIP will assist farmers and livestock producers with environmental and conservation improvements. Participating landowners will agree to five- to ten-year contracts with conservation plans and receive up to 75% cost-sharing assistance for structural conservation practices. Payments are limited to \$10,000 per person per year or \$50,000 for any multi-year agreement. USDA intends to select projects so as to maximize environmental benefits per dollar spent under the program.

EQIP has placed added emphasis on livestock as a pollution problem. Half of program funding is reserved for livestock-related conservation problems, and half for

other conservation problems. Levels of funding are \$130 million in FY 1996 and \$200 million annually from 1997 to 2002.

7.4.10. Farmland Protection Program

Under this \$35 million program, USDA will work with state and local governments to purchase conservation easements on 170,000 to 340,000 acres of farmland of special interest. To be included in this program, land must be subject to a pending offer from a state or local government for the purpose of protecting topsoil by limiting nonagricultural uses.

7.4.11. Conservation Farm Option

Under this pilot program for producers of cotton, rice, feed grains, and wheat, producers may consolidate their CRP, WRP, and EQIP payments into one annual payment in exchange for entering into 10-year contracts and implementing conservation plans addressing water, soil and related resources as well as wildlife habitat. The incentive effect of the possibility of consolidating payments is unknown. A total of \$197.5 million will be provided for this program through 2002.

7.4.12. Wildlife Habitat Incentives Program

This program is intended to offer cost-sharing assistance to landowners to plan and adopt approved management practices to ameliorate wildlife habitat. Total funding from FY 1996 to FY 2002 is \$50 million.

7.4.12.1. State Initiatives

In addition to the federal programs described above, various types of subsidies have been used to promote land preservation on the state level. A 1994 USDA report found that as of 1990, 25 states had cost-sharing programs, 6 offered tax credits, and 5 offered low-interest loans.³⁶

In Lake Okeechobee, Florida, phosphorus from dairy waste has posed a threat to water quality. The "Dairy Rule" that entered into effect in June 1987 required dairy farmers to use specified techniques to prevent barn wash water discharges. The Florida Department of Agriculture and Consumer Services (DACCS) provided cost share construction funds from the state legislature to facilitate implementation of this policy. Of the 49 dairy operations affected by the Dairy Rule, 18 chose to participate in a buyout program under which they received \$602 for every cow they permanently removed from their land. The buyout program took 14,039 cows out of production.³⁷

A survey of wildlife management programs in the 20-state region of the Northeast

found that 5 states had cost-sharing programs, 5 offered equipment loans, 4 offered property tax incentives, 1 offered state income tax benefits, and 8 had tie-in with federal programs. In Indiana, the Wildlife Habitat Cost-Share Project pays up to 90% of the cost of establishing permanent wildlife habitat, windbreaks, brushpiles, vegetation management, and wetland improvement. Property tax assessments are lowered for landowners who adopt measures to enhance or preserve existing wildlife habitat.³⁸

Minnesota has a property tax exemption for undisturbed wetlands and ungrazed prairie.³⁹ The State also has a Pheasant Habitat Improvement Program under which landowners can receive cost-sharing assistance of up to 75% and technical assistance in return for improvements such as food plots, nesting cover, and woody cover.⁴⁰ In Texas, the Galveston Bay Comprehensive Conservation and Management Plan approved by the EPA in April 1995 called for economic incentives, such as tax breaks, for private landowners. The tax incentives are intended to encourage owners to preserve wetlands.⁴¹

In November 1995, voters in Texas approved a constitutional amendment to allow open-space land used for wildlife management to be taxed in the same manner as open-space agricultural land: based on its productive capacity rather than its higher market value. The Sierra Club lauded the measure, which it said "will allow landowners to take lands out of traditional agricultural production without penalizing them for protecting their property for wildlife."⁴²

7.4.12.2. Purchasable Development Rights

A number of states (11 as of April 1996) and several counties and local governments have purchasable development rights (PDR) programs in place under which landowners are paid not to convert farmland to commercial or residential uses. (Such rights are also known as conservation easements.) As shown in table 7-9, such programs are especially common in the Northeast and have involved over 400,000 acres at a cost of almost \$730 million. In addition to food security and agricultural objectives, PDR programs have several environmental objectives, including maintenance of habitat and resting places for wildlife and the aesthetic value of open space. Among the advantages of PDRs are their voluntary nature that helps avoid legal conflicts that can arise from zoning laws and their low cost for state and local governments compared to outright land purchase. PDR program funding mechanisms vary from state to state and include general revenues, land transfer taxes, property taxes, and bonds. Criteria used to select land parcels to be purchased include cost, threat of conversion, and location. Many programs prefer to purchase development rights on parcels that are near each other. Another policy instrument to prevent excessive development, transferable development rights (TDRs), can be regarded as a trading system and is therefore discussed in Section VI.

Table 7-9: STATUS OF PDR PROGRAMS AS OF APRIL 1996⁴³

State	Year Started	No. of Farms	No. of acres	Funds spent (\$000)	Funds Available (\$000)
California*	1980	72	47,992	46,515	23,100
Connecticut	1978	164	25,042	73,430	8,800
Colorado*	1986	6	1,904	3,254	2,800
Delaware	1995	31	8,561	12,000	0
Maine	1990	1	307	380	0
Maryland	1977	809	117,319	125,099	8,100
Massachusetts	1977	398	35,907	86,109	6,000
Michigan	1993	2	79	709	10,000
New Hampshire	1979	57	9,148	no data	0
New Jersey	1981	189	27,924	88,463	107,000
New York*	1976	154	6,941	46,000	4,950
North Carolina*	1987	21	1,255	1,785	0
Pennsylvania	1989	596	74,500	148,000	31,000
Rhode Island	1982	30	2,428	14,000	0
Vermont	1987	140	45,511	26,304	2,000
Washington*	1979	187	12,600	58,000	1,500
Total			417,418	730,049	205,250

*Denotes county or other local programs

Source: American Farmland Trust.

7.5. CONSUMER PRODUCT WASTE MANAGEMENT

Consumer product waste management is one area where command-and-control measures may be less likely than incentives to protect the environment because it is difficult to monitor the behavior of millions of consumers. Bans on landfilling used motor oil or containers, for example, are hard to enforce. Consumers are more likely to respond to factors such as more convenient collection service (brought about by subsidies) or refunds.

Various types of subsidies, including grants, loans, payments, and tax incentives, have been used extensively in consumer product waste management. Also included in the following discussion are preferential procurement and recycled content policies, both of which encourage recycling by stimulating demand for recycled products. Most of these measures have been implemented primarily on the state and local levels.

The example of used tire management, as illustrated in Table 7-10, shows the variety of subsidy measures that have been adopted in waste management.

Table 7-10: SUBSIDIES FOR USED TIRE MANAGEMENT

Type of subsidy	Number of states
Tax benefits	13
Payments based on tires recycled	7
Public procurement	28
Grants and loans	34

Source: *Scrap Tire News*, January 1996, p. 18.

7.5.1. Advance Disposal Fee Systems

As noted in Section 4, advance disposal fees (ADFs) on consumer products generate revenues to subsidize the otherwise unprofitable activity of disposing of the products after their use. In Rhode Island, for example, fees on "hard-to-dispose material," such as motor oil, tires, antifreeze, and solvents, are used to fund centers to collect these products after their use as well as research and public education on the disposal and reuse of these products.

In Virginia, an ADF of \$0.50 per tire in effect since 1990 generates revenues for the State's Waste Tire Trust Fund. Annual ADF revenues are about \$2 million, and the Fund had a balance of \$7.6 million as of January 1996. The fund finances used tire disposal site cleanups, activities in several regions to manage the current flow of used tires, permitting and inspection, and subsidies of \$22.50 per ton for end users of tires.⁴⁴

(Info on VA program: www.deq.state.va.us/envprog/tires.html)

7.5.2. Deposit Handling Fees

In most states with mandatory bottle deposits, distributors are required to pay handling fees to retail outlets and other used bottle collection centers. In California and

Maine, for example, handling fees are 3¢ per bottle. Such handling fees have encouraged used bottle collection to the point that many redemption centers have been voluntarily created to earn profits. See Section 5 for details on deposit-refund systems in California, Maine, and other parts of the U.S. and Section 11 for information on such systems outside the U.S.

7.5.3. Recycling Loans and Grants

A total of 24 states have grant or loan programs to promote the recycling industry.⁴⁵ Under Washington's Model Litter Control and Recycling Act, grants are awarded to persons developing recycling programs. Under the Litter Control and Recycling Act, Rhode Island provides grants to communities and organizations for litter and recycling initiatives.⁴⁶

As shown in Table 7-11, Wisconsin offers both loans and grants to promote recycling. The largest program provides grants to municipalities and counties to fund various recycling activities. Recycling rebates are either general rebates offered for up to five years to offset the increased cost of making or processing recyclable materials generated in the state or property rebates covering 5-25% of the cost of qualified property. In 1993-94, 17 qualified property rebates worth \$1,136,805 and 10 general rebates worth \$4,599,334 were awarded.

Table 7-11: WISCONSIN RECYCLING FINANCIAL ASSISTANCE PROGRAMS
(in thousands of dollars)

Program	1994-95
Municipal and County Recycling Grants	\$29,200
Waste Reduction and Recycling Demonstration Grants	1,750
Recycling Loans	2,519
Minority Business Recycling Grants and Loans	400
Recycling Rebates	5,100
Recycling Market Development Board Assistance	2,892
Waste Tire Reimbursement Grants	750
Waste Tire Management or Recovery Grants	250
Total	\$42,861

Source: Bonderud and Shanovich, p. 11.

Under the Waste Tire Reimbursement Grant Program, Wisconsin businesses receive payments of \$20 per ton for using waste tires in any of the following ways: energy recovery, including the production of combustible by-products; road base in highway improvement projects; recycling to make a new product; and other uses approved by the Department of Natural Resources. Uses must be approved in advance. Businesses receive payments based on documented tire use over the course of a given calendar year. Expenditures for 1990-94 totalled approximately \$5.5 million.⁴⁷

As shown in Table 7-12, at least 16 states had loan funds for recycling businesses in 1995. In one of these states, Iowa, loans have included \$485,000 for a project to convert waste gypsum into new wallboard, \$145,000 to convert used electrical wire into cushion for the dairy cattle industry, and \$245,000 to manufacture rubber mats from used tires.⁴⁸

Table 7-12: STATE LOAN FUNDS FOR RECYCLING BUSINESSES

State	Maximum loan	Interest rate	Fund size	Funding source
California	\$1 million	5.8%	\$25 million by 1996	Landfill tipping fees
Colorado	\$150,000 initially	prime	\$1-1.5 million per year (total \$4 million)	\$1 tire fee
Florida	unknown	<prime	\$3.5 million	ADFs
Illinois	\$750,000	5%	\$1-3 million per year	Landfill tipping fees
Indiana	\$500,000	<prime	\$3-4 million per year	landfill tipping fees
Iowa	\$2 million	0%	\$4 million per year	landfill tipping fees
Kentucky	None for cities	3.4%	\$16 million initially, reduced to \$4 million	General revenues
Louisiana	\$600,000	unknown	\$2 million	Tire fees
Maine	\$100,000	4%-8%	About \$100,000 per year	Brown goods disposal fee
Michigan	\$500,000	0%	\$4 million	Landfill tipping fees

Minnesota	\$500,000	2% below prime	\$4 million	General revenues
Mississippi	\$200,000	2% below prime	unknown	unknown
New Jersey	\$500,000	3% below prime	\$21 million	landfill tipping fees
New York	\$500,000	<prime	\$5 million, \$100,000 remaining	Petroleum overcharge funds
Pennsylvania	\$300,000	3%	\$5 million	Landfill tipping fees
Vermont	TBD	TBD	TBD	TBD
Wisconsin	\$750,000	4%	\$5.6 million	Business tax

Sources: Trombly (June 1995), p. 38; Louisiana Department of Environmental Quality; California Environmental Protection Agency.

The California Integrated Waste Management Board offers loans to organizations located in the state's 40 Recycling Market Development Zones. Zones range in size from a portion of a city to areas encompassing several counties. Loans are repayable within 10 years with a 5.8% interest rate and can be used to cover up to 50% of the cost of a project, up to \$1 million. In the three years leading up to March 1996, 67 loans totaling \$28 million were approved, of which 42 totaling over \$16 million have closed. The California Environmental Protection Agency has stated that these 42 loans have diverted nearly 1.4 million tons of waste from landfills annually. Recent loans include \$1 million to finance the production of custom packaging out of shipping boxes and \$475,000 to finance equipment for producing fire logs out of paraffin-saturated cardboard from grocery stores and sawdust from a local sawmill.⁴⁹

(CA recycling loans: www.calepa.cahwnet.gov/epadocs/mar96.txt)

Louisiana's used tire subsidy program combines a loan program with rebate payments based on the number of tires recycled. Loans of up to \$600,000 are available for waste tire processing activities. Each loan is limited to 25% of the value of the processing facility and is repayable to the State, with interest, at a rate of \$0.15 per tire processed. The State also offers rebates of \$0.85 per tire processed.⁵⁰

(Louisiana tire program: www.deq.state.la.us/osec/n950124.htm)

7.5.4. Tax Incentives

28 states have offered tax incentives for recycling businesses. Idaho, for example, enacted a tax credit in 1994 pertaining to equipment for manufacturing postconsumer

paper.⁵¹ "An Act Concerning Solid Waste Management" in Kansas allows "up to \$100,000 of income tax deductions determined at a rate of 20% of purchase price of new equipment that uses recycled materials to produce products or energy and expands the taxpayer's ability to use recycled goods."⁵²

7.5.5. Preferential Procurement of Recycled Products

One type of policy measure that could be considered a subsidy is the preferential procurement of recycled products. By stimulating demand for recycled products, such policies are intended to promote recycling. This subsection considers only government as opposed to private procurement practices. Mandates governing private sector use of recycled materials are discussed in the next subsection.

Preferential procurement could take one of at least two forms. Price preferences refer to willingness to pay a higher price for recycled products. Set-asides and goals refer to rules or targets concerning the percentage of total product purchases that must be recycled products.

Paper is the product most commonly subject to recycled goods procurement policies. An executive order signed by President Clinton requiring 20% postconsumer content in federal paper purchasing took effect in January 1995. EPA required the authors of this report to print it on recycled paper. At least 50 cities and 26 states are now following the federal policy.⁵³

A 1993 survey conducted by the Northeast Maryland Waste Disposal Authority found that all fifty states and the District of Columbia favored recycled products, compared to only 13 states in 1986. In the 38 states (including DC) that had price preference policies, the preferences were usually 5% (15 states) or 10% (20 states). Oregon had a preference of 12%, and two other states had preferences between 5% and 10%. In 21 of these states, the preferences applied not only to paper but also to other recyclable products. Vermont used life-cycle costing in deciding on its purchases, buying recycled products "where the added cost of using waste materials rather than virgin materials is less than the cost avoided by not having (that waste) in the waste stream."

The same survey found that 30 states had set-asides or goals, mostly for paper. Iowa, Montana, and Nebraska had the most stringent set-asides. The first state had set-asides of 90% recycled printing and writing paper by January 1, 2000 and 100% recycled tissue products by January 1, 1992. Montana had a set-aside of 95% by 1996. Nebraska bought only recycled paper and was considering similar policies for plastic bags, motor oil, and carpet. North Carolina required the use of recycled paper for all reports, memoranda, and other documents unless written authorization was obtained from the head of the agency.

The 1993 survey also identified 186 local governments that favored recycled products, with some cities adopting price preferences as high as 20% and some having set-asides.

Newark, New Jersey required that its agencies use recycled product if available regardless of price.

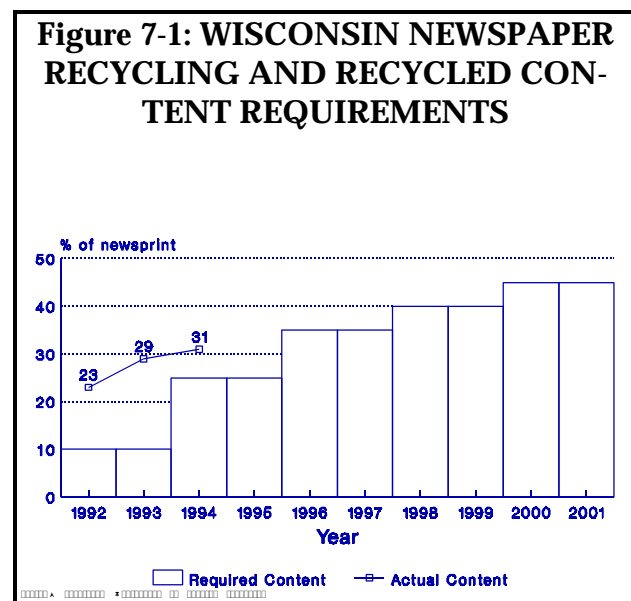
In Florida, for example, prison industries reprocess tires for sale to state, county, and local governments, and state grants to counties are used to purchase products from waste tires. The State Department of Transportation uses 10,000 tons of crumb rubber (made from two million waste tires) annually in rubber modified asphalt for roads. As a result of these initiatives and other market development activities, the percentage of tires disposed of in landfills has decreased since 1989.⁵⁴

7.5.6. Recycled Content Policies

To facilitate discussion, recycled content policies as defined here refer only to requirements that private organizations use a percentage of recycled products. Recycled content rules applied to government purchases, such as the aforementioned executive order on paper purchases, have been placed under the heading of public procurement policies and therefore discussed in the previous subsection.

Although there is a large element of command-and-control regulation in policies requiring a minimum recycled content for certain products or containers, such policies also create incentive effects by stimulating demand for recycled products. If manufacturers are forced to use a certain amount of recycled product, they or their suppliers are more likely to offer consumers better access to recycling services.

At least 13 states have passed laws and 15 states have created voluntary agreements for recycled content in newspapers. (The voluntary agreement in Massachusetts is described in Section 10 on voluntary programs.) A typical example is the 1990 Wisconsin Recycling Law, which requires newspapers to use recycled content newsprint. As shown in Figure 7-1, the minimum content requirements are rising from 10% in 1992 to 45% in 2000.⁵⁵ Publishers failing to meet these requirements are subject to fees based on the extent of non-compliance. In this respect, the law also could be considered a product charge on non-recycled newsprint. However, the Department of Natural Resources sometimes exempts publishers from fees if they can show that they could not obtain recycled newsprint at reasonable cost.



In 1992 and 1993, over 90% of publishers exceeded the minimum content requirement of 10%, and fewer than 1.5% failed to meet the requirement. In 1994, however, when the standard was increased to 25%, 14 publishers (18%) failed to meet the standard.⁵⁶ Five of these paid the fee.⁵⁷

7.6. NEW JERSEY INFORMATION AWARDS PROGRAM⁵⁸

Under this program, which became effective in 1990, citizens who report illegal dumping to environmental authorities receive the larger of 10% or \$250 of any civil penalty collected. Information leading to criminal convictions is rewarded by 50% of the collected penalty. The identity of those seeking rewards is protected.

Four other New Jersey statutes also contain provisions for monetary awards for reporters of violations:

1. Major Hazardous Waste Facilities Siting Act: 50% of any criminal penalty collected for the illegal treatment, storage, or disposal of hazardous waste;
2. Regional Low Level Radioactive Waste Disposal Facility Siting Commission: 50% of any penalty collected for the illegal treatment, storage, or disposal of low level radioactive waste;
3. The Comprehensive Regulated Medical Waste Management Act: 10% or \$250 of any civil or criminal penalty collected for violations.
4. Ocean Dumping Enforcement Act: 10% of any criminal penalty collected for violations.

This scheme differs from most subsidies and other incentive mechanisms featured in this report in that it seeks to affect behavior by rewarding enforcement. As of May 1996, three penalties had been collected as a result of information provided by citizens. One payment of \$50,000 and two of \$250, 10% of the penalties, were awarded in these three cases. Other rewards are pending.⁵⁹

A similar source of support for environmentalist organizations is attorney's fees awarded in successful citizen suits against environmental violators. As noted in Section 9, attorney's fees awards appear to create stronger incentives for private parties to initiate suits under California's Proposition 65 than the so-called "bounty hunter provision" under which the person who brought the suit can receive 25% of any fines.

Although other state and federal laws include the possibility of rewards for reporting potential environmental violations or initiating suits, it is beyond the scope of this report to determine their extent or their effects on environmental behavior.

7.7. ALTERNATIVE FUELS AND LOW-EMITTING VEHICLES

Various levels of government subsidize alternative fuels (AF) and alternative fuel vehicles (AFV) through measures such as tax incentives, rebates, and preferential procurement. The annual costs of federal programs alone have been estimated at more than \$1 billion.⁶⁰ Some of these subsidies result in environmental improvements, but as noted below, alternative fuels are also subsidized for other reasons.

7.7.1. Federal Subsidies

As shown in Table 7-13, the largest subsidy in the area of cleaner fuels is the exemption of ethanol blends from \$0.054 of the \$0.184 per gallon gasoline tax. Since ethanol blends of 10% receive this deduction, the exemption for ethanol is the equivalent of \$0.54 per gallon.

(API paper on this topic: www.api.org/cat/SEC12.htm#11)

Table 7-13: ALTERNATIVE FUEL AND ALTERNATIVE FUEL VEHICLE SUBSIDIES
(in millions of 1994 dollars)

Type of subsidy	1994	2000 (Projected)
Research & Development	348	350
Ethanol credit	573	914
Other direct subsidies	53	76
Preferential procurement	6	614
Tax credits for AFVs and equipment	20	100
RVP waiver for ethanol blends	95	120
Total	1,115	2,174

Source: Anderson (September 1994), pp. 18-21.

The "other direct subsidies" in Table 7-13 include preferential taxation of compressed natural gas (CNG) and payments to subsidize purchases of AFVs and AFV infrastructure. The CNG tax deduction is equivalent to \$0.128 per gallon. Although this subsidy is currently small compared to ethanol tax deductions, it is expected to increase in importance by the year 2000 as the number of CNG vehicles increases. The federal government also subsidizes the purchase of alternative fuel mass transit buses and school buses, state

AFV planning, and the purchase of alternative fuel vehicles by small businesses.

Tax credits for AFVs and refueling stations currently amount to about \$20 million annually but are predicted to rise to \$100 million annually by the year 2000. The federal government also subsidizes a number of research and development activities.

The RVP (Reid vapor pressure) waiver entitles ethanol blends to an extra pound of vapor pressure beyond the limits imposed on conventional gasoline. (Adding ethanol to gasoline raises vapor pressure about 1 lb. of RVP in a 10% ethanol blend. Without the waiver, ethanol blends would be disadvantaged in the marketplace.) This waiver is worth approximately \$0.09 per gallon of ethanol, based on additional costs incurred by refiners to produce a blend stock with lower vapor pressure.

Table 7-13 also shows that another type of subsidy, preferential procurement, is expected to rise significantly in value by the year 2000. This trend is due to the fact that many procurement requirements are only now entering into effect and are scheduled to become more stringent over time. Table 7-14 shows these requirements, many of which will eventually also be applied to private vehicle fleets.

The federal government also provides income tax deductions of \$2,000 to \$50,000 for clean-fuel vehicles. Electric vehicles purchases are eligible for 10% income tax credits up to \$4,000. The cost to the government of the electric vehicle credits has been estimated at \$65 million in 1995.⁶¹

7.7.2. State Subsidies

Besides the federal AFV purchasing requirements imposed on state governments shown in table 8, several states, including New York and Massachusetts, have their own vehicle purchasing requirements. In addition, most states offer tax benefits or grants for AF or purchases of AFVs.⁶²

(Site containing information on state subsidies:
www.ccities.doe.gov/documents/funding/toc.html)

In Connecticut, for example, vehicles powered by natural gas, propane, or electricity, vehicle conversion equipment, and AF refueling station equipment are exempt from the state's 6% sales and use taxes. In addition, businesses are entitled to 50% tax credits for investments in vehicle conversions and refueling stations. Companies that derive at least 75% of their income from alternative energy sources are exempt from income tax, and natural gas sales are exempt from gross earnings taxes of 4%-5%.⁶³

Table 7-14: ALTERNATIVE FUEL VEHICLE PROCUREMENT REQUIREMENTS⁶⁴
(percentage of new vehicles purchased that must be AFVs)

Model year	Federal	State	AF suppliers	Private Fleets
1993	5,000			
1994	7,500			
1995	10,000			
1996	25%	10%	30%	
1997	33%	15%	50%	
1998	50%	25%	70%	
1999	75%	50%	90%	
2000	75%	75%	90%	
2001	75%	75%	90%	
2002	75%	75%	90%	20%
2003	75%	75%	90%	40%
2004	75%	75%	90%	60%
2005	75%	75%	90%	70%
2006 and beyond	75%	75%	90%	70%

Source: Anderson (September 1994), p. 10.

The California Air Resources Board (CARB) requires that the seven largest vehicle manufacturers' sales in the state be at least 2% AFVs by 1998. The percentage will increase to 5% in 2001 and 10% in 2003. The direct incremental and infrastructure costs of this mandate have been projected at \$19.5 billion through 2010, which makes up almost 80% of the expected costs of all AF promotion activities.⁶⁵

A number of cities use AFVs in their mass transit systems. In Los Angeles, for example, the Metropolitan Transit Area board has adopted the policy that all future bus purchases will be AFVs.⁶⁶

As shown in Table 7-15, which focuses on the Ozone Transport Region consisting of 12 Mid-Atlantic and Northeastern states and the District of Columbia, state subsidies for AF and AFVs are expected to rise significantly over the next fifteen years.

Table 7-15: ANNUAL ALTERNATIVE FUEL AND ALTERNATIVE FUEL VEHICLE SUBSIDIES IN THE OZONE TRANSPORT REGION⁶⁷
(excluding federal mandates, in millions of dollars)

Type of subsidy	1995	2000	2005
AFV procurement requirements	0	153.3-930.5	719.0-5,875.5
State and local tax incentives	4.3-4.8	(44.8)-12.0	unknown
Other state and local incentives	2.9-10.5	0.0-4.0	unknown
Total	7.2-15.3	108.5-946.5	719.0-5,875.5

Source: Perkins (September 1995), p. 9.

(Perkins paper: www.api.org/cat/SEC12a.htm#52)

The incentive effect of some of the AF and AFV subsidies is likely to be significant. Preferential tax treatment has played a large role in the rise in ethanol production in recent years. A 1995 GAO report found that elimination of the excise tax reduction would result in a 50%-90% reduction in ethanol use.⁶⁸ The purchase of AFVs has also stimulated demand for methanol and CNG.

The environmental impact of such incentive effects is unclear. Some alternative fuels are definitely cleaner than gasoline. Ethanol, however, generates less carbon monoxide in winter but worsens ozone conditions in summer. Alternative fuels are promoted not just for environmental reasons but also because their use is thought to increase U.S. energy security and to provide a market for part of the country's large agricultural surpluses.

7.7.3. Car Buyback Schemes

Several private programs have been implemented to offer cash payments to motorists to turn in old, high-emitting automobiles. As noted in Section VI, the South Coast Air Quality Management District (SCAQMD) allows the generation of emission reduction credits for scrapping not only old vehicles but also lawnmowers, both of which are blamed for significant air pollution.

In 1990, Unocal Corporation purchased and scrapped 8,376 pre-1971 vehicles in Los Angeles at \$700 per vehicle. Since SCAQMD estimated at \$4,900 per ton the cost of combined NO_x and ROC reductions through scrapping of pre-1972 vehicles compared to \$10,000 to \$20,000 per ton for traditional control methods, this vehicle scrapping program appears to have been relatively cost-effective.⁶⁹

7.8. RENEWABLE ENERGY AND CONSERVATION

Renewable energy and conservation are subsidized by tax benefits. Renewable electricity generation earns income tax credits of 1.5¢ per kwh, adjusted for inflation. For 1995, the credit was 1.6¢ per kwh. It applies to closed-loop biomass and wind energy sources. The estimated cost of these credits to the government was approximately \$970 million in 1995.⁷⁰

Conservation subsidies paid by utilities are also partly or fully excluded from income tax. Since 1992, subsidies to residential consumers have been fully deductible, and 65% of subsidies to non-residential consumers have been deductible. The annual cost to the government of this exclusion has been estimated at roughly \$100.⁷¹

7.9. MUNICIPAL SEWAGE TREATMENT PLANT CONSTRUCTION

The federal government has subsidized the construction of municipal sewage treatment plants since the 1956 Water Pollution Control Act Amendments. The subsidies took the form of cost-sharing grants in which the federal government's contribution was limited to 55% in 1956, raised to 75% by the Federal Water Pollution Control Act of 1972, then decreased back to 55% by the 1981 Municipal Wastewater Treatment Construction Grant Amendments. The 1987 Water Quality Act (commonly referred to as the Clean Water Act) significantly reduced the amounts of funding available and provided for a transition from grants to loans.⁷²

Although the grants undoubtedly encouraged construction activities that increased public access to sewage treatment, they have been criticized for giving municipalities "only weak incentives to hold the line on capital costs by seeking cost-effective design and technologies or by matching more carefully the designed capacity of the plant to projected need." This effect was compounded by state grants covering part of the non-federal share that effectively lowered communities' share to 10-25% of costs.⁷³

Under the Clean Water Act, grants were phased out by 1991 and replaced by federal contributions to state-managed revolving loan funds in what is known as the Clean Water State Revolving Fund (SRF) program. SRFs in all fifty states and in Puerto Rico are capitalized by federal government grants (83%) and required state matching funds (17%). (States are required to provide 20% matching funds for all federal grants.) As shown in Figure 7-2, states have leveraged the federal grants as security for bonds to raise additional funds, bringing total SRF FY 1988-95 investment to approximately \$16 billion.⁷⁴ One study found that 21 states have used leveraging in this manner.⁷⁵ The SRF appropriation for 1996 is \$1.348 billion, of which \$50 million is set aside for small communities.⁷⁶

States are responsible for fund management. Interest rates vary from 0% to a market rate, the average being about 3%. Repayment periods are as long as 20 years, with

reimbursement beginning one year after project start-up.

Data collected by the State of Ohio indicate that as of June 30, 1995, the states collectively had lent \$14.6 billion, or 77%, of the \$18.9 billion available to them. The percentages lent varied significantly from state to state, with 8 states having lent over 90% of their funds, 11 less than 60%, and 3 less than 40%. A GAO study found that various obstacles had limited states' lending, including lack of state experience managing revolving loan funds. In addition, the requirement that loans be repaid has discouraged applications from some small communities with a limited number of ratepayers to support project costs. In at least two states, the possibility of obtaining grants from other federal programs appears to have discouraged SRF loan applications. Eight federal agencies manage 17 different programs that may be used by rural areas for construction, expansion, or repair of water and wastewater facilities. Some states report that larger communities with solid credit ratings may be able to borrow money at more favorable conditions from private sources than from the SRF.⁷⁷

Unlike the grant program it replaced, the SRF program funds a number of initiatives other than municipal wastewater treatment, including projects addressing stormwater, combined (sanitary and storm) sewer overflows, and agricultural runoff. About 150 loans worth roughly \$1 billion have financed combined sewer overflow control investments, and approximately 100 loans worth about \$100 million have financed agricultural and urban runoff control measures.

Although it is beyond the scope of this report to provide an evaluation of the grant and SRF programs, figure # shows that the population served by modern sewage treatment has increased significantly. EPA has stated that "the SRF is probably the most efficient program of its kind in the federal government."⁷⁸

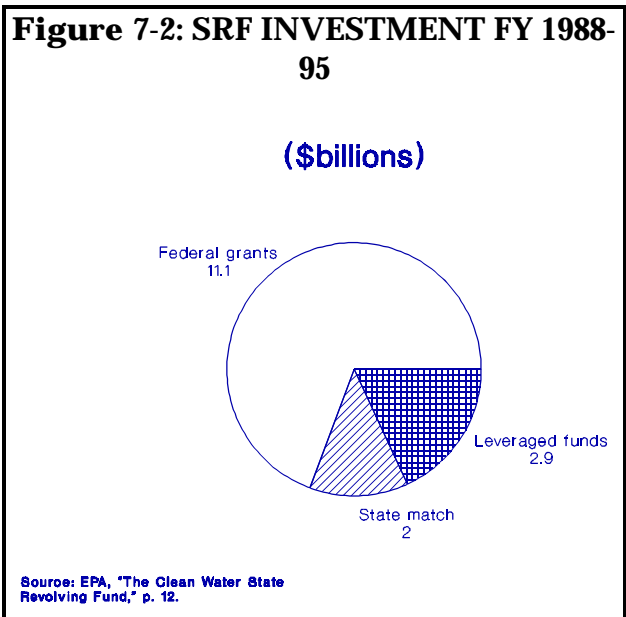
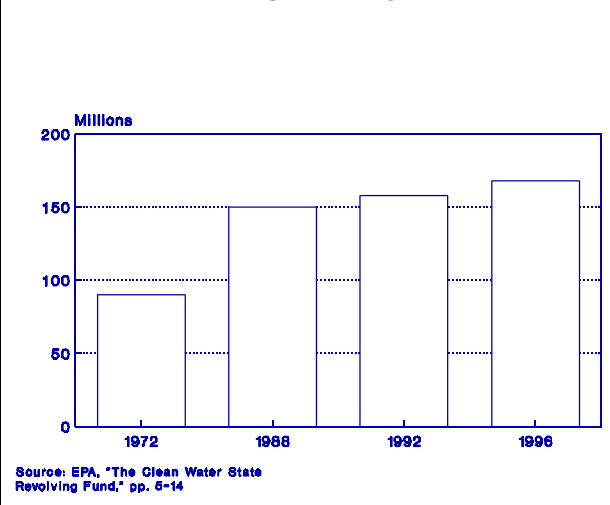


Figure 7-3: U.S. POPULATION SERVED BY MODERN SEWAGE TREATMENT FACILITIES



7.10. ENVIRONMENTALLY HARMFUL SUBSIDIES

Some subsidies are widely believed to have the unintended effect of encouraging environmentally harmful activities. In many cases, such subsidies were not designed as environmental policy instruments but have had adverse environmental consequences. This subsection briefly discusses a few examples of such subsidies.

7.10.1. Subsidies for Timber, Minerals, and Water Extraction

It has been widely asserted that timber, minerals, water, and public grazing land have been priced below their true social cost and in many cases even below their private cost. For all of these resources, user fees such as those described in Section IV have been assessed. However, to the extent that these fees are lower than the private cost of the resources or services on which they are charged, such resources and services are actually being subsidized to the detriment of environmental protection.

As mentioned in Section 4, for example, livestock grazing fees on federal lands imposed according to a formula established by the 1978 Public Rangelands Improvement Act (PRIA) are widely believed to be below market value. Although fees have been between \$1.35 and \$1.98 per animal unit month (AUM) since 1986, the Bureau of Land Management (BLM) and Forest Service estimated in 1992 that fair market values were \$4.75 per AUM for sheep and varied across regions from \$4.68 to \$10.26 per AUM for cattle and horses.⁷⁹ The costs of the grazing programs were \$2.40 to \$3.24 per AUM for the Forest Service and \$2.18 to \$3.21 per AUM for BLM. The low end of the cost range applies if only the funding directly linked to the livestock grazing program is considered, while the high end considers all range management funding.⁸⁰ Moreover, state and private fees are significantly higher than PRIA fees. Data from the National Agricultural Statistics Service indicate that in 1993, private fees in 17 western states averaged \$9.80 and state government fees average \$4.58. As noted in Section IV, the PRIA fee that year was \$1.86.⁸¹

(CRS Grazing fees primer: www.cnie.org/nle/ag-5.html)

(1995 Green Scissors on grazing fees: www.essential.org/orgs/FOE/scissors95/greenpart22.html)

Table 7-16 shows that estimated U.S. Bureau of Reclamation irrigation water subsidies in selected areas ranged from 57% to 97% of the Bureau's full water delivery cost. Excessive irrigation has been associated with a number of environmental problems, including water shortages and contamination of water with natural pollutants and agricultural inputs.

Table 7-16: U.S. BUREAU OF RECLAMATION WATER SUBSIDIES⁸²

Irrigation district	Irrigable acres	Subsidy (\$/acre)	Subsidy as % of full cost
Oroville-Tonasket	9,500	417	82
Black Canyon #2	53,200	762	89
East Columbia Basin	134,500	1,619	97
Cachuma Project	38,700	1,378	81
Truckee-Carson	73,000	931	83
Glen	152,300	101	91
San Luis Unit	571,900	1,422	85
Coachella Valley	78,500	1,000	70
Wellton-Mohawk	65,800	1,787	89
Imperial Valley	519,500	149	74
Moon Lake	75,300	58	57
Grand Valley	23,300	1,623	85
Elephant Butte	102,100	363	64
Lugert-Altus	47,100	675	90
Malta	42,400	812	92
Lower Yellowstone #1	34,500	507	73
Farwell	50,100	1,446	93
Goshen	52,500	416	74

Source: U.S. Dept. of Interior, as cited in Kanazawa, p. 114.

Historically, the mining (including oil and gas) and timber industries have benefitted from preferential taxation of their income. The impact of subsidizing mineral and timber production through the tax code is to favor virgin material use over secondary (recycled) materials. Two types of adverse environmental effects may result from such subsidies: destruction of natural areas as minerals and timber are harvested and excessive disposal of materials that otherwise might be recycled.

Percentage depletion allowances for petroleum and other minerals, for example, allow companies to write off as expenses arbitrary percentage reductions in mineral deposits resulting from their operations. The value of these allowances for oil and gas was

estimated at over \$2 billion annually from 1980 to 1982 but has since decreased to insignificant levels. One reason for the decrease is that only independent oil and gas companies (which account for about 30% of total U.S. oil and gas consumption) are now entitled to allowances. Moreover, only 25%-40% of these independent companies pay the standard (rather than alternative minimum) tax required for eligibility for allowance claims, and many of these are excluded from claims by other criteria under the tax code. Percentage depletion allowances for other minerals were worth over \$500 million annually for much of the early 1980s but fell in value after the 1986 tax reform. Oil, gas, and other mineral extraction companies also have the advantage of being able to expense (rather than capitalize) exploration and development costs.

Timber companies were formerly allowed to consider certain timber income as capital gains, which are subject to lower tax rates. This practice, worth about \$800 million a year in the first half of the 1980s, was eliminated by the 1986 tax reform. However, the elimination of this practice led timber companies to increase their use of other previously underused tax advantages: provisions allowing timber management and reforestation costs to be expensed rather than capitalized and tax credits and accelerated amortization for reforestation activities. Government construction of roads to facilitate harvesting is another form of subsidy for timber.⁸³

7.10.2. Agriculture

The effect of the sugar price support program on the Florida Everglades is frequently cited as an example of an environmentally harmful subsidy.⁸⁴ The federal government subsidizes sugar by guaranteeing a floor price of \$0.18 per pound, almost twice the world market price. The policy is further supported by tariffs of \$0.16 per pound on imported sugar in excess of quota levels. In 1992, this support program resulted in \$161.5 million in benefits for sugarcane farmers and \$107.7 million for processors.

The positive impact of the subsidy on sugarcane production increases the amount of water diverted to sugarcane fields as well as the amount of runoff. The diversion and the runoff, which is contaminated with pesticides and fertilizers that sugarcane growers apply to maximize production, damage the ecosystem of the Everglades.

Agricultural subsidies appear to be having similar adverse effects elsewhere in the U.S. A Competitive Enterprise Institute study found that the use of pesticides and fertilizers in several Midwestern states was higher on subsidized fields than elsewhere. The study concluded that "the complete elimination of subsidies could result in a 35 percent reduction in chemical use per acre and a 29 percent reduction in fertilizer use per acre." The USDA peanut program has also been accused of promoting environmental degradation. By requiring farmers to grow peanuts on the same land more often than they otherwise would to retain their sales quotas, critics charge, the program results in increased pesticide use to counteract the negative effects of lack of crop rotation.⁸⁵ Price supports for cotton have been accused of similar effects.⁸⁶

7.10.3. Mortgage Interest Tax Deduction

Although most interest deductions from personal income tax were eliminated by the 1986 Tax Reform Act, the deduction of mortgage interest remained in place. This deduction in effect subsidizes the construction and purchase of large homes. To the extent that larger homes use more building materials, take up more space, and require more energy, the deduction has a negative impact on the environment.

Endnotes for Section 7

1. Goldhammer et al. (1995), pp. 1-5.
2. *DEN*, March 24, 1995, p. B1-2.
3. Unless otherwise stated, all information on the Louisiana Scorecard system is provided by Environmental Law Institute (August 1993), pp. 118-21.
4. Joe Acton, Environmental Protection Agency, Office of Enforcement and Compliance Assurance, personal communication, 1996.
5. The Kodak and Honolulu SEPs are described in EPA (May 1995), p. 2-14.
6. With the exception of the estimate of the number and value of SEPs negotiated in 1995 and information on Kodak and Honolulu SEPs, the information on supplemental environmental projects comes from *Environment Reporter*, February 12, 1993, pp. 2692-4.
7. Whitehouse (1996), p. 74.
8. California Pollution Control Financing Authority, "Small Business Pollution Control Tax-Exempt Bond Financing Program."
9. James Goldstene, California Pollution Control Financing Authority, personal communication, June 1996.
10. California Pollution Control Financing Authority, "California Capital Access Program."
11. Goldstene, op cit.
12. *DEN*, May 26, 1995, p. E100.
13. *DEN*, July 27, 1995, p. A4. For more information on brownfields pilot projects, see EPA brownfields internet site: earth1.epa.gov/swerosps/bf/answers.htm#5.
14. *DEN*, January 16, 1996, p. A10.
15. Pennsylvania Department of Environmental Protection internet site, "Land Recycling Fact Sheet 8: Financial Assistance (Grants and Loans)." www.dep.state.pa.us/dep/deputate/airwaste/wm/landrecy/

facts/fs8.htm

16. Pennsylvania Department of Environmental Protection, "Pennsylvania's Land Recycling Program: Six-Month Progress Report," 1996. www.dep.state.pa.us/dep/deputate/airwaste/wm/landrecy/facts/6monrpt.htm

17. *DEN*, July 18, 1995, p. B2.

18. Environmental Law Institute (1995), p. 76.

19. *Environment Reporter*, May 17, 1996, p. 279.

20. Table adapted from GAO (April 1995), pp. 2-6. Information on programs created by 1996 Farm Bill provided by USDA (1996).

21. For all programs created before the 1996 Farm Bill, appropriations in this column are totals for FY1992-1995. For the four programs created by the 1996 Farm Bill (at the bottom of the table), appropriations are totals for FY1996-2002.

22. GAO (February 1995), p. 13.

23. *Ibid*, p. 16.

24. USDA (December 1994), pp. 180-1.

25. GAO (February 1995), p. 21.

26. USDA (December 1994), p. 194.

27. Osborn et al. (February 1994), p. 16.

28. USDA (December 1994), p. 182.

29. Rolfe (1993), p. 21. [internet:yvrww1.pwc.bc.doe.ca/ec/frap/fr-pof.html](http://internet.yvrww1.pwc.bc.doe.ca/ec/frap/fr-pof.html)

30. USDA (December 1994), p. 186.

31. USDA (April 1996).

32. USDA (December 1994), p. 166.

33. Information on programs created by the 1996 Farm Bill provided by USDA (April 1996) and by Tim Osborn, USDA Economic Research Service, personal communication, 1996.

34. GAO (April 1995), pp. 17-18.

35. *Ibid*, p. 168.

36. USDA (December 1994), p. 175.

37. Sidhu (November 1993), pp. 30-32. www.api.org/cat/SEC12.htm#13

38. Sendak (1995), p. 5.

39. *DEN*, July 14, 1995, pp. A3-4.

40. Sendak (1995), p. 5.
41. *DEN*, May 2, 1995, p. B1.
42. *DEN*, November 14, 1995, p. B5.
43. American Farmland Trust, "Purchase of Agricultural Conservation Easements: Status of Programs as of 4/12/96," unpublished table.
44. Virginia Department of Environmental Quality, "Waste Tire Program." www.deq.state.va.us/envprog/tires.html. The amount of the end user subsidy was provided by *Scrap Tire News Legislative Report*, p. 19.
45. Steuteville (1995), p. 36.
46. *Beverage World 1994-1995 Data Bank*, pp. 274-286.
47. Bonderud and Shanovich (1995), pp. 11-32.
48. Trombly (June 1995), pp. 35-38. The information on Louisiana was added to the table from Louisiana Department of Environmental Quality, "DEQ Announces Programs to Aid Tire Dealers and Tire Processors," January 25, 1995. California's interest rate was lowered from 6% to 5.8% on January 1, 1996.
49. "State Waste Board Lowers Interest Rate on Recycling Loan" (March 1996), *CAL/EPA Report*. www.calepa.cahwnet.gov/epadocs/mar96.txt
50. Louisiana Department of Environmental Quality (January 25, 1995), "DEQ Announces Programs to Aid Tire Dealers and Tire Processors," www.deq.state.la.us/osec/n950124.htm.
51. Steuteville (1995), p. 36.
52. *Beverage World 1994-1995 Databank*, pp. 277-8.
53. Steuteville (1995), p. 36.
54. Florida Department of Environmental Protection (1995), "Waste Tires in Florida: State of the State," and Bill Parker, Florida Department of Environmental Protection, personal communication, May 1996.
55. Wisconsin Department of Natural Resources, "Wisconsin's Newspaper Recycled Content Requirements: 1994 Update."
56. *Ibid.*
57. Julia Barrett, Wisconsin Department of Natural Resources, personal communication, May 1996.
58. Unless otherwise stated, all information on New Jersey's Information Awards Program is provided by Environmental Law Institute (August 1993).

59. Toni Hendricksen, New Jersey Department of Law and Public Safety, personal communication, May 1996.
60. Unless otherwise stated, all information on federal subsidies for alternative fuels and alternative fuel vehicles is provided by Anderson (September 1994). www.api.org/cat/SEC12.htm#11
61. Whitehouse (1996), p. 74.
62. For a description of state alternative fuel vehicle incentives, see "Clean Cities Guide to Alternative Fuel Vehicle Incentives & Laws," DOE internet site:www.ccities.doe.gov/documents/funding/toc.html
63. Perkins (September 1995), pp. 15-17. www.api.org/cat/SEC12a.htm#52
64. Information provided by Anderson (September 1994), p. 10. The requirements for private fleets could be introduced three years earlier if the Department of Energy determines that early introduction is necessary in order to attain alternative fuel replacement goals for 2000 and 2010.
65. Sierra Research (1995), pp. 4-6.
66. Ibid, pp. 33-34.
67. Source: Perkins (September 1995), p. 9. AFV requirements refer to requirements for zero-emission vehicles and ultra-low emissions vehicles. Negative numbers are in parentheses. The Ozone Transport Region is composed of Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia.
68. DEN, September 26, 1995, p. A4.
69. Environmental Law Institute (August 1993), pp. 5-7.
70. Information on the 1.6¢ per kwh renewable electricity credit was provided by DEN, March 21, 1995, p. A2.
71. Joe Mikrut, Joint Committee on Taxation, U.S. Congress, personal communication, July 1996.
72. Freeman (1990), pp. 100-1.
73. Ibid, p. 138.
74. EPA (January 1995).
75. Study by the Ohio State Water Development Authority cited in GAO (April 1996).
76. Rafael Stein, EPA, personal communication, May 1996.
77. Information in this paragraph provided by GAO (April 1996). This document also cited the Ohio State Water Development Authority survey. GAO reported that EPA did not compile nationwide SRF lending data.

78. EPA (January 1995).

79. For an explanation of the concept of animal unit month, see the discussion on grazing fees in Section IV.

80. Cody (1994). www.cnie.org/nle/ag-5.html

81. Green Scissors Campaign of Citizens United to Terminate Subsidies (January 1995). www.essential.org/orgs/FOE/scissors95/greenpart22.html.

82. Source: U.S. Department of Interior, *Acreage Limitation*, Interim Report, Government Printing Office, Washington, DC, March 1980, pp. 38-41 as cited in Kanazawa (1994), p. 114.

83. For more information on subsidies for timber, mining, energy, and water, see EPA (August 1994b), *Federal Disincentives: A Study of Federal Tax Subsidies and Other Programs Affecting Virgin Industries and Recycling*. For a list of taxes affecting timber, mining and energy, see Barthold (1994), p. 149.

84. See, for example, *DEN*, August 16, 1995 or Tolman (1995).

85. Tolman (1995).

86. *DEN*, February 16, 1996, p. A8.

8. LIABILITY APPROACHES

Two federal environmental statutes, CERCLA and OPA, provide liability for cleanup of releases of hazardous substances and petroleum, respectively, that pose a threat to human health and the environment. The statutes also provide for compensation for lost use of injured resources and for restoration of the environment. The incentive effect is clear, since environmental values in effect become part of the overall cost of doing business. Avoiding harm to the environment is good practice when it reduces the overall cost of doing business.

Several of the federal environmental statutes provide for civil and criminal liability for failure to comply with the law and implementing regulations. The incentive effect of this form of liability is to encourage individuals to comply with what are largely command and control regulations. Such an incentive is qualitatively different from the subject matter for this report: incentives that put a price on pollution that harms health, the environment, or natural resources. No study has attempted to address whether the existing level of penalties and enforcement produce the correct incentive effect (an optimal level of investment in pollution control). Excessive investment in pollution control is possible if entities seek to avoid penalties that are too harsh. Also possibility is too little effort at pollution if penalties are low and enforcement is lax.

Tort law is a fourth means through which liability encourages behavior that improves the state of the environment. Under tort law, individuals may seek compensation from polluters for harm to their property or person. The difficulty of proving harm caused by pollution, particularly chronic health effects, creates a severe barrier to such cases, meaning that many environmental costs will not be internalized through a liability mechanism. In fact, it is largely the failure of tort law to address many types of environmental harm that led to the passage of the principal environmental statutes.

8.1. LIABILITY FOR CLEANUP COSTS

Enacted by Congress during the change-over from a Democratic to a Republican administration in 1980, the Comprehensive Environmental Response, Liability, and Compensation Act (CERCLA) responded to an issue that had no precedent: the legacy of contaminated sites containing hazardous wastes. CERCLA established a trust fund (the Superfund) which is financed primarily by a tax on corporate income, crude oil and certain chemicals. EPA uses the fund to pay for cleanup and restoration activities at sites where no solvent responsible party can be identified or where immediate response is deemed necessary.

The most important feature of CERCLA centers on the cleanup of hazardous waste sites posing a threat to human health and the environment. CERCLA is unique among the principal environmental statutes in that it is backward looking, seeking to remedy problems stemming from past actions, rather than forward looking and trying to prevent damage from current or future activities. The incentive effects of CERCLA cleanup

responsibility must lie outside of the actual costs of cleanup, since the actions that precipitated the need for cleanup are historical not contemporary. But the mere prospect of CERCLA cleanup liability can affect current and future decisions regarding the disposal of hazardous wastes.

Section 107(a) of CERCLA provides for liability for anyone who is did something “from which there is a release (of a hazardous substance), or threatened release which causes the incurrence of response costs...” The courts have interpreted this to require strict, joint and several liability for parties deemed responsible for disposing of hazardous wastes that pose risks to human health and the environment. Joint and several liability means that if the government can identify just one party out of many that contributed wastes to a site, potentially the one party can be held responsible for all cleanup costs. In turn any potentially responsible parties identified by the government may seek to involve other potentially responsible parties. Joint and several liability appears to some to be a recipe to ensure litigation over who is responsible for what. Strict liability is a standard that holds parties responsible regardless of the circumstances of their action.

Private sector cleanup costs under CERCLA certainly have run into the tens of billions of dollars already and eventually may amount to several hundred billion dollars. As noted earlier, transactions costs associated with determining liability run high under this program.

8.2. LIABILITY FOR DAMAGE TO NATURAL RESOURCES

Until 1990, CERCLA included damage to natural resources resulting from oil spills within its scope.¹ Where responsible parties can be identified, CERCLA provides for compensation to the public by the responsible party for the loss of services from natural resources: so called "interim lost uses" while pollution and cleanup are ongoing, and residual damages if restoration is not complete. CERCLA designates federal and state authorities as trustees for natural resources. Trustees, in conjunction with the Justice Department pursue the natural resource damage assessments. At the federal level, the Department of the Interior is the trustee for freshwater anadromous fish, migratory birds and waterfowl, and endangered species. The National Oceanic and Atmospheric Administration is trustee for the coastal and marine environment, including commercial and recreational fisheries, marine mammals and anadromous fish in salt water.

The Oil Pollution Act of 1990 (OPA), enacted following the 1989 *Exxon Valdez* spill in Prince William Sound, created an independent statute separate from CERCLA for addressing damages resulting from oil spills. In Section 1006(e)(1) OPA directed the National Oceanic and Atmospheric Administration (NOAA), a part of the Department of Commerce, to promulgate regulations for assessing natural resource damages. On January 5, 1996 NOAA issued final regulations on natural resource damage assessment conducted under OPA.² The Department of the Interior is expected to issue NRDA regulations for assessments under CERCLA in 1997; those regulations are expected to

follow closely NOAA's approach. The goal of OPA and the NOAA regulations is to restore the natural resources and services to their baseline condition and to compensate for the interim lost use of natural resources and services through the restoration, rehabilitation or replacement through the acquisition of comparable resources and/or services. Damage assessments conducted by trustees in conformance with the NOAA regulations are accorded the status of a rebuttable presumption, which means that parties responsible for the damage bear the burden of showing that damage claims presented by trustees are inappropriate.

The two components of a natural resource damage assessment assure that the public is made whole following an oil spill. The resource and resource services are restored and the public is compensated for any lost use of the resource and resource services. In assuring that responsible parties will pay the amounts necessary to make the public whole, OPA gives potentially responsible parties a financial incentive not to spill oil.

By 1996, under provisions of CERCLA, OPA, and the Clean Water Act, federal agencies had settled more than 100 natural resource damage cases for a total of well over \$700 million. By that date state agencies acting as trustees also had settled several cases on their own for a total of at least another \$20 million. In comparison, cleanup settlements by that date under CERCLA alone totaled at least \$10 billion, or approximately 100 times the magnitude of the natural resource damage settlements. If no settlement agreement can be reached with the responsible party, OPA authorizes the trustee to file a civil action for the damages in federal district court or to seek funds from the Oil Spill Liability Trust Fund for the damages.

A number of large NRDA cases are still pending, at least three of which could amount to at least \$500 million. Several important cases involving the federal government as a responsible party also are outstanding. The following table summarizes the largest cases reported as settled (or partially settled) by 1996. Somewhat surprisingly, neither the *Exxon Valdez*, nor the Shell Oil Martinez, CA refinery spills are listed. NOAA does not list the \$620 million (present value) *Exxon Valdez* since the case was settled before the NOAA Damage Assessment Center was established. The Martinez case is not listed because it was brought by the State of California.

It is clear that liability for natural resources is having an effect on firm behavior. Shortly after the *Exxon Valdez* incident and about the same time as the passage of OPA, the petroleum industry announced the creation of the \$600 million, industry funded Marine Spill Response Corporation, an organization that would develop response capabilities specifically for large spills. Another sign of change is the care taken when tankers transit congested waterways and load or offload petroleum. In the Arthur Kill and Kill Van Kull of New York and New Jersey, tankers are now accompanied by tug escorts and offloading tankers are surrounded by booms.

One largely unresolved issue concerns spills and releases that are too small to justify an a natural resource damage assessment under either CERCLA or OPA. For example, the Coast Guard records approximately 10,000 oil spills per year, but fewer than 20 are followed by an assessment of natural resource damage. While the expected damage from many of the smaller spills may not justify the costs of a traditional damage assessment, some natural resource damage may nonetheless exist. Not charging for natural resource damage gives incorrect price signals to potential polluters (because it fails to internalize an externality). The petroleum industry has argued that the magnitude of these small assessments should closely match the actual damage done. The reason for this position probably has more to do with attempting to avoid formula-type assessments altogether than with a quarrel over the incentive effect of a formula. The correct economic incentive for a given spill is provided to potential polluters if the calculated value of the assessment equals the average harm done by such a spill.

Table 8-1: LARGEST FEDERAL NATURAL RESOURCE DAMAGE SETTLEMENTS

Case	Location	Dollar Amount
Southern California	Palos Verdes Shelf, CA	\$54,200,000
City of Seattle	Elliott Bay, WA	\$24,250,000
AVX	New Bedford, MA	\$21,127,000
Southern Pacific	Cantara Loop Derailment, CA	\$14,000,000
Simpson /Port of Tacoma	Commencement Bay, WA	\$13,035,000
Exxon Bayway	Arthur Kill, NY	\$11,113,000
Blackbird Mine	Salmon, ID	\$7,200,000
Apex Houston	San Francisco, CA	\$5,416,000
Tenyo Maru	Olympic Peninsula, WA	\$5,160,000
Eagle Pitcher Industries	Tri State Site: MO, KS, OK	\$4,734,000
Nautilus	Kill Van Kul, NY/NJ	\$3,300,000
Sharon Steel Corp.	Midvale Tailing Site, UT	\$2,600,000
Schlumberger	Crab Orchard Wildlife Refuge, IL	\$2,500,000
New York Trap Rock Co.	Portland Cement Site, UT	\$2,207,510
Presidente Rivera	Delaware River, PA	\$2,141,000
Greenhill	Timbalier Bay, LA	\$1,878,000
Elepis	Florida Keys NMS, FL	\$1,660,000
Charles George Trucking Co.	Charles George Reclamation Trust Landfill, IL	\$1,378,350

Sources: Department of Justice, NOAA³

At least four states, Alaska, Washington, Florida and Texas have responded by enacting compensation formulas or tables that assess charges based on the volume spilled, the nature of the receiving waters and other factors. In 1995 NOAA proposed a similar formula approach for small spills, but later withdrew the initiative for further study when it was pointed out that the proposed method resulted in unrealistically large assessments in some cases.

8.3. CIVIL AND CRIMINAL LIABILITY

Congress first decreed pollution of the environment to be a federal crime in the Refuse Act of 1899, which made it a misdemeanor to "throw, discharge, or deposit" into navigable waters of the United States refuse of any kind other than runoff from streets and discharge from sewers. Violators convicted of violating the act could be punished by fines not less than \$500 nor more than \$2,500, or by imprisonment for not less than 30 days nor more than one year. The court had the discretion to reward persons who provided information leading to conviction with one-half of the fine.

More recently, the 1970 Amendments to the Clean Air Act punished violations of the Act as a misdemeanor. The 1970 Amendments to the Federal Water Pollution Control Act established misdemeanor penalties for "negligent or willful" release of pollutants into navigable waters without a permit or in violation of a permit. The Resource Conservation and Recovery Act of 1976, as amended by the Solid Waste Disposal Act Amendments of 1980, provides felony penalties for treatment, storage or disposal of hazardous waste without a permit.

Continuing through the 1980s, Congress further refined the scope of environmental crimes, as well as the maximum fines and terms of imprisonment, in the Hazardous and Solid Waste Amendments of 1984, the Superfund Amendments and Reauthorization Act of 1986, and the Water Quality Act of 1990. In the Clean Air Act Amendments of 1990, Congress increased the penalty provisions to felonies.

By 1995 the Justice Department had indictments against 443 corporations and 1,068 individuals, and had recovered \$297 million in criminal penalties. Sentences for individuals totaled 561 person-years of prison for those convicted.⁴

State and local prosecutors also can pursue environmental crimes, since they are required to demonstrate such a capacity in order to obtain EPA authorization to administer locally programs of the Clean Air Act, the Clean Water Act and RCRA. While most states were not active in pursuit of environmental crimes, there are a number of important exceptions. New Jersey, Ohio, Pennsylvania and California are active in the prosecution of environmental crimes. Los Angeles maintains its own team of investigators and prosecutes cases.

An important sanction in addition to fines and sentences is mandatory "blacklisting" of contractors under the CAA and the CWA. Both statutes prohibit the federal government from entering into new contracts with or issuing grants to any organization convicted of environmental crimes under these laws. Federal agencies and all states also have the authority to temporarily disqualify contractors from new work pending receipt of further information, when a contractor is violates a permit and is suspected of harming the environment. Consequently, environmental violations can adversely affect a firm or individual even if no criminal conviction is imposed.

The remainder of this Section describes the principal civil and criminal penalties available under the nation's environmental laws.

8.3.1. RCRA

The purpose of RCRA is to establish a legal framework for a national system to oversee the management of hazardous waste. Congress included within the RCRA statute several enforcement authorities and penalty provisions. EPA relies on four types of compliance orders as its primary enforcement tools.

1. EPA may issue to facilities in violation of a regulatory requirement of Subtitle C an order requiring compliance within a set time frame, usually 30 days. Such EPA orders include penalties for any noncompliance period.
2. EPA may require monitoring, testing, analysis and reporting for facilities that present a substantial threat to human health or the environment.
3. EPA may issue corrective action orders requiring corrective action of other measures to interim status facilities (without full RCRA permits) to protect human health and the environment.
4. EPA may sue any person who contributes or contributed to solid waste management practices that pose an imminent and substantial threat to human health or the environment.

Beyond forcing compliance with RCRA and making owners of facilities take actions to protect public health and the environment, compliance orders may also assess a civil penalty for past and current violations. Civil penalties can be as large as \$25,000 per day for each RCRA violation. Criminal penalties of up to \$50,000 per day of violation or imprisonment for as long as five years may be meted out to any responsible person who knowingly:

transports hazardous waste to a facility not permitted under RCRA;

treats, stores, or disposes of hazardous waste without a permit;

makes a false statement or representation in an application, label, manifest, record or other document used for compliance with RCRA;

generates, treats, or disposes of hazardous waste and intentionally destroys records or other documents required for compliance with RCRA;

transports hazardous waste without a manifest; or

exports hazardous waste without the consent of or in violation of procedures of the receiving county.

8.3.2. CERCLA

Any person who releases hazardous substances, other than a federally-permitted release, from a vessel must notify the National Response Center. Failure to provide notification "immediately" or knowingly supplying false or misleading information may be imprisoned for not more than 3 years (5 years in the case of a subsequent conviction), and fined in accordance with title 18 of the Act.

Within 180 days of enactment of the Act, any person who owns, operates a hazardous waste storage facility, or who accepted hazardous wastes for transport and selected a treatment or disposal facility for the wastes, must notify the Administrator of EPA of the existence of such a facility and supply information concerning the wastes as requested by the Administrator. Parties subject to the above requirement must retain records concerning the identity, characteristics, origin and condition of the wastes for 50 years. Failure to comply with either provision can result upon conviction in a fine of not more than \$10,000 or imprisonment for not more than one year.

8.3.3. CWA

The EPA can begin civil actions against violators of CWA permits and seek appropriate relief including permanent or temporary injunctions. EPA can seek criminal penalties, including fines of not less than \$2,500 nor more than \$25,000 per day of violation or imprisonment for not more than one year, or both, for parties who negligently violate permit conditions and limitations. EPA may seek criminal penalties of not less than \$5,000 per day nor more than \$50,000 per day of violation or imprisonment of not more than three years, or both for parties who knowingly violate permit conditions and limitations. EPA may seek criminal penalties, including a fine of not more than \$250,000 or imprisonment of not more than 15 years, or both, for parties who violate permit conditions and limitations and knowingly place another person in danger of death or serious bodily injury. An organization found guilty of knowingly endangering another person may be subject to a fine of not more than \$1,000,000. After the first conviction, the fines and prison terms for subsequent convictions can be doubled.

The CWA also provides for civil penalties for other offenses, including making false statements on records, reports and other documents filed under the CWA, or wrongfully introducing pollutants into treatment works.

8.3.4. CAA

The Administrator of EPA can seek a permanent or temporary injunction and civil penalties of not more than \$25,000 per day for permit violations by major stationary sources (generally those emitting more than 100 tons per year of a regulated pollutant). Criminal penalties that include both fines and imprisonment for up to two years may be sought for any person who knowingly violates permit terms and conditions through such actions as making material false statements, or omitting material information. Convicted second-time violators can have their fines and sentences doubled. Negligent violators who place another human in imminent danger of death or serious bodily injury, upon conviction, are liable for fines and prison sentences of up to one year. Knowing violators who similarly endanger human health may, upon conviction, receive fines and sentences of up to 15 years or both. Finally, organizations can be liable for fines of up to \$1,000,000 for knowingly committing permit violations and similarly endangering human health.

8.4. TORT LIABILITY

Litigation concerning claims of personal injury from chronic exposures to toxic agents in the environment is a relatively recent phenomenon and largely is the domain of asbestos workers. Workplace-related injury claims are not within the scope of this paper. However, a few cases involve alleged exposure to toxic substances in ambient air and water supplies.

The law under which toxic tort actions are brought has undergone considerable evolution in recent years, brought about by several factors including the need to accommodate improved scientific information on the effects of human exposure to toxic agents, recognition of the potentially long latency periods between exposure and onset of a disease, and a growing desire by the courts to hold defendants to a standard of strict liability. Despite the evolution of tort law in favor of plaintiffs, relatively few cases have been filed that claim harm from pollution in the environment, and of these cases very few involving health effects have been decided in favor of plaintiffs.

The statute of limitations is an important barrier to litigation in a few states, but most states have struck down this once-important obstacle by allowing plaintiffs one to three years after the discovery of an injury to file a case rather than starting the clock with the date of initial exposure.

A difficult obstacle to plaintiffs in many situations of environmental harm is identifying the party responsible for the harm. Identifying the source of contamination in well water would be a challenge for most households. Even if the contamination could be

traced to a waste disposal facility, it might be very hard to identify whose wastes caused the contamination. For toxic pollutants in the air, identifying responsible parties is even more difficult.

Demonstrating causation represents a major challenge, since most diseases that have been linked to toxic substance exposure have multiple causes. Tort law generally requires that plaintiffs demonstrate that the harm they experienced was "more likely than not" caused by the defendant. Courts generally interpret this to mean that the probability the defendant caused the harm was at least 50%. Imagine a situation in which a polluter increased the risk of cancer in a nearby residential area by 20%. Rather than 100 people dying of cancer each year, 120 die. None of the 120 cases would be compensable under the "more likely than not" criterion. Two other things should be pointed out: (1) statistical data of this nature are not likely to be accepted by courts, no matter what the standard of proof, and (2) epidemiology is limited in its ability to detect elevated incidence of a disease, the smallest detectable excess incidence being on the order of 30%.

In sum, the legal norms under which tort actions for harms caused by exposure to pollution are such that few cases can satisfy the burdens of identifying the responsible party and proving causation.

Endnotes for Section 8

1. A good background source is: Ward, Kevin and John Duffield, 1992. *Natural Resource Damages: Law and Economics*, John Wiley & Sons, Inc.
2. Natural Resource Damage Assessments: Final Rule, 61 *FR* 440-510, January 5, 1996.
3. Department of Justice data cited in "Status of Natural Resource Damage Claims," testimony of Peter F. Guerrero, US General Accounting Office, before the Subcommittee on Commerce, Trade, and Hazardous Materials, Committee on Commerce, House of Representatives, June 20, 1995; and NOAA, "The Damage Assessment and Restoration Program," 1996.
4. Cooney, John F. et al., 1996 "Criminal Enforcement of Environmental Laws," in *Environmental Crimes Deskbook*, Washington, D.C., Environmental Law Institute.

9. INFORMATION APPROACHES

9.1. INTRODUCTION

For the purposes of this Section, information approaches to environmental protection may be defined as policy instruments that attempt to improve companies' environmental behavior through the collection and dissemination of information on the environmental consequences of their products and activities. They differ from command and control regulation in that they entail no requirements other than reporting, but the information reported could have negative or positive repercussions for the firm. If information on environmental performance is readily available, companies with poor performance could risk losing customers (and perhaps financing, labor, and other inputs) at the expense of companies with better environmental performance. Negative information could also be used in citizen suits against polluters. Information approaches could also help polluters see the impacts of their pollution on the environment and their profitability and develop appropriate abatement methods.

In assessing information approaches, one should bear in mind that having an incentive effect is not their only objective. The Toxics Release Inventory and other mechanisms discussed below are also intended to provide information to regulators, scholars, and others interested in pollution.

Information approaches have been used in environmental protection on both the state and federal levels. This Section begins with a discussion of the federal Emergency Planning and Community Right-to-Know Act (EPCRA) and two similar state programs. It then discusses California's Proposition 65 and air toxics release reporting requirements, environmental impact assessment reporting requirements, product labeling, environmental performance awards, Securities and Exchange Commission environmental reporting requirements, and radon and lead paint disclosure requirements. Information approaches used outside the U.S. are discussed in Section 11.

9.2. EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT (EPCRA)

Enacted in 1986 as Title III of the Superfund Amendments and Reauthorization Act (SARA), EPCRA requires emergency planning and disclosure of information on releases and transfers to disposal facilities of hazardous chemicals. Section 313 of EPCRA requires certain businesses to report each year on the amounts of toxic chemicals that their facilities release into the environment and transfer to disposal facilities.¹ As a result of the 1990 Pollution Prevention Act, reporting requirements were expanded beginning in 1991 to include source reduction and recycling information. Data for a given year normally must be submitted by July 1 of the following year, but the deadline for 1995 data was extended to August 1, 1996. EPA then compiles the information and makes it available to the public as the Toxics Release Inventory (TRI).

TRI reporting is required of all manufacturing facilities with ten or more employees in the Standard Industrial Classification (SIC) codes 20 through 39 that manufacture, process, or otherwise use one or more of the listed chemicals above certain threshold amounts. Thresholds are 25,000 pounds per year for manufacturing and processing and 10,000 pounds per year for otherwise using. Table 1 shows which industries are included in these codes. Federal facilities were also required to submit their first TRI reports by July 1, 1995 for the 1994 calendar year.

The number of listed chemicals was originally set at 320 but has since been increased. (A few chemicals have also been deleted from the list.) The most significant expansion took place in 1994, when EPA added 286 new chemicals to the list effective for the 1995 calendar year, bringing the number to 654.² Individuals and organizations can petition EPA to add or remove chemicals from the list.

Also in 1994, EPA streamlined reporting requirements for small businesses. Facilities that have a total annual reportable amount of 500 pounds or less of a TRI chemical, and that manufacture, process, or use 1 million pounds or less of a TRI chemical can now submit a shorter, annual certification statement in lieu of the longer Form R. These streamlined requirements became effective for the 1995 calendar year. "EPA believes that this rule strikes a positive balance between maintaining the community's right-to-know about toxic chemical releases, and the economic costs (both to EPA and industry) of collecting the information."³ EPA estimates that the streamlining will result in annual cost savings of about \$17.3 million for industry and \$700 thousand for EPA.⁴

After expanding the number of listed chemicals in what it referred to as phase 1 expansion, EPA turned to phase 2, intended to expand TRI requirements to other industries that have significant releases of listed chemicals and which are related to facilities currently subject to reporting. The proposed expansion would extend reporting requirements to the following seven industries: metal mining, coal mining, electric utilities, commercial hazardous waste treatment, petroleum bulk terminals, chemical wholesalers, and solvent recovery services.⁵ The expansion is not expected before 1998.

A third phase will focus on expanding the types of data to be collected for the TRI. New data could include chemical use and materials accounting information. This third phase is intended to provide more information on topics such as the results of companies' source reduction efforts and the amounts of chemicals in companies' finished products.

EPA has sought to make TRI information available to industry, environmental groups, and the general public so that they can know about facilities' toxic releases and transfers off-site. This information is available via several media, including printed reports, CD-ROM, and Internet.

(EPA TRI data: www.epa.gov/docs/TRI_94)

The emergency planning component of EPCRA calls for the creation of state and local emergency response bodies to plan for toxic releases. It also requires facilities to inform these bodies of the existence of certain hazardous substances on their premises, give immediate notice of accidental releases, and develop response plans to be implemented in the event of such accidents. Information provided by facilities is available to the public.

9.2.1. Trends in TRI Data

As shown in Table 9-1, reported TRI releases have decreased 44.1% since 1988. Decreases have been reported in most industry SIC codes.

Although the data in Table 9-1 suggest significant reductions in toxic releases, there are several reasons why they may not be equal to actual decreases in releases. EPA points out that TRI increases and decreases can be "real changes" or "paper changes."⁶ The latter result from errors, changes in facilities' estimation or calculation techniques, changes in reporting guidance and facilities' interpretation of that guidance, and facilities' use of exemptions. Companies generally determine their TRI release amounts through estimation rather than monitoring. EPA guidance has not been issued for all aspects of TRI reporting, and companies can sometimes lower reported releases by using different estimation techniques.

EPA says that estimation errors are more likely for releases such as fugitive air emissions and complex wastewater for which little monitoring data are available. However, EPA audits have found companies' estimation techniques to be reasonably accurate. An audit of 1987 data at selected facilities led to the conclusion that releases had been under-reported by 2%, but a 1988 audit found that companies reported about the same amount as the auditor's own estimate.⁷

Another potential problem is that most chemicals have not been subject to TRI requirements. A 1994 GAO study stated that over 70,000 chemicals are used commercially in the United States, of which only 320 had been included in the TRI. "Consequently," the study added, "the companies may maintain or even increase their usage of toxic chemicals while concurrently reducing the chemicals that are reported to EPA."⁸ The original list focused on the most important toxics, and, as noted above, EPA included another 286 chemicals in TRI requirements effective 1995. However, some highly toxic chemicals have not been included because they are generated in amounts that are too small to meet criteria for inclusion.

In addition, a number of small sources in SIC codes 20-39 and all sources outside that code range are currently excluded from the TRI. It is not known what percentage of releases are currently exempt from reporting. As noted above, however, EPA intends to include other SIC codes in the system.

Table 9-1: TRI RELEASES BY INDUSTRY⁹
(in millions of pounds)

SIC	Industry	1988	1992	1993	1994	% Change 88-94
20	Food	9.1	11.9	12.0	10.3	13.7
21	Tobacco	1.2	0.6	0.6	1.0	-22.1
22	Textiles	34.3	19.1	17.6	15.9	-53.6
23	Apparel	0.9	1.3	1.0	1.3	42.9
24	Lumber	31.1	30.0	29.8	31.7	2.0
25	Furniture	61.4	53.2	54.0	50.6	-17.6
26	Paper	227.7	199.1	179.8	218.6	-4.0
27	Printing	60.7	40.4	35.9	34.2	-43.7
28	Chemicals	1322.8	991.3	874.4	700.7	-47.0
29	Petroleum	67.7	61.7	50.9	43.8	-35.3
30	Plastics	146.6	121.1	111.0	111.6	-23.9
31	Leather	11.9	7.2	4.4	3.6	-69.9
32	Stone/Clay/Glass	27.1	14.3	14.3	12.4	-54.3
33	Primary Metals	496.2	341.2	304.6	293.8	-40.8
34	Fabr. Metals	131.8	100.6	88.6	86.1	-34.7
35	Machinery	59.6	33.0	26.5	23.5	-60.6
36	Electrical	115.8	47.1	32.9	29.0	-75.0
37	Transportation equipment	191.0	125.3	123.8	119.7	-37.3
38	Measure., photo.	49.9	29.1	22.5	15.7	-68.5
39	Miscellaneous	28.6	16.9	15.2	13.7	-52.0
NA	Multiple codes 20-39	446.6	191.8	137.2	142.9	-68.0
NA	Code not reported or not in 20-39 range	14.0	13.6	20.1	16.9	21.2
	Total	3536.1	2449.6	2157.4	1976.9	-44.1

Source: 1994 Toxics Release Inventory: Public Data Release, p. 195.

Releases are not weighted according to toxicity or the dangers posed by various methods of disposing of various types of chemicals and do not indicate exposure or potential effects on human health and the environment. Moreover, the TRI does not include information on the quantity of toxic chemicals in products leaving the facility. Such products themselves can eventually be released into the environment.

Although a reduction in releases is generally desirable, another important question is how the reduction is achieved. Methods include controlled disposal, recycling, conversion to energy, and source reduction. The 1990 Pollution Prevention Act set source reduction as the preferred method of reducing releases, but the transfer data in table 9-2 show no clear trend toward this method. Since recycling and conversion to energy were not reported as transfers until 1991 (as required under the 1990 Pollution Prevention Act), 1988 total transfers are difficult to compare with total transfers in the period 1992-1994. Excluding these two types of transfers, reported transfers have decreased significantly since 1988 but show no clear trend since 1992. Total releases and transfers decreased significantly from 1992 to 1993 but increased slightly from 1993 to 1994. The decrease in releases from 1993 to 1994 coincided with an increase in transfers.

Table 9-2: TRI WASTE TRANSFERS¹⁰
(in millions of pounds)

Transfers	1988	1992	1993	1994	% Change 1988-94
Recycling	NA	2,609	2,057	2,234	NA
Energy	NA	431	447	463	NA
Treatment	396	257	254	290	-26.8
POTWs	297	226	186	180	-39.3
Disposal	437	217	267	280	-35.9
Other off-site	42	13	2	4	NA
Total transfers	1,173	3,752	3,213	3,451	NA
Total releases	3,536	2,450	2,157	1,977	-44.1
Total releases and transfers	4,709	6,202	5,370	5,428	NA

Source: 1994 Toxics Release Inventory, p. 171.

The assessment of source reduction achievements is complicated by the lack of TRI data on quantities of waste decreased by source reduction measures. Only the practices

used to reduce waste and not their results are included in the TRI. Changes in waste generation reported in the TRI could be due to factors other than source reduction, including estimation errors or changes in production levels of specific products. Lack of information on source reduction and on chemicals in facilities' products is one of the main issues surrounding the phase III expansion of the TRI noted above.

As discussed in Section 10, the trend of decreases in releases and transfers is more pronounced under the voluntary 33/50 program. Total releases and transfers under this voluntary program have decreased every year from 1988 to 1994, with a total reduction of 51% during that period.

9.2.2. Incentive Effect of the TRI

The incentive effect of the TRI on polluters cannot be assessed solely on the basis of reported decreases in releases. A number of factors, including command-and-control regulations and other economic incentive mechanisms discussed in this report, have affected releases. Pollution prevention is also influenced by a number of factors unrelated to the TRI.

Nonetheless, the TRI is widely believed to have a significant impact on polluters. EPA has called it "one of the most powerful tools in this country for environmental protection"¹¹ and "one of the most successful policy instruments ever created for improving environmental performance."¹² Vice-President Gore called the annual TRI publication "the single most effective common-sense tool" to promote environmental protection.¹³ Shortly after the first TRI was released in 1989, citizen groups placed a full-page advertisement in the *New York Times* listing "the corporate top ten" land, water, and air polluters. Several of these polluters subsequently promised the EPA that they would improve their environmental performance, effectively beginning the 33/50 voluntary releases reduction program described in the next Section.¹⁴ Monsanto, for example, promised 90% reductions of 1987 air emission levels by 1992.¹⁵ AT&T said it would halt all TRI air emissions by the end of the century.¹⁶ Dow said it planned to reduce overall emissions by 50% by 1995, and Dupont promised to cut air emissions by 60% by 1993 and cancer-causing components by 90% by the year 2000. In Minnesota, public outcry over revelations that an electronic circuits manufacturer was emitting methylene chloride led the facility to promise 90% reductions in emissions by 1993.¹⁷ After 1987 TRI data found an IBM facility in California to be the state's largest emitter of CFCs, a public interest group organized a campaign and IBM subsequently promised to end the use of CFCs at the plant by 1993.¹⁸

TRI data also appear to influence investors. Some of the investor interest may be attributed not so much to socially responsible investing but rather to the belief that companies with relatively high emissions might face mounting environmental costs in the future.

Hamilton (1995) found that companies' 1988 TRI performance (as reported in June 1989) was of interest to journalists and investors. The higher a firm's TRI pollution figures, the study found, the more likely journalists were to write about the firm's toxic releases, especially for firms previously less associated with pollution. Those companies that reported TRI releases underperformed the market during the five days after the data were released. The more chemicals for which a company submitted data, the greater its under-performance. The under-performance was less significant, however, for companies previously associated with pollution.

The Investor Responsibility Research Center has analyzed TRI data to provide clients with environmental profiles of companies. The Clean Yield investment portfolio management group compares companies' TRI data with industry-wide averages of releases per unit of sales. *Fortune* magazine has used TRI data in its "green index" of American manufacturers, assigning scores of zero to 10 in 20 performance categories, including toxic emissions per unit of sales.¹⁹

Although EPCRA's emergency planning element briefly described above has received less attention than the TRI as an incentive mechanism, it could also have a significant effect on polluters' behavior. Firms might reduce the amounts of hazardous substances on their premises if forced to disclose these amounts to local emergency response bodies and (indirectly) to the public. They might also manage hazardous substances more safely if required to plan for and give immediate notice of accidental releases.

9.3. STATE EPCRA PROGRAMS

Several states have toxic release reporting programs similar to the federal EPCRA but with different reporting requirements. The requirements may cover additional chemicals, industries, or reporting elements; toxics use; and pollution prevention plans.²⁰

The programs in Massachusetts and New Jersey, for example, differ from their federal counterpart in that they require companies to use materials accounting to plan pollution prevention activities, report their goals and progress on pollution prevention, and examine whether inputs and outputs balance.²¹

One advantage of such requirements is that they offer more information on toxics use and wastes that could be of interest to the companies themselves, their regulators, and the general public. One disadvantage of these requirements appears to be the potential administrative burden they impose on polluters and regulators. If the state attempts to lessen its burden by taxing the polluters, it adds to the polluters' burden.

EPA has studied these two programs in the context of its phase III expansion to obtain insight on how the federal EPCRA might be improved.

9.3.1. Massachusetts Toxics Use Reduction Act

Enacted in 1989, the Massachusetts TURA requires large-quantity toxic material users, including those in several SIC codes not covered by the federal EPCRA, to submit an annual Toxic Use Report to the State Department of Environmental Protection and to develop toxic chemical use and waste reduction plans. Subject facilities must report annually on their inputs and outputs of materials and their waste generation and management methods.

For every production unit, facilities must also report on their use of chemicals and on use reduction techniques (within range codes to protect confidential business information) and indicate a Byproduct Reduction Index (BRI) and an Emission Reduction Index (ERI). ("Byproduct" can be considered "waste" in this context, although it may be reusable.) These two indices are determined in the following manner:

$BRI = (A-B) \times 100$ and $ERI = (C-D) \times 100$, where

- A = Byproduct quantity in base year divided by the number of units of product produced in base year.
- B = Byproduct quantity in reporting year divided by the number of units of product produced in reporting year.
- C = Emissions quantity in base year divided by the number of units of product produced in base year.
- D = Emissions quantity in reporting year divided by number of units of product in reporting year.

Additional data must be reported every two years on actual and projected changes in chemical use and wastes compared to planned and base year amounts.

Summaries of the chemical use and waste reduction plans must also be submitted biennially, but the detailed plans remain at the facilities to ensure confidentiality. These plans must be endorsed by certified Toxics Use Reduction Planners.

TURA also created two agencies to provide technical assistance to toxics users and conduct training and research on TURA and toxic use reduction techniques. The operations of these agencies and other program costs are covered by toxics use fees that depend on the number of employees at a facility and the number of chemicals it uses. These fees are limited to \$31,450 per facility annually and are not closely linked to the quantities or toxicities of chemicals used. Annual revenues amount to about \$5 million.

TURA also contains provisions for citizen involvement. Residents may assist in monitoring and access the TURA information on toxics use reported to the Department. The Department is required to act on petitions to inspect a facility's plans and data if the petitions are filed by 10 or more residents living within ten miles of the facility.

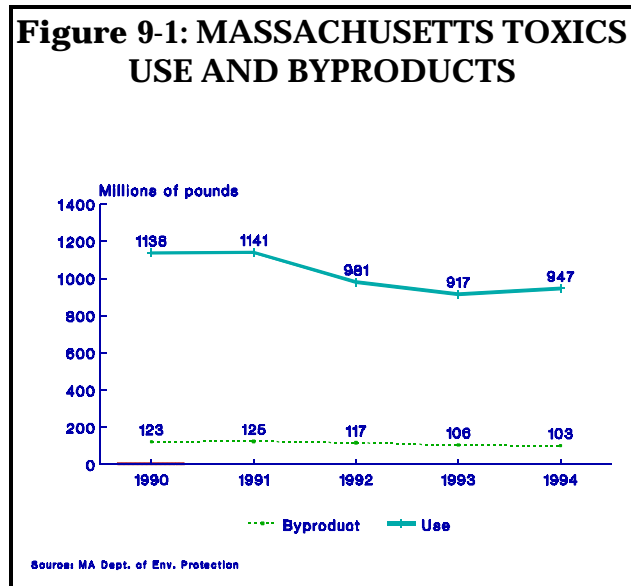
The information collected through TURA has also proven helpful to the subject facilities. By making facilities aware of the quantities of toxics used during production, released to the environment, and transformed into products, the reporting requirements allow them to identify improvements in their chemical use efficiency and cost-cutting opportunities.

TURA set a waste reduction goal of 50% over ten years, using 1987 as a baseline. Reporting began in 1991 for 1990 data. As shown in figure #, toxics use and waste generation have fallen since 1990.

(T U R A i n t e r n e t s i t e :
www.state.ma.us/dep/bwp/dhm/tura)

9.3.2. New Jersey Reporting Requirements

New Jersey's Worker and Community Right to Know Act was enacted in 1984, before the federal EPCRA. Since 1987, the state has collected data on inputs and outputs of materials and on amounts of waste reduced through source reduction activities.



The 1991 New Jersey Pollution Prevention Act required facilities to undertake pollution prevention planning and, like the Massachusetts law discussed above, set a goal of 50% reduction in waste output by 1997, with 1987 as a baseline. Plan Summaries must be submitted to the State every five years.

Like Massachusetts, New Jersey requires the use of performance indices. Instead of focusing on waste generation and emissions, however, New Jersey has indices for waste generation and use of toxics.

The New Jersey Department of Environmental Protection reports that it has conducted surveys showing that its reporting requirements have been beneficial to companies by providing them the information they need to assess waste minimization options. Department officials also claim that the data allow them to better manage their activities, including the implementation of the facility-wide permitting scheme described in Section 6.

9.4. PROPOSITION 65

Adopted by voter referendum in 1986, California's Safe Drinking Water and Toxic Enforcement Act, commonly referred to as Proposition 65, requires polluters to issue warnings if they expose people to significant levels of carcinogens or reproductive toxicants listed by the Governor. The list currently contains 570 chemicals.²²

If a substance is listed as a carcinogen, businesses may not discharge it into drinking water unless it poses "no significant risk." For any other listed carcinogen exposures posing "significant risk," the business must provide "clear and reasonable warning." For reproductive toxicants, the same rules apply, but the threshold is 1/1,000 of the "no observable effect" exposure level.²³ The water discharge ban takes effect 20 months after listing, and the other requirements take effect 12 months after listing.

State regulation sets the levels of "significant risk" for most important chemicals on the list, but they can be superseded by more stringent levels mandated by other environmental laws. The burden of proof that the exposure is below the significant risk level is on the defendant. Drinking water utilities, government agencies, and organizations employing fewer than ten people are exempt from the rule.

Citizens have the right to initiate law suits under Proposition 65 if authorities do not respond to their requests to pursue potential violators. Under the "bounty hunter provision," the person who brought the suit can receive 25% of any fines. Fines can be as high as \$2,500 a day. Data obtained from the State Attorney General's office indicate that several environmental groups (including Environmental Defense Fund and As You Sow) and individuals have been compensated for initiating Proposition 65 suits.²⁴ (A similar enforcement award scheme in New Jersey is discussed in Section VII.) However, a source in that office reports that the "bounty hunter provision" creates less incentive for private parties to initiate suits than the possibility of obtaining attorney's fees, as plaintiffs can recover all attorney's fees but must give the state 75% of penalties. As a result, plaintiffs and defendants frequently characterize entire negotiated settlement amounts as attorney's fees.²⁵

In many cases, businesses in California appear eager to avoid issuing clear warnings and have been sued for providing warnings deemed too vague or inconspicuous. For example, the food, drug, and cosmetics industries established a toll-free product information number in lieu of placing hazard labels on their products. In another case, warnings for air emissions of ethylene oxide were published as advertisements in the classified section of a local newspaper. In both of these cases, the warnings were found by the courts to be insufficient.²⁶

Process modifications, chemical substitution, and the use of pollution control devices have all been attributed to Proposition 65. Some products have been reformulated to avoid negative labeling. For example, solvents were removed from correction fluids and lead

from foil and other products. The lead content of tableware was also reduced. However, products such as tobacco and alcohol had to bear warning labels. Businesses appear much more likely to take measures to avoid warnings for products such as tableware that consumers generally believe are safe and for which there are unlabeled substitutes than for products such as spray paint that consumers know can be dangerous.

At least one study found that consumers were indifferent to some warnings because they had become so prevalent. "Overuse of labeling may therefore result in a reduction of effectiveness."²⁷ Another study has suggested that firms might collude to label to excess, thereby minimizing label impact.²⁸

Proposition 65 gives polluters incentives not only to identify ways of reducing or eliminating toxic discharges but also to study the effects of toxics to determine safe exposure levels. Anecdotal evidence suggests that after passage of the law, businesses devoted significant resources to assessing the risks of exposure to toxics.²⁹ While business groups asserted that compliance with the law would be very costly, when given the opportunity by the State of California during a retrospective analysis of the law, they failed to provide evidence that significant costs actually were incurred.

9.5. HOT SPOTS ACT³⁰

Adopted in 1987, California's Air Toxics "Hot Spots" Information and Assessment Act (AB 2588) requires stationary sources to report releases of certain substances into the air. According to the California Air Resources Board (CARB), the goals of the Act are "to collect emission data, to identify facilities having localized impacts, to ascertain health risks, and to notify nearby residents of significant risks." The Hot Spots Act uses at least two potential incentive mechanisms to reduce toxic air emissions: public notification requirements and unit-based fees. The latter mechanism, which is also intended to cover all of the administrative costs associated with the Act, is discussed in Section IV. The former is discussed here.

Facilities are required to submit to air pollution control districts an air toxics emission inventory plan, a subsequent inventory, and, for certain priority facilities, a health risk assessment. If the district judges that a facility's emissions pose a potentially significant health risk, the facility operator must notify all exposed persons.

The Hot Spots Act originally relied on the information requirement and fees to discourage risky toxic emissions. In 1992, however, it was amended to require facilities to reduce emissions below the significant risk level within five years or a period not to exceed ten years as determined by the district. This amendment introduced a considerable command-and-control element to what previously had been an incentive-based instrument. However, emissions data and health risk assessments remain accessible to the public and could give polluters incentives to reduce emissions more substantially and quickly than they otherwise would.

According to CARB, the Hot Spots inventory requirements have increased facilities awareness of their toxic emissions, leading to reductions in emissions. Surveys have revealed voluntary reductions of over 1.9 million pounds per year of air toxics from 21 facilities. Potentially reduced costs, concern for worker health, community relations, and anticipation of future regulations are some of the motives for these reductions.

(Summary of Hot Spots program: arbis.arb.ca.gov/toxics/ab2588/2588summ.txt)

9.6. ENVIRONMENTAL POLICY ACTS

Under the terms of the National Environmental Policy Act (NEPA), environmental impact assessments, statements, or reports must be prepared prior to certain government actions affecting the environment. The results of such reports could influence government, especially since they are subject to public review. However, most federal actions subject to NEPA do not concern activities initiated by the private sector.

On the state level, NEPA-like laws could influence private behavior. At least 14 states have such laws, which vary in nature from state to state but which generally require a government agency to engage in a public comment process on environmental impact assessments prior to making a decision.³¹ In some of these states, the laws apply only to state-initiated actions. In states such as California, New York, and Massachusetts, however, the laws apply to public and private actions requiring permits. Laws in these states have resulted in the restructuring, reconsideration, or withdrawal of proposals before and after public review.

9.7. LABELING SCHEMES

Labeling products according to their effects on the environment is another type of information approach to environmental management. Consumers can use the information provided by such labels in making purchasing decisions. If consumers, investors, and others prefer companies and products they believe are environmentally friendly, businesses have an incentive to improve their environmental performance to receive a favorable label or avoid a negative one.

Table 9-3 shows the classification scheme for environmental labeling programs proposed by a 1994 EPA study³². Programs can be either voluntary or mandatory. Moreover, the information provided by labeling can be either negative, positive, or neutral.

Seals of approval are given to products deemed less harmful to the environment, and single attribute programs certify that a product has a certain positive environmental attribute. Report cards and information disclosure schemes inform customers of products' various impacts on the environment. Hazard labels warn customers of the harmful effects of a particular product.

Table 9-3: CLASSIFICATION OF ENVIRONMENTAL LABELING SCHEMES

Program Type	Positive	Neutral	Negative	Voluntary	Mandatory
Seal-of-Approval	x			x	
Single at-tribute	x			x	
Report card		x		x	
Information disclosure		x			x
Hazard warnings			x		x

Source: EPA (1994a), p. 9.

Experience with labeling schemes indicates that they are more likely to influence behavior if accompanied by promotional activities targeting retailers and consumers. In many cases, the label itself is only one element of a larger effort to promote the use of environmentally friendly products. As a result, it is often difficult to isolate the incentive effect of a label from that of related promotional activities.³³

Although the United States does not have a national government-initiated environmental labeling program like many other industrialized countries, it does have a few public and private labeling schemes. The rest of this subsection discusses various schemes that have been used in the U.S.

9.7.1. Federal Trade Commission Guidelines for Environmental Marketing Claims

Issued in 1992 and, at the time of this writing, under review for possible revisions, the FTC Guidelines for Environmental Marketing Claims or "Green Guides" do not constitute a labeling system as such, but they are designed to have an effect on labeling. The guidelines are intended to prevent false or misleading use of advertising claims such as "environmentally friendly," "degradable," and "recyclable." Confusion over the meaning of such terms affected not only consumers but also companies, who were concerned about lawsuits over their environmental claims.

The Guides outlined four general principles for environmental claims: qualifications and disclosures should be sufficiently clear and conspicuous to prevent deception; claims should make clear whether they apply to the product, packaging, or just a component of either; claims should not overstate environmental benefits; and comparative claims should be presented in such a way that the basis for comparison is clear. The guides also ad-

dressed claims concerning environmental friendliness, degradability, compostability, recyclability, recycled content, source reduction, refillability, and ozone friendliness.³⁴

*9.7.2. Green Seal and Other Seals of Approval*³⁵

Founded in 1989, Green Seal is the nonprofit organization that awards the Green Seal of Approval to products that it finds less harmful to the environment. The organization develops a set of standards for each product category it studies. Categories are chosen according to the significance of their associated environmental impact and their range of products. Products within a category are then studied to determine their impacts on the environment in their various stages of production, use, and disposal. After public review and comment, Green Seal adopts a standard. Standard criteria vary across categories but may include reduction of toxic chemical pollution, improved energy efficiency, protection of water resources, minimization of impacts on fish and wildlife and their habitats, efficient use of natural resources, protection of the ozone layer, and prevention of global warming. Products are not subjected to a complete life-cycle analysis but rather judged according to those aspects of the life cycle with the most significant environmental impact. Standards are reviewed at least once every three years.

Manufacturers pay product evaluation fees to apply for the Green Seal mark, and accepted products are also subject to annual monitoring fees. The fees vary according to the product category and size and number of manufacturing facilities. The Green Seal mark for approved products appears with an explanation of the basis for certification.

The organization has published environmental standards or criteria for about 25 types of products. Its list of certified products contains central air conditioning systems (1 brand), architectural coatings (2 brands), cleaning products (1 brand), compact fluorescent lamps (5 brands), recycled paper (5 brands), recycled newsprint (1 brand), re-refined engine oil (3 brands), reusable bags (3 models), showerheads (four models), toilets (2 brands), watering hoses (several models), one manufacturer's line of windows and doors, and one brand each of unbleached coffee filters, baking cups, and parchment.³⁶

Besides labeling, Green Seal helps market environmentally friendly products in several ways. A list of certified products is included in a catalog with product information and addresses and phone numbers of product vendors. "Choose Green Reports" are available on topics such as "Environmentally Preferable Printing" and energy-efficient lighting, computers, and other office equipment. Organizations that agree to purchase environmentally friendly products, reduce waste, and increase recycling are eligible for the Green Seal Environmental Partners mark. This mark can be placed on reports, letterhead, and store signs.

The incentive effects of Green Seal's activities appear not to have been comprehensively studied. In a Green Seal survey, however, 4 of 5 consumers said they would be

more likely to purchase a Green Seal-certified product than other products of equal quality and price.³⁷

Some retailers have adopted labeling schemes for products they find environmentally friendly. In 1989, for example, Wal-Mart created a program under which shelves were labeled to indicate that their products were environmentally friendly. Wal-Mart ended this program in 1992, mainly because of difficulties in determining the criteria for environmental friendliness and in assessing manufacturers' environmental claims.

Wal-Mart's experience illustrates one of the main problems encountered by environmental seal-of-approval schemes: lack of agreed-upon criteria for assessing environmental friendliness. While seals of approval may be relatively easy for consumers to understand, they risk not only lacking agreed-upon standards but also oversimplifying complex environmental issues. Menell (1995) cites a number of cases in which the environmental friendliness assessments necessary for labeling are difficult. For example, a study of the environmental impacts of disposable cups found that wax-coated paperboard was preferable to polystyrene on the grounds of reduced volumes of solid waste generation but inferior in the areas of energy consumption, air emissions, water pollution, and weight of solid waste generation. Disposable diapers generate more solid waste than cloth diapers, but they also use less water and result in less water pollution. Another study (cited by Menell) found that the environmental impacts of washing machines depend less on the model of the machine than on how it is used.

9.7.3. Single-Attribute Seals of Approval

The problems of lack of criteria and oversimplification are likely to be less serious for labeling programs based on a single product attribute. EPA's Energy Star office equipment label is reserved for computers, printers, photocopiers, and typewriters that are relatively energy-efficient. This label is part of a voluntary energy-efficient office equipment promotion initiative described in Section X.

Created in 1992 and licensed by Earthtrust, a non-profit organization based in Hawaii, the Flipper Seal of Approval is awarded to companies that harvest tuna in a manner that minimizes killings of dolphins. The seal has been awarded to tuna companies in the United States and abroad.

From 1986 to 1991, the Bonneville Power Administration managed a Blue Ribbon Award Campaign to promote the use of energy-efficient refrigerators and freezers. Under this program, refrigerators and freezers in the top 15 percent of their size and function category were awarded blue magnetic ribbons.³⁸ A retailers survey conducted early in the program estimated that about 22% of customers had been "influenced" in their purchasing decisions.³⁹

Scientific Certification Systems (SCS), a for-profit business, has two single-attribute seal of approval programs. The SCS Forest Conservation Program uses a 100 point index to evaluate the management of forest tracts by timber operations. A separate score is given for each of the following categories: sustainability of timber resources, forest ecosystem maintenance, and socio-economic benefits to the surrounding community. Scores over 60 are required in each category to be awarded the "Well-Managed Forest" label. Operations scoring in the top ten percent are further labelled as "State-of-the-Art."⁴⁰ SCS can also use chain of custody certification to verify that wood products sold to consumers come from well-managed forests. About ten forestry operations in South, Central, and North America have been rated by SCS.

SCS has also certified over 500 environmental claims by manufacturers concerning recycled content, recycling rates, energy efficiency, water efficiency, biodegradability, and lack of smog-producing ingredients. Some claims concern materials, whereas others concern final products and packages. Certified products are allowed to bear an authorized certification emblem.

According to SCS, anecdotal evidence indicates that its labels are valued by businesses and individuals, with consumers willing to pay a premium for products identified as environmentally friendly. Glidden Company, for example, found that a label designating its paints as free of VOCs is valued by institutional customers such as hospitals.⁴¹

9.7.4. Report Cards and Information Disclosure

SCS also issues environmental "report cards" that rate products according to various criteria. (The company refers to these as "eco-profiles.") These profiles are based on a cradle-to-grave assessment of the environmental burdens associated with raw material extraction, manufacture, transportation, use, and disposal of a product. The environmental burdens considered include resource depletion, energy use, air and water emissions, and solid wastes. Bar graphs for each of approximately twenty types of environmental impacts are included on the label. Eco-profiles have been done for Holiday Fair (handbags, accessories, and travel ware), North American Plastics (plastic bags), Plasti-kote (paints), Wellman, Inc. (polyester fiber), and Zeta Consumer Products (plastic bags). Some companies request eco-profiles for internal use rather than for marketing purposes.

The advantage of such an eco-profile is that it provides more information than simple seals of approval. Among the disadvantages are that the information on the card can be difficult to obtain and understand and that the report card may be misinterpreted by consumers as a product endorsement. Since the SCS report cards are voluntary and appear only on a limited number of products, they have led many consumers to believe that the card itself implies the environmental superiority of a product.⁴²

9.7.5. Energy-Efficiency Labeling

Two other information disclosure programs are required and managed by the federal government. The EPA manages the Fuel Economy Information Program, under which new cars must have labels in their windows listing their milage-per-gallon for city and highway driving, the estimated annual fuel cost associated with their operation, and the fuel economy of comparable models. This program was voluntary at its inception in 1974 but was made mandatory by the Energy Policy and Conservation Act (EPCA) as of March 1976. Car dealers were also required to have available for customers the Gas Mileage Guide of car fuel efficiency.

A 1976 study found that more than half of new car buyers had seen the fuel economy label and that those aware of the label bought cars with higher mileage than other car buyers. The program was credited with a fuel consumption reduction for 1976 model cars of 893 million gallons. However, the influence of the labeling program decreased as a result of falls in gasoline prices after the mid-1970s. Moreover, 64% of buyers did not believe the mileage estimates. Consumers believed that fuel efficiency was not assessed in realistic driving conditions and that mileage was therefore overstated. A 1981 DOE survey found that this skepticism was the main reason why more consumers did not rely on the labels. EPA changed the fuel efficiency assessment procedure in 1985 to make it more realistic.⁴³

The 1975 EPCA also required that Energy Guide labels be placed on refrigerators, freezers, water heaters, washing machines, dishwashers, furnaces, air conditioners, and heat pumps. The 1992 Energy Policy Act expanded these requirements to fluorescent lamps, showerheads, faucets, water closets, and urinals. Although labels vary depending on the type of appliance, they formerly all included information on the manufacturer and appliance model number and capacity, an energy efficiency rating (EER) or estimated annual operating cost, the EER or annual operating cost of the most and least efficient comparable appliances, and a table showing annual estimated costs for varying use habits and energy prices.

The Federal Trade Commission changed the labels in 1994 so that for refrigerators, freezers, dishwashers, clothes washers, and water heaters, they now include the kWh of energy use of the labelled appliance and of the most and least efficient comparable appliances. Climate control appliances are labelled not according to kWh of energy use but rather to fuel efficiency indices such as EER, seasonal EER, annual fuel utilization efficiency, or heating seasonal performance factor. The energy cost table has been replaced by a single energy cost estimate for products with kWh energy use ratings and for room air conditioners. Other products must have operating cost information either on fact sheets or in industry product directories. In a press release on the new labelling requirements, the FTC stated that they would "make the labels easier to read and more useful to consumers in comparing the energy efficiencies of the appliances."⁴⁴

An in-store survey of appliance buyers conducted for DOE showed that 90% of buyers had noticed the Energy Guide label, and three-fourths described it as "somewhat" or "very" helpful in comparison shopping. The same survey revealed that consumers found the labels confusing and believed that labels should emphasize one or two pieces of information, such as energy costs.⁴⁵ Studies have shown that the labels raise consumers' energy awareness without necessarily influencing their purchases. The energy efficiency of appliances has risen significantly since the adoption of EPCA, but this rise appears to be due more to command-and-control requirements than the Energy Guide.⁴⁶

FTC has also adopted labelling requirements for resistance to heat flow in insulation materials, emissions characteristics of alternative fuel vehicles, and the minimum content of alternative fuels.⁴⁷

An industry initiative, the National Fenestration Rating Council rates the energy efficiency of windows. Over 120 manufacturers have submitted over 25,000 window products for NFRC ratings. According to NFRC, building energy codes and utility programs rely increasingly on these ratings, and manufacturers try to improve energy efficiency to avoid being listed with poor ratings in the NFRC directory.⁴⁸

9.7.6. Hazard Labels

Hazard labels inform consumers of environmental risks associated with particular products. Proposition 65, which was discussed above, has a hazard information requirement that frequently results in product labeling, and products have been altered to avoid a negative label. However, Proposition 65 warnings frequently take forms other than labels.

Ozone-depleting substances are subject to warning labels under the Clean Air Act. The incentive effect of this label might have been diminished by announcements that such substances would be phased out earlier than originally expected.

A variety of toxics, including PCBs and asbestos, have been required to bear warning labels under authority granted to EPA by the Toxic Substances Control Act. Pesticides are subject to detailed labelling requirements under the Federal Insecticide, Fungicide, and Rodenticide Act.

Retailers in Vermont have been required since 1991 to identify household products containing hazardous constituents with shelf warning labels. The goal of this law is to discourage consumers from purchasing such products. Among the types of products subject to the requirement are cleaning agents, auto and machine maintenance products, hobby and repair products, shoe polish, aerosols, and butane lighters. The state label bears the text: "REDUCE TOXICS USE. These products contain HAZARDOUS INGREDIENTS." This label must be placed either on the shelf or near the subject products. Green exemption labels can be attached to shelves displaying products that have been included

in the program but contain none of 24 ingredients listed in the Vermont Community Right-to-Know list of hazardous chemicals. Vermont has a parallel warning program for pesticides and commercial fertilizers.

9.8. ENVIRONMENTAL PERFORMANCE AWARDS

EPA and numerous state and local governments periodically issue awards for environmental behavior they deem exemplary. To the extent that such awards generate positive publicity, they could encourage environmentally friendly behavior.

In California, for example, 305 businesses won awards under the Waste Reduction Awards Program (WRAP) in 1995. The Target department store chain won awards at 2 distribution centers and 90 stores for recycling and waste minimization efforts that have resulted in a 75% reduction in garbage. Winners received certificates of recognition from the Integrated Waste Management Board as well as the right to use the WRAP logo to publicize their waste reduction achievements.⁴⁹

(WRAP awards announced: www.calepa.cahwnet.gov/epadocs/janfeb96.txt)

In Texas, Governor's Awards for Environmental Excellence are issued for the following categories: large business - technical, large business - non-technical, small business, government, civic and non-profit organizations, education, youth organization, media, agriculture, individual, and special.⁵⁰ (These awards are part of the Clean Texas 2000 initiative that also includes the Clean Industries 2000 program discussed in the next section.) In the large technical business category, Lockheed Martin Tactical Aircraft Systems was the 1995 winner. The company has also received awards from EPA for reducing emissions of ozone-depleting chemicals and VOCs and the EPA Regional Administrator's Environmental Excellence Award for Excellence in Hazardous Waste Minimization Program Development.⁵¹

9.9. SEC DISCLOSURE REQUIREMENTS

The Securities and Exchange Commission (SEC) requires publicly owned companies to report financial information to allow investors to evaluate them. Included in this requirement are environmental expenditures or liabilities that could have a "material" impact on the company's financial or competitive position. Companies also must report individual environmental enforcement proceedings expected to cost over \$100,000 as well as environmental litigation that might have significant financial impact. SEC access to information submitted by companies to EPA enables it to verify company disclosures on Superfund and RCRA sites and on federal enforcement actions. The SEC is authorized to require companies to revise filings in case of inaccuracies and has written to companies to inquire why they did not disclose certain environmental information in their filings.

The number of large companies disclosing environmental information in Form 10-Ks is increasing. Among S&P 500 companies, 322 submitted environmental information in 1990 compared to 217 in 1988. The incentive effect of these disclosure requirements is not known. However, evidence presented elsewhere in this Section indicates that information on company environmental performance is of interest to investors.⁵²

9.10. RADON AND LEAD PAINT DISCLOSURE REQUIREMENTS

EPA and other public and private organizations have used information as an environmental policy tool in other ways. In many cases, educational activities have influenced behavior. EPA education on the dangers of radon, for example, has led many people to adopt appropriate abatement measures. Awareness of the problem has risen to the point that many homebuyers as well as lending institutions have requested radon measurements before making final purchases or participating in transactions. Such testing is recommended in EPA's "Home Buyer's and Seller's Guide to Radon." A number of states have also enacted radon disclosure requirements for real estate transactions. In Illinois, for example, the Residential Real Property Act, which went into effect in October 1994, requires sellers to disclose knowledge of elevated radon test result levels.⁵³

(EPA pubs on Radon: www.epa.gov/docs/RadonPubs/index.html)

(Illinois radon act description: www.state.il.us/idns/radon/prgdecsr/radonprg.htm.)

An amendment to the Federal Lead-based Paint Poisoning Prevention Act entered into effect in 1995 requiring the owner of any house built before 1978 to alert potential buyers or tenants to possible hazards from lead paint and to disclose lead paint known to be in the house. The buyer has a 10-day grace period in which to test the house.⁵⁴

Endnotes for Section 9

1. TRI data distinguish between releases and transfers. A release is an on-site discharge of a toxic chemical to the environment, whereas a transfer is a movement of waste to another facility for recycling, energy recovery, treatment, or disposal.
2. EPA (March 1995), "Expanding Community Right-to-Know," p. 4.
3. Ibid, p. 5.
4. *1994 Toxics Release Inventory*, p. A11.
5. *Wall Street Journal*, June 27, 1996, p. B12.
6. *1994 Toxic Releases Inventory*, p. 201.
7. Ibid, pp. C2-C3.

8. GAO (September 1994), p. 14.
9. Because all figures have been rounded to one decimal place, percentage changes may not correspond exactly with release data and total releases might differ slightly from the sums of the columns. Not included in these data are delisted chemicals, chemicals added in 1990, 1991, or 1994, and aluminum oxide, ammonia, ammonium sulfate (solution) and sulfuric acid.
10. "Other off-site" refers to transfers reported with no management code or invalid codes. For 1988, "other off-site" may also include codes not required to be reported in that year. Not included in these data are delisted chemicals, chemicals added in 1990, 1991, or 1994, and aluminum oxide, ammonia, ammonium sulfate (solution) and sulfuric acid.
11. EPA (March 1995), p. 3.
12. *DEN*, October 10, 1995, p. E1.
13. *Wall Street Journal*, June 27, 1996, p. B12.
14. Arora and Cason (1995), p. 9.
15. "The Nation's Polluters - Who Emits What, and Where," *New York Times*, October 31, 1991, as reprinted in ELI (June 1993).
16. "For Communities, Knowledge of Polluters is Power," *New York Times*, March 24, 1991, as reprinted in ELI (June 1993).
17. "Right to Know: A U.S. Report Spurs Community Action By Revealing Polluters," *Wall Street Journal*, January 2, 1991, as reprinted in ELI (June 1993).
18. *1994 Toxics Release Inventory*, p. D-2.
19. *Ibid*, pp. D7-D8.
20. For a summary of state TRI activities, see the *State Fact Sheets* section of the 1994 TRI.
21. Unless otherwise stated, information on TRI programs in Massachusetts and New Jersey provided by EPA (October 1995).
22. Susan Luong, California Office of Environmental Health and Hazard Assessment, personal communication, May 1996.
23. Helfand (1994), p. 290.
24. California Attorney General's Office (May 1996).
25. Edward Weil, California Deputy Attorney General, personal communication, June 1996.
26. Helfand (1994), p. 289.
27. EPA (April 1994a), p. 29.
28. Helfand (1994), p. 291.

29. Ibid, p. 293.

30. Unless otherwise stated, information on the Hot Spots Act provided by the California Air Resources Board, "Overview of the Air Toxics 'Hot Spots' Information and Assessment Act."

(arbis.arb.ca.gov/toxics/ab2588/2588summ.txt)

31. The states are California, Connecticut, Hawaii, Indiana, Maryland, Massachusetts, Minnesota, Montana, New York, North Carolina, South Dakota, Virginia, Washington, and Wisconsin. The District of Columbia and Puerto Rico have similar laws as well. For more information, see Environmental Law Institute (August 1993), pp. 122-124.

32. EPA (April 1994a), p. 9.

33. Ibid, p. 49.

34. *DEN*, October 23, 1995, p. A3.

35. Most information in this subsection is based on EPA (April 1994a).

36. A list of published environmental standards and criteria is found in the "Green Seal Order Form," and a list of products certified by Green Seal is found in "Green Seal's Choose Green Report: Catalog of Certified Products."

37. Harris and Casey-McCabe, p. 8.

38. EPA (April 1994a), p. 13.

39. Harris and Casey-McCabe, p. 8.

40. EPA (September 1993), p. 118.

41. Rebecca Ward, Scientific Certification Systems, personal communication, May 1996.

42. EPA (September 1993), pp. 145-146.

43. The studies cited in this paragraph are discussed in EPA (April 1994a).

44. Harris and Casey-McCabe, p. 11.

45. Ibid, p. 9.

46. EPA (April 1994a), pp. 27-28.

47. See 16 CFR Part 460 on insulation materials and 16 CFR Part 309 on alternative fuels and alternative fuel vehicles.

48. Harris and Casey-McCabe, p. 10.

49. "305 State Businesses Win Awards for Reducing Waste," CAL/EPA Report, Vol. 5, No. 1/2, January/February 1996. www.calepa.cahwnet.gov/epadocs/janfeb96.txt

50. TNRCC (March 1995), *A Report to the 74th Texas Legislature: Pollution Prevention and Waste Reduction in Texas*, p. 35.

51. Quinn (1996), p. 25.
52. Investor Responsibility Research Center, pp. 11, 61-62.
53. Illinois Department of Nuclear Safety, "Radon Program Strives to Increase Public Awareness," internet: www.state.il.us/idns/radon/prgdecsr/radonprg.htm.
54. "Lead in Paint: Controlling the Hazard," *Consumer Reports*, July 1995, p. 460.

10. VOLUNTARY PROGRAMS

This Section is devoted primarily to programs under which EPA asks companies to voluntarily participate in activities to protect the environment. Such programs have become increasingly popular in the 1990s: a recent EPA publication, *Partnerships in Preventing Pollution*, listed and described 28 such initiatives.¹ As the EPA stated in its June 15, 1995 report to the President on regulatory reform, "Over the past two years, EPA has shifted its emphasis from command-and-control to building partnerships with stakeholders to achieve environmental results in a cooperative manner."²

Although these voluntary programs may not be pure economic incentive instruments like pollution charges or deposit-refund mechanisms, they differ from command-and-control approaches. Instead of imposing requirements on businesses, these programs merely encourage them to participate.

One incentive for businesses to take part in these programs appears to be favorable public relations, which indirectly could result in less public pressure to regulate participants and increased market share at the expense of competitors perceived to be less environmentally friendly. Polls have shown that consumers are willing to pay a premium for products with environmental advantages.³ Henriques and Sadorsky (1996) found that pressure from shareholders and customers significantly influenced Canadian firms' decisions to formulate environmental plans. In this respect, voluntary programs could have effects similar to the information approaches discussed in Section 9.

Another reason for participation in voluntary programs is that the sponsoring regulatory authority often provides technical assistance to participants. Such assistance could be regarded as a subsidy as discussed in Section 8. As noted below, some companies have saved money by implementing the activities associated with voluntary programs such as Green Lights and WasteWiSe.

Moreover, voluntary programs may limit potentially high litigation, monitoring, and enforcement costs incurred by regulators and businesses. Some of these programs offer participating companies the opportunity to identify and address environmental problems that could later subject them to regulatory sanctions. They also sometimes give companies flexibility to improve their environmental performance at less cost.

A Resources for the Future study of EPA's 33/50 program (discussed below) cited several reasons other than publicity benefits and added flexibility why firms might voluntarily overcomply with environmental regulations. In some industries, firms might improve their performance in the hope of leading government to make such performance mandatory, thereby creating barriers to the entry of potential competitors. It has also been suggested that firms overcomply to forestall additional mandatory regulation. Another possibility is that the "lumpiness" of pollution abatement investments means that large investments offer significantly more abatement per dollar than a series of small investments made to comply with progressively tighter restrictions.⁴

(RFF study abstract: www.rff.org/dpapers/abstract/9538.htm)

This Section discusses the following EPA-initiated voluntary programs: Green Lights and Energy Star, WasteWiSe, 33/50, XL, ELP, WAVE (Water Alliances for Voluntary Efficiency), Climate Wise, and methane recovery. (These programs are listed in table 10-1.) It concludes with a description of several state voluntary programs. Three other voluntary initiatives (supplemental environmental projects, joint implementation, and Brownfields activities) are excluded from this Section because they are discussed elsewhere in this report.

Table 10-1: EPA VOLUNTARY PROGRAMS

Program	Objective
Green Lights	Promote the use of energy-efficient lighting
Energy Star Buildings	Promote energy-efficiency in heating, cooling, and ventilation of buildings
Energy Star	Promote the use of energy-efficient office equipment and other devices
WasteWiSe	Reduce commercial solid waste
33/50	Reduce emissions of selected TRI chemicals
XL	Offer flexibility in meeting federal environmental standards
ELP	Offer flexibility in compliance management and verification systems
WAVE	Encourage businesses to reduce water use
Climate Wise	Reduce greenhouse gas emissions across all sectors
Methane recovery (4 programs)	Reduce methane emissions and promote reuse of methane as energy source

(enviroSenSe site for voluntary programs: es.inel.gov/partners)

Businesses voluntarily carry out numerous environmental initiatives on their own, such as the Chemical Manufacturers Association's Responsible Care program and the Coalition for Environmentally Responsible Economies' (CERES) principles. While such purely private sector activities may promote environmental protection, they are beyond the scope of this report.

Some voluntary programs are directed primarily at individuals. For example, many municipalities encourage consumers to voluntarily recycle wastes such as beverage containers, newspaper, and used oil. These types of programs are not discussed here.

10.1. GREEN LIGHTS AND ENERGY STAR

One of the first of the EPA voluntary programs discussed in this Section, the Green Lights program was launched in January 1991. Green Lights participating companies agree to install energy-efficient lighting wherever profitable as long as lighting quality is not diminished. EPA provides technical assistance and public recognition for participation. The primary purpose of the program is to encourage the use of energy-efficient lighting to prevent air emissions (CO₂, SO₂, and NO_x) and other pollution associated with electricity generation.

The Washington Times installed at its headquarters 6,360 T8 lamps, 1151 compact fluorescents, 145 occupancy sensors, 409 halogen PAR lamps, and 153 LED exit signs, resulting in the following savings:

Electricity reduction:	1,085,328 kWh/year
Lighting electricity savings:	62.9%
Energy cost savings:	\$72,810/year
Pollution prevented:	CO ₂ : 1,736,524 lbs/year SO ₂ : 8,899,686 grams/year NO _x : 2,821,851 grams/year

At its Fairfax, VA headquarters, Mobil Corporation installed a number of T8 lamps, electronic ballasts, halogen reflector lamps, compact quad-tube lamps, LED exit signs, and timed light switching devices, resulting in the following savings:

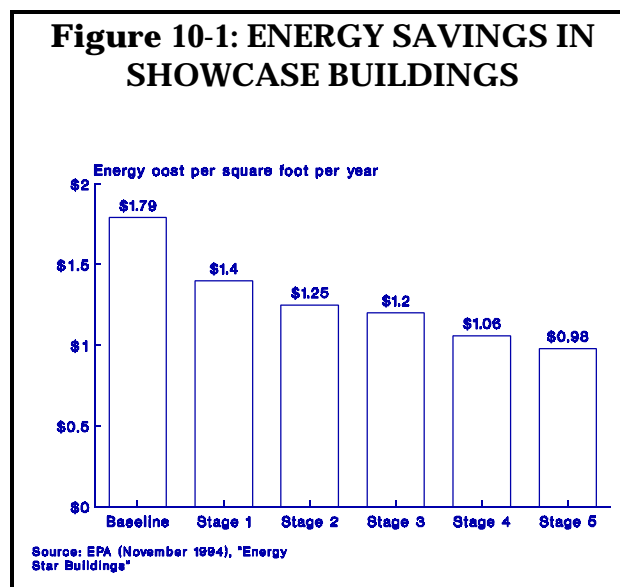
Electricity reduction:	2,036,794 kWh/year
Lighting savings:	47.19%
Energy cost savings:	\$123,000/year
Pollution prevented:	CO ₂ : 3,258,869 lbs/year SO ₂ : 16,701,706 grams/year NO _x : 5,295,663 grams/year

2. Examples of Green Lights savings

As of May 1996, the program had 1,316 Partners (corporations, industry groups, nonprofit organizations, hospitals, governments, and universities), 585 allies (electric

utilities, lighting manufacturers and distributors, and lighting management companies), and 286 endorsers (professional and trade associations), with 3.8 billion square feet committed to the program by December 1993 and 4.3 billion square feet by December 1994. By December 1994, Green Lights investments in energy-efficient lighting had resulted in annual energy savings of 1 billion kWh, translating into annual energy cost savings of about \$92 million. EPA predicted that the 3.8 billion square feet in the program in December 1993 would eventually result in the following annual reductions: 8.6 billion kWh of energy use, 1.8 million metric tons of carbon emissions, 49,590 metric tons of SO₂ emissions, 21,375 metric tons of NO_x emissions, and \$600 million in electricity costs.⁵

The Green Lights program is the required first step in another voluntary energy savings program, Energy Star Buildings. Under Energy Star Buildings, EPA asks participants to perform energy-efficiency upgrades in buildings where profitable. After installing energy-efficient lighting, participants tune up building systems, invest in upgrades to reduce heating and cooling loads, improve fans and air handling systems, and improve the heating and cooling plant. The program began in June 1994 with a demonstration project based on 24 Energy Star Showcase Buildings, including both public and private facilities. As shown in Figure 10-1, EPA predicted that energy costs at Showcase Buildings could fall by nearly 50%.⁶



The Energy Star label is awarded to energy-efficient office products, including copiers, fax machines, computers, and printers. As of December 1994, more than 350 computer and monitor manufacturers had joined Energy Star and were producing eligible PC systems. In the first year of the program, 45% of PCs and 85% of printers sold in the U.S. met Energy Star guidelines. President Clinton has signed an Executive Order directing the U.S. government to limit computer purchases to Energy Star products.

EPA predicted that an office with 100 PCs and monitors, 20 printers, and 10 fax machines could save approximately \$3,800 a year with Energy Star equipment.⁷ Energy Star programs have also been created for transformers and selected household appliances.

10.2. WASTEWISE

Created in 1994, WasteWi\$e is a voluntary program intended to reduce businesses' solid waste. Participants are required to implement three significant waste prevention

activities, improve collection programs for recyclables on company premises, and increase either their purchases of recycled products or the recycled content of the products they manufacture.

EPA has offered several benefits to WasteWiSe participants. It provides technical assistance via a telephone hotline, electronic bulletin board, and other information services and allows participants to use the WasteWiSe logo in their advertising.

As of November 1995, 370 companies had joined WasteWiSe. In the first year of the program, participating companies conserved over 240,000 tons of solid waste, mostly transportation packaging. They also recycled about 1 million tons of waste and purchased twenty different kinds of recycled content products.

Some companies have managed to save a significant amount of money through the program. Target Stores saved \$4.5 million in 1994 by switching to packaging for clothing requiring less time to unpack and prepare for display. Bank of America saved over \$1 million by printing customer statements on both sides of a page.⁸

10.3. 33/50 PROGRAM⁹

The purpose of the 33/50 program is to reduce chemical emissions reported annually in the Toxic Releases Inventory. The specific goals are to reduce 1988 baseline amounts of 17 of the 320 TRI chemicals by 33% by 1992 and 50% by 1995.¹⁰ These chemicals were selected for the program based on their toxicity, the high volumes in which they are released, and release prevention possibilities.

EPA first issued invitations to take part in 33/50 in February 1991, focusing initially on 555 primarily large companies with the highest releases of the 17 33/50 chemicals. As of March 1994, EPA had invited over 8,000 companies to join, and almost 1,200 had said they would participate.

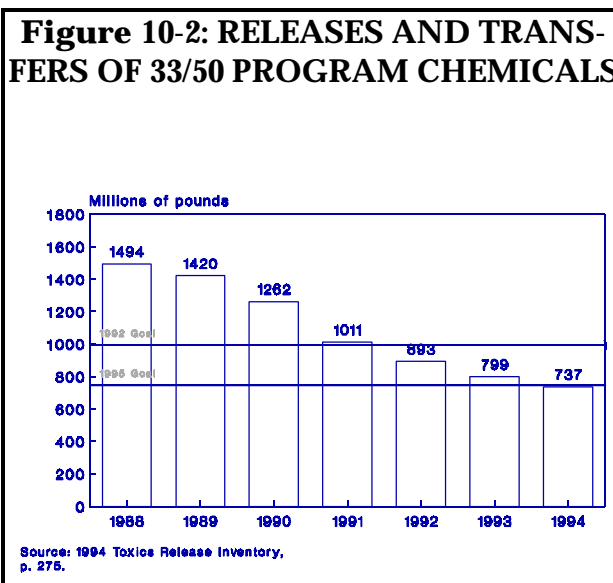
The aforementioned RFF study found that the 33/50 program had a significant incentive effect. Although willingness to participate varied greatly across industries and firms and a relatively small percentage of any industry's firms participated, those that did participate were responsible for most of the toxic emissions within their respective industries. In the case of petroleum and chemicals, for example, participating companies were responsible for over 80% of their industries' total emissions. The participation of large polluters allows the program to be effective in targeting the main sources of pollution.

RFF also found that participation rates were highest in "consumer contact" industries (proxied by advertising expenses) and that participants in Green Lights were significantly more likely to participate in 33/50 as well. This "suggests that 'environmentally con-

scious' firms seek to improve their reputation by participating in several voluntary pollution reduction programs at the same time."

(RFF study abstract: www.rff.org/dpapers/abstract/9538.htm)

Figure 10-2 shows that as of 1994, the latest year for which data are available, 33/50 chemical transfers and releases had been reduced by 50.7% from their 1988 baseline level, surpassing the 50% goal set for 1995. Although some of these reductions may have been due to other factors such as publicity surrounding the TRI itself, reductions during the first full year of the 33/50 program (1992) of the 17 33/50 chemicals were four times greater than for non-program chemicals. During the period 1988-1994, non-program chemical releases and transfers fell by 38%, a significantly lower percentage than the 50.7% reduction achieved for 33/50 chemicals. However, this phenomenon could be due in part to the availability of more abatement options for 33/50 chemicals, one of the criteria for including them in the program.



10.4. PROJECT XL

Project XL (Excellence in Leadership) was created in part as a follow-up to the Amoco-EPA Yorktown refinery experiment which identified VOC abatement options that were more cost-effective than the wastewater VOC control measures being proposed by EPA. EPA formally launched XL with the announcement of eight Regulatory Reinvention Pilot Projects in November 1995. The project is designed to give companies, states, and communities flexibility in determining how to meet federal environmental standards. The pilot projects will "test a variety of regulatory management systems as alternatives to traditional command and control approaches to regulation."¹¹

Selected projects had to meet the following criteria:

1. Improve environmental results;
2. Reduce costs and paperwork;
3. Enjoy stakeholder support and participation;
4. Develop an innovative strategy;
5. Have potential to serve as a model regulatory measure;
6. Be technically feasible;
7. Achieve measurable results;

8. Avoid shifting pollution to other areas.

The participants in the first eight projects are Intel, Anheuser-Busch, HADCO, Merck, AT&T Microelectronics, the Minnesota Pollution Control Agency, the South Coast Air Quality Management District, and 3M. Some of these projects entail different types of incentive mechanisms discussed elsewhere in this report. The SCAQMD project, for example, is a "flexible clean air partnership" under which businesses will have the flexibility to attain the goals of the Clean Air Act's employee trip reduction programs by implementing their own initiatives to reduce auto emissions. The Merck project will allow the company to operate its entire Elkton, VA facility under a single air emissions permit. Intel's "contract" with EPA and the state of Arizona requires it to exceed current environmental standards for air, land, and water pollution at its Chandler, Arizona facility in exchange for flexibility in meeting those goals.

EPA intends to implement 50 XL projects targeting specific facilities, entire industries, communities, and EPA-regulated government agencies. As of November 1995, EPA had received 20 to 25 applications, all of which either had been chosen or were being reviewed.¹²

10.5. ENVIRONMENTAL LEADERSHIP PROGRAM (ELP)

Like XL, ELP involves innovative approaches to environmental protection through flexible laws and regulations and seeks to use greater information to empower citizens and communities. However, ELP focuses on the role of compliance management systems in enforcement whereas XL focuses on regulatory management systems in regulation.

EPA launched the pilot phase of ELP in April 1995 by announcing the selection of 12 projects selected from a pool of 40 proposals. The projects, which involve ten companies and two federal facilities, center on compliance management systems, verification procedures, management accountability systems, and community access and participation in compliance. EPA has said that participants would receive public recognition for their efforts as well as a limited time period to correct minor violations discovered in their audits "so long as the violations are not criminal in nature and do not present an imminent and substantial endangerment to the public health or environment."¹³

One ELP participant, Gillette Co., is working with EPA and state authorities on environmental management system auditing and certification. The company's ELP project involves the following four steps: development of criteria for compliance audits, preparation of detailed instructions for conducting such audits, preparation of guidelines for third party verification, and use of the guidelines for audits of three company facilities.

Gillette officials have cited several reasons for participating in the program. Not only does it prepare them to comply with ISO 14000 environmental management certification

standards, which are expected to become important in the years to come, it also gives the company the chance to avoid excessive EPA monitoring by monitoring itself.

It is not clear to what extent the results of audits conducted under ELP will be made available to the public. Public interest groups believe that they are entitled to access to such information, but businesses maintain that much of the data contained in audits should be kept confidential. After the pilot projects are completed, EPA will seek to develop standards for participation in the final ELP program. EPA intends to have the final program in place by late 1997.¹⁴

10.6. WAVE

Another EPA initiative, WAVE (Water Alliances for Voluntary Efficiency) encourages businesses and institutions, primarily in the lodging sector, to reduce water use while increasing efficiency, profitability, and competitiveness. EPA says that the program "is designed to focus attention on the value of water and the need for efficient use of this important natural resource."¹⁵

WAVE participants include partners, supporters, and endorsers. The partners agree to equip new facilities with water-efficient equipment and to install such equipment in existing facilities wherever profitable. In exchange, they receive technical support and EPA assistance in publicizing their water efficiency initiatives. The role of supporters is to publicize the benefits of water use efficiency and to assist partners in their conservation efforts. Supporters are also supposed to implement water efficiency measures. Endorsers include "conservation-minded environmental groups, trade and professional associations" who "are invited to review and endorse the WAVE program."¹⁶

As of April 29, 1996, there were 30 WAVE partners, all of which were in the lodging sector. (Some of the partners had several hotels participating in the program.) The list of supporters consisted of 14 consulting firms, 10 equipment distributors, 13 manufacturing companies, 7 utilities, and 14 water management companies. The American Hotel & Motel Association, the American Water Works Association, Green Seal, and three other institutions were WAVE endorsers.

EPA has stated that WAVE's measures can result in significant decreases in energy, water and wastewater management costs. In 1995, the program resulted in estimated annual savings of 500 million gallons of water, 120 billion BTUs of energy, and nearly \$3 million in water and energy costs. Table 10-2 shows examples of savings achieved by individual participants.

Table 10-2: WAVE INVESTMENTS AND SAVINGS

Hotel	Investments	Savings (millions of gallons per year, %)	Annual Cost Savings
Hyatt Regency Monterey (CA)	Water reclamation system for laundry area	4.563 (52% laundry)	\$46,000
Sheraton Miramar, Santa Monica	New faucet aerators, shower heads, toilet dams	11 (28%)	\$40,000
Outrigger East Hotel, Honolulu	Early closure devices, shower heads, faucet restrictors	7.9 (18%)	\$60,000
Boston Park Plaza Hotel & Towers (Saunders Hotel Group), Boston	Faucet aerators, flush-meters	7.6 (14%)	\$49,000
Westin St. Francis Hotel, San Francisco	Water reuse-system for laundry area	2.678 (48%)	\$32,400

Source: EPA (September 1994)

An EPA official says that the main incentive for businesses to participate in WAVE is the cost savings that can be achieved, but that positive publicity is also a factor. Although the program has resulted in water and energy savings, it has not been without problems. The development of water management software has taken longer and cost more than originally expected, and marketing the program to hotels and motels has been complicated by reluctance of the lodging industry and by significant variations in hotel branch ownership and management structures.¹⁷

10.7. CLIMATE WISE

Designed to reduce greenhouse gas emissions across all sectors, this program challenges participants to devise and implement innovative ways of limiting, reducing, or mitigating greenhouse gases. Methods include process modifications, use of alternative raw materials, carbon sequestration, and other emissions abatement measures.

According to EPA, participating companies' Climate Wise activities will bring about annual savings of over \$80 million by the year 2000 and emissions reductions of more than 5 million metric tons of carbon equivalent.¹⁸ Participants include AT&T, DuPont, Martin Marietta, Weyerhaeuser, and Quad/Graphics.

The program is a partnership between EPA and the Department of Energy. It is working with the Small Business Administration to improve small businesses' energy efficiency investment financing possibilities and with state and local governments to improve technical support and outreach services.

10.8. METHANE RECOVERY PROGRAMS

EPA has launched at least four voluntary programs (Natural Gas Star, AgStar, Coalbed Methane Outreach, and Landfill Methane Outreach) to promote methane recovery. A greenhouse gas, methane can be recovered for energy use.

Initiated in March 1993, the Natural Gas Star Program is intended to reduce emissions of methane from natural gas transmission and distribution systems. Methane emissions can be decreased by up to 1/3 by improving inspection and maintenance practices to reduce fugitive emissions, replacing equipment that normally vents gas with low-emission technologies, and repairing or replacing leaking service lines. Over 25 natural gas transmission and distribution companies have signed on to the program, and the program was expanded in the summer of 1994 to gas producers. EPA intends to have Natural Gas Star partnerships in place with 70% of the gas transmission and distribution industry and 40% of the production industry by 1997.

Under the AgSTAR Program, which was launched in April 1994, EPA works with the Departments of Energy and Agriculture to encourage swine and dairy producers to recover methane from manure management. Participants commit themselves to surveying their facilities and installing AgSTAR selected technology wherever profitable and to appoint managers to oversee their participation in the program. In return, EPA provides technical assistance and information on potential financing sources for investments under the program.

The Coalbed Methane Outreach Program encourages coal mining companies to recover methane released during mining. The program disseminates information to address a number of obstacles to mine methane recovery and development, including lack of information on recovery technology, difficulties in obtain financing for recovery investments, lack of markets for recovered methane, and uncertainty concerning ownership of mine methane.

The Landfill Methane Outreach Program seeks to promote energy recovery from landfill gas. In April 1994, EPA estimated that over 700 U.S. landfills could install economically viable landfill gas recovery systems, but that only about 115 had recovery facilities in place. The program works with State Allies, who "agree to review and explore opportunities to overcome any unnecessary regulatory, administrative, and other barriers to widespread adoption of energy recovery at landfills," and with Utility Allies, who "agree to cooperate with EPA to develop win/win strategies that fulfill the goals and recognize the constraints of the Utility Ally while promoting the development landfill gas

energy resources."¹⁹ In addition to positive publicity, the program offers Utility Allies the possibility to receive Renewable Energy Reserve credits under the Acid Rain Program discussed in Section 6.

10.9. STATE PROGRAMS

Voluntary programs based on agreements between industry and environmental authorities have also been implemented on the state level. This subsection briefly describes two programs in Massachusetts and Texas before concluding with a discussion of adopt-a-highway schemes in place in several states.

10.9.1. Massachusetts Recycled Newsprint Program²⁰

As described in Section VI, Wisconsin has imposed recycled content requirements on newspaper publishers and fees on those failing to meet the requirements. By contrast, Massachusetts has developed a voluntary newsprint recycling program. Under the terms of a 1992 memorandum of understanding between the Commonwealth of Massachusetts and the Massachusetts Newspaper Publishers Association, the Commonwealth agreed to develop newsprint collection and processing programs within the state and the Association agreed to increase its use of recycled content. The following recycled content targets were set: 13% by December 1993, 23% by December 1995, 31% by December 1997, and 40% by December 2000.

The publishers agreed to give preference to newsprint recycled within the state. They are exempt from the targets above if high-quality recycled newsprint cannot be obtained at prices comparable to those of virgin newsprint.

In return for the publishers' efforts, the Commonwealth agreed to promote de-inking and processing facilities in an attempt to increase the supply of recycled content newsprint available to the publishers. It also agreed to oppose recycled content mandates or penalties for the use of virgin newsprint and to facilitate private investment in the publishing industry.

10.9.2. Texas Clean Industries 2000

Under this voluntary program, companies in Texas agree to reduce 1987 levels of hazardous wastes and/or toxic releases at their facilities by at least 50% by the year 2000. Participating companies must also implement an internal environmental review and management program to verify compliance with state and federal regulations, create a citizen communication program, and provide financial or in-kind support for at least one community environmental project.

Clean Industries 2000 membership applications must include projections of waste generation and toxic releases. These projections are later compared with the results of

participants' mandatory annual reports to ensure compliance. Membership is renewed for companies that appear to be on schedule. Facilities can abandon their plans for a year in case of financial hardship.

By participating in Clean Industries 2000, companies can lower waste disposal costs and receive positive publicity. Another advantage of the program is that instead of dictating control technology standards, it gives industry the flexibility to meet the reduction targets in more cost-effective ways. A collection of pollution prevention case studies compiled by the Texas Natural Resource Conservation Commission (TNRCC), which oversees the program, shows that Clean Industries 2000 members have used a variety of techniques to reduce waste, including input changes, segregation of hazardous and non-hazardous wastes, and waste recovery and reuse.²¹

Clean Industries 2000 members have three options for meeting citizen communication program requirements: citizens' advisory committees, community or neighborhood meetings or open houses, and ombudsman programs. In ombudsman programs, companies designate a permanent ombudsman with direct access to senior management to respond to citizen questions and concerns. Over 75 facilities have implemented citizens' advisory committees, which appear to be the most popular option. 17 facilities chose ombudsman programs, and 16 chose open house meetings. Several facilities have implemented more than one type of program. In Freeport, for example, BASF holds monthly Industrial Community Awareness and Emergency Response meetings. It also has a Community Advisory Panel that meets once a month and educates the community on the chemical industry, emergency preparedness, environmental and safety concerns, and social commitments. Another element of the citizen communication program is guided tours of the facility.²²

The community environmental projects required of Clean Industries 2000 members can be any of the following types: nature preserve/habitat restoration, environmental quality monitoring, environmental councils/committees, household hazardous waste, recycling, Earth Day activities, scholarships/donations, and cleanups. Union Carbide, for example, sponsored a paper/cardboard recycling program for the 15 schools of the Texas City/La Marque Independent School Districts. Initiated in 1993, the program included educational materials for teachers and students and recovered 11 tons of recyclable paper and cardboard during its first year.²³

As of March 1995, the 132 Clean Industries 2000 members had made commitments to reduce their 1987 baseline levels of hazardous waste generation by 57% and toxic releases by 64% by the year 2000. These percentages correspond to reductions of 29 million tons of hazardous waste and 268 million pounds of toxic emissions.²⁴ In 1993, the first year of the program, member facilities reduced hazardous waste generation by 17% and toxic releases by 9.5%.²⁵ By March 1996, 147 industrial facilities had joined Clean Industries 2000.²⁶

(March 1995 TNRCC press releases on Clean Industries 2000:

www.tnrcc.state.tx.us/pub/bbs1/press/clean.txt
www.tnrcc.state.tx.us/pub/bbs1/press/tri.txt)

10.9.3. Adopt-a-Highway²⁷

In adopt-a-highway programs, volunteers agree to periodically clean up selected stretches of roadside. Although such programs vary from state to state, they typically involve agreements by organizations to clean up a stretch of roadside approximately two miles long, two to seven times a year, for one to three years. The state usually offers trash bags, safety vests and other gear. Perhaps most important for businesses that participate, the state also usually provides at least one sign to be placed on the adopted roadside indicating the name of the adopting organization. However, a 1994 survey revealed that 10 states did not allow businesses to adopt highways and 33 states did not allow adopting organizations to contract others to perform cleanup.

Adopt-a-highway programs offer advantages both to states and to adopting organizations. They allow states to maintain roadsides at lower state expense and generate positive publicity for businesses and other adopting organizations.

Although there is no federal adopt-a-highway activity, state programs have spread rapidly since Texas created the first one in 1985. The number of states with programs increased to 41 by 1990. The aforementioned 1994 survey revealed that all states except Maine and Vermont had programs. According to the same survey, 121,700 adopting groups composed of 1.3 million volunteers were participating in programs, and over 200,000 miles of roadside had been adopted.

In Virginia, for example, which has one of the largest programs in the country, families, churches, businesses, and other groups and individuals can adopt a highway. Adopting organizations agree to clean up a stretch of road that is generally two miles long, four times a year, for two years. The State Department of Transportation (VDOT) provides trash bags and bright orange vests and collects and disposes of bagged trash. Adopting organizations also have the right to recycle the trash. VDOT also provides signs with the name of the adopting organization at both ends of the adopted stretch of road. According to VDOT, "Adopt-a-Highway volunteers clean over 14,300 miles of state highways -- about 25% of the state's available roads -- and have provided the equivalent of more than \$6.3 million in litter-control services to the state."²⁸

Similar voluntary cleanup programs have been created in various parts of the United States. The 1994 survey identified 19 states with adopt-a-river, 11 with adopt-a-lake, and 15 with beach cleanup programs. Parks, schools, and trails have also been included in such programs.

Endnotes for Section 10

1. EPA (Spring 1996).
2. *DEN*, June 23, 1995, p. E9.
3. Arora and Cason (1995), p. 2. www.rff.org/dpapers/abstract/9538.htm
4. Arora and Cason (1995), pp. 3-4.
5. Membership data provided by Amanda Ferguson, EPA. Data on building space committed by December 1993 and associated savings and pollution reductions provided by EPA (August 1994a), *The Climate is Right for Action*, p. 4. Figure on building space committed by 1994 provided by EPA (June 1995), p. 14.
6. Data based on the Energy Star Buildings upgrade of a 7-story, 196,000 square foot office building in Washington, DC.
7. EPA (June 1995), p. 26.
8. *DEN*, November 1, 1995, p. A5.
9. The 1994 release and transfer data were provided by *1994 Toxics Release Inventory*. All other information on the 33/50 program was provided by Arora and Cason (1995).
10. The 33/50 chemicals are cadmium and compounds, chromium and compounds, lead and compounds, mercury and compounds, nickel and compounds, benzene, methyl ethyl ketone, methyl isobutyl ketone, toluene, xylenes, carbon tetrachloride, chloroform, dichloromethane (methylene chloride), tetrachloroethylene, trichloroethane, trichloroethylene, and cyanides.
11. *DEN*, November 27, 1995, p. AA2.
12. *DEN*, November 6, 1995, pp. AA1-2.
13. *DEN*, June 23, 1995, p. E10.
14. *DEN*, November 27, 1995, pp. AA1-3.
15. *DEN*, June 23, 1995, p. E11.
16. EPA (September 1994).
17. John Flowers, EPA, personal communication, 1996.
18. *Ibid*, p. E11.
19. EPA (April 1994b), p. 2.

21. TNRCC (March 1996), *Pollution Prevention Ideas from Texas Industries*.
22. TNRCC (March 1996), *Clean Industries 2000: Citizen Communication Programs*, p. 11.
23. TNRCC (March 1995), *Clean Industries 2000: Community Environmental Programs*, p. 138.

24. TNRCC (March 1995), *A Report to the 74th Texas Legislature*, p. 10.
25. TNRCC press releases, March 20 and March 27, 1995.
www.tnrcc.state.tx.us/pub/bbs1/press/clean.txt and
www.tnrcc.state.tx.us/pub/bbs1/press/tri.txt
26. TNRCC (March 25, 1996), "Clean Industries 2000 Fact Sheet."
27. Throughout this subsection, the 1994 survey cited is an "Adopt-a-Highway National Survey" conducted by the Oklahoma Department of Transportation.
28. Virginia Department of Transportation (April 1996).

