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U.S.
INFRASTRUCTURE

Funding Trends and
Opportunities to
Improve Investment
Decisions



G A O

Accountability * Integrity * Reliability

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Abbreviations

CBO	Congressional Budget Office
DOD	Department of Defense
DOT	Department of Transportation
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
GAO	General Accounting Office
GDP	gross domestic product
GSA	General Services Administration
OMB	Office of Management and Budget
TIFIA	Transportation Infrastructure Finance and Innovation Act of 1998
VA	Department of Veterans Affairs



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To the President of the Senate and the
Speaker of the House of Representatives

A sound public infrastructure plays a vital role in encouraging a more productive and competitive national economy. In addition, public facilities are vital to meeting immediate as well as long-term public demands for safety, health, and improved quality of life. For example, transportation systems and water supplies directly support the nation's economy by facilitating the movement and manufacture of goods. Public schools, housing, parks, and other facilities enhance the quality of life of Americans.

When infrastructure problems occur, they can be very visible, and their effects can be widespread. Several examples of infrastructure problems and failures that occurred over the past decade illustrate these effects.

- In the summer of 1999, airline delays increased dramatically at major airports, thus inconveniencing air travelers and giving rise to many complaints about the airlines' on-time performance and inefficiencies in air traffic control equipment and procedures to manage it.
- In 1997, the District of Columbia's public schools, many of which are over 100 years old, were closed, under court order, for 14 school days during construction to fix 66 roofs and repair other severe structural deficiencies and fire code violations. In New York City, schools were closed for the first 11 days of the school year in 1993 for noncompliance with asbestos requirements. Such incidents have led to widespread public concern over the physical condition of America's schools.
- In 1993, contaminated drinking water in Milwaukee sickened more than 400,000 people and resulted in 100 deaths. The incident led the city to upgrade its water treatment facilities and focused national attention on protecting the public from the microbiological contamination of drinking water.
- Traffic growth on the nation's roads, leading to congestion, is an escalating problem, particularly in many urban areas. Traffic congestion in the nation's 50 most populous urban areas is estimated to cost over \$39 billion a year in time and fuel wasted.
- In January 1998, a water-main break on Fifth Avenue in New York City caused a huge sinkhole. Estimates of the costs of repair ran into the millions. In May 1997, Baltimore had a 30-foot sinkhole; in less than 6

months, an even bigger hole occurred on another street in the middle of the city. In 1993, two people in Atlanta were killed when they fell into a massive sinkhole, which occurred after a storm sewer collapsed.

Given the profound economic and social importance of the public infrastructure, it is crucial that federal, state, and local governments make prudent decisions on how to invest limited available resources. In making these decisions, governments will need to address an array of challenges that include repairing and maintaining aging infrastructure, making more efficient use of existing infrastructure, accounting for population growth, and incorporating new technologies in funding for infrastructure. Governments also face constraints on their resources in the form of competing demands to pay for their daily operations, basic public services, and entitlements. In this environment, the infrastructure improvements that all levels of government want may not reflect what they truly need and what the nation can afford. Accordingly, the decisions about the appropriate level of spending on infrastructure—the balance between building new projects and maintaining old ones and determining which projects to fund—are difficult to make but of enormous importance.

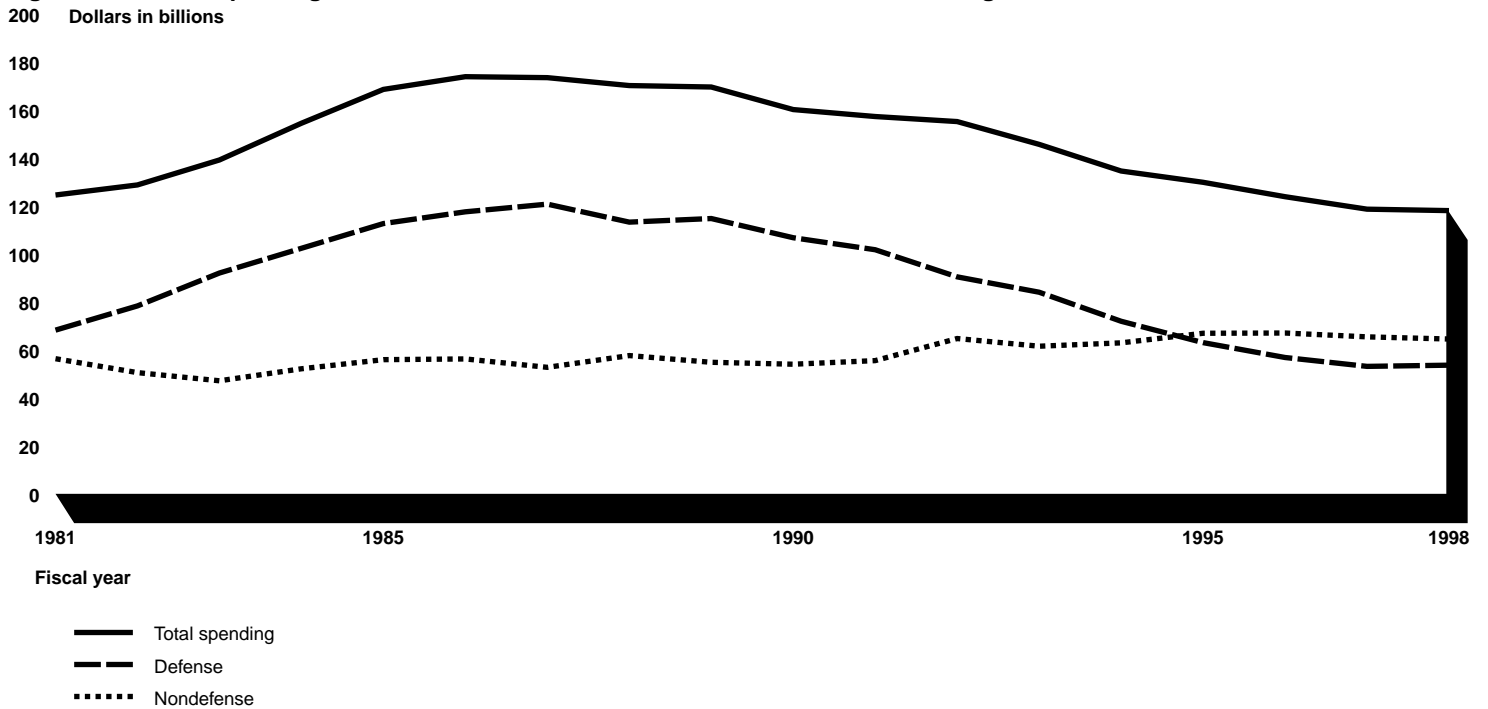
To address such concerns about the government's investment in infrastructure, this report describes (1) trends in the government's investment in infrastructure, (2) how federal agencies can improve their decision-making for the acquisition and management of infrastructure, and (3) the challenges to an effective investment in infrastructure at the federal level. In this report, we define "infrastructure" broadly to include facilities, structures, and land for public use and for other purposes, such as national defense.

To address the first objective, we analyzed selected federal government expenditures for the acquisition of, construction of, major improvements to, and repair of this infrastructure—we did not include its routine maintenance and repair—and reviewed GAO's and others' reports about trends in and demands for infrastructure spending. In this report, we express expenditures in fiscal year 1998 dollars, unless otherwise noted. To address the other objectives, we reviewed reports about public budgeting for capital assets, best practices for improving infrastructure, and federal agencies' acquisition and management of infrastructure. (See app. I for a detailed description of our methodology.)

Results in Brief

The United States has historically made an extraordinary investment in its infrastructure. For instance, the federal government has spent an average of \$149 billion annually since the late 1980s on the nation's infrastructure. The amount of federal spending devoted to infrastructure shows a continuous downward trend after fiscal year 1987—ranging from a high of \$174 billion in fiscal 1986 to a low of \$118 billion in fiscal 1998, as shown in figure 1. This trend is driven, in part, by reductions in defense spending for the acquisition and construction of infrastructure and by constraints that deficit reduction agreements between the Congress and the President have placed on the government's discretionary spending, which finances most federal spending for infrastructure. In contrast, federal spending for nondefense infrastructure shows a slightly upward trend. Similarly, spending by state and local governments is continuing an upward trend that began in the 1980s and exceeds federal spending in certain categories. In many cases, spending on infrastructure is intended to have a beneficial effect on the nation's economy, but studies on whether it has increased economic growth have shown mixed results. On the other hand, some federal spending on infrastructure is motivated by noneconomic policy goals, such as improved safety, and should not be expected to always be directed toward improving economic productivity.

Figure 1: Federal Spending on Infrastructure in 1998 Dollars, Fiscal Years 1981 Through 1998



To maximize the benefits of investments in infrastructure, federal agencies can improve their decision-making for the acquisition and management of infrastructure by following the best practices of leading government and private-sector organizations. Our past work has shown that some of these practices—shown in figure 2—are not being consistently applied at some federal agencies. For example, some federal agencies lack basic information on the condition of their facilities, including the total number and age of their facilities; other agencies have excess facilities, the disposal of which could be cost-effective in the long run. Enhanced decision-making concerning the acquisition and management of federal infrastructure is needed both to ensure that the purchase of new assets will have the highest and most efficient returns to the taxpayer and the government and to ensure that existing infrastructure will be adequately repaired and maintained.

Figure 2: Examples of “Best Practices” That Would Strengthen Federal Agencies’ Acquisition and Management of Infrastructure

Best practices

Conduct needs assessments that are based on results-oriented goals and consider capital and noncapital approaches to meeting these goals.

Use needs assessments to identify excess infrastructure capacity.

Identify current capabilities, including an inventory of assets and their condition.

Use inventories to identify unmet needs for maintenance and repairs.

Identify alternative, noncapital approaches to investing in new infrastructure.

Evaluate and select new infrastructure projects using an investment approach.

Consider innovative approaches to fund infrastructure projects.

Manage infrastructure improvements by regularly monitoring and validating information such as costs, benefits, and risks.

Federal agencies and the Congress face several challenges in determining the appropriate levels of and effective approaches to infrastructure investment. First, there is a general lack of accurate, consistent information on the existing infrastructure and its future needs. For example, in some cases, the current information may not distinguish between genuine needs and “wish lists.” In other cases, the information may not identify all the needs. In addition, federal agencies have not taken a consistent approach to analyzing the costs and benefits of potential infrastructure projects, which would help in setting priorities and determining noncapital alternatives. Moreover, until recently, agencies have not been required to relate their planned infrastructure spending to their missions and goals, so evaluating these plans has presented a challenge to agencies and the Congress. Finally, the federal budget structure does not prompt explicit debate about infrastructure spending that is intended to have long-term benefits. Overcoming these impediments will not be easy. Recent guidance by the Office of Management and Budget and legislation such as the Government Performance and Results Act may provide interim steps toward doing so. However, these steps might not go

far enough toward improving infrastructure investments because spending decisions are made by a variety of agencies and levels of government that have differing goals and missions. In order to better coordinate these investments to meet national, regional, and local goals and ensure that they are mutually supportive, it is crucial that agencies throughout the government reduce inefficiencies in their current investments and analyze potential investments to identify those that achieve the greatest benefits in the most cost-effective manner.

Background

Infrastructure has been defined in a number of ways.¹ Most commonly, infrastructure refers to those facilities or structures that are provided for public use and are intended to enhance the nation's long-term productivity. Such infrastructure includes, for example, transportation systems, water supply facilities, flood prevention structures, and solid and hazardous waste disposal facilities. Infrastructure can also refer to structures that federal, state, or local governments build or significant equipment that they procure for purposes other than economic growth. For example, the federal government builds and operates facilities to provide services for the public, maintains national park facilities and monuments to provide recreational opportunities and conserve natural resources, and finances public housing to provide safe shelter. The federal government also constructs hospitals and family housing and procures military equipment and weapons systems to provide for the well-being of military personnel, veterans, and their families and to provide for national security. This report focuses on all of the physical structures, facilities, and equipment mentioned above—those that are intended to enhance the nation's long-term productivity as well as those that provide long-term benefits other than economic ones.² While this report focuses on government-owned

¹See, for example, *Stewardship of Federal Facilities: A Proactive Strategy for Managing the Nation's Public Assets*, National Research Council (Washington, D.C.: 1998); Edward M. Gramlich, "Infrastructure Investment: A Review Essay" in *Journal of Economic Literature* (vol. 32, Sept. 1994); and David A. Aschauer, "Is Public Expenditure Productive?" in *Journal of Monetary Economics* (vol. 23, 1989).

²Occasionally, infrastructure has been defined as physical structures as well as intangible assets, such as the benefits accruing from human capital and technology. See, for example, D. Swimmer, "An Overview of Infrastructure: Its Measurement and Relation to Productivity and Economic Growth" in J.M. Mintz and R.S. Preston, eds., *Infrastructure and Competitiveness*, John Deutsch Institute for the Study of Economic Policy (Ottawa, Ontario, Canada, 1993). We do not address intangible assets in this report.

and -financed infrastructure, it is important to note that significant portions of the nation's infrastructure are, in fact, privately financed and/or owned. For example, railroads and pipelines—two important methods of transporting resources—are privately owned.

Federal Role in Infrastructure Development

While most spending on infrastructure takes place at the state, local, or private-sector level, the federal government exerts an important influence on the type of infrastructure that is developed. The federal government's influence can be seen in several ways. First, the federal government is directly responsible for acquiring and maintaining various federally owned assets. These include, for example, federal office buildings, military installations, weapons systems, dams and flood control structures, the nation's air traffic control system, and research laboratories for a number of federal agencies. The funding for such infrastructure is directly appropriated by the Congress.

Second, the federal government provides funding—such as grants, loans, or loan guarantees—for infrastructure that is owned and operated by others. The funds may be provided for particular activities or purposes that are specified in legislation. The federal funds cover a portion of the capital development and improvements, as shown in the following examples:

- The Department of Transportation's (DOT) Federal Highway Administration (FHWA) provides states and localities with grants that partially fund the construction and improvement of urban and rural highways, including major maintenance of interstate highways. DOT estimated that the federal share of total capital funding for highways was 45 percent in fiscal year 1995.
- DOT's Federal Transit Administration provides funding for mass transit primarily through formula and capital assistance grants. The formula grants provide capital and planning assistance for mass transit in urbanized areas. The capital assistance grants to state and local agencies fund new transit systems and improvements to existing systems. In fiscal year 1997, 54 percent of the capital funding for transit came from the federal government.
- DOT's Federal Aviation Administration (FAA) provides airports with grants for capital development. FAA allocates most grants on the basis of (1) a legislated formula that is tied to the number of passengers that an airport enplanes and (2) categories earmarked for specific types of airports and projects. FAA allocates the remaining funds on the basis of

needs identified by the airports. In fiscal year 1996, FAA funded about 20 percent of total airport development.

- The Environmental Protection Agency (EPA) finances the local construction and improvement of drinking water and wastewater facilities primarily through state revolving fund programs. Federal grants provide the “seed” money for the state programs, which prioritize projects and make interest-bearing loans and other types of assistance to public water systems for eligible capital improvements. As a condition of receiving federal funds, states provide a matching amount equal to 20 percent of the total grant.

Third, the federal government influences infrastructure investment through tax incentives. For example, under the Department of the Treasury’s Low-Income Housing Tax Credit program, people who own or invest in the development of qualified low-income rental housing receive a credit that may be claimed annually on their tax returns for 10 years in exchange for providing the development with a specified amount of cash equity. In addition, the interest on municipal bonds, which are primarily used for infrastructure purposes, are exempt from federal taxes.

Finally, federal legislation and regulation influence the way infrastructure projects are designed and built. For example, DOT-approved pavement standards influence road construction, the Safe Drinking Water Act includes public health-based performance criteria that affect the construction or modification of local water systems, and worker safety and accessibility regulations influence the design of public and private buildings.

Laws and Guidance to Improve Infrastructure Planning

The Congress and the Office of Management and Budget (OMB) have identified the need to improve federal decision-making regarding the acquisition and management of infrastructure and other capital assets. The Congress has expressed concern over the management of information technology projects, the federal acquisition process, and the collection of information pertaining to deferred maintenance on infrastructure and other capital assets. OMB has noted a lack of a clear sense of mission for many programs, an insufficient consideration of life-cycle costs, and agencies’ failure to analyze and manage the risk inherent in the acquisition of infrastructure and other capital assets. Because of these concerns, the Congress and OMB have placed requirements on federal agencies that will affect how they plan for, acquire, and manage infrastructure spending. The Congress enacted the Federal Acquisition Streamlining Act of 1994 to

improve the federal acquisition process. The Clinger-Cohen Act, enacted in 1996, requires that agencies engage in capital planning and performance and results-based management for investments in information technology. The Government Performance and Results Act of 1993 requires agencies to develop mission statements, long-range strategic goals and objectives, and annual performance plans. To help agencies integrate and implement these various requirements, OMB added a section to its annual budget preparation guidance (Circular A-11) requiring agencies to provide OMB with information on major capital acquisitions and to submit a capital asset plan and justification. This guidance is supplemented by OMB's Capital Programming Guide, which provides detailed steps on planning, budgeting, acquiring, and managing infrastructure and other capital assets. Circular A-11 also includes guidance to agencies on linking annual performance plans to capital planning efforts. These laws and guidance are described in appendix II.

Trends of Government Spending for Infrastructure

The United States has historically made an extraordinary investment in its infrastructure. For example, the federal government has spent an average of \$149 billion annually, in 1998 dollars, since the late 1980s on the nation's infrastructure. But the percentage of gross domestic product (GDP) devoted to infrastructure as well as the share of total federal spending devoted to infrastructure show continuous downward trends after fiscal year 1987. These trends are driven by reductions in defense spending. In contrast, federal spending for nondefense infrastructure shows a slightly upward trend. The focus of federal infrastructure spending varies according to the priorities being addressed—for example, the trend for transportation spending has been generally upward, while the natural resources and environment area shows a downward trend. In contrast to federal spending for infrastructure, a 1999 Congressional Budget Office (CBO) study reported that state and local spending is continuing an upward trend that began in the 1980s and exceeds federal spending in certain categories.³ Two-thirds of state and local governments' spending in these

³See *Trends in Public Infrastructure Spending*, Congressional Budget Office (May 1999). CBO defined infrastructure to include spending for highways, mass transit, rail, aviation, water transportation, water resources, water supply, and wastewater treatment. CBO's database includes federal spending from fiscal year 1956 through fiscal 1997 and state funding from fiscal 1956 through fiscal 1994. We defined infrastructure to include these transportation and water categories as well as spending for other federally funded physical assets such as federal buildings and land, weapons systems, and military installations and family housing.

categories was used for major improvements and repairs, which contrasts sharply with that at the federal level—where over two-thirds was used to purchase or construct physical assets. The private sector has also made a significant investment in infrastructure, which may be at a higher level than government investment.

To provide information on trends in spending for infrastructure, we analyzed information from OMB on federal outlays and obtained data from CBO on states' and local governments' spending for certain infrastructure categories. Information on federal outlays includes spending to construct, acquire, modify, or replace physical assets, but does not include spending for routine repairs and the maintenance of infrastructure, such as the routine maintenance of major weapons systems. Because OMB discontinued reporting on operation and maintenance expenditures after the budget for fiscal year 1989, there are no governmentwide data on how much is spent each year on the maintenance of physical assets. In addition, we looked at federal spending for infrastructure relative to overall spending. While this information provides a general yardstick for measuring the resources allocated for infrastructure, it does not necessarily indicate what the appropriate level of spending should be. Appendix I describes the types of infrastructure included in the federal and state/local spending analyses.

Public Spending for Infrastructure in Selected Areas, as Calculated by CBO

The cost of our nation's infrastructure is great: CBO's 1999 study on infrastructure trends showed that during the 1970s, an average of \$119 billion was spent annually for transportation and water resources, supply, and treatment—major areas of civilian infrastructure spending.⁴ By fiscal year 1994, total public spending for these areas had risen to almost \$200 billion annually.⁵ However, the relative contributions provided by federal, state, and local governments have significantly changed over the years. The federal share of such spending rose dramatically during the fiscal year 1956-94 period—expanding from 17 percent in fiscal 1956 to 40 percent in fiscal 1977. Since the 1980s, however, state and local governments have

⁴Amounts are in 1997 dollars.

⁵We were not able to obtain information on the private sector's spending in areas similar to infrastructure and other physical assets. However, the *Report of the President's Commission to Study Capital Budgeting* (Feb. 1999) reported that since World War II, the private sector's investment on physical assets has substantially exceeded the public sector's investment.

contributed approximately 75 percent of public infrastructure spending in these areas, and current patterns of spending maintain that trend.

Since the 1950s, federal infrastructure spending in the areas examined by CBO has been dominated by spending for highways. During the 1970s, however, federal spending for infrastructure focused relatively more on wastewater treatment and mass transit. Beginning in the 1980s and continuing in the 1990s, the federal emphasis has shifted back to highways and aviation. Compared with the priorities for federal spending, the priorities for state and local spending have changed little since the 1970s, and spending on highways has led this spending. Some spending increases occurred in the categories of mass transit, aviation, and wastewater treatment.

Percentage of Federal Spending for Infrastructure

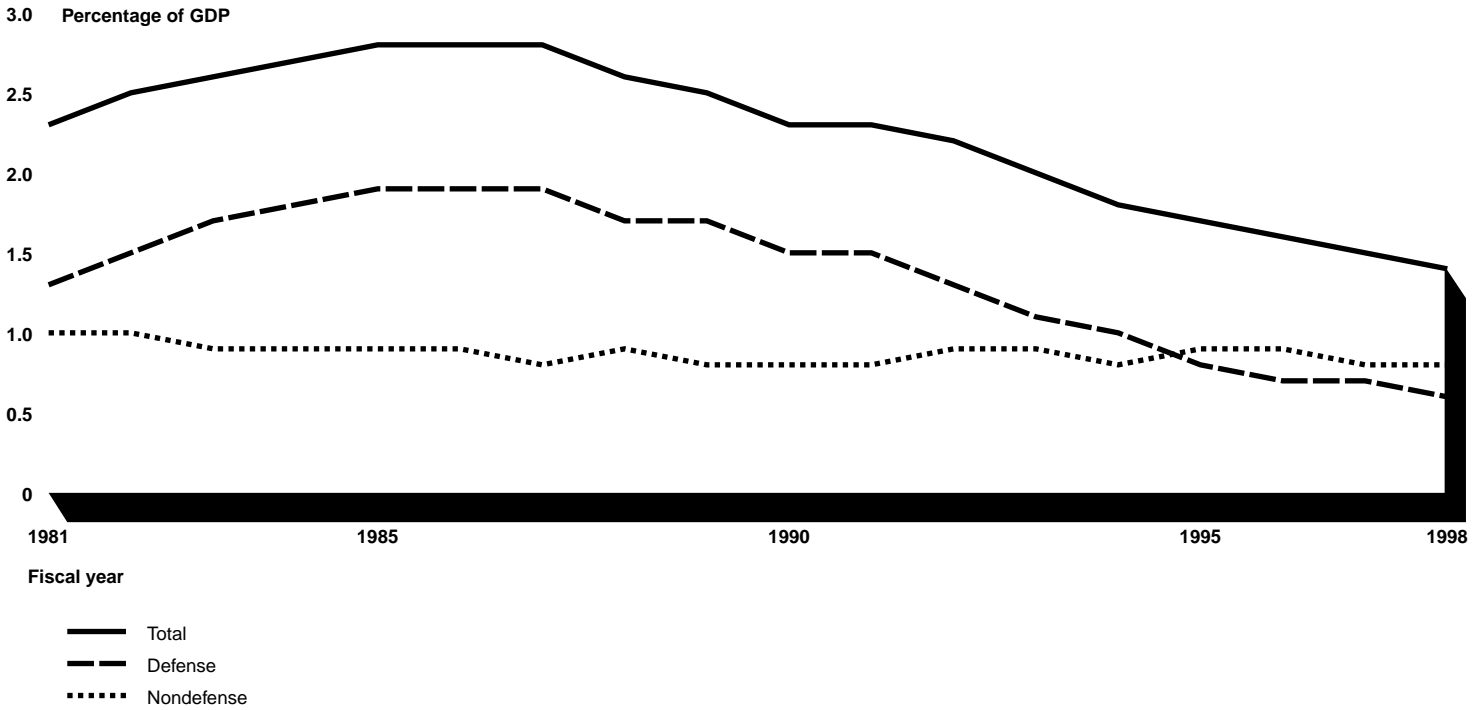
Since the late 1980s, an average of \$149 billion in federal funds (in 1998 dollars) has been spent annually for civilian and defense infrastructure; however, spending for infrastructure as a percentage of GDP is declining.⁶ As figure 3 shows, the percentage of GDP devoted to infrastructure spending rose slightly from the early 1980s through fiscal year 1987. However, figure 3 shows a continuous downward trend after fiscal year 1987. From highs of 2.8 percent in fiscal years 1985, 1986, and 1987, infrastructure spending gradually fell each year until reaching a low of 1.4 percent of GDP in fiscal year 1998. Similarly, the percentage of total federal spending devoted to infrastructure has steadily declined since the late 1980s, as shown in figure 4. These trends may be due, in part, to decreases in defense spending and constraints on the government's discretionary spending, which finances most federal spending for infrastructure.⁷ The Congress put these "caps" in place in 1990 in an effort to implement a deficit reduction agreement between the Congress and the administration,

⁶We used information from OMB's budget database to analyze actual federal infrastructure outlays (spending) for fiscal years 1981 through 1998, using our broad definition for infrastructure spending that includes the physical structures and facilities that are intended to enhance the private sector's long-term productivity, as well as spending for physical capital designed to achieve federal agencies' goals or improve the government's operating efficiency. OMB's budget database does not contain state and local spending for infrastructure.

⁷The Budget Enforcement Act of 1990, as amended, divided all discretionary spending, of which infrastructure is a part, into categories and imposed statutory limits, or "caps," on each category. The categories have changed over the years and in February 1999 consisted of defense, nondefense, violent crime reduction, highways, and mass transit.

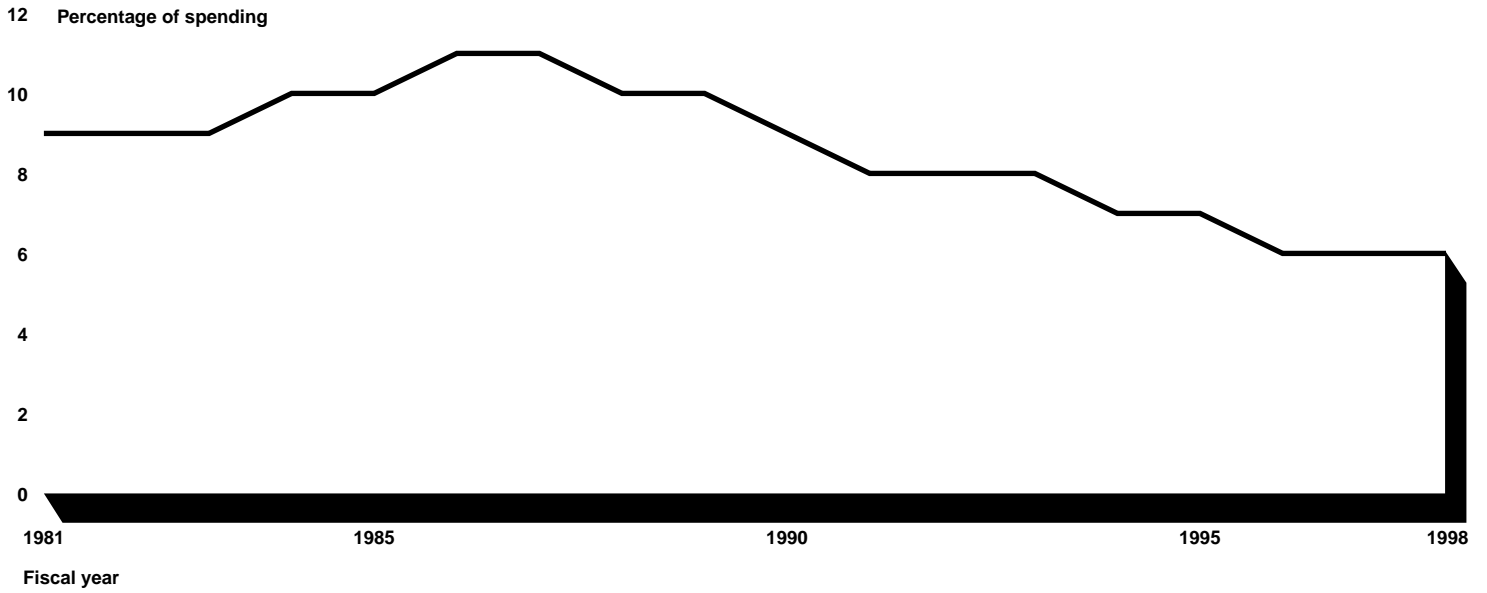
thereby reducing the federal deficit. In addition, the downward trends for spending on infrastructure may be due to required increases in spending for entitlement programs like Social Security and Medicare. Since the late 1980s, entitlement programs have grown as a percentage of federal spending, while discretionary spending has done the opposite.

Figure 3: Federal Infrastructure Spending as a Percentage of Gross Domestic Product, Fiscal Years 1981 Through 1998



Source: GAO's analysis of OMB's data.

Figure 4: Infrastructure as a Percentage of Federal Spending, Fiscal Years 1981 Through 1998



Source: GAO's analysis of OMB's data.

Total Federal Spending for Defense and Civilian Infrastructure

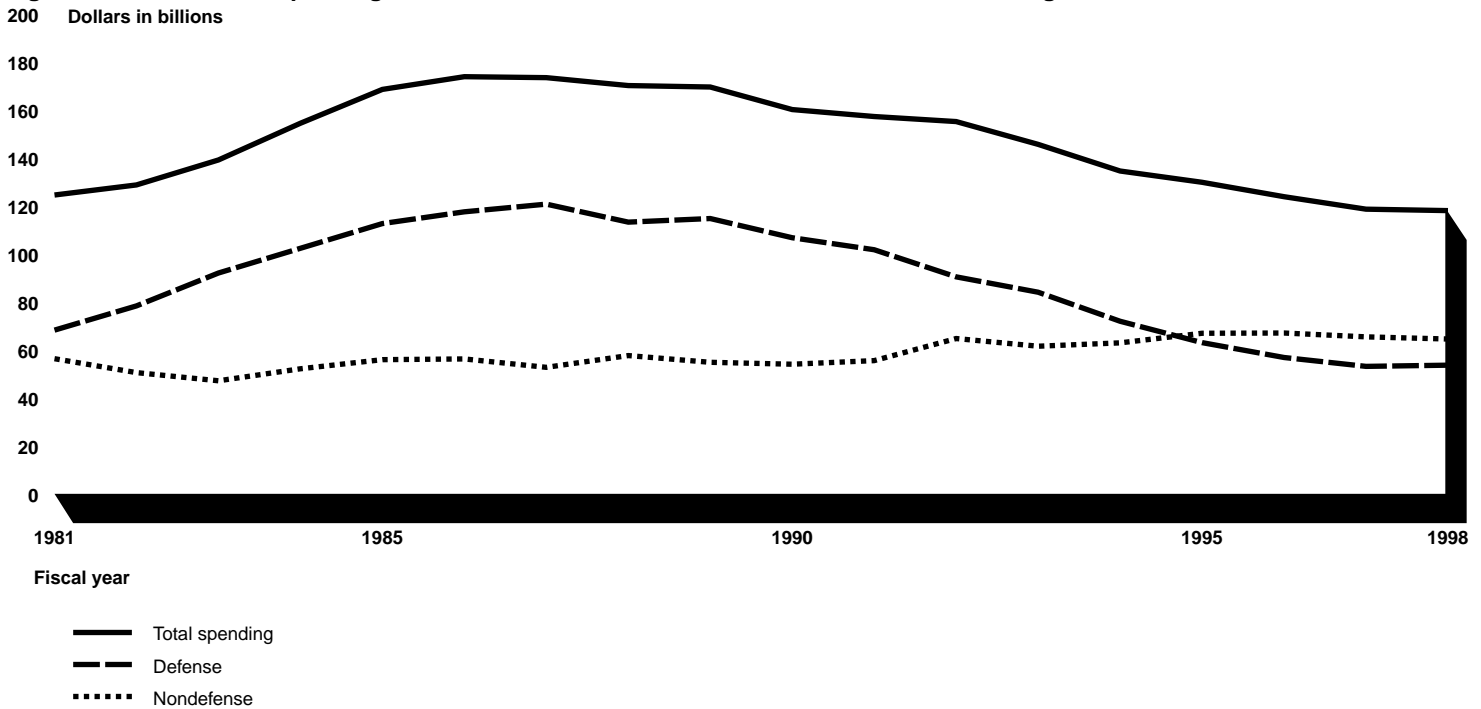
The amount of total federal dollars allocated for infrastructure spending is also declining. Infrastructure spending in constant (inflation-adjusted) dollars generally increased from the early 1980s through fiscal year 1988 before dropping in the 1990s—ranging from a high of \$174 billion in fiscal 1986 to a low of \$118 billion in fiscal 1998. This overall downward trend is driven by reductions in defense spending for the acquisition of, construction of, major improvements to, and repair of infrastructure.⁸ Defense investment has ranged from a high of \$121 billion in fiscal year 1987 to lows of about \$54 billion in fiscal 1997 and fiscal 1998, as shown in figure 5.⁹ In contrast, federal spending for nondefense infrastructure showed a slightly upward trend and, since fiscal year 1995, accounted for 51 to 55 percent of total spending. For instance, in fiscal year 1998, the federal government spent an estimated \$118 billion on infrastructure. Of this, the largest portion—\$64 billion (or 55 percent)—was spent on non-defense-related activities.¹⁰ Defense-related infrastructure spending in fiscal year 1998 was \$54 billion.

⁸Our analysis does not include spending for routine maintenance.

⁹Our other reports on defense infrastructure used the Department of Defense's definition of its infrastructure, which includes maintenance of weapon systems and equipment, research and development, personnel costs associated with support activities, and physical assets, but excludes weapon systems procurement. These reports showed that the Department allocated about 60 percent of its annual funds (\$147.4 billion in fiscal year 1998) to its infrastructure. See *Future Years Defense Program: Substantial Risks Remain in DOD's 1999-2003 Plan* (GAO/NSIAD-98-204, July 31, 1998).

¹⁰Non-defense-related activities include infrastructure spending for budget functions such as transportation; health; general science, space, and technology; natural resources; and environment and energy. Defense-related activities include military construction and weapons procurements.

Figure 5: Total Federal Spending on Infrastructure in 1998 Dollars, Fiscal Years 1981 Through 1998



Source: GAO's analysis of OMB's data.

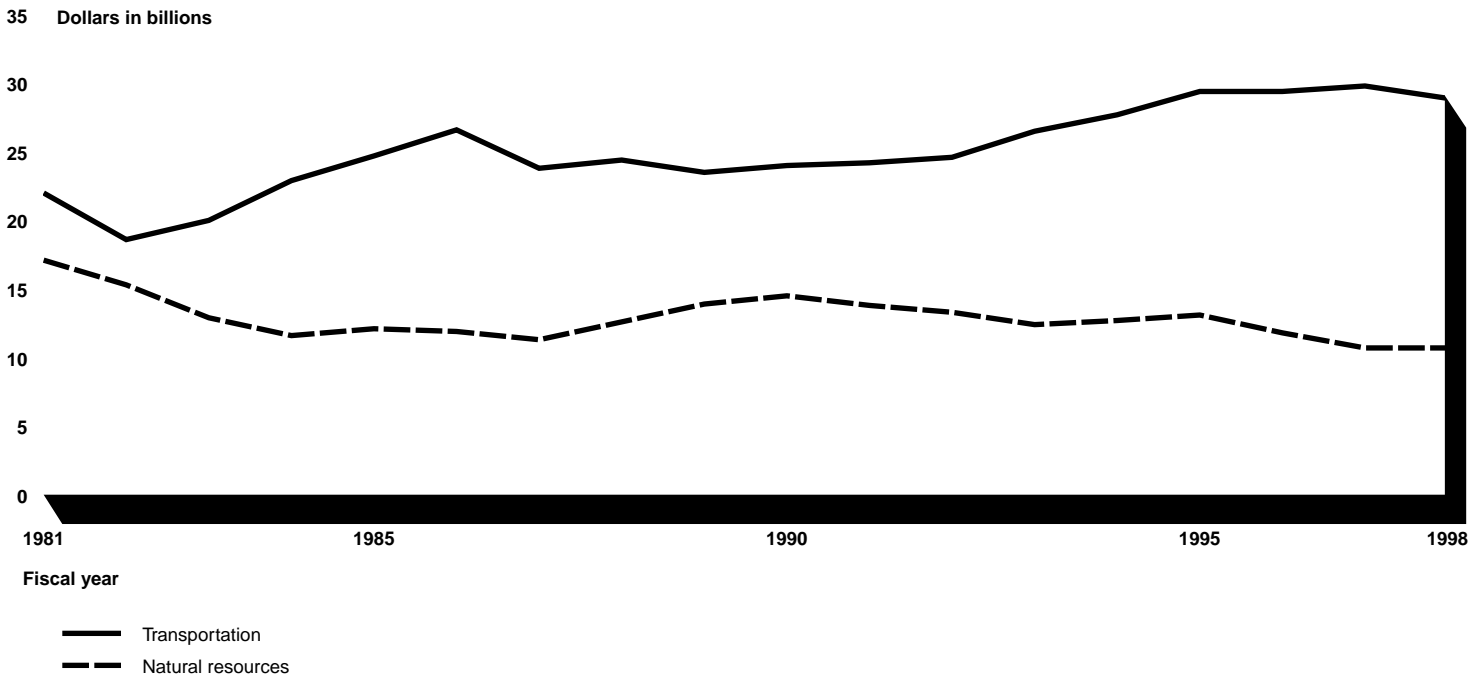
Federal Spending for Selected Infrastructure Areas

The focus of federal infrastructure spending varies according to the priorities being addressed. For example, the trend for transportation spending (which includes federal-aid highways spending from the transportation trust fund, spending from federal transit formula grants, and spending on facilities and equipment from the airport and airway trust fund) has been generally upward, reaching a high of about \$30 billion in fiscal year 1997. CBO's analysis showed that increased spending for surface transportation, provided by the Transportation Equity Act for the 21st Century, will continue that upward trend.¹¹ In contrast, infrastructure

¹¹CBO's analyses showed that under the act, from fiscal year 1998 through fiscal year 2003, nominal spending for highways totals \$158 billion, increasing in real terms at a projected average annual rate of 1.8 percent. Mass transit expenditures will increase at an average annual rate of 5.6 percent in real terms, and nominal spending is expected to total \$33 billion over the period fiscal years 1998 through 2003.

spending for the natural resources and environment budget function (which includes items such as water resources, conservation and land management, recreational resources, and pollution control) showed a downward trend from \$17 billion in fiscal year 1981 to about \$11 billion in fiscal 1998, with a few intervening small upswings, as shown in figure 6.

Figure 6: Federal Spending for the Transportation and Natural Resources and Environment Functions in 1998 Dollars, Fiscal Years 1981 Through 1998

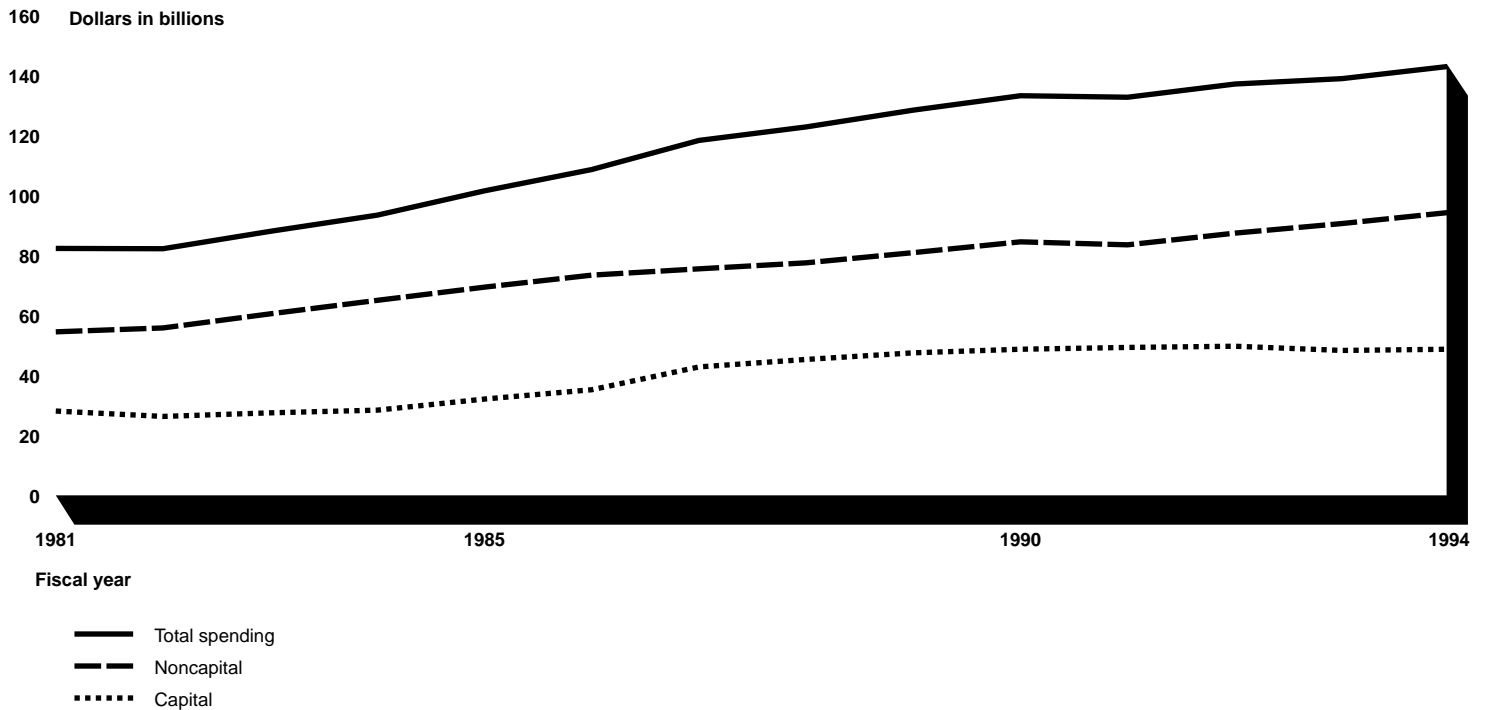


Source: GAO's analysis of OMB's data.

State and Local Spending for Selected Infrastructure Areas, as Calculated by CBO

In contrast to federal spending for infrastructure, state and local spending for transportation and water resources, supply, and treatment rose from slightly over \$82 billion in fiscal year 1981 to over \$130 billion in early fiscal 1990, in 1997 dollars.¹² The upward spending trend has continued throughout the 1990s. For example, state and local expenditures for these areas in fiscal year 1994 reached \$143 billion, in 1997 dollars—a real increase of 2.9 percent over the spending for fiscal 1993. (See fig. 7.)

Figure 7: State and Local Spending for Selected Infrastructure Areas in 1997 Dollars, Fiscal Years 1981 Through 1994



Source: CBO.

¹²State and local spending excludes federal grants and loans. Spending data for water resources—the net of federal grants and loans—were not available for fiscal years 1991 through 1994.

The distribution of state and local spending for capital and noncapital purposes has remained about the same over this period—approximately two-thirds on noncapital spending and one-third on capital spending.¹³ CBO’s analysis showed that the mix of capital and noncapital spending for the selected infrastructure areas at the state and local levels contrasted sharply with that at the federal level. In fiscal year 1994, state and local spending for these areas was divided into roughly 34 percent for capital spending and 66 percent for noncapital spending. The corresponding federal shares were 71 percent for capital spending and 29 percent for noncapital spending.

Spending priorities in these areas at the state and local levels also differ from those at the federal level. For instance, according to CBO, in fiscal year 1994, highways led infrastructure spending at each level of government; such spending accounted for 43 percent of state and local spending and 45 percent of federal spending. However, after highway expenditures, the similarities in spending priorities for infrastructure vanish. At the federal level, spending was focused on such things as aviation and water resources, whereas at the state and local levels, spending priorities included drinking water supply, mass transit (predominately noncapital operating expenses), and wastewater treatment.

¹³Capital spending includes primarily the purchase, rehabilitation, and construction of physical assets, such as building a subway system. Noncapital spending includes the operation and maintenance of physical assets, such as maintaining subway tracks and cars, but does not include ordinary repairs and maintenance.

Infrastructure Spending and Its Effect on Economic Growth

Some federal spending on infrastructure—for such things as transportation systems and water projects—is intended to have a beneficial effect on the nation’s economy. However, studies have shown mixed results on whether such spending has increased economic growth. Upon reviewing a number of past studies, CBO reported that many federal infrastructure projects yield net economic benefits that are small or even negative and that only a few projects have very high returns.¹⁴ CBO concluded that federal spending that is not targeted toward cost-beneficial projects can reduce economic growth by absorbing resources that could be more productive in private investments. CBO further noted that federal spending on infrastructure can displace spending by state and local governments and the private sector. This effect may be substantial in some cases, such as the displacement of spending for roads and bridges, which state and local governments have a strong incentive to fund because the benefits accrue primarily to local users. We have reported that the economic impact of spending can be thwarted when federal funds are used to replace nonfederal funding.¹⁵

On the other hand, in many cases, federal spending for infrastructure is motivated by noneconomic policy goals, such as improved safety, national security, and enhanced quality of life. For this reason, federal funds should not be expected to always be directed toward improving economic productivity. Nonetheless, it is important that federal spending on infrastructure be based on decisions that are likely to yield the greatest return as measured by social, environmental, and economic benefits and costs.

¹⁴*The Economic Effects of Federal Spending on Infrastructure and Other Investments*, CBO (June 1998).

¹⁵*Budget Issues: Budgeting for Capital* (GAO/T-AIMD-98-99, Mar. 6, 1998).

Ways to Strengthen the Acquisition and Management of Federal Infrastructure

To maximize the benefits of investments in infrastructure, federal agencies can improve decisionmaking for the acquisition and management of infrastructure by following the practices of leading government and private-sector organizations. We have identified leading practices that include concepts such as determining the gap between the capacity of the current infrastructure and the organization's mission and goals, evaluating alternative approaches to achieving results, considering innovative approaches to funding, and monitoring a project's performance.¹⁶ These practices are summarized in appendix III. From a review of our recent evaluations of individual federal agencies' acquisition and management of infrastructure, we believe that some practices are lacking or in need of improvement. Enhanced decision-making concerning the acquisition and management of federal infrastructure is needed to ensure that the purchase of new assets will have the highest and most efficient returns to the taxpayer and to the government and that existing infrastructure will be adequately repaired and maintained.

Conducting Needs Assessments

We have reported that conducting a comprehensive needs assessment or analysis of program requirements is an important first step in an organization's decision-making process for infrastructure. Leading organizations conduct comprehensive needs assessments that (1) consider the organizations' overall mission, (2) identify the resources needed to fulfill both immediate requirements and anticipated future needs on the basis of the results-oriented goals and objectives that flow from the organizations' mission, and (3) consider both capital and noncapital approaches to addressing these goals. The needs assessments by leading organizations are results-oriented in that they determine how specific outcomes—such as improved mobility on highways—might be obtained rather than what is needed to maintain or expand the existing infrastructure. Placing the focus on results drives organizations to consider alternative ways to fulfill a program's requirements, such as congestion management strategies to improve mobility on highways.

Federal, state, and private organizations have conducted "needs assessments" for various components of public infrastructure. These assessments, however, are made for a variety of purposes, and many do not

¹⁶ *Executive Guide: Leading Practices in Capital Decision-Making* (GAO/AIMD-99-32, Dec. 1998).

follow the practices of leading organizations. As a result, some needs assessments can be better described as “demands” for infrastructure spending, leaving decisionmakers with the challenge of determining whether the assessments overestimate or underestimate the true “needs.”

In response to congressional mandates, both DOT and EPA periodically report on the national demands and planned investment in highways, bridges, public transit, drinking water systems, and wastewater treatment facilities. The two agencies have estimated demand using a variety of methods—some of which incorporate elements of the leading organizations’ practices. For example, DOT used an economic approach for the highway and transit estimates that takes into account the most cost-beneficial improvements. The benefits include results-oriented criteria such as reduced highway congestion and delay, improved mobility, and reduced vehicle emissions, which link to DOT’s strategic goals and objectives.¹⁷ DOT and EPA also used functional approaches for the bridge and water cost estimates, such as measuring costs by some standard of physical condition or performance. For example, DOT’s bridge estimates used engineering structural criteria to prioritize projects, and EPA’s estimates for drinking water systems included the amount needed to comply with the Safe Drinking Water Act. Figure 8 contains information on the agencies’ most recent estimates and how they were developed.

¹⁷DOT’s 1997 strategic plan includes long-term goals to improve mobility and the human and natural environment, among other things.

Figure 8: Examples of “Needs Assessments” Used by DOT and EPA

Highways

The Congress requires DOT to report on the condition, performance, and investment required for the nation’s highways every 2 years. In its 1997 report, DOT estimated the spending on highways from fiscal year 1996 through fiscal 2015, using two scenarios. DOT made the estimates by sampling 120,000 highway segments nationwide and evaluating characteristics, such as pavement condition, then projecting these segments’ future performance on the basis of such situations as projected traffic growth. Using a computer model, DOT then considered various ways to maintain or improve the highway segments and calculated the cost-benefit ratio of these improvements. DOT estimated that the cost of its first scenario—to maintain the cost to users (such as the costs of travel time, accidents, and vehicle operations)—would be \$40.5 billion annually. DOT estimated that the cost of the second scenario—implementing all improvement projects where the benefits exceeded the costs—would be \$70.3 billion annually. Because the estimates are based on a sample of highway segments, they cannot be used to identify specific projects worth completing or to identify the potential need for highway improvements by state or region.

Bridges

The Congress also requires DOT to report every 2 years on the condition, performance, and investment required for the nation’s bridges. DOT’s 1997 bridge report estimated investment from fiscal year 1996 through fiscal 2015 using two scenarios—the cost to maintain bridge conditions and the cost to improve them. DOT made the estimates using data in the national bridge inventory, which includes information on the condition and capacity of all bridges covered by the National Bridge Inspection Standards and located on a public road. DOT’s analysis identified bridge deficiencies, selected and simulated improvements, and calculated their costs. An engineering ranking scheme was used to prioritize potential improvements. DOT estimated that the cost to maintain bridges in their current condition was \$5.6 billion annually and that the cost to improve the conditions of bridges by correcting all deficiencies was \$9.3 billion annually.

Transit

Similar to its reporting requirements for highways and bridges, the Congress has a requirement that DOT report every 2 years on the nation's transit systems. DOT's 1997 report covered fiscal years 1996 through 2016 and estimated investment under two scenarios—the cost to maintain the condition of mass transit systems and the cost to improve them. To make investment estimates, DOT used data from its nationwide inventory of transit assets that included the condition, age, usage rate, and maintenance history of equipment and facilities and applied a cost-benefit analysis to potential investments. DOT estimated that the cost to maintain facilities and equipment in their current state of repair and operating performance was \$9.7 billion annually and that the cost to improve condition and performance was \$14.2 billion annually.

Drinking water

The Congress required EPA to survey local water systems about their capital investment needs every 4 years. EPA's first survey, issued in 1997, estimated that \$138.4 billion in 1995 dollars was needed from fiscal year 1995 through fiscal 2014 for infrastructure improvements. Of that amount, \$12.1 billion was needed right away to comply with the Safe Drinking Water Act's regulations, and \$18.2 billion was needed in the future to comply with the existing and proposed regulations. EPA's estimates were derived from a nationwide survey mailed to large and medium-sized community water systems. The water systems either submitted documentation of the cost estimates or recorded design parameters to enable EPA to model the costs. For small systems, EPA compiled the documentation by conducting site visits. Because the survey relied on documented needs reported to EPA, officials believe the agency's estimates are conservative. For example, most water systems identified needs that covered a 5-year period—not the 20-year period asked for in the survey. In addition, although constructing new water systems to address water quantity or quality problems is eligible for funding under the act, EPA excluded these types of projects from its estimate because of the difficulty of identifying the costs of new systems.

Wastewater treatment

The Congress required EPA to conduct wastewater needs surveys every 2 years to determine the nation's needs for wastewater treatment facilities and to guide EPA's grants to states for these systems. The survey issued in 1997 found that wastewater facilities estimated they would need to spend \$139.5 billion (in 1996 dollars) over the following 20 years. This estimate covers building treatment systems, new sewer pipes, and systems to handle storm water and repairing and correcting existing sewers to improve service or prevent sanitary sewer overflows. More recently, EPA estimated that the amount was closer to \$220 billion because some needed work had been underestimated. EPA's estimates were derived from a survey that used documented plans for capital improvement provided by states on a facility-by-facility basis. Because the survey relied on documented plans reported to EPA, officials believe the estimates are conservative. For example, most plans covered only a 5-year period—not the 20-year period asked for in the survey.

Sources: *1997 Status of the Nation's Surface Transportation System: Condition and Performance*, Department of Transportation; *Drinking Water Infrastructure Needs Survey: First Report to Congress*, Environmental Protection Agency (EPA 812-R-97-001, Jan. 1997); and *1996 Clean Water Needs Survey Report to Congress*, Environmental Protection Agency (EPA 832-R-97-003, 1997).

Others and we have noted the difficulty of estimating needs accurately and have pointed out that estimates vary widely, depending on what is included in the definition of "need." For example, estimates of the amount of capital spending required by the nation's airports have varied widely.¹⁸ In 1996, airports estimated these costs at \$10 billion per year, while airlines estimated the costs at \$4 billion per year. FAA's estimate was \$6.5 billion per year. We reviewed the estimates and found that the airports defined demands broadly to include all projects planned at more than 3,300 airports. The airlines included only those projects eligible for federal grants at the 421 largest commercial airports, and FAA included all projects eligible for federal grants at 3,300 airports.¹⁹ EPA officials also pointed out difficulties in making the estimate for drinking water systems (see fig. 8), such as the fact that the 20-year estimate was based on communities' plans, most of which covered only 5 years. Because EPA was required to make a long-term estimate, it characterized these needs as 20-year needs.

¹⁸Airports receive funding for capital development from a number of sources, including federal, state, and local grants; tax-exempt bonds; and revenues generated by the airport.

¹⁹See *Airport Development Needs: Estimating Future Costs* (GAO/RCED-97-99, Apr. 7, 1997).

Identifying Excess Capacity

Needs assessments may also reveal that an agency has excess capacity that is draining its resources. In 1998, the National Research Council reported that the number of excess federal facilities appears to be increasing as agencies realign their missions in response to changing circumstances.²⁰ The closing of excess federal facilities would require an up-front investment of funds but could, in the long run, be cost-effective through annual savings on operations, utilities, maintenance, and repair. The closing of these facilities, however, can be expensive, time-consuming, and difficult.

For example, from 1988 to 1995, the Department of Defense (DOD) undertook four “rounds” of base realignments and closures as part of the U.S. military’s restructuring of its mission in the post-Cold War era. The four rounds resulted in decisions to close 97 out of 495 major domestic installations and many smaller ones and to realign other facilities. However, DOD has found that infrastructure reductions are a difficult and painful process because they require up-front investments, the closure of installations, and the elimination of jobs. DOD projects that the cost of base realignments and closures during the implementation period from 1990 to 2001 will reach \$23 billion. Over time, DOD’s projections show that savings from the four rounds will begin to offset implementation costs and are expected to produce recurring savings of about \$5.7 billion each year once those costs are offset.

²⁰See *Stewardship of Federal Facilities: A Proactive Strategy for Managing the Nation’s Public Assets*, National Research Council (Washington, D.C.: 1998).

In 1998, DOD submitted to the Congress a legislative proposal indicating that the Department still retained excess facilities and requesting authority for two additional base realignment and closure rounds—one in 2001 and another in 2005. Our work strongly supports the need to further reduce excess infrastructure within DOD, as well as the need for improved planning to address remaining infrastructure needs.²¹ For example, we reported that opportunities exist to demolish old, excess buildings that are relatively costly to maintain and can be a drain on operating costs at military bases.²² DOD has identified 8,000 buildings totaling 50 million square feet of space as no longer needed and candidates for disposal. We found that the potential exists for avoiding annual recurring costs of hundreds of millions of dollars once the initial disposal costs are recouped.

²¹See, for example, *Military Bases: Review of DOD's 1998 Report on Base Realignment and Closure* (GAO/NSIAD-99-17, Nov. 13, 1998), *Defense Infrastructure: Challenges Facing DOD in Implementing Reform Initiatives* (GAO/T-NSIAD-98-115, Mar. 18, 1998), *High-Risk Series: Defense Infrastructure* (GAO/HR-97-7, Feb. 1997), and *Military Bases: Lessons Learned From Prior Base Closure Rounds* (GAO/NSIAD-97-151, July 25, 1997).

²²See *Defense Infrastructure: Demolition of Unneeded Buildings Can Help Avoid Operating Costs* (GAO/NSIAD-97-125, May 13, 1997).

Other agencies are also likely to have excess facilities in response to changing circumstances. For example, the precursor to the Department of Veterans Affairs (VA)—the Veterans Administration—was established in 1930, primarily to provide for the rehabilitation and continuing care of veterans injured during wartime service. VA provided direct care to its clients and owned and operated its own health care facilities. In recent decades, VA's client population has been declining in size and aging. At the same time, VA is improving the efficiency of its health care delivery by shifting from providing inpatient services to providing health care services on an outpatient basis, sometimes through partnerships with private-sector health care providers. As a result of this shift to outpatient settings and other cost control measures, during fiscal years 1996 through 1998, VA placed out of service over 20,000 hospital beds—a 40-percent reduction. We noted that the demand for care in some hospitals could fall to the point where it is no longer economically feasible to keep them open.²³ Our reviews of VA's management of its health care infrastructure²⁴ indicated that the agency may spend billions of dollars operating hundreds of unneeded buildings over the next 5 years or more.²⁵ We recommended that VA improve its capital asset planning by developing restructuring plans that incorporate OMB's guidelines for capital asset planning.²⁶

²³See *VA Health Care: Opportunities to Increase Efficiency and Reduce Resource Needs* (GAO/T-HEHS-96-99, Mar. 8, 1996).

²⁴VA's infrastructure includes over 4,700 buildings and 18,000 acres of land. Our reviews focused on VA's land and structures—primarily buildings.

²⁵See *VA Health Care: Improvements Needed in Capital Asset Planning and Budgeting* (GAO/HEHS-99-145, Aug. 13, 1999), *Veterans' Affairs: Progress and Challenges in Transforming Health Care* (GAO/T-HEHS-99-109, Apr. 15, 1999), *VA Health Care: Capital Asset Planning and Budgeting Need Improvement* (GAO/T-HEHS-99-83, Mar. 10, 1999), *Major Management Challenges and Program Risks: Department of Veterans Affairs* (GAO/OCG-99-15, Jan. 1999), and *VA Hospitals: Issues and Challenges for the Future* (GAO/HEHS-98-32, Apr. 20, 1998).

²⁶See *Capital Programming Guide*, Office of Management and Budget, Version 1.0 (Washington, D.C., July 1997). The guide suggests that agencies conduct market-based assessments to determine asset needs. The assessments include determining a target population's needs, evaluating the capacity of existing assets, identifying any performance gaps (excesses or deficiencies), estimating assets' life-cycle costs, and comparing such costs with alternatives for meeting the target population's needs.

Identifying Current Capabilities

We have noted that an effective practice by leading organizations is to identify current capabilities, including the use of an inventory of assets and their condition, and determine if there is a gap between current and needed capabilities. Routinely assessing the condition of assets and facilities allows decisionmakers to evaluate the capabilities of current assets and plan for replacements. For example, we reported in 1997 that state transportation departments were developing and implementing infrastructure management systems that cover pavements, bridges, and other infrastructure and provide information such as the condition, inspection and maintenance history, maintenance costs, and estimates of future maintenance needs.²⁷

Many federal agencies, however, have poor information on the inventory and condition of their assets. For example, we reported that the Coast Guard needed better information on the condition of its deepwater ships and aircraft as it planned a 20-year, \$9.8 billion project to replace or modernize many of them. In October 1998, we reported that the Coast Guard had understated the remaining useful life of its aircraft and, to a lesser extent, its ships.²⁸ After our report was issued, the agency began developing more accurate and updated information. The Coast Guard hired naval architects to evaluate the condition of its deepwater ships. According to a Coast Guard project official, this information will be validated by the contractors who are bidding on the project and have conducted independent evaluations of the condition of the deepwater ships and aircraft.²⁹

We have also reported that the Department of the Interior—the caretaker for much of the nation’s natural and cultural resources, including the Grand Canyon and Yosemite national parks, Independence Hall, the Statue of Liberty, and the Washington Monument—frequently lacks information on the condition of its resources.³⁰ In addition, Interior does not know the

²⁷See *Transportation Infrastructure: States’ Implementation of Transportation Management Systems* (GAO/RCED-97-32, Jan. 13, 1997).

²⁸See *Coast Guard’s Acquisition Management: Deepwater Project’s Justification and Affordability Need to Be Addressed More Thoroughly* (GAO/RCED-99-6, Oct. 26, 1998).

²⁹See *Coast Guard: Strategies for Procuring New Ships, Aircraft, and Other Assets* (GAO/RCED-99-116, Mar. 16, 1999).

³⁰See *Major Management Challenges and Program Risks: Department of the Interior* (GAO/OCG-99-9, Jan. 1999).

scope and extent of maintenance problems at the tens of thousands of buildings and other facilities, such as roads, dams, bridges, utility lines, and recreation sites, that it manages. As a result, it is difficult to determine whether the condition of key resources under the Department's stewardship is deteriorating, stabilizing, or improving.

The U.S. Department of Agriculture's Forest Service also lacks basic information on the condition of the assets it manages—about 155 national forests covering about 192 million acres of land. One result has been that many acres may remain at high risk of uncontrollable wildfire. We have noted that the Forest Service lacks basic data on the (1) locations and levels of accumulations of vegetation that can fuel wildfires, (2) effects on other resources of different methods of reducing this vegetation, and (3) relative cost-effectiveness of these methods.³¹

³¹See *Western National Forests: A Cohesive Strategy Is Needed to Address Catastrophic Wildfire Threats* (GAO/RCED-99-65, Apr. 2, 1999).

Furthermore, anecdotal information indicates that the condition of federal facilities—buildings and structures as well as power plants, utility distribution systems, and roads—is deteriorating. Although hampered by a lack of published data related to federal facilities’ inventories, the National Research Council found that the physical condition of federal facilities continues to deteriorate and that many federal buildings require major repairs to bring them up to acceptable quality.³² The Council noted that its work was stymied by the lack of accurate counts of basic items, such as the total number of federal facilities, their age, and expenditures for their maintenance and repair. As a result, the Council relied heavily on briefings by federal agency program managers, personal experience, and our reports. For example, we reported that 31 percent of the laboratory floor space built and operated by agencies such as DOD, the Department of Energy, and the National Aeronautics and Space Administration was more than 40 years old and that over half of this space was more than 30 years old. Laboratories reported that the buildings were generally not designed for modern health and safety standards or for the power demands of computers, air conditioning, and scientific equipment. Problems such as leaking roofs, inadequate ventilation, insufficient humidity control, and drafty windows slowed down and limited research conducted in these facilities.³³

³²See *Stewardship of Federal Facilities: A Proactive Strategy for Managing the Nation’s Public Assets*, National Research Council (Washington, D.C., 1998).

³³See *Best Practices: Elements Critical to Successfully Reducing Unneeded RDT&E Infrastructure* (GAO/NSIAD/RCED-98-23, Jan. 8, 1998) and *Federal Research: Aging Federal Laboratories Need Repairs and Upgrades* (GAO/RCED-93-203, Sept. 20, 1993).

Identifying Unmet Needs for Maintenance and Repairs

Routinely assessing the current capabilities and condition of assets and facilities allows decisionmakers to identify and plan for maintenance and to document repair backlogs or deferred maintenance. However, we and others have reported that the maintenance of the existing infrastructure—such as roads, bridges, and other public facilities—often does not receive adequate attention, whether the infrastructure is owned by federal, state, or local governments.³⁴ Moreover, some agencies lack adequate data on the extent of deferred maintenance. If maintenance is deferred, this can result in public facilities of poor quality, reduced public safety, poor service for the public, and higher subsequent repair costs. For example, the Federal Highway Administration has estimated that each dollar of repair costs spent when highway pavement is in good condition saves \$4 or \$5 that would be needed if the pavement deteriorated to fair condition and saves \$10 if the pavement deteriorated to poor condition.³⁵

We and others have raised concerns about the extent of deferred or backlogged maintenance. For example, the Joint Center for Housing Studies of Harvard University estimated that backlogged repairs at subsidized and unsubsidized housing units insured by the Department of Housing and Urban Development were estimated to cost \$4.2 billion in 1995. This was the amount estimated as necessary to bring basic systems in the buildings back to working order.³⁶ In 1993, we reported a backlog of more than \$3.8 billion in needed repairs at government-owned research and development laboratories.³⁷

³⁴See, for example, *High Performance Public Works: A New Federal Infrastructure Investment Strategy for America*, U.S. Advisory Commission on Intergovernmental Relations (Washington, D.C., Nov. 1993).

³⁵See *Highway Infrastructure: Quality Improvements Would Safeguard Billions of Dollars Already Invested* (GAO/RCED-94-198, Sept. 19, 1994).

³⁶*The State of the Nation's Housing: 1999*, Joint Center for Housing Studies of Harvard University (Boston, Mass., 1999).

³⁷Our study covered eight federal agencies with the largest research and development budgets. See *Federal Research: Aging Federal Laboratories Need Repairs and Upgrades* (GAO/RCED-93-203, Sept. 20, 1993).

The lack of priority given to the maintenance of military infrastructure has led to growing backlogs of deferred maintenance. In September 1999, we reported that none of the military services' real property maintenance plans provided sufficient funds to keep the backlog of repairs from increasing beyond the current level. For example, the Marine Corps estimated that unfunded repair backlogs will rise 60 percent during 1998-2008—from \$711 million to \$1.1 billion. As a result of insufficient planned funding, we noted that the Corps' overall service infrastructure conditions may deteriorate over the next 4 to 5 years, although improvements in some specific types of facilities, such as barracks, may result from targeted spending.³⁸

In addition, we have found that some agencies lack adequate data on maintenance backlogs. For example, in 1997, the Park Service estimated that its maintenance backlog was about \$6.1 billion. We found that the Park Service compiled its maintenance backlog estimates on an ad hoc basis in response to requests from the Congress or others and that the agency did not have a routine, systematic process for doing so. The 1997 estimate was based largely on information compiled over 4 years earlier. This fact, as well as the absence of a common definition of what should be included in the maintenance backlog, contributed to an inaccurate and out-of-date estimate.³⁹

³⁸See *Military Infrastructure: Real Property Management Needs Improvement* (GAO/NSIAD-99-100, Sept. 7, 1999).

³⁹See *National Park Service: Efforts to Identify and Manage the Maintenance Backlog* (RCED-98-143, May 14, 1998).

Beginning in fiscal year 1998, federal agencies were required to report on the deferred maintenance of their assets in their annual financial statements and, since April 1999, to include the information as a supplement to the financial statements. The annual audits of the financial statements and supplemental information will ensure that the amounts reported are subjected to independent scrutiny and will help address long-standing concerns about the validity of the amounts of deferred maintenance that agencies have reported in the past. We have reported that this requirement will go a long way toward improving the information available to congressional and executive branch decisionmakers. It can help improve the allocation of federal resources and, ultimately, the condition of federal assets. Nonetheless, the requirement also raises some implementation and definitional challenges—such as determining the acceptable condition of assets and the estimation methods to be used.⁴⁰

Identifying Alternative Approaches to Investing in New Infrastructure

An effective practice by leading organizations is to decide how best to meet the gap between current and needed capabilities by identifying and evaluating alternative approaches, including noncapital approaches, before choosing to purchase or construct facilities or other assets. One alternative approach is to consider the use of existing assets, through conversion, expansion, and consolidation. For example, we have noted that the changing missions of federal research laboratories and VA hospitals point to the need to restructure and possibly consolidate facilities.⁴¹

⁴⁰See *Deferred Maintenance Reporting: Challenges to Implementation* (GAO/AIMD-98-42, Jan. 30, 1998) and *Deferred Maintenance: Reporting Requirements and Identified Issues* (GAO/AIMD-97-103R, May 23, 1997).

⁴¹See *Best Practices: Elements Critical to Successfully Reducing Unneeded RDT&E Infrastructure* (GAO/NSIAD/RCED-98-23, Jan. 8, 1998) and *Major Management Challenges and Program Risks: Department of Veterans Affairs* (GAO/OCG-99-15, Jan. 1999).

In some cases, a noncapital approach might replace the need for additional infrastructure. For example, financial and environmental constraints limit state and local governments' ability to provide extensive new road capacity to reduce highway congestion, which is a growing problem in many urban areas. As a result, some congestion will have to be handled by managing the transportation system for greater efficiency. Some transportation experts have suggested, for instance, that this could be accomplished by increased use of congestion pricing, ride-sharing programs, new community designs, or an enhanced emphasis on using existing urban mass transit or passenger rail.⁴²

Another alternative approach to constructing or purchasing infrastructure is to consider options such as leasing, privatizing the activity, or engaging in joint-venture projects with other organizations to minimize the amount of government funds invested. For example, DOD's housing privatization initiative is designed to leverage private-sector resources to address pressing needs for military housing faster than would be possible from relying solely on traditional military construction funding. In 1997, DOD officials testified that about two-thirds of the Department's 300,000 family housing units and about 60 percent of its 400,000 barrack spaces were below acceptable standards and needed to be renovated or replaced. Given expected budgets and using the traditional approaches to construction, DOD officials said that it would take 30 to 40 years and more than \$30 billion to bring these units up to acceptable standards. Under the Military Housing Privatization Initiative, authorized by the Congress in 1996, DOD will test, over a 5-year period, a variety of tools—such as loan guarantees to private parties—to obtain private-sector financing, expertise, and management to revitalize military housing. The goal of the program is to eliminate all inadequate housing by fiscal year 2010.⁴³

⁴²See *Surface Transportation: Moving Into the 21st Century* (GAO/RCED-99-176, May 1999). See also *Transportation Infrastructure: States' Implementation of Transportation Management Systems* (GAO/RCED-97-32, Jan. 13, 1997) for a discussion of the use of congestion management systems by states.

⁴³See *Military Housing: Privatization Off to a Slow Start and Continued Management Attention Needed* (GAO/NSIAD-98-178, July 17, 1998) and *Defense Infrastructure: Challenges Facing DOD in Implementing Reform Initiatives* (GAO/T-NSIAD-98-115, Mar. 18, 1998).

Evaluating and Selecting Future Projects Using an Investment Approach

Leading organizations use an investment approach to determine where they should spend resources for the greatest benefit over the long-term. The practices that these organizations use include establishing a framework for reviewing and approving decisions concerning infrastructure and other capital assets, ranking and selecting projects on the basis of established criteria, and preparing long-term plans for infrastructure and capital development.

When choosing between alternative projects, leading private organizations focus on investment methods that draw attention to cash flows associated with potential projects, such as payback or net present value. In addition, they consider the strategic fit of the project with the organization's overall goals. The federal agencies that we studied have begun to focus on the project's fit with the organization's goals, but they have not focused as heavily on quantifying the benefits and identifying which projects provide the most value.⁴⁴ Furthermore, CBO has reported that many federal infrastructure projects yield net economic benefits that are small, or even negative. Although some individual projects appear to have very high returns, CBO noted that the number of such projects is small.⁴⁵

⁴⁴See *Executive Guide: Leading Practices in Capital Decision-Making* (GAO/AIMD-99-32, Dec. 1998).

⁴⁵See *The Economic Effects of Federal Spending on Infrastructure and Other Investments*, Congressional Budget Office (June 1998).

We have reported that some federal agencies' decision-making policies and procedures have elements of an investment approach but that improvements are needed. For example, we reviewed the General Services Administration's (GSA) plans to construct new courthouses in response to the judiciary's growing space needs. In 1995, we reported that the construction initiative could cost \$10 billion over a 10- to 15-year period. During our review, we found that GSA and the judiciary have processes to identify needs and to propose projects. However, GSA and the judiciary have not developed and implemented a strategic investment plan that (1) puts projects in a long-term strategic context, (2) sets priorities among competing projects, and (3) identifies short- and long-term project funding needs. Without this information, the Congress has little choice but to consider projects individually. This situation impedes sound decisionmaking and can result in the substitution or addition of projects that have had little or no planning or evaluation. Our review indicated that there is little assurance that the 47 new courthouse projects that the Congress funded from fiscal year 1992 through fiscal 1995 were fully justified or of the highest priority.⁴⁶

⁴⁶See *Courthouse Construction: Improved 5-Year Plan Could Promote More Informed Decisionmaking* (GAO/GGD-97-27, Dec. 31, 1996) and *Federal Courthouse Construction: More Disciplined Approach Would Reduce Costs and Provide for Better Decisionmaking* (GAO/T-GGD-96-19, Nov. 8, 1995).

Considering Innovative Funding Approaches

In addition, we noted that an effective practice by some leading organizations is to consider innovative approaches to funding infrastructure and other capital projects. For example, under the Transportation Infrastructure Finance and Innovation Act of 1998 (TIFIA), DOT can provide secured loans, loan guarantees, and standby lines of credit for private and public sponsors of eligible surface transportation projects, including highway, rail, and port projects. The program is designed to help large infrastructure projects—those costing at least \$100 million or 50 percent of a state's federal-aid highway apportionment for the preceding fiscal year—access capital by using federal funds to leverage substantial private investment. The eligible projects will repay the assistance, in whole or in part, from dedicated revenue streams, such as tolls or passenger fares. TIFIA requires the Secretary of Transportation to establish criteria for selecting projects and includes general selection criteria. The criteria determine whether a project is creditworthy and nationally or regionally significant and whether the use of federal funds would expedite implementing the project. The legislation⁴⁷ provides \$530 million over fiscal years 1999 through 2003 to cover the cost of up to \$10.6 billion in credit. DOT selected the first five projects to receive credit assistance under the program in September 1999.

⁴⁷TIFIA, as amended by the Transportation Act for the 21st Century.

Other agencies are also using innovative approaches to funding infrastructure. For example, in 1996, the Congress authorized a recreation fee demonstration program for four agencies that manage federal lands—the Park Service, the Fish and Wildlife Service, the Bureau of Land Management, and the Forest Service. The program allows these agencies to test new or increased fees in order to increase the funding available to address deteriorating conditions at many federal recreation areas, among other things. As a result of the demonstration program, the four agencies estimated that their combined recreation fee revenues nearly doubled from about \$93 million in fiscal year 1996—the last year prior to implementing the demonstration program—to about \$179 million in fiscal 1998. In addition, we reported that the Forest Service and Bureau of Land Management used the program to establish different pricing structures, for example, fees that vary on the basis of the extent of the area’s use or whether the visit occurred during a peak period, such as a weekend.⁴⁸ Innovative pricing structures may result in less crowding in popular areas. Furthermore, reducing visitation during peak periods can lower the costs of operating recreation sites by reducing, for example, the size of facilities, the need for maintenance and future capital investments, and the extent of damage to a site’s resources. We recommended that the Park Service and Fish and Wildlife Service look for additional opportunities to set innovative pricing structures.

⁴⁸See *Recreation Fees: Demonstration Fee Program Successful in Raising Revenues but Could Be Improved* (GAO/RCED-99-7, Nov. 20, 1998).

Managing Infrastructure Improvements

We have also noted the need to ensure that spending on infrastructure improvements is adequately managed. For example, we have outlined three goals for the successful management of information technology investments, which are a form of infrastructure. Agencies need to (1) institutionalize management processes for identifying and selecting projects that will best meet mission needs; (2) regularly validate the cost, benefit, and risk data used to support information technology decisions; and (3) focus on measuring and evaluating results.⁴⁹ Using these criteria, we evaluated FAA's management of investments to modernize its air traffic control system.⁵⁰ Over the past 17 years, FAA's multi-billion-dollar modernization effort has experienced substantial cost overruns, lengthy delays, and significant performance shortfalls. To help address these problems, the Congress directed FAA to develop a new acquisition management system, which the agency implemented in 1996. We reported that the new system is a good first step in establishing a structured investment management approach for selecting and controlling the agency's investments. The system contains a set of policies, procedures, and reporting requirements to analyze mission needs; assess the affordability of proposed projects; and establish life-cycle costs, schedules, benefits, and performance baselines. Additionally, under this system, a senior management investment review group makes key decisions about which projects best meet the agency's needs and are to be funded.

However, we noted several weaknesses with FAA's acquisition management system. This system applies only to proposed projects and those under development and not to projects already in operation. Because FAA does not apply the same scrutiny to all of its projects, senior officials are unable to fully assess and make trade-offs about the relative merits of spending funds to develop new systems, enhance current ones, or continue operating and maintaining existing ones. In addition, the system does not provide complete and reliable information for selecting, controlling, and evaluating projects. For example, the cost data used to select projects are of questionable reliability because of weaknesses in FAA's cost-estimating practices and the lack of a cost-accounting system.

⁴⁹See *Assessing Risks and Returns: A Guide for Evaluating Federal Agencies' IT Investment Decision-Making* (GAO/AIMD-10.1.13, Feb. 1997).

⁵⁰See *Air Traffic Control: FAA's Modernization Investment Management Approach Could Be Strengthened* (GAO/RCED/AIMD-99-88, Apr. 30, 1999).

Challenges in Determining Appropriate Levels and Focuses for Federal Infrastructure Investment

Federal agencies and the Congress face several challenges in determining how much the federal government should spend on infrastructure construction and rehabilitation and where to focus these decisions and in coordinating these decisions across the government. First, the federal agencies and the Congress have not been able to identify an optimal level of infrastructure spending because the information that agencies have gathered on investment needs has not been adequate to determine whether the needs are understated or overstated. Also, because agencies have taken different approaches to analyzing the costs and benefits of potential infrastructure investments and because decisions about infrastructure spending are made by individual federal agencies and at all levels of government, the government as a whole has difficulty in setting priorities for investment and determining noncapital alternatives to investment. Moreover, until recently, agencies have not been required to relate their planned infrastructure spending to their missions and goals, so evaluating these plans was difficult for agency decisionmakers and the Congress. Finally, the federal budget process does not prompt explicit debate about infrastructure spending, which is intended to have long-term benefits. Overcoming these impediments will not be easy, but recent guidance from OMB and legislation may help federal agencies and, consequently, the Congress and the President to make more informed decisions regarding infrastructure investment.

Accurate and Consistent Information Is Critical in Making Infrastructure Decisions

The lack of accurate, consistent information on the condition of existing infrastructure and future needs is a challenge facing federal decisionmakers. Good data and investment analysis are critical to support decision-making on federal infrastructure investments. In order to make effective decisions on these investments, the Congress requires information on what the true needs for investment are and information on how to allocate its funds most efficiently. Agency decisionmakers and the Congress also need this information to be prepared in a reliable and consistent manner so that informed investment decisions can be made within and between agencies.

As we discussed earlier in this report, needs assessments conducted by some federal agencies do not always result in comprehensive information about the pressing needs that must be met in order to advance the agency's mission. Because of the methods used in assessing needs, the needs identified may in fact be critical in meeting an agency's goals and objectives or they may contain elements of a "wish list" of proposed capital projects. Nevertheless, the magnitude of these needs assessments has caused some to call for significantly increased investments in infrastructure,⁵¹ while others have argued that the nation's infrastructure is generally in good condition and that current levels of spending are adequate.⁵² As a result, there is little consensus on the optimal level of investment in infrastructure at the federal or other levels of government, and a consensus is not likely to occur until better information is available.

We also reported that federal agencies frequently did not have good information on the condition of their assets. Similarly, our reviews of agencies' financial statements showed that some agencies had not adequately accounted for their assets in these statements. These financial statements are to reflect the nation's assets and investments for which there is a federal stewardship responsibility. We noted, for example, that because of FAA's continuing serious problems in accounting for property, plant, and equipment, DOT's Inspector General issued a disclaimer of opinion on the financial statements. We concluded that these problems could affect FAA's ability to make prudent business decisions and safeguard its assets.⁵³

⁵¹See, for example, *1998 Report Card for America's Infrastructure*, American Society of Civil Engineers (1998).

⁵²See, for example, John A. Tatom, "Paved With Good Intentions: The Mythical National Infrastructure Crisis," in *Policy Analysis*, No. 196 (Cato Institute, Aug. 12, 1993).

⁵³See *Major Management Challenges and Program Risks: A Governmentwide Perspective* (GAO/OCG-99-1, Jan. 1999).

Our work and the work of others have shown that agencies have not taken a consistent approach to analyzing potential infrastructure investments. Using tools like cost-benefit analysis or applying criteria that align with the agencies' missions can help agencies prioritize their spending on infrastructure and inform decisionmakers throughout the government of the value of these investments. While some agencies are using these approaches, our work showed that agencies and programs within the agencies have developed their own techniques for analyzing potential infrastructure spending. In its 1993 report on the nation's infrastructure, the U.S. Advisory Commission on Intergovernmental Relations noted the importance of using equivalent methods at all levels of government to establish consistency in how infrastructure investments are analyzed.⁵⁴ The report noted that using these methods could result in agency decisionmakers' and the Congress's improved ability to compare potential uses of their infrastructure dollars and choose those that best meet the nation's needs. OMB now requires agencies to conduct cost-benefit analyses of major capital investments, although we have not determined whether these analyses are being completed or whether they are useful in prioritizing infrastructure projects.

Infrastructure Decisions Are Made Among Various Agencies and Levels of Government

The responsibility for determining how to allocate federal infrastructure spending is spread widely throughout the federal government. Nearly every federal agency oversees some capital spending. Multiple congressional committees also have jurisdiction over capital spending for infrastructure investment. As a result, decisions on infrastructure are largely ad hoc in that they are aligned with agencies' programs, which have differing goals. Even within agencies with significant infrastructure budgets like DOT, infrastructure investment strategies for different programs like transit and aviation may be developed separately. Because the federal government does not have an overall plan for its capital investments, the challenge of selecting the most important or cost-effective projects is even more difficult across federal agencies. In addition, the Congress makes specific appropriations for particular infrastructure projects that may not have been requested in agencies' budgets and may or may not meet the criteria of federal agencies or state or local governments.

⁵⁴See *High Performance Public Works: A New Federal Infrastructure Investment Strategy for America*, U.S. Advisory Commission on Intergovernmental Relations (Nov. 1993).

In contrast to the federal government, some state governments have taken some steps to coordinate and plan their investments in infrastructure. These state governments generally have long-range capital plans and maintain capital budgets that are separate from their operating budgets. For example, in 1998, the state of California reported that it undertook a study to improve the coordination of spending on statewide infrastructure needs. The study reports that the state was aware of numerous pressing infrastructure needs and priorities but had trouble responding to these needs because decision-making and information about them were spread out among so many state and local agencies. The development and implementation of a statewide capital outlay plan based on priority-setting criteria is one of the recommendations of that study.⁵⁵

Significant portions of the decisions about the nation's infrastructure and how federal infrastructure dollars will be spent are not made at the federal level. Certain federal programs rely on states and local governments to allocate federal infrastructure funding. As we mentioned earlier in this report, some infrastructure, such as highways, transit, and water systems, is largely controlled at the state and local levels though it may have been developed with federal assistance, and state and local governments now provide almost two-thirds of the total public infrastructure spending in these areas. In some cases—for example, most highway funding—federal grants to states are provided through a legislatively mandated formula and the states decide which eligible projects to allocate the funds to. For wastewater treatment funding, the Congress decides the amounts to grant to states, which, in turn, determine criteria for making loans that fund the wastewater projects.

⁵⁵See *Overhauling the State's Infrastructure Planning and Financing Process*, California Legislative Analysts' Office (Dec. 1998).

Impediments to Planning for Federal Infrastructure Investment

Another challenge facing federal agencies is to relate their infrastructure plans to their missions and goals. The requirements that agencies must meet under the Government Performance and Results Act of 1993 (the Results Act) provide an opportunity for federal agencies to improve their planning for infrastructure investment. While agencies have been encouraged to prepare some type of capital investment plan, they have not had to explicitly relate these plans to their missions and goal. The Results Act requires agencies to develop mission statements, long-range strategic goals and objectives, and annual performance plans. The Results Act also emphasizes that agencies should identify and measure the outcomes of their programs, including benefits. Recognizing that the Results Act provided an opportunity for agencies to relate their infrastructure plans to their missions and goals, we recommended in 1996 that agencies ensure that their capital plans flow from and are based upon their strategic and annual performance plans.⁵⁶ The President's Commission to Study Capital Budgeting made a similar recommendation but called for an explicit link to agencies' 5-year budget forecasts.⁵⁷

In 1997, OMB issued guidance to implement our recommendation. For example, OMB's *Capital Programming Guide* encourages agencies to submit a capital asset plan and justification. The guide also includes suggestions to agencies on linking annual performance plans to capital planning efforts. In addition, the guide encourages federal agencies to develop long-term capital plans as part of their capital planning process and to use these plans to develop a summary for their budget justifications and for congressional authorizations.⁵⁸

⁵⁶See *Budget Issues: Budgeting for Federal Capital* (GAO/AIMD-97-5, Nov. 12, 1996).

⁵⁷See *Report of the President's Commission to Study Capital Budgeting*, President's Commission to Study Capital Budgeting (Washington, D.C.: U.S. Government Printing Office, Feb. 1999). The Commission was charged with considering the possibility of creating a separate capital budget within the federal budget.

⁵⁸See *Capital Programming Guide*, Office of Management and Budget, Version 1.0 (Washington, D.C.: July 1997).

Our ongoing reviews of agencies' implementation of the Results Act found that agencies' fiscal year 2000 performance plans showed moderate improvements over previous plans and contain better information and perspective. Nevertheless, we also concluded that while agencies' fiscal year 2000 plans show progress in relating programs and strategies to goals, few relate the use of capital assets and management systems to achieving results.⁵⁹ We observed that weaknesses remain with many of the plans and that important opportunities exist to improve future plans. Whether OMB's guidance will result in a better incorporation of capital planning into agencies' annual performance or strategic plans remains to be seen.

Infrastructure in the Federal Budget

A final challenge that decisionmakers face is that the current federal budget structure does not prompt explicit debate about spending for long-term investment, such as infrastructure, and spending for current consumption. For example, in the annual budget process, spending on infrastructure, such as buildings or water systems—which are expected to have long-term use and benefits—is treated and evaluated in the same manner as consumption expenditures, such as supplies for government agencies—which have primarily short-term benefits. We previously reported that the budget process can favor consumption over investment because the initial cost of an infrastructure project looks high in comparison to consumption spending, which varies little from year to year.⁶⁰

⁵⁹See *Managing for Results: Opportunities for Continued Improvements in Agencies' Performance Plans* (GAO/GGD/AIMD-99-215, July 20, 1999.)

⁶⁰See *Budget Trends: Federal Investment Outlays, Fiscal Years 1981-2003* (GAO/AIMD-98-184, June 15, 1998); *Budget Structure: Providing an Investment Focus in the Federal Budget* (GAO/T-AIMD-95-178, June 29, 1995); and *Budget Issues: Incorporating an Investment Component in the Federal Budget* (GAO/AIMD-94-40, Nov. 9, 1993).

The President's Commission to Study Capital Budgeting also recently reviewed these issues.⁶¹ The Commission did not reach a consensus on whether capital spending for items like infrastructure receives low levels of funding because of its cost in comparison with other budget items. The Commission noted, however, that the budget process is heavily focused on the current year and that little attention is paid to longer-run matters. It also noted that the budget process may exhibit a bias against the routine and major maintenance that is vital to the continued health of infrastructure. Because, according to the Commission, maintenance requires more rapid budgetary spending than new construction and has a lower visibility, it is less likely to be funded at a sufficient level. The Commission concluded that better information was needed in the federal budget about the resources needed for maintenance and the implications of deferred maintenance in order to help decisionmakers allocate infrastructure resources between new projects and maintenance. In its review of the condition of federal buildings, the National Research Council had similar findings.⁶²

⁶¹See *Report of the President's Commission to Study Capital Budgeting*, President's Commission to Study Capital Budgeting (Washington, D.C.: Government Printing Office, Feb. 1999).

⁶²See *Stewardship of Federal Facilities*, National Research Council (Washington, D.C.: National Academy Press, 1998).

In response to these issues about the treatment in the federal budget of spending expected to have long-term benefits, we recommended, and continue to support the concept, that the federal budget include an investment component that would provide specific targets within the discretionary funding caps to ensure that investment is considered formally in the budget process.⁶³ Such an approach would promote a discussion about the appropriate level of investment within a constrained budget environment. Neither the Congress nor the executive branch has acted on this recommendation. The President's Commission also reviewed several options for a "capital budget."⁶⁴ The Commission decided against recommending that a capital budget be adopted for several reasons. First, since no consensus exists on the definition of capital, agencies and decisionmakers would have an incentive to label their spending proposals as capital or to have their programs included in any new definition in order to get special treatment in the budget. Second, selecting an optimal level of capital spending would be difficult, given current levels of knowledge about the actual needs for infrastructure investment.

Observations

Over the past several decades, federal, state, and local governments have made an extraordinary investment in infrastructure. Making additional investments in infrastructure, improving that infrastructure, and effectively managing it will be a continuing challenge for decisionmakers at all levels of government because the demands for spending on new infrastructure or upgrading existing infrastructure will likely exceed the available resources. In order to make meaningful trade-offs between competing demands among infrastructure projects, and between infrastructure and other government programs, decisionmakers need to prioritize demands and distinguish between wants and needs. This is especially important because decisions about the level and nature of infrastructure spending made today have long-term effects and implications for future generations.

⁶³See *Budget Structure: Providing an Investment Focus in the Federal Budget* (GAO/T-AIMD-95-178, June 29, 1995). In defining investment, this report focused on spending for certain types of infrastructure, research and development, and education and training.

⁶⁴Under the first option, the size of the budget deficit or surplus would depend, in part, on the amount of expenditures defined as capital. A variation of this option would allow capital expenses to be financed by government borrowing. Under the second option, decisionmakers would decide how much of the budget to spend on capital and design the budget to meet that target or cap.

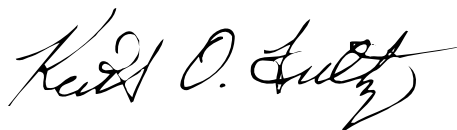
Enhanced decision-making tools for the acquisition and management of infrastructure—such as the leading practices that we identified—are needed to ensure that investments in new infrastructure will have the highest and most efficient benefits for the taxpayer and the government and that existing infrastructure will be adequately repaired and maintained. To be effective, such tools must be in place throughout the government and must distinguish between wants and needs for infrastructure investment, which should help lead to sound investment strategies, plans, and budgets. An investment approach to deciding where to spend resources, including the leading practices we outlined in this report, would provide decisionmakers with the information needed to achieve the greatest benefit over the long term. New guidance on budget preparation and cost-benefit analysis issued by OMB, combined with other efforts such as planning and reporting required by the Results Act, could serve as interim steps toward implementing such an investment approach. However, these steps might not go far enough toward improving infrastructure investments because spending decisions are made by a variety of agencies and levels of government that have differing goals. In order to better coordinate these investments to meet national, regional, and local goals and ensure that they are mutually supportive, it is crucial that agencies throughout the government reduce inefficiencies in their current investments and analyze potential investments to identify those that achieve the greatest benefits in the most cost-effective manner.

Agency Comments

We provided CBO, DOT, and EPA—the three agencies from which we obtained new information in writing this report—with drafts of the report for review and comment. Other information in the report was primarily drawn from our previously issued reports, which included comments from the agencies we reviewed. The Director of CBO’s Special Studies Division said that CBO agreed with the report, but questioned the effectiveness of incorporating an investment component in the federal budget—a concept that we have supported. In response to this comment, we added additional information about the potential advantages and disadvantages of this change to federal budgeting practice. DOT did not offer overall views on the report. Instead, the Department provided technical and clarifying comments—for example, comments about the percentage of airport development accomplished with federal funds—which we incorporated as appropriate. Overall, EPA agreed with many of the key findings of our report but said that the report did not recognize that under the agency’s Drinking Water and Clean Water State Revolving Fund programs, states prioritize the projects they finance from the revolving funds according to

legislative criteria. We made no revisions in response to this comment because the report explains that EPA's two programs provide money for state revolving funds and explains that states prioritize their financing of projects according to criteria established in law. EPA's letter and our response appear in appendix IV.

We are sending copies of this report to each Member of Congress; the heads of the 24 agencies covered by the Chief Financial Officers Act; and the Honorable Jacob J. Lew, Director, OMB. We will make copies available to others on request. If you have any questions about this report, please contact John H. Anderson, Jr., at (202) 512-2834 or Paul Posner at (202) 512-9573. Staff acknowledgements are listed in appendix V.



Keith O. Fultz
Assistant Comptroller General

Objectives, Scope, and Methodology

The objectives of our study were to determine (1) trends in the government's investment in infrastructure, (2) how federal agencies can improve decision-making for the acquisition and management of infrastructure, and (3) the challenges to an effective investment in infrastructure at the federal level.

To determine the trends in the government's spending in infrastructure, we analyzed actual federal infrastructure outlays (spending) for fiscal years 1981 through 1998. The analysis was done on a macro basis, using aggregate data by category ("physical assets" or infrastructure) and budget function for transportation and natural resources and environment. We analyzed federal expenditures for acquisition, construction, and repair of infrastructure and major improvements to infrastructure but did not include routine maintenance and repair. We also did not analyze data at either the agency or account level. Outlay data used for this analysis were extracted from the automated information system that the Office of Management and Budget (OMB) used to prepare the President's annual budget request. We traced totals to published budget documents but did not independently verify this information. Reported actual outlay data (including offsetting collections but excluding offsetting receipts) for fiscal years 1981 through 1998 were used for both physical assets and total federal outlays. Annual implicit price deflators used in calculating constant dollar values for infrastructure investment for fiscal years 1981 through 1998 were obtained from the historical tables accompanying the President's fiscal 2000 budget.

OMB's automated information system does not include state and local spending. To obtain this information, we used the Congressional Budget Office's (CBO) 1999 report *Trends in Public Infrastructure Spending*. CBO's database shows outlays by state and local governments for fiscal years 1956 through 1994 and outlays by the federal government for fiscal 1956 through fiscal 1997.¹ The database lists eight types of infrastructure: highways, mass transit, rail, aviation, water transportation, water resources, water supply, and wastewater treatment. CBO assigned the data on the basis of OMB's federal budget functions and accounts. For the fiscal years before 1980, CBO primarily used unpublished OMB historical data and the federal budget for various years. CBO's estimates of real infrastructure spending used separate deflators for federal spending and

¹State and local outlays for water resources were not available for fiscal years 1991 through 1994.

state and local spending. For fiscal years 1956 through 1997, the deflators were calculated in 1997 dollars. We did not independently verify CBO's estimates. See table 1 for a description of the types of infrastructure included in the federal and state/local spending analyses.

Table 1: Types of Infrastructure Included in Spending Analyses

Infrastructure area	Included in federal spending analysis	Included in state/local spending analysis
Defense (equipment, weapons procurement, military construction)	X	
Transportation (aviation, rail, highways, mass transit, water transportation)	X	X
Water resources, supply, and treatment	X	X
Public housing	X	
Public buildings (post offices, court houses, federal buildings)	X	
Military and public hospitals and clinics	X	
Research and development facilities	X	
Public lands and parks	X	
Public schools and higher education	X	

To determine how federal agencies can improve decision-making for the acquisition and management of infrastructure, we used the guidance contained in two of our reports—*Executive Guide: Leading Practices in Capital Decision-Making* and *Assessing Risks and Returns: A Guide for Evaluating Federal Agencies' IT Investment Decision-Making*. Using the best practices identified in those reports, we reviewed reports that we have issued on federal agencies' infrastructure investments and compiled examples of when those practices were followed and not followed. The reports that we reviewed are listed at the end of this report under "Related GAO Products." To obtain information on infrastructure needs assessments, we interviewed officials from the Department of Transportation's Federal Highway Administration and Federal Transit Administration and the Environmental Protection Agency's Office of Groundwater and Drinking Water and Office of Wastewater.

To identify the challenges to effective infrastructure investment at the federal level, we relied on our reviews of the federal budget structure, implementation of the Results Act, and major management challenges and

Appendix I
Objectives, Scope, and Methodology

risks facing federal agencies. In addition, we reviewed governmentwide studies of infrastructure management and investment, including reports by the U.S. Advisory Council on Intergovernmental Relations, the President's Commission to Study Capital Budgeting, and the National Research Council. We conducted our work from August through October 1999 in accordance with generally accepted government auditing standards.

Laws and Guidance to Improve the Management of Federal Assets

A number of laws enacted in this decade and guidance issued by OMB are beginning to propel agencies toward improving their capital decision-making practices for spending on federal infrastructure. When fully implemented, these requirements will provide policy makers and agency program managers with more reliable financial information to formulate budgets, manage government programs, and help make difficult policy choices.

The Government Performance and Results Act of 1993 (P.L. 103-62 (1993))

- Requires federal agencies to develop mission statements, long-range strategic goals and objectives, and annual performance plans. The Results Act emphasizes identifying and measuring outcomes, including benefits.

Executive Order 12893, January 26, 1994

- Requires federal agencies to develop and implement plans for infrastructure investment and management that include an analysis of expected benefits and costs, efficient management, private-sector participation, and encouragement of more effective state and local programs. Initial plans to implement these principles were due by March 15, 1994. Beginning with fiscal year 1996, budget submissions to OMB should have included these principles to justify major infrastructure investment and grant programs.

The Federal Acquisition Streamlining Act of 1994 (P.L. 103-355)

- Enacted to improve the federal acquisition process. Title V of the act was designed to foster the development of (1) measurable cost, schedule, and performance goals and (2) incentives for acquisition personnel to reach these goals. Civilian and Department of Defense agencies are required to report annually on whether major and nonmajor programs are achieving 90 percent of their program goals and to identify suitable action if the goals are not being met.

The Clinger-Cohen Act of 1996 (P.L. 104-106, 104-208 (1996))

- Enacted to improve the implementation and management of information technology projects by requiring that agencies engage in capital planning and performance and results-based management.

**Statement of Federal
Financial Accounting
Standards, No.6,
*Accounting for
Property, Plant, and
Equipment***

- This standard specifically addresses the need for better information by requiring the disclosure of deferred maintenance in agencies' financial statements beginning for fiscal years after September 30, 1997.¹

OMB Circular A-11

- Added as a new section to OMB's annual budget preparation guidance. It was developed to help agencies integrate and implement the various legislation and regulations on the planning, budgeting, and acquisition of capital assets. It also requires agencies to submit a "capital asset plan and justification." Circular A-11 also includes guidance to agencies on linking annual performance plans to capital planning efforts.

**OMB Capital
Programming Guide**

- Supplements Circular A-11 and provides detailed steps on planning, budgeting, acquiring, and managing capital assets. The guide encourages federal agencies to develop long-term "agency capital plans" as part of their capital planning process and to use these plans to develop a summary for their budget justifications, congressional authorizations, and justifications for appropriations to the Congress.

¹The deferred maintenance requirement of the Statement of Federal Financial Accounting Standards, No. 6, applies to all property, plant, and equipment.

Leading Practices in Capital Decision-Making Concerning Infrastructure

To enhance the effectiveness of federal investments in capital assets, OMB and GAO have been working to promote improvements in decision-making practices to ensure that the purchase of new assets and infrastructure will have the highest and most efficient returns to the taxpayer and the government and that existing assets will be adequately repaired and maintained.

In July 1997, OMB issued the *Capital Programming Guide*, which provides federal agencies with detailed guidance on the planning, budgeting, acquisition, and management of capital assets. This guidance ranges from information on linking capital decisions to strategic goals and objectives, to analyzing and ranking potential investments, to making informed decisions that are based on the full cost and risk of a project. We participated in the development of the *Capital Programming Guide* and conducted extensive research to identify leading practices in capital decision-making used by state and local governments and private-sector organizations. We have provided OMB with examples for inclusion in the second version of the guide and produced an executive guide that is based on these leading practice examples.¹ The executive guide summarizes 12 fundamental practices that have been successfully implemented by organizations recognized for their outstanding capital decision-making practices. It also provides examples of leading practices from which the federal government may be able to draw lessons and ideas.² In 1994-95, we also worked with OMB to produce guidance on evaluating information technology investments,³ which are a form of capital asset. We produced a leading practices guide⁴ in that instance as well and subsequently produced additional guidance on information technology investments.⁵ The guidance provided in OMB's *Capital Programming Guide* and in our leading practices executive guide applies to all forms of capital investment, including information technology investments, and should be used in conjunction with other GAO and OMB information technology guidance.

From our interviews with leading organizations, we found that principles and related practices used by leading organizations in making infrastructure decisions are most effective when reinforced by four

¹See *Executive Guide: Leading Practices in Capital Decision-Making* (GAO/AIMD-99-32, Dec. 1998).

²The executive guide also includes information from one federal agency, which helped us in considering the applicability of our findings to the federal government's experience.

³See *Evaluating Information Technology Investments: A Practical Guide*, Office of Information and Regulatory Affairs, Information Policy and Technology Branch, Office of Management and Budget (Nov. 1995).

⁴See *Executive Guide: Improving Mission Performance Through Strategic Information Management and Technology* (GAO/AIMD-94-115, May 1994).

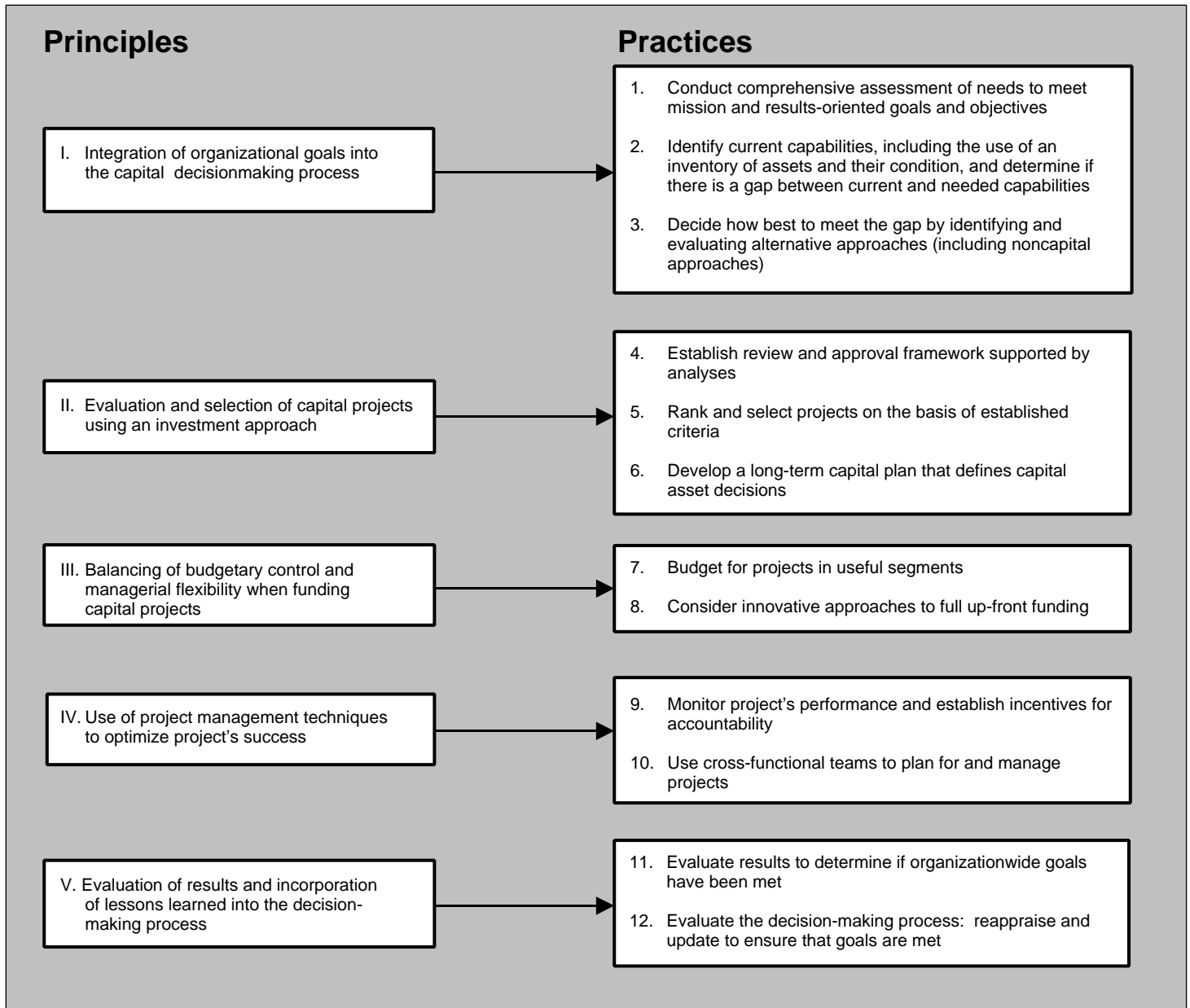
⁵See *Information Technology Investment: Agencies Can Improve Performance, Reduce Costs, and Minimize Risks* (GAO/AIMD-96-64, Sept. 30, 1996).

Appendix III
Leading Practices in Capital Decision-Making
Concerning Infrastructure

important success factors—vision, strategic planning, the availability of good information, and communication. From these critical success factors, we distilled five general principles that leading organizations use to make critical investment decisions: (1) the integration of organizational goals into the capital decision-making process, (2) the evaluation and selection of capital assets by using an investment approach, (3) the balancing of budgetary control and managerial flexibility when funding capital projects, (4) the use of project management techniques to optimize a project’s success, and (5) the evaluation results and the incorporation of lessons learned into the decision-making process. To provide more concrete examples of how agencies and the Congress can apply these principles, we identified practices used by the leading organizations that best demonstrate each principle. Our executive guide is composed of five principles divided into 12 practices, as illustrated in figure 9.

**Appendix III
Leading Practices in Capital Decision-Making
Concerning Infrastructure**

Figure 9: Principles and Practices



Practice 1: Conduct Comprehensive Assessment of Needs to Meet Mission and Results-Oriented Goals and Objectives

Conducting a comprehensive needs assessment or analysis of a program's requirements is an important first step in an organization's capital decision-making process. Leading organizations conduct comprehensive needs assessments that (1) consider the organization's overall mission, (2) identify the resources needed to fulfill both immediate requirements and anticipated future needs on the basis of the results-oriented goals and objectives that flow from the organization's mission, and (3) consider noncapital approaches to addressing these goals. The needs assessments by leading organizations are results oriented in that they determine how specific outcomes might be obtained rather than what is needed to maintain or expand existing infrastructure.

Practice 2: Identify Current Capabilities, Including the Use of an Inventory of Assets and Their Condition, and Determine if There Is a Gap Between Current and Needed Capabilities

Leading organizations gather and track information that helps them identify the gap between what they have and what they need to fulfill their goals and objectives. To help assess current capabilities and establish a baseline, such organizations maintain systems that track the use and performance of existing assets and facilities. This is an area where current and accurate information is essential. Some functions performed by asset inventory and tracking systems include (1) identifying the location and status of assets and facilities, (2) tracking and reporting the condition and deferred maintenance needs of assets and facilities, and (3) tracking user satisfaction. Federal accounting standards now require agencies to report information on the deferred maintenance of federal assets. A critical step in making deferred maintenance estimates is to take a complete and reliable inventory of capital assets as a basis for assessing maintenance needs.

Practice 3: Decide How Best to Meet the Gap by Identifying and Evaluating Alternative Approaches (Including Noncapital Approaches)

Leading organizations consider a wide range of alternatives to satisfy their needs, including noncapital alternatives, before choosing to purchase or construct a capital asset or facility. Managers carefully consider such options as contracting out or divesting the activity that the asset would support. When it is determined that capital is needed, managers also consider the repair and renovation of existing assets. When evaluating alternatives, prudent decisionmakers also consider the various funding options available to them. They weigh the different impacts of debt financing, engaging in joint-venture projects, or the use of current-year appropriations.

Practice 4: Establish Review and Approval Framework Supported by Analyses

We found that establishing a decision-making framework that encourages the appropriate level of management review and approval, supported by the proper financial, technical, and risk analyses, is a critical factor in making sound capital investment decisions. A well-thought-out review and approval framework can mean that capital investment decisions are made efficiently and are supported by better information. Some leading organizations have review processes in place that determine the level of analysis and review that will be conducted on the basis of the size, complexity, and cost of the project. Projects that are expensive, span a number of years, or are crucial to the organization's strategy or structure usually require more analysis, support, and review than projects that cost less, have shorter time frames, or have less organizationwide impact.

Practice 5: Rank and Select Projects on the Basis of Established Criteria

Leading organizations also have defined processes for ranking and selecting projects. The selection of projects is based on preestablished criteria and a relative ranking of investment proposals. Leading organizations determine the right mix of projects by viewing all proposed investments and existing capital assets as a portfolio. Organizations generally find it beneficial to rank projects because the number of requested projects exceeds available funding.

Practice 6: Develop a Long-Term Capital Plan That Defines Capital Asset Decisions

Once projects are ranked, they are put into a long-term capital plan. Leading organizations develop long-term capital plans to guide the implementation of organizational goals and objectives and help decisionmakers establish priorities over the long term. While the plans must be responsive to changing requirements, they are based on the long-range vision for the organization embodied in the strategic plan. Therefore, any year-to-year changes should be driven by strategic decisions.

Practice 7: Budget for Projects in Useful Segments

One strategy that has proven useful to organizations in dealing with the problems posed by full funding in a capped budget environment is to budget for projects in useful segments. This means that when a decision has been made to undertake a specific capital project, funding sufficient to complete a useful segment of the project is provided in advance. OMB has defined a useful segment as a component that either (1) provides information that allows the agency to plan the capital project, develop the design, and assess the benefits, costs, and risks before proceeding to full

acquisition (or canceling the acquisition) or (2) results in a useful asset for which the benefits exceed the costs even if no further funding is appropriated.⁶

Practice 8: Consider Innovative Approaches to Full Up-Front Funding

Alternative strategies used by some leading organizations and federal agencies to accommodate the full funding of capital projects in a constrained budget environment include contracting out for capital-intensive services, using an investment component that is similar to a savings account, and developing public/private partnerships. These strategies enhance an organization's flexibility to finance the full costs of capital projects without compromising top management's (or, in the federal arena, Congress's) ability to make decisions that are based on full costs. However, it should be noted that agencies must obtain authority from the Congress to establish an investment component.

Practice 9: Monitor Project Performance and Establish Incentives for Accountability

The successful implementation of a capital investment project is determined primarily by whether the project was completed on schedule, came in within budget, or provided the benefits intended. As noted previously, however, the first step is to provide decisionmakers with good information about cost estimates, risks, and the scope of a planned project *before* committing substantial resources to it. This, in combination with full up-front funding, can help to prevent cost overruns, project cancellations, and projects that fail to meet completion schedules. By monitoring a project's performance against cost, schedule, and technical performance goals, as well as establishing incentives to meet those goals, organizations can increase the likelihood that a project will be successfully completed.

Practice 10: Use Cross-Functional Teams to Plan for and Manage Projects

Leading organizations use multidisciplinary teams, consisting of individuals that come from different functional areas and are led by a project manager, to plan and manage projects. Typically, a core project team is established early in the life cycle of a project, and additional individuals with particular technical or operational expertise are incorporated during appropriate phases of the project. The team must not only possess technical and operational expertise, but, as an executive

⁶Principles of Budgeting for Capital Asset Acquisitions, *Budget of the United States Government, Fiscal Year 1998*.

explained, it must also be composed of the “right” people. The selection of the team members is critical—they must be knowledgeable, willing to trade off leadership roles, and be able to plan work and set goals in a team setting.

Practice 11: Evaluate Results to Determine if Organizationwide Goals Have Been Met

One way of determining if a capital investment achieved the benefits that were intended when it was selected is to evaluate its performance using measures that reflect a variety of outcomes and perspectives. By looking at a mixture of hard and soft measures, for example, financial improvement and customer satisfaction, managers are able to assess performance that is based on a comprehensive view of the needs and objectives of the organization. To implement this balanced approach to performance measurement, the leading organizations we studied developed financial and nonfinancial criteria for success that link to the organization’s overall goals and objectives. Unit managers then developed project-specific performance measures that are tied to these criteria and which are used as the basis for developing unit performance measures and goals. The unit measures are ultimately rolled up into a divisionwide or organizationwide “scorecard” that measures how well the organization is meeting its goals and objectives.

Practice 12: Evaluate the Decision-Making Process: Reappraise and Update to Ensure That Goals Are Met

Although some organizations evaluate their capital decision-making process on an ongoing basis, we found in our study that this was not the norm. Leading organizations seemed generally to revise their processes in response to an internal crisis or to a perception of changing needs and/or a changing environment. In such situations, these entities felt that they had to conduct difficult self-assessments and undergo major changes in their capital decision-making practices in order to continue successful operation.

Comments From the Environmental Protection Agency

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



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

JAN 7 2000

OFFICE OF
WATER

John H. Anderson, Jr.
Director, Transportation Issues
U.S. General Accounting Office
441 G Street, NW
Washington, DC 20548

Dear Mr. Anderson:

Thank you for the opportunity to provide comments on the draft General Accounting Office (GAO) report entitled *U.S. Infrastructure: Funding Trends and Opportunities to Improve Investment Decisions*. This report summarizes GAO's review of several Federal agencies' infrastructure investment programs.

Many of the key findings in your report are consistent with our recent analysis of water and wastewater infrastructure. We have found that overall investment in water and wastewater infrastructure increased over the last several decades. The increases were a result of State and local spending in operations and maintenance of these systems. At the same time, the aging of the nation's capital stock of treatment plants, collection and distribution systems is pointing toward a significant need to increase capital investment to make system improvements and replace the existing systems.

The draft report, however, deals with Federal infrastructure programs in general, ranging from capital assets owned and managed by a Federal agency to financial assistance provided by Federal agencies for the construction of infrastructure that is owned and operated by local governmental entities. It is very difficult to reach conclusions that hold equally true for such a variety of programs, and we believe that some of your conclusions do not apply to our Drinking Water and Clean Water State Revolving Fund (SRF) programs. I request that GAO revise its report to note the important differences in the way the EPA programs operate.

For example, the draft report is critical of the priority-setting processes in infrastructure programs. Both of our SRF programs provide funds to states which in turn provide loans and other types of assistance to public water and wastewater systems. Clean Water SRF monies are allotted to the States according to a specific formula stipulated in the law. The formula for allotting Drinking Water SRF monies is based directly on need. States are required to develop systems for setting priorities for making loans. The criteria for prioritizing projects are also specified in the law. For instance, in the Drinking Water SRF program, priority for funding is based on the level of public health protection that the projects would provide. We are pleased to note that every State has developed and is using priority systems that meet these criteria. While there may be room at the local level to conduct the kinds of analyses suggested in the report, I am not sure that there is a need

See comment 1.

See comment 2.

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**Appendix IV
Comments From the Environmental
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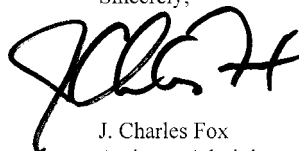
See comment 3.

at the Federal level to adjust the priority setting processes.

In addition, the report states that the Federal Government's needs assessments fail to distinguish between "demands" (or "wish lists") and "true" needs. Again, this is not the case for our SRF programs. All of the projects included in our Needs Surveys are based on documented needs. For a need to be accepted, a state or the public facility must provide written documentation that links the need to the protection of public health.

I hope these suggestions strengthen the conclusions of the draft report. If you have any questions or would like to discuss the issues in this letter further, please call me at (202) 260-5700 or Cynthia C. Dougherty, Director, Office of Ground Water and Drinking Water at (202) 260-5543.

Sincerely,



J. Charles Fox
Assistant Administrator

The following are GAO's comments on the Environmental Protection Agency's letter dated January 7, 2000.

GAO's Comments

1. We did not make any changes in response to this comment because the report explains that EPA's Drinking Water and Clean Water State Revolving Fund programs are among several different types of federal infrastructure programs. The report states that the federal government participates in infrastructure development in a number of ways, which include directly providing states with money that they, in turn, use to fund local projects. The report also explains how the Drinking Water and Clean Water State Revolving Fund programs operate.
2. The report explains that EPA's Drinking Water and Clean Water programs provide states with funds for their revolving funds. The report also states that projects financed by these revolving funds must meet criteria established in federal law and that states are responsible for prioritizing projects for funding. The report does not suggest any changes to EPA's drinking water and clean water programs with respect to priority-setting. We made no changes in response to this comment.
3. The report notes that information available to federal agencies when conducting infrastructure needs assessments is often not consistent or accurate. The report states that, as a result, needs assessments may overstate needs by generating a "wish list" of projects, or they may understate needs because they are not able to identify all the needs for infrastructure investment. We made no changes in response to this comment.

GAO Contacts and Staff Acknowledgements

GAO Contacts

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Paul Posner (202) 512-9573

Acknowledgements

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Related GAO Products

Department of Agriculture

Western National Forests: A Cohesive Strategy Is Needed to Address Catastrophic Wildfire Threats (GAO/RCED-99-65, Apr. 2, 1999).

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Military Infrastructure: Real Property Management Needs Improvement (GAO/NSIAD-99-100, Sept. 7, 1999).

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Military Housing: Privatization Off to a Slow Start and Continued Management Attention Needed (GAO/NSIAD-98-178, July 17, 1998).

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