

Draft Final Report.

The Cost of Environmental Protection:
EPA, the States, and Local Governments

Submitted to:

U.S. Environmental Protection Agency
Office of the Comptroller

Submitted by:

 APOGEE RESEARCH, INC.

April 7, 1989

ACKNOWLEDGEMENTS

This paper was written by Lynne Abdel-Megeid and Kenneth I. Rubin of Apogee Research. Many at Apogee contributed to the collection, analysis, and graphical interpretation of our data base on environmental expenditures including: Russ Brodie, Amy Doll, Lori Hyman, Sonny Jose, Neil Tender, and Jordan Ellenberg. John Cromwell of Wade Miller Associates, Inc. provided insightful text and comprehensive analysis of public and private expenditures under the drinking water program. Paul Scodari of the Environmental Law Institute provided estimates of the costs of all new environmental regulations. The authors wish to thank the following EPA officials for their constructive comments on early drafts: David Osterman, Tim McProuty, Peg Binney, Skip Luken, Bill O'Neil, Brett Snyder, and Alan Carlin.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAY 04 1989

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MEMORANDUM

SUBJECT: Cost of Environmental Protection - Draft Report

FROM: David P. Ryan
Comptroller

TO: Steering Committee on Public-Private Partnerships
Task Force on Public-Private Partnerships
Assistant Administrators
Regional Administrators
Assistant Regional Administrators
OARM Office Directors

As we discussed in earlier meetings, one objective of the Public-Private Partnerships initiative is to document the current and future costs of environmental protection to determine funding needs. Accordingly, I am pleased to provide you with this draft report entitled "The Cost of Environmental Protection: EPA, the States and Local Governments" prepared by Apogee Research, Inc. for your review and comment.

Purpose of the Study

This study documents the costs of environmental protection for the public sector and uses the data to:

- o Examine the growing gap between current expenditures and future costs of environmental protection;
- o Assess trends in the distribution of costs among EPA, states and local governments; and
- o Identify the financial impact of environmental programs on local governments, capital markets, and households.

Costs Examined

The study examines spending data for environmental programs during 1981-1987 and projects them to the year 2000. This projection estimates the future costs of maintaining existing standards at 1987 levels of compliance.

It also incorporates the findings of the municipal sector study. That study examined the future cost impact of 22 new environmental regulations on municipalities. Both studies will serve as building blocks for future EPA "Cost of Clean" reports.

Major Findings

1. The gap between current spending (1987) and future costs is estimated to grow to nearly \$ 21 billion by the year 2000.
 - Of this, \$ 15.6B will be needed by governments to maintain 1987 levels of compliance levels for existing standards.
 - And, \$ 5.3B will be needed by local governments to comply with 22 new environmental standards.
2. There will be a shift in who pays for environmental protection between the federal and local levels.
 - For the period from 1981-2000, federal spending will decline by about one-third, while local spending will nearly double.
3. To accommodate these growing costs; by the year 2000, the average family will need to spend more on environmental services.
 - Specifically, average costs will increase by 54%, from \$419 per household in 1987 to \$647 per household in 2000.
 - This represents an increase from 1.3 to 1.8 percent of average household income.
 - During the same period, household costs in small communities (population under 500) will double.

Implications of the Report

Although it is clear that the cost of environmental services will increase in the future, this may be mitigated by a number of factors. First, the higher cost must be viewed in the context of expected cost increases for other commodities such as energy, transportation and food. Second, it should also be recognized that a portion of the increase will be covered by increases in future revenues resulting from economic growth. Third, the development of new technologies may reduce the costs of providing environmental protection. Finally, costs can be reduced by implementing more innovative and efficient ways of financing environmental activities.

Public-private partnerships are one such innovative and efficient way to finance these activities, particularly at the local level. By reducing costs and freeing up resources for other investments, these partnerships can increase the public monies available for meeting environmental needs.

Next Steps

- o Revise draft "Cost of Environmental Protection Report" based on comments received.
- o Consolidate data from this report with data collected on private sector costs and incorporate analyses into OPPE's Congressionally-mandated "Cost of Clean" reports.
- o Conduct additional Sector Studies at the state and local levels (OPPE).

Comments

Please provide any comments you have on the draft report by May 24, 1989 to David Osterman, PM 225 or E-Mail 3720. Thank you for your continuing cooperation and assistance in working to assure the success of the Public-Private Partnerships initiative.

Attachment

Note:

**All spending figures in this report are
presented in 1988 dollars unless
otherwise noted**

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EXECUTIVE SUMMARY

Since the early 1970s, the U.S. Environmental Protection Agency (EPA) has overseen a national mandate to restore and protect our water, land and air resources. In this massive undertaking, EPA has relied heavily on state and local governments to help administer programs and to expend resources to comply with requirements. However, the expanded programs and tightened controls of the environmental legislation enacted in the 1980s challenge our ability to pay for future environmental needs.

PURPOSE OF THE STUDY

This study documents the costs of environmental protection for EPA, states, and local governments and uses these data to:

- o Examine the growing gap between current expenditures and future costs of environmental protection
- o Assess trends in the distribution of costs among EPA, states, and local governments
- o Identify the cost impacts of environmental policies on local governments, capital markets, and households

WHAT COSTS ARE EXAMINED?

This report examines environmental expenditures over the period 1981-1987 and projects them to the year 2000. These projections are estimates of the future costs of maintaining existing environmental standards, assuming the same level of compliance as in 1987. In addition, the report examines local costs of new environmental regulations that local governments will bear in the future.

The report complements the work of the Municipal Sector Study recently completed by EPA.¹ The Sector Study examined the future costs of 22 new environmental regulations and their impacts on municipalities. Both studies will serve as building blocks for the

¹The Municipal Sector Study: Impacts of Environmental Regulations on Municipalities, Office of Policy Planning and Evaluation, U.S. Environmental Protection Agency (September 1988). See Appendix 3 for an explanation of the differences between the methodology and content of the Sector Study and this report.

Agency's upcoming "Cost of Clean" report.²

SPENDING WILL HAVE TO INCREASE SIGNIFICANTLY TO MAINTAIN CURRENT PROGRAMS

In 1987, EPA, states, and local governments spent \$40 billion for environmental protection, compared to \$31 billion a year a decade earlier. If recent trends continue, they will need to spend over \$55 billion in the year 2000 just to maintain 1987 levels of environmental quality.

THE GAP BETWEEN CURRENT SPENDING AND FUTURE COSTS IS ESTIMATED TO BE NEARLY \$21 BILLION A YEAR BY THE YEAR 2000

Spending trends reveal two important cost gaps. The first, about \$15.6 a year by the year 2000, is the amount of government spending needed, in addition to 1987 expenditures, to maintain 1987 levels of environmental quality. The second, \$5.3 billion a year in 2000, is the amount of local government spending needed to comply with the new environmental regulations examined in this study.

Together these gaps represent a difference of nearly \$21 billion between what governments spent in 1987 and what we expect them to spend by 2000 for environmental protection. The gap could narrow if we are more efficient in meeting environmental goals. However, these estimates are conservative since they do not include the costs to EPA and states of new regulations or the costs associated with future Congressional mandates and the growing number of new state and local environmental mandates.

SPENDING FOR WATER QUALITY WILL INCREASE MORE SLOWLY THAN FOR DRINKING WATER AND SOLID WASTE

With the exception of the air quality program, expenditures to maintain current levels of environmental quality have steadily increased in the 1980s and are expected to continue to do so in the 1990s. Spending for some programs, however, will increase more than others.

In the 1990s, increases in government spending for water quality are not expected to keep pace with rates of growth in other environmental programs. Between 1987 and 2000, spending for

²The Clean Air and Water Acts require that EPA prepare a Report to Congress every five years estimating the costs of carrying out the respective acts. The next report will be submitted in 1989.

38 percent, respectively. Spending for water quality will increase by 24 percent.

THE LOCAL SHARE OF PUBLIC ENVIRONMENTAL SPENDING WILL INCREASE

Local spending is projected to increase significantly by the turn of the century. In 1981, local spending was about \$26 billion, or 76 percent of the government share of environmental costs. By the year 2000, localities will need to spend over \$48 billion to maintain 1987 levels of environmental quality and will bear 87 percent of government costs for environmental protection.

In contrast, EPA expenditures are expected to decline by about one-third, from \$6.3 billion in 1981 to \$4.3 billion in 2000. EPA's share of spending on the environment will drop from 13 to 8 percent between 1987 and 2000. This drop is due largely to the phasing-out of EPA grants to build wastewater treatment plants.

Although little is known about future state outlays for environmental programs, trends identified in a recent EPA study suggest that by the year 2000 states will need to spend more than twice the amount spent in 1987 to administer water programs.³ State administrative costs could triple by 2000 if the air and solid waste programs impose similar demands.

LOCAL DEMANDS FOR CAPITAL ARE PROJECTED TO DOUBLE (1981-2000)

The key issue in examining the impact of environmental spending on capital markets is the ability of local governments to support higher levels of capital formation. We project that annual local demands for capital to maintain current levels of environmental quality could double from about \$8 billion in 1981 to over \$16 billion in 2000. Additional demands for capital imposed by new regulations will add more than \$2 billion a year by 2000. EPA analyses indicate that increased levels of capital formation may prove difficult for many small and medium-sized cities.

HOUSEHOLD COSTS IN SMALL COMMUNITIES WILL INCREASE DRAMATICALLY

Costs to households of environmental regulations are measured by increased user charges, increased general taxes, and/or reduced levels of services in other municipal programs. There are also

³State Funding Study, Details of State Needs, Funding, Funding Gap, U.S. Environmental Protection Agency (August 8, 1988). Trends in the State Funding Study were extended from 1995 to 2000 in order to provide consistent data for this report.

levels of services in other municipal programs. There are also indirect costs, such as when private industries pass their share of environmental costs to households in the form of price increases for goods and services.

The annual cost of environmental programs for the average household is expected to increase by 54 percent from \$419 in 1987 to \$647 in 2000. Over the same period, however, household costs for small cities are expected to increase more dramatically. In cities with fewer than 500 people, they will more than double, from \$670 in 1987 to \$1,580 in 2000.

The financial impact of environmental costs on households can be examined by measuring costs as a percentage of household income. The results show a significant impact on households in small cities (less than 500 population), for whom expenditures are expected to increase from 2.8 percent to 5.6 percent of household income between 1987 and 2000. On average, impacts are much less for households in all other city size categories, with projected increases of about one-half percentage point to 1.8 percent of household income by the year 2000.

WHERE DO WE GO FROM HERE?

The growing costs of environmental protection suggest the need to reexamine how we make such investments. The large differences between current spending and future costs clearly indicate the need for more innovative ways to finance environmental programs, particularly at the local level.

One way to meet this challenge is to charge more and spend more on environmental services. On the other hand, we could reduce costs by limiting environmental goals. However, increased public support for a cleaner environment suggests that expenditures will increase, not decline.

EPA is studying a third option, forming public-private partnerships to help provide environmental services. Greater private involvement can increase public resources available for environmental protection in at least two ways:

- o Private equity can free municipal resources for other investments, and
- o Even without private financing, properly designed and executed partnerships can provide improved environmental services at the lowest possible cost to the public

We must seek innovative financing strategies, particularly at the local level, to meet the environmental resource challenges facing this country in the 1990s and beyond. This is absolutely

necessary if we are to preserve and build on the many important, hard-won environmental gains made during the past two decades.

CHAPTER I

INTRODUCTION AND METHODOLOGY

Since the early 1970s, the U.S. Environmental Protection Agency (EPA) has overseen our national mandate to restore and protect water, land, and air resources. Carrying out this mandate has proven expensive for all levels of government.

Faced with escalating environmental protection costs in competition with the fiscal pressures attributable to other public programs, governments may be limited in their ability to finance all the environmental protection activities anticipated by Congress. The largest problems lie with local governments that have low economies of scale in provision of environmental services and limited ability to raise large amounts of capital.

This study documents recent government expenditures for environmental protection and projects future costs to the year 2000. Costs associated with new regulations are added to the costs of maintaining current levels of environmental quality in order to examine the growing gap between current expenditures and future costs of environmental protection. In turn, trends in the distribution of costs among EPA, states and local governments are assessed. Finally, the impacts of environmental policies on local governments, capital markets, and households are analyzed.

Trends in the expenditures of local governments and impacts at the local level are examined in more detail than for other levels of government because more local data are available at this time.⁴ This analysis provides background for a separate evaluation of financing alternatives to meet the rising cost of environmental protection.⁵

While this report focuses on the costs of environmental regulations and the ability of local governments and households to pay for environmental improvements, investments in environmental quality yield substantial benefits. Those cited most often include

⁴EPA is collecting data for the 1989 Report to Congress, The Cost of Clean Air and Water. In addition to the data provided in the present report, The Cost of Clean Air and Water will include federal non-EPA expenditures and environmental expenditures by private industry associated with current and new regulations.

⁵Apogee Research, Inc., Public-Private Partnerships for Environmental Services: Anatomy, Incentives, and Impediments, prepared for the U.S. Environmental Protection Agency, Office of the Comptroller, Resource Management Division (October 17, 1988).

reduced incidence of disease and death, reduced property damages, increased levels of recreation, improved fish and shellfish yields, enhanced property values, and related aesthetic improvements. Investments in the environment also yield stronger local economies.

While such an analysis lies beyond the scope of this study, understanding the links between such investments and community well-being is important in helping identify financing alternatives to support environmental programs.

DEFINITION OF EXPENDITURES

The terms expenditures, spending, and outlays are used interchangeably in this report. They follow the definition of expenditures used by the Bureau of the Census. Capital expenditures include acquisitions of depreciable plant and equipment, replacement, and expansion as well as expenditures for construction in progress. Research and development spending is excluded.

Operating and maintenance expenditures account for the purchase of materials, parts, supplies, fuel, and power; upkeep or leasing of equipment; direct labor; and purchased contract services. Depreciation of plant and equipment are excluded, as are the costs of financing capital equipment.

This report examines two kinds of expenditures: (1) those to maintain the current levels of environmental quality and (2) those to comply with new regulations.

WHICH ENVIRONMENTAL SERVICES, REGULATIONS, AND SECTORS ARE INCLUDED?

Following is an explanation of the environmental expenditures included and sectors for which data are available. Expenditures to maintain current levels of environmental quality are more comprehensive because cost estimates for new regulations are available only for local governments.

Calculating Expenditures to Maintain Current Levels of Environmental Quality

A. Environmental Services

- o Wastewater Treatment - expenditures pursuant to the Clean Water Act, including expenditures for construction, management, and operation of facilities to monitor and control municipal and industrial wastewater

- o Drinking Water - expenditures pursuant to the Safe Drinking Water Act plus expenditures to supply adequate quantities of potable water
- o Solid Waste - expenditures pursuant to Subtitle D of the Resource Conservation and Recovery Act (RCRA) plus expenditures for solid waste collection, transportation, and disposal services
- o Hazardous Waste - expenditures pursuant to RCRA, exclusive of those for Subtitle D
- o Superfund - expenditures pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
- o Air Quality - expenditures pursuant to the Clean Air Act
- o Toxic Substances - expenditures pursuant to the Toxic Substances Control Act (TSCA)
- o Pesticides - expenditures pursuant to the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
- o Energy - expenditures pursuant to the Energy Security Act

In addition, this study covers several EPA program areas that are administered independently of the above programs, including management and support, interdisciplinary, radiation, and the Leaking Underground Storage Tank Trust Fund.

B. Sectors

Expenditures to maintain current levels of environmental quality include those by EPA, states, and local governments, as currently available in public budgets and national aggregate statistics. Although a major effort was made to include most of the relevant costs, several gaps in the data were unavoidable. Expenditures that are included in this study and those that we were not able to gather at this time are summarized below by sector.

Federal. At the federal level, this study includes only programs managed by the EPA, although other federal agencies administer similar programs. EPA expenditures by program area were derived from the agency's annual budget justification documents.⁶

⁶The following programs are included: construction grants, water quality, hazardous waste, solid waste, Superfund, air quality, drinking water, toxic substances, pesticides, energy, radiation, underground storage tanks, management and support, and interdisciplinary.

State Governments. The Bureau of the Census collects the only consistent data on state expenditures to administer air, drinking water, and wastewater treatment programs. They are reproduced in this study as provided by Census. Expenditures for leaking underground storage tank and hazardous waste programs were estimated from the requirements to match federal grants. For each of these program areas, it is impossible to distinguish among the various types of state expenditures, such as program administration, assistance to local governments, compliance, and intergovernmental coordination. At this time, we are unable to gather consistent time-series data on state expenditures for solid waste, Superfund, or hazardous waste programs.

Local Governments. Local expenditures are also reproduced from Census reports, although the figures for intergovernmental grants to localities have been removed in this study, leaving only local spending from own sources. Expenditures are included for drinking water, wastewater treatment, and solid waste management services. While local expenditures for other programs are not reported to the Bureau of the Census in separate categories, they may be reported under one of the above categories.

Local capital and operating expenditures for drinking water and solid waste management cover both the delivery of adequate quantities of services (water flows to meet all demands; adequate garbage removal and disposal) and the assurance of mandated quality of services (maximum concentration of pollutants in potable water; testing and containment in landfills). To be fair in a comparison of the effects of future regulations, one might argue that the appropriate baseline is quality expenditures, exclusive of those to deliver adequate quantities. While arguably appropriate, the data were not sufficiently detailed to separate expenditures for quantity from those for quality of service. Therefore, in projecting the cost of maintaining current programs, both of these components were included.

Calculating Local Environmental Costs Associated With New Regulations

In this report, costs of new regulations include only those for local governments. The new regulations considered in the study are associated with local wastewater treatment, drinking water, and solid waste programs. In addition, estimates of costs are provided for several other regulations that are independent of these program areas. In total, costs were estimated for 22 new regulations (see Table 1).

The estimated local costs of new regulations were derived from Regulatory Impact Analyses (RIAs) prepared for EPA program offices. These estimates are conservative for a number of reasons. First,

Table 1. New Regulations That Impose Local Costs
(Included in the Cost Analysis)

Regulation	Status
A. DRINKING WATER	
1. Inorganic Compounds (IOCs)	In Development
2. Synthetic Organic Compounds (SOCs)	In Development
3. Volatile Organic Compounds (VOCs)	Promulgated
4. Fluorides	Promulgated
5. Lead and Copper Corrosion Control	Proposed
6. Lead and Copper MCL	Proposed
7. Coliform Monitoring	Proposed
8. Surface Water Treatment Rule: Filtered	Proposed
9. Surface Water Treatment Rule: Unfiltered	Proposed
10. Radionuclides	In Development
11. Disinfection	In Development
B. WASTEWATER TREATMENT	
1. Secondary Treatment of Municipal Wastewater	Promulgated
2. Pretreatment Requirements	Promulgated
3. Sewage Sludge Disposal- Technical Regulations for Use and Disposal	In Development
4. Stormwater Management	In Development
C. SOLID WASTE DISPOSAL	
1. Municipal Landfill Subtitle D Criteria	Proposed
2. Municipal Waste Combusters Air Standards	In Development
3. Municipal Waste Combusters Ash Disposal	In Development
D. MISCELLANEOUS REGULATIONS	
1. Underground Storage Tanks Technical Standards	Promulgated
2. Underground Storage Tanks Financial Standards	In Development
3. Asbestos in Schools Rule	Promulgated
4. SARA Title III Requirements	Promulgated

of the 37 pending regulations with an impact for local governments, only 22 had sufficiently precise cost estimates for inclusion in this study.⁷ Second, when RIAs estimate capital costs, they generally include only the installed cost of plant and equipment. When these investments are financed with municipal or industrial bonds or loans, transaction costs can add 20 percent or more to the capital cost estimates. Moreover, this study cannot account for several regulations that are currently under development pursuant to the federal environmental statutes reauthorized in the mid-1980s.⁸ Also, several major programs will be reauthorized in the next few years including RCRA and the Clean Air Act. New costs associated with these programs could be significant. Finally, this study does not incorporate the cost of new state environmental regulations that would impose costs in addition to those attributable to federal regulations.

How Future Costs Were Derived

Current Regulations. The future costs of maintaining today's level of environmental quality were estimated for each program area and level of government by regressing five years of historical trends in spending against time. This assumes that the factors contributing to recent spending trends will continue to do so in the future. Such factors include population growth, the implementation of current policies, rates of compliance, replacement of current capital facilities, and budget cutbacks. Significant changes in any of these factors could have an important effect on costs. For example, rates of compliance are related to enforcement efforts. If enforcement activities increase, then costs would be expected to increase as a result of higher rates of compliance. Full compliance is assumed in estimating costs of new regulations.

New Regulations. The costs and timing of new regulations with an impact on local governments were estimated based on information included in Regulatory Impact Analyses (RIAs) prepared for EPA's program offices. The Environmental Law Institute, which provided all estimates on future costs, chose to represent demands for capital attributable to each new regulation either as a single lump sum in the year in which capital will first be required or spread out in equal lumps over a relatively short average time during which affected entities comply with programs. This method

⁷Appendix 1 to this report presents a list of the pending regulations applicable to local governments but not included in the cost analysis.

⁸Including the 1984 Hazardous and Solid Waste Amendments to the Resource Conservation and Recovery Act (HSWA), the 1986 Superfund amendments (SARA), the 1986 Safe Drinking Water Act amendments, and the 1987 amendments to the Clean Water Act.

of estimating demand for capital results in graphs showing erratic changes from year to year. In practice, regulations will phase in, imposing smoother demands for capital over a 5 to 10 year compliance period.

COST ACCOUNTING PRINCIPLES USED IN THIS STUDY

This report presents three views of the costs of environmental protection:

- o A budgetary perspective that accounts for capital and operating outlays in the year they are incurred as reported in federal, state, and local budgets
- o A capital markets perspective that isolates demands for capital to build new facilities or expand existing facilities to comply with environmental and service standards
- o A household impacts perspective that accounts for capital expenditures as if they were financed with long-term bonds, with annualized payments for capital added to annual local operating and maintenance payments

Each view provides insights that may be significant to different audiences. The details associated with each perspective are discussed in subsequent chapters.

CHAPTER II

OVERVIEW -- THE COST OF ENVIRONMENTAL PROTECTION

Under Congress's statutory direction, the EPA has expended considerable resources to develop the components of broad national programs, including minimum national standards for environmental quality, permit systems, enforcement procedures, and remediation protocols. By offering grants and other forms of assistance, EPA has encouraged states to help implement our national programs. Most states, however, have also committed their own resources to administer the basic programs and others that reach beyond minimum federal standards. Despite federal and state grants to localities, local governments that provide drinking water, wastewater, and solid waste management services have contributed much of the cost to build capital facilities and almost all of the cost to operate and maintain them.

This chapter provides an overview of environmental expenditures from 1981 to 2000, both to maintain current levels of environmental quality and to meet standards associated with new regulations. Expenditures are examined by program and by sector.

THE COST OF CURRENT ENVIRONMENTAL REGULATIONS AND SERVICES

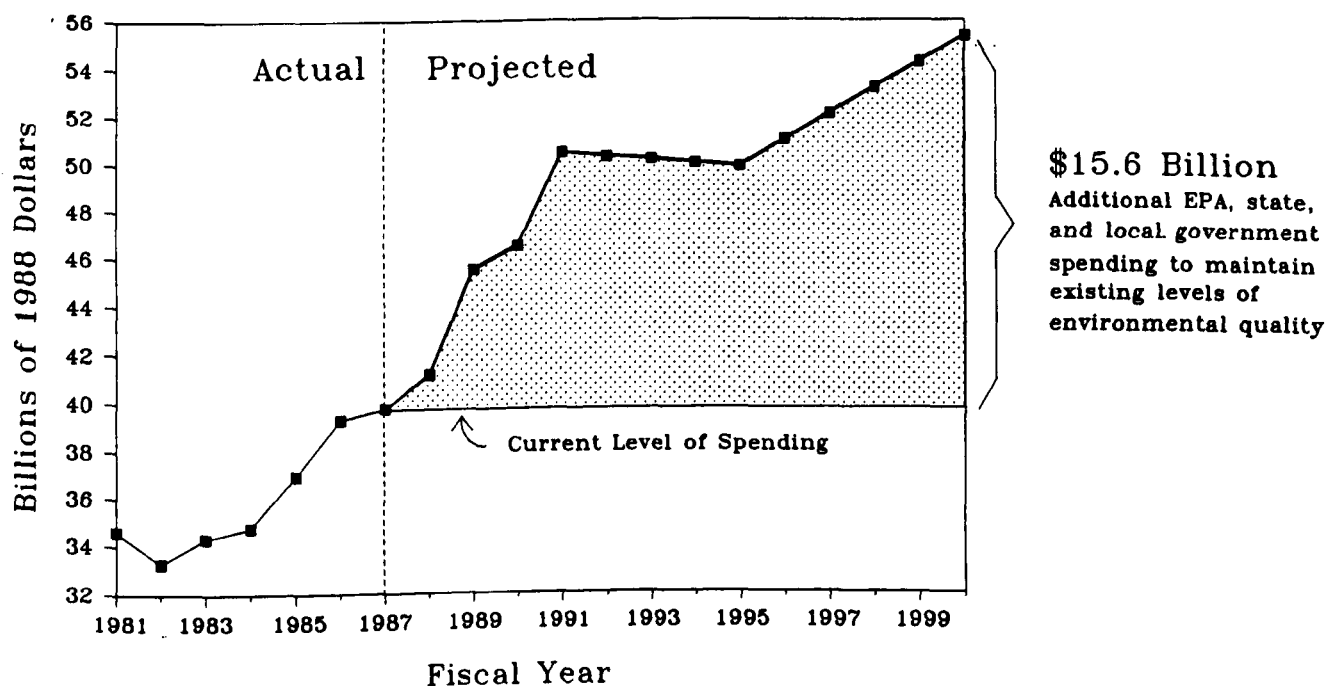
In 1987, EPA, states, and local governments spent an estimated \$40 billion for environmental protection (see Figure 1). If recent trends continue, environmental expenditures by all levels of government are expected to increase to \$55 billion in the year 2000 just to maintain current levels of environmental quality. Extending current trends assumes, of course, that recent levels of compliance and rates of capital expansion and replacement remain steady throughout the projection period.

The capital portion of these expenditure estimates may be low if, as some experts argue, future spending will have to be higher to recover from the effects of deferred maintenance and rehabilitation. For this report, it was assumed that rehabilitation and maintenance of capital plant would be undertaken at the same rate as in recent years.⁹ If spending for maintenance and

⁹National Council on Public Works Improvement, Fragile Foundations: A Report on the Nation's Public Works (February 1988). The National Council on Public Works Improvement reported a steady increase in net depreciated capital assets from 1960 to 1987 for drinking water and wastewater treatment services, with asset bases increasing by 2.5 percent each year for drinking water and by 4.4 percent each year for wastewater treatment. While some of this investment is due to higher quantity and levels of service, it is clear that new additions to the capital stock have outpaced the depreciation of existing plant and equipment.

Figure 1

Projected EPA, State, and Local Government Expenditures to Maintain Existing Levels of Environmental Quality Compared to Their Current Environmental Expenditures



Source: Apogee Research from: U.S. Bureau of the Census, Government Finances (various years); Bureau of Economic Analysis, Pollution Abatement and Control Expenditures (various years); Bureau of the Census, Pollution Abatement Cost and Expenditure Survey (various years); U.S.EPA, Justification of Appropriation Estimates for Committee on Appropriations (various years).

rehabilitation has indeed been inadequate in the past, then incorporating the historical trend of capital outlays in the forecast of future costs embodies the assumption that the backlog of infrastructure rehabilitation needs will continue to grow. Capital expenditure estimates are particularly important for drinking water and water quality because of the large amount of capital plant associated with these services.

Expenditure Trends by Environmental Program

With the exception of the air quality program, expenditures to maintain current levels of environmental quality have steadily increased in the 1980s and are expected to continue to do so in the 1990s (see Figure 2).¹⁰ Rapid growth in spending for "other" environmental programs is attributable largely to steady increases in Superfund program activities.¹¹ Spending in some programs, however, will increase more substantially than in others (see Figure 3). While spending for drinking water and solid waste programs will increase as a percentage of the total, water quality expenditures will decrease as a percentage of total spending.

Water Quality. In the 1980s, governments devoted roughly \$16 billion a year, or 46 percent of all environmental expenditures, to restore the quality of surface and ground water. Most of the \$16 billion was used to build and operate municipal wastewater treatment plants. In the 1990s, increases in national spending for water quality are not expected to keep pace with rates of growth in other environmental programs. Thus, compared to its 46 percent share in 1981, water quality expenditures could drop to a 36 percent share of environmental expenditures by the year 2000. Future water quality expenditures to maintain current levels of water quality will be dominated by costs of building new or upgrading existing facilities to provide secondary treatment as required in the Clean Water Act (CWA). EPA estimated in 1988 that \$83.5 billion in capital expenditures would be required to bring all municipal wastewater treatment facilities into compliance with

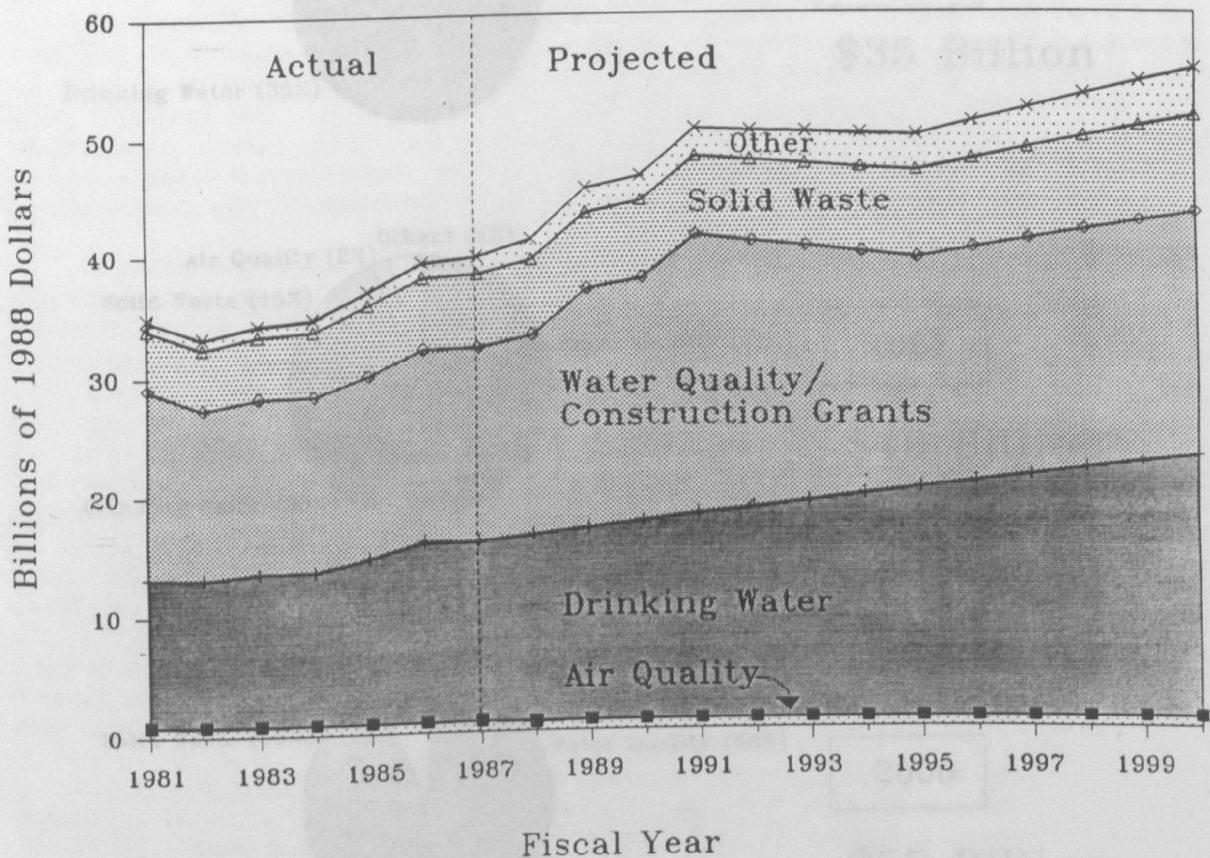
¹⁰The Clean Air Act was last reauthorized in 1976 and most of the regulations attributable to the clean air program have had their major cost effects already. Congress is now debating a new Clean Air Act, which undoubtedly will impose new costs on governments and the private sector. That these costs cannot be included in this study probably underestimates the projected outlays for air quality control.

¹¹The "other" category also includes the Leaking Underground Storage Tank Program, interdisciplinary studies, administration within EPA, plus EPA programs in energy, radiation, pesticides, and toxic substances.

Figure 3

Figure 2

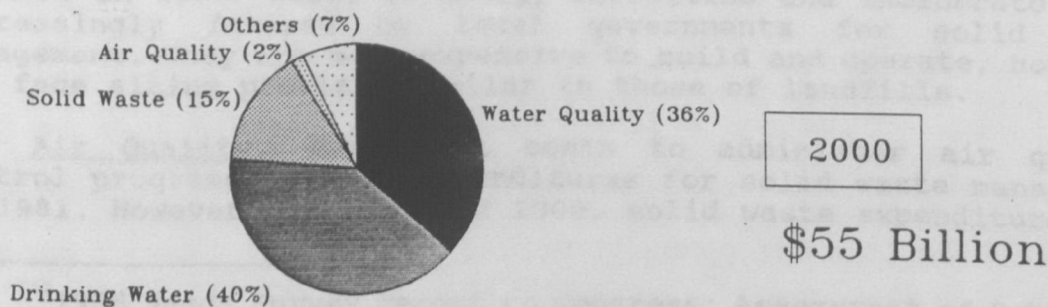
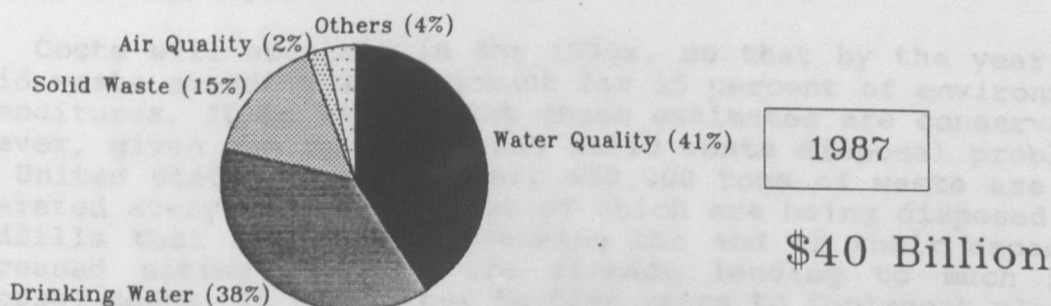
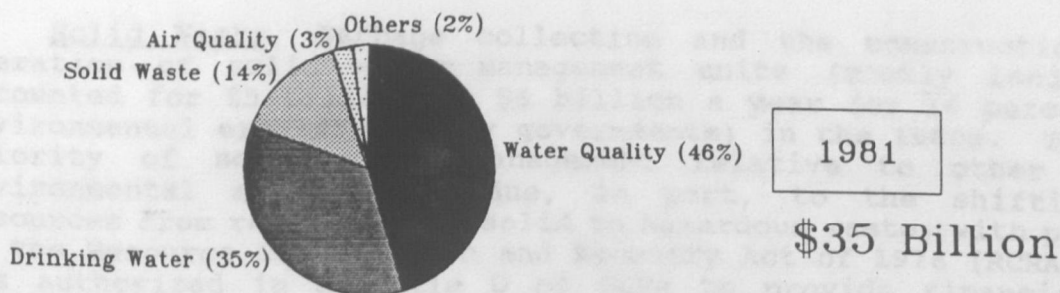
Percentage of Total Federal Expenditures,
by Environmental Media
Current Expenditures to Maintain Current
Levels of Environmental Quality, by Media
1981 - 2000



Source: Apogee Research from: U.S. Bureau of the Census, Government Finances (various years); Bureau of Economic Analysis, Pollution Abatement and Control Expenditures (various years); Bureau of the Census, Pollution Abatement Cost and Expenditure Survey (various years); U.S.EPA, Justification of Appropriation Estimates for Committee on Appropriations (various years).

Figure 3

Percentage of Total Public^a Expenditures, by Environmental Service, to Maintain Current Levels of Environmental Quality



^a EPA, states and local governments

Source: Apogee Research from: U.S. Bureau of the Census, Government Finances (various years); Bureau of Economic Analysis, Pollution Abatement and Control Expenditures (various years); Bureau of the Census, Pollution Abatement Cost and Expenditure Survey (various years); EPA Justification of Appropriation Estimates for Committee on Appropriations (various years).

minimum national standards.¹²

Drinking Water. Compared to \$12 billion in 1981, accounting for only 35 percent of all environmental expenditures, drinking water expenditures are expected to nearly double to \$22 billion a year by 2000 and to account for 40 percent of total environmental expenditures. Much of this increase is attributable to capital replacement and expansion; but beginning in 1993, the cost of water purification will grow considerably.

Solid Waste. Garbage collection and the construction and operation of solid waste management units (mostly landfills) accounted for \$5 billion to \$6 billion a year (or 14 percent of environmental expenditures by governments) in the 1980s. The low priority of solid waste management relative to other local environmental services is due, in part, to the shifting of resources from regulation of solid to hazardous waste, with passage of the Resource Conservation and Recovery Act of 1976 (RCRA). EPA was authorized in Subtitle D of RCRA to provide financial and technical assistance to states and local governments to develop solid waste management plans. However, federal funds for Subtitle D were not appropriated after 1980.

Costs will escalate in the 1990s, so that by the year 2000, solid waste spending will account for 15 percent of environmental expenditures. It is likely that these estimates are conservative, however, given the extent of the solid waste disposal problem in the United States. Approximately 450,000 tons of waste are being generated every day, 95 percent of which are being disposed of in landfills that are rapidly reaching the end of their capacity.¹³ Increased siting problems are already leading to much higher disposal costs. It takes four to five years to implement plans for a sanitary landfill, and demand far exceeds supply of these facilities. On average, disposal costs in 1987 were four times the cost in 1977, having increased from \$3 or \$4 per ton in 1977 to \$20 or more in 1987. Waste-to-energy facilities and incinerators are increasingly favored by local governments for solid waste management. They are more expensive to build and operate, however, and face siting problems similar to those of landfills.

Air Quality. Government costs to administer air quality control programs matched expenditures for solid waste management in 1981. However, by the year 2000, solid waste expenditures are

¹²1986 Needs Survey Report to Congress: Assessment of Publicly-Owned Wastewater Treatment Facilities in the United States, USEPA (February 1987).

¹³R.W. Beck and Associates, The Nation's Public Works: Report on Solid Waste Management, prepared for the National Council on Public Works Improvement (May 1987).

estimated to be four times those for air quality programs. In the absence of renewed programs or changes in recent rates of compliance, air quality spending will remain flat through the turn of the century.

Environmental Expenditures by Level of Government

The future cost of maintaining current levels of environmental quality (the shaded area shown on Figure 1) falls unevenly on different levels of government, with municipalities expected to underwrite a growing share in the future. While EPA expenditures are expected to decline by a third between 1981 and 2000, local spending could almost double (see Figure 4).

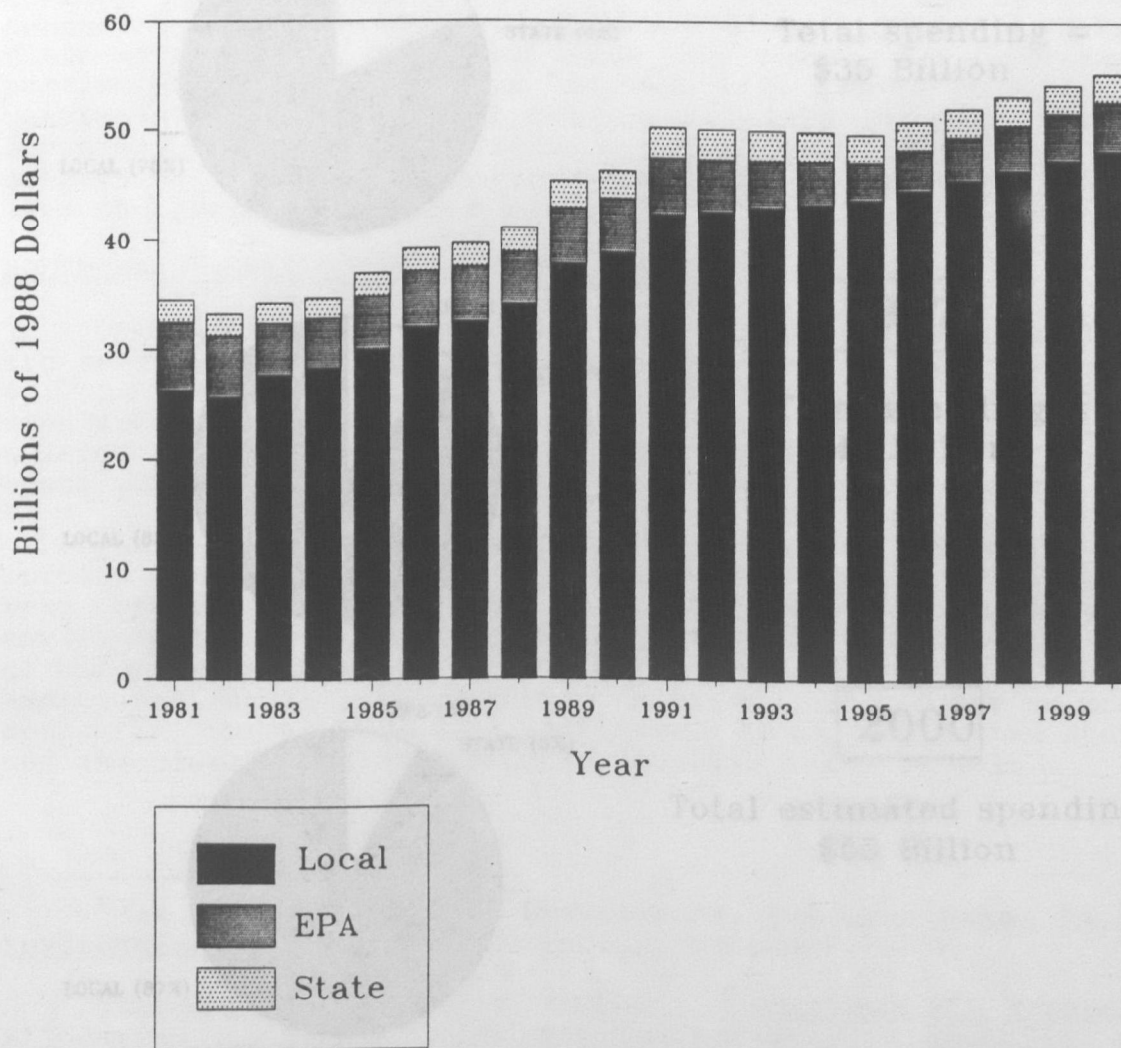
Local Governments. Annual environmental expenditure by local governments is expected to nearly double by the turn of the century -- just to maintain today's level of environmental quality. Assuming environmental standards are enforced, local capital expenditures also have to double to compensate for scheduled reductions in federal grants. Operating expenditures, paid entirely by local governments, are also escalating due to the use of more sophisticated chemical and energy-intensive treatment technologies. In 1981, local governments spent about \$26 billion or 76 percent of the public sector share of environmental costs to comply with federal mandates (see Figure 5). By 1987, these communities were spending \$33 billion a year and the local share had grown to more than 82 percent. By the year 2000, localities are expected to spend over \$48 billion and bear more than 87 percent of the public sector cost of environmental programs.

EPA. EPA expenditures to maintain current programs are expected to decline by about one-third, from \$6.3 billion a year in 1981 to \$4.3 billion a year in 2000. This drop -- from 18 percent of national environmental expenditures in 1981 to less than 8 percent in 2000 -- is attributable largely to the phasing-out of federal grants to build wastewater treatment plants. EPA's Construction Grants program will gradually decline from today's \$2.4 billion authorization to zero in 1991. Federal grants to help capitalize state wastewater treatment revolving loan funds will peak at \$2.4 billion in 1991 and decline to zero by 1995. There is no comparable federal assistance program in solid waste, and none anticipated within EPA or the Congress. EPA grants to states to administer the Safe Drinking Water Act have declined by 27 percent in real terms, from a high of about \$56 million in 1979 to an estimated \$41 million in 1989.

State Governments. The Bureau of the Census estimates that state outlays to administer environmental programs, comply with them where applicable, and provide assistance to localities for their compliance, have grown slowly from just under \$2 billion a year in 1981 to about \$2.1 billion in 1987. The Census data are

Figure 4

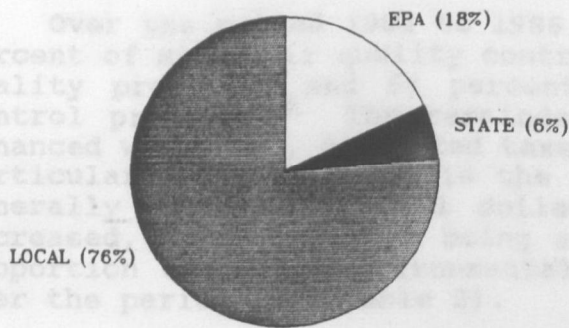
Expenditures to Maintain Current Level of Environmental Quality, by Sector, 1981-2000



Source: Apogee Research, from the following: Bureau of the Census, Pollution Abatement Costs and Expenditures, various years; EPA, Justification of Appropriation Estimates for Committee on Appropriations, various years;

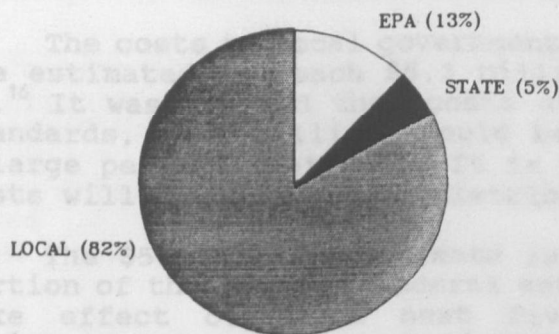
Figure 5

Proportion of Environmental Outlays (Capital and O & M), by Level of Government, to Maintain Current Levels of Environmental Quality, 1981-2000 (in 1988 Dollars)



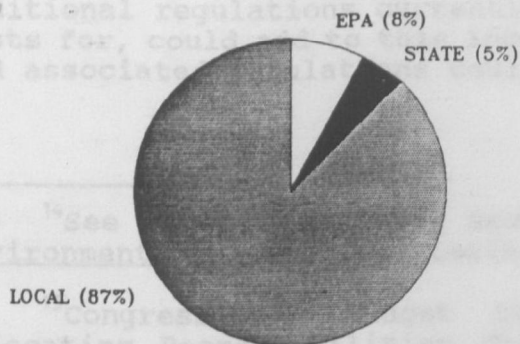
1981

Total spending =
\$35 Billion



1987

Total spending =
\$40 Billion



2000

Total estimated spending =
\$55 Billion

Source: Apogee Research from: U.S. Bureau of the Census, Government Finances (various years); Bureau of Economic Analysis, Pollution Abatement and Control Expenditures (various years); Bureau of the Census, Pollution Abatement Cost and Expenditure Survey (various years); U.S.EPA, Justification of Appropriation Estimates for Committee on Appropriations (various years).

roughly comparable to the results of a recent survey of state environmental expenditures that reported 1986 state outlays of \$1.9 billion for air pollution, drinking water, hazardous waste, indoor air pollution, marine and coastal initiatives, pesticides, solid waste, and water quality.¹⁴ If current trends continue, state environmental expenditures could reach \$2.6 billion a year in 2000. This represents a decrease in the share of total public sector environmental expenditures accounted for by states, from 6 percent in 1981 to 5 percent in 2000.

Over the period 1982 to 1986, EPA grants to states funded 47 percent of state air quality control programs, 38 percent of water quality programs, and 54 percent of hazardous and solid waste control programs.¹⁵ The remainder of state program budgets are financed with fees, dedicated taxes, and general tax revenues. Of particular note, however, is the fact that grants to states have generally declined in real dollars as state program costs have increased, the net result being a rather precipitous drop in the proportion of state environmental budgets covered by EPA grants over the period (see Table 2).

ADDITIONAL LOCAL COSTS OF NEW REGULATIONS

The costs to local governments associated with new regulations are estimated to reach \$5.3 billion by the year 2000 (see Figure 6).¹⁶ It was assumed that costs of municipal waste combustion air standards, \$2.5 billion, would be incurred in 1992, resulting in a large peak in that year. It is more likely, however, that these costs will be more evenly distributed over several years.

The \$5.3 billion estimate is conservative, reflecting only a portion of the costs of federal environmental regulations that will take effect over the next five to ten years, none of the environmental programs envisioned by Congress beyond 1987, and none of the growing number of new state or local environmental mandates. Additional regulations currently in place, but too new to project costs for, could add to this increment. Of course, future statutes and associated regulations could increase costs as well.

¹⁴See Council of State Governments, Resource Guide to State Environmental Management, Lexington, Kentucky (1988).

¹⁵Congressional Budget Office, Environmental Federalism: Allocating Responsibilities for Environmental Protection, Staff Working Paper (September 1988).

¹⁶Estimates were prepared by the Environmental Law Institute from data abstracted from Regulatory Impact Analyses prepared for EPA's major pending rules.

Table 2. State Budgets and EPA Grants to States for Air, Water, and Hazardous Waste Programs

	Total State Budgets (in millions of 1987 dollars)			EPA Grants as a Percentage Of State Budgets		
	Air	Water ^a	Hazardous Waste ^b	Air	Water ^a	Hazardous Waste ^b
1982	\$210	\$23	\$64	49%	49%	76%
1983	213	274	76	45	38	66
1984	206	296	110	46	35	47
1985	202	326	146	48	34	41
1986	213	336	169	46	33	40

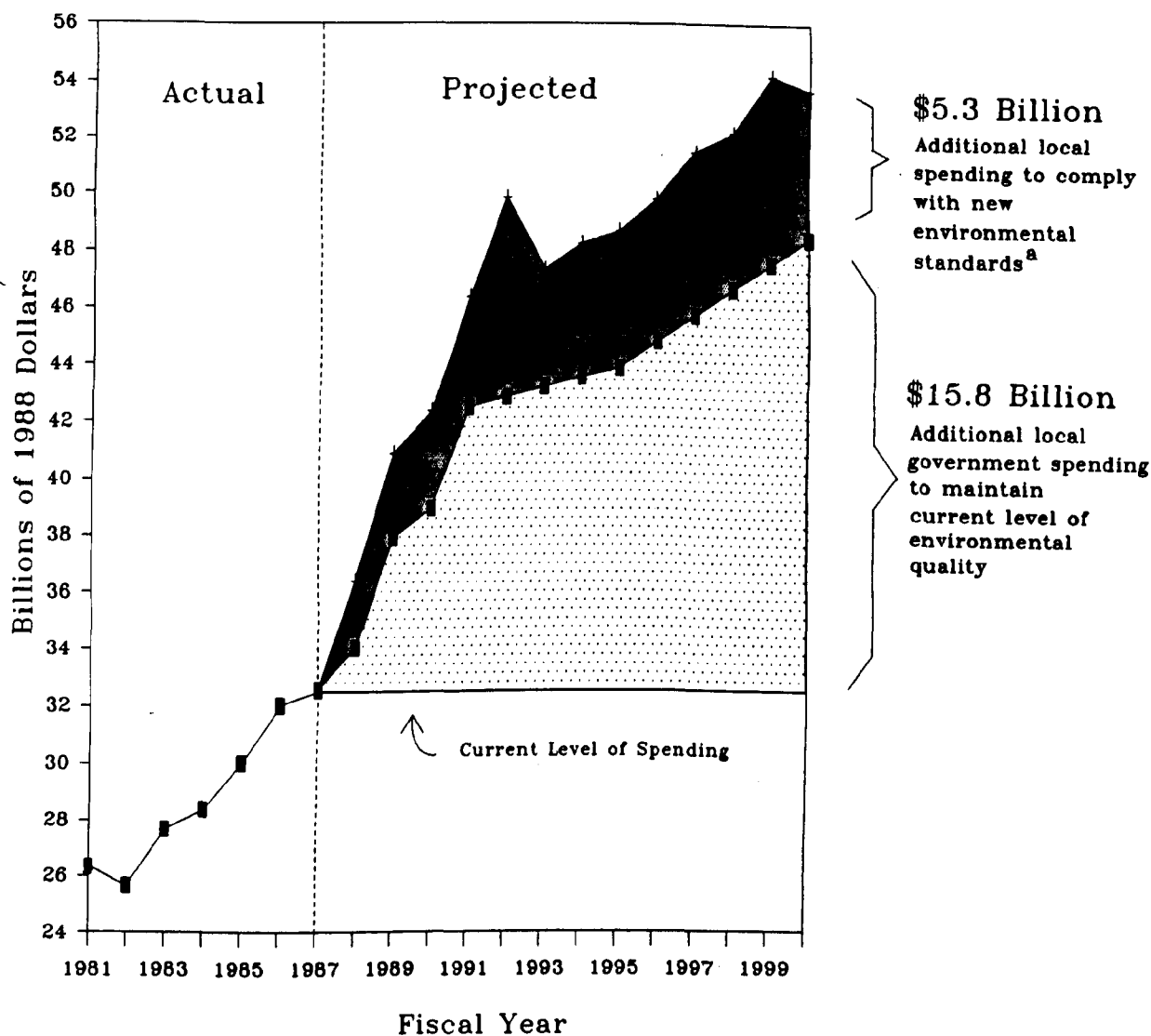
Source: Congressional Budget Office, Environmental Federalism:
Allocating Responsibilities for Environmental Protection,
Staff Working Paper (September 1988).

^a Includes water quality programs; some drinking water programs may be excluded

^b Includes both hazardous and solid waste programs

Figure 6

Projected Local Government Expenditures to Maintain Current Levels of Environmental Quality Plus Local Expenditures to Comply With New Environmental Standards



Source: Apogee Research from: U.S. Bureau of the Census, Government Finances (various years) and data prepared by the Environmental Law Institute from Regulatory Impact Analyses

^a Includes spending for drinking water, water quality, solid waste, air and others.

Water Quality

Local costs of new water quality regulations will average \$2.6 billion per year in the 1990s (see Figure 7). Most of these new costs are associated with building new or upgrading existing facilities to provide secondary treatment as required in the Clean Water Act. EPA estimated in 1986 that \$76 billion would be required to bring all municipal wastewater treatment facilities into compliance with minimum national standards.¹⁷

Drinking Water

In the year 2000, expenditures for new drinking water regulations are estimated to be only 2 percent of total expenditures. The percentage is low because most water supply expenditures relate to the quantity attributes (included in estimates of future expenditures to maintain current programs) and the program initiated in the 1986 Amendments to the Safe Drinking Water Act (SDWA) has been slow getting started. The costs of new drinking water regulations will be relatively low in the early 1990s, averaging \$36 million a year. By 1994, however, costs are projected to jump to \$539 million as the capital costs associated with these regulations start to be incurred. For the rest of the century, annual costs will average \$830 million.

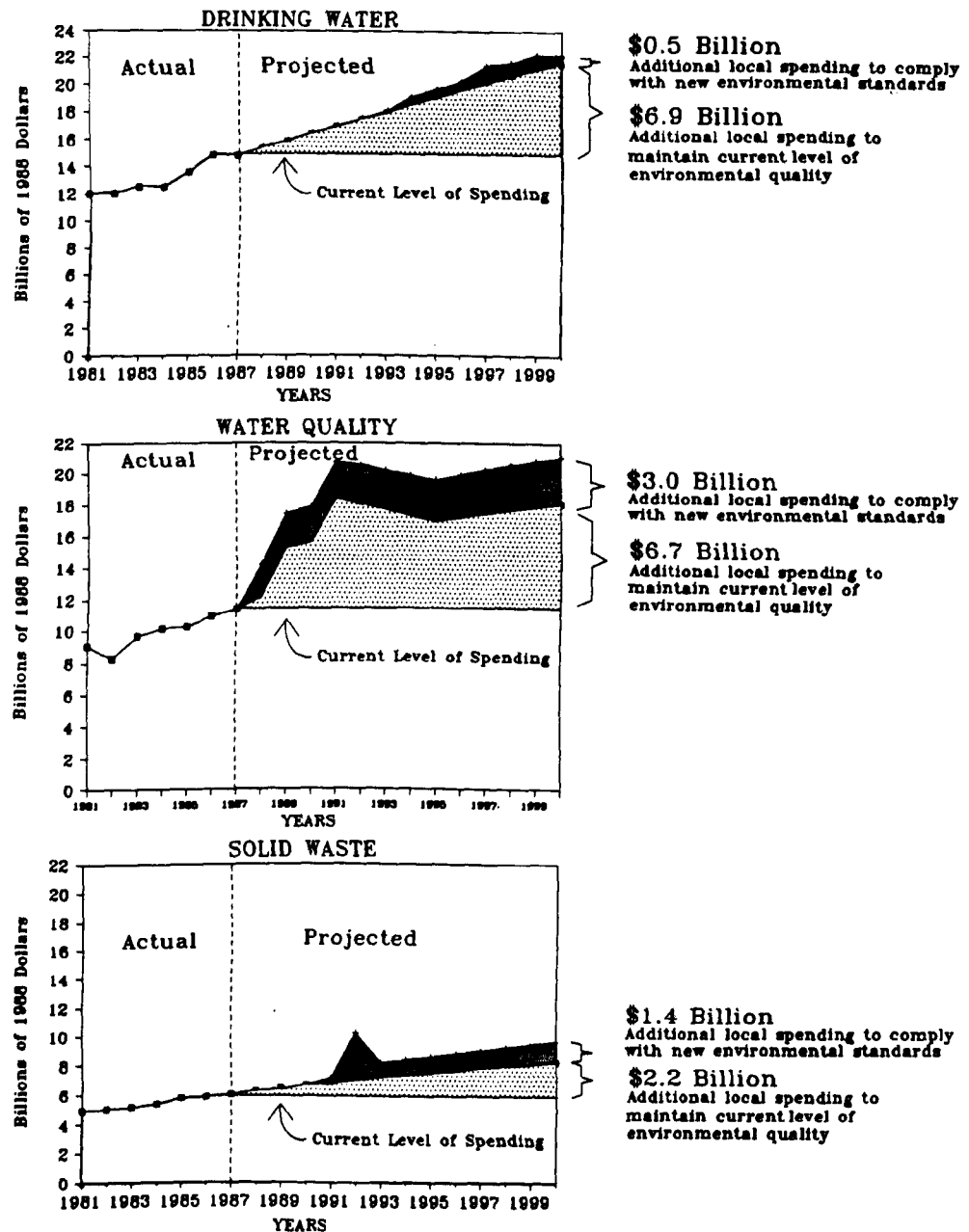
Solid Waste

New regulations included in this study increase estimated solid waste expenditures by a large percentage. In 1992, for example, costs associated with new regulations are estimated at \$3 billion, almost half of the \$7 billion spent to maintain current environmental standards. This large increase is due to capital costs associated with municipal waste combustion air standards. It is assumed that these costs, \$2.5 billion, will all be incurred in 1992. For the rest of the 1990s, costs of new regulations are about \$1.2 billion each year.

Local solid waste management is likely to be a focus of Congress in the 1990s and the potential for new and more costly regulations is large. Concerns about the hazardous constituents in the residue from incineration of municipal solid waste have already led Congress to consider regulation of municipal ash as a hazardous waste. Potential costs for local governments would be very high. Also, the outcome of EPA's investigation of regulatory alternatives to control air emissions from municipal waste combustion will be an important determinant of future costs to local governments for

¹⁷1986 Needs Survey Report to Congress: Assessment of Publicly-Owned Wastewater Treatment Facilities in the United States, USEPA (February 1987).

Figure 7
Local Government Expenditures to Maintain
Current Levels of Environmental Quality and Additional
Costs to Comply with New Environmental Standards, For
Each Environmental Service



Source: Apogee Research from: U.S. Bureau of the Census, Government Finances (various years) and data prepared by the Environmental Law Institute from EPA Regulatory Impact Analyses.

disposal of solid waste.

Total Local Year-2000 Expenditures by Media

Adding the local costs of new regulations to the costs of maintaining current levels of environmental quality shows a small change in the proportion spent for each environmental program between 1987 and 2000 (see Table 3). Water quality and drinking water expenditures overshadow those for solid waste by about 2 to 1 over the period. The most important shift between 1987 and 2000 is the 5 percent increase in water quality expenditures from 35 to 40 percent of total expenditures and corresponding 3 percent reduction in the percentage that is expended for drinking water, from 45 to 42 percent. This change is due primarily to the increased local costs of financing wastewater treatment facilities as federal grants are phased out. This is reflected in the fact that while local spending on water quality is increasing, total public sector spending for water quality is estimated to decrease by 5 percent between 1987 and 2000 (from 41 to 36 percent). While spending for other programs is only \$1.3 billion by the year 2000, the percentage increase from 1987 is large due to costs imposed by new regulations examined in this study (Underground Storage Tank Standards, Asbestos in Schools and SARA Title III Requirements).

Table 3. Summary of Local Government Environmental Expenditures by Service
(billions of \$1988)

Program	1987	Percentage of Total	2000 ^a	Percentage of Total	% Increase 1987-2000
Water Quality	\$11.4	35.0%	\$21.1	39.3%	85%
Drinking Water	14.8	45.4	22.2	41.4	50
Solid Waste	6.1	18.7	9.7	18.0	59
Others	0.3	0.9	0.7	1.3	133
Total Local Spending	\$32.6	100.0%	\$53.7	100.0%	327%

^a Costs of maintaining current levels of environmental quality plus costs of new regulations.

Source: Apogee Research from U.S. Bureau of the Census and data prepared by the Environmental Law Institute from EPA Regulatory Impact Analyses.

CHAPTER III

IMPACT OF SPENDING FOR ENVIRONMENTAL PROTECTION ON CAPITAL MARKETS

This chapter examines the impact on capital markets of the financing needs of local governments. The focus is on local governments because of the dramatic increase in local demands for capital for environmental services relative to other sectors and due to the availability of local cost estimates for new regulations. The capital markets view is an important one when examining local costs because localities rely on municipal bonds to finance environmental facilities. Increasing local demands for capital signal proportional increases in demand for new bond issues.

CAPITAL REQUIREMENTS OF ENVIRONMENTAL REGULATIONS

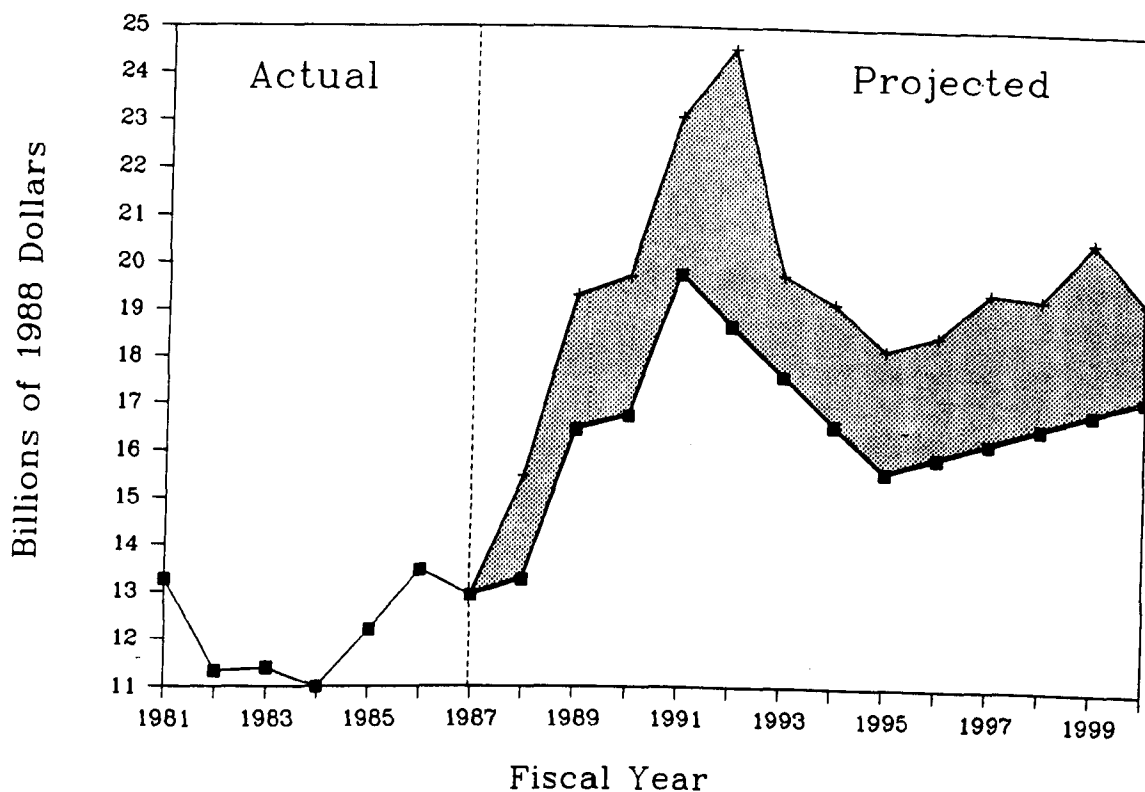
Capital formation by EPA, states, and local governments to maintain current levels of environmental quality is expected to fluctuate between \$13 billion and \$20 billion a year between 1987 and the year 2000 (see Figure 8). If recent trends continue, by the year 2000 most of the demand for capital to maintain current programs will be accounted for by local governments. Local demands for capital are estimated to increase from \$9.5 billion a year in 1987 to \$16.5 billion a year in 2000 (see Figure 9). State demands for capital are stable over the period and are relatively small, averaging about \$680 million per year.

Estimated local capital costs of new regulations add an average of \$3 billion a year to local capital needs associated with current environmental regulations. As a result, localities are estimated to have capital needs of nearly \$19 billion a year by 2000 (see Figure 9).

Moreover, as operating expenses grow, local governments could be forced to rely more heavily on borrowed funds to finance their capital needs. Operating and maintenance expenditures are expected to increase by 45 percent, from roughly \$23 billion a year in 1987 to \$35 billion a year in 2000 (see Figure 10). This rate of increase in operating expenditures -- 3.6 percent a year -- is almost three times the rate of population growth expected over this period. New environmental programs will add another 10 to 20

Figure 8

Total Capital Expenditures, by EPA, States, and Local Governments, to Maintain Current Levels of Environmental Quality and Local Capital Spending to Comply with New Regulations, 1981 – 2000

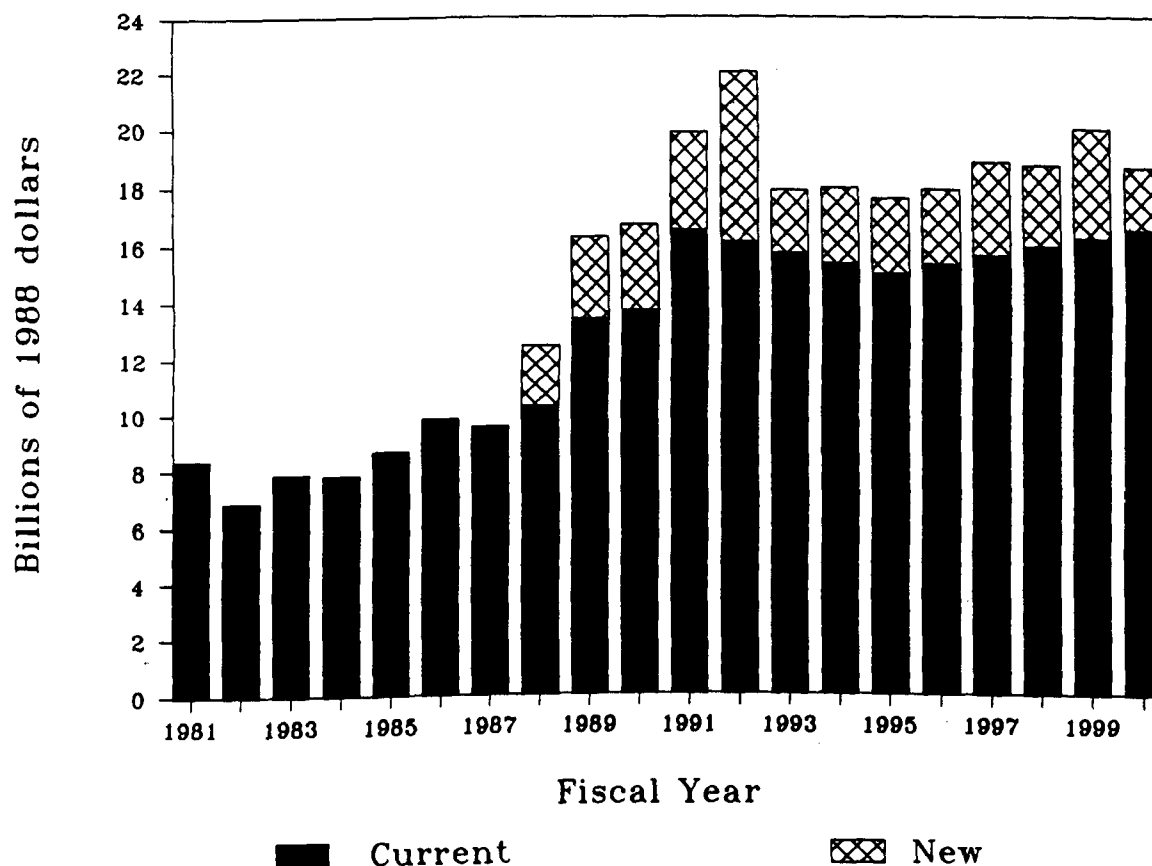


- Total Capital Expenditures to Maintain Current Levels of Environmental Quality + Local Capital Expenditures to Comply With New Regulations

Source: Apogee Research from: U.S. Bureau of the Census, Government Finances (various years); Bureau of Economic Analysis, Pollution Abatement and Control Expenditures (various years); Bureau of the Census, Pollution Abatement Cost and Expenditure Survey (various years); U.S.EPA, Justification of Appropriation Estimates for Committee on Appropriations (various years).

Figure 9

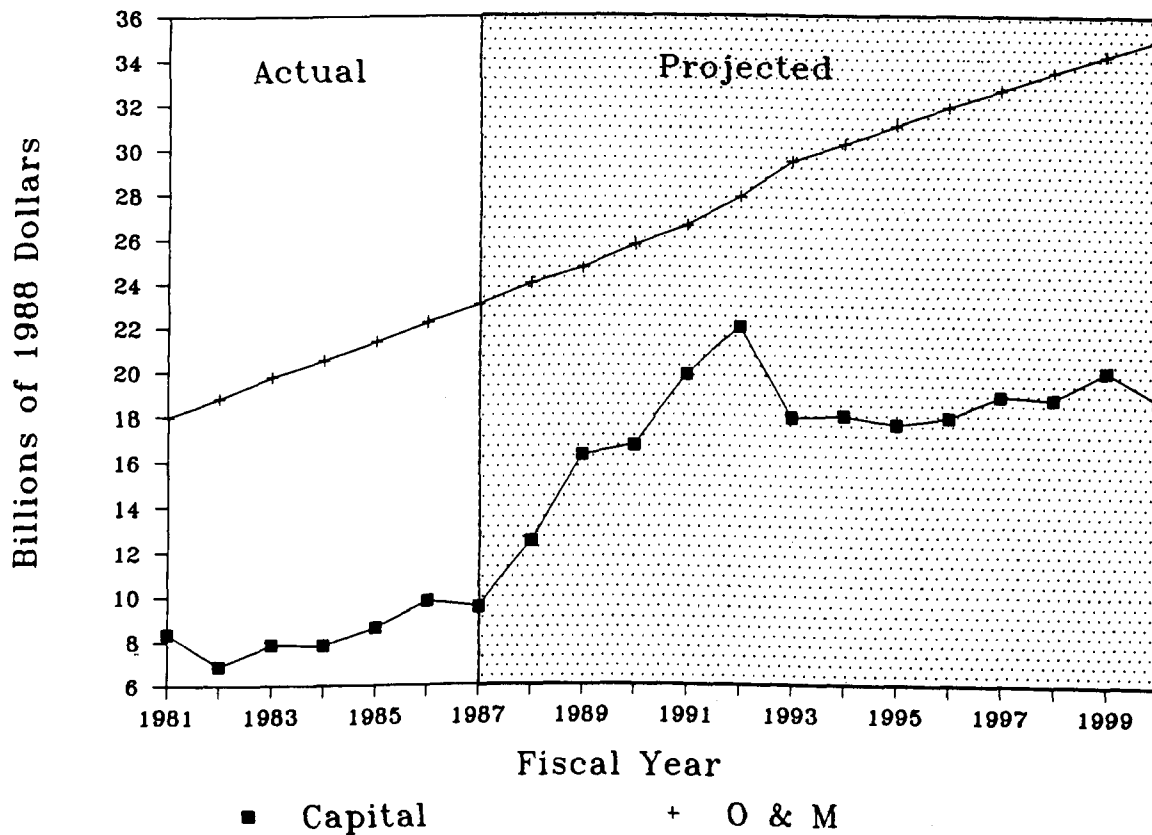
Local Capital Expenditures to Maintain Current Levels of Environmental Quality and Comply with New Regulations, 1981-2000



Source: Apogee Research from: U.S. Bureau of the Census, Government Finances (various years); Bureau of Economic Analysis, Pollution Abatement and Control Expenditures (various years); Bureau of the Census, Pollution Abatement Cost and Expenditure Survey (various years); U.S.EPA, Justification of Appropriation Estimates for Committee on Appropriations (various years).

Figure 10

Local Government Capital and Operating/Maintenance Expenditures to Maintain Current Levels of Environmental Quality and Comply with New Regulations, 1981 - 2000



Source: Apogee Research from: U.S. Bureau of the Census, Government Finances (various years); Bureau of Economic Analysis, Pollution Abatement and Control Expenditures (various years); Bureau of the Census, Pollution Abatement Cost and Expenditure Survey (various years); U.S.EPA, Justification of Appropriation Estimates for Committee on Appropriations (various years).

percent to these totals.

SUBSTITUTION OF LOCAL FOR FEDERAL CAPITAL

Aggregate costs tend to mask shifts in the projected share of capital formation. While local demands for capital are estimated to increase by 97 percent between 1987 and 2000, under current policy EPA's capital grants for environmental services will end by 1995 (see Figure 11). To a large extent, the substitution of local for federal capital is due to the phasing-out of EPA's construction grants for wastewater treatment facilities. Capital grants are expected to decline from \$4.5 billion a year in 1981 to zero once grants to capitalize state wastewater treatment revolving funds expire in 1994.

FINANCING LOCAL ENVIRONMENTAL FACILITIES

Because of the variation in intergovernmental roles, wastewater treatment facilities are currently financed differently than are either water supply or solid waste management facilities. The federal role in financing wastewater treatment works is significant compared to the other two areas.

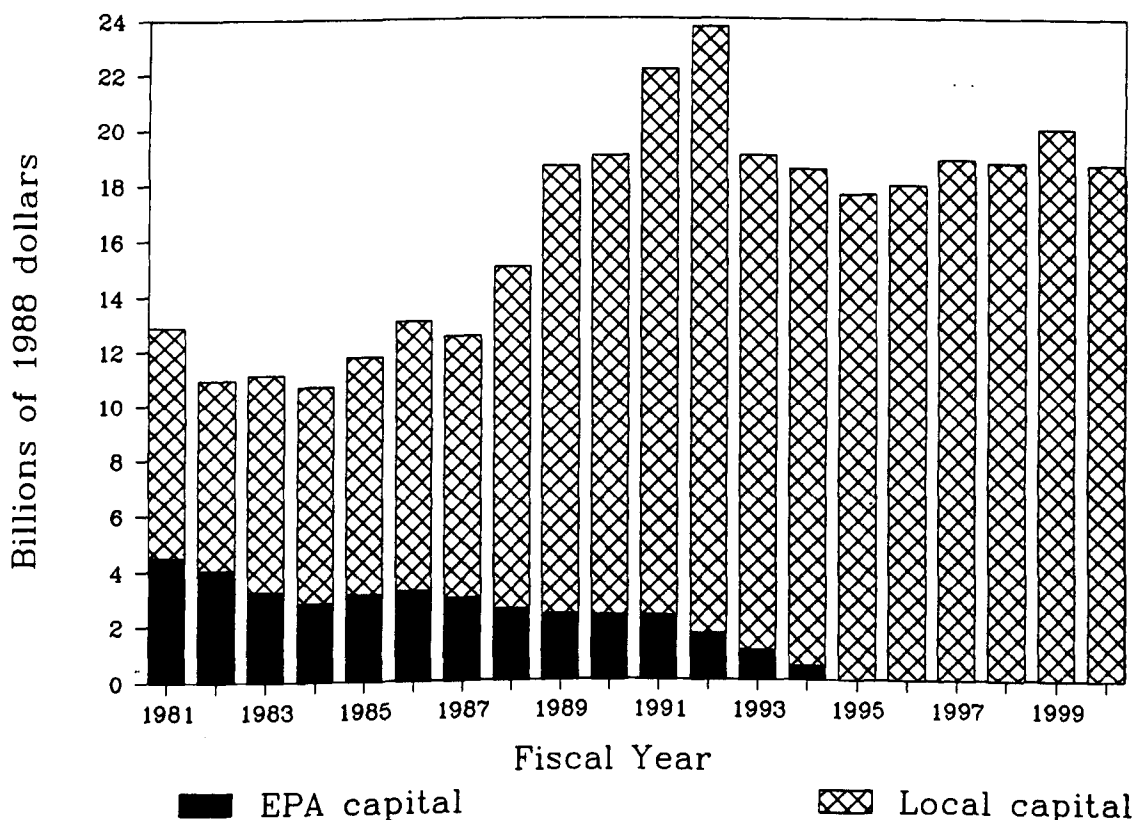
Wastewater Treatment

So far in the 1980s, municipal bonds have substituted for declining federal grants to finance wastewater treatment plants. An average of \$3.9 billion a year in federal grants have financed roughly half of all wastewater facilities over the period 1980 to 1984. Municipal bonds provided another \$2.3 billion a year in capital, on average. But the ratio in grant-to-bond dollars has fallen dramatically, from 2.93 in 1980 to 0.56 in 1988 (see Table 4). State assistance, private loans, retained earnings, and private equity constituted the remaining sources of wastewater capital.

Federal support for wastewater treatment will be near zero by 1994. EPA's Construction Grants program -- by far the largest source of federal aid to build wastewater treatment plants -- will

Figure 11

EPA Capital Expenditures to Maintain Current Levels of Environmental Quality Compared with Local Capital to Maintain Current Levels of Environmental Quality and Comply with New Regulations, 1981 - 2000



Source: Apogee Research from: U.S. Bureau of the Census, Government Finances (various years); Bureau of Economic Analysis, Pollution Abatement and Control Expenditures (various years); Bureau of the Census, Pollution Abatement Cost and Expenditure Survey (various years); U.S.EPA, Justification of Appropriation Estimates for Committee on Appropriations (various years).

Table 4. Estimated Sources of Capital Used to Finance Municipal Wastewater Treatment Works (current dollars)

Year	Federal Grants^a	Municipal Bonds	Ratio of Grants/Bonds
1980	\$4,720	\$1,610	2.93
1981	4,293	1,620	2.65
1982	4,113	2,870	1.43
1983	3,416	2,410	1.42
1984	2,969	3,150	0.94
1985	2,900	7,007	0.41
1986	3,113	6,823	0.45
1987	2,920	4,517	0.65
1988	2,514	4,498	0.56
Average	\$3,440	\$3,834	0.90

Sources: Published and unpublished data supplied by the Bureau of the Census and The Public Securities Association

Includes EPA Construction Grants, Farmers Home Administration Sewer Grants; The Department of Housing and Urban Development's Community Development Block Grants (sewer uses); Economic Development Administration Grants (sewer uses).

be eliminated after 1991.¹⁸ Beginning in 1989, federal grants will help capitalize state revolving loan funds (SRFs) in place of construction grants, but they will expire in 1994. The federal role in financing local wastewater treatment plants will be reduced to a handful of small, targeted programs. In many states, the SRF programs are not expected to meet financing needs.¹⁹ If the difference between wastewater construction needs and funds that might reasonably be expected as grants or loans through current intergovernmental aid programs is financed from strictly local sources, some 20 states will face a combined financing burden of nearly \$57 billion.²⁰

Moreover, municipalities in many of these states and others face rapidly escalating operating expenses, tending to put upward pressure on user fees which, on the margin, will make capital financing more difficult. In 1960, for example, the local operating cost per person served by central sewer systems was \$17.67 a year. At the beginning of EPA's Construction Grants program in 1972, local operating costs per person served were \$19.35 a year. By 1984, local operating costs had skyrocketed to \$41.61 per person. Per-capita operating costs should continue to increase as more sophisticated energy and chemical-intensive treatment processes come on line, especially in small communities with limited economies of scale. Higher operating expenses can reduce the ability of local governments to issue debt for capital investments, particularly in cities where the average annual income is low.

Water Supply

While water supply capital needs (\$4 to \$5 billion a year in the 1980s) are equivalent to those of the nation's wastewater treatment plants, water systems have almost no federal assistance. Traditionally, municipal systems have financed capital needs through a combination of tax exempt municipal bonds (about 60 percent of all capital); retained earnings (20 to 30 percent);

¹⁸Other federal aid programs that can be used for local wastewater treatment works include the Farmers Home Administration's water and sewer grants and loans and the Economic Development Administration's grants to under-developed regions.

¹⁹Some states such as New York are planning to meet the shortfall with highly leveraged SRFs. That is, the original capitalization will be used to secure bonds, raising up to five times the amount available for loans in the original capitalization grants.

²⁰For details, see Apogee Research, Inc. The Nation's Public Works: Report on Wastewater Management, prepared for the National Council on Public Works Improvement (May 1987).

state and federal grants (5 to 10 percent); and other sources such as private loans, special tax assessments, and private equity (5 to 10 percent). Larger water systems tend to rely more heavily on bonds than do small ones, which generally rely on private bank loans to finance their capital needs.

Solid Waste Management

There is no federal aid for local solid waste management. Local governments spend about \$700 million a year for capital improvements. The literature is far less insightful on the financing of solid waste facilities than on the other two municipal services. The few reports that do address the issue agree that municipal bonds provide the majority of all investment capital for publicly-owned waste management facilities.²¹ Like water and wastewater plants, however, some publicly-owned facilities finance capital improvements with retained earnings, private bank loans, and private equity.

IMPACT ON CAPITAL FORMATION

The impact of capital demands for environmental programs on local capital formation can be examined from two perspectives: the ability of the market to respond to capital demands, and the ability of local governments to raise capital. Assuming that the market will respond if the price of capital can be met, the key issue is municipal ability to support capital formation.

Whereas private companies are often able to pass along the costs of capital to consumers in the price of goods and services they provide, local governments are more limited in their ability to meet capital needs. Often, elected officials face political difficulties in raising taxes or fees, or constraints on their authority to raise revenues imposed by statutes, regulations, or state constitutions. In other cases, local resources may be insufficient to support large amounts of debt. This is particularly true for small municipalities that face relatively high fixed costs of issuing bonds, constrained by limited revenue bases and no economies of scale. If capital-intensive facilities are forced on these and other cities, the cost of increased levels of capital formation could crowd out other investments.

Can the Capital Markets Respond?

If the gap between current capital formation and future capital requirements for environmental programs were to be financed entirely with new bonds, municipalities would have to issue roughly twice as much environmental debt as they currently do. Compared

²¹See, R.W. Beck and Associates, Report on Solid Waste.

to the volume of tax-exempt bonds issued to finance water, sewer, and solid waste projects so far in the 1980s -- from \$4.5 to \$9 billion a year -- this change in volume would not be unusual. In water supply, for example, meeting the capital needs of the 1986 Safe Drinking Water Act will require an estimated \$0.5 billion to \$1.0 billion a year in new capital financing over the period 1994 to 2000. This would represent a 25 to 35 percent increase over the current volume of water supply bonds -- fluctuations well within the range in volume for such bonds between 1977 and 1985.

In addition, debt issued for environmental purposes is a small percentage of total debt issued by state and local governments (see Table 5). Debt issued for water and sewer projects was only 14 percent of total state and local debt in 1960 and 1970 and declined to 9 percent of the total by 1987.

Limitations on Municipal Capital Financing

The overall volume of bonds necessary to meet new capital requirements is not unmanageable from the perspective of market expansion. However, large capital demands associated with environmental services often cause large peaks in capital needs that can crowd out other investments. For example, San Diego has total outstanding debt of about \$1.3 billion but is faced with a cost of \$800 million for an ocean outfall (conveyance of treated wastewater to the ocean). If financed by long term debt, the cost of the conveyance would represent a 61 percent increase in the city's total outstanding debt. The large capital demands for this project will limit the amount of debt the city can issue for other purposes.

In addition, the ability of some cities, especially small ones, to issue new debt is limited and most of the nation's environmental systems are in small communities. Nearly 90 percent of all community water systems serve fewer than 3,300 residents; 88 percent of all wastewater treatment systems handle less than 1 million gallons per day; and most of the solid waste landfills in the nation serve communities under 10,000.²²

Because they are not well known, small communities have limited access to financial markets, forcing them to seek generally higher-cost commercial loans to finance capital expansion. When they are able to issue bonds publicly, small denominations often bear a high cost of capital for two reasons: because the fixed costs (e.g., legal fees and underwriters fees) are more burdensome when spread over a small base, and because the credit markets

²²For details, see Apogee Research, Inc. and Wade Miller Associates, Inc., Problems in Financing and Managing Smaller Public Works, prepared for the National Council on Public Works Improvement (September 10, 1987).

Table 5. Water/Sewer Debt as Percentage of Total State and Local Debt (billions of 1988 dollars)

Year	Water/Sewer Debt	Total State & Local Debt	Water/Sewer as Percent of Total
1960	\$4.57	\$31.67	14%
1970	8.14	59.02	14
1980	4.49	60.91	7
1987	9.17	105.83	9

Source: Apogee Research from data compiled by the Public Securities Association

generally demand a premium to compensate the risks of lending money to little-known communities with a less certain ability to repay principal and interest.

The EPA recently completed a study that examines the ability of different sized cities to raise capital for environmental programs through the bond market.²³ If the increases in debt service attributable to either the capital demands of all new drinking water regulations or new water quality regulations were limited to 1 percent of gross household income (about a doubling in current user fees), EPA estimates that 26 percent of all cities under 2,500 persons (nearly 7,000 cities and towns) could have trouble issuing revenue bonds. Fewer than 10 percent of cities with populations between 2,500 and 250,000 would have similar problems. Eleven percent of cities with populations above 250,000 could have trouble issuing new revenue-backed debt.

Even if municipalities were willing to offset user fees with general revenues and their full taxing powers were brought to bear on the issuance of general obligation bonds to support new environmental initiatives, most small cities would be no better off. In contrast, medium and larger cities would benefit significantly. While about 21 percent of all small cities would still face difficulties issuing new bonds, the proportion of medium and large cities expected to have trouble in the capital markets would decline to 3 percent and 0 percent, respectively.

But these calculations account for only the capital demands imposed by new regulations. The ability of many cities (regardless of size) to support new bonds to cover total capital needs by the year 2000 -- capital replacement plus the demands of new programs -- worsens the outlook presented above.

²³EPA, Municipal Sector Study (September 1988).

CHAPTER IV

IMPACTS OF ENVIRONMENTAL SPENDING ON HOUSEHOLDS

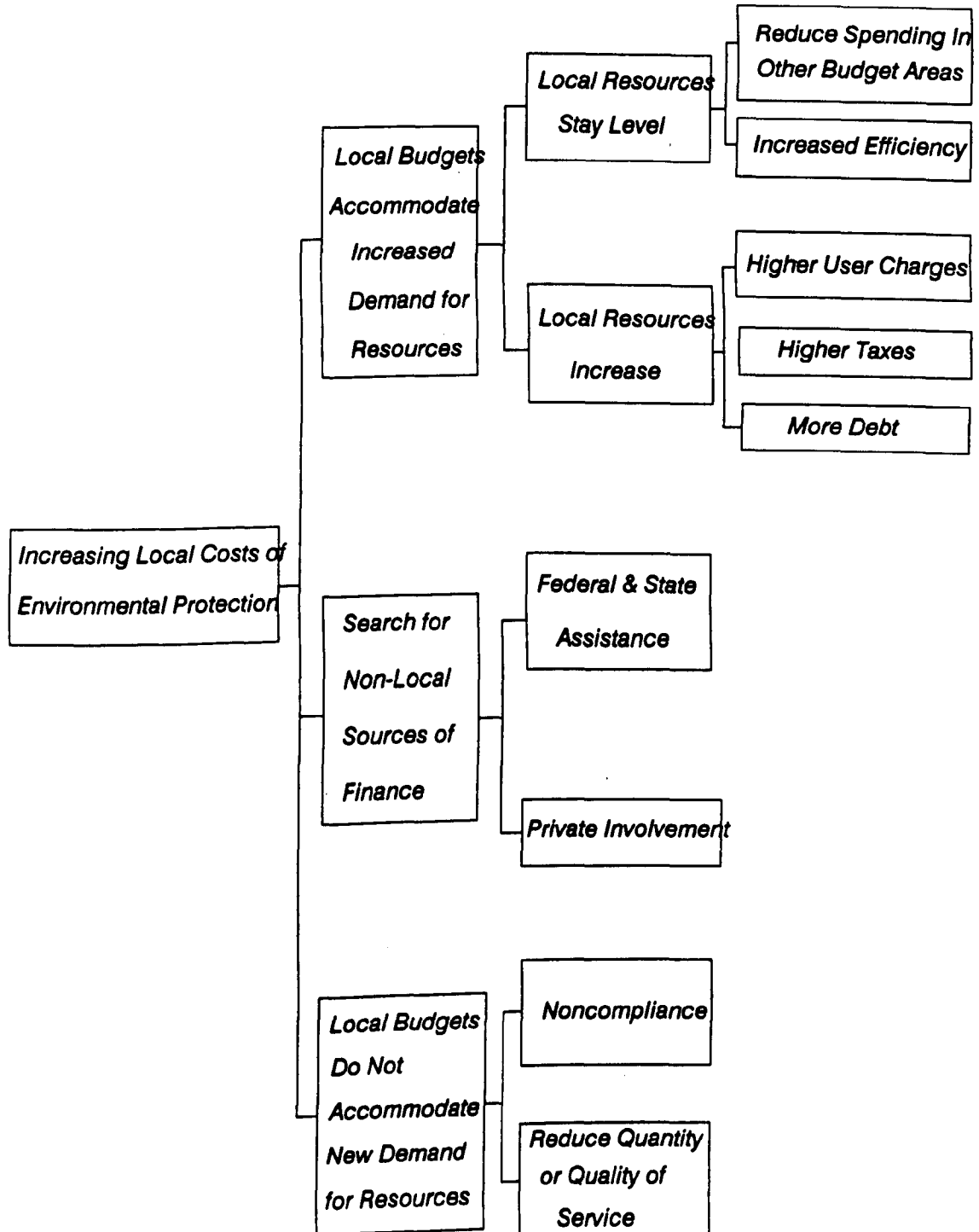
As municipalities are the primary providers of environmental services, local government responses to increasing costs of these services will determine, to a large extent, the impact on households. There are three ways local governments may respond (see Figure 12). Local budgets could accommodate increased demand for resources by increasing own-source revenues through (1) higher user charges or taxes (2) increasing the efficiency of current programs, or (3) shifts to environmental services from spending in other budget areas. Second, local governments could seek alternative sources of finance, either through federal and state assistance or by involving private companies in finance and provision of environmental services. Finally, local governments may choose not to accommodate the higher costs of environmental services, which could lead to noncompliance or reduced quality or quantity of service.

For this report, it was assumed that local governments would seek to increase own-source revenues. To the extent that local governments can exercise other options, particularly private involvement in service provision, household costs may be reduced. Estimates of combined capital and operating cost savings associated with private provision of environmental services compared to public provision range from 5 to 40 percent.²⁴

Meeting the increasing costs of environmental services with local revenues means that households and businesses pay for regulations financed at the municipal level through increased user charges, increased general taxes, or reduced levels of services in competing municipal programs. Household effects of environmental spending are calculated assuming all capital facilities are financed with long-term bonds backed by user fees. Under these assumptions, lump-sum capital outlays are amortized, with the annualized payments to capital added to operating and maintenance outlays each year. The result is divided by the number of households served to provide an estimate of household resources necessary to pay for environmental services. Recalculating to take out costs paid by industrial and commercial facilities, the estimates reflect increases in direct costs for average

²⁴According to a recent report by a prominent investment banking firm, overall savings attributable to a properly structured privatization transaction (prior to tax reform) may reduce user fees by 15 to 40 percent, compared to conventional Construction Grants funding. See Dean, Witter, Reynolds, Inc., Privatization: A Financing Alternative for State and Local Governments (October 1986).

Figure 12
Local Government Responses to Increasing
Costs of Environmental Protection



households.²⁵

To the degree that costs to private companies are passed on to consumers in the form of increased prices for goods and services, household costs will increase. While it is not possible to forecast these effects exactly, for most companies environmental compliance costs constitute only a small portion of their total cost of production, so resulting price increases will not have a significant effect on consumption of a product or service.

HOUSEHOLD COSTS OF ENVIRONMENTAL PROGRAMS²⁶

If current trends continue, the average household will spend \$647 a year by the year 2000 for environmental services including drinking water, wastewater treatment, and solid waste management (see Table 6). This represents 54 percent more than the average household payment for such services in 1987. The largest increment -- \$599 dollars a year in 2000 -- is attributable to simply maintaining the current level of environmental and service standards. The average annual cost of complying with new regulations is estimated to be \$48.

Household Payments by City Size To Maintain Current Levels of Environmental Quality

Implementing current environmental programs will have more profound effects for households in smaller cities than in larger ones. Small cities face limited economies of scale in the provision of environmental services and generally higher costs of capital. These two effects combined tend to drive up the price of environmental protection for small cities.

As a result, households in the smallest cities are expected to pay substantially more than those in large and medium-sized cities through the turn of the century. Household costs are expected to increase by about 88 percent, from \$670 in 1987 to \$1,263 in 2000 in the smallest cities (less than 500 population). Household payments to maintain current programs in medium-sized cities (populations from 50,000 to 100,000) will increase by 38 percent, on average -- from \$373 in 1987 to \$515 in 2000. Household costs in large cities (populations in excess of 500,000) will increase by 36 percent, from \$393 in 1987 to \$533 in 2000.

²⁵See Appendix 3 to this report for an explanation of differences in methodology between this report and the Municipal Sector Study.

²⁶ Cities were divided into the following population-size categories: less than 500; 500-2500; 2500-10,000; 10,000-50,000; 50,000-100,000; 100,000-250,000; 250,000-500,000; more than 500,000.

**Table 6. Average Annual Household Payments for Environmental Services
for a Sample of 8,032 Cities, Towns, and Townships (1988 dollars)**

City Size	Average payments in 1987		Additional payments to maintain current levels of environmental quality in 2000		Additional payments to comply with new environmental and service standards in 2000		Total estimated household payments for environmental protection in 2000
500 or less	\$670	+	\$593	+	\$317	=	\$1,580
500- 2,500	473		223		67		763
2,500- 10,000	433		143		29		605
10,000- 50,000	444		197		24		665
50,000- 100,000	373		142		24		539
100,000- 250,000	291		111		34		436
250,000- 500,000	335		126		68		529
500,000 or more	393		140		93		626
Population Weighted Average	\$419	+	\$180	+	\$48	=	\$647

Source: Apogee Research, from U.S. Bureau of Census, 1986 Survey of Community Water Systems, and data compiled by the Environmental Law Institute from EPA Regulatory Impact Analyses.

Household Payments for New Regulations

Added to the large increases in household costs of current programs are the additional costs of new regulations. Households in cities with populations below 500 will pay an additional \$317 a year to comply with new regulations in 2000; for the largest cities, new regulations will cost the average household \$93 more each year by 2000. Households in medium-sized cities, with populations of 10,000 to 50,000 and 50,000 to 100,000, are faced with additional costs of just \$24 each year.

Household Payments for Environmental Programs Compared to Income

The difference in costs between households based on city size is even more dramatic when examined as a percentage of household income (see Table 7). For the smallest cities, with lower household income and higher costs per household, the cost of environmental protection as a percentage of household income will increase from 2.8 percent in 1987 to 5.6 percent in 2000. For medium-sized cities the percentage is expected to change slightly over the period 1987 to 2000, from 1.0 to 1.2 percent, and in large cities, to change from 1.1 to 1.5 percent.

Estimates of costs as a percentage of household income may be conservative because, to the extent that companies pass through environmental costs to consumers, household income will be reduced. As a result, the costs of environmental protection as a percentage of household income could be higher.

Household Payments by Program

Household costs of each environmental program, including those to maintain levels of environmental quality and to comply with new regulations in the year 2000, differ by city size category (see Table 8). Households in smaller cities will pay comparatively more than in both large and medium-sized cities. Pending wastewater improvements along with the additional future costs of maintaining current levels of environmental quality will cost the average household in cities of 500 or less about \$259 a year by 2000, when all regulatory programs are assumed to be on-line. Drinking water regulations will add another \$366 a year and solid waste regulations another \$218. This adds up to \$910 for households in small cities, in addition to the baseline amount of \$670.

Households in medium-sized cities (50,000 to 100,000) are expected to pay less than a third of the amount paid by households in small cities for wastewater treatment, 17 percent of that paid for drinking water, and only 9 percent of the amount spent for solid waste. This is in addition to the baseline amount of \$373 that is about half that of small cities (\$670). The largest cities (500,000 and above) are also expected to pay sums

Table 7. Cost of Environmental Protection Per Household As Percentage of Household Income, By City Size (1988 Dollars)

City Size	1987			2000		
	Average Household Cost of Environmental Programs	Average Household Income	Cost as a Percentage of Household Income	Average Household Cost of Environmental Programs ^a	Average Household Income	Cost as a Percentage of Household Income
500 or less	\$670	\$24,277	2.8%	\$1,580	\$28,357	5.6%
500-2,500	473	26,361	1.8	763	30,792	2.5
2,500-10,000	433	30,546	1.4	605	35,680	1.7
10,000-50,000	444	31,685	1.4	665	37,010	1.8
50,000-100,000	373	37,189	1.0	539	43,440	1.2
100,000-250,000	291	33,769	0.9	436	39,445	1.1
250,000-500,000	335	31,943	1.0	529	37,312	1.4
Over 500,000	393	34,756	1.1	626	40,597	1.5
Weighted Average	419	31,617	1.3	647	36,931	1.8

^a Includes costs of maintaining current levels of environmental quality plus costs of complying with new regulations.

Source: Apogee Research, from U.S. Bureau of the Census, 1986 Survey of Community Water Systems, and data compiled by the Environmental Law Institute from EPA Regulatory Impact Analyses.

Table 8. Increase in Annual Household User Charges in 2000 to Maintain Existing Levels of Environmental Quality and to Comply with New Regulations (in 1988 Dollars)

Municipality Size Category	Average Payments in 1987 ^a	Additional Fees By Program in the Year 2000				Total Additional Fees
		Wastewater Treatment	Drinking Water	Solid Waste	Other	
Less than 500	\$670	\$259	\$366	\$218	\$67	\$910
500- 2,500	473	174	59	43	14	290
2,500- 10,000	433	85	59	19	9	172
10,000- 50,000	444	124	71	19	7	221
50,000- 100,000	373	77	64	20	5	166
100,000- 250,000	291	63	63	14	5	145
250,000- 500,000	335	114	43	33	4	194
Over 500,000	393	146	42	40	5	233

^a See Appendix 4 for average 1987 payments by media.

Source: Apogee Research from U.S. Bureau of the Census, 1986 Survey of Community Water Systems, and data compiled by the Environmental Law Institute from EPA Regulatory Impact Analyses.

comparably much less than the smallest ones. Wastewater treatment and solid waste show decreasing economies of scale with the result that households in large cities will pay more for these services than those in medium-sized cities. However, household costs are much less than in the smallest cities. Households in large cities will pay 56 percent of the amount paid for wastewater treatment in small cities and 18 percent of that paid for solid waste. As drinking water shows increasing economies of scale, households in large cities will only pay 11 percent of household costs in small cities. This is in addition to a baseline of \$393, that is only 59 percent of the 1987 cost for households in small cities.

Drinking Water. The largest cost to households in small cities in the year 2000 is estimated to be for drinking water programs. About 95 percent of the total estimated costs of drinking water programs in 2000 is associated with current Safe Drinking Water Act programs and the provision of adequate quantities of water.

Water Quality. Wastewater treatment is the highest cost service for households in most city sizes. Costs are estimated to be particularly high for households in the smallest cities, where substantial investments are necessary to bring wastewater treatment facilities into compliance with minimum national standards.

Solid Waste. Household expenditures for solid waste show a trend similar to that for the other environmental services, with households in smallest cities expected to pay more than 5 times the amount paid by households in larger cities. For the larger size categories, estimated household costs of solid waste programs show reverse economies of scale. This is due to the amount of quality and quantity-related costs included in total solid waste expenditures. There are limited economies of scale in providing greater quantities of solid waste services. Costs of maintaining existing levels of environmental quality, that are mostly quantity-related, constitute the majority of total costs in cities larger than 2,500. Thus, for the most part, larger cities do not benefit from economies of scale normally associated with environmental service provision as compared to medium-sized cities.

CHAPTER V

CONCLUSIONS

The growing costs of environmental protection suggest a reexamination of the way in which the nation finances and pays for investments in environmental protection. Increasing costs of environmental programs to governments at all levels, from \$40 billion a year in 1987 to \$55 billion in 2000 to maintain current standards, challenge their ability to finance future environmental needs. New regulations will only increase demands, adding \$5.3 billion a year in municipal expenditures alone by the year 2000.

Growing demand for municipal resources will require tradeoffs between financing environmental mandates and balancing limited local budgets. Local governments with responsibilities for drinking water, wastewater, and solid waste management services face an increase from 76 percent of the public sector's bill to comply with federal environmental mandates in 1987 to 87 percent by 2000. This increase will mean that real annual environmental outlays by all local governments will nearly double by the turn of the century.

IMPACTS ON MUNICIPALITIES, CAPITAL MARKETS, AND HOUSEHOLDS

The relative effects on municipal budgets of spending for environmental programs increase as the size of the municipality declines. Additions to current environmental programs will have the most profound effects on small governments. Hence, programs to assist in compliance -- regardless of their nature -- should focus on small to medium-sized localities.

Since capital markets can be expected to meet expanded demands once prices reflect risk and supply-demand interactions, the key issue in examining the effects on capital markets is the ability of local governments to support capital formation. Increasing demand for capital can put upward pressure on interest rates, which in turn, could increase the cost of environmental compliance. Communities without the income or industrial base to finance these expenses could face hardship. This is particularly true for small municipalities, faced as they are by relatively high fixed costs of issuing bonds, constrained by limited revenue bases, and without the benefits of economies of scale.

If current trends continue, households in the smallest cities will be expected to pay substantially more for environmental programs than those in large and medium-sized cities, with household costs more than doubling in the smallest cities by the year 2000. As a percentage of household income, households in the

smallest cities will be expected to pay 5.6 percent of household income on environmental programs while households in large and medium-sized cities will pay 1.5 and 1.2 percent, respectively.

POLICY CONSIDERATIONS

Given the strong legislative and popular support for a cleaner environment, there will be pressure for stricter environmental standards in the future. One way to meet the challenge of financing environmental mandates is to simply charge more and spend more to provide adequate levels of environmental services. Alternatively, governments could take steps to reduce the cost of environmental protection.

A third alternative -- encouraging greater involvement of the private sector in the provision of environmental services -- can reduce pressure on local budgets, with the potential to provide such services in the most efficient manner. Greater private involvement can increase public resources available for environmental protection in at least two ways. First, private equity can free municipal resources for other investments. Second, even without private financing, properly designed and executed partnerships can provide improved environmental services at the lowest possible cost to the public. Improvements in efficiency, over provision of services by strictly public agencies, can lower public costs of compliance, which in turn, frees municipal resources for other investments.²⁷ Areas for federal government action include investigating the use of tax policy to promote partnerships; reformulating federal environmental regulations to reduce bias against public-private partnerships; and working with states to reduce their barriers to private involvement, such as state restrictions on interstate shipping of solid waste.

Finally, financial management assistance could be provided to small and medium-sized cities to promote implementation of innovative solutions to financing environmental programs. Local decision makers and private vendors of environmental services alike need better information to make informed investments.

²⁷See Apogee Research, Inc., Draft Report on Public Private Partnerships for Environmental Services: Policy Issues and Options, prepared for the Environmental Protection Agency, Office of the Comptroller, Resource Management Division (September 26, 1988).

Appendix 1. List of Environmental Regulations Applicable to Local Governments
But Not Included in the Cost Estimates

<u>Regulations</u>	<u>Status</u>
A. Drinking Water	
Well-head Protection Plan	In Development
Pesticides in Groundwater	In Development
Disinfection By-products	In Development
B. Wastewater Treatment	
National Estuary Program	In Development
Wetlands Protection Program - 404(c) permits	Promulgated
Nonpoint Source Regulations	In Development
Guidance/Mgmt. Plans	
Section 304(1) - Toxics in Water Bodies	In Development
C. Solid Waste Disposal	
National Contingency Plan - Superfund Program	In Development
Low-Level Radiation Waste Standards	In Development
Toxicity Characteristics of Solid and Hazardous Wastes	In Development
D. Miscellaneous Regulations	
Heavy Duty Diesel Vehicles	Promulgated
Gasoline Marketing	In Development
Diesel Fuel Standards	In Development
Revisions to National Ambient Air Quality Standards (Ozone, Carbon Monoxide, Particulate Matter, Nitrogen Oxides, Sulfur Oxides)	In Development
Asbestos in Public Buildings	May Be Required

Appendix 2. Tables of Data

FIGURE 1. PROJECTED EPA, STATE, AND LOCAL
GOVERNMENT EXPENDITURES TO MAINTAIN
EXISTING LEVELS OF ENVIRONMENTAL
QUALITY COMPARED TO CURRENT ENVIRONMENTAL
EXPENDITURES (MILLIONS OF \$1988)

YEAR	TOTAL EXPENDI- TURES	SPENDING TO MAINTAIN EXISTING LEVELS OF ENVIRONMENTAL QUALITY IN ADDITION TO EXISTING EXPENDITURES (1987)
1981	34,608	0
1982	33,293	0
1983	34,316	0
1984	34,765	0
1985	36,958	0
1986	39,312	0
1987	39,749	0
1988	41,160	1,411
1989	45,508	5,759
1990	46,478	6,729
1991	50,418	10,669
1992	50,240	10,491
1993	50,115	10,367
1994	49,956	10,207
1995	49,814	10,065
1996	50,957	11,208
1997	52,078	12,329
1998	53,178	13,429
1999	54,258	14,509
2000	55,320	15,571

FIGURE 2. EPA, STATE, AND LOCAL GOVERNMENT EXPENDITURES TO MAINTAIN
CURRENT LEVELS OF ENVIRONMENTAL QUALITY, BY MEDIA, 1981-2000
(IN MILLIONS OF 1988 DOLLARS)

Year	Air	DW	WQ	SW	Others	Total
1981	887	12,253	15,647	4,984	837	34,608
1987	896	15,002	16,339	6,056	1,456	39,749
2000	867	21,906	20,339	8,336	3,873	55,320

FIGURE 3. PERCENTAGE OF EPA, STATE, AND LOCAL GOVERNMENT EXPENDITURES,
BY ENVIRONMENTAL SERVICE, TO MAINTAIN CURRENT LEVELS OF
ENVIRONMENTAL QUALITY, 1981-2000

Year	Air	DW	WQ	SW	Others	Total
1981	3	35	46	14	2	100
1987	2	38	41	15	4	100
2000	2	40	36	15	7	100

FIGURE 4. PROPORTION OF ENVIRONMENTAL OUTLAYS (CAPITAL AND O&M), BY LEVEL OF GOVERNMENT, TO MAINTAIN CURRENT LEVELS OF ENVIRONMENTAL QUALITY, 1981, 1987, AND 2000 (IN MILLIONS OF 1988 DOLLARS)

YEAR	EPA		STATE		LOCAL		TOTAL	
	Amount	Percent Share	Amount	Percent Share	Amount	Percent Share	Amount	Percent Share
1981	6276	18	1992	6	26340	76	34608	100
1987	5036	13	2132	5	32581	82	39749	100
2000	4293	8	2602	5	48424	87	55320	100

Figure 5.

PROPORTION OF ENVIRONMENTAL OUTLAYS (CAPITAL AND O&M), BY LEVEL OF GOVERNMENT, TO MAINTAIN
CURRENT LEVELS OF ENVIRONMENTAL QUALITY, 1981, 1987, AND 2000 (IN MILLIONS OF 1988 DOLLARS)

YEAR	EPA		STATE		LOCAL		TOTAL	
	Amount	Percent Share	Amount	Percent Share	Amount	Percent Share	Amount	Percent Share
1981	6276	18	1992	6	26340	76	34608	100
1987	5036	13	2132	5	32581	82	39749	100
2000	4293	8	2602	5	48424	87	55320	100

Figure 6.

PROJECTED LOCAL GOVERNMENT EXPENDITURES TO
 MAINTAIN CURRENT LEVEL OF ENVIRONMENTAL QUALITY AND
 COMPLY WITH NEW ENVIRONMENTAL STANDARDS
 (IN MILLIONS OF 1988 DOLLARS)

YEAR	CURRENT LEVEL OF LOCAL SPENDING	ADDITIONAL SPENDING TO MAINTAIN CURRENT ENVIRONMENTAL QUALITY	ADDITIONAL SPENDING TO COMPLY WITH NEW STANDARDS
1981	26,340	0	0
1982	25,680	0	0
1983	27,677	0	0
1984	28,399	0	0
1985	30,029	0	0
1986	32,036	0	0
1987	32,581	0	0
1988	34,068	1,487	2,362
1989	37,933	5,352	2,986
1990	38,973	6,392	3,411
1991	42,520	9,939	3,874
1992	42,857	10,276	6,985
1993	43,223	10,642	4,111
1994	43,542	10,961	4,665
1995	43,859	11,278	4,815
1996	44,810	12,229	4,970
1997	45,740	13,159	5,750
1998	46,652	14,071	5,542
1999	47,546	14,965	6,677
2000	48,424	15,843	5,297

Figure 7.

LOCAL GOVERNMENT EXPENDITURES TO MAINTAIN CURRENT LEVELS OF ENVIRONMENTAL QUALITY AND TO COMPLY WITH
NEW ENVIRONMENTAL STANDARDS, BY MEDIA

DRINKING WATER

YEAR	CURRENT PROGRAMS (1988 \$MM)	NEW PROGRAMS (1988 \$MM)	TOTAL (1988 \$MM)
1981	12,073	0	12,073
1982	12,087	0	12,087
1983	12,547	0	12,547
1984	12,533	0	12,533
1985	13,625	0	13,625
1986	14,873	0	14,873
1987	14,816	0	14,816
1988	15,348	0	15,348
1989	15,879	1	15,880
1990	16,411	24	16,434
1991	16,942	26	16,968
1992	17,474	35	17,509
1993	18,005	94	18,100
1994	18,537	539	19,076
1995	19,068	580	19,648
1996	19,600	625	20,225
1997	20,131	1,296	21,427
1998	20,663	951	21,614
1999	21,194	1,030	22,225
2000	21,726	497	22,223

WATER QUALITY

YEAR	CURRENT PROGRAMS (1988 \$MM)	NEW PROGRAMS (1988 \$MM)	TOTAL (1988 \$MM)
1981	9,086	0	9086
1982	8,309	0	8309
1983	9,693	0	9693
1984	10,169	0	10169
1985	10,295	0	10295
1986	10,967	0	10967
1987	11,376	0	11376
1988	12,148	2052	14200
1989	15,288	2130	17418
1990	15,605	2266	17871
1991	18,433	2305	20738
1992	18,054	2506	20560
1993	17,710	2499	20209
1994	17,322	2574	19896
1995	16,938	2650	19588
1996	17,192	2725	19917
1997	17,429	2800	20229
1998	17,651	2875	20526
1999	17,858	2951	20809
2000	18,052	3026	21078

SOLID WASTE

YEAR	CURRENT PROGRAMS (1988 \$MM)	NEW PROGRAMS (1988 \$MM)	TOTAL (1988 \$MM)
1981	4948	0	4948
1982	5043	0	5043
1983	5163	0	5163
1984	5384	0	5384
1985	5771	0	5771
1986	5858	0	5858
1987	6050	0	6050
1988	6233	0	6233
1989	6426	0	6426
1990	6617	0	6617
1991	6804	357	7161
1992	6987	3194	10181
1993	7166	1035	8201
1994	7340	1069	8410
1995	7510	1104	8614
1996	7675	1138	8813
1997	7836	1172	9009
1998	7994	1234	9228
1999	8150	1297	9447
2000	8302	1361	9663

Figure 8.

TOTAL CAPITAL EXPENDITURES BY EPA,
STATES, AND LOCAL GOVERNMENTS,
TO MAINTAIN CURRENT LEVELS OF
ENVIRONMENTAL QUALITY AND
LOCAL CAPITAL SPENDING TO
COMPLY WITH NEW REGULATIONS, 1981-2000
(IN MILLIONS OF 1988 DOLLARS)

YEAR	Total Capital Expenditures to Maintain Current Levels of Environmental Quality	Local Capital Costs to Comply With New Regulations
1981	13,274	0
1982	11,334	0
1983	11,399	0
1984	11,010	0
1985	12,205	0
1986	13,468	0
1987	12,935	0
1988	13,267	2,199
1989	16,433	2,881
1990	16,718	2,994
1991	19,749	3,313
1992	18,640	5,892
1993	17,574	2,177
1994	16,550	2,617
1995	15,567	2,610
1996	15,892	2,597
1997	16,217	3,209
1998	16,541	2,774
1999	16,865	3,707
2000	17,188	2,110

Figure 9.

LOCAL CAPITAL EXPENDITURES
TO MAINTAIN CURRENT LEVELS OF
ENVIRONMENTAL QUALITY AND TO
COMPLY WITH NEW REGULATIONS,
1981 - 2000 (Millions of \$1988)

YEAR	CURRENT CAPITAL EXPENDITURES	NEW CAPITAL COSTS	TOTAL CAPITAL
1981	8374	0	8374
1982	6877	0	6877
1983	7883	0	7883
1984	7853	0	7853
1985	8650	0	8650
1986	9810	0	9810
1987	9547	0	9547
1988	10262	2199	12461
1989	13379	2881	16260
1990	13689	2994	16683
1991	16517	3313	19830
1992	16112	5892	22004
1993	15728	2177	17905
1994	15366	2617	17983
1995	15024	2610	17634
1996	15337	2597	17934
1997	15650	3209	18859
1998	15962	2774	18736
1999	16275	3707	19982
2000	16587	2110	18697

Figure 10.

LOCAL GOVERNMENT CAPITAL AND
O&M EXPENDITURES TO
MAINTAIN CURRENT LEVELS OF
ENVIRONMENTAL QUALITY
AND TO COMPLY WITH
NEW REGULATIONS
(MILLIONS OF \$1988)

YEAR	LOCAL Capital	LOCAL O&M	LOCAL Total
1981	8,374	17,966	26,340
1982	6,877	18,803	25,680
1983	7,883	19,794	27,677
1984	7,853	20,546	28,399
1985	8,650	21,379	30,029
1986	9,810	22,225	32,036
1987	9,547	23,034	32,581
1988	12,461	23,969	36,430
1989	16,260	24,659	40,919
1990	16,683	25,700	42,384
1991	19,830	26,564	46,394
1992	22,004	27,838	49,842
1993	17,905	29,429	47,334
1994	17,983	30,224	48,207
1995	17,634	31,040	48,674
1996	17,934	31,846	49,781
1997	18,859	32,631	51,490
1998	18,736	33,459	52,195
1999	19,982	34,242	54,223
2000	18,697	35,017	53,714

Figure 11.

EPA CAPITAL OUTLAYS TO MAINTAIN
CURRENT LEVELS OF ENVIRONMENTAL QUALITY
COMPARED WITH LOCAL CAPITAL
SPENDING TO MAINTAIN CURRENT LEVELS OF
OF ENVIRONMENTAL QUALITY AND COMPLY WITH
NEW REGULATIONS, 1981 - 2000
(MILLIONS OF \$1988)

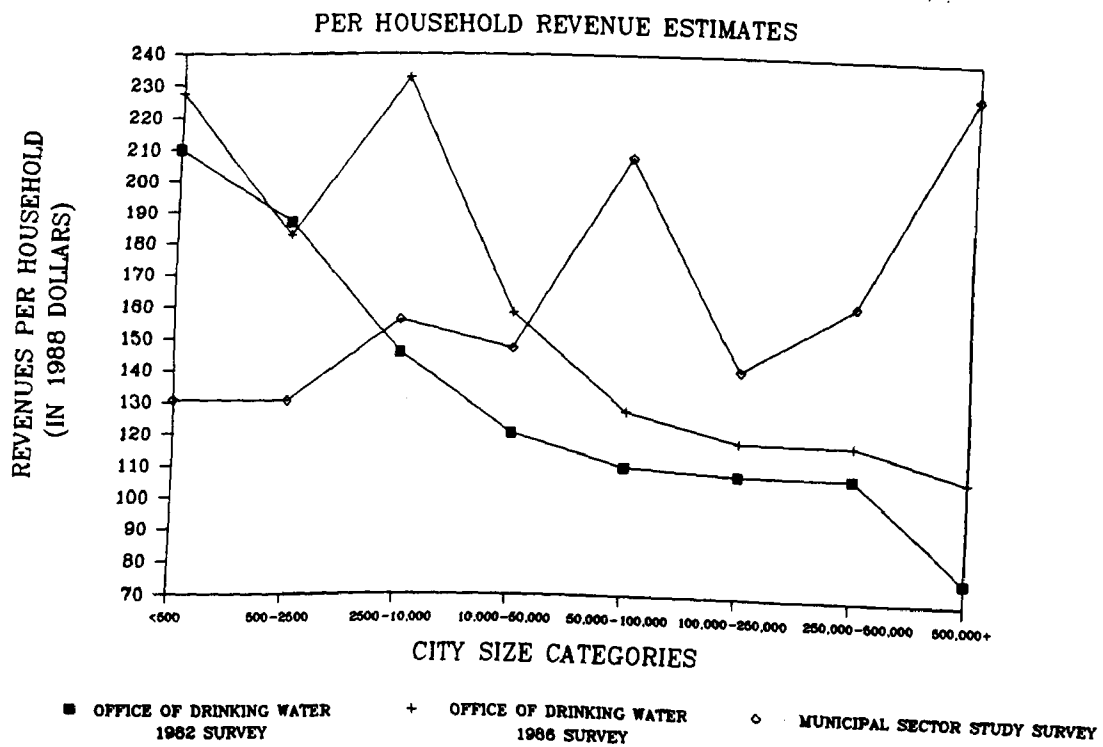
YEAR	EPA CAPITAL OUTLAYS	LOCAL CAPITAL OUTLAYS
1981	4,511	8,374
1982	4,071	6,877
1983	3,250	7,883
1984	2,848	7,853
1985	3,126	8,650
1986	3,258	9,810
1987	2,967	9,547
1988	2,566	12,461
1989	2,362	16,260
1990	2,325	16,683
1991	2,288	19,829
1992	1,689	22,004
1993	1,108	17,905
1994	545	17,983
1995	0	17,635
1996	0	17,934
1997	0	18,859
1998	0	18,736
1999	0	19,982
2000	0	18,696

Appendix 3. Differences in Methodology and Content Between the Municipal Sector Study and This Report

1. The Municipal Sector Study (MSS) estimates local costs associated with new regulations assuming that costs of existing environmental regulations remain constant over the period studied, 1988 to 1996. This report (Cost Report) incorporates these data and, in addition, provides data on expenditures pursuant to current regulations. For the Cost Report, local expenditures pursuant to existing regulations are provided for 1981 to 1986 and projected to the year 2000 to estimate local costs of existing regulations. Tables indicating costs to municipalities and households in year 2000 include both costs of maintaining current programs and costs of new regulations.
2. The final years of cost projection differ for the two studies. For the MSS it is 1996 and for the Cost Report it is 2000 so, while the MSS discusses future costs for 1996, this report compares 1987 with 2000.
3. All data in the MSS are presented in 1986 dollars and for the Cost Report they are presented in 1988 dollars.
4. Capital costs were amortized using different methods. The MSS used a 10 percent real rate. The Cost Report assumed a 3 percent real rate.
5. The MSS reports costs in fewer size categories than the Cost Report. The large expenditures estimated for households in smallest cities (<500) in the Cost Report are reduced considerably when averaged across households in cities with <2,500 people (the smallest size category in the MSS). This is also true when calculating expenditures as a percentage of household income.
6. Average costs per household are calculated in the MSS based on a survey of household user charges for environmental services whereas in the Cost Report household costs are based on necessary expenditures per household to provide the services. This difference in methodology results in different cost estimates because revenues from charges do not necessarily equal expenditures to provide a service. In addition, costs of provision vary between cities -- even for communities of comparable size. Finally, the use of different surveys contributes an additional source of variation. The MSS data are based on survey results gathered specifically for the MSS project. Data in the Cost Report are based on survey results gathered by the Office of Drinking Water and the U.S. Census Bureau. To illustrate, Figure 13 shows a comparison of estimates of per household revenues for water supply from the MSS survey and the ODW survey.

Figure 13

COMPARISON OF THE OFFICE OF DRINKING WATER
SURVEYS AND THE MUNICIPAL SECTOR STUDY SURVEY



Appendix 4. Average Annual Household User Charges for Environmental Services in 1987 (1988 Dollars)

Municipality Size Category	Drinking Water	Water Quality	Solid Waste	Total
Less than 500	\$ 304	\$304	\$62	\$670
500-2,500	210	213	50	473
2,500-10,000	191	174	68	433
10,000-50,000	182	184	78	444
50,000-100,000	150	143	80	373
100,000-250,000	126	106	59	291
250,000-500,000	127	92	116	335
Over 500,000	108	100	185	393
Weighted Average	172	154	83	419

Source: Apogee Research from data compiled by the U.S. Bureau of the Census and 1986 Survey of Community Water Systems, conducted by the Research Triangle Institute for the Environmental Protection Agency, Office of Drinking Water, October 23, 1987.