

October 1993

# ENVIRONMENTAL INFRASTRUCTURE

## Effects of Limits on Certain Tax-Exempt Bonds



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United States  
General Accounting Office  
Washington, D.C. 20548

Resources, Community, and  
Economic Development Division

B-249942

October 28, 1993

The Honorable Christopher Shays  
The Honorable Nita M. Lowey  
House of Representatives

As requested, we are reporting on the impacts of the volume cap—a limit that the Tax Reform Act of 1986 placed on tax-exempt bonds that can be issued to fund private projects—on state and local investment in environmental infrastructure. This report discusses the impact of the volume cap in the context of the investment states and localities need to make to comply with federal environmental requirements.

As arranged with your offices, unless you publicly announce its contents earlier, we will make no further distribution of this report until 30 days after the date of this letter. At that time, we will send copies to the appropriate congressional committees; the Administrator, Environmental Protection Agency; the Secretary of the Treasury; and the Director, Office of Management and Budget. We will make copies available to other interested parties on request.

Please contact me at (202) 275-6111 if you or your staff have any questions. Major contributors to this report are listed in appendix IV.

Richard L. Hembra  
Director, Environmental  
Protection Issues

# Executive Summary

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## Purpose

While the costs of complying with federal environmental mandates have increased dramatically for states and localities in recent years, the Congress, in the Tax Reform Act of 1986, placed a cap on the volume of certain tax-exempt bonds that could be issued each year for this and other purposes. State and local governments rely heavily on tax-exempt bonds to help finance environmental infrastructure. The Environmental Protection Agency (EPA) estimates that local costs for meeting federal environmental mandates will continue to rise, reaching almost \$28 billion a year by 2000. Moreover, environmental projects will increasingly have to compete for limited funding with other types of infrastructure.

To estimate how the cap on the volume of tax-exempt bonds that states and localities could issue affected investment in environmental infrastructure, GAO (1) examined the impacts of the volume cap on national investment—both public and private—in solid waste, wastewater treatment, and drinking water facilities and (2) assessed the effects of the cap on private companies' decisions to invest in these facilities.

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## Background

The federal government provides subsidies to state and local governments by allowing them to issue tax-exempt bonds—either in the form of government bonds or private activity bonds (PAB) for private projects that help meet public needs. Because the interest earned on the bonds is exempt from federal taxation, the issuing entity can pay a lower interest rate to bond holders, thus lowering the cost of borrowing. The economic rationale for the federal subsidy is that the benefits of environmental infrastructure extend beyond individual states and communities to neighboring jurisdictions. Because the community making the investment must bear the entire cost but does not receive all of the benefits, the community is considered likely to underinvest without the subsidy.

During the 1980s, state and local governments substantially increased their issuance of tax-exempt bonds, raising concerns about the loss of federal revenues and the level of public benefits actually realized. In the Tax Reform Act of 1986, the Congress restricted the types of projects eligible for financing with PABs. Among environmental projects, pollution control equipment (primarily air pollution control devices) could no longer receive tax-exempt financing, but solid and hazardous waste disposal (including recycling), wastewater treatment, and drinking water facilities remained eligible.<sup>1</sup> The act also placed a cap, or dollar limit, of \$50 per capita or

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<sup>1</sup>Hazardous waste facilities were omitted from GAO's analysis because spending by local governments for these facilities is negligible and federal grants support the majority of spending by states.

\$150 million, whichever is greater, on the volume of PABS that each state could issue. States then had to distribute the subsidy among various competing localities and purposes.

In 1990, a study conducted by experts on tax-exempt bonds found that the volume cap had reduced the issuance of PABS for all purposes below the level at which they would have been issued without the cap. The model used in that study was adapted to estimate whether the volume cap has resulted in the reduced issuance of PABS for environmental facilities. GAO used the results of the model to corroborate other findings from an analysis of national data on capital spending and the issuance of tax-exempt bonds for environmental projects.

## Results in Brief

Capital spending and the volume of tax-exempt bonds issued for environmental projects have changed relatively little since the Tax Reform Act, suggesting that the volume cap has not resulted in less overall investment nationwide. However, about half the states used most of their PAB allocation under the cap, and in these states the results of the model suggest that the volume cap resulted in fewer PABS issued for environmental facilities than would have been issued without the cap. This decrease is due, in part, to states' decisions to use only a small portion of their PAB allocation for these projects. Despite the impact of the cap on some states, however, one reason that overall investment did not decline may be that tax-exempt government bonds were substituted for PABS to finance environmental projects.

Nevertheless, while national investment in environmental projects has remained level, capital spending on the environment as a percentage of the gross domestic product has declined. Moreover, it has not kept pace with the increase in federal environmental mandates, which will require considerably higher levels of investment in the future.

The volume cap has discouraged investment in environmental infrastructure by some companies, in large part because states' allocation processes give low priority to environmental projects. In addition, a number of states allocate PAB authority on a first-come, first-served basis. This practice increases the risk that investors in environmental projects, which often require more than one year's allocation, will be unable to secure all necessary financing. However, private companies claim that their decisions to invest in environmental infrastructure are less affected by the volume cap than by the provisions of the 1986 Tax Reform Act that

eliminated the investment tax credit and lengthened depreciation schedules.

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## Principal Findings

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### Volume Cap Has Not Reduced National Investment, but Investment Levels Remain Inadequate

Trends indicate that the volume cap has not reduced the overall volume of bonds issued for environmental infrastructure. Between 1982 and 1990, the volume of tax-exempt municipal bonds issued for environmental projects increased from \$10.1 billion to about \$11.2 billion (in constant 1991 dollars), with a temporary large increase just before the 1986 tax reforms.

About half of the states issued significantly fewer bonds than their full PAB allocation; that is, they used less than 80 percent of their allocation, which is the cutoff point defined in the model. Consequently, in these states the volume cap did not appear to constrain the use of PABS for environmental projects. But for the remaining states, which used 80 percent or more of their allocation, GAO's analysis suggests that, with other factors held constant, the cap resulted in fewer PABS being issued for environmental purposes. States decide how to apportion their allocation among various authorized uses; most give low priority to environmental projects, typically choosing to support housing and industrial development projects instead. California officials told us that the state directs 85 percent of its allocation to housing.

GAO's analysis also suggests that some states may have issued government bonds in place of PABS to finance environmental projects, thus accounting for the relatively insignificant change in the overall volume of bonds issued for environmental purposes. While substituting government bonds for PABS may not currently be difficult, it could become so in the future as the competition increases for public investment to meet a variety of infrastructure needs—for schools and roads, for example.

While national investment in environmental facilities increased from \$17.7 billion in 1972 to \$20.7 billion in 1989 (in constant 1991 dollars), as a proportion of gross domestic product it decreased from 0.49 percent to 0.37 percent over the same period. More importantly, spending has not grown rapidly enough to keep pace with the rapid growth in federal environmental requirements. EPA's Administrator testified before the Subcommittee on Water Resources and the Environment, House

Committee on Public Works and Transportation, that a 1992 EPA survey estimated the cost of meeting wastewater treatment requirements alone to be over \$108 billion (in 1990 dollars) by the year 2012, or \$5.4 billion a year.

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### Private Investment Decisions Are Affected by a Number of Factors

According to officials in several companies of various sizes, the availability of tax-exempt financing is an important incentive for investment in environmental infrastructure, but the processes by which states allocate PABS under the volume cap have made investment less attractive. Because these projects are often very expensive, with costs exceeding the maximum annual amount per project that states allow, funds for the projects must be carried forward into subsequent years. However, many states, such as New Jersey, allocate the authority to issue PABS among projects on a first-come, first-served basis within categories of uses. Texas uses a lottery to distribute its allocation. Because companies cannot count on getting PAB financing in subsequent years, they say that they are reluctant to invest in a large project that relies on tax-exempt financing.

While the availability of tax-exempt financing is important, companies claim that the elimination of the investment tax credit and accelerated depreciation are greater obstacles to investment than the volume cap. Ultimately, if private investment in environmental facilities declines as a result of the difficulty in obtaining tax-exempt financing and other tax subsidies, public ownership could take its place. If this change occurs, however, the federal government could continue to forgo revenues, since municipalities would still issue tax-exempt bonds to finance the facilities. Moreover, local costs could increase in cases in which private ownership would have been less costly and more efficient than public ownership. However, these impacts must be weighed against the benefits that would result from restricting the level of subsidy. With a limited volume of PABS available, governments are likely to use them for projects that benefit the public the most. In addition, limiting the subsidy could help ensure that private investment decisions are not driven by tax considerations.

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### Recommendations

GAO is not making any recommendations in this report.

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### Agency Comments

EPA generally agreed with the facts and conclusions in this report regarding the impact of the volume cap on investments in environmental infrastructure (see app. II). The Treasury Department stated that GAO's

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**Executive Summary**

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conclusions were plausible but questioned whether the model provided adequate support for some of them. As GAO notes in appendix III, its conclusions are based largely on aggregate data. Where appropriate, the model's results are used to corroborate these data.





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## Abbreviations

ACIR	Advisory Commission on Intergovernmental Relations
AMT	alternative minimum tax
EFAB	Environmental Financial Advisory Board
EPA	Environmental Protection Agency
GAO	General Accounting Office
GDP	gross domestic product
IDB	industrial development bond
IRS	Internal Revenue Service
ITC	investment tax credit
MRB	mortgage revenue bond
NBER	National Bureau of Economic Research
PAB	private activity bond
PSA	Public Securities Association
SRF	state revolving funds

# Introduction

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Tax-exempt government bonds are the most important source of financing for environmental infrastructure, including solid waste, wastewater treatment, and drinking water facilities. States and local governments issue two types of bonds, depending on the level of private involvement: government bonds for public projects and private activity bonds (PAB) for private projects that help meet public needs.

Tax-exempt financing allows the entity that issues the bonds to borrow at a lower interest rate. Bond purchasers are willing to accept this lower rate of return because the interest they earn on their investment is not subject to federal taxation. To those seeking financing, the difference between the market interest rate for taxable bonds and the interest rate for tax-exempt bonds of comparable risk and maturity can be significant—typically about 2 percentage points. Given the huge capital costs of some environmental facilities, this difference can account for considerable savings.

In the case of environmental infrastructure, the economic rationale for a federal subsidy (e.g., the tax-exemption for interest earned on PABS) is to correct for underspending by states and local governments. While investment in infrastructure may be in the national interest, communities that are responsible for investing in environmental facilities may not receive all the benefits of the investment and may therefore undervalue the benefits relative to the costs and fail to invest. For example, when a community builds a wastewater treatment facility, the community that is located downstream from the facility receives significant benefits, but the community building the plant pays the entire cost of the project.

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## Tax Policy and Bond Authority

The Congress allowed states to issue tax-exempt bonds virtually without limits until the late 1960s. However, the Congress became concerned with the loss of revenue associated with tax-exempt bonds and the use of the bonds to subsidize private projects with minimal public benefits. The first restrictions on the use of tax-exempt bonds for private activities were imposed in a 1968 law. Tax-exempt status was limited to bonds used for purposes specified in the law, such as airports and facilities for sports, parking, wastewater treatment, and solid waste disposal. Tax-exempt bonds issued for privately owned environmental facilities were primarily industrial development bonds. In general, these bonds were used when more than 25 percent of the proceeds were used by a single private company.

State and local issuance of long-term, tax-exempt bonds for private activities (e.g., industrial development, student loans, mortgage revenue, and pollution control) increased almost sevenfold from 1975 to 1985—from \$21 billion to over \$144 billion.<sup>1</sup> Revenue losses to the federal Treasury also increased, because bond holders were not subject to tax on the interest income. As a result, after 1968 the Congress continued to revise the tax-exempt bond laws. In 1984, the Congress placed a cap on the volume of tax-exempt bonds that a state could issue for industrial development and student loans.

The Tax Reform Act of 1986 placed further restrictions on tax-exempt bonds for private activities, expanding the category of bonds called private activity bonds and placing a cap on the volume of PABS that can be issued annually by each state. In addition, the act restricted the types of projects eligible for PAB financing to those considered to provide public benefits. The act also eliminated the use of PABS for certain purposes that the Congress did not deem eligible, such as sports and parking facilities. Most environmental facilities, including ones for drinking water, wastewater treatment, solid waste and hazardous waste disposal, remained eligible for PABS.<sup>2</sup> According to an official at the Treasury Department, the act required governments to demonstrate that drinking water facilities and other types of projects eligible for PABS, with the exception of solid waste disposal and wastewater treatment facilities, provide public benefits before the governments could issue PABS. The act did not specifically require governments to demonstrate that wastewater treatment and solid waste projects provided public benefits because, according to the official, it was assumed that they did. The official added that a solid waste or wastewater treatment facility built primarily to serve an industrial plant may provide public benefits because the town may also use it or because it offsets the need for public investment. In any event, he noted that because the act limits the volume of PABS that states can issue, it is unlikely that governments would issue bonds for environmental projects that officials do not believe have public benefits.

The act also lowered the level of private involvement in a project that was necessary to trigger the requirement for projects to be financed with PABS. Compared with a 25-percent limit before, the act required PABS to be issued when (1) more than 10 percent of the proceeds is to be used in a trade or business by a nongovernment entity and the principal or interest on more

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<sup>1</sup>All references to dollars in this report are in constant 1991 dollars unless otherwise indicated.

<sup>2</sup>Hazardous waste facilities were omitted from GAO's analysis because spending by local governments for these facilities is negligible and federal grants support the majority of spending by states.

than 10 percent of the proceeds is directly or indirectly paid from, or secured by, payments or property from a private trade or business or (2) more than 5 percent of the proceeds, or \$5 million, is used for loans to private persons. Finally, the 1986 act eliminated the investment tax credit available to private investors in infrastructure and, for facilities that are financed with PABS, it lengthened the depreciation schedules for private owners. However, private companies that finance projects with taxable debt can continue to take advantage of shorter depreciation schedules.

As shown in list 1.1, most types of environmental facilities—wastewater treatment plants, solid waste facilities, and drinking water facilities—fall under the volume cap. The annual cap set by the Tax Reform Act of 1986 applies to each state and is either \$150 million or \$50 per state resident, whichever is greater. (In 1986 and 1987, when the cap was phased in, each state was limited to \$250 million or \$75 per resident, whichever was greater.<sup>3</sup>) Under the act, all state agencies, which are treated as a single unit, are allocated 50 percent of the total PABS under the cap for the year. Local issuing authorities are allocated the other 50 percent, to be divided according to a statutory formula. However, a state may divide the allocation differently if the governor issues a proclamation or the state legislature passes a statute with an alternative allocation.<sup>4</sup>

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<sup>3</sup>In 1986, the cap applied only to bonds issued between August 16 and December 31 but was not prorated for a partial year.

<sup>4</sup>Exceptions apply to certain constitutional home rule cities, like Chicago.

Table 1.1: Projects That Qualify for PAB Financing

<b>Subject to volume cap</b>
Government-owned mass commuting facilities
Drinking water facilities
Wastewater treatment facilities
Nongovernment-owned solid waste disposal facilities
Hazardous waste facilities
Local electric or gas utilities
Local district heating or cooling facilities
Residential rental projects
Mortgage revenue
Small-issue industrial development
Student loans
Redevelopment
Government acquisition of nongovernment output property (e.g., private utilities)
High-speed rail
<b>Not subject to volume cap</b>
Government-owned airports <sup>a</sup>
Government-owned docks and wharves <sup>a</sup>
Government-owned solid waste disposal facilities
Veterans' mortgage revenue (has a separate volume cap)

<sup>a</sup>Airports, docks, and wharves must be government owned to qualify for PAB financing.

Source: Daphne A. Kenyon and Dennis Zimmerman, "Private Activity Bonds and the Volume Cap in 1990," *Intergovernmental Perspective*, vol. 17 (Washington, D.C.: Advisory Commission on Intergovernmental Relations, Summer 1991).

Allocation responsibilities and priorities vary widely by state. States administer the allocation through the governor's office, the state treasury, the departments most closely concerned with facilities or activities for which the funds will be spent, or committees established for that purpose. According to a 1990 survey conducted for the Advisory Commission on Intergovernmental Relations (ACIR), states have distributed their allocation in several ways: between state and local issuers according to some formula; by purpose (i.e., housing, student loans, industrial development, environmental facilities, etc.); by economic development indicators (such as jobs created); and on a per capita basis by district.<sup>5</sup>

<sup>5</sup>Daphne A. Kenyon and Dennis Zimmerman, "Private Activity Bonds and the Volume Cap in 1990," *Intergovernmental Perspective*.

States can elect to carry forward all or part of their unused allocation from one year to the next, providing it is used within 3 years. When states elect to carry forward a portion of their allocation, they are required to make an irrevocable decision on the general purpose for which that portion will be used. For costly projects, such as incinerators, states often carry funds forward to provide financing for the whole project.

## Objectives, Scope, and Methodology

Former Representative Frank J. Guarini, Chairman of the House Committee on the Budget's Task Force on Urgent Fiscal Matters, asked us to analyze how the volume cap imposed on PABS has affected investment in environmental infrastructure. In subsequent discussions with the requester's office, we agreed to

- examine the impacts of the volume cap on national investment (both public and private) in drinking water, wastewater treatment, and solid waste facilities and
- assess the effects of the cap on private companies' decisions to invest in these facilities.

As agreed, we are providing this report to Representatives Christopher Shays and Nita M. Lowey. They have expressed their concern that the investment needed to comply with existing environmental standards is rapidly exceeding the financial capacity of governments.

To estimate how the volume cap has affected national investment in environmental infrastructure, we interviewed officials in 11 states, representing a mixture of states with large, medium, and small populations and with different rates of growth. These states included Arkansas, California, Florida, Maryland, Nevada, New Jersey, New York, Texas, Utah, Virginia, and Washington. In addition, within some of these states we interviewed officials of local governments, including Chicago; Carbon County, Utah; the Southwest Water District in Arkansas; and Suffolk County, New York.

To determine the nationwide impact of the cap on the volume of tax-exempt bonds issued for environmental infrastructure, we analyzed data on capital spending and issuance of tax-exempt bonds for environmental infrastructure. To corroborate those findings, we used a model developed by Dr. Daphne Kenyon of Simmons College in Boston. Dr. Kenyon had originally developed the model to estimate the impact of



the volume cap for all purposes,<sup>6</sup> the first such study after the volume cap was established. Working with GAO economists, Dr. Kenyon and her assistant, Ritu Nayyar of Boston University, adapted this model to estimate the effects of the cap on investment in solid waste, wastewater treatment, and drinking water facilities. Because the model held other factors constant, it allowed us to estimate whether states and local governments would be issuing more PABS for environmental projects if the volume cap had not been imposed. Appendix I describes the model's methodology.

We interviewed financial experts and bond counsels to elicit their views on the impacts of the volume cap on private decisions to invest in environmental facilities. We talked with representatives of companies that have invested in environmental infrastructure in the past to discuss how the volume cap has affected their investment strategies.

We conducted our review between November 1991 and February 1993 with updates through August 1993 in accordance with generally accepted government auditing standards. The draft report was reviewed by Dennis Zimmerman of the Congressional Research Service, an expert on tax-exempt bonds. We also obtained agency comments from the Environmental Protection Agency and the Department of the Treasury on a draft of this report. Comments and our responses are included in appendixes II and III.

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<sup>6</sup>Dr. Kenyon's model and her analyses, conducted for the National Bureau of Economic Research, underwent peer review before publication of her findings in the National Tax Journal, vol. 44, December 1991, p.81-92.

# Volume Cap Has Not Reduced National Investment, but Investment Is Inadequate to Meet Federal Mandates

The volume of bonds issued and the level of capital spending for environmental infrastructure have changed relatively little since the provisions of the Tax Reform Act of 1986 took effect, suggesting that national investment has not been reduced as a result of the volume cap. However, in states where the cap has limited the total volume of PABS issued for all purposes, the cap seems to have resulted in reduced issuance of PABS for environmental infrastructure. This reduction may have occurred in part because many of these states chose to allocate only a small portion of their PABS for environmental projects. Furthermore, we found that states that were limited by the volume cap may have substituted government bonds for PABS to finance environmental facilities.

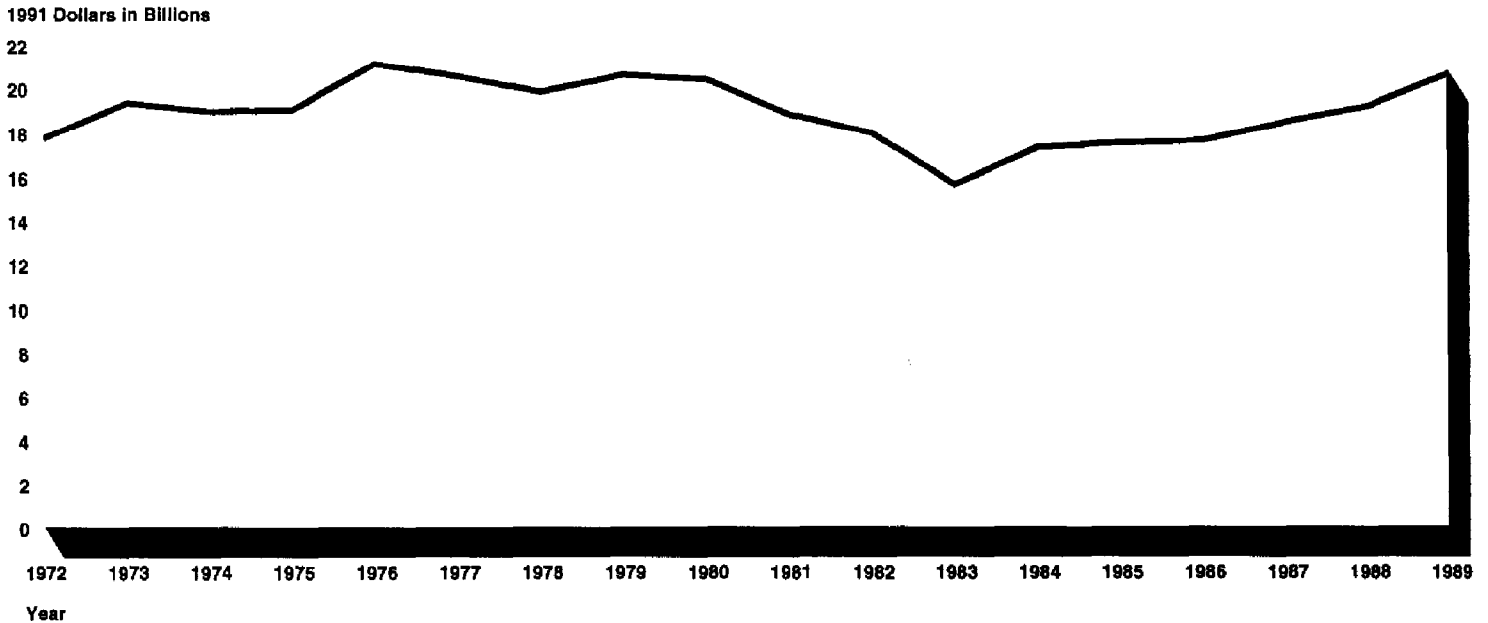
However, while national investment in environmental projects remained level, capital spending on the environment as a percentage of gross domestic product has declined. Moreover, it has not kept pace with the increase in federal environmental mandates, which will require considerably higher levels of investment in the future.

## Investment in Environmental Infrastructure Has Remained Relatively Unchanged

Data on capital spending collected by the Environmental Protection Agency (EPA) indicate that total public and private investment in environmental infrastructure has remained relatively unchanged over the last 20 years (see fig. 2.1, which summarizes the data in figs. 2.2-2.4). In 1972, total capital investment in environmental infrastructure was about \$17.7 billion a year compared with \$20.7 billion in 1989. The only important change in spending was a decline in 1983, part of which may be attributed to the reduction in federal construction grants for wastewater treatment facilities. Since 1983, however, investment in environmental infrastructure has steadily grown back to 1972 levels. More importantly for this analysis, spending before and after the Tax Reform Act of 1986 was relatively unchanged and has in fact increased from \$17.5 billion in 1985 to \$19.2 billion in 1988. While the data are limited because the act was implemented so recently, they suggest that the act has not had an impact on capital spending for the environment—at least in the short term.

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**Figure 2.1: Investment in Environmental Infrastructure, 1972-89**



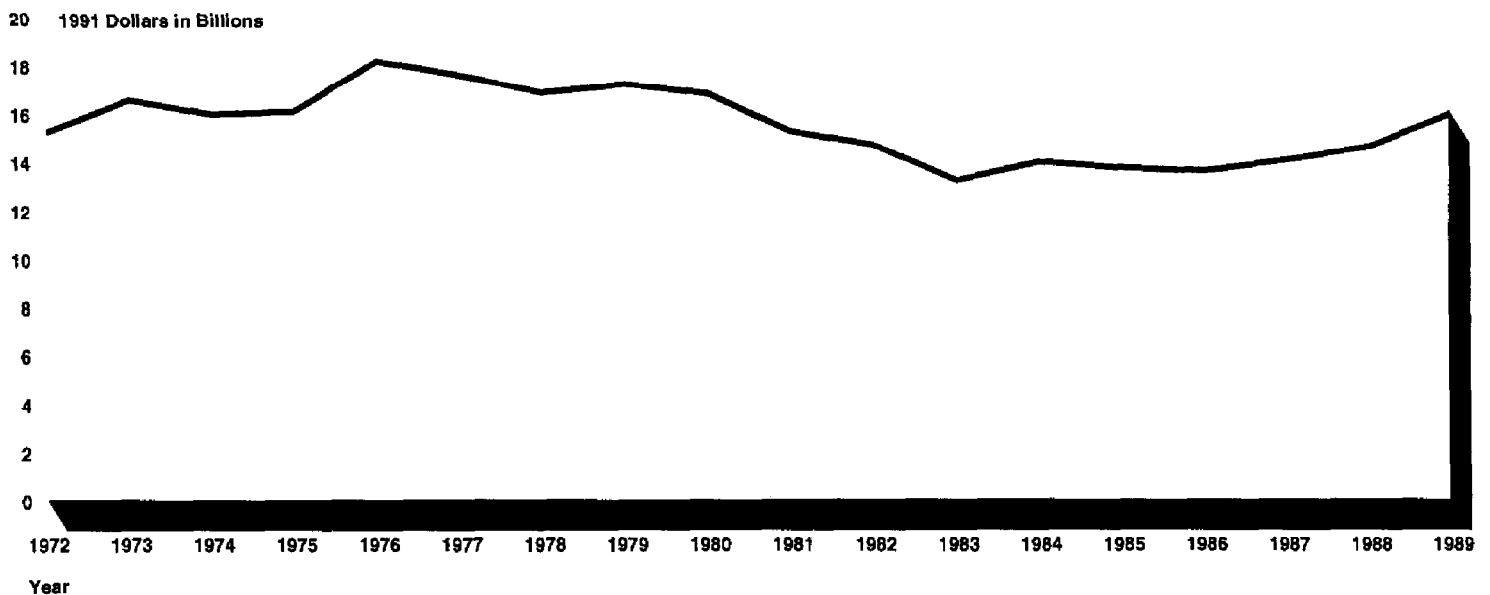
Source: Based on data from Environmental Investments: The Cost of a Clean Environment, Environmental Protection Agency (EPA), November 1990.

Factors that affect investment vary by type of facility. For example, investment in wastewater facilities has changed as the level of federal construction grants has changed. Figure 2.2 shows how investment in wastewater facilities—including federal, state, local, and private spending—has changed as the level of grants has been reduced or increased. Because industrial facilities are required to treat the water they use to a certain degree before discharging it, the private sector has historically invested the most in wastewater facilities. However, wastewater facilities that serve the general public, including industrial customers, have traditionally been municipally owned and financed, largely through the Construction Grants Program, which was authorized by the Clean Water Act of 1972. In the late 1970s and through the 1980s, the Congress decreased funding of the Construction Grants Program. In 1987, the Congress amended the Clean Water Act to replace grants with State Revolving Funds (SRF), which were authorized through 1994. Under

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this program, the states provide low-interest loans to local governments for wastewater treatment facilities. As indicated in fig. 2.2, investment has increased slightly since SRFs were created.

**Figure 2.2: Investment in Wastewater Infrastructure, 1972-89**

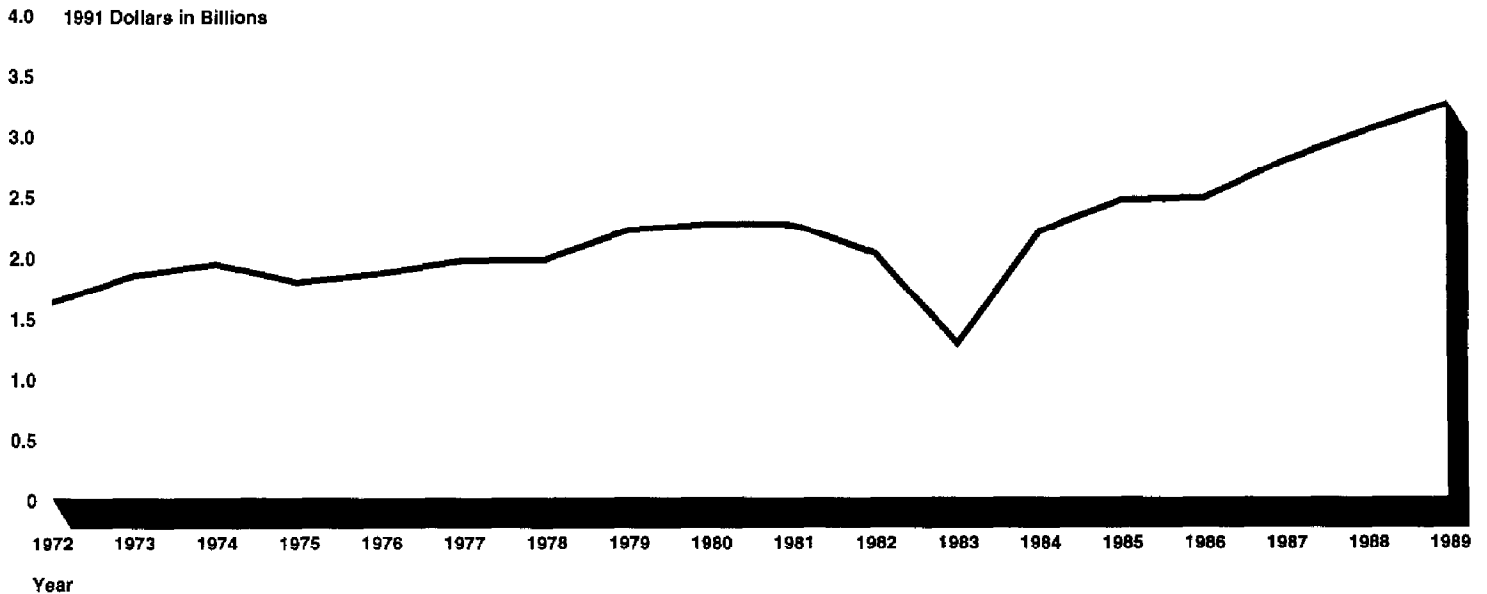


Source: Based on data from Environmental Investments: The Cost of a Clean Environment, EPA, November 1990.

As shown in figure 2.3, capital spending for solid waste facilities has more than doubled in recent years, from \$1.6 billion in 1972 to \$3.3 billion in 1989. This increase is due primarily to the increasing costs of building landfills in anticipation of forthcoming regulations under the Resource Conservation and Recovery Act.

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**Figure 2.3: Investment in Solid Waste Infrastructure, 1972-89**

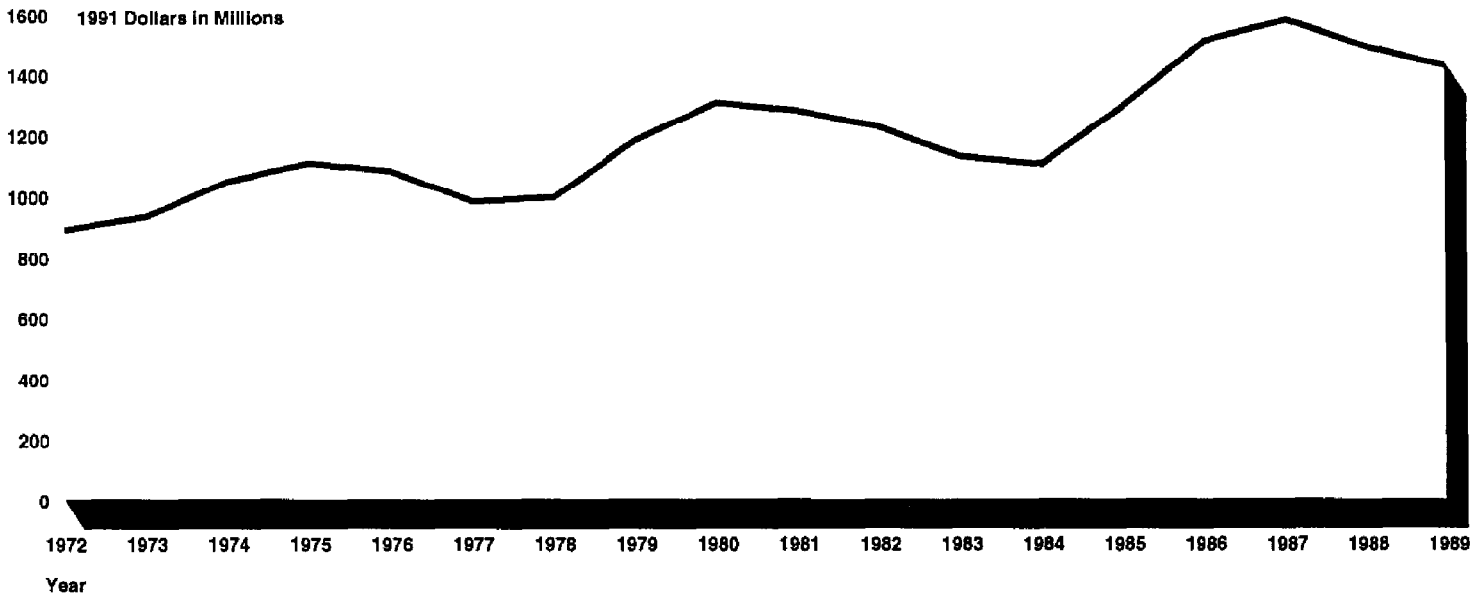


Source: Based on data from Environmental Investments: The Cost of a Clean Environment, EPA, November 1990.

Capital spending to comply with federal regulations on drinking water quality increased by about 57 percent from 1972 to 1989, from \$891 million per year to \$1.4 billion per year (see fig. 2.4). The majority of the spending has come from the public sector, since publicly owned drinking water facilities provide water to over 70 percent of the population. In addition to the costs of complying with drinking water quality standards, local governments also spend significant sums to repair, replace, and enlarge water supply facilities.

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**Figure 2.4: Investment in Drinking Water Quality Infrastructure, 1972-89**



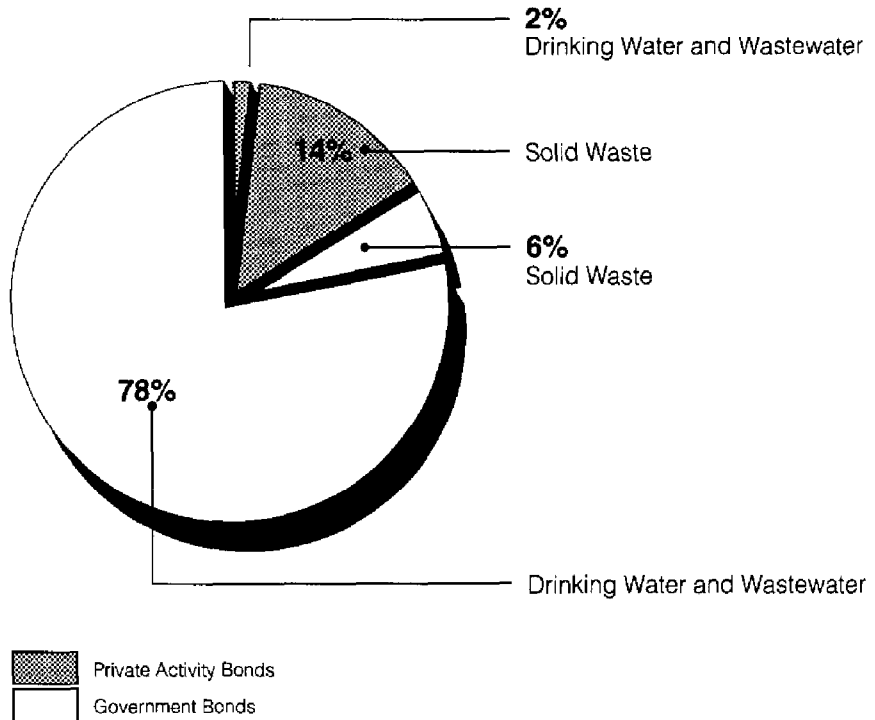
Source: Based on data from Environmental Investments: The Cost of a Clean Environment, EPA, November 1990.

The annual volume of tax-exempt municipal bonds for environmental facilities, including government bonds and PABS, increased from \$10.1 billion in 1982 to about \$11.2 billion in 1990. A large temporary increase occurred preceding the Tax Reform Act of 1986, as governments rushed to finance projects before the law changed.

Cumulatively between 1987 and 1990, the volume of tax-exempt bonds issued for environmental projects reached \$37.6 billion. Of this amount, about \$1.5 billion a year, or roughly 16 percent of all bonds issued to finance drinking water, wastewater treatment, and solid waste facilities, were PABS (see fig. 2.5). Solid waste projects accounted for a major portion of the total volume of PABS issued for environmental purposes, and since 1987 PABS have accounted for about 70 percent of all solid waste bonds. By contrast, issuance of PABS for drinking water and wastewater treatment facilities has been very low because they have typically been government owned.

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**Figure 2.5: Tax-Exempt Bonds for Environmental Projects Issued by Type of Bond and Facility, 1987-90**



Note: Total bond issuance from 1987 to 1990 was \$37.6 billion. State and local governments also issued another \$4.9 billion worth of bonds designated for "pollution control." Bonds for this purpose were authorized as PABs before the Tax Reform Act of 1986 and were "grandfathered in" under various transitional rules.

Source: Based on data from the Public Securities Association.

Trends since 1987 give no indication that governments have substituted taxable bonds for PABs as a result of the cap. Although taxable bonds were not used at all to finance environmental infrastructure before 1986, their use for such purposes subsequently increased to about 1 percent of total bond issuance. The taxable bonds are used to pay for expenses that are ineligible for tax-exempt financing, such as certain costs of issuing bonds.

## Cap Resulted in Reduced Volume of PABs Issued for Environmental Projects in Some States

Our model results indicate that the cap has resulted in reduced issuance of PABs for environmental projects in the states that used all or most of their PAB allocation—18 states in 1989 and 24 states in 1990. (Our model is discussed in detail in app. I). However, total national spending and bond issuance for environmental projects has not decreased. Bond issuance trends and some of the model results suggest that government bonds may have replaced PABs to finance environmental infrastructure.

According to a 1990 study conducted for the Advisory Commission on Intergovernmental Relations (ACIR), about half the states have not been constrained by the volume cap because the total volume of PABs they issued was substantially below the allowed level.<sup>1</sup> In those states, additional PABs could have been issued for any authorized purpose desired by state and local governments, and so there was no evidence that the volume cap had an effect on the volume of any particular type of PAB issued, such as those for environmental facilities.

However, a study conducted for the National Bureau of Economic Research (NBER) that examined the impacts of the volume cap used a regression model. This study found evidence that as a result of the cap, the total volume of PABs issued in the states that used 80 percent or more of their annual allocation (18 states in 1989 and 24 in 1990) was less than it would have been without the cap.<sup>2</sup> Using an adaptation of that model, we anticipated that in those states the cap might have resulted in a reduced volume of PABs issued for environmental projects, depending on (1) what the states' priorities were for allocating available funds under the cap and (2) whether states with binding volume caps tended to give priority to environmental projects over bonds for other purposes. Dr. Daphne Kenyon, author of the study conducted for the NBER, worked closely with GAO economists in adapting her regression model to estimate whether states that used up most of their allocation under the cap issued fewer PABs for environmental facilities than they would have if there had been no volume cap.<sup>3</sup> This model allowed us to control for the effects of other

<sup>1</sup>Daphne Kenyon and Dennis Zimmerman, "Private Activity Bonds and the Volume Cap in 1990," Intergovernmental Perspective.

<sup>2</sup>Daphne Kenyon, "Effects of Federal Volume Caps on State and Local Borrowing," National Tax Journal, vol. 44, No. 4 (Dec. 1991), p. 81-92.

<sup>3</sup>We were limited in our analysis by the availability of data; changes in the tax law restricted us to data that covered only 2 years for most of the model runs, and other data did not correspond precisely to our definitions. For example, we had to substitute the interest rate on all tax-exempt bonds for the interest rate on environmental tax-exempt bonds. (See app. I for a more detailed description of the model and our analysis.)



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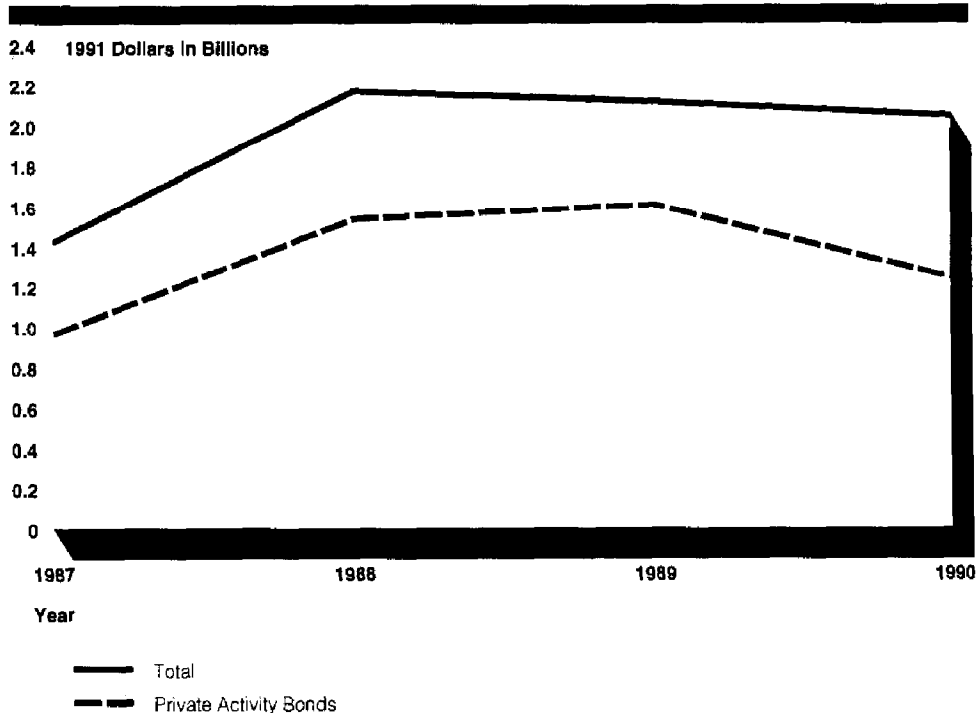
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factors—such as population growth—that might also influence the volume of PABS issued for environmental projects.

The results of our model suggest that in the states that used most (at least 80 percent) of their allocation in 1989 and 1990, the volume of PABS issued for environmental purposes was lower than it would have been without a cap. We also used the model to estimate the impact of the cap on the total volume of tax-exempt bonds, both government bonds and PABS, issued for environmental projects. While our results are less definitive, they suggest that the cap may not have reduced the total volume of tax-exempt bonds that were issued for environmental projects. Combined, the results suggest that the volume cap may be affecting the mix of PABS and tax-exempt government bonds issued for environmental projects. This evidence is supported by the data on investment in solid waste infrastructure—the principal use of PABS issued for environmental projects. These data show that while the volume of PABS issued has decreased since 1986, the total volume of tax-exempt bonds issued for solid waste facilities has not decreased by the same amount. (See fig. 2.6.) As noted above, this result suggests that states and localities may have issued tax-exempt government bonds instead of PABS.

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**Figure 2.6: Solid Waste Bonds Issued**



Source: Based on data from the Public Securities Association.

Because heavily populated states receive smaller per capita allocations of PAB authority than other states, they may, in general, be more affected by the volume cap. As noted earlier, the law allocates \$150 million or \$50 per state resident annually, whichever is greater. States with more than 3 million people, such as New Jersey, Texas, and California, receive an allocation of \$50 per capita, while less populous states, such as New Mexico or Delaware, receive the minimum allocation of \$150 million. Thus, in 1989 New Jersey received an allocation of \$50 per capita, while Delaware received an allocation of \$223 per capita.<sup>4</sup> The results of our model suggest that the states that receive an allocation of \$50 per capita issued a smaller volume of PABs for environmental projects on a per capita basis than states that receive the minimum allocation of \$150 million.

<sup>4</sup>Daphne Kenyon and Dennis Zimmerman, "The Volume Cap for Tax-Exempt Private Activity Bonds: State and Local Experience in 1989," *Intergovernmental Perspective* (Washington, D.C.: Advisory Commission on Intergovernmental Relations, Summer 1990).

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At the same time, state officials told us that less populous states can also be constrained by the cap. Their allotment of \$150 million a year may be less or not much more than the cost of some facilities, so if a large project receives an allocation, little will be left for other purposes. An Arkansas official told us, for example, that environmental facilities accounted for about half of the state's total allocation in 1992, and the state still had two projects costing over \$30 million that could not get an allocation. The official said that, as a result, the state is forced to reduce spending in other areas or to rely on carrying forward allocations to finance expensive environmental facilities.

States' processes for allocating authority to issue PABS can limit the volume of PABS issued for environmental projects. Since states may allocate PABS toward any of the authorized uses for them, it is not necessary to reduce the volume of PABS issued for environmental projects to comply with the volume cap as long as the volume of PABS issued for other purposes is reduced. However, in the past many states developed fixed percentages for each authorized use, and most states allocated the bulk of their funds to housing and industrial development projects.

Developing a formula for allocating PABS is a political process and has resulted in a relatively small volume being allocated to environmental projects. Officials in several states explained that it is more politically attractive to allocate the funds to highly visible projects that directly benefit their constituents, such as student loans and housing, as opposed to environmental facilities that no one wants "in their backyards." In 1989, housing bonds accounted for 45.4 percent of all PABS issued, while environmental facilities accounted for around 15 percent.<sup>5</sup> Some states allocate considerably more of their PABS to housing; for example, California officials told us that the state allocated 85 percent to housing.

States also chose to allocate a large portion of their total for mortgage revenue bonds (MRB) and industrial development bonds (IDB) because the authority to issue these types of bonds was scheduled to expire. An official with the National Association of Bond Lawyers told us that in the past, states have rushed to the market with PABS for these purposes, in case the authority to issue such bonds expired, even though the Congress extended it each time. However, in the Omnibus Budget and Reconciliation Act of 1993, the Congress made the authority permanent.

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<sup>5</sup>The Volume Cap for Tax-Exempt Bonds: State and Local Experience in 1989, Advisory Council on Intergovernmental Relations, (Washington, D.C.: July 1990).

In the future, constraints on environmental financing resulting from the volume cap could increase. First, many projects begun before the Tax Reform Act of 1986 took effect were "grandfathered in" and, thus, were not subject to the cap. Second, because the cap was phased in during 1986 and 1987, state allocations in those years were larger than they have been since, allowing many projects to be financed in those years or to receive an allocation that was carried forward. Third, the recession has decreased the demand for all investment, thus understating the demand for PABS during a period of economic growth. Finally, while states and local governments have apparently been substituting government bonds for PABS, such substitution could become more difficult as the competition increases for public investment to meet a variety of infrastructure needs, such as those for schools and roads. At that point, communities that want to turn to private companies to meet environmental requirements may be constrained by the volume cap.

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## Current Investment Will Not Meet Compliance Needs

Despite the volume cap's limited impact thus far on total investment, the current rate of investment is not high enough to meet the nation's environmental infrastructure needs—that is, the level of spending necessary to ensure that environmental facilities comply with federal environmental laws and regulations. In fact, when measured as a percentage of gross domestic product (GDP), capital spending for environmental facilities has declined—decreasing from 0.49 percent of GDP in 1972 to 0.37 percent in 1989.

New federal standards for wastewater, drinking water, and solid waste will increase costs for local governments. EPA estimates that the local governments' total costs of complying with environmental regulations—both capital and operation/maintenance costs—will increase from \$18.5 billion in 1990 to \$27.7 billion in the 2000, an average annual increase of 4.5 percent. Yet over the same period, the U.S. GDP is estimated to increase by only 2.6 percent a year and population to grow by only 0.8 percent. The resulting slow growth in fiscal capacity will reduce the ability of state and local governments to meet these increasing costs.

In addition to the investment needs associated with environmental mandates, state and local governments are facing other pressing infrastructure needs. A report by the National Council on Public Works Improvement, a group established by the Congress in 1984 to advise on infrastructure issues, stated that national spending on infrastructure was

inadequate to maintain a stable and growing economy.<sup>6</sup> The Council estimated that the \$45 billion spent each year on infrastructure would have to double to \$90 billion a year just to meet growth and replacement needs.

While infrastructure needs have increased, the federal share of the cost of domestic programs has declined in recent years and state and local shares have increased. In a 1990 report, we noted that between 1980 and 1986, federal subsidies to states as a percentage of the states' total revenues dropped by 11 percent, and subsidies to cities dropped by 57 percent.<sup>7</sup> Furthermore, as federal subsidies have decreased, so has the percentage of these subsidies devoted to capital infrastructure. In 1961, over 40 percent of these subsidies was devoted to capital investment, compared with less than 20 percent in 1990.<sup>8</sup> While some states made up for some of the decreased revenues to cities with additional state aid, economically depressed states were unable to do so. A common strategy for coping with fiscal problems is to defer capital projects. For example, fiscal pressure forced about half the cities in Texas to postpone planned capital construction projects in 1987, contributing to an estimated \$16 billion backlog of such projects by 1992.

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## Investment Requirements Differ by Type of Facility

EPA estimated in its 1991 survey on wastewater needs that more than \$80 billion (in 1990 dollars) will have to be spent on wastewater treatment infrastructure over the next 20 years to comply with federal environmental mandates. As the Construction Grants program is phased out in response to the Clean Water Act Amendments of 1987, states and municipalities will rely increasingly on state revolving loan funds to finance these infrastructure needs. However, in a January 1992 report, we found that states expect to meet only about 31 percent of the nation's wastewater infrastructure compliance needs through SRFs by the year 2001<sup>9</sup> (see fig. 2.7). We also reported that EPA's estimates of compliance costs are understated—the actual needs are significantly higher when replacement costs are accounted for.

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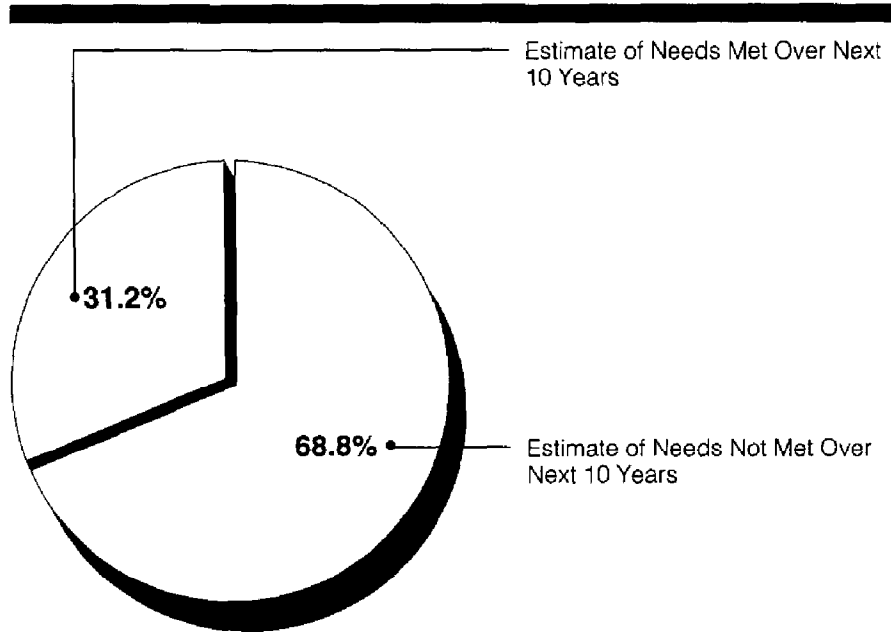
<sup>6</sup>Fragile Foundations: A Report on America's Public Works, National Council on Public Works Improvement (Washington D.C.: Feb. 1988).

<sup>7</sup>Federal-State-Local Relations: Trends of the Past Decade and Emerging Issues (GAO/HRD-90-34, Mar. 22, 1990), p. 18. Federal financial assistance to states and localities takes the form of grants, tax subsidies, loans, and loan guarantees.

<sup>8</sup>Intergovernmental Relations: Changing Patterns in State-Local Finances (GAO/HRD-92-87FS, Mar. 31, 1992).

<sup>9</sup>Water Pollution: State Revolving Funds Insufficient to Meet Wastewater Treatment Needs (GAO/RCED-92-35, Jan. 27, 1992).

Figure 2.7: Percentage of Wastewater  
Treatment Needs States Expect to  
Meet Over the Next 10 Years



Note: The needs are those identified by EPA in its 1988 Needs Survey Report to Congress to cover population growth through the year 2008. The estimated costs to meet these needs is \$83.5 billion. More recent agency estimates are that costs will be \$108 billion by 2012.

Most of the cost of drinking water infrastructure is for delivering water to customers rather than complying with environmental regulations. While EPA has not studied the future compliance costs for drinking water infrastructure, local government capital costs related to drinking water quality have risen from about \$891 million per year in 1972 to \$1.4 billion in 1989. In a May 1991 hearing, EPA testified that it expects the annual compliance costs for local water systems to reach \$3 billion in the next two decades to comply with the 1986 amendments to the Safe Drinking Water Act.<sup>10</sup>

EPA estimates that annual capital costs to comply with new and existing regulations governing solid waste disposal will increase from \$3.3 billion in 1989 to over \$5.1 billion in 2000. These costs are based on the existing stock of facilities because EPA has not attempted to predict the future mix

<sup>10</sup>Testimony of Lajuana S. Wilcher, EPA Assistant Administrator for Water, before the U.S. Senate, Committee on Environment and Public Works, Subcommittee on Superfund, Ocean, and Water Protection (May 17, 1991).

of solid waste treatment and disposal facilities. Therefore, these costs are probably understated because the new technologies are more expensive, and as landfills close and communities are faced with high land costs to site new ones, they are turning to more expensive facilities, such as incinerators. An incinerator costs \$100 to \$200 million, while a landfill costs \$20 to \$30 million.

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### **EPA Has Taken Steps to Deal With Financing Issues**

Recognizing the important environmental finance problems facing states and local governments, EPA developed an Environmental Finance Program to foster public-private partnerships and encourage innovative, efficient solutions to meeting environmental needs. Key initiatives of the Environmental Finance Program include the establishment of an agencywide network of environmental finance coordinators in regional and program offices, the formation of 22 model public-private partnerships nationwide with grants awarded to fund another 23 projects, and preparation of a compendium of alternative financing mechanisms and technical assistance documents for state and local environmental programs. To promote outreach to states and local governments, EPA has established two pilot Environmental Finance Centers at the universities of Maryland and New Mexico. These centers will provide training, advisory services, publications, and analyses for states and localities on ways to pay for environmental facilities and services.

In 1989, EPA helped establish the Environmental Financial Advisory Board (EFAB) as an independent adviser to the Administrator. The purpose of the Board is to develop national environmental finance expertise and to educate the public and decisionmakers. It includes Members of Congress; federal, state, and local officials; representatives from academia and associations; and experts in the business, banking, and financial communities. EFAB has developed working groups to examine the most pressing national environmental finance issues. Thus far, EFAB has issued a number of policy and program recommendations on a range of finance issues. For example, EFAB suggested that private investment might be increased by reclassifying PABS for public-purpose environmental infrastructure as government bonds and by removing obstacles to private purchase of government owned wastewater treatment facilities. According to an EPA official, municipalities have been required to repay the federal government when they sell facilities that were originally financed by federal grants to private companies. This requirement has been a barrier to private investment in wastewater treatment facilities, which were financed from federal construction grants in the 1970s and 1980s. On April 30, 1992,

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the administration issued Executive Order 12803, which would free municipalities from some of their repayment obligation. An EPA official said that the agency is planning to create an advisory group of outside parties to support the agency's implementation of the order.



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# State Allocation Processes Inhibit Companies Seeking Tax-Exempt Financing, Leading to Both Costs and Benefits

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Private investors with whom we spoke said that the availability of tax-exempt financing is an important factor in making investment decisions and that state allocation processes pose obstacles to the use of PABS for environmental infrastructure. However, the investors noted that changes in other federal tax policies—particularly the loss of the investment tax credit and lengthened depreciation schedules—have had a greater impact on their decisions to invest in environmental projects.

Ultimately, if private investment in environmental facilities declines as a result of the difficulty of obtaining tax-exempt financing and the availability of other tax subsidies, public ownership could take its place. However, local costs may increase in cases in which private companies might be able to provide facilities more rapidly—and with less total costs—than municipalities could. In addition, to the extent that public investment through government tax-exempt bonds replaces private investment and PABS, federal subsidies for environmental infrastructure will not decrease. Concurrent with these potential costs, however, are the benefits resulting from restrictions on the issuance of PABS. These benefits include the elimination or reduction of subsidies for projects with marginal public benefits and the reduced likelihood that private investment decisions are driven by tax considerations rather than economic considerations.

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## Private Involvement Varies by Service

The extent to which private companies have historically invested in a particular type of infrastructure and the characteristics of the service provided are important determinants of the effects of the volume cap. For example, the impact on drinking water facilities has been relatively small because they are traditionally owned by municipalities.<sup>1</sup> But for more expensive and technologically sophisticated facilities, such as recycling facilities, private ownership is much more common and has been more heavily affected by the volume cap.

Drinking water facilities are probably the least affected by the volume cap. Over two-thirds of drinking water is publicly provided, in part because drinking water facilities are good revenue raisers for municipalities, and the technology used in these systems is relatively simple. According to an EPA official in the Office of Water, however, opportunities to increase private involvement in the provision of drinking water facilities exist in medium-sized cities that have major financial problems and deteriorating

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<sup>1</sup>Although most water is provided by publicly owned systems, EPA points out that two-thirds of regulated water systems are privately owned, and so the volume cap does impact some drinking water systems.

public services. However, the official said that it is unlikely that the availability of tax-exempt financing would be necessary to attract private providers, since regulated private water utilities are able to pass capital costs on to users and are guaranteed a stable return on investment.

Private involvement in wastewater treatment facilities in the past has mostly been limited to providing facilities for the pretreatment of industrial wastewater before it is discharged to municipal wastewater treatment plants. Large subsidies to local governments for publicly owned treatment plants through the Construction Grants Program meant that private companies were generally unable to provide wastewater treatment facilities at a lower cost. As a result, few of the facilities have been owned by private companies.

However, opportunities for the private sector to provide facilities to treat municipal wastewater have increased since the federal Construction Grants Program was replaced by SRFS. SRFS provide smaller subsidies to municipalities, thus increasing opportunities for private providers—particularly if the providers can secure tax-exempt financing. A further incentive will exist once EPA revises its regulations to eliminate the current requirement that municipalities repay grants when they sell wastewater facilities that were financed with construction grants to private companies.<sup>2</sup>

The Tax Reform Act of 1986 eliminated the use of PABS to finance water pollution control facilities that pretreat industrial wastewater, but PABS could still be issued for privately owned facilities that treat public wastewater. However, until 1990 private companies were successful in securing individual or private letter rulings from the Internal Revenue Service (IRS) that allowed PABS to be issued for industrial wastewater facilities on the grounds that the companies' pretreatment facilities were part of sewage systems. The IRS reversed itself in 1990 by disallowing the use of tax-exempt PABS for an industrial wastewater facility. Officials at the Treasury Department said they are currently reviewing their definition of sewage to develop a final ruling on the matter.

Of the three types of environmental infrastructure, solid waste facilities are the ones that are privately provided most often; as a result, they are also potentially the most affected by the volume cap. While most solid waste is still disposed of in landfills, many states are relying on

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<sup>2</sup>This requirement is in accordance with Executive Order 12803, which promotes private investment in infrastructure.

incinerators (including waste-to-energy facilities) and recycling facilities. Opportunities for private ownership of these types of facilities are great, in part because the technology is new and sophisticated, and several companies have developed proprietary technologies for treatment and disposal. An EPA official told us that because at least 22 states have laws requiring that a certain percentage of waste be recycled, they are likely to build recycling plants to meet their state goals. PABS may be used to finance only the portion of the recycling facilities that is used for solid waste disposal; the part of the process in which the substance gains commercial value as a recycled material is not eligible for PAB financing.

Currently, more than a third of the nation's waste-to-energy facilities are privately owned; according to an EPA official, virtually all of the recycling facilities are privately owned as well. As a result, about 70 percent of the value of all bonds issued for solid waste facilities are PABS. However, some of the demand for PABS is for solid waste disposal facilities to serve industrial sites that are still authorized to use PABS.

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## **States' Processes for Allocating PABs Inhibit Companies Seeking Tax-Exempt Financing**

States' processes for allocating their funds under the volume cap are another important determinant of the decisions made by companies to seek PAB financing. Allocation processes have been major obstacles for companies seeking tax-exempt financing for environmental projects. As discussed in chapter 2, allocation formulas in some states give low priority to environmental facilities. One bond counsel told us that in states that allocate a large percentage of their total to housing, such as California, Maryland, and Minnesota, private companies are reluctant to consider undertaking an environmental project that depends on tax-exempt financing.

In addition, the total is allocated on a first-come, first-served basis among the projects that apply, making multiyear financing very difficult and risky to obtain. Company officials and bond counsels told us that the lack of secure financing at the outset increases the risk involved and therefore discourages companies from investing in these projects. After states determine broad allocations among uses, they generally make allocations to specific projects on a first-come, first-served basis. For example, Virginia, after making allocations to several categories of projects, awards a maximum of \$10 million to each request on a first-come, first-served basis. If more money is needed for the project, investors must wait until the end of the year for any unallocated funds. Texas uses a lottery system, according to officials there, because it would be very difficult to set

priorities on the basis of need given the large number of deserving projects. However, this system can make it very difficult to plan for environmental projects, which often require more than one year's allocation, because investors cannot rely on getting money in subsequent years.

In addition, some states' administrative procedures for carrying funds forward are difficult. State or local governments can elect to carry forward their allocation for up to 3 years as long as they irrevocably assign it to particular purposes. Expensive projects, such as incinerators and recycling facilities, often depend on accumulating allocations over several years. However, states sometimes limit themselves by assigning the allocation carried forward to purposes that can not use all the funds. For example, Arkansas lost part of the allocation it carried forward in 1991 because the responsible agency did not issue student loan bonds before the expiration of the 3-year limit on using the money that was carried forward.

New Jersey officials said that they had a problem with carrying forward allocations because of changing state environmental objectives. In the early 1980s, the state sought to build incinerators in each of its 21 counties. After 1986, when the volume cap was in effect, allocations carried forward under the volume cap began to accrue for these facilities. However, in 1989, the state decided to build recycling facilities instead, resulting in the loss of all allocations carried forward to build incinerators.

Finally, it is hard to obtain allocations for environmental facilities in some states because state laws pose barriers to private ownership of environmental facilities. In Utah, according to the federal Rural Community Assistance Corporation, a community that was examining the feasibility of privatizing a new wastewater facility faced barriers posed by state procurement regulations that discouraged ownership transfer to private companies.

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## **Other Factors Are Considered More Important in Influencing Private Investment Decisions**

Private companies and bond counsels told us that other provisions of the Tax Reform Act of 1986, such as elimination of the investment tax credit (itc) and the lengthening of the depreciation schedules for environmental infrastructure, have had a more significant impact on their investment decisions than the volume cap because these changes affected the profitability of the facilities. Table 3.1 outlines the major provisions of the

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Tax Reform Act of 1986 that affect tax-exempt bonds issued to finance private activities.

**Table 3.1: Rules Governing Tax-Exempt Bonds for Private Activities Before and After 1986**

<b>Issue</b>	<b>Before the 1986 tax act</b>	<b>After the 1986 tax act</b>
Definition of a private activity	More than 25% of bond proceeds used by a private entity and used to secure property used by or revenues derived from a private entity	More than 10% of bond proceeds used by a private entity or used to secure property used by or revenues derived from a private concern
Volume cap	No unified volume cap; cap on certain private activities	Phased-in unified volume cap: in 1986, \$75 per capita or \$250 million; in 1988 and later, \$50 per capita or \$150 million
Investment tax credit	10% of certain investments	None
Depreciation schedules	5-year depreciation schedule	Depreciation schedules lengthened depending on type of environmental facility
Arbitrage	Yield restricted to .125%	Rebate rule extended, limiting the amount of interest that an issuing authority can earn on the investment of proceeds
Bank deduction of PAB carrying costs	Banks could deduct up to 80% of carrying costs	No deductions are allowed except for certain small issues
Allowable nonqualifying costs	10% of bond proceeds	5% of bond proceeds
Cap on issuance costs	No cap	2% of bond proceeds can be used to finance issuance costs
Alternative minimum tax	Not applicable to tax-exempt bonds	Interest income from PABS included in calculation

Before the 1986 Tax Reform Act, private companies received an ITC of up to 10 percent of their investment in infrastructure and were allowed to depreciate the facility over a 5-year period instead of over a period that was closer to the expected useful life of the facility. Companies could take advantage of this "accelerated depreciation" even when they were financing the project with tax-exempt bonds.

The 1986 Tax Reform Act limited these incentives substantially by eliminating the ITC and lengthening the depreciation schedules for solid waste, wastewater, and drinking water facilities that are financed with PABS. With the more rapid depreciation and the ITC that existed before the 1986 Tax Reform Act, the tax benefits were larger for some equipment than if the full cost of the investment was deducted immediately—a result more generous than exempting all earnings on the investment from taxation. As a result, it was argued that investments were made that would not have occurred without the existence of the tax advantages. This outcome is sometimes the intent of tax subsidies, particularly when the federal government expects that without the subsidy state or local

governments will invest less than is in the national interest. However, the Congress changed the tax code to try to ensure that more of the investments in the capital stock are not driven by tax considerations.

Bond counsels we spoke with and representatives from several private companies listed the elimination of the IRC, the lengthening of the depreciation schedules, and the volume cap restrictions as obstacles to investment, in that order of importance. A representative of one company told us that since the company cannot compete with municipalities as owners of facilities, it concentrates on obtaining contracts for facility operation and maintenance or will design and build facilities for municipal owners. Many other companies, however, told us that they still seek to own environmental facilities and rely on other cost efficiencies, such as their ability to construct facilities faster, to be cost-competitive with public providers. Requiring private companies to compete without the large tax benefits may lead to more efficient private provision because the companies that relied primarily on the large tax subsidies are no longer cost competitive. At the same time, even companies that can provide infrastructure at the lowest cost may not be able to compete with public providers if they cannot secure PAB financing.

Some of the restrictions the act placed on the use and issuance of PABS increased issuance costs for governments and project costs for private companies that use PABS. Some financial experts have maintained that the arbitrage restrictions of the Tax Reform Act of 1986 have also added costs for entities that issue tax-exempt bonds. Arbitrage provisions limit the amount of interest that an issuing authority can earn on the investment of proceeds from tax-exempt bonds to a rate that does not exceed by more than 0.125 percent the rate at which the bonds were issued. The Congress restricted arbitrage earnings to stop state and local governments from issuing tax-exempt bonds primarily to earn arbitrage profits. Under the Tax Reform Act of 1986, the rebate of arbitrage earnings to the federal government was made mandatory, except in special cases, such as bonds whose proceeds are spent within a specified period—generally 6 months from the date of issue. EPA's Environmental Financial Advisory Board maintains that the associated administrative requirements are costly because it is difficult to track earnings.

The act also eliminated the possibility for banks to deduct the carrying costs of PABS, which had allowed financial institutions to drastically reduce their tax liability. According to bond counsels, this change has also increased the costs of issuing PABS, thus increasing the costs of

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environmental projects. Before passage of the 1986 act, banks were important investors in tax-exempt bonds, in part because they were allowed to write off 80 percent of the holding costs of these bonds. Because the act eliminated this benefit, banks are no longer the primary holders of PABS. Instead, bond counsels told us that PABS must be sold to more investors, increasing the number of transactions and the amount of marketing required. As a result, they maintain, the cost of issuing bonds is driven up. At the same time, however, the increase in mutual funds has made it easier to market bonds.

The cost of projects financed with PABS also increased because of the act's limitations on the amount of nonqualifying costs; that is, costs not associated with the central purpose of the tax-exempt bond. These costs include the costs to issue bonds and expenses related to parts of facilities that are not directly involved in providing the service, such as turbines that produce saleable electricity in a waste-to-energy facility. Before the enactment of the 1986 Tax Reform Act, 10 percent of the bond proceeds could be spent on these costs. The Congress was concerned that 10 percent was too much to spend on costs that were not authorized for tax-exempt financing. The act therefore reduced to 5 percent the eligible amount of nonqualifying costs and limited to 2 percent the amount that could be used for issuance costs. Under the act, taxable—and thus more expensive—bonds, known as “taxable tails,” must be issued to cover these nonqualifying costs.

Finally, to reduce the tax advantages for high income investors who purchase tax-exempt bonds, the Congress included tax-exempt bond earnings as a preference item<sup>3</sup> for individuals or corporations subject to the alternative minimum tax (AMT), which again increased the interest rate on PABS. The AMT provisions require that taxpayers calculate their taxes in one of two ways, depending on which yields the largest tax. Under one calculation method, taxpayers are allowed to exclude the interest from taxable income; under the other method, the AMT is imposed and the taxpayers must include interest on certain tax-exempt bond holdings as a preference item. This provision has reduced the demand for these bonds, particularly from high-income investors. Some bond counsels we talked to estimated that as a result of reduced demand due to the AMT provision, interest rates on such tax-exempt bonds have increased by 20 to 30 basis points.<sup>4</sup>

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<sup>3</sup>Preference items are any items that are given preferential treatment in the tax system for calculating income taxes, such as capital gains.

<sup>4</sup>100 basis points equal 1 percent.

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## Tax Reforms Have Other Effects

In addition to their direct effects, the volume cap and other changes in tax policy may have longer-term indirect impacts that are difficult to gauge precisely but are nevertheless important to recognize. One such effect, noted earlier, is the apparent replacement of PABS with government bonds. This substitution has implications for federal revenues as well as for the total cost of environmental projects to the economy.

The Congress placed the cap on the volume of PABS that states and local governments can issue in part to limit the amount of revenue forgone by the Treasury. However, the ability of municipalities to issue tax-exempt government bonds is limited only by their ability to issue debt. As noted in chapter 2, trends show that municipalities continued to issue tax-exempt debt—whether as government bonds or PABS. To the extent that substitution occurs, the volume cap will not reduce the amount of revenues the federal government forgoes.

In addition to these revenue implications, the national cost of providing environmental services may be higher as a result of the reduced number of private providers. Costs may be higher overall because, in some cases, private companies can construct facilities more cheaply and efficiently than public providers. EPA reported in 1989 that combined capital and operating cost savings from private provision as compared with public provision vary from 5 to 40 percent.<sup>5</sup> Bond counsels and service providers have said that private provision is sometimes less expensive because companies can build facilities faster. In its report, EPA explained that private companies are free from competitive bidding requirements and the paperwork associated with intergovernmental grants (or SRF loans). In addition, private companies may benefit from design, construction, and operation efficiencies, and they may have easier access to new low-cost technologies. Furthermore, EPA noted that when privatization occurs, governments are often motivated by the goal of sharing the risks of high technology solutions to environmental management problems, particularly in the area of solid waste management. New, sophisticated technologies entail risks that local governments may be unwilling to undertake, while private companies may earn a profit by undertaking innovative projects.

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## Observations

The overall effect of the volume cap and its limits on investment in environmental infrastructure may not appear to be large because the option of public provision is available—to the extent that a community has

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<sup>5</sup>Public-Private Partnership Case Studies: Profiles of Success in Providing Environmental Services, U.S. Environmental Protection Agency (Washington, D.C.: Sept. 1989).



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a revenue base large enough to support the user charges. However, private provision of these facilities may be cheaper in some cases. Therefore, to the extent that the difficulty of obtaining tax-exempt financing reduces private investment in environmental facilities, national costs to comply with federal environmental mandates may be higher.

However, as noted earlier, the volume cap and restrictions on the eligibility of activities for PAB financing were intended to curb the abuses of the authority to issue tax-exempt bonds in which private projects with few public benefits were financed with tax-exempt bonds. Restrictions on the activities eligible for PABS ensured that projects that primarily benefit private companies, such as shopping malls, would not be financed with PABS. For activities that are eligible for PABS but have marginal public benefits, the volume cap has probably meant that investors in such activities could not secure PAB financing. With a limited supply of PABS, and in many cases a large demand, state and local governments are unlikely to issue PABS for environmental projects that officials believe do not provide significant public benefits.

Furthermore, the restricted availability of the volume cap, along with other changes in the law, have reduced the likelihood that private investment decisions will be driven by tax considerations. Before the 1986 Tax Reform Act, companies were able to take advantage of accelerated depreciation and the investment tax credit, in addition to financing projects with the proceeds of tax-exempt bonds. These subsidies permitted some investments that would not otherwise have been viable and diverted money from more efficient investments.

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# Model Used to Analyze Volume Cap's Impact on Environmental Tax-Exempt Bonds Issued

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To estimate the impact of the cap that the Tax Reform Act of 1986 placed on the volume of tax-exempt bonds issued to finance environmental infrastructure, we used a model developed with the assistance of Dr. Daphne Kenyon of Simmons College in Boston. In consultation with GAO economists, Dr. Kenyon adapted her model, derived from her previously published work on volume caps, to estimate the effects of various factors, including the volume cap, interest rates, and population, on the volume of tax-exempt private activity bonds (PAB) issued by states and local governments for environmental purposes.<sup>1</sup> By controlling for factors other than the volume cap, the model allowed us to estimate whether states and localities would have issued more PABS for environmental purposes if the volume cap had not been implemented. We also used the model to examine whether state and local governments were substituting tax-exempt government bonds for PABS to maintain investment in environmental projects despite the volume cap.

Although previous studies have found that the cap constrained the total volume of PABS issued for some states in particular years, this does not mean that PABS for environmental projects were affected in the same way. Whether or not the volume of environmental bonds issued becomes depressed when the volume of total PABS issued is depressed depends upon a state's priorities for allocating its total and upon if states with binding volume caps give priority to bonds for environmental projects over bonds for other purposes.

Our model is representative of the latest work on tax-exempt bond financing in the economics literature, and we estimated it using the best available data on the volume of bonds for environmental purposes and other factors. Nevertheless, all model estimation has limitations. For this analysis, an important limitation is that for most of our model runs, changes in the tax laws restricted us to data for only 2 years. In addition, the available data did not always correspond precisely to our definitions. For example, we had to substitute the interest rate on all tax-exempt bonds for the interest rate on environmental tax-exempt bonds. Despite these limitations, we believe our model is a useful tool for estimating the effects of the volume cap.

The results of our model suggest that the cap has reduced the volume of PABS issued for environmental purposes in states where the volume cap on total PABS is binding. Our results on the effect of the cap on the total

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<sup>1</sup>In this appendix, environmental bonds are defined as bonds issued to finance drinking water, wastewater treatment, and solid waste facilities (including recycling centers and incinerators).

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volume of tax-exempt bonds issued are less definitive, but some of the results suggest that the cap may not reduce the overall volume of bonds for environmental purposes. Combined, the results suggest that the volume cap may be affecting the mix of environmental bonds between PABS and tax-exempt government bonds, which implies that states and localities may have substituted government bonds for PABS for environmental purposes.

This appendix describes the economic model we developed, the data we used, and the results of our analysis.

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## The Model

We began by specifying the following equation:

$EBONDPC = f(\text{CONSTANT, CAPSPEND, INT, UNEMPL, LIMITPC, CARRYPC})$  where

EBONDPC = per capita tax-exempt bonds issued for environmental purposes, including drinking water, wastewater, and solid waste facilities

CONSTANT = the constant term that is used in most regressions

CAPSPEND = capital spending for environmental purposes per capita

INT = tax-exempt interest rate

UNEMPL = unemployment rate

LIMITPC = per capita volume cap

CARRYPC = per capita amount of volume cap carried forward from previous years

We specified this equation on a per capita basis to reduce the heteroskedasticity that can be present if data are obtained on a state-by-state basis.<sup>2</sup> We hypothesized the following signs for the regression coefficients:

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<sup>2</sup>Although the above per capita specification is a frequently suggested modification when a cross-section data set is likely to exhibit heteroskedasticity, there is no guarantee that adopting this specification will eliminate heteroskedasticity. In particular, heteroskedasticity may remain because environmental projects are costly, and in states with small populations, a small change in the number of projects may have a large influence on the size of the error term.

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$$EBONDPC = f(\text{CONSTANT}, \overset{+}{CAPSPEND}, \overset{-}{INT}, \overset{?}{UNEMPL}, \overset{+}{LIMITPC}, \\ \overset{+}{CARRYPC})$$

We do not have a clear hypothesis about the sign for the coefficient on the unemployment rate. Higher levels of unemployment may be associated with increased volume of environmental bonds being issued, because during a recession a state government may increase its borrowing to fund environmental projects in an effort to stimulate the state's economy. Since tax-exempt bonds inherently include a federally funded subsidy, these bonds may seem like a particularly attractive economic development device. On the other hand, states may reduce their borrowing on behalf of private companies because companies are less interested in investing in large capital projects during a recession.

The key variables of interest are LIMITPC and CARRYPC. If the volume cap is associated with a reduction in the volume of bonds issued for environmental purposes, then increases in a state's volume cap and in the amount carried forward from previous years are likely to be associated with an increased volume of tax-exempt bonds issued. We expected higher rates of capital spending for environmental purposes to be associated with more tax-exempt bonds being issued because a large portion of total capital spending for environmental facilities is financed with tax-exempt bonds. Also, because state and local borrowing may be sensitive to the price governments have to pay for funds, we anticipate that higher interest rates are associated with a decrease in the number of tax-exempt bonds issued.<sup>3</sup>

When we estimated the model, we were unable to find an adequate measure of CAPSPEND. However, capital needs for environmental purposes are likely to be closely related to CAPSPEND, and data are available to allow us to create proxy variables for capital needs.

We can think of capital spending on environmental facilities as the sum of replacement needs, new needs, and needs that arise when new federal regulations are enacted. Replacement needs will be influenced by existing population and income. New needs will be influenced by increases in population and income. We assume, therefore, that the need for

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<sup>3</sup>We considered whether there might be a simultaneous influence of a higher volume of bonds being issued for environmental purposes, leading to higher interest rates. However, we did not incorporate this into our model because such bonds represent a relatively small share of state and local bonds.

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environmental facilities depends on, among other things, the level of population, growth in population, level of income, and growth in income. We found no available proxy for the capital needs that arise when new federal regulations are enacted.

Because our model estimates per capita bond issuance, we cannot simply substitute population, change in population, income, and change in income for CAPSPEND to estimate our model. Instead, after dividing by population, the new explanatory variables become percentage change in population (CHPOP), income per capita (INCPC), and change in income per capita (CHINCPC). We do not need a new variable equaling population divided by population, which equals one for each state, because of the presence of the constant term. Once this substitution was made, the equation we estimated and the hypothesized signs became

$$EBONDPC = f(\text{CONSTANT}, \overset{-}{INT}, \overset{?}{UNEMPL}, \overset{+}{LIMITPC}, \overset{+}{CARRYPC}, \overset{+}{CHPOP}, \overset{+}{INCPC}, \overset{+}{CHINCPC})$$

We estimated the model using two major alternative dependent variables. One includes only PABS for environmental projects. The other includes both PABS and government bonds for environmental projects. By using alternative dependent variables, we were able to estimate not only whether there is an association between the volume cap and the volume of PABS issued for environmental purposes, but also whether states are substituting other government bonds for PABS. If higher values of LIMITPC and CARRYPC appear to be significantly associated with a higher volume of PABS being issued for environmental purposes but not associated with the total volume of environmental bonds issued, this would suggest that the volume cap was leading state and local authorities to substitute government bonds for PABS to finance environmental projects. On the other hand, if LIMITPC and CARRYPC appear to have significant associations in both versions of the model, then this result would suggest that little substitution was occurring; that is, any effect of the cap on the volume of PABS issued was not being offset by increases in the volume of government bonds issued. We estimated one alternative regression to test whether the volume cap has a disproportionate effect on the more populous states, as some previous research has suggested. We did this by omitting the LIMITPC and CARRYPC variables and including a dummy variable, CAP50, which takes on a value of 1 for those states subject to the

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\$50 per capita volume cap.<sup>4</sup> The coefficient on CAP50 gives us an estimate of the extent to which the volume of bonds issued in the more populous states is disproportionately reduced by the volume cap.

We estimated all equations in linear form using ordinary least squares regression methodology. Because of the potential for the volume cap to limit bond issuance, we considered using a tobit technique, which is the generally preferred methodology when the dependent variable is truncated. (A truncated dependent variable is one that is limited, such as contributions to individual retirement accounts, which are subject to an annual dollar limit.)

We did not use a tobit technique, however, for two reasons. If we had used a tobit methodology, we could not have directly tested for the statistical significance of the volume cap variable. Furthermore, since applying the tobit methodology in this context requires making an assumption regarding the point at which a volume cap becomes binding, we would have unavoidably introduced some error into the estimation. The error introduced by this assumption could outweigh the error that results from using ordinary least squares when the dependent variable is truncated.

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## The Data

We created a cross-section, time-series data base for the period 1982 through 1991, although as described in the next section we only used the period 1989 through 1991 in our estimations. We obtained observations for each state in the continental United States in each year with the following exceptions: Illinois for 1990 and 1991, and Mississippi, Nevada, and Rhode Island for 1990. We omitted these states because either data on allocations carried forward were missing (the case in most of the states that we omitted) or interest rate data were missing (the case for Nevada in 1990). We converted all the data on bond issuance, volume cap, allocations carried forward, population, and income to per capita measures.

Our data base contains one measure of PABS for environmental purposes, EBONDPRIV, and two measures of total environmental bonds (both private activity and government), EBONDXPOL and EBONDALL. We

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<sup>4</sup>In states with fewer than 3 million people, PAB authority is \$150 million per year, which is greater than \$50 per capita.

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obtained the data to construct EBONDPRIV from surveys conducted by the Advisory Commission on Intergovernmental Relations (ACIR).<sup>5</sup>

Our data for both measures of the total volume of bonds for environmental purposes came from the Public Securities Association (PSA). We created alternative measures because of a peculiarity in the data coding. The coding of bonds for pollution control in the PSA data set has changed over time. Initially, PSA coded as bonds for pollution control only those bonds that approximately matched the Internal Revenue Service (IRS) definition of such bonds. When the Tax Reform Act of 1986 eliminated pollution control bonds as an eligible category for tax-exempt PABS, however, the PSA began including in its data set under the pollution control category many bonds that would otherwise have been listed in other environmental categories.

This peculiarity in the data coding prompted us to include two alternative dependent variables from the PSA data: EBONDXPOL and EBONDALL. We defined EBONDXPOL as per capita bonds (both private activity and government) issued for solid waste, drinking water, and wastewater facilities. EBONDALL includes all bonds included in EBONDXPOL, plus a portion of the tax-exempt bonds that the PSA has coded as bonds for pollution control.

To solve the problem of the changing data coding, we used IRS data on bonds for pollution control and subtracted this volume from the volume of such bonds reported by the PSA. This residual category of bonds, which might be considered "other bonds for environmental purposes," was added to EBONDXPOL to obtain EBONDALL. We did not include all bonds for pollution control in the data series because pollution control facilities defined in former Internal Revenue Code section 103(b)(4)(F) could no longer be issued as tax-exempt bonds after the Tax Reform Act of 1986, except through special transitional rules. If we had included such pollution control bonds in the data set, there would have been a large drop in this component after the Tax Reform Act of 1986, giving the impression that imposing the volume cap constrained that type of bond considerably.

The PSA provided us with a measure of the net interest cost for tax-exempt bonds issued by state for each year, which we used as a proxy for the

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<sup>5</sup>We obtained data on PABS for solid waste, drinking water, and wastewater treatment facilities issued by state for 1990 from the 1990 ACIR Private Activity Bond Survey. See Daphne A. Kenyon and Dennis Zimmerman, "Private Activity Bonds and the Volume Cap in 1990", *Intergovernmental Perspective*, vol. 17, (Washington, D.C.: Advisory Commission on Intergovernmental Relations, Summer 1991). We obtained similar data for 1989 from the Internal Revenue Service.

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interest cost for bonds for environmental purposes. We obtained data on each state's volume cap from Federal Funds Information for States. We obtained population and income data from standard sources. We obtained data on allocations carried forward from two sources: The 1990 ACIR survey reported allocations carried forward in 1989 and 1990; we estimated allocations carried forward in 1988 using IRS data. We subtracted the total volume of PABS issued in 1988 from the allowable volume cap in 1988 to obtain an estimate of the amounts carried forward. This estimate will be flawed to the extent that data on bond issuance include bonds issued from amounts carried forward from previous years, or to the extent that states fail to carry forward all of their unused allocations.

Tables I.1 and I.2 contain descriptive statistics for the major explanatory variables used in the empirical analysis. Entries in the correlation matrix can sometimes provide a warning of likely multicollinearity, which can reduce the statistical significance of certain regression coefficients. Of particular interest is the fact that the correlation between CARRYPC and LIMITPC for 1989-90 is 0.74, which may be considered high.

**Table I.1: Descriptive Statistics for Explanatory Variables 1989-90**

Variable	Mean	Standard deviation
CHPOP	.004	.015
INCPC	\$17,012	\$2,887
CHINPC	\$992	\$349
INT	7.06%	.27%
UNEMPL	5.22%	1.17%
LIMITPC	\$86.57	\$67.00
CARRYPC	\$41.57	\$86.41
CAP50	.598	.493

**Table I.2: Descriptive Statistics for Explanatory Variables—Correlation Matrix**

	CHPOP	INCPC	CHINPC	INT	UNEMPL	LIMITPC	CARRYPC	CAP50
CHPOP	1.000	0.326	(0.311)	0.290	(0.175)	(0.274)	(0.201)	0.220
INCPC	0.326	1.000	0.261	(0.103)	(0.375)	(0.173)	(0.217)	0.348
CHINPC	(0.031)	0.261	1.000	(0.183)	(0.320)	0.145	0.064	(0.050)
INT	0.290	(0.103)	(0.183)	1.000	0.146	(0.086)	(0.212)	0.107
UNEMPL	(0.175)	(0.375)	(0.320)	0.146	1.000	(0.188)	(0.085)	0.097
LIMITPC	(0.274)	(0.173)	0.145	(0.086)	(0.188)	1.000	0.735	(0.670)
CARRYPC	(0.201)	(0.217)	0.064	(0.212)	(0.085)	0.735	1.000	(0.498)
CAP50	0.220	0.348	(0.050)	0.107	0.097	(0.669)	(0.498)	1.000



## Estimation Results

Although volume caps were created by the Tax Reform Act of 1986, we were able to use data only from 1989 and 1990 to estimate our model because 1989 was probably the first year in which the volume cap was binding in any state.<sup>6</sup> The transition provisions in the 1986 legislation established higher caps for 1986 and 1987, and in 1988 a substantial amount of allocation was carried forward from those years, probably reducing the effect of the cap in those years. Data on the volume of PABS issued by state after 1990 were not available at the time we completed our analysis.

Previous research found that, even beginning in 1989, the volume cap was binding only in some states.<sup>7</sup> In others, state and local authorities did not come close to using up their entire allocation. We eliminated those states from our analysis; if a state had plenty of unused allocation for PABS for all purposes, then it would not be reasonable to expect that an incremental change in the total volume of PABS that states are authorized to issue would affect the volume of PABS they issued for environmental purposes.

We selected states that used more than 80 percent of their current-year allocation as those for which the cap constrained the overall volume of PABS issued in that year.<sup>8</sup> Table I.3 lists those states that used more than 80 percent of their current-year allocation in 1989 or 1990. Eighteen states used 80 percent or more of their allocation in 1989 and 24 states used 80 percent or more of their allocation in 1990. Fifteen states found their volume caps binding in both 1989 and 1990.<sup>9</sup>

<sup>6</sup>In our review of the literature, we did not find any studies that provided empirical evidence that the volume cap was binding for any state before 1989 although, as discussed below, some studies concluded that the cap was binding in some states beginning in 1989.

<sup>7</sup>See Daphne A. Kenyon, "Effects of Federal Volume Caps on State and Local Borrowing," *National Tax Journal*, vol. 44, pp. 81-92; Joan Pryde, "Volume Limit Helps Small States, But Larger Ones Feel Cramped," *The Bond Buyer*, June 14, 1990; Joan Pryde, "Bond Hungry: Volume Caps Devoured by Environmental and Energy Projects," *Muniweek*, May 28, 1991; and Dennis Zimmerman, *The Private Use of Tax-Exempt Bonds*, (Washington, D.C.: The Urban Institute Press, 1991).

<sup>8</sup>As Zimmerman discusses, administrative difficulties make it difficult for a state to use 100 percent of its PAB allocation in a particular year. Zimmerman makes three alternative assumptions regarding the percentage of allocation used that represents a constraining volume cap: 70 percent, 80 percent, and 90 percent. We have chosen to follow Zimmerman's intermediate assumption. See Dennis Zimmerman, *The Private Use of Tax-Exempt Bonds* (Washington, D.C.: The Urban Institute Press, 1991), pp. 312-315.

<sup>9</sup>There does not appear to be a geographical pattern to the volume cap's impact. Only one region, the Mideast (Delaware, Maryland, New Jersey, New York, and Pennsylvania) had no state with a binding volume cap for both 1989 and 1990. The Great Lakes Region (Illinois, Indiana, Michigan, Ohio, and Wisconsin) might be considered the region where the volume cap had the greatest impact because three of the five states found the volume cap to be binding in both years. Otherwise, each of the remaining six regions in the United States found that the volume cap was binding for a minority of its states in both 1989 and 1990.

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**Table I.3: States Using More Than 80  
Percent of Their Current-Year  
Allocation**

1989	1990
Arkansas	Alabama
California	Arizona
Connecticut	Arkansas
Florida	California
Georgia	Colorado
Illinois	Connecticut
Indiana	Florida
Kansas	Georgia
Minnesota	Indiana
Missouri	Kansas
New Hampshire	Louisiana
Ohio	Maine
Oklahoma	Massachusetts
South Carolina	Michigan
Texas	Minnesota
Utah	Missouri
West Virginia	Ohio
Wisconsin	Oklahoma
	South Carolina
	Texas
	Utah
	Virginia
	Washington
	Wisconsin

Sources: Daphne A. Kenyon and Dennis Zimmerman, "Private-Activity Bonds and the Volume Cap in 1990," *Intergovernmental Perspective*, vol. 17, Summer 1991, p. 36, and "Data Tables for 1990 Private Activity Bond Survey," U.S. Advisory Commission on Intergovernmental Relations, Aug. 14, 1991, table 9.

Table I.4 shows the results of the regression model that was run for the subset of states with binding volume caps listed in table I.3. The first column, which presents the results for environmental PABS, indicates that LIMITPC has a strongly significant statistical association with bond issuance while CARRYPC shows a weaker level of statistical association (at the 10-percent level). According to those results, a one-dollar increase (or reduction) in the per capita volume cap from its current level, holding all other explanatory variables constant, is associated with a \$0.58 increase (or decrease) in the per capita issuance of PABS for environmental purposes. Furthermore, a dollar increase in the amount of allocation carried forward per capita is associated with an increase in the volume of PABS issued for environmental purposes of \$0.27.<sup>10</sup> However, because the high correlation between LIMITPC and CARRYPC makes it difficult for the regression to estimate the separate impact of each factor, some of the

<sup>10</sup>The coefficient on LIMITPC estimates the association of the volume cap with the issuance of environmental PABS at the margin. However, it cannot be used to estimate the total dollar reduction in environmental PABS due to the volume cap in these particular states.

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impact of the volume cap may be improperly attributed to the allocation carried forward or vice versa. Therefore, we do not believe our coefficient estimates should be used as precise estimates of the association between LIMITPC or CARRYPC and the volume of PABS issued for environmental projects.<sup>11</sup>

**Table I.4: Estimated Effects on Per Capita Environmental Bonds Issued for States With Binding Volume Caps**

Dependent variable	EBONDPRIV	EBONDXPOL	EBONDALL
Time period	1989-90	1989-90	1989-90
Number of observations	42	42	42
Constant	-50.44 (-1.55)	-193.9 (-1.53)	-221.9 (-1.86) <sup>a</sup>
INPC	0.001 (1.76) <sup>a</sup>	0.005 (2.41) <sup>b</sup>	0.007 (3.49) <sup>b</sup>
CHPOP	236.0 (1.70) <sup>a</sup>	157.5 (0.29)	163.3 (0.32)
CHINPC	0.009 (1.72) <sup>a</sup>	-0.010 (-0.51)	-0.015 (-0.82)
INT	-4.207 (-0.92)	14.29 (0.80)	9.346 (0.56)
UNEMPL	5.154 (3.34) <sup>b</sup>	3.244 (0.54)	5.373 (0.95)
LIMITPC	0.576 (4.14) <sup>b</sup>	0.447 (0.83)	0.962 (1.89) <sup>a</sup>
CARRYPC	0.271 (1.93) <sup>a</sup>	0.462 (0.85)	0.314 (0.61)
Adjusted R <sup>2</sup>	0.80	0.32	0.52

Note: T-statistics are in parentheses:

<sup>a</sup>Indicates significance at the 10-percent level.

<sup>b</sup>Indicates significance at the 5-percent level.

The coefficient estimates for all of the control variables in this equation were statistically significant at least at the 10-percent level and their signs were as hypothesized, except for the interest rate variable, which was statistically insignificant. This may mean that in states with binding caps, the volume of PABS issued for environmental purposes may not be associated with the cost of funds, at least over the range of our data set, or

<sup>11</sup>Although we did not anticipate that LIMITPC would not be significantly associated with environmental bond issuance in states that were not constrained by the cap in their total PAB issuance, we ran one set of regressions with each of our dependent variables in which we included all states. As expected, there was no reduction of bond issuance associated with lower volume caps. However, CARRYPC was statistically significant in all the regressions, which may provide some additional suggestion that state and local governments respond to the availability of more cap allocation by issuing more environmental bonds.

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may be the result of our having to use a proxy for interest rates for such bonds. A high adjusted  $R^2$  value of 0.80 suggests that most of the variance in the dependent variable is associated with variation in the independent variables.

The second and third columns of table I.4 present our regression results when the dependent variable is either of our two measures of total tax-exempt bonds (government and private activity) for environmental purposes. In one of these equations, neither LIMITPC nor CARRYPC is statistically significant, while in the other, LIMITPC shows an association with bond issuance that is weakly significant (10-percent level) and CARRYPC is not significant. Because we have preliminary 1991 data for EBONDXPOL and EBONDALL (but not for EBONDPRIV), we ran additional regressions incorporating those data. LIMITPC was not significant in either regression but CARRYPC was significant in both.

Although there is some inconsistency in these results, in general they suggest that the cap may not be associated with reduced volume of bonds for environmental purposes. When combined with our estimate that there is a statistically significant association between the cap and the volume of PABS issued, these results suggest that state and local governments may be responding to the cap by substituting government bonds for PABS to finance environmental projects. If so, the volume cap may be affecting the mix of bonds between PABS and government bonds more than it is affecting the total level of tax-exempt bonds for environmental purposes. That result is consistent with the results of the analysis of data on aggregate bond issuance reported in chapter 2. However, we conducted some sensitivity analyses of our model that suggested that substitution might not have occurred.<sup>12</sup> In addition, substitution did not appear when we tested for it directly.<sup>13</sup> Taken together, the currently available evidence is not conclusive regarding substitution between PABS and government bonds. A replication of our analysis when 2 or 3 more years of data are available may shed more light on this question.

Compared with the equation in which the dependent variable was EBONDPRIV, the results are weaker— $R^2$  values of 0.32 and 0.52 compared with 0.80—when the dependent variable was EBONDXPOL or

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<sup>12</sup>We conducted a sensitivity analysis in which we added the LIMITPC and the CARRYPC variables to obtain a total measure of the ability of a state to issue PABS for environmental projects. We ran additional regressions with and without this new limit variable that included states that used 70, 80, and 90 percent of their current-year allocation.

<sup>13</sup>The direct test of the substitution hypothesis consisted of a regression of per capita government bonds on per capita PABS and some control variables.

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EBONDALL. In addition, none of the control variables except income per capita was statistically significant.

Table I.5 presents an additional set of regression results. These regressions test whether the more populous states that are subject to the \$50 per capita volume cap experience a greater constraint on the issuance of environmental bonds than do the less populous states that are subject to the \$150 million volume cap. To test this hypothesis, we dropped LIMITPC and CARRYPC from the regressions and added CAP50, a dummy variable that was set equal to 1 for those states facing the \$50 per capita volume cap.

**Table I.5: Determinants of Per Capita Volume of Environmental Bonds Issued**

Dependent variable	EBONDPRIV	EBONDXPOL	EBONDALL
Time period	1989-90	1989-91	1989-91
Number of observations	92	139	139
Constant	-41.76 (-0.70)	-165.8 (-2.81) <sup>b</sup>	-221.8 (-3.49) <sup>b</sup>
INCPC	0.002 (2.30) <sup>b</sup>	0.005 (5.00) <sup>b</sup>	0.007 (5.90) <sup>b</sup>
CHPOP	-164.7 (-0.99)	431.5 (1.91) <sup>a</sup>	315.3 (1.29)
CHINCPC	-0.001 (-0.17)	0.018 (1.98) <sup>a</sup>	-0.018 (1.87) <sup>a</sup>
INT	1.234 (0.16)	10.05 (1.33)	14.95 (1.83) <sup>a</sup>
UNEMPL	4.254 (2.16) <sup>b</sup>	3.550 (1.55)	4.352 (1.76) <sup>a</sup>
CAP50	-18.57 (-4.17) <sup>b</sup>	4.8333 (0.81)	2.051 (0.32)
Adjusted R <sup>2</sup>	0.21	0.27	0.30

Note: T-statistics are in parentheses:

<sup>a</sup>Indicates significance at the 10-percent level.

<sup>b</sup>Indicates significance at the 5-percent level.

The coefficient estimates and standard errors for the regression in which EBONDPRIV is the dependent variable suggest with 95-percent confidence that states subject to the more constraining \$50 per capita volume cap issued about \$10 to \$27 per capita fewer PABS for environmental purposes than the other states. At the middle of this range, the estimate of the average impact of the volume cap on the more populous states translates

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**Appendix I  
Model Used to Analyze Volume Cap's  
Impact on Environmental Tax-Exempt  
Bonds Issued**

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into an estimated reduction in PABS for environmental purposes for these states in 1990 of about \$4 billion more than other states, which our earlier results suggest may have been balanced by an increase in government bonds for this purpose. This regression, therefore, provides additional evidence that the cap is associated with a decrease in the volume of PABS issued for environmental purposes. The insignificant coefficient estimates for CAP50 in the regressions presented in the second and third columns of table I.5 also support the possibility of substitution between government bonds and PABS.

# Comments From the Environmental Protection Agency

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



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

AUG - 4 1993

OFFICE OF  
ADMINISTRATION  
AND RESOURCES  
MANAGEMENT

Mr. Richard L. Hembra  
Director  
Environmental Protection Issues  
Resources, Community, and Economic Development Division  
U.S. General Accounting Office  
Washington, D.C. 20548

Dear Mr. Hembra:


I am transmitting to you the Agency response to the General Accounting Office's (GAO) draft report entitled Volume Cap Effect on Investment Is Mixed but Total Investment Inadequate (GAO/RCED-92-22).

On the whole, we found that the report accurately describes the impacts of the volume cap on investments for facilities constructed in support of environmental goals. These facilities affect solid waste, wastewater treatment and drinking water objectives. Enclosed are detailed comments addressing various aspects of the draft report for your consideration.

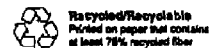
I am pleased that many of our comments presented at a September 30, 1992, meeting between the Agency and GAO were incorporated in this latest draft report. I also wish to express my appreciation for the collegial approach that has been evolving between our respective organizations over the last several months.

Again, thank you for the opportunity to comment on the draft report. I look forward to receiving the final report.

Sincerely,

  
Sallyanne Harper  
Acting Assistant Administrator

Enclosure



Appendix II  
Comments From the Environmental  
Protection Agency

Environmental Protection Agency  
Comments on GAO's Draft Report,  
Volume Cap Effect on Investment Is Mixed  
But Total Investment Inadequate (GAO/RCED-93-22)

Now on p. 4.

See comment 1.

Page 4

The discussion on the decline in percentage of capital spending on the environment as a percentage of Gross National Product (GNP) could imply an increase in GNP and a greater cost effectiveness in other social programs. The report then explains the current rate of spending relative to a different criterion and asserts a sense of urgency by relating current expenditures to future mandates. This data/presentation may confuse the reader. To reduce the potential misinterpretation and clarify the conclusion, the final report should present the same criteria and then compare the past, present and future expenditures across the same criteria.

See comment 2.

Page 4

In the last paragraph, we suggest the following revision: "There has been a decrease in investment in environmental infrastructure relative to GNP. Different sectors attribute the decrease to a variety of causes. Industry claims that a number of States issue Private Activity Bonds (PABs) on a first-come first-served basis. In virtually all of these cases, the PABs need to be re-issued annually. Given the multi-year nature of investment in environmental infrastructure, companies are unwilling to accept the risk of a cutoff in funding at any given year's end. Other companies assert that the decrease in investment is a function of the elimination of the Investment Tax Credit..."

Now on p. 5  
See comment 3.

Page 6

Perhaps the \$80 billion figure could be annualized to make it comparable to the data on page 1.

Now on p. 11.

See comment 4.

Page 11

The comment by a Treasury official that drinking water projects need to prove that these programs provide "public benefit" is of concern. It seems obvious that provision for safe drinking water supplies is a public benefit and the tax laws should recognize this.



Appendix II  
Comments From the Environmental  
Protection Agency

Now on pp. 18-19.

Pages 19-20

The report notes that capital spending for solid waste facilities increased from \$1.6 million in 1972 to \$3.3 billion in 1989. The increase is attributed to the introduction of expensive incinerators and recycling facilities as well as the increasing costs of building landfills to comply with Resource Conservation and Recovery Act (RCRA) regulations.

See comment 5.

The increase of costs being attributable to RCRA regulations is incorrect if the report is referring to the municipal solid waste landfill regulations. Please note that landfill regulations were published in October 1991 and that the effective date for compliance is October 1993. From 1972 to 1989, there was no increase in landfill construction costs attributable to regulations not yet published. With regard to recycling, there was very little activity prior to 1989, especially in the area of construction of recycling facilities.

Now on p. 19.

Page 20

We recommend that the last sentence read as follows: "EPA estimates that both publicly and privately-owned drinking water facilities will have \$14 billion in projects ready to go by the end of 1993 for storage, distribution lines and water treatment. Most of these costs are to repair, replace, and enlarge water supply facilities, not to comply with the new Safe Drinking Water Act (SDWA) regulations."

See comment 6.

Now on p. 29.

Page 30

The report states "As the Congress phases out (emphasis added) the wastewater construction grants..." This is incorrect since Congress eliminated the Construction Grants program for wastewater with the Clean Water Act (CWA) Amendments of 1987. EPA is in the process of closing out final projects. To accurately reflect the history of the Construction Grants program, the sentence should read, "As the Construction Grants program is phased out in response to the Clean Water Act Amendments of 1987, States and municipalities will rely..."

See comment 7.

Appendix II  
Comments From the Environmental  
Protection Agency

Now on p. 28.  
See comment 8.  
See comment 9.

Page 31 The first line of the page, under the note for the chart, actually completes the sentence started on page 30. This needs to be separated from the footnote for clarity.

Page 31 The \$15 billion (and the derived \$18 billion figure) cannot be confirmed by OGWDW. GAO is correct in its reference to the \$3 billion per year estimated cost in the future of SDWA-related compliance costs. We cannot, however, validate a conclusion that in the near future local governments are likely to be facing a bill of at least \$18 billion a year for drinking water systems.

Now on p. 31.  
See comment 10.

Page 34 The basis for a sound argument for exempting drinking water and other environmental facilities is stated here, and should be more completely documented. The report says that the reduced ability of private systems to receive tax-exempt financing could keep private companies out and encourage greater public activities. This, in turn, could lead toward greater public tax-exempt financing. Thus, there would not be a reduction in over-all tax-exempt financing and the resultant reduction in tax losses to the treasury intended by the volume cap restrictions. In addition, by limiting private involvement, you limit future tax revenues that would result in a private system paying taxes on income derived from sales, such as water.

Now on pp. 31-32.  
See comment 11.

Pages 34-35 The statement at the bottom of page 34 and top of page 35 that "...the impact of drinking water facilities has been relatively small because they are traditionally owned by municipalities" is incorrect. Approximately two-thirds of regulated drinking water systems are private, including 46% of the community water systems. Therefore, restrictions on private system financing could have a significant impact on drinking water system infrastructure financing.

**Appendix II  
Comments From the Environmental  
Protection Agency**

Now on p. 32.

See comment 12.

Page 35

We believe that the statement concerning the reason why so many people receive water from private systems is due to the fact they are good revenue raisers is misleading. It should be noted that many public systems fail to pass adequate rates to cover the costs of producing water, and/or to the cost of adequate infrastructure maintenance. This is due to the political difficulties of passing rate increases for publicly run systems.

Now on p. 33.

See comment 13.

Pages 36-37

PABs can be used only for the disposal portion of recycling facilities; recycling processes which create jobs and add value to recovered materials are not eligible for PABs. Federal policy strongly encourages recycling in preference to disposal. Federal tax law, therefore, subsidizes the less preferred option (disposal), yet fails to foster the more desirable and beneficial use of materials which can aid the local and national economy.

The following is GAO's comments on EPA's letter dated August 4, 1993.

## GAO Comment

1. Our analysis of investment needs and spending over time presented in chapter 2 and summarized in the Executive Summary is based solely upon a comparison of past and present spending with the investment requirements associated with current environmental mandates. Our reference to environmental spending as a percentage of GDP is mentioned to provide the national economic context. The sense of urgency referred to is related to the rising costs of environmental mandates, both current and new, and the underinvestment that has occurred in the past, as explained in more detail in chapter 2.
2. We do not have any evidence to link the decrease in environmental investments as a percentage of GDP with the availability of PABS or the Investment Tax Credit. Our point, which is discussed in the body of the report in chapter 3, is that the availability of PABS, along with other factors, affects the decisions of private companies to invest in environmental infrastructure. Companies assert that PABS make securing tax-exempt financing more difficult and that other tax changes make projects more expensive. However, as we point out on p. 34, the sustained level of investment in environmental infrastructure, despite these "barriers," suggests that governments may be making up for any reduction in private investment.
3. We have revised this paragraph to include an annualized cost. We have updated the estimated cost on the basis of testimony delivered by the EPA Administrator before the House of Representatives, Committee on Public Works and Transportation, Subcommittee on Water Resources and Environment, on May 5, 1993. The 1992 estimate of compliance needs for municipal wastewater treatment is \$108 billion by 2012, which is \$5.4 billion on an annualized basis.
4. The Treasury official cited in this paragraph was stating the agency's interpretation of the law. The Congress required a different standard for drinking water facilities than for other environmental facilities eligible for PABS. See the General Explanation of the Tax Reform Act of 1986, Joint Committee on Taxation, May 4, 1987, page 1169.
5. While the evidence is not clear about the importance of recycling and incinerators in increasing the treatment and disposal costs of solid waste, the costs are due in part to the increasing costs of building landfills. Our

determination is based on EPA's report Environmental Investments: The Cost of a Clean Environment (November 1990), and was substantiated in our discussions on our draft report with EPA staff. In this report, higher costs are attributed to the local cost of collecting and disposing of solid waste (operating costs) and compliance with federal standards for solid waste disposal facilities (capital costs). Despite the fact that landfill regulations were not in place before 1989, it is likely that as facilities closed and were replaced, the new facilities were constructed to meet the higher and more expensive standards in anticipation of the forthcoming regulations. We revised the sentence by deleting "incinerators and recycling facilities" and by adding that "the increased costs of building landfills were in anticipation of forthcoming regulations under the Resource Conservation and Recovery Act."

6. As we point out in chapter 2, we agree that a small portion of total spending on drinking water is for compliance with environmental regulations. However, it is important to note that EPA has estimated that the amount will double—in constant dollars— over the next 20 years.

7. We revised the language as EPA suggested.

8. This comment was addressed in preparing the final report.

9. As suggested, we deleted the \$15 billion estimate and retained the \$3 billion per year estimate.

10. We agree that private companies may be discouraged from investing in environmental infrastructure as a result of the volume cap. Furthermore, we agree that public investment may have replaced private investment as a result of limitations on the availability of PABS and that, as a result, federal tax revenues associated with tax-exempt bonds have probably not been affected by the volume cap. However, we did not examine options for removing barriers to private investment in environmental infrastructure, such as exempting the bonds issued for these projects from the volume cap. We believe that to make a judgment about the merits of any particular solution, it would be necessary to examine all the potential impacts—environmental and budgetary—as well as to examine the range of options that might achieve the same objective. In addition, we disagree that increased federal tax revenues would necessarily be realized from private investment in environmental infrastructure. From a national economic perspective, if private investors do not invest in environmental infrastructure, they will make other investments that generate taxable

revenue. As a result, there would be little difference in federal tax revenues.

11. We clarified our statement to reflect the fact that while the majority of the U.S. population is served by municipal water systems, this does not imply that there will be no impact on private drinking water systems. While EPA correctly points out that two-thirds of regulated drinking water systems are private, the preponderance of systems serving large populations are owned by municipalities.

12. In the report, we note that most systems are publicly owned because drinking water facilities are good revenue raisers for municipalities and the technology used in the systems is relatively simple. EPA commented that not all municipal systems can pass on costs so easily. We are not suggesting that passing on costs is easy in all cases. However, for large municipal systems that account for most of the drinking water provided, the rate base is generally large enough to support the higher rates.

13. Treasury officials maintain that PABS can be used to finance all portions of recycling facilities, including trucks to pick up materials, sorting, and handling equipment up to the point where a marketable product is created (see 26C.F.R. sec. 17.1). Companies we spoke with support that interpretation, and while they would prefer the entire facility to be eligible, they maintain that most aspects of recycling facilities are in fact eligible for PABS.

# Comments From the Treasury Department

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



DEPARTMENT OF THE TREASURY  
WASHINGTON  
August 10, 1993

ASSISTANT SECRETARY

Mr. Richard L. Hembra, Director  
Environmental Protection Issues  
U.S. General Accounting Office  
Washington, D.C. 20548

Dear Mr. Hembra:

Thank you for providing the Treasury Department with the opportunity to comment on the draft GAO report entitled *Volume Cap Effect On Investment Is Mixed But Total Investment Inadequate*. Following detailed discussions about the report between our staffs, I have enclosed our outstanding comments. Please do not hesitate to contact Mitchell Rapaport at (202) 622-0871 or William Trautman at (202) 622-1314 if you have any questions or if we can be of assistance.

Sincerely,

A handwritten signature in cursive script that reads "Leslie Samuels".

Leslie Samuels  
Assistant Secretary (Tax Policy)

Enclosure

Appendix III  
Comments From the Treasury Department

Comments on Draft GAO Report:  
*Volume Cap Effect On Investment Is Mixed But Total Investment Inadequate*

See comment 1.

We think that the following conclusions of the report, as described on pages 3-4, are plausible: 1) that the private activity bond volume cap has limited the issuance of private activity bonds for environmental facilities in certain states, 2) that state and local governments may have substituted the issuance of governmental bonds for private activity bonds when faced with a private activity bond volume cap constraint, and 3) that the substitution of governmental for private activity bonds may explain why both capital spending and the volume of tax-exempt bonds issued for environmental projects have changed little since the Tax Reform Act of 1986. Our general comment is that the regression models presented in Appendix I provide, at best, weak support for these conclusions and that other conclusions are equally plausible.

See comment 2.

The report argues that the positive and statistically significant coefficients on the annual volume cap and carryforward variables in the private activity environmental bond model provide support for the hypothesis that state private activity bond volume caps actually reduced the issuance of private activity environmental bonds in certain states. Because only 18 states in 1989 and 24 states in 1990 were included in the regression analysis as a result of the expectation that their volume caps were binding, the report correctly points out that the results of the model only apply to the states included in the analysis. Indeed, no inference may be drawn about states excluded from the analysis. That the volume cap caused a statistically significant reduction in the volume of private activity environmental bonds *in certain states* does not mean that the volume cap caused a statistically significant reduction in private activity environmental bonds *nationwide*.

See comment 3.

The report argues that the statistically insignificant coefficients on the annual volume cap and carryforward variables in the total (governmental and private activity) environmental bond models suggest that the state and local governments may have substituted governmental for private activity environmental bonds when faced with a private activity bond volume cap constraint. Because the coefficients are consistent at a 95 percent level of confidence with the hypotheses of no substitution, partial substitution, and perfect substitution, they do not allow one to make any statistical inferences about whether substitution has taken place. Figure 2.6 provides more convincing evidence that state and local governments may have substituted governmental for private activity bonds, at least with respect to solid waste facilities after 1989.

See comment 4.

The report implicitly makes the argument that since the private activity bond volume cap reduced the per capita volume of private activity environmental bonds in certain states, and since the total volume of governmental and private activity environmental bonds has remained relatively constant nationwide over time, state and local governments must have substituted governmental for private activity bonds when faced with a private activity bond volume cap constraint. This argument is flawed for two reasons. First, as argued above, there is no evidence that the private activity bond volume cap caused a statistically significant decrease in the volume of private activity environmental bonds *nationwide*.



Appendix III  
Comments From the Treasury Department

Second, if the total volume of governmental and private activity bonds has remained constant but population has increased, then the per capita volume of governmental and private activity bonds must have decreased. It would only be possible to argue that substitution has occurred if the per capita volume of private activity bonds decreased as a percentage of the per capita volume of total bonds.

Finally, the specification and estimation of the models do not appear to have accounted for the possibility that the dependent variables may have been truncated by the volume caps. To the extent that there is truncation, the estimation results may be biased.

Office of Tax Policy  
August 9, 1993

See comment 5.

The following is GAO's comment on the Treasury Department's letter dated August 10, 1993.

## GAO Comment

1. In general, Treasury finds our conclusions to be plausible but says that the results of the regression analysis provide, at best, weak support for conclusions. Throughout the report we express the value of the regression results while noting that they suggest, but do not prove, a particular finding. Moreover, we clearly indicate the model's limitations, and we use the recession results to corroborate findings that are largely supported by aggregate data. Finally, we point out that the results are less definitive with respect to the effect of the cap on total bond issuance (and, therefore, on the issue of substitution) than they are on the effect of the cap on the issuance of PABS.
2. As Treasury acknowledged in its comments, we only use the results of the model to make statements about the effect of the volume cap in those states where the cap appears to be binding with respect to the issuance of PABS in total (for all purposes). We agree with Treasury that our results do not imply that the cap causes a statistically significant reduction in PABS used for environmental purposes nationwide.
3. We agree with Treasury that the data on which figure 2.6 are based provide evidence of substitution of governmental bonds for PABS. We also agree that our regression analysis results, by themselves, do not allow the conclusion that substitution has taken place. We do not reach that conclusion on the basis of the regression results but, instead, note that at least some of these results are consistent with the data from figure 2.6.
4. Treasury contends that we combine evidence showing a relatively constant volume of total environmental bonds issued nationwide with regression results suggesting that the cap resulted in reduced private activity environmental bonds in some states. The agency then states that we incorrectly conclude from this that in states where the cap is constraining there was substitution of governmental for private activity bonds. However, we do not reach that conclusion but instead say that some of our regression results suggest that such substitution may have occurred in states where the cap is constraining. Furthermore, this suggestion comes from the regression results alone, not from the aggregate data on bond issuance. These data are used to suggest that nationwide there may have been substitution of governmental for PABS.

The regression results are used only to make inferences about the states where the cap is constraining.

5. Treasury contends that our estimation results may be biased because our models do not account for the possibility that the dependent variables may have been truncated. However, we do not believe that an alternative estimation technique that would have explicitly dealt with the truncation issue would have necessarily been preferable, and we added a discussion of the truncation issue to appendix I.

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# Major Contributors to This Report

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