97-459 ENR
April 16, 1997

Environmental Protection: How Much It Costs and Who Pays

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Summary

A recurring issue in environmental policy is the cost of pollution control imposed on individuals, businesses, and governments. To inform policymakers about these costs, a number of surveys and analyses have been conducted over the years. Consistent, basic sources have been an annual survey of costs to manufacturers, conducted by the Bureau of Census (BOC), and an annual analysis of total costs, prepared by the Bureau of Economic Analysis (BEA). Overall, the BEA analysis showed the nation spent $122 billion for pollution abatement and control in 1994, or about 1.76% of Gross Domestic Product. Personal consumption expenditures for pollution control were $22 billion, government $35 billion, and business $65 billion. These 1994 data represent the end of the annual series: the BOC survey and BEA analysis have been discontinued.

Background

While debate continues over defining environmental protection costs and what they mean for society as a whole,[1] every year individuals, communities, businesses, and industries pay billions of dollars to control pollution. They pay both directly for pollution control technologies and services (e.g., catalytic converters on autos and sewerage fees) and indirectly for pollution control costs embedded in goods and services (e.g., the price of electricity may include the costs of electrostatic precipitators and flue-gas desulfurization units to reduce air pollution).

Efforts to measure those costs at the national level began shortly after national environmental protection programs emerged in the 1960s. Beginning in the 1970s, several general sources of cost data were widely available. Key sources were annual surveys by the BOC and McGraw-Hill, regular analyses by the BEA and the Council on

[1] For an overview of literature on the relationship between Federal regulations, including pollution control requirements, and the economy, see Robert W. Hahn and John A. Hird, "The Costs and Benefits of Regulation: Review and Synthesis," *Yale Journal on Regulation*, Vol. 8, no. 233 (1990), 233-278. For a spirited debate reflecting divergent views of pollution control costs, see David Gardiner and Paul R. Portney, "Does Environmental Policy Conflict with Economic Growth," *Resources*, no. 115 (Resources for the Future, Spring, 1994), 19-23.

Environmental Quality (CEQ), and various studies by the Environmental Protection Agency (EPA).[2] These sources of information varied in coverage, but taken together they provided a multifaceted picture of pollution control costs.

The McGraw-Hill surveys ended in 1988; EPA's reports have appeared irregularly[3]; and the CEQ ceased analyzing data in the 1980s and recently has merely reproduced data from the BOC and BEA reports. Now, the BOC survey and the BEA analysis—both basic sources to many studies of environmental protection costs—are being discontinued: the BEA explains it "is reallocating resources" toward more "urgent priorities for maintaining and improving the U.S. economic accounts."[4] The survey data and analysis series running from 1972 cease with 1994 (published in 1996), so the 1994 data will be a benchmark for pollution control costs, pending future surveys and analysis.

Pollution Abatement Expenditures by U.S. Industries

The BOC survey report "Pollution Abatement Costs and Expenditures: 1994" is the last of a series that has been a primary source of data on the costs of pollution control for manufacturing industries. Surveying manufacturing establishments with 20 or more employees, the BOC collects data on capital and operating costs by industry sector. The data also distinguish expenditures by media (air, water, solid/contained waste, and nonmedia); and by state. Additional details are also provided, for example, a breakdown of operating costs; and capital expenditures are presented for three nonmanufacturing sectors, mining, petroleum, and electric utilities.[5] Despite the thoroughness of the survey, the figures probably underreport actual costs. In a report on competitiveness in 1994, the congressional Office of Technology Assessment (OTA) analyzed the BOC's cost data and concluded that the survey may underreport costs by as much as 25%.[6]

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[2]For a list and discussion of cost surveys and studies, see U.S. Congress, Senate, Committee on Environment and Public Works, *The Status of Environmental Economics: The 1984 Update* [Prepared under contract to CRS by J. Biniek] (98th Congress, 2nd session) S. Prt. 98-248 (Washington D.C.: U.S. Govt. Print. Off., 1984), pp. 12-40.

[3]In 1990 the EPA published a comprehensive analysis of the costs of environmental protection. Using BOC and BEA data as a starting point, the report expanded the analysis by including additional costs (e.g., drinking water protection), recalculating some costs, and supplementing data by drawing on additional sources. Using actual data through 1987, EPA projected costs through the year 2000. EPA, *Environmental Investments: The Cost of a Clean Environment*, Report of the Administrator of the EPA to the Congress of the U.S. [EPA-230-11-90-083] (Washington, D.C.: 1990). See http://www.epa.gov/docs/oppe/eaed/eedhmpg.htm for other EPA reports on costs.

[4]Christine R. Vogan, "Pollution Abatement and Control Expenditures, 1972-1994," *Survey of Current Business* (Sept. 1996), 48. The pollution abatement cost programs were among several that were canceled or scaled back during reallocation of resources.

[5]The nonmanufacturing petroleum sector includes drilling and retail marketing, while the manufacturing petroleum sector includes primarily refining.

[6]U.S. Congress, Office of Technology Assessment, *Industry, Technology, and the Environment: Competitive Challenges and Business Opportunities*, OTA-ITE-586 (Washington, D.C.: U.S. Govt. Print. Off., 1994), pp. 222-225.

From the extensive data reported in the BOC survey, two kinds of figures stand out. First—and often the only question asked of these data—are the total costs of pollution abatement. The BOC's 1994 survey identified pollution abatement capital expenditures of $7.88 billion for manufacturing establishments and $8.92 billion for nonmanufacturing establishments (see tables 1&2); plus operating costs for manufacturing establishments amounting to $20.67 billion (see table 1)—however, BOC included depreciation in operating costs. Net operating costs[7] for U.S. manufacturers totaled $14.1 billion (see table 3). This gives a grand 1994 total of $30.9 billion.

Second, within these totals, expenditures concentrate in a few geographic areas and industrial sectors. For 1994, Texas, California, and Louisiana accounted for approximately 35% of pollution abatement capital expenditures. At the same time, four major industry groups—chemicals and allied products, petroleum and coal products, paper and allied products, and primary metal industries—accounted for approximately 73% of new capital expenditures; similarly, pollution control costs were significantly higher for a number of subsectors than for an industry group—for example, the proportion of capital expenditures

Table 1: Manufacturing Pollution Abatement Costs and Expenditures: 1994
(millions of 1994 dollars)

	Manufacturing	
	Capital	Operating (incl. depreciation)
Air	$4,311	$6,139
Water	2,430	7,031
Solid/contained Waste	838	5,601
Nonmedia/other	302	1,899
TOTAL	$7,880	$20,669

SOURCE: U.S. Bureau of Census; Current Industrial Reports; MA200(94-1) *Pollution Abatement Costs and Expenditures, 1994* (Washington, D.C.: U.S. Govt. Print. Off., 1996), p. 3.

Table 2: Nonmanufacturing Capital Expenditures for Pollution Abatement: 1994
(millions of 1994 dollars)

	Nonmanufacturing		
	Mining	Petroleum	Electric Utilities
Air	$ 131	$2,628	$3,145
Water	191	1,114	606
Solid/contained Waste	113	449	428
Nonmedia/other	116	473	170
TOTAL	$ 551	$4,189	$4,179

SOURCE: U.S. Bureau of Census; Current Industrial Reports; MA200(94-1) *Pollution Abatement Costs and Expenditures, 1994* (Washington, D.C.: U.S. Govt. Print. Off., 1996), Table 14, p. 71.

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[7]OTA, p. 189, note 4 discusses netting operating costs.

for pollution control by pulp mills was three times that by the paper industry as a whole (see table 3). Total compliance costs—capital costs plus net operating costs (not including recovered costs and depreciation) also vary substantially among industries. The OTA analysis suggests that share of value added may be the most accurate measure of environmental regulatory burden—since it measures the level of economic activity performed by the establishment, and does not include the cost of materials purchased.[8] By this measure, petroleum refining bears the largest burden of pollution control requirements (table 3).

National Pollution Abatement and Control Expenditures

BEA's annual "Pollution Abatement and Control Expenditures" analysis, which appeared in *Survey of Current Business*, takes a broader look at the nation's pollution control costs. It examines spending for pollution abatement across all sectors of the economy, including personal consumption, business, and government; it also breaks down data by media—air, water, solid wastes, and other. Surveys, including the BOC survey of manufacturing costs, are sources of nearly two-thirds the data; indirect sources and estimates account for the remainder. The primary values of the BEA analysis have been its comprehensiveness and its consistent time-series data, which cover the period 1972-1994. Overall, the BEA analysis shows the nation spent $121.8 billion for pollution abatement and control in 1994, or about 1.76% of Gross Domestic Product. This represented an increase of 3.1% over 1993; the largest increase was for air pollution control, largely to implement the 1990 Clean Air Act Amendments (CAAA).

In terms of evaluating who pays for pollution control, one characteristic of the BEA analysis can be misleading: it attributes pollution control costs to the sector that performs, rather than pays for, the air or water pollution abatement or the solid waste collection and disposal. In response to questions about who bears the costs of pollution control, both CRS and OTA have in earlier years reanalyzed the BEA data to transfer certain costs from those who performed pollution control to those who paid for it. The primary shift was to move costs of private septic systems and sewer connections to personal consumption from business. This reanalysis has been repeated here, adapting slightly the method used by OTA[9] (see table 4). This indicates 1994 personal consumption expenditures for pollution control were $22.2 billion, government $35 billion, and business $64.7 billion.

Pollution Control Cost Data in the Future

The end of the BOC survey and the BEA analysis diminishes the limited data on pollution control costs and adds to the difficulty of fulfilling mandates for improved cost analyses of environmental regulations. For example, EPA's report, *The Benefits and Costs of the Clean Air Act, 1970-1990* [1996], the first in a series required by the 1990 CAAA, relied heavily on BOC and BEA data; sources of cost data when EPA extends its analysis beyond 1994 are problematic. Congress has recently enacted requirements for cost-benefit analyses of other regulations, as well. Even if new data sources for pollution control costs emerge, demonstrating reliability and establishing continuity will take time.

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[8]OTA, p. 191.

[9]OTA, Table 7-1, p. 190.

Table 3: Manufacturing Pollution Abatement Costs & Expenditures by Industry: 1994[a]
(millions of 1994 dollars)

Industry (SIC Code)[b]	Capital Expenditures		Net Pollution Abatement Operating Costs[c]	Total Pollution Control Expenditures[d]		
	$ millions	% of Total Capital Expenditures	$ millions	$ millions	% of Value of Shipments	% of Value Added
Food (20)	$ 284	2.90%	$1,216	$1,500	0.36%	0.90%
Tobacco (21)	3	0.78	26	29	0.10	0.13
Textile (22)	67	2.38	273	340	0.46	0.11
Apparel (23)	NA[e]	NA	NA	NA	NA	NA
Lumber (24)	163	8.31	275	438	0.52	1.34
Furniture (25)	72	7.63	112	184	0.40	0.79
Paper (26)	648	9.14	1,194	1,842	1.31	2.95
Pulp Mills (261)	*73*	*29.32*	*104*	*177*	*4.08*	*9.38*
Printing (27)	59	1.17	144	203	0.13	0.19
Chemical (28)	2,034	13.50	3,396	5,430	1.70	3.12
Inorg . Chem. (281)	*155*	*12.83*	*461*	*616*	*2.70*	*4.48*
Petroleum (29)	2,587	46.94	2,051	4,638	3.31	17.07
Rubber (30)	87	1.57	343	430	0.34	0.65
Leather (31)	6	4.83	51	57	0.64	1.31
Stone & glass (32)	217	8.44	438	655	1.70	1.89
Primary Metal (33)	446	6.90	1,765	2,211	1.46	3.68
Blast furnace (331)	*231*	*7.36*	*1,020*	*1,251*	*1.81*	*4.56*
Fabricated Metal (34)	159	3.35	673	832	0.48	0.94
Plating (3471)	*12*	*8.39*	*136*	*148*	*3.58*	*5.20*
Machinery (35)	297	3.47	365	662	0.23	0.45
Electronic (36)	294	2.38	598	892	NA	NA
Transportation (37)	351	3.01	856	1,207	0.27	0.72
Motor vehicles (371)	*233*	*2.68*	*519*	*752*	*0.17*	*0.51*
Instruments (38)	88	2.15	250	338	0.25	0.38
Miscellaneous (39)	18	2.02	79	97	0.26	0.46
TOTAL U.S. Manufacturers	$7,880	7.40%	$14,105	$21,985	0.71%	1.48%

[a] This table lists expenditures and costs reported by industry to the U.S. Census Bureau. It parallels Table 7-2 in U.S. Congress, Office of Technology Assessment, *Industry, Technology, and the Environment: Competitive Challenges and Business Opportunities*, OTA-ITE-586 (Washington, D.C.: U.S. Government Printing Office, 1994), p. 193, which provides figures for 1991. As discussed by OTA, these data may underreport actual costs, possibly by as much as 20 to 30 percent.

[b] Pollution abatement and control costs data are only for establishments with 20 employees or more. To ensure comparability, total capital expenditures, value-added, and value of shipments were estimated for establishments of 20 employees or more, using ratios from 1992, the most recent year the Census provides data for.

[c] Net Pollution Abatement Operating Costs = Total pollution abatement operating costs including payments to governmental units minus costs recovered and equipment depreciation.

[d] Total Pollution Control Expenditures = Total pollution abatement operating costs including payments to governmental units plus total pollution abatement capital expenditures minus costs recovered and equipment depreciation.

[e] NA = Not Available

SOURCES: U.S. Bureau of the Census, Current Industrial Reports; MA200(94)-1; *Pollution Abatement Costs and Expenditures: 1994* (Washington, D.C.: U.S. Government Printing Office, 1996). U.S. Bureau of the Census, 1994 Annual Survey of Manufacturers; M94(AS)-1; *Statistics for Industry Groups and Industries* (Washington, D.C.: U.S. Government Printing Office, 1996).

Table 4: Sector Spending on Pollution Abatement and Control, 1991-1994[a]

(millions of current dollars)

Sector	1991	1992	1993	1994
Personal Consumption				
Air (motor vehicles)[b]	$ 7,425	$ 7,897	$ 8,436	$ 9,756
Sewage treatment[c]	10,995	11,310	11,596	12,394
Subtotal - Personal Consumption	18,420	19,207	20,032	22,150
Government				
Direct expenses[d]	25,229	26,639	28,394	31,234
Regulation & monitoring	2,288	2,604	2,343	2,201
R & D	633	1,015	1,133	1,304
Other	174	204	154	220
Subtotal - Government	28,324	30,462	32,024	34,959
Business				
Plant & Equipment	44,133	48,519	50,636	55,369
Capital	14,173	16,150	17,478	19,094
Operating	31,531	34,325	34,770	38,008
Costs recovered	(1,571)	(1,956)	(1,612)	(1,733)
Motor Vehicles[b]	5,793	5,892	6,625	8,649
R & D	1,235	546	736	685
Subtotal - Business	51,161	54,957	57,997	64,703
TOTAL	$97,905	$104,626	$110,053	$121,812

[a] This table rearranges data from the Bureau of Economic Analysis (BEA); it is similar to Table 7-1 in U.S. Congress, Office of Technology Assessment, *Industry, Technology, and the Environment: Competitive Challenges and Business Opportunities*, OTA-ITE-586 (Washington, D.C.: U.S. Government Printing Office, 1994), p. 190, which provides figures for 1991 (differences for 1991 between this table and OTA's derive from slight changes in the method of calculating and from BEA revisions to 1991 data in later years.

[b] BEA divides the costs of mobile source pollution control between personal consumption and business.

[c] Includes private septic systems and sewer connections linking household plumbing to street sewers, and household payments for sewage treatment.

[d] Includes primarily capital expenditures for sewage treatment facilities.

SOURCE: Christine R. Vogan, "Pollution Abatement and Control Expenditures, 1972-1994," *Survey of Current Business* (September 1996), 48-62.