The costs that this option would impose on farmers are difficult to assess, for the cost of switching to BMPs has not been well studied. Some studies, however, have found that many BMPs would be profitable for farmers. Some evidence indicates that farmers have not adopted them because information has not been available or because they are averse to risk.[20] This option also would raise administrative and enforcement difficulties, for it would require EPA and the Soil Conservation Service to agree on the nature of BMPs when the two objectives of soil conservation and water quality do not dovetail.

An administratively simpler approach would use taxes to discourage use of those agricultural chemicals that are most harmful to water quality. For example, a 10 percent tax on the sale of nitrogen and phosphorus would reduce consumption of these chemicals by about 3 percent. The revenue from this tax could be returned to the states to fund state NPS control programs. The chief virtue of such a tax, its simplicity, is also its principal flaw. Agricultural NPS pollution is a multifaceted problem, and agricultural chemicals contribute to water-quality problems in very disparate ways in various watersheds. Like all uniform national standards, the tax would cause unnecessary reduction in some places and too little reduction elsewhere.

20. See Industrial Economics, Inc, *Point/Nonpoint Trading to Reduce Phosphorus Loads to Chesapeake Bay* (May 1987), prepared for the Environmental Protection Agency, Office of Policy, Planning, and Evaluation; and J.G. Konrad and others, "Nonpoint Pollution Control: The Wisconsin Experience," *Journal of Soil and Water Conservation*, vol. 40, no. 1 (January-February 1987).

CHAPTER VI

COMPREHENSIVE STRATEGIES

The preceding chapters have presented options for improving individual infrastructure programs. This chapter examines some proposals that would require a broader-based restructuring of federal programs. The proposals share one key feature: each would lower the boundaries between existing infrastructure programs and thereby increase competition among them for federal resources.

IS GREATER COMPETITION AMONG INFRASTRUCTURE FORMS DESIRABLE?

The arguments in favor of broadening the bases of federal infrastructure programs are twofold. First, successful infrastructure development increasingly requires planning for many forms of infrastructure. Allowing more explicit trade-offs between different kinds of infrastructure can lead to more cost-effective decisions about what to build and how to maintain it. Second, narrowly defined programs are less necessary and less useful than they once were, for the historical circumstances that prompted their establishment no longer exist.

Economic development officials recognize a growing need for greater coordination in planning among institutions and infrastructure sectors. The interaction between different infrastructure modes and the importance of a coordinated, comprehensive approach to infrastructure development can be seen most easily in local water supply and wastewater treatment policies. Since the price of water affects the amount of water used, it also influences both the wastewater treatment capacity needed and the amount of nonpoint-source pollution generated. Conversely, the price of wastewater treatment influences the amount of water that is used.

The need for similar coordination can be seen in a variety of transportation and environmental problems. Regional transportation plan-

ners, for example, will have to decide on a combination of aviation, rail, and highways to provide mobility and ease congestion; local transportation officials must relieve congestion through a combination of new or expanded roads, mass transit facilities, and nonstructural alternatives (such as increased traffic management, changes in car parking policies, and land use planning); and local economic development officials will have to coordinate the provision of both transportation and environmental infrastructure to serve local economic development. In each case, the efficient provision of one kind of infrastructure will depend on having coordinated policies for many kinds of infrastructure.

Federal infrastructure policies that give different subsidies to different modes may fail to promote the best investment choices for local infrastructure. For example, many localities have been unable to find projects worth financing with the federal mass transit formula grants to which they are entitled. At the same time, however, states and localities cannot receive federal matching grants for all of the highway and wastewater treatment investments that they would like to make. This mismatch between federal funds and local spending preferences could be ameliorated by federal programs that allowed more competition among projects in different modes.

Historical developments have made narrowly defined, categorical infrastructure programs less necessary than they once were. Some were designed, in part, to foster a competitive transportation network. The long-term federal policy sought to promote the economic viability of different transportation modes; competition among them was to ensure an efficient overall transportation system. In the short term, however, making these modes of transportation economically viable required regulations and subsidies specific to each, and made it desirable to create agencies and programs that could articulate and defend the interests of different transportation industries. These federal policies have borne fruit. The nation now has a comprehensive transportation system that is largely deregulated and competitive. Following the deregulation of air, truck, long-distance bus, and rail travel, the various modes compete for business on roughly equal footing, making different federal subsidies less necessary.

The arguments in favor of maintaining the current array of federal programs are twofold. First, federal matching grants are de-

signed in part to increase state and local infrastructure investment by correcting inefficiencies in private markets. Many kinds of infrastructure--the interstate highways, the national air traffic control system, inland waterways, and others--confer benefits on residents outside the jurisdiction providing a particular facility. When a community that pays for a facility can recover the cost of providing services to nonresidents (through user fees, for example), no federal intervention may be necessary. But when a community receives only a fraction of the benefits from a facility, yet must pay all of the associated costs, it will have no incentive to provide what is most beneficial for the nation as a whole. The federal government can encourage states and localities to make the appropriate infrastructure investments by paying that portion of state and local expenditures corresponding to the uncompensated benefits that spill over into neighboring jurisdictions.

The existence of this jurisdictional problem argues for continuing categorical grants that allow federal agencies to address the particular circumstances of each mode. A significant fraction of the traffic on the Interstate highway system, for example, moves between states; on the other hand, mass transit ridership, though often substantial, falls mainly within the political jurisdiction of metropolitan areas. To the extent that federal subsidies are intended to correct this jurisdictional problem, they should differ according to the characteristics of each infrastructure mode.

In this view, the benefits of broadening grant categories so that federal funds can be better tailored to local conditions must be weighed against the loss of federal ability to compensate for different effects in different jurisdictions. Yet, the current structure of categorical grants may actually have little effect on state and local infrastructure outlays. Many studies have concluded that federal subsidies mostly substitute for, rather than complement, state spending, because states tend to reduce their own spending in the subsidized areas.[1]

Narrowly defined federal grants also allow the Congress to define a different target population for each type of infrastructure. One pur-

1. For a review of these studies, see Congressional Budget Office, *Federal Policies for Infrastructure Management* (June 1986), pp. 80-86.

pose of mass transit grants is to increase the mobility of the poor, while highway grants are intended to benefit all drivers, without explicit reference to income.

COMPREHENSIVE INFRASTRUCTURE OPTIONS

Competition among the different infrastructure modes can be increased either by (1) ceding to states and localities greater discretion in the use of federal infrastructure subsidies; or by (2) changing the manner in which the federal government allocates those subsidies. Options giving greater control over infrastructure outlays to states and localities would make such investment more efficient from the local perspective, but simultaneously would replace federal infrastructure preferences with state and local preferences. Options that would follow this approach include:

- Replace existing categorical grants with one or more block grants;
- Allow categorical grant recipients to "fine tune" their federal grants by trading in, on perhaps less than a dollar-for-dollar basis, funds from one infrastructure account for money in another account;
- Capitalize state revolving funds so states could use federal grants to lower localities' cost of borrowing for infrastructure investment; and
- Subsidize state and local governments' access to capital markets.

Options that would retain decisionmaking at the federal level include:

- Change the manner in which existing agencies evaluate and nominate infrastructure projects; and
- Create a new federal agency to rationalize federal investment choices in infrastructure.

Use Block Grants

States and localities would get the most control over federal infrastructure funds if those funds were made available as a single infrastructure block grant. Such a grant would provide the same subsidy to all state and local infrastructure outlays. At present, the federal share under categorical grants varies both within and between the infrastructure modes.

Allowing states and localities to allocate federal funds among infrastructure modes might lead to a more efficient set of projects: by virtue of their greater proximity to local problems, states and localities may be better able to choose among projects for which rates of return vary widely both by mode and by region. An example may be seen in highways: fixing all deficiencies on rural Interstates would have little or no economic value, while relieving congestion on certain urban arteries would have a high rate of return. Similarly, the per capita cost of building the wastewater treatment facilities mandated by the 1972 Clean Water Act would be higher in the coastal regions (where population concentrations are highest) than in the Midwest.[2] Moreover, the kinds of wastewater treatment facilities needed vary by region: a state such as Florida, with newer cities and a more rapidly growing population, would have to spend less to correct combined sewer overflows than would states such as Massachusetts and New Jersey. Given these regional differences, a more efficient set of infrastructure investments might result from state and local choices than from a standard pattern of federal subsidies.

Evidence as to changes that might follow from adopting a single infrastructure block grant can be found in the consolidation of several social welfare grants in the early 1980s.[3] States directed block grant funds less toward low-income populations and more toward the general population. If this were to occur under a general infrastructure block grant, one might see a shift away from mass transit toward other kinds of infrastructure that are less targeted to the poor. Indeed, the evidence in Chapter II suggests that current mass transit services

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2. See National Council on Public Works Improvement, *Wastewater Treatment* (May 1987).

3. See George Peterson, *The Reagan Block Grants* (Washington, D.C.: The Urban Institute, 1985).

ill serve the poor, and may be no more targeted toward them than are infrastructure services generally.

States also shifted funds toward programs that benefited rural areas more than did the categorical programs. This result could be partly avoided under an infrastructure grant by requiring states to maintain the current division of federal grants between rural and urban areas.

Consolidating categorical programs would raise a number of issues. First, a single infrastructure block grant would increase the amount of "fiscal substitution" that occurs with federal infrastructure grants--that is, federal funds would be more likely to supplant rather than supplement state and local infrastructure outlays. While current categorical grants allow significant amounts of substitution, it is not uniform among infrastructure modes.[4] By providing a smaller percentage of a larger spending category, a federal block grant for all infrastructure would make it easier for states and localities to substitute federal funds for their own resources. Indeed, the broader the block grant, the more the federal grant would resemble general revenue sharing, and the less it would encourage state and local spending on infrastructure relative to other investments. Thus, a block grant would be less efficient than categorical grants at increasing total infrastructure investment. Moreover, since a block grant would subsidize all modes at the same rate, it could not correct for jurisdictional problems that differ by type of infrastructure.

Moving from categorical to block grants might also change the political dynamics involved in getting approval for federal infrastructure outlays. When programs are very narrowly defined, their benefits redound to a relatively small constituency while their costs are spread among taxpayers generally; the particular merits of a program aside, interest groups representing program beneficiaries are likely to exert more pressure in support of the program than taxpayers generally are likely to exert in opposition to it. The more broad-based an infrastructure grant program, then, the easier it is to keep outlays under budgetary control. For this reason, supporters of narrowly de-

4. Congressional Budget Office, *Federal Policies for Infrastructure Management* (June 1986), p. 80.

fined programs sometimes see a change to more broadly based grants as a prelude to cutting spending for their programs.[5]

Finally, state and local bureaucracies may have to be changed if block grants are to increase the efficiency with which federal grants are used. Most state and local infrastructure agencies have developed along the lines of the federal agencies that administer their grant programs. If the states and localities are to increase the efficiency of their infrastructure choices, they may need agencies that can make explicit trade-offs among investments in different modes.

Allow Transfers Among Infrastructure Accounts

Allowing recipients of categorical grants to transfer funds between infrastructure accounts would be a half step toward block grants. By enabling states to fine tune federal assistance at the margin, these trade-ins would have effects qualitatively similar, with a few exceptions, to those of block grants. Unlike block grants, however, trade-ins would maintain different matching rates on different modes. Grant recipients would have more influence over the level of spending in each account, but the effects on incentives of the various matching rates would be unchanged.

If the grants were traded in on a less than dollar-for-dollar basis, transfers among accounts would increase the effectiveness of federal spending (since states would transfer funds of their own volition) and also reduce the amount of spending. The available evidence suggests that states would be willing and able to trade in funds. Under a program operated by the Federal Highway Administration in the 1970s and early 1980s, which allowed states to trade in Interstate Highway funds in favor of other transportation projects, states generally eliminated highway projects with low or negative rates of return. If carried out on a broader scale, the long-term result of such a program would probably be the reallocation of resources from those programs with large unspent balances (such as mass transit) to programs on which state and local governments wish to spend more (such as airports).

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5. See Peterson, *The Reagan Block Grants*; and Robert Reischauer, *Fiscal Federalism and Grants-in-aid* (Washington, D.C.: The Brookings Institution, 1979).

A trade-in program would have important implications for discretionary and formula grants. Discretionary grants sometimes are provided under the assumption that formula grants are insufficient to satisfy the spending needs of a state or locality. Allowing a community to trade in formula money when it also received discretionary money would undo the purposes of the discretionary grant: if receipt of a discretionary grant led a community to trade in formula grant money, the discretionary grant would merely be substituting for the formula grant.

Capitalize State Revolving Funds

Capitalizing state revolving funds (SRFs) could give localities easier access to subsidized credit. SRFs could use the federal money to provide localities with low-interest loans; to collateralize further state borrowing, the proceeds of which would be used to make loans to localities; to purchase credit insurance for localities; and to provide guarantees for similar revolving funds set up by municipalities. Limits could be set on the form and purposes of the SRF loans. For example, the federal government could specify the types of projects that could be financed with SRF loans, set a maximum term for the loans, and require loan recipients to establish dedicated revenue sources for repayment of the loans.

In general, credit subsidies are substantively no different from direct matching grants. For example, a locality paying 8 percent interest on a $100,000 SRF loan would have the same annual outlay as if it received an outright grant for 20 percent of the $100,000 and had to borrow the remainder without subsidy at 11 percent interest. Table 24 (in Chapter V) shows the percentages of local costs that would be subsidized by various SRF loans.

Grant and credit assistance programs may differ, however, in the amount of aid that each provides to smaller, infrequent borrowers. While matching grants cover the same percentage of each recipient's costs, SRF loans that offered the same interest rate to all borrowers would provide higher implicit matching rates for those with the weakest credit ratings (and thus the highest rates were they to borrow in the market). In general, smaller and less frequent borrowers have lower credit ratings.

State revolving funds also could provide a more stable source of financing than does the existing grants structure. The stability of SRF financing depends on whether an SRF lends the amount of its capitalization grant directly to localities or keeps the money as a reserve against which it can borrow more money. The total volume of SRF lending would be most predictable if the capitalization grants were lent directly to localities. If the capitalization grants were used instead as collateral against further borrowing, the total volume of SRF loans would be larger but less stable, since the amount borrowed (and then lent) by an SRF would depend on changing credit-market conditions.

More stable long-term financing would allow states to make long-term plans in a more certain climate. Yet, the history of federal categorical programs shows that too much stability can have a price. There is evidence, for example, that the federal wastewater treatment grants encouraged some localities to postpone needed wastewater treatment projects until federal matching grants were available instead of addressing their needs promptly.[6] Localities might wait in like manner for infrastructure funding from the SRFs.

Subsidize Localities' Infrastructure Borrowing Costs

Three limitations of private capital markets now make the borrowing costs of state and local governments higher than they otherwise would be--the illiquidity of municipal bonds, the relatively high fixed costs of issuing debt in small quantities, and the uncertainty surrounding the creditworthiness of infrequent borrowers.

The heterogeneity of municipal bonds makes them relatively illiquid, and makes it difficult for investors to reduce their municipal bond portfolios before the bonds have matured. As a result, investors require an interest-rate premium to compensate them for accepting most of the risk associated with interest-rate changes that may occur before the bond comes to term. If investors could more easily resell the bonds whenever they wanted to reduce their participation in a market, they would accept somewhat lower yields than they now require.

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6. Congressional Budget Office, *Efficient Investments in Wastewater Treatment Plants* (June 1985).

Borrowers of small amounts pay more because some borrowing costs (bond counsel fees, printing, and so forth) are only loosely related to the amount borrowed. Further, many of the more innovative methods of financing can be tapped only by larger offerings. And infrequent borrowers must compensate for the fact that lenders often perceive borrowers without established borrowing records as more risky than others who have been in the market for a while.

The federal government could lower these borrowing costs by subsidizing a financial entity that would purchase state/local bonds and resell them in some standard format. By transforming a plethora of bond types into a standard bond, the intermediary would eliminate the current heterogeneity of municipal bonds and facilitate their resale. Such a program could lower the borrowing costs of small and infrequent borrowers, much as do existing state bond banks, since loans would be resold in large amounts. Indeed, such a program could reduce borrowing costs more than could a single state bond bank, since it would pool risk over both a wider geographic area and a broader class of borrowers.

The federal government could subsidize the repackaging of municipal debt in a variety of ways: by establishing an off-budget, government-sponsored enterprise that would repackage specific types of municipal debt; by creating an on-budget federal agency that would guarantee bonds backed by pools of state/local infrastructure bonds; or by providing grants to private firms in exchange for an undertaking by those firms to securitize (that is, issue new securities backed by) specific classes of infrastructure bonds. Each of these approaches would make state and local infrastructure debt more marketable. The approaches would differ principally in the control that the Congress would retain over both the magnitude of the subsidy provided and the types of securities that would be eligible for the subsidy.

The federal government has previously established, with widely varied success, government-sponsored enterprises (GSEs) to improve the secondary markets for loans in housing, education, and farming.[7] If history is a guide, establishing a GSE for infrastructure bonds

7. The benefits and costs of GSEs are reviewed in Thomas H. Stanton, *Government Sponsored Enterprises: Their Costs and Benefits as Instruments of Federal Policy* (Washington, D.C.:

(Continued)

would lower state and local borrowing costs, but also leave the Congress little control over the budget consequences of the GSE's actions. The principal effect on costs would arise from a federal guarantee that investors would impute to the GSE's bonds. Even if legislation explicitly disavowed any federal responsibility for the GSE's debt, investors would treat the bonds as if they were the debt of a federal agency, with backing nearly as good as the "full faith and credit" that lies behind Treasury bonds.

In the past, investors have found many reasons for ignoring disclaimers of federal guarantees of GSE debt. Lenders have found some of these reasons in Congressional action. For example, the Congress recently provided a multibillion-dollar refinancing of the Farm Credit System--a nominally private GSE lacking federal debt guarantees. The federal government also has been willing to help even nonfinancial private corporations (such as Lockheed and Chrysler) in an effort to avoid the disruption that might follow the collapse of a large firm. Buyers of debt from an infrastructure GSE would be likely to assume that similar assistance would lie behind the GSE's bonds.

Investors also have found federal debt guarantees inherent in the structure of the GSE itself. Most important are the tangible benefits available to GSEs, such as: a line of credit at the Treasury; the ability to issue bonds that bank regulators often treat as being as secure as Treasury bonds; and the ability to issue bonds that are exempt from the securities laws intended to protect investors (lenders have taken this exemption as a sign that the Congress believes the debt of these GSEs to be more secure than other privately issued debt--a belief that can be rationalized by assuming a Congressional willingness to provide needed financial support, but not, in general, by the GSE's balance sheet).

A GSE for infrastructure would thus reduce borrowing costs primarily through the subsidy inherent in an implied federal guarantee for its bonds. Since the government's contingent liability would not

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7. Continued

Association of Reserve City Bankers, April 1988); *The Budget of the United States Government, Fiscal Year 1989, Special Analysis F*; Congressional Budget Office, *Government-Sponsored Enterprises and Their Implicit Subsidy: The Case of Sallie Mae* (December 1985); and Michael Moran, "The Federally-Sponsored Credit Agencies: An Overview," *Federal Reserve Bulletin* (June 1985), pp. 373-388.

appear in the unified budget, the cost of the subsidy would be difficult to control through the budget process.

The Congress would retain greater control over the magnitude of the subsidy provided to infrastructure bonds and would be better able to target the subsidy to particular beneficiaries were it to establish a federally owned, on-budget agency to guarantee securities backed by pools of state and local infrastructure debt. As with a GSE, the Congress could attempt to target the benefits provided by this agency by specifying the types of securities eligible for repackaging (restrictions could be placed on the issuer and on the size and purpose of preferred debt). The subsidies delivered by an on-budget agency, unlike those of a GSE, would be provided through the normal budget process, and thus would be subject to greater Congressional oversight and control.

The assistance provided by either a GSE or an on-budget agency would be complicated by the fact that the federal government already subsidizes municipal debt by exempting from federal income taxes all interest earned from most municipal bonds. If the GSE issued taxable bonds (as do all existing GSEs), it would require an appropriation each year to make up for ongoing losses, since the comparable tax-exempt debt that it bought would earn less than the taxable bonds that it sold. Similarly, if an on-budget agency guaranteed taxable bonds backed by tax-exempt infrastructure debt, a federal subsidy would be required to cover the difference between taxable and tax-exempt debt. The alternative--to have the program issue tax-exempt debt--may at first glance appear to be cost-free. Yet, tax-exempt debt would lower federal revenues by increasing the amount of tax-exempt debt outstanding (and so increasing the amount of interest income sheltered from federal income taxation). Issuance of tax-exempt, federally guaranteed debt also would be at odds with a longstanding Congressional policy to discourage such debt instruments. Such debt would compete directly with Treasury bonds and, if issued in large volume, would increase the cost of all federal borrowing.

The federal government need not rely on a new agency, whether off-budget or on-budget, to subsidize municipal infrastructure debt. The government could instead provide grants to private firms in exchange for an undertaking to securitize specific classes of infrastructure bonds. The government's cost would then be limited to the capital grants; the government's role would be limited to oversight

and regulation of the firms to be sure that they securitized the required types of bonds and passed the savings through to state and local borrowers; and, as with an on-budget agency, the amount of the subsidy would be controlled by the budget process.

Change Procedures of Existing Federal Agencies

Competition among the various types of infrastructure could be increased within the current program structure by improving and making routine the information that individual federal agencies are required to provide the Congress.[8] This information might include:

- Broadening the context of budget requests to that of a development plan;
- Using agency reports to examine the past effectiveness of policies; and
- Altering the format of budget requests to require project evaluations in which all agencies use a common methodology.

These policies would require agencies to generate specific, budget-oriented reports. They would be distinct from those in common use now, however, in that they would evaluate spending requests in relation to larger program goals.

To provide a more informative context for legislative consideration of requests, the Congress could require agencies to prepare plans outlining the long-term goals of individual infrastructure programs, and specifying how those goals could be achieved, when, and at what cost. Such plans would provide the Congress with a ready system for measuring progress and assessing possible adjustments. The drawback of such plans is that they can be difficult to change.[9] Planning

8. A full discussion of these issues can be found in Congressional Budget Office, *Federal Policies for Infrastructure Management*, pp. 91-98.

9. For an example, see General Accounting Office, "Water Projects Construction Backlog--A Serious Problem with No Easy Solution" (January 26, 1983).

must balance the need for consistent purpose against the need for flexibility.

Using consistent parameters to evaluate projects in different federal infrastructure agencies would greatly assist in making agency budget requests more informative. These parameters might include the cost of capital, the discount rate, and the value of time (when computing the cost of delays) or of human life. Requiring agencies to use the same evaluation parameters would make it easier for the Congress to allocate resources among different types of infrastructure.

Finally, requiring agencies to submit periodic evaluations of past investments (either by general groups of projects or by types of financing arrangements) could indicate how well management was performing and could alert the Congress to the need for improvement. Yet, federal managers might regard the evaluation process as divisive. Further, personnel closely involved in program administration might have difficulty in making objective assessments of a program's performance. Assigning the review process to an outside body, however, might sacrifice much of the benefits of this option, for a reviewer's findings might be subject to debate or negotiation with the program agency under scrutiny.

Create a National Infrastructure Fund

The federal government could merge all of its infrastructure spending into a single National Infrastructure Fund (NIF). A NIF could take many forms; the one considered here--an agency that would negotiate assistance in the form of grants after evaluating proposed projects--would give the government greater control over the distribution of funds between and within the different infrastructure modes.

By comparing projects in different modes, and providing assistance that varied with the national interest in particular projects, a NIF could improve the allocation of federal infrastructure resources. For example, a NIF could target federal funds to particular regions or populations better than the existing categorical programs. Such an agency also would standardize government analyses of all federal infrastructure projects, thereby providing a better guide to choosing among different projects.

There would be drawbacks, however, to a NIF that gave out money on a project-by-project basis. Most important, guaranteeing a measure of political independence for the NIF might prove difficult. The very forces that make narrow categorical grants more difficult to control than block grants would be magnified with an agency empowered to subsidize not just specific modes but specific projects.

APPENDIX

THE REPORT OF THE NATIONAL COUNCIL ON PUBLIC WORKS IMPROVEMENT

The National Council on Public Works Improvement was established by the Public Works Improvement Act of 1984 (Public Law 98-501) to assess the state of the nation's infrastructure. The Council's final report, *Fragile Foundations: A Report on America's Public Works* (1988), brings together a wide literature and makes policy recommendations in five broad areas: the level of infrastructure investment needed to ensure continued economic growth; methods of financing infrastructure; the roles of federal, state, and local governments in providing infrastructure; improving the efficiency of infrastructure services; and promoting research and development in public works. The Public Works Improvement Act also required the Congressional Budget Office to review the Council's findings. The main study reviews some of the issues raised by the Council, and this appendix focuses more specifically on its findings.

HOW MUCH INVESTMENT?

The Council explores first the issue that is least tractable: how much must the nation invest each year in public works in order to "sustain future economic growth?" The Council notes that few specifics are known of the relation between infrastructure and economic growth. The economics literature supports a conclusion that some infrastructure is necessary for economic growth, but little is known about how much is necessary for a particular level of growth. Nonetheless, the Council concludes that national infrastructure outlays should be increased by as much as 100 percent. No direct explanation is offered for this recommendation. Instead, the Council presents a series of heuristic arguments designed principally to show that the demand for infrastructure exceeds, or soon will exceed, the likely available supply. The arguments offered by the Council all have serious limitations, not only as a guide to the sufficiency of existing public works spending but also

as a means of establishing investment priorities among different kinds of infrastructure.

The Council's Arguments for More Investment

The Council's recommendation for a large spending increase rests largely on three sets of statistics. The Council first cites the infrastructure "needs" estimated by the Association of General Contractors, the Joint Economic Committee, and the Congressional Budget Office. These studies, from the early 1980s, show annual investment requirements, in 1982 dollars, of $118.2 billion, $64.3 billion, and $52.6 billion, respectively (see the Appendix Table). With 1986 infrastructure capital spending by all levels of government equaling $46 billion (in 1982 dollars), each of these estimates implies a substantial shortfall of investment.

Second, the Council estimates future industrial demand for infrastructure services. On the assumption that infrastructure use per dollar of output will remain unchanged for each industry, the Council concludes that industry's infrastructure use will increase by more than 30 percent during the next 10 years.

Finally, the Council notes that, between 1960 and 1985, capital outlays for infrastructure declined as a percentage of both gross national product (GNP) and private investment--from 2.3 percent of GNP to 1.1 percent, and from about 15 percent of total private investment to 7 percent.

These statistics indicate to the Council that national public works investment is inadequate to sustain future economic growth. But the data are open to various interpretations. The relation between infrastructure investment and GNP is poorly understood; economic theory provides no indication of the optimal level of infrastructure investment relative to GNP. The Council nonetheless assumes that the decline in public works outlays relative to GNP and private investment endangers economic growth. Its recommendation to double infrastructure spending implicitly assumes that sustained economic growth requires a constant proportion of GNP to be devoted to infra-