



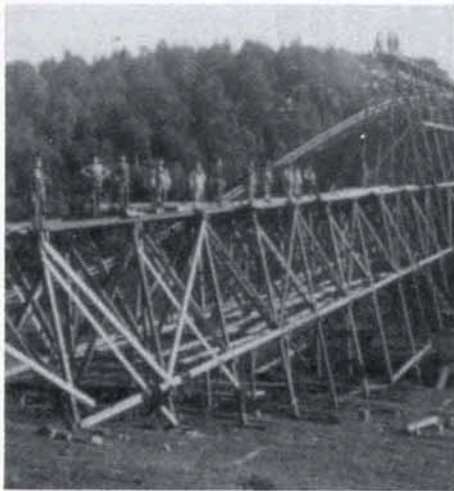
**Fragile Foundations:
A Report on America's
Public Works**

Final Report to
the President and Congress

National Council on
Public Works Improvement
February 1988

Summary of Findings

The quality of a nation's infrastructure is a critical index of its economic vitality. Reliable transportation, clean water, and safe disposal of wastes are basic elements of civilized society and a productive economy.



Their absence or failure introduces an intolerable dimension of risk and hardship to everyday life, and a major obstacle to growth and competitiveness.

The Erie Canal; the transcontinental railroads; the great dams and water systems of the west; the airports, seaports, and transit systems that serve our cities; our network of

modern highways and soaring bridges—all these are part of this country's great public works inheritance from the generations of Americans who built before us. These massive and sometimes daring achievements supported the growth of the greatest economic power the world has ever known. They have been the envy of other countries and the model for our competitors.

Now that inheritance is in danger.



After two years of study, the National Council on Public Works Improvement (the "Council") has found convincing evidence that the quality of America's infrastructure is barely adequate to fulfill current requirements, and insufficient to meet the demands of future economic growth and development.

And unless we dramatically enhance the capacity and performance of the nation's public works, our own generation will forfeit its place in the American tradition of commitment to the future. Without such an effort, our legacy will be modest at best. At worst, we will default on our obligation to the future, and succeeding generations will have to compensate for our failures.

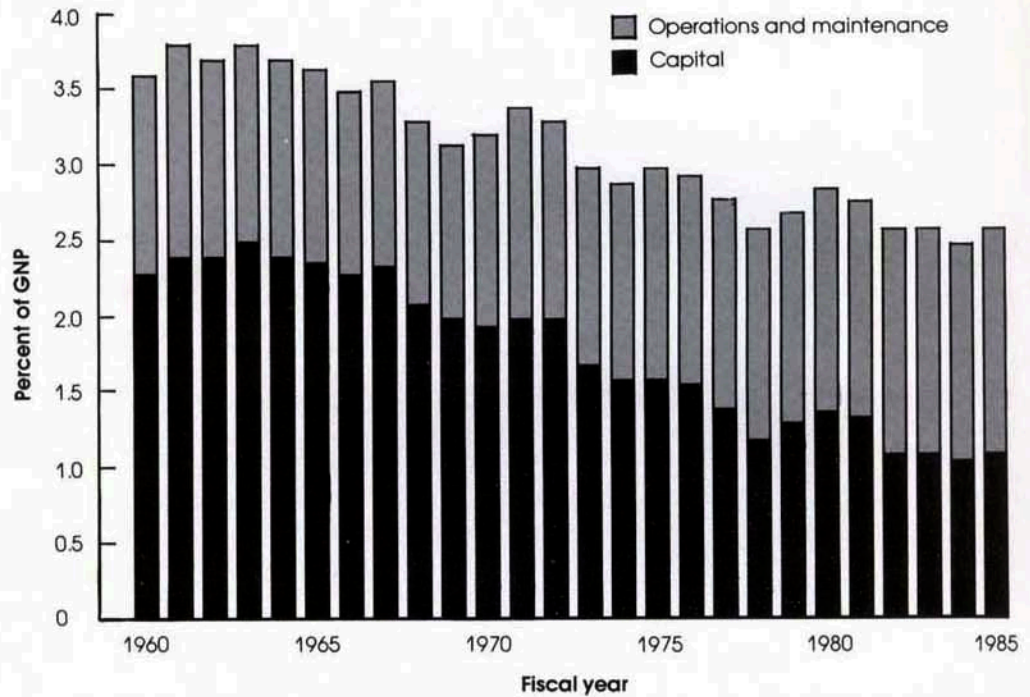
"We're spending our inheritance. You know, we built this freeway system . . . in the '50's and '60's, and we are still trying to make that do for today's needs."

Secretary Dewey Lonsberry,
New Mexico Dept. of Highways
and Transportation
Council Hearing,
Los Angeles, July 29, 1987

At present, most major categories of public works in the United States are performing at only passable levels. A few, such as water supply and water resources, remain in reasonably good shape. But others, such as solid waste and hazardous waste disposal, have serious and growing problems. In addition, smaller systems—in all categories and in nearly all regions of the country—face especially acute difficulties.

Part of the problem is financial. Overall investment in public works has slowed in the last two decades in relation to the demands of growth and environmental concerns. We have worn through the cushion of excess capacity built into earlier investments. In effect, we now are drawing down past investments without making commensurate investments of our own. Fig-

Figure 1—Public works outlays as a percent of GNP



Sources: U.S. Office of Management and Budget, *Budget Appendices of the United States*; U.S. Department of Commerce, Bureau of the Census, *Government Expenditure Series*; and *The Economic Report of the President*, for various years.

Figure 1 illustrates this pattern of decline in public works spending as a percent of GNP.

With nearly one trillion dollars of public works assets¹ in the United States, reduced spending over the short term does not mean that individual facilities are in imminent danger of collapse, or that particular regions are in immediate peril. However, a

¹This represents the approximate cumulative depreciated value of the public works facilities in the Council's purview. These include: highways, mass transit, aviation, water resources, water supply, and wastewater, solid waste and hazardous waste disposal. Public works can be interpreted more broadly to include communications, energy facilities, schools, hospitals, prisons, and parks. In an effort to target its resources, the Council has limited its primary focus to transportation, water, and waste disposal issues. Nevertheless, a considerable portion of its research findings and policy conclusions may apply to other areas.

declining infrastructure inevitably will jeopardize the productivity of our economy and our quality of life. Failure to reverse this decline will exact a high price for the nation in the future, both in the cost of deferred investment and in reduced economic competitiveness.

Therefore, the Council recommends a national commitment, shared by all levels of government, the private sector, and the public, to vastly improve America's infrastructure. Such a commitment could require an increase of up to 100 percent in the amount of capital the nation invests each year in new and existing public works. In 1985, this amount was approximately \$45 billion.

Dramatically expanding current capacity or doubling the rate of capital spending is not an absolute requirement in all infrastructure categories, at all levels of government, or in all regions of the country. However, an increase in capital spending of this

magnitude is an important and achievable goal for the nation as a whole by the end of this century. For some categories, such as hazardous waste disposal, an even greater effort may be warranted.

A strategy to upgrade America's infrastructure must incorporate other tactics in addition to increased investment. **Thus the Council also recommends:**

- Clarification of the respective roles of the federal, state and local governments in the construction and management of infrastructure to focus responsibility and increase accountability;
- Steps to improve the performance and efficiency of existing facilities;
- A rational capital budgeting process at all levels of government;
- Strong incentives to ensure adequate maintenance and, where appropriate, adopt new technologies; and
- More rigorous and widespread use of low capital techniques for delivering services and meeting service needs, such as demand management, coordinated land-use planning, and waste reduction and recycling.

Through these measures the nation can make the best use of existing assets. This



approach also may help to defer or avoid a significant portion of capital needs and costs that otherwise would be required in the future.

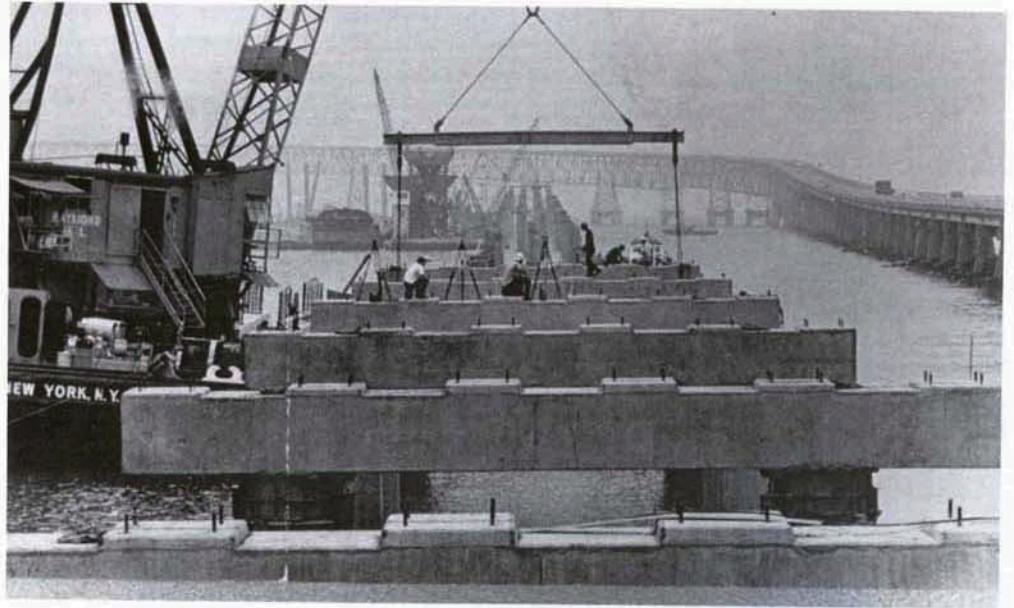
"Where in this myriad of problems is the good news? I would suggest that it lies in the opportunity to get government moving before an infrastructure crisis is upon us."

Michael Deland,
Regional Administrator, EPA,
Boston, Massachusetts
Council Hearing,
Boston, Aug. 3, 1987

The Council recommends that state and local governments continue to play their traditional leadership roles in the construction and management of the nation's infrastructure. But the Council also believes that the federal government must act as a full and responsible partner on a long-term basis in the national effort to increase and sustain public capital investment.

There is much to set right in America's house. The Council recognizes that an increased investment in infrastructure is just one among many critical claims on the nation's resources. To address this claim and others requires that we reckon first with the growing imbalance between consumption on the one hand and investment and savings on the other. This imbalance, reflected in the federal budget deficit and in other forms of borrowing against the future, affects all federal spending decisions. **The Council supports appropriate actions to redress the imbalance between consumption and savings so that future infrastructure commitments will not be shortchanged.**

The Council believes that infrastructure must rank high among our priorities. We must ensure that our highways and subways can move us swiftly and safely; that our homes, farms, and industries are supplied with ample clean water; that we re-



duce and safely dispose of the increasing volume of poisonous wastes our society generates; and that we provide the structural underpinning for a robust and competitive economy.

To reach this goal by the turn of the century, we must start now to rebuild what we have neglected, to repay where we have borrowed, and to invest again in our future and our children's future.

Joseph M. Giglio
Joseph M. Giglio
Chairman, New York, New York

Peter C. Goldmark Jr.
Peter C. Goldmark Jr.
New York, New York

Lowell B. Jackson
Lowell Jackson
Aurora, Colorado

Freeman Holmer
Freeman Holmer
Eugene, Oregon

Frieda K. Wallison
Frieda K. Wallison
Washington, D.C.

Reinvesting in America

Sharply upgrading America's infrastructure is an ambitious goal. It cannot be achieved in a short period. Our infrastructure problems are manageable, but only if we begin to mobilize our resources now. These problems cannot and should not be solved through a crash program. Rather, success requires that all levels of government and the private sector dedicate themselves to a sustained effort.

This effort should focus on the effective capacity of our infrastructure systems—the level and quality of public services provided by each category. No single approach by itself will be adequate. More money alone will not suffice. More effective management alone will not get the job done. Technology will not save the day. The complexity of these systems and their attendant problems demand a broad-based strategy.

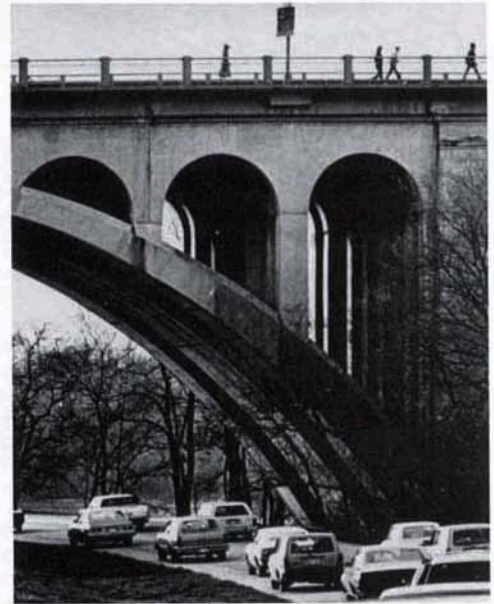
"... there is no 'quick-fix' for the problem. It's much more likely to be solved—eventually—through deliberate remedial steps rather than through a fast, dramatic 'conversion' of practices and attitudes."

Mayor George Latimer,
City of Saint Paul, Minnesota
Letter to the Council,
June 22, 1987

Rating America's Infrastructure Performance

To determine where we must go, we first must assess where we are. The current condition of the nation's infrastructure is hardly encouraging. If our public works were graded on an academic scale, their recent performance would earn a scant "C"—barely adequate to support current demands.

Yet a single grade cannot reflect the variability of performance by category or within



categories. For example, municipal refuse is collected with some success, but limited landfill capacity is making disposal more expensive and less effective.

The report card on the following page provides an overview of the performance of eight categories of public works. By identifying recent program changes and outstanding policy concerns, it also highlights opportunities for improvement.

"The public needs to understand that major public works projects have a tremendous lead time, especially if they are located in a metropolitan area or involve controversy. It took more than 20 years from inception to the opening of Interstate 66 from the Capitol Beltway to the city of Washington, D.C."

Albert A. Grant, P.E., President,
American Society of Civil Engineers

REPORT CARD ON THE NATION'S PUBLIC WORKS

Subject Category	Grade	Successes/ Recent Changes	Problems/ Future Weaknesses
HIGHWAYS	C+	Federal and state gas tax increases have injected new capital into the system. This, along with increased O&M spending, has improved pavement conditions. However, quality of service in terms of congestion is declining.	Spending for system expansion has fallen short of need in high-growth urban and suburban areas. Many roadways and bridges are aging and require major work. Needs of most rural and smaller systems exceed available resources. Highway Trust Fund has a sizeable cash balance.
MASS TRANSIT	C-	Federal capital grants have helped improve quality of service in some areas, but overall productivity of the system has declined significantly. Growth of transit vehicles is double the rate of increase in ridership. Diverting people from cars is increasingly difficult.	Mass transit is overcapitalized in many smaller cities and inadequate in large, older cities. Systems rarely are linked to land-use planning and broader transportation goals. Maintenance has been erratic and inadequate, especially in older cities.
AVIATION	B-	In general, the aviation system has handled rapid increases in demand safely and effectively. However, service has begun to decline in the face of increasing airport and airspace congestion as a result of strong traffic growth. The air traffic control system is currently undergoing a \$16 billion modernization.	Congestion is the system's primary problem. Despite recent increases in authorizations, sizeable cash balance remains unspent in the Airport and Airway Trust Fund. The air traffic control system needs substantial upgrading to maintain safety.
WATER RESOURCES	B	Water Resources Act of 1986 made cost-sharing mandatory for many types of water projects. This change should improve project selection and reduce overall project costs.	Cost-sharing will improve efficiency but also increase local costs of water projects. Poorer communities may find it difficult to finance projects. Implementation is often excessively slow and cumbersome.
WATER SUPPLY	B-	While regional performance varies, water supply stands out as an effective, locally-operated program. Strict new standards created by the 1986 Safe Drinking Water Act will require drastic increases in water rates over the next decade.	Many public water systems suffer from pricing below costs, inability to meet purity standards, or source contamination. Storage and distribution systems are deteriorating in some older cities and supplies are limited in some parts of the West and several cities along the East coast.
WASTEWATER	C	Over 75% of U.S. population is served by secondary treatment plants. Shift from federal grants to state revolving loans may improve efficiency of plant construction. Broadened focus on nonpoint source pollution and groundwater contamination may accelerate progress toward cleaner water.	Despite \$44 billion federal investment in sewage treatment since 1972, water quality has not improved significantly. This is due in part to uncontrolled sources of pollution, such as run-off from farmland and roadways. Overall productivity of secondary treatment facilities is declining, resulting in an increase in water quality violations.
SOLID WASTE	C-	Testing and monitoring of solid waste facilities are more rigorous as a result of tougher environmental standards. Waste-to-energy technology is growing as alternative to landfills. More aggressive waste reduction, separation, and recycling efforts are beginning at the local level. However, few states have moved boldly on these measures.	Nation faces significant costs of adequate and safe facilities. Limited data suggest trends toward fewer but safer landfills, rapid growth in resource recovery, and little progress toward waste reduction. Public opposition to siting all types of facilities is a major problem.
HAZARDOUS WASTE	D	Funding for site clean-up has increased five-fold since 1986, but progress has been slower than expected. Only a small fraction of the two tons of waste per capita produced in America each year is being treated safely. Major challenge is still ahead of us.	Nation has forfeited much of its opportunity to reduce waste before it is produced. Waste control legislation promotes "end-of-pipe" rather than source reduction solutions. Congressional mandates and schedules may be overly optimistic, given administrative resources. A massive backlog of poisons and needed cleanup projects faces the nation.

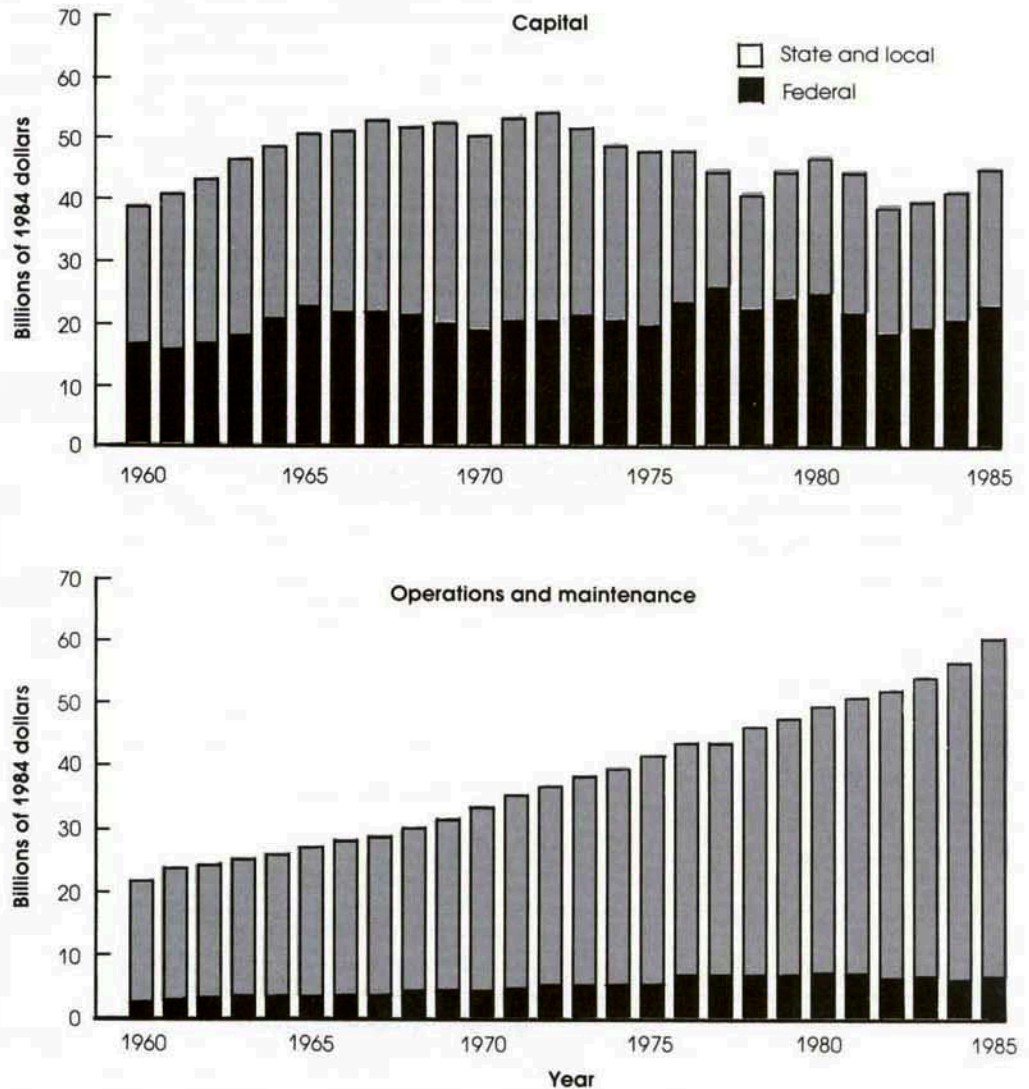
Current Spending on Public Works²

Capital investment represents front-end, long-term resources committed to the plant and rolling stock that provide public works services. Measured in 1984 dollars, state and local capital investment peaked in 1972 at \$34 billion; annual federal outlays for capital, however, peaked at \$25 billion in the late 1970s. This trend is charted in Figure 2.

Spending for operations and maintenance (O&M) is key to the overall longevity and efficiency of public works capital assets. In the aggregate, spending for O&M has continued to grow at a rapid rate since the 1960s (from \$21.6 billion in 1960 to \$56.5 billion in 1985).

²All dollars are expressed in constant 1984 dollars, unless otherwise noted in the text.

Figure 2—Government outlays for public works



Source: Apogee Research, Inc., Government expenditure databases.

"There is . . . growing concern at the state and local level that . . . given competing demands for funding at the local level for education, health, welfare and public safety programs, the public works infrastructure may indeed experience severe deterioration in the coming years."

Harout Sanasarian, Supervisor
Milwaukee County, Wisconsin
Council Hearing,
Indianapolis, July 12, 1987

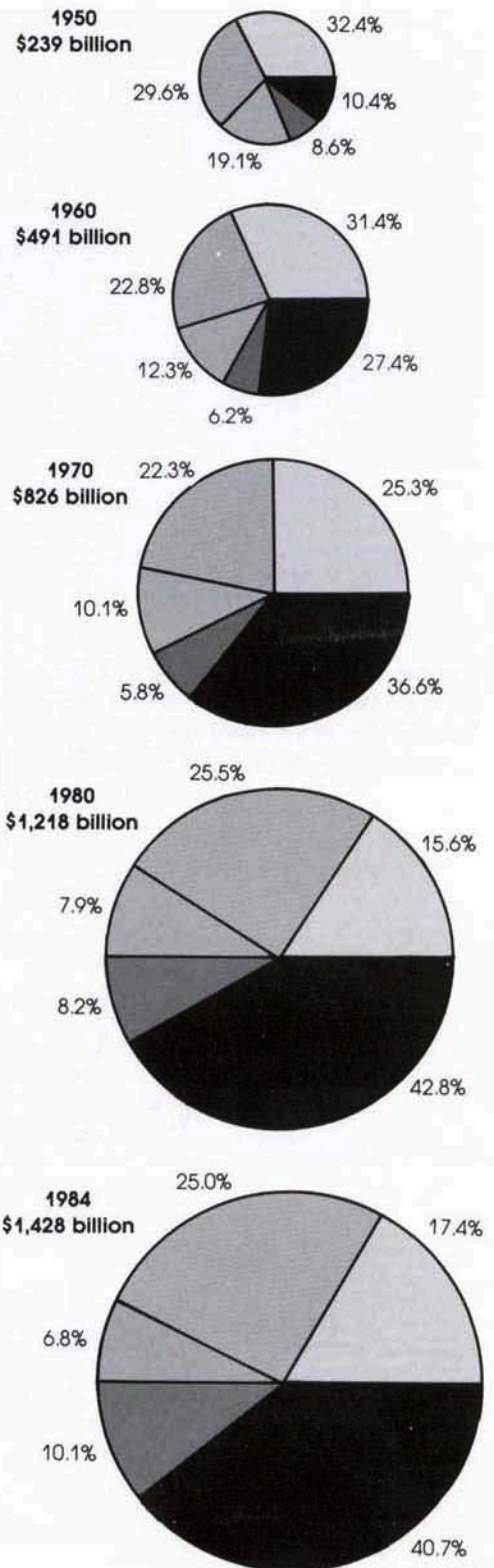
billion in 1984), as also shown in Figure 2. Underlying this trend was a small decline in federal operating outlays since the mid-1970s and a substantial increase in local O&M outlays over the entire 24-year period.

Public works spending patterns are of particular concern when viewed in relation to other measures of economic activity. For example, total public spending on infrastructure has dropped from 3.6 percent of the gross national product (GNP) in 1960 to 2.6 percent in 1985. While spending on operations and maintenance has remained a constant share of GNP, capital spending has dropped from 2.3 percent of GNP in 1960 to 1.1 percent today. The relative share of public works spending at all levels of government has declined drastically from nearly 20 percent of total expenditures in 1950 to less than 7 percent in 1984, as shown in Figure 3. During this same period, government spending for welfare and education increased from 10 percent to over 40 percent of total expenditures.

Figure 3—All government spending, 1950-1984 in 1984 dollars

1950	\$239 billion
1960	\$491 billion
1970	\$826 billion
1980	\$1,218 billion
1984	\$1,428 billion

- Defense
- Nondefense discretionary
- Public works
- Interest on general debt
- Public welfare/education



Source: Apogee Research, Inc.

Public works investment is growing more slowly than private capital investment. Private-sector capital investment increased by about 51 percent between 1975 and 1985, but public works investment fell by more than 6 percent over the same period. Figure 4 shows the decline in public works spending per dollar of new private capital put in place.

Economic Prognosis

What do these trends mean for the health of the economy? The level of public works spending is only one indicator of the quantity and quality of service. However, we do know that public investment generally increases the productivity of private investment. Thus the growing imbalance between public and private investment means that we probably are not getting as much value as we could for every private investment dollar. The resulting loss in productivity limits the growth of the economy and our ability to compete in world markets.

In light of these spending trends and the concerns about future performance outlined above, it is clear that substantially more must be done—and we must start soon.

"For the sake of our nation's future, we must provide the funds necessary to maintain and improve roadways and bridges. These are the networks essential for our economic survival."

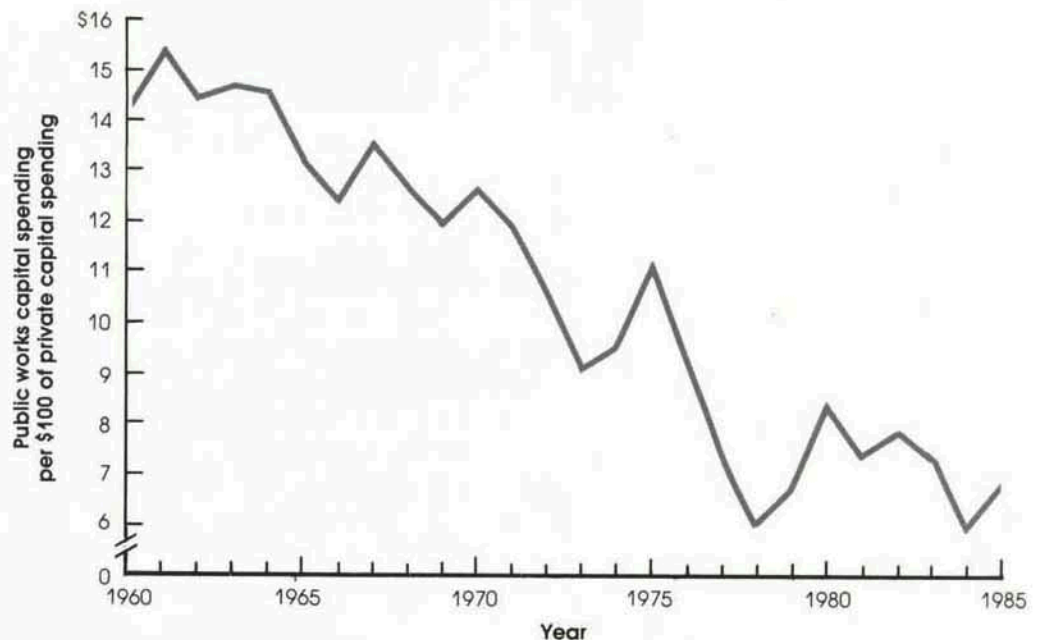
James Sullivan, President,
Greater Boston Chamber of Commerce
Council Hearing,
Boston, Aug. 3, 1987

Elected officials and the public at large must recognize that capital expenditures are not the only cost of public works; rather, the expense incurred through delays in providing needed services, added to the value of lost economic opportunities, often can exceed direct budget costs.

"The long pattern of disinvestment and a deteriorating infrastructure have eroded our capacities to sustain economic growth—growth which is translated directly into jobs for Americans."

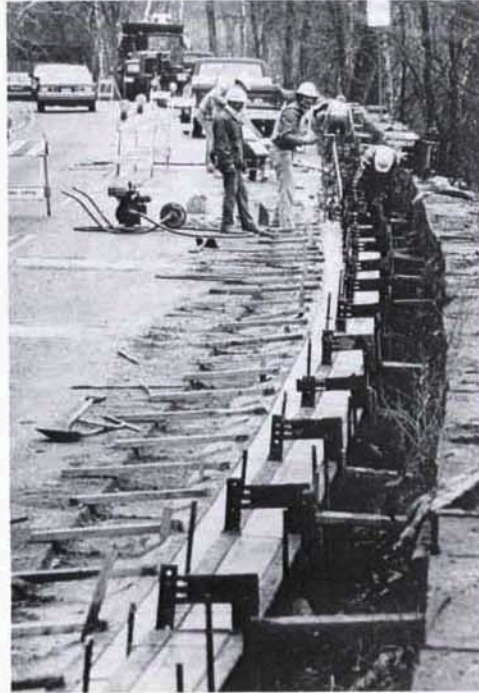
The late
Mayor Harold Washington
City of Chicago
Council Hearing,
Chicago, Sept. 30, 1987

Figure 4—Comparison of public works capital spending to private capital spending



Sources: National Council on Public Works Improvement calculations based on the *Economic Report of the President*, January 1987, Appendix B, and Apogee Research, Inc., Government expenditures database.

Our current level of capital investment is barely enough to offset annual depreciation, much less meet new demands. The U.S. Department of Commerce estimates that infrastructure use by industry alone will increase by at least 30 percent over the next ten years as a result of economic



"The condition of our transportation infrastructure is a critical factor in determining our nation's productivity and our ability to compete and survive in today's world market. We face widespread economic decline if we allow our tremendous highway infrastructure investment to deteriorate."

Commissioner Leonard Levine,
Minnesota Department of
Transportation
Council Hearing,
Chicago, Sept. 30, 1987

growth, the dispersion of population and economic activity, and technological and structural changes. Infrastructure capacity must keep pace with this increase while still maintaining the current quality of service. Better service—reduced congestion, improved water quality, higher safety levels—will require even greater capacity expansion, as well as extensive operational improvements.

"Currently the cost of congestion in Los Angeles County is about 485,000 hours per day of wasted time by our residents or people driving through the county. That converts . . . by our estimates to a minimum of about \$507 million per year in wasted time, and about 72 million gallons of gasoline . . . just in our county."

Rich Richmond, Executive Director,
Los Angeles County
Transportation Commission
Council Hearing,
Los Angeles, July 29, 1987

While a sound infrastructure does not guarantee future prosperity, long-term economic growth cannot be achieved without it. Economic efficiency and public health both are linked inextricably to adequate transportation, water quality, and waste disposal services. In addition, infrastructure investment directly supports additional economic activity. For every public dollar spent on an annual basis to build and maintain our network of roads, streets, and bridges, the private sector spends \$15 to move people and goods. For every public aviation dollar, private firms and individuals spend nine.

If we spend too little on public works or if we invest in inefficient projects, society loses more than the direct public cost. In the long run, our ability to compete in the international economy will be weakened, and our standard of living will suffer.

Finding the Money

Much of the discussion about public works in recent years has focused on choosing appropriate finance mechanisms—e.g., revolving loan funds, intergovernmental grants, tax-exempt debt techniques, or various forms of privatization. While these options may differ in terms of the attractions they offer to public officials, they all draw on two basic sources of funds—*general tax revenues* and *user fees*.

Mobilizing adequate financing to meet our current and future public works needs requires participation by all levels of government. **The Council endorses the following principles to guide this effort:**

- **Users and other beneficiaries should pay a greater share of the cost of infrastructure service.**
- **The federal government should be a reliable partner in financing public works.**
- **States should develop comprehensive infrastructure finance strategies.**
- **Local governments should give budgetary priority to funding the maintenance of existing facilities.**

Emphasis on the Beneficiaries

Today almost 75 percent of public capital spending on infrastructure is derived from

users. Yet only about 50 percent of spending on operations and maintenance comes from this source. Significant elements of transportation, water supply, wastewater treatment, and solid and hazardous waste systems serve identifiable consumers on a continuing basis. Use can be measured and priced; those who do not pay can be excluded from services. Linking financing to use can produce a steady and predictable revenue stream, encouraging better maintenance, rehabilitation, and replacement.

“New strategies like public-private partnerships will help. So will federal initiatives. . . . But what I think is really needed first is a national consensus. We need to better define the scope of the problem—what are the specific needs for all levels—and then identify what resources can be marshalled and by whom.”

Mayor Don Erickson,
Cheyenne, Wyoming
Council Hearing,
Los Angeles, July 29, 1987



The Council recognizes important limitations to the user fee principle. Many smaller communities lack the financial base necessary to finance a facility—especially when new capital investment is required. Fees for certain types of essential services, such as water supply, sewage treatment, and solid waste disposal, also can be excessively expensive for lower income residents or hard-to-serve areas.

Options to address these problems may include guarantees or insurance for small-issue debt; state bond banks that combine small bond issues into larger, more credit-worthy statewide issues; selected increases in grants targeted to smaller facilities or those serving lower income areas; and re-

gionalization of services to achieve economies of scale. Providing a threshold level of service and a safety net in these instances also may require general revenues to supplement user fees.

Public works produce both direct and indirect benefits. For example, a mass transit system benefits the transit riders as well as the motorists who travel in the area. In addition, mass transit often benefits business and commercial interests. Thus, the cost of transit development or expansion should be borne by all three groups.

"Twenty years ago developers looked almost entirely to the public sector for infrastructure. Today with increasing population and migration of people and businesses to the cities and surrounding counties of Nashville growing so much faster, the public sector can no longer provide total infrastructure needs. The future must be a joint effort."

George Volkert, President,
Southeast Venture Company,
Nashville, Tenn.
Council Hearing, Nashville, June 9, 1986

User fees may prove inadequate for major new investments in infrastructure technology and economic development. Such projects have few immediate or easily identifiable beneficiaries. Instead, they represent long-term commitments to the future, and rightfully are a matter of common responsibility, to be financed out of general funds or a user fee base that includes both present and future beneficiaries.

The Council endorses the general principle that developers should pay an equitable portion of the cost of new facilities necessary to service commercial, industrial, and residential development. State and local officials should exercise due care to see that the allocation of such costs is fair and reasonable

and does not result in undue private influence over public development policies and priorities. Further, it should be recognized that developer fees and exactions will have an impact on the cost and availability of housing.

The Council urges that federal user fees paid in good faith by beneficiaries to preserve and protect public works systems be spent for that purpose. The accumulation of unspent balances in the federal highway, transit, aviation, and waterways trust funds—nearly \$24 billion in the 1987 budget—is at odds with this principle. **The Council supports a determined, incremental effort to reduce these balances—in line with responsible management and planning—so that the funds can be used for necessary infrastructure improvements.**

Federal Partnership

Between 1960 and 1975, federal grants-in-aid as a portion of total state and local capital spending remained relatively stable at about 33 percent (Figure 5). In the late 1970s, federal aid rose to more than 50 percent; since then it has leveled off at 40 to 45 percent. These patterns reflect a decline in capital spending by state and local governments as well as shifts in federal grant policy.

In the realm of infrastructure finance, the federal government traditionally has focused on providing public works capital. Because of its limited involvement in maintenance and operations, the federal government accounts for less than 30 percent of all public works spending.

The Council urges the President and the Congress to recognize the importance of maintaining a continuing federal role in infrastructure finance. Intergovernmental aid still is necessary to launch major projects of national interest, or to help governments with limited fiscal capacity. However, some changes in the form of federal spending may be necessary to accommodate shifting federal, state, and local roles and relative fiscal capacities.

"I think we have seen the end of . . . massive amounts of federal dollars returning to local governments through federal revenue sharing and any grant program. I think at the state and local levels we must . . . go to Washington and ask for programs and policies that are feasible in light of the changed fiscal circumstances."

Ronald Bean, Executive Director,
Illinois Development Finance
Authority
Council Hearing,
Chicago, Sept. 30, 1987

Whatever form federal assistance takes, it should offer state and local governments:

- Stability over several years to aid long-range planning;
- Flexibility in the use of funds through such mechanisms as block grants; and
- Incentives for increased efficiency and improved maintenance.

In addition, the federal government should exercise restraint in adopting legislation that would limit the revenue-raising capacities of state and local governments.

Federal tax policy also has a significant impact on infrastructure finance. For example, the Tax Reform Act of 1986 drastically limits arbitrage earnings on borrowed funds and restricts the use of municipal bond proceeds for quasi-public projects by imposing ceilings on allowable issues. These and other provisions are expected to limit the growth of tax-exempt

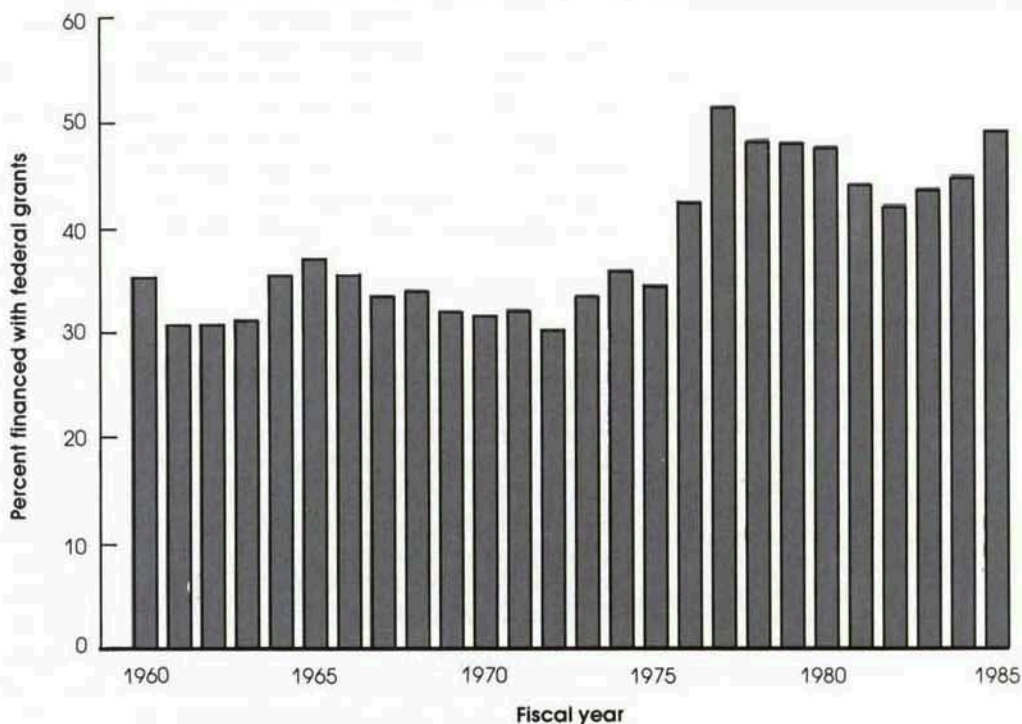
bonds, and to increase state and local borrowing costs. The law also lengthens depreciation schedules and repeals investment tax credits, which will increase the cost of joint development of certain public works with the private sector. In combination, the provisions of the 1986 law may impede the financial plans of state and local governments, reduce their fiscal capacity, and limit their ability to finance necessary improvements.

The Council urges the President and the Congress to pay close attention to the effects of tax reform, and to remove unwarranted limitations on the power of state and local governments to finance public works.

State Strategies

Although a number of states have instituted innovative financing programs, the state share of overall spending on infrastructure dropped from 32 percent in 1970 to 23 percent in 1985. At \$25 billion annually, state

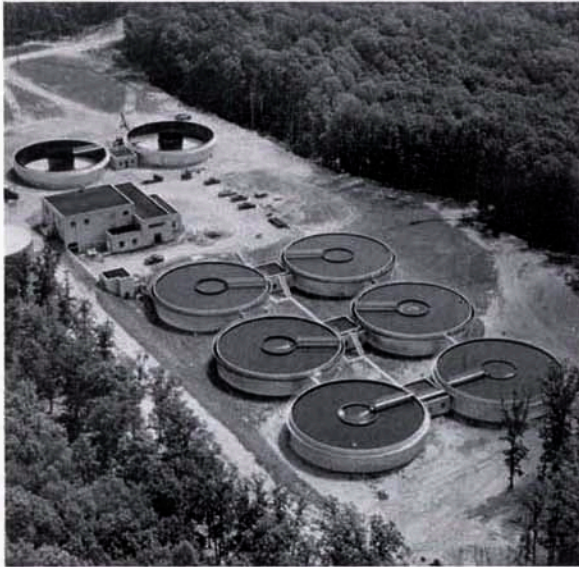
Figure 5—Percent of state and local public works capital spending financed with federal grants



Source: Apogee Research, Inc., Government expenditures databases.

taxes and fees now finance less than one-third of expenditures on state and local public works programs.

While localities are under pressure to fund an increasing portion of total public works spending, often they must contend with state restrictions on taxation or bonding. For example, as of 1985, 31 states had imposed specific property tax rate limits on local governments. Six states had either constitutional or statutory limits on the total amount of revenues that local governments could collect annually.



The Council encourages governors and state legislatures to examine the impact of such restrictions on state and local public works.

Where state constitutional or statutory limitations hinder the ability of the state and local jurisdictions to deliver essential services or adversely affect their credit ratings and finance capacity, states should assume responsibility for either remedying the situation or providing compensatory assistance.

Future Finance Options

The Council has called for a substantial increase in the capacity and effectiveness of the nation's public works. This goal is not attainable unless we first make better use of existing financial resources. In most cases, however, we cannot rely simply on wiser spending; we also must generate additional sources of funding. This burden will fall on all levels of government and involve virtually every category of public works.

The Council supports the concept that the unit of government responsible for service delivery should be the one that levies the fees or taxes to the extent possible and practical.

This will strengthen accountability for the cost and quality of public works service. Local governments already bear the lion's share of operating and maintenance costs and a growing portion of capital costs as well. But to carry out their responsibilities, they must have the proper tools, such as taxing and bonding authority and access to the tax-exempt municipal bond market.

"One point seems to be very clear. The people are willing to dig into their own pockets to pay for better roads, more schools, clean water, expanded airports, improved transportation, and the items which help shape the quality of life in the Golden State."

Don McGrew, President,
Griffith Company,
Long Beach, California
Council Hearing,
Los Angeles, July 29, 1987

It is not appropriate for the Council to propose a specific legislative program of new fees and taxes to finance public works improvements. The most equitable and efficient mechanisms will depend on the type of infrastructure problem being addressed and on local conditions, traditions, and institutions. These trade-offs are made through the political process at all levels of government. The menu of possible revenue sources listed in Table 1 provides a starting point for assembling such a program.

Many of the options in Table 1 represent simple expansions of existing user fees or related excise taxes. The largest potential sources of funding are motor fuel taxes used by the federal and state governments to support highways and some transit spending, and developer exactions and related fees imposed by many local governments. Local exactions are perhaps the fastest growing means of infrastructure finance, as well as the least well known.

"We as local communities are property tax dependent. We have no access . . . and it is true in most all New England states, to any other forms of taxation."

Pam Plumb, City Council
Member, Portland, Maine,
and 1988 President of the
National League of Cities
Council Hearing,
Boston, Aug. 4, 1987

Table 1.—Possible Sources of New Public Works Revenues

Source	Level of Government	Current Rate	Possible Increment	Potential Revenues (\$ millions/year)
<i>Motor Fuels Tax</i>				
a) Flat Tax	F,S,L	\$0.23/gal ^a	\$0.10/gal	\$12,000
b) Ad Valorem	F,S,L	(^b)	10% of fuel costs	9,500
<i>Repeal Exemptions from Highway Taxes</i>				
	F	(^c)	N.A.	1,000
<i>Heavy Truck Taxes</i>	F,S			1,000
<i>Aviation Ticket Tax</i>	F	8% of value	2% of value	800
<i>Airport Service Charge</i>	L	None ^d	\$3/passenger	1,500
<i>Inland Barge Fuel</i>	F	\$0.10/gal ^e	\$0.10/gal	50
<i>Port Tax</i>	F	0.04% of cargo value	0.06% of cargo value	250
<i>Cash Balances in Trust Fund Cash</i>				
	F	N.A.	(^f)	2,000
<i>Water Supply</i>	F,S	None ^g	\$0.10/1,000 gallons	750
<i>Waste-End Taxes</i>				
a) Generation	F,S	None	\$5/ton	1,500
b) Disposal —by Hazard		None	\$0-\$60/ton	2,600
c) Disposal —by Method		None	\$4-\$25/ton	3,200
<i>Local Impact Fees on Developers</i>	L	(^h)	(ⁱ)	10,000-15,000

NOTE: Revenue estimates show gross receipts and have not been adjusted for potential reductions in other taxes. These offsets could reduce gross receipts by as much as 25 percent.

SOURCE: Apogee Research

^a The current federal tax is 9 cents per gallon of gasoline. State taxes average 14 cents per gallon. The federal government taxes diesel fuel at an additional 6 cents per gallon.

^b Some states currently collect sales taxes on motor fuel.

^c State and local vehicles, transit buses and users of gasohol are exempt from certain federal and state taxes despite the wear and tear they cause on roads and bridges.

^d This charge, commonly referred to as a "head tax," currently is prohibited by federal law.

^e Scheduled to increase to 20 cents per gallon by 1995.

^f Assumes the current trust fund cash balances will be used over the next ten years.

^g None at the federal level; Washington is one of the few states with a water excise tax.

^h Many local governments already impose some form of negotiated fee for the infrastructure costs resulting from new development.

ⁱ Assumes that impact fees and related techniques are increased to equal 20 to 30 percent of capital spending. Potential revenues are not likely to be realized until the mid-1990s.



Sharpening Accountability for Infrastructure

Dependable, high-quality infrastructure is not the product of money alone; building and maintaining public works requires a shared vision, commitment of time and energy, and the skills of people throughout the public and private sectors. Historically, such consensus often has been a local or regional phenomenon in America. The result is a system that is highly decentralized and subject to continual change. Each community has its own laws, traditions, and other characteristics that govern the way it apportions responsibility and resources for public works.

On the whole, this system has worked well in providing public works facilities and services for a large number of communities. But too often, when problems arise, ultimate responsibility among various levels of government is not understood clearly by either the public or its leaders. When the solutions are costly, complex, and controversial, or involve a wide range of players, our tendency, as individual communities and as a nation, is to stall and point our fingers at the "other guy" until we reach a crisis. By this time we generally have foregone the most sensible and inexpensive options. Last summer's story of the Long Island garbage barge wandering forlornly around the Caribbean is one such example. Most of its cargo was used paper—a commodity that could have been recycled

for sale in many parts of the world. In the end, accountability was fixed back on the community that generated the garbage, but by then the cargo was waterlogged and without value.

The Council urges that the roles of the federal, state, and local governments be clarified to help boost the performance of the nation's public works.

In general, the Council believes the federal government should continue its primary role in hazardous waste disposal and clean-up, air traffic control, inland waterways, highways of national significance, intermodal freight transportation, minimum performance standards for environmental protection, major capital investments for flood control and shoreline protection, and the overall coordination of water resource programs.

"There is no perfect solution to solid waste disposal. . . . Everything we do will have some minor impact. . . . It must be disposed of and that place is inevitably in somebody else's backyard, and that is one of our problems."

Frank Borchardt,
Executive Vice President,
HDR Techserv,
Omaha, Nebraska
Council Hearing,
Chicago, Sept. 30, 1987



In turn, states should have lead responsibility for highways of statewide significance, non-federal dam safety, major capital financing of wastewater treatment, airport system planning, and the siting of waste disposal facilities.

Local governments, or in some cases regional authorities, should have primary responsibility for local streets and roads, public transit, individual airports, water supply systems, ports, urban stormwater, wastewater treatment facilities, and solid

waste disposal. In many instances, these services may be financed and operated by private firms through agreements with local jurisdictions. Opportunities for private participation should be considered actively by all levels of government but should not be seen as a panacea.



The impact and importance of most public works are not neatly locked within the boundaries of any given jurisdiction. One community's failure to provide good roads or adequate sewage treatment may hinder all others in the vicinity. Stewardship of the infrastructure as a whole demands some degree of accountability by all levels of government. However, in a dynamic and fractionated federal system such as ours, accountability can be measured more usefully against general principles than rigid standards.

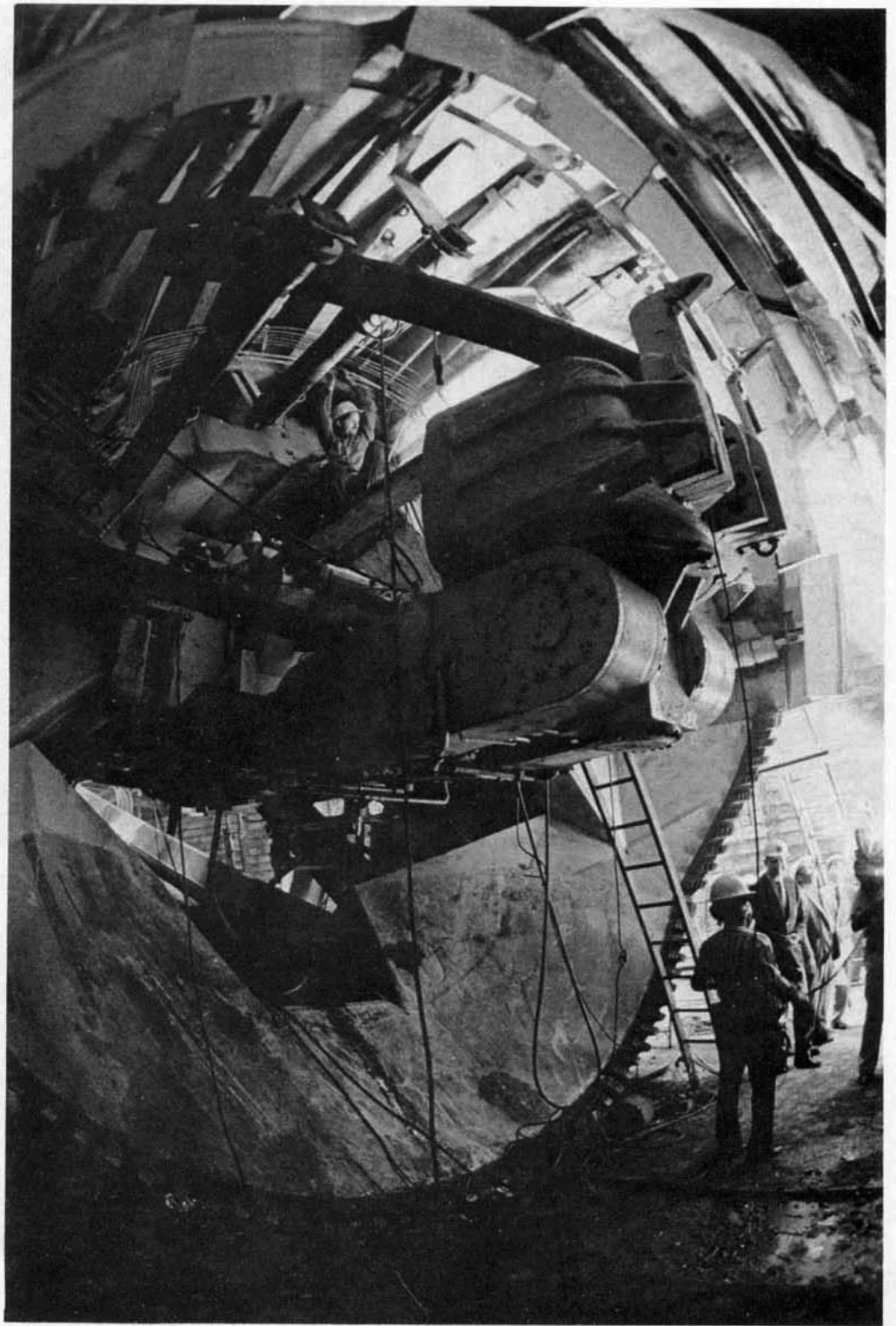
The Council believes that state and federal infrastructure policy should support local self-sufficiency to the greatest extent possible. This means that:

- (1) **Federal and state statutes should be far clearer and more rigorous in specifying who is responsible for doing what, and by what deadline.** Many laws and program guidelines governing complex projects contribute to delay and lack of accountability by failing to set timely deadlines for reviews. Nor do they specify who will resolve conflicting advice or opinions when many different agencies are involved. The immense difficulties of siting solid and hazardous waste facilities and the long, costly delays associated with port and navigation projects are reflections of this bureaucratic equivocation;
- (2) **Federal and state public works mandates should be considered carefully and allow cost-effective methods of compliance rather than rigid technical requirements.** For example, in older urban areas, "dial-a-ride" services can provide equivalent mobility for the physically handicapped more cost-effectively than retrofitting all transit vehicles;
- (3) **Rules governing state and federal programs should recognize the distinct financial and managerial needs of small and rural governments;**
- (4) **States should seek to promote cooperation among local jurisdictions, as well as between state and local government.** State advisory councils on intergovernmental relations, regional planning commissions, councils of government, and interlocal agreements are useful mechanisms to achieve this goal; and
- (5) **The federal and state governments should address the need for adequate technical information and expertise when they impose responsibilities on local government.** "Circuit riders" or other forms of technical assistance and training should be considered where appropriate.

"There is an urgent need for the assignment . . . of responsibility for the assurance of the integrity and safety of bridge structures. The current fragmentation among state agencies and separate authorities . . . fails to provide the level of public protection for which government is ultimately accountable."

David Axelrod, M.D., Chairman,
New York State Disaster
Preparedness Commission
Memorandum to Gov. Mario M. Cuomo
on the Schoharie Creek Thruway
Bridge Collapse Report,
Dec. 2, 1987





Strengthening System Performance

The principal value of public works lies in the services they deliver—e.g., reliable transportation, clean water, and safe disposal of wastes. Physical assets, such as pipes, bridges, and lane-miles of freeway, make these services possible, but they come with no guarantee that they will deliver the quality, quantity, or cost of service needed to sustain our economy and standard of living. The performance of these assets depends on a range of human and technical factors, as well as the ongoing level of capital investment and maintenance.

If, as the Council recommends, the public is asked to provide increased capital for current and future infrastructure capacity, governments at all levels have a corresponding responsibility to get the maximum value out of every dollar spent. In many cases, it may be possible and prudent to postpone some new investment by increasing efficiency through improved operations, employing more aggressive maintenance procedures, and adopting various demand management techniques (such as full-cost pricing, land-use policies, or waste reduction and recycling).

Public works design, construction, operation, and maintenance should be viewed as phases of a single process. New equipment or facilities can be designed and built for ease of operation and maintenance. Timely repairs reduce long-term operating costs and ensure the full life expectancy of existing facilities and equipment. Innovative operations sometimes can add capacity for little cost and reduce maintenance needs (e.g., computerized traffic control systems and non-corrosive snow and ice melting compounds).

The Council encourages renewed attention at every level of government to maintaining our current assets to optimum standards. Maintenance is perhaps the single most important element of governments' stewardship obligation. It also is the element that is easiest to defer, and the one most likely to be cut from the current expense budget.



Maintenance must be made more visible. This means providing understandable information on infrastructure conditions, performance, maintenance costs, and the annual amounts of deferred maintenance.

"When highways and bridges are regularly maintained there is no press coverage. When they are rebuilt it is an 'event.' There is a ribbon-cutting and plenty of press coverage. The incentives, therefore, are for public officials to purposefully starve the maintenance budget. . . . Until this motivation . . . is acted upon, we will be treated to recurrent infrastructure crises. In fact, proposals for infrastructure bonds, banks, etc., only abet this whole process."

Edward V. Regan, State Comptroller,
State of New York
Letter to the Council, January 15, 1988

It means actively educating the public—as shareholders in the nation’s capital stock—to the importance of the *long-term* integrity of the system. In fact, public education is an important element of any strategy to improve our nation’s infrastructure.

“One of the problems with the streets is that as you delay, the cost escalates. . . . If you allow them to fail without maintenance, then you are tripling or quadrupling . . . the cost to repair a street versus just maintaining it.”

Robert Horii, City Engineer,
Los Angeles Dept. of Public Works
Council Hearing,
Los Angeles, July 29, 1987

Other options that may help to lengthen the life of infrastructure systems include removing restrictions on federal and state grant funds to allow them to be used for improved operations and maintenance, and creating stronger maintenance incentives in revenue bond covenants.

The Council endorses a variety of operational improvements to increase current capacity and improve performance. For example, the primary problem with airport and airway facilities is congestion. However, new runways may not be the only answer; the solution at some airports may be to install available equipment that allows planes to depart and land safely at closer intervals. Demand management strategies, such as peak load landing fees, have reduced congestion at all three major airports serving the New York/New Jersey metropolitan area.

Demand for waste disposal facilities can be managed by waste reduction, separation, and recycling. Certain states have established goals of recycling anywhere from 15 to 40 percent of the waste stream. For example, ten states, including Oregon, Massachusetts, Maine, and Michigan, have

implemented “bottle bills” to promote recycling and reduce waste. Massachusetts also is constructing a number of materials recovery facilities throughout the state.

Regulations governing product packaging can help reduce waste. Fees or surcharges on items that are difficult to dispose of (e.g., lead, zinc, or plastics) can reduce their use. Regulations requiring reuse of, or deposits on, recyclable items such as automotive batteries and motor oil serve the same purpose.

The Council strongly encourages all levels of government to upgrade the quality and quantity of basic public works management information in order to measure and improve system performance. At present, too many infrastructure investment decisions in America are made “by the seat of the pants.” Small and medium-sized jurisdictions (and many large ones too) do not have complete inventories of existing facilities; most do not conduct regular surveys of the condition of public facilities or collect information on the quality, quantity, or cost of services. Only a handful of jurisdictions take advantage of established analytic techniques for computer mapping, life-cycle cost analysis, automated asset management, or precise tracking of growth trends.

While the up-front costs and paperwork required to set up data collection, management, and reporting systems can appear formidable, the absence of this information means that public officials must make multi-million dollar investment decisions on an *ad hoc* basis. The costs of estimating required capacity incorrectly or selecting a project ill-suited to needs can be staggering, particularly in the face of the fiscal and economic pressures facing most state and local governments.

In planning for public works investments, every jurisdiction should be guided by clearly stated performance objectives, consider alternative ways of achieving them, and have access to realistic information about costs of operation and maintenance. The capital budgeting process should





examine the entire range of public works needs to guarantee that the choices made reflect a rational set of priorities.

“Only with broad public understanding and support, especially as perceived by the responsible public officials, can any initiative or action involving political risk be successful.”

Walter T. Olson, Program Director,
Build-up Greater Cleveland
Council Hearing, Chicago, Sept. 30, 1987

The private sector and a majority of state and local governments are setting the course and establishing proper standards for capital budgeting to meet generally accepted accounting principles (GAAP) and to gain a clearer picture of their capi-

In Madison, Wisconsin, a \$40,000 public education campaign convinced many residents to shift their water use away from the 6 p.m. peak. The relatively modest investment averted the construction of a new well system once thought necessary to meet peak demands. Savings to the community were at least \$750,000 in new well construction, plus some \$60,000 a year in operating costs.

tal needs and related financing requirements and resources.

The Council believes that the federal government should consider following their example. Capital budgeting at the federal level should seek to identify, define, and present separate operating and capital components of the federal budget while *maintaining a unified budget*. Direct federal spending on capital projects—such as roads and bridges, hospitals and housing, and military bases—and federal grants to state and local governments represent distinct forms of federal capital investment that may require different approaches. However, both can benefit from better planning and more consistent allocation procedures.

By requiring an annual analysis of federal capital spending, the Federal Capital Investment Program Information Act of 1984 (passed as Title II of P.L. 98-501 which established the Council) provided a constructive first step toward the development of an overall federal infrastructure strategy. **The Council urges the Congress and the President to institute capital planning and budgeting procedures as an integral element of the federal decision-making process. Such procedures would be the next logical step toward building a stronger fiscal—and physical—foundation for America.**



The City of Saint Paul offers one example of a far-reaching program designed to take advantage of computer technology and avert future crises. The first phase, Computerized Infrastructure Inventory, was put in place in 1986, and provides a detailed data-base on the construction materials, location, age, and condition of all the city's public works facilities. The second phase, Computerized Maintenance Management, which began to be implemented this past summer, links inventory data to city maintenance schedules, requests for service, and maintenance results. The third phase, Computerized Mapping, will be installed in the next few years and is expected to provide a complete electronic map of all streets in Saint Paul. Public works managers will be able to "overlay" infrastructure information on this map in order to develop and analyze maintenance strategies.

Accelerating Innovation

The strength of America's infrastructure systems directly reflects our capacity and commitment to renew and improve public works technologies and their applications. Such technologies range from sophisticated robotics for trenchless pipe-laying to the asphalt used to pave the streets. Their development, implementation, and maintenance depend on a combination of knowledge, materials, equipment, and skilled people. Innovative, up-to-date technologies can guarantee efficient, safe, effective service and contribute to economic growth. Outdated technologies may endanger public safety, increase the cost of service, and reduce the competitiveness of business and industry.

The Council finds that the level of effort and resources applied to infrastructure research and development (R&D) in the United States falls far short of current as well as future requirements. Federal spending on infrastructure R&D in 1985 was approximately \$103 million, less than one third of one percent of total new infrastructure construction in that same year. This portion has been falling steadily in recent years, as has private sector spending on similar activities. The potential return on more research is enormous.

Such a decline in R&D is especially troubling in light of evidence that the nation is becoming more dependent on foreign producers in certain public works categories.



For instance, not a single American-owned firm currently builds transit rail cars. U.S. imports of machinery exceeded exports by \$15.8 billion, or 27 percent, in 1985. By comparison, only a decade ago, our machinery exports exceeded imports by 58 percent.

"We have lost a generation of talent in transportation . . . because we haven't been putting money to support R&D through universities."

Dr. Robert Paaswell, Executive Director,
Chicago Transit Authority
Council Hearing,
Chicago, Sept. 30, 1987

Other developed countries give greater support to public works R&D and technical innovation. Most of our trading partners invest a larger share of GNP in infrastructure R&D than the U.S. In addition, Japan and many European governments support R&D through tax incentives or matching funds, as well as flexible bidding and contracting arrangements. Major Japanese construction firms, although they had less than two-thirds the contract volume of their American counterparts, spent ten times as much on R&D in 1985. A sustained investment of this magnitude is likely to produce an increasing number of "cutting-edge" technologies that will find their way into the American public works construction market.

With nearly a trillion dollars of infrastructure fixed assets already in place in the United States, small changes in the reliability or efficiency of key components can result in major cost savings. However, we also face emerging problems of immense technical complexity—such as groundwater contamination, hazardous waste disposal, and traffic and airport congestion—that demand much more than tinkering with current methods. Technology is not the total answer, but clearly it is an essential part of it.



"Science and technology are fundamental to U.S. competitiveness. America's preeminence in research and innovation has long been the envy of the world and a critical source of our national strength."

President Ronald Reagan
State of the Union Message,
1987

Currently, no federal agency or other organization has the primary responsibility for systematically focusing national R&D efforts on infrastructure problems. Current federal programs are spread over a number of agencies with narrowly targeted missions. Ongoing research efforts conducted by other levels of government, professional organizations, and the private sector are fragmented and aimed only at incremental improvements. The opportunities for major breakthroughs and for sharing research results among all groups often are very limited.

The Council concludes that the scope and complexity of infrastructure problems throughout the United States merit a far more intense national focus on public works technology. This focus should be comprehensive—encompassing all infrastructure categories. It should be cooperative—involving representatives of all levels of government, professional organizations, and the private sector. Finally, it should be coordinated—tying together and building upon current R&D efforts.

While federal leadership and a continuing national framework are necessary, this approach need not require a large new federal bureaucracy. The Council believes that

the goal of accelerating public works innovation would be served best by regional centers responsive to the public works market and particular variations and requirements within their respective geographic areas. Such centers could be either university based or operated in conjunction with existing research institutions.

Models for this approach are readily available. The National Science Foundation recently established specialized Engineering Research Centers at a number of universities. Each is focusing on a major topic of interest in engineering—for example, systems engineering for large structures at Lehigh University—with the aim of developing a center of excellence in its field. The Department of Transportation is in the process of creating ten regional university-based centers for R&D.

The Council also recognizes that the significant technical, financial, and legal risks involved with innovation can deter development and application. Risk-sharing arrangements for demonstration projects that test technology in an operating environment can help overcome these barriers. The size of many projects and the degree of risk involved may require a federal role. The federal government has assumed such responsibility in the past—most notably in the field of energy development—and the extent of our infrastructure needs may justify its doing so again.

Funding for efforts to expand infrastructure innovation should be provided by all levels of government and the private sector, with additional support from consumers as well. The latter could be collected in the form of a small assessment on utility bills earmarked for research and development in areas related to the source of funds. For instance, a 10 cent monthly assessment on year-round housing served by public sewers would yield over \$77 million a year. A small percentage of public infrastructure capital funds also could be set aside for R&D. Potential sources include dedicated revenues, grants, trust funds, and

general revenue contributions to capital budgets.

The Council also recognizes that to encourage and implement innovative technology, we must provide adequate education and training for the people who build, manage, and operate public works. These tasks demand increasingly complex technical and professional competencies, particularly in the areas of maintenance and rehabilitation.

Enrollments in schools of civil engineering—traditionally the mainstay of the public works profession—are declining significantly just as many senior engineers are reaching retirement age. Over the period 1985–1989, about 16 percent of all engineers in state transportation agencies are expected to retire; in some states the figure will exceed 20 percent. Yet between 1984 and 1987, the number of bachelor degrees awarded

in engineering declined from 76,931 to 71,372. The share of degrees awarded in civil engineering has been falling rapidly: from about 20.3 percent in 1976 to 15.7 percent in 1982, and then to 12.8 percent in 1984. In addition, civil engineering graduates often have more financially rewarding job opportunities than are available in public works agencies.

The Council concludes that the nation has a shortage of technically competent personnel to meet future requirements of the public works profession. Federal action is needed to support and stimulate the education and training of public works professionals from all disciplines and academic specialties. Government agencies and private organizations should conduct an aggressive and sustained campaign to encourage young people to enter the profession. Major professional organizations such as the American Public Works Association and the American Society of Civil Engineers already have taken the initiative on this issue.



“There should be an immediate national concern for the provision of public works management training for the next generation of leaders in this field.”

Max Whitman, Director of Public Works, Village of Winnetka, Illinois
Council Hearing,
Chicago, Sept. 30, 1987

However, they should receive much more active support from government, business, and the education community. In addition, specialists from a range of other fields who could apply fresh perspectives should be encouraged to join the public works profession. Finally, retraining and continuing education programs should be utilized to upgrade the skills and abilities of current staff members.

A Strategy for Improving America's Public Works

No single approach is adequate to ensure the future viability of America's infrastructure. A broad range of measures is necessary to make a meaningful difference by the turn of the century. Specifically, these should include:

- **A national commitment, shared by all levels of government and the private sector, to increase capital spending by as much as 100 percent above current levels;**
- **Clarification of the respective roles of the federal, state, and local governments in infrastructure construction and management to focus responsibility and increase accountability;**
- **More flexible administration of federal and state mandates to allow cost-effective methods of compliance;**
- **Accelerated spending of the federal highway, transit, aviation, and waterways trust funds;**
- **Financing of a larger share of the cost of public works by those who benefit from services;**
- **Removal of unwarranted limits on the ability of state and local governments to help themselves through tax-exempt financing;**
- **Strong incentives for maintenance of capital assets and the use of low-capital techniques such as demand management, coordinated land-use planning, and waste reduction and recycling;**
- **Additional support for research and development to accelerate technological innovation and for training of public works professionals; and**
- **A rational capital budgeting process at all levels of government.**

None of these steps will be easy or unopposed. But the increasing cost of delay is certain. The Council urges the President, the Congress, and the nation's state and local leaders to act on this agenda immediately.