

Public Policy Brief

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**Infrastructure  
Investment for  
Tomorrow**

A Financing Plan to Eliminate  
the Deferred Maintenance on  
the Nation's Roads

*Edward V. Regan*

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## Contents

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Preface

*Dimitri B. Papadimitriou* .....7

A Financing Plan to Eliminate  
the Deferred Maintenance on  
the Nation's Roads

*Edward V. Regan* .....9

About the Author .....61

## Preface

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Hardly a day passes without a media report about the poor and deteriorating condition of the nation's infrastructure. Long traffic jams and travel delays due to reconstruction and repair along the nation's highways have become commonplace. Firsthand experience has led many Americans to believe that the country's infrastructure network, if not in chronic disrepair, is at least inadequate.

In this *Public Policy Brief*, Edward V. Regan, who formerly served as a city councilman in Buffalo, chief executive of an urban county, and chief fiscal officer of New York State, confronts the problem of inadequate maintenance and upkeep of the country's vast network of roads, bridges, and highways. He declares that deficiencies in the state of the nation's infrastructure have impeded the efficient flow of information, goods, and people so essential in a modern economy. Regan's paper is a compendium on infrastructure—the result of his extensive research and a thorough analysis of hundreds of relevant sources, including works in progress.

The Levy Institute has a rich background in the topic of public investment, especially in infrastructure, as a means to enhance productivity, growth, and the nation's long-term economic competitiveness. In June 1992, we organized a major policy conference on the role of public capital in stimulating employ-

ment and fostering growth. Subsequently, the Institute published two *Public Policy Briefs*, including the seminal research of David A. Aschauer, that tackle the subjects of (1) the broad relationships between public infrastructure and economic growth, and the merits of public investment in an environment of scarce economic resources, and (2) the specific link between public infrastructure and private sector equipment investment.

In addition, a preliminary version of the novel financing plan described in this *Brief* was outlined by S Jay Levy and David A. Levy in a January 1992 paper entitled "How to Restore Long-Term Prosperity in the United States and Overcome the Contained Depression of the 1990s." The bipartisan Competitiveness Policy Council, in its May 1994 report, "Promoting Long-Term Prosperity," endorsed a modest program of strategic public infrastructure investment, with particular interest in redressing the propensity of states and municipalities to defer maintenance.

Regan's proposal has several components, all of independent significance and merit. They weave together into a public investment program consisting of a one-time renovation that addresses the nation's infrastructure maintenance needs. He tackles the continuing practice of deferred maintenance by proposing the use of court-enforceable bond covenants that would require mayors and governors to maintain, according to professional standards, the upgraded infrastructure. Thus, he avoids the political trap that often confronts public capital programs—politicians more inclined to authorize new construction projects for the media attention they will attract than to appropriate funds for very necessary, but unglamorous but maintenance work.

The proposal herein is also sensitive to the national mood of fiscal responsibility, which measures the merits of nearly all public programs by their effects on the federal budget deficit and national debt. Because the plan relies on bond financing and a minimal federal subsidy to cover the interest payable on the taxable bonds, the modest financial impact of the program can be absorbed over a much longer span, say 15 years, rather than a one-time lump sum hit on the federal budget.

There is little disagreement over the inadequate condition of the nation's infrastructure, and the need to improve the stock of this vital national resource to enhance the competitive position of the U.S. economy in the twenty-first century. This proposal promotes that essential long-term objective by providing a meaningful and feasible vehicle to improve America's infrastructure.

Dimitri B. Papadimitriou  
*Executive Director*

November 1994

# A Financing Plan to Eliminate the Deferred Maintenance of the Nation's Roads

## I. Introduction

In the course of my campaign for the Buffalo City Council in 1965, I met hundreds of voters, many of whom complained about potholes, structurally deficient bridges and viaducts, and other infrastructure problems that plagued the city. I would jot down the information, stuff the notes in my pocket, and promise to look into it if elected. My campaign was successful, and shortly after I took office the council held its annual budget hearings. As the department heads appeared to speak for their appropriations, I fished out the notes I had taken and started questioning the DOT chief and the head of Public Works about the condition of the bridges and streets.

During a recess, a long-term council member, Joe Dudzick, gave me a lesson that has

never left me, and which I often repeat. "Kid," he said, "what's all this viaduct and bridge stuff?"

With freshman earnest I recounted the hardships of the residents and appealed for the merits of the projects.

"Kid," Joe explained, "you're talking about the 'operation and maintenance' budget, where every buck spent is an instant buck of taxes."

"Well, what do you do?" I asked.

"Let it slide," he said. "When conditions deteriorate, that calls for a major overhaul, which is funded out of the capital budget, where a buck of expenditures is only five cents in taxes—because you can borrow."

A light bulb went off in my head. The second flash quickly followed.

"Besides," this veteran of many successful campaigns said, "it's a joke to think that a newspaper reporter or TV crew would ever notice a bridge being scraped and painted. What has to happen is the bridge falls down, you go with the mayor when he cuts the ribbon to open the new bridge, and you'll be on the 6 o'clock news getting the credit."

Some 20 years later, on June 11, 1988, New York City's Mayor Ed Koch, flanked by camera crews and reporters, raised his arms in a victory sign as he stood on an elevated train platform on the Williamsburg Bridge and announced the restoration of subway service on the newly reopened bridge. Two months earlier, in April 1988, the Williamsburg Bridge had been shut down when inspectors found corrosion so extensive that they feared the collapse of the bridge. The closing of the bridge inconvenienced 240,000 daily commuters, cost business in the Lower East Side an 80 percent drop in revenues, and required an immediate infusion of millions of dollars for bridge repairs.

According to subsequent commission reports, the blame for the failure of the Williamsburg Bridge was easy enough to pinpoint:

a lack of simple preventative maintenance such as regular cleaning of expansion plates has led to earthquake-like cracks in the abutment . . . and shifting of the concrete-bearing pedestals; a combination of salt,

water leakage, and lack of regular painting is responsible for the corrosion of structural steel members; . . . and a lack of frequent monitoring can be blamed for the recent failure to identify a weak portion of the outer roadway grating, which fell into the East River. . . .<sup>1</sup>

Penny-wise and pound-foolish. In the mid-1980s, the city of New York was spending approximately \$8 million annually on repair and maintenance for its 846 bridges. By contrast, the Triborough Bridge and Tunnel Authority spent \$20 million in 1985 to maintain its seven bridges and two tunnels. But the taxpayers ultimately paid dearly for the city's policy. According to analysts, it would cost nearly three times as much to repair the Williamsburg Bridge as it would have cost to maintain it properly over the years.

While dramatic, the Williamsburg Bridge is not an atypical example of Joe Dudzick's insights at work. There are strong incentives throughout our system to defer maintenance. Over the years, many people have been troubled by these perverse incentives and have tried various methods of solving the problem. After countless discussions with experts who are well grounded in the issues—state and local government officials, community leaders and activists, academics, and financiers—I have developed the proposal outlined in this paper as an alternative approach. Its unique features, detailed in this paper, are designed to address some of the long-standing problems in this area.

Fortunately, several factors have converged to make this moment ripe for action. Over a period of years, some members of Congress have grown increasingly reluctant to hand out more funds for new construction when existing infrastructure was not being looked after. The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 was one reflection of that sentiment, encouraging states to take maintenance activities seriously, with the threat of penalties to states that do not comply. Some states have begun to address their own problems, and some are turning the tables on their own local jurisdictions, encouraging public scrutiny of the performance of localities. Gradually, both cities and states are coming to the realization that the bills for unfunded maintenance are long overdue and that the practice of "deferred maintenance" adds nothing to the asset side of the balance sheet—in fact, it is an enormous economic and fiscal liability. Also at this time, public and



private pension funds are coming under enormous pressure to invest in the communities where their workers live and retire.

Finally, at the federal level, as part of the debate on deficit spending, there is renewed interest in directing our nation's resources away from spending for immediate consumption and toward sound long-term investments. All of these factors may provide the motivation to put an end to old ways of managing the nation's infrastructure.

At the end of the twentieth century, the country faces both the opportunity and the need for an infusion of investment to preserve and upgrade our existing infrastructure. Such investments, judiciously chosen, have the potential for immediate economic improvements in many communities, while laying the groundwork for increased productivity for the future. Our goal should be an infrastructure system in good working order, capable of meeting the needs of the twenty-first century.

### *Background*

The government-owned infrastructure in the United States forms a vast, pervasive network of constructed facilities accumulated over a period of centuries and used daily by virtually every American. In dollar terms, the value of this infrastructure—consisting of the nonmilitary stock of physical structures and equipment—was placed at nearly \$2.2 trillion in 1990.<sup>2</sup> Nearly two-thirds of that amount is in the form of core infrastructure, including highways and bridges, mass transit, airports, water and sewer systems, and government-owned electric and gas utilities.

Despite the vastness of the public capital, its value has been falling in relation to the overall economy—from a postwar high of 49 percent of GDP in 1970 to a postwar low of 41 percent in 1990.<sup>3</sup> As has been extensively reported, the rate of public investment in infrastructure slowed considerably over the same twenty-year period. Between 1980 and 1990, federal spending on infrastructure fell from 4.7 percent of all federal outlays to 2.5 percent.<sup>4</sup> There are several reasons for this slowdown, including demographic changes, rapidly escalating social and health spending, the completion of the interstate system, budget cutbacks, and the failure of dedicated motor vehicle fuel taxes to keep up with inflation. While vehicle miles of travel grew more than 40 percent

between 1983 and 1990, capital investment in highways in 1991 was at about the same level (in constant dollars) as in 1965.<sup>5</sup>

In recent years, a steady stream of reports on the state of the nation's infrastructure has focused on deteriorations in the quality of existing infrastructure and the need to preserve the system (see "Findings from Recent Reports" on the next page). Although environmental and other infrastructure areas are also in need of attention, transportation has been the primary focus of those reports, as it is of this one. A series of roundtables convened in late 1993 by the U.S. Department of Transportation (DOT) in each region of the country reported:

From Hartford to Seattle, DOT was reminded that it will do little good to develop a world class transportation system if we cannot maintain what we already have. . . . DOT officials were told that existing infrastructure is in dire need of repair and that this problem affects every township and county in the nation.<sup>6</sup>

Federal grants for transportation infrastructure have been skewed toward new investment at the expense of maintenance and upkeep of the existing capital stock. In the past, new capital projects typically were funded by the federal government at a higher matching ratio than preservation; preventive maintenance was typically ineligible for federal funding entirely. The disparity in eligibility and matching ratios created yet another disincentive for states to perform preventive maintenance, since deteriorating systems ultimately became eligible for federal funding for reconstruction.

Even today, when preventive maintenance on the Interstate Highway System is eligible for federal funds, states are unable or reluctant to use federal funds for maintenance, preferring to spend the money on capital projects instead.<sup>7</sup> Facing continuing shortfalls in funding, states and localities often manage maintenance as the activity of last resort. Preventive maintenance funds are lumped together with other maintenance items in the budget, and preventive measures are often undertaken only as time permits.

The Strategic Highway Research Program of the National Research Council noted, "Given the low priority that pavement maintenance may receive from the very agencies that perform it, it is not surprising that first-year failures of pavement repairs are quite common, and that the

### Findings from Recent Reports

"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."

National Council on Public Works Improvement, *Fragile Foundations: A Report on America's Public Works*, February 1988

". . . [M]uch of the basic transportation infrastructure has been in place for at least 20 to 40 years—long enough to need substantial repair or rehabilitation, especially in heavily traveled corridors. In jurisdictions where maintenance has been neglected, deteriorated and congested rail, highway, water, and air facilities slow travel, hinder national productivity, and increase costs . . . The 1990s . . . loom as a pivotal decade for public works. Squeezed by demands for every conceivable type of public service, State and local officials have postponed routine maintenance and rehabilitation of vital infrastructure systems for years."

Congress of the United States, Office of Technology Assessment, *Delivering the Goods*, April 1991

"By and large, America's days of building whole new systems of roads are over. Attention must turn now toward an aggressive program to update, maintain, and manage our existing system."

Competitiveness Policy Council, *A Competitiveness Strategy for America*, March 1993

potential benefits of performing regular maintenance activities are not realized."<sup>4</sup> Rodney Slater, administrator of the Federal Highway Administration, (FHWA), recently noted, "collectively, the federal, state, and local governments are not investing at a rate to maintain overall conditions and performance."<sup>5</sup> The practice of deferring maintenance has had deleterious effects on the quality of the nation's infrastructure in virtually every jurisdiction.

Evidence of the problems with poorly maintained infrastructure has mounted. Each year brings anecdotes of broken water mains, bridges closed for safety reasons, highway segments repeatedly closed for repair work, and so on. Examples include:

- The main road between Baton Rouge and Shreveport, Louisiana, is so bad that truckers drive 130 miles out of their way to avoid the road.<sup>10</sup>
- In Ohio, 605 bridges have been closed, and another 4,000 show ominous signs of deterioration.<sup>11</sup> In Texas, the structural deficiencies of bridges are estimated to cost over \$2 billion.<sup>12</sup> An average of 120 bridges collapse each year across the nation.<sup>13</sup>
- Chicago taxpayers suffered over \$1 billion in emergency response costs, property damage, and lost business when a break in the retaining wall holding back the Chicago River flooded the downtown. City transportation officials had relegated repair of the leaky wall to low priority status; repair of the leaks would have cost \$10,000.<sup>14</sup>
- A 1992 survey by *Financial World* of 29 cities found that 25 of them had postponed replacement and repair of infrastructure and 20 had postponed preventive maintenance.<sup>15</sup>

#### *Impetus for Change*

Impetus for changing the current way of doing business has come from several directions over the past decade. Recognition of the maintenance gap was made explicit in the nation's most significant transportation initiative of the past two decades, the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991.<sup>16</sup> Although ISTEA does not set aside specific portions of the highway programs for maintenance activities, it does, for the first time, make certain types of preventive maintenance expenditures eligible for funding. The Federal Highway Administration is required to certify annually whether states are properly maintaining the federal-aid highway system; if maintenance is not adequate, the state must be notified within 90 days of the need to undertake corrective action.<sup>17</sup>

ISTEA goes further in recognizing the problem of deferred maintenance by requiring state and local governments to demonstrate formally by 1996 that they are "adequately maintaining the transportation systems." Specifically, states must develop, establish, and implement three management systems: one to deal with the maintenance of highway pavement, one with bridges, and the third with public transportation facilities and equipment. In urban areas, these systems must be developed and

implemented in cooperation with the metropolitan planning organizations, which usually operate with significant public involvement. The management systems must include an analysis of maintenance needs and the proposals for the optimal allocation of funds; both the analysis and the proposals are required to be aired in public. Significantly, failure to have the management systems in place by FY 1996 will result in a 10 percent penalty of apportioned highway funds and transit funds.

Another, more subtle, push toward preservation of the existing system comes from the linkage between the environmental provisions of the Clean Air Act Amendments of 1990 and travel demand measures incorporated in ISTEA. These measures and the watchdog activities of national and grassroots environmental groups are creating pressures on many regions not to build new roads and highway systems; the alternatives for many jurisdictions are to confront the need for better maintenance and to examine measures to upgrade highway and mass transit facilities to reduce the need for new roads.

The Federal Accounting Standards Advisory Board, an interagency commission that recommends accounting principles for the federal government, is discussing "a proposal on accounting for and reporting deferred maintenance. Conceptually, the proposal recommends the recording of required future maintenance and deferred maintenance."<sup>18</sup> The board is expected to promulgate the standards for public discussion in January 1995. Ultimately, such standards could apply to all executive branch agencies.

Also at the federal level, recent policy statements from the administration have produced some impetus to change. For example, Executive Order 12893, "Principles for Federal Infrastructure Investments," issued on January 28, 1994, directs federal agencies to incorporate into all infrastructure spending programs the systematic analysis of expected benefits and costs over the full life cycle of each project, to conduct periodic reviews of the operation and maintenance of existing facilities, and to encourage more effective state and local programs. In response to the executive order, the Department of Transportation issued an interim policy statement that establishes life-cycle cost analysis principles to be applied by the Federal Highway Administration in analyzing infrastructure investment and in evaluating state highway investment decisions involving federal-aid funds.<sup>19</sup> The policy would require consideration of

long-term maintenance costs, costs of repetitive maintenance and lane closings, and user costs in project cost analyses. Additional technical guidance and training courses are under development to help states apply life-cycle cost analysis to all types of new construction, maintenance, and restoration programs.<sup>20</sup>

In April 1994, the FHWA issued a policy directive making it possible to obtain contractor warranties on federal-aid highway projects. Warranties had been prohibited because it was thought that they might involve the federal government in maintenance-related work. Warranties, however, can be useful to a state interested in testing innovative highway technologies or materials without assuming undue risk or for projects that officials suspect will require additional repair work. A warranty can relieve the state transportation department of repair work for which the contractor is properly accountable. As of spring 1994, nine states had included warranty clauses in highway contracts for 33 projects.<sup>21</sup>

Still more pressure to close the maintenance gap might come from an effort to raise the accountability of public decision makers. The Governmental Accounting Standards Board (GASB), which sets the standards for state and local government accounting and financial reporting, is developing guidelines for reporting the condition of government buildings and infrastructure. The GASB and those who analyze the financial condition of state and local governments have long been concerned that a significant financial liability was quietly building up as expensive repairs and renovations were postponed for decades. The GASB recently issued a statement on Service Efforts and Accomplishments Reporting, which will lay the groundwork for standards in this area and for subsequent progress on reporting deferred maintenance.<sup>22</sup> According to informal discussions with GASB officials, ultimately that body will require state and local government financial reports to include a separate accompanying schedule that clearly and publicly documents the cost of returning infrastructure assets to an acceptable condition, including the extra costs associated with the practice of deferred maintenance.

Some states are already encouraging their municipalities to set up dedicated funds for infrastructure repairs and modifications. For example, Wisconsin's Department of Natural Resources requires municipalities to submit annual reports that assess the physical condition and perfor-

mance of their sewage systems.<sup>23</sup> Ohio requires local applicants for financial support for public works to provide a capital improvements report that includes an inventory of existing capital improvement needs, a plan detailing the capital improvement needs in the next five years, and a list of the community's priorities for addressing those needs.<sup>24</sup>

In light of these developments, the time is ripe to come to grips with the deferred maintenance problem. This report proposes a one-time project to tackle the backlog of neglect through a state and municipal infrastructure bond issue. The bonds would be partially subsidized by the federal government through reimbursement for the interest costs; they would be dedicated to upgrading and preserving existing infrastructure. Section II of this paper includes a closer examination of the problems with the nation's transportation infrastructure and estimates of the costs of maintenance and upgrading. In Section III, the bond program is explained, followed by an analysis of the available sources of funding in Section IV and positive economic effects in Section V. Additional technical information on municipal bond financing is presented in two appendixes.

## **II. Defining the Problem**

The nation's network of transportation infrastructure encompasses a wide range of modes, facilities, routes, and services, with widely varying levels of quality and modernization.<sup>25</sup> Within any given transportation system there are also widely varying conditions. One of the best-known components of the transportation infrastructure, for example, is the 45,300-mile Interstate Highway System. While over 60 percent of interstate pavement is rated "good" by the Department of Transportation, at 35 years old, it has almost outlived its design life, and parts of it are beginning to deteriorate.<sup>26</sup>

Table 1 presents a summary of physical conditions of bridges, transit, and federal-aid highways in recent years. The data indicate progress in most areas, although a backlog of deficiencies remains. Pavement condition has been improving in recent years; the percentage of nonlocal mileage rated poor or unpaved declined from 21.8 percent in 1989 to 19.5 percent in 1991. About 8 percent of bridges on nonlocal systems are in poor to critical condition. Bridge performance has improved, with only 6.8 percent of interstate bridges considered structurally deficient.

However, 25 to 30 percent of all nonlocal bridges are still considered deficient.<sup>27</sup> Transit facilities have seen across-the-board improvements in the last decade, although significant portions of capital stock are still below desirable levels.

The *Maintenance Manual* published by the American Association of State Highway and Transportation Officials (AASHTO) distinguishes four subcategories in construction and maintenance: (1) construction and reconstruction; (2) betterment; (3) physical maintenance; and (4) traffic services.<sup>28</sup> Nevertheless, the boundaries between maintenance and construction can overlap considerably and vary across jurisdictions.

The specific focus of this proposal is the preservation and upgrading of existing infrastructure, activities that keep public capital in good working order and that increase the life expectancy and sustainable use of existing infrastructure by 10 to 30 years. Excluded from consideration are the routine types of operations and maintenance activities—snow and trash removal, security services, patching potholes, fixing broken traffic lights and meters, and so forth. Also excluded, at the other end, are activities that constitute major expansions in infrastructure, such as building new highways, purchasing rights-of-way, and reconstructing bridges. The emphasis is on eliminating the backlog of deficiencies so that preventive maintenance can be successfully implemented.

Examples of the types of activities that could be included in this proposal are:

- Bridge maintenance, such as scraping and painting with specialized paints to increase the lifespan of a bridge.
- Pavement repairs that improve performance and the lifetime of the roadway, including patching, resurfacing, seal coating, repairing joints, grinding and grooving of pavement, repairs to subbase, drainage.
- Upgrading transit facilities to make public transportation more attractive and convenient to a wider range of users. Upgrading railroad tracks and equipment to allow for higher-speed rail service.



**Table 1** Summary of Federal-Aid Highway Pavement, Bridge, and Transit Conditions

## Federal-Aid Highway Pavement

Condition	1989 <sup>a</sup>	1991 <sup>a</sup>
Poor and unpaved	21.8%	19.5%
Mediocre (called low fair in 1989)	31.0%	11.9%
Fair (called high fair in 1989)	12.2%	31.9%
Good	35.0%	36.7%
Total	100.0%	100.0%

## Bridge

Performance	Number (Percent)	
	1990 <sup>a</sup>	1992 <sup>a</sup>
<b>Structurally Deficient</b>		
Interstate	3,848 (7.2%) *	3,697 (6.8%) *
Other arterial	15,989 (12.8%)	17,509 (13.2%)
Collector	33,056 (20.1%)	28,373 (17.6%)
Local	81,179 (34.6%)	68,974 (30.3%)
<b>Functionally Obsolete</b>		
Interstate	11,360 (21.4%)	10,028 (18.5%)
Other arterial	23,502 (18.9%)	22,856 (17.2%)
Collector	23,566 (14.3%)	19,744 (12.3%)
Local	33,326 (14.2%)	28,171 (12.4%)

\* Reflects percentages of all bridges in that category.

Condition	1991 <sup>a</sup>
Excellent	3.4%
Very good	27.8%
Good	33.4%
Fair/satisfactory	28.6%
Poor	5.4%
Very poor/critical	2.2%

**Table 1 (cont'd.)** Summary of Federal-Aid Highway Pavement, Bridge, and Transit Conditions

Transit	Percent in Bad, Poor, or Fair Condition	
	1984 <sup>a</sup>	1992 <sup>a</sup>
Track	56%	37%
Rolling stock	64%	24%
Power substations	34%	38%
Overhead and third rail	58%	43%
Stations	71%	34%
Bridges	68%	24%
Maintenance facilities	72%	48%
Maintenance yards	83%	65%

Sources: <sup>a</sup>U.S. DOT (1991), Exhibit 12. <sup>b</sup>U.S. DOT (1993), Exhibit 3-12. <sup>c</sup>U.S. DOT (1991), Exhibit 14. <sup>d</sup>U.S. DOT (1993), Exhibits 3-21, 3-22, 3-23, and data provided by Cliff Como, Department of Transportation. <sup>e</sup>Data apply to federal-aid highways only. U.S. DOT (1993), Exhibit 3-24. <sup>f</sup>U.S. DOT (1993) Exhibit 2. <sup>g</sup>Federal Transit Administration (1992), pp. 34-42.

- Purchase and installation of information management systems, such as geographic information systems, to monitor maintenance conditions and provide early warnings of deficiencies.
- Purchase and installation of new maintenance equipment that will permit use of better performing materials or technologies or that will increase the efficiency and safety of maintenance work.

#### *Costs of Deferring Maintenance*

As one would expect, the "ounce of prevention" adage applies to infrastructure. Preventive maintenance, such as scraping and painting bridges and applying seal coats to pavement, can slow the rate of deterioration and extend the useful life of an asset. If pavement joints and cracks are not filled with sealant, water may intrude, shortening the life of the pavement. Bridges that are not regularly painted will rust, and the weakened bridge structure can pose a safety hazard.

The costs of inadequate maintenance can be significant. According to the U.S. Department of Transportation, pavements that are allowed to

### Maintaining Bridges

Bridge inspection was a relatively haphazard affair until the 1967 collapse of the Silver Bridge over the Ohio River, which killed 46 people. Congress then established a federal program for bridge inspection, and national standards were put in place by 1972 for the scope and frequency of inspections.

Bridges that are consistently maintained can last indefinitely. They don't fall down and they do not require reconstruction. Some parts are subject to wear and tear, however, and require periodic replacement or upgrading. Expansion joints and bearings, for example, tend to need replacement every 10 to 15 years. Resurfacing of a bridge's deck with better materials can extend the life of the deck for an additional 10 years. According to a 1988 report on the status of New York's bridges:

"Without an active preventive maintenance program, the City's bridge managers are always forced to play a game of catch-up. It is only through preventive maintenance that bridges can be preserved in good working order, thus breaking the cycle of deterioration. Once a full service preventive maintenance program is carried out on an inventory of Good and Very Good bridges, not only will repair needs be minimal, but no bridge should deteriorate to Fair condition."

*Source: New York City Department of Transportation (1988).*

deteriorate into the "poor" category must be reconstructed at a unit cost two-and-a-half to four times the cost of resurfacing the road while it is still rated in "mediocre" condition. (Reconstruction typically involves removing and replacing paving material down to the subbase.) Meanwhile, until improvements are made, highway users incur added costs in the form of added vehicle maintenance, fuel and oil consumption, and tire wear. Roads in poor condition often require lower traffic speeds, adding to the time needed to complete a given trip.<sup>29</sup>

Studies of the interstate system have shown that a failure to perform needed maintenance can be quite costly. One study cited by the U.S. General Accounting Office (GAO) found that when the State of Utah deferred \$7 million in preventive and corrective maintenance costs in one year, it increased the costs of future preservation projects by \$42 million.<sup>30</sup> A 1993 report by the Advisory Commission on

Intergovernmental Relations confirms what every state and local government budget officer and auditor knows—maintenance deferred today results in higher costs in the future.<sup>31</sup>

### *Needs Estimates*

How extensive are the backlogs of deferred maintenance and needed upgrades? In 1991, the GAO reported that four out of the seven states it examined had unfunded maintenance needs for the interstate system and had failed to perform needed maintenance, such as sealing joints and cracks, painting and repairing bridges, patching concrete pavement, and repairing guardrails.<sup>32</sup> The four states with unfunded maintenance needs cited a lack of budget support, while the three states that were able to meet their interstate maintenance obligations cited legislative support for maintenance programs. In 1994, an updated GAO study reported that all six of the states it examined "lacked sufficient funds to cover needed maintenance work" and had postponed needed repairs on highway and bridges.<sup>33</sup>

In aggregate dollar terms, the size of the maintenance gap as reported by the Department of Transportation is substantial and widening. DOT's most recent cost estimates for maintaining or improving conditions remain astronomically high:<sup>34</sup>

- The annual cost over the next 20 years just to maintain highway, bridge, and transit conditions and performance at current levels was estimated in 1991 at \$55.5 billion.
- The annual cost over the next 20 years to improve highway, bridge, and transit conditions and performance was estimated in 1991 at \$73.7 billion.
- Actual capital expenditures by state and local governments on arterial and collector highways and bridges in 1991 were \$26.4 billion; the cost of maintaining those systems' performance was estimated at \$47.2 billion annually, leaving a current annual shortfall of \$20.8 billion.<sup>35</sup>

An alternative approach is to estimate the total cost of improving conditions and performance and eliminating backlogs of deficiencies (defined

as a violation of at least one minimum condition standard). As of the end of 1991, the DOT estimated the total cost of eliminating existing backlog bridge deficiencies at \$78 billion. The total cost to eliminate the existing backlog of highway pavement deficiencies and capacity deficiencies on arterials and collectors was estimated at \$212 billion, which is \$7 billion more than it would have cost to eliminate the backlog in 1989. (Capacity deficiencies represent 58 percent of the backlog; the remainder consists of pavement deficiencies.)<sup>36</sup> The total cost to eliminate the 1992 backlog of bus and rail transit deficiencies was placed at \$17.6 billion.<sup>37</sup>

Most analysts believe that the DOT's numbers represent benchmarks rather than actual targets, and even the DOT notes that they are not recommended as an investment strategy. The figures include pavement improvements on little-used roads and capacity expansions in high-cost urban areas that may never be made because of lack of need, lack of resources, or siting problems. The DOT cautions, however, that even at the high end of its estimates, transportation systems in the nation's 33 largest urban areas would not function at desired levels. Poorer roads and increased congestion are likely to occur even with reasonably optimistic assumptions about the rate of growth in travel demand, aggressive expansion of transit and intelligent vehicle/highway applications, and expanded capital investment.

### **III. The Proposal: Taxable State and Local Infrastructure Bonds**

I propose a one-time, major infrastructure program to upgrade and preserve infrastructure, funded through taxable state and local bonds. One of the unique features of the program is that the federal government is to reimburse the interest costs of the bonds, with payments spread, in capital budget style, over the "useful life" of the renovations (say, 15 years). At the present time, I recommend a modest pilot program—using as examples a \$10 billion and a \$25 billion program—for a major upgrading of roads, bridges, and transit facilities.

The program has three major components:

1. The focus is on a *one-time effort to upgrade* the nation's infrastructure, eliminating much of the backlog of deferred maintenance

needs and locking in the upgraded maintenance status. This focus on maintenance rather than new projects means limited start-up delays and few of the political machinations that often accompany new construction projects. Maintenance gains would be locked in through the use of new high-performance materials and maintenance covenants in the bond financing conditions.

2. *Partial federal financing* through a reimbursement of the interest payments on *taxable state and municipal bonds* over the life of those bonds. Real federal expenditure would be less than the actual federal reimbursement, since the federal government would collect significant taxes on the interest payments received by the holders of the taxable bonds.
3. *Attracting pension funds*. This proposal would authorize the creation of a standard fixed-income instrument that will readily compete in the Treasury and corporate bond market and be attractive to the vast pool of private and public pension funds.

#### A. *One-Time Effort to Eliminate Backlog*

Because the program is focused on maintenance activities, many of the usual start-up delays associated with large-scale construction projects would be avoided. Most state, county, and city public works departments are well aware of their top maintenance priorities. Limited or fewer studies would be needed rather than full-scale environmental impact assessments and complex feasibility studies. The often-heard charges of wasting taxpayer dollars on "pork" projects would similarly be avoided. Because maintenance is not a particularly glamorous activity, political mischief-making and media attention are likely to be minimized on these projects. The re-election incentives that distort choices made by public officials are absent.

Since the problem is that otherwise responsible officials do not fund maintenance (or find it difficult to do so) on an ongoing, year-in, year-out basis, it may seem surprising to propose a one-time maintenance upgrading program. My response is threefold. First, many jurisdictions have substantial backlogs that they cannot get out from under. This proposal would tackle those backlogs directly and presumably put the locality back in a position to use its own resources to deal with routine main-

tenance obligations as they accrue. Second, by using high-performance materials and technologies to change the nature of the facilities, less future maintenance work will be required. Third, I propose the use of maintenance covenants to lock in ongoing maintenance practices. The second and third elements are discussed further below.

### *High-Performance Roads*

One way of achieving permanent improvements in infrastructure quality is to require, as a condition of receiving federal reimbursement, the use of life-cycle cost analysis and high-performance materials and technologies, wherever feasible and cost-effective.

Road maintenance problems are exacerbated by the use of conventional technologies and design specifications that are intended to produce roads that last only 20 years. Recently federal agencies and state governments have become interested in the standards for road building used in Europe.<sup>38</sup> These standards call for thicker surfaces, foundation materials that drain better, and thicker foundations. Such roads involve higher up-front costs, but cost less to maintain; rather than being built to last 20 years, they are designed for a 30 to 50 year lifespan. Over their life cycle, they result in cost savings through reduced maintenance and less downtime (see "Redesigning American Roads"). In addition, the cost of disrupting service to perform maintenance is minimized. This cost can be significant, both to the government agency and to road users. The Department of Transportation estimates that in 1991, half the cost of all capital investments in improving pavement conditions or increasing highway capacity was spent on traffic control and rerouting.<sup>39</sup>

### *Maintenance Covenants*

In my view, backsliding—the "cut the ribbon and run" syndrome that follows construction or reconstruction projects—is eminently preventable. The demonstrable benefits of the one-time upgrading program can be locked in through the use of maintenance covenants as an essential condition of bond financing.

I propose that the federal statute creating the program require participating state and local governments to covenant, in the bonds' financing documents, that they will maintain the facilities at their upgraded level

of performance. Maintenance covenants are routinely and successfully used for such revenue-producing facilities as sewer and water lines and toll bridges and roads. (They have not, to my knowledge, been used for general obligation bonds.) Typical language, in this case applying to the Massachusetts Turnpike, is as follows:

The [Massachusetts Turnpike] Authority shall at all times . . . maintain, preserve, reconstruct and keep the same, or cause the same to be so

### **Redesigning American Roads**

The superiority of European roads comes from a mixture of technical and institutional factors. Technical factors include stronger bases and subgrade support; a concern for the total pavement structure rather than thickness alone; and superior mix design of concrete. Institutional factors include more preventive maintenance funded by gas taxes; stronger industry involvement in research; and more responsibility given to contractors in selecting materials in return for contractor warranties.

In New York State, officials recently embarked on a review of state practices in road design. Such a review had not been done since the interstate period of the late 1950s and early 1960s. Problems with existing design included its limited 20-year lifespan; poor drainage; excess faulting, joint spalling, and cracking; thin asphalt shoulders; and high maintenance costs. The goal was to achieve the opposite, increasing durability to a 50-year lifespan, improving long-term performance, minimizing traffic disruptions from constant repair, and lowering life-cycle costs.

In several demonstration projects, New York State redesigned its roads and standards, strengthening the base by adding a four-inch treated permeable base, improving drainage placement, widening the driving lanes, and adding full-depth shoulders. Life-cycle analysis and pavement performance analysis showed a large benefit in adopting the new approaches, especially for high-volume roads. The higher initial project costs of the new approaches constituted less than 0.5% of overall program costs, and were coupled with projected lower annual maintenance costs.

Source: Roger M. Larson, Federal Highway Administration, and Michael J. Cuddy, New York State Department of Transportation, presentations at the Transportation Research Board 73rd Annual Meeting, Washington, D.C., January 9-13, 1994.



maintained, preserved, reconstructed and kept, with the appurtenances and every part and parcel thereof, in good repair, working order and condition, and shall from time to time make, or cause to be made, all necessary and proper repairs, replacements and renewals.<sup>40</sup>

Other types of covenants incorporate professional architecture standards and engineering specifications and require annual public reports as to adherence to those standards and specifications. In the case of O'Hare Airport, for example, an independent consultant is hired each year to assess the condition of the airport and report on the improvements needed.

With all significant public borrowings, it is routine for a bank trustee to be appointed to represent the bondholders' interests. If the covenant is breached—for example, if the issuer has not taken steps to prevent bridge deterioration over a period of time—the trustee has the authority to enforce the covenant, including seeking a court decree. The issuer would be required to adhere to the covenant language (in the example above, requiring that the bridge be repaired). While not exactly the same situation, a case involving a financial covenant was argued before the U.S. Supreme Court. The covenant was established by concurrent statutes in two states and restricted the use of the proceeds of a bi-state authority bond issue. The Supreme Court affirmed the covenant as valid in 1977 on the grounds that the contract clause of the U.S. Constitution protects such arrangements.<sup>41</sup>

In the proposed program, the federal statute would stipulate inclusion of covenant language in each bond similar to that cited above for the Massachusetts Turnpike Authority. There is no legal (and certainly no moral or ethical) reason why the use of such covenants cannot be broadened beyond non-toll road and bridge situations. Naturally, states and localities are not eager to bind themselves in this way and would not initiate such an option. In this case, however, there is a substantial benefit to be gained—significant federal reimbursement for repairs they are ultimately going to make anyway—by agreeing to such a covenant.

The authorizing statute would state that the purpose of the covenant is twofold—to give effect to the federal ISTEA requirements that state and local governments establish maintenance programs, and to slow down the practice of state and municipal officials seeking public works grants

for new construction projects necessitated by their failure to maintain their infrastructure and public facilities.

The federal government has many tools at its disposal to encourage states to live up to their agreements. In this situation the federal government could just withhold its reimbursement of debt service to enforce the covenant. It is anticipated, however, that the bond trustees and/or the bondholders would be the ones to enforce the covenants. Language in the covenant would make it clear that the maintenance covenant is a contractual obligation, negotiated between the buyer and seller of the bond. It would state that regular maintenance can help eliminate the financial waste associated with deferred maintenance and therefore strengthen the financial and economic base of the government that issues the bonds. Regular maintenance offers some security to the bondholder for it enhances the ability of the state or local government to discharge its debt.

Bondholders have certain expectations with regard to the public works they help finance, and those expectations have meaning. If a government enters into a covenant, that government should be held to the covenant's terms—even in situations where the bondholders' security is not totally eroded by the lack of the agreed-upon maintenance. The Supreme Court in the case cited above said, "we cannot sustain the [breach] of the 1962 covenant simply because the bondholders' rights were not totally destroyed."<sup>42</sup>

While a maintenance covenant would have legal standing, its success might conceivably be more related to the ballot box than the courts. For instance, a bondholder who was also a user of the road or bridge renovated with the bond proceeds might be motivated to initiate a court proceeding if the facility deteriorated. Of course, this would be publicly recorded and noted. Governors or mayors would not want that kind of attention drawn to their administrations.

#### *B. Taxable Bonds; Federal Financing*

Since the 1820s, states and localities have been allowed to use tax-exempt financing to finance roads, bridges, schools, and water and sewer systems.<sup>43</sup> By exempting interest on most state and local debt from fed-

eral income taxes, the federal government lowers the cost of borrowing to states and municipalities. Purchasers of the state and local bonds are willing to accept a lower rate of interest because they receive interest payments that are tax-free. States and municipalities benefit because they have to pay less interest.

Tax-exempt bond financing is used only by one other country directly (Italy) and several other industrial countries indirectly. From a federal perspective, it is inherently inefficient. The exemption from taxation not only lowers the cost of borrowing for state and local governments, it benefits wealthy individuals who take advantage of tax-exempt interest payments to increase their income. (More discussion of this is included in Appendix A.)

Nevertheless, this pilot proposal is not an attempt to restrict tax-exempt bond financing. Instead, it takes a taxable-bond approach for this one-time program, for several reasons. First, the actual cost to the federal government would be lower than if tax-exempt bonds were used because of the taxes that the federal government could collect on interest payments to bondholders. Second, pension funds could become potential purchasers of the bonds (see the discussion below of "Attracting Pension Funds").

Under this proposal, state and local governments would sell clearly identified, taxable infrastructure bonds, either on a general obligation or revenue bond basis. (The choice of instrument would depend on the revenue-producing potential of the infrastructure projects in question.) The federal government would reimburse the interest payments on the bonds as those payments are made by the state and local governments.

#### *Estimating Federal Costs*

To estimate the likely costs to the federal government of the interest cost reimbursement, I have made some simplifying assumptions about interest rates and tax rates. For purposes of this analysis, assume that municipal tax-exempt bonds yield 6.0 percent.<sup>44</sup> Interest rates on taxable infrastructure bonds are likely to range from 150 to 200 basis points above tax-exempt bonds.<sup>45</sup> Major infrastructure renovation projects typically have a useful life of 10 to 20 years. As an example of the securities to be sold, I will use a 15-year instrument carrying a 7.5 percent yield.

The tables below show possible ways of structuring such a security. Table 2 illustrates a \$10 billion program with a "level principal" schedule (interest rate payments descend over time while the principal paid out remains the same); this is the usual practice for municipal bonds since it results in the lowest cost of capital to the issuer. Table 3 shows a level debt service arrangement for a \$25 billion program with ascending interest payments. Here, the total debt payments each year are the same; the repayments of principal decrease over time while interest payments start low and rise in the outyears. Although this is less typical, it may be more attractive by offering the option of lower initial interest payments (and therefore lower initial costs for the federal government). Alternative payment schedules are shown in Appendix B.

At \$10 billion, the level principal financing structure would result in a gross federal outlay of \$6 billion over 15 years. The federal outlay would start at \$750 million in the first year and gradually drop to \$50 million in year 15, the final year. However, as noted earlier, the real federal expen-

**Table 2** Hypothetical Principal and Interest Payments at 7.5% Interest Rate, \$10B Pilot Program, Level Principal (\$000s)

Year	Principal	Interest	Total
1	666,667	750,000	1,416,667
2	666,667	700,000	1,366,667
3	666,667	650,000	1,316,667
4	666,667	600,000	1,266,667
5	666,667	550,000	1,216,667
6	666,667	500,000	1,166,667
7	666,667	450,000	1,116,667
8	666,667	400,000	1,066,667
9	666,667	350,000	1,016,667
10	666,667	300,000	966,667
11	666,667	250,000	916,667
12	666,667	200,000	866,667
13	666,667	150,000	816,667
14	666,667	100,000	766,667
15	666,667	50,000	716,667
Total	10,000,000	6,000,000	16,000,000

diture in each year would be lower, since the federal government would collect taxes on these interest payments, whereas no taxes are collected on the interest payments on tax-exempt bonds.<sup>45</sup>

The extent of the offsetting taxes collected by the federal government depends on the tax status and income distribution of the purchasers of the bonds. Although the majority of tax-free municipal bonds are bought by individuals in higher tax brackets (28 percent and above),<sup>46</sup> a taxable bond would likely be attractive to potential buyers across a broader range of income. Still, using the assumptions about interest rates, the average federal tax rate of bondholders would have to be as low

**Table 3** Hypothetical Principal and Interest Payments at 7.5% Interest Rate, \$25B Pilot Program, Level Debt Service (\$000s)

Year	Principal	Interest	Total
1	2,654,168	202,795	2,856,963
2	2,465,768	391,195	2,856,963
3	2,290,741	566,222	2,856,963
4	2,128,138	728,825	2,856,963
5	1,977,077	879,886	2,856,963
6	1,836,739	1,020,225	2,856,963
7	1,706,362	1,150,601	2,856,963
8	1,585,240	1,271,723	2,856,963
9	1,472,715	1,384,248	2,856,963
10	1,368,178	1,488,785	2,856,963
11	1,271,061	1,585,902	2,856,963
12	1,180,838	1,676,126	2,856,963
13	1,097,018	1,759,945	2,856,963
14	1,019,149	1,837,814	2,856,963
15	946,807	1,910,156	2,856,963
Total	25,000,000	17,854,450	42,854,450

as 20 percent for the net cost to the federal government of this program to be the same as the cost of reimbursing a state or locality for a tax-exempt interest payment (i.e., 6 percent). This is calculated as follows: At a 20 percent average tax rate, for each taxable bond bought, the federal government gains 1.5 percent back in taxes on the interest (20 x

7.5). The net cost to the federal government after reimbursing interest payments to the issuer is then 6 percent (7.5 minus 1.5).

If the purchaser is a tax-exempt institution, such as a pension fund, federal tax collections on taxable bonds will be postponed until retirement benefits are collected by the beneficiaries. But as pension funds buy the infrastructure bonds, they buy fewer of other bonds (or stocks or mortgages). These other financial instruments, like the proposed infrastructure bonds, are taxable until they move into a pension fund portfolio (or into the portfolios of other tax-exempt entities such as university endowment funds). The size of a pension fund is stable in any given year; the addition of a new financial instrument in the marketplace does not increase its size or annual cash flow. If pension funds reallocate their resources, switching some of their purchases to these infrastructure bonds, they leave more bonds on the market to be bought by taxpaying individuals and institutions. The federal government would come out even. It might be argued that more bonds in the marketplace would cause interest rates to rise slightly; however, the supply of a large amount of new purchasing power in the marketplace would have a countervailing effect.

#### *"Scoring" the Budget*

Because the interest payments on the proposed program would be paid out over the course of a 15-year period, it would be reasonable for the federal budget to reflect the expenditures as checks are written each year over the 15-year period, with the impact on each year's budget adjusted downward for the significant taxes the federal government will collect. However, because the federal government (unlike all other large governments and businesses) does not have a capital budget process, the costs of capital projects—such as buildings or battleships that will be around for dozens of years—are not stretched over that period but are added to the federal budget in one lump sum. This unusual federal process means that a payment for immediate consumption and a payment for a long-lasting investment are handled in exactly the same manner (a factor that undoubtedly encourages the shifting of federal spending away from long-term investments).

An initial inquiry in November 1993 about the budget effects of this bond proposal elicited a not-unexpected response from the

Congressional Budget Office (CBO) that the proposal would constitute a loan guarantee under the provisions of the Federal Credit Reform Act of 1990. Under this law, a loan guarantee is defined as any "guarantee, insurance, or other pledge" by the federal government with respect to the payment of interest or principal on any debt obligation of a non-federal borrower to a non-federal lender.<sup>48</sup> The law requires that the federal budget record (or "score") the full net present value (i.e., the value of the payments if they were all paid in the first year) of all interest subsidies associated with a loan guarantee at the time the loan guarantee is disbursed. The reasoning behind this approach is presumably based on the federal budgeting process. The legislation authorizing this program would make a very strong promise that interest reimbursement payments would be made by the federal government for the life of the bonds. Therefore, according to the CBO, the budget ought to record whatever the value is of today's "promise" to pay a specific amount over 15 years.

This approach seems inconsistent for several reasons. First, no such reasoning is applied to the most sacred "promise" of all—Social Security payments. If, say, 15 years' worth of Social Security payments were lumped into one year's budget, the distortion would send the economy into a tailspin. Second, the "promise" itself is not binding; one session of Congress cannot legally commit another. Although state and local officials do rely on federal aid programs, funds for many of these must be appropriated each year (as this one would be) and the programs are subject to amendment or cancellation at any time. Cancellation, although rare, does happen with federal grant-in-aid programs (as I discovered during my tenure as a local government official).

In addition, the express purposes of the Federal Credit Reform Act of 1990 indicate that its intended scope is "Federal credit programs," and not investment programs that—like this proposal—inadvertently fit within the definition of a loan guarantee because the federal payments relate to interest charges on a debt obligation.<sup>49</sup> If an ambiguity exists, a new interpretation of either the program or the Federal Credit Reform Act could be sought by members of Congress, or the legislation could be amended so that it applies more strictly to loan subsidy and credit programs rather than to long-term investments. Finally, it is possible that the Office of Management and Budget (OMB) could reach different conclusions than the CBO as to the budget effects of this bond proposal.

Under the act, it is the director of the OMB who has responsibility, for the executive branch, for coordinating the necessary cost estimates.<sup>50</sup>

However the budget is scored, this proposed pilot project has a modest financial impact. Even scoring the budget for the full net present value, at a 7.5 percent discount rate, the cost to the federal government of reimbursing interest payments would be \$4.1 billion for a \$10 billion program, and \$9.1 billion for a \$25 billion program. I believe this is eminently affordable (see Section IV, "Sources of Funding"), particularly in light of the economic benefits infrastructure investment is sure to bring.

### *C. Attracting Pension Funds*

Municipal bond markets are broad and active, roughly comparable to the corporate debt market. In 1992, more than \$235 billion in debt, including over \$78 billion in infrastructure debt, was sold; roughly half of the total was for new capital, the other half for refinancing.<sup>51</sup> While municipal bond markets are considered healthy and pose a low credit risk,<sup>52</sup> they have undergone considerable change in the composition of investment in the last decade. Table 4 shows the percentage of municipal debt held by various categories of holders between 1980 and 1990.

Several points are remarkable about these figures. First, between 1980 and 1990, there was a dramatic drop in the municipal debt holdings of institutions (banks, savings and loans, and insurance companies)—from 66 to 25 percent—owing principally to the provisions of the Tax Reform Act of 1986. Conversely, holdings by individuals doubled during this time period and holdings by mutual and money market funds increased tenfold. In 1990, individuals held close to 63 percent of municipal debt—44 percent directly and a substantial portion (perhaps 90 percent) of the 19.5 percent of mutual and money market funds. Some municipal bond professionals argue that the absence of institutions such as banks from the municipal market could lead to instability if individual investors, in the face of some market tremor, were to sell off their holdings.<sup>53</sup> In such a situation, interest rates would rise, freezing some states and municipalities out of the bond market.

A second, related point is the virtual absence of another type of stable institution—pension funds—as holders of municipal debt. Because they



are already tax-exempt, pension funds should not, and do not, buy tax-exempt instruments. On average, private pension funds and state and local government retirement funds invest only 0.1 percent of their portfolios in tax-exempt municipal bonds; their holdings represent a mere 0.2 percent of outstanding municipal debt.<sup>54</sup>

At \$4.78 trillion,<sup>55</sup> pension funds represent the largest single pool of money in the country. The municipal bond market currently has extensive access to capital, and the availability of this pool of funds would be of great benefit. Pension funds are currently invested in virtually every recognized asset class, such as stocks, bonds, real estate, and venture capital, both in the United States and globally. The exception is bonds issued by state and local governments. Because the trustees of pension funds are fiduciaries and have an obligation to maximize return, they cannot invest in the lower-yield, tax-exempt bonds that finance roads, bridges, government office buildings, and water treatment plants.

State and local public pension funds (with assets of \$1.1 trillion), though, are under enormous pressure to invest in their communities. High-ranking officials, including the president and three cabinet secretaries, as well as Congress in the ISTEA legislation, are on record as favoring tapping the funds held by pension systems for public purposes.<sup>56</sup> The media, private labor unions, and even some trustees themselves have joined in what is developing into a small stampede. Despite the potential risk involved in some of the proposed investment, politically appointed trustees of public pension funds find it hard to resist the calls of their governors and mayors to "rebuild the cities" and "revitalize their economies."

**Table 4** Composition of Municipal Debt

	1980	1990
Commercial banks	41.7	11.3
Households	21.9	44.2
Mutual and money market funds	1.7	19.5
Insurance companies	23.9	14.0
Pension funds	1.1	0.2
Other	9.7	10.8

Source: Congressional Budget Office (1994a), Table 3, p. 24.

As a result, a variety of mechanisms have been proposed to make tax-exempt bonds attractive to pension funds, including subsidies to pension funds, infrastructure bond banks, and special financing instruments. Other proposals would have the funds make "economic" investments that private investors universally shun.

Many of the proposals, however, are quite serious. For example:

- Financier Felix Rohatyn has spoken widely about a proposed 10-year, \$250 billion public works program to create 1 million jobs, financed through bonds sold to private and public pension funds. The Department of Housing and Urban Development has undertaken a program to produce \$1.2 billion of affordable housing by attracting pension fund investment, with \$100 million in federal funds and guarantees.
- The ISTEA legislation created a commission to study the feasibility and desirability of "creating a type of infrastructure security to permit the investment of pension funds in funds used to design, plan, and construct infrastructure facilities in the United States." Following a series of hearings, the commission recommended that a National Infrastructure Corporation be established to provide a range of credit enhancement and development insurance services, as well as direct loans for certain types of infrastructure projects. Both the corporation's proposed subsidiary, an infrastructure insurance company, and the taxable debt securities that the corporation would itself issue were presumed to offer institutions such as pension funds the opportunity to invest in infrastructure.<sup>57</sup>
- Twenty-two states have passed laws or programs encouraging pension funds to make so-called economically targeted investments (ETIs), particularly in-state investments designed to create local jobs.
- In June 1994, the Labor Department issued guidelines aimed at encouraging pension funds to make investments in affordable housing and other ETIs.<sup>58</sup> The guidelines allow pension fund trustees to consider the collateral benefits of socially worthwhile projects when choosing among alternatives. Naturally, the guidelines state that the investments must be for the benefit of workers and retirees and produce competitive financial returns.

By now, many public pension funds have signed on to the ETI concept and invested in projects that range from affordable housing to golf courses to small business. Even some private funds, headquartered in New York City, indicated they would consider investing in a state-sponsored fund for business investments. Numerous critics—including myself—have charged these ETI proposals with attempting to foist risky social investing on pension funds. Typically, pension funds invest in recognized asset classes where the investments are screened by expert staff and consultants, usually after following a rigid set of investment procedures. ETIs, however, are not a recognized asset. They have no measurable rates of return and no fiscal standards by which they can be evaluated.

The pressure on public pension funds to invest in ETIs or invest through government-sponsored "bond banks" has the potential to cause real damage to the retirement income of 16 million public servants. One recent study attempting to estimate the effect of such pressures estimated that state pension funds suffered as much as \$5 billion in losses between 1985 and 1989 as a result of social investment statutes.<sup>39</sup> The pressure on pension funds, and these losses, would quickly disappear if pension funds had available to them a productive outlet for investing in the core infrastructure of their communities at competitive rates of return.

The concept advanced in this paper authorizes a standard financial instrument—state and municipal bonds. These would appeal straightforwardly to pension funds by virtue of good credit ratings and interest payments above Treasury yields. Pension funds could participate in financing the nation's infrastructure needs without going through awkward and risky twists and turns to get there. The availability of pension fund resources, along with the assets of all the individuals and institutions that normally purchase in the "taxable" market, will provide an immediate and deep market for these infrastructure bonds.

#### *D. Other Issues*

##### *Limitations on Borrowing and Administration*

While the borrowing practices of some states would permit ready adoption of this program, for other jurisdictions it may not be so easy. Some states have a constitutional prohibition against borrowing, and others

require voter approval for certain types of borrowing. Nevertheless, municipal bond financing occurs in all states. In 1992, a total of 986 bond issues worth \$22.5 billion were submitted to the electorate, and 568 were approved; however, a total of 12,709 long-term debt securities were actually issued, worth \$235 billion.<sup>60</sup> Over the decade 1982 to 1992, municipal bonds involving voter approval averaged well under 20 percent of the dollar volume of bonds issued annually.<sup>61</sup>

Administration of the program, allocation across states, eligibility requirements, initial project selection, and other issues common to any government grant-in-aid program would be resolved during the development of legislation. Needs vary greatly across states, and every program involving federal reimbursements must address the distribution and allocation of funds responsibly and equitably. I acknowledge that, while ultimately solutions do emerge, political realities make these problems very difficult to resolve. Another issue involves adjusting for variations in credit ratings, which, no matter how intense the bidding for the bonds, would produce some slight differences in interest costs.

I am recommending a pilot project because of the uniqueness of the program and its financing. This will allow experimentation and time to work through as yet unknown obstacles. It will also afford an opportunity to fine-tune the allocation and administrative matters. Of course, a pilot program cannot meet the full range of state and local infrastructure needs.

#### *Easier Access to the Taxable Market*

Federal laws and regulations surround the tax-exempt market with complex rules. They strictly limit access to this market to state and local governments and their agencies. (This is only logical, given that tax-exempt bonds represent an expensive federal subsidy.) In addition, municipalities are constrained by provisions of federal tax law from using tax-exempt debt to finance infrastructure projects that would be used, at least in part, by private institutions for private activities.<sup>62</sup> In 1989, requests for some \$2.4 billion in bonds to finance solid waste, water, and sewage treatment facilities were denied or delayed because of these limitations on private activity bonds.<sup>63</sup> The much-touted concepts of privatization of public facilities and of public-private partnership are significantly hobbled by these legal constraints. However, if states issue taxable

bonds that do not subvert federal tax collections, then the private sector would be free to join in.

Under the proposed pilot program, some types of activities might be acceptable that may be more difficult to finance under current conditions. An example might be transit station renewal programs, such as those pioneered by New Jersey Transit and the Project for Public Spaces,<sup>44</sup> where public-private partnerships could be developed to provide on-site management of transit stations and surrounding areas.

#### **IV. Sources of Funding**

A key question in proposing this program is where the money should come from, both at the federal and at the state and local levels. Each is discussed in turn.

##### *Federal Funding*

Federal funding for this program is a decision of the administration and Congress—again, a difficult one. I recommend that the funds come from an existing program dedicated to highway expenditures or through cuts in programs of lesser priority. First, the Highway Trust Fund, with a balance of \$21.1 billion at the close of the 1992 fiscal year, allocates and apportions funds to states for highway construction and related purposes. While most of the fund is undoubtedly dedicated to specific construction projects over the next few years, maintenance could and should be given a high priority in future fund spending.

Second, the federal share of this program could come from cuts in entitlement programs, which are currently the subject of intense scrutiny in the Congress. I recognize that this is politically contentious, but I also know that powerful members of Congress are considering cuts in these programs for further deficit reduction.

The spending cuts authorized in the 1993 Omnibus Budget Reconciliation Act put deficit reduction on a steady track. Projections for the deficit are showing even sharper decreases than expected. The CBO now estimates a deficit of \$162 billion in FY 1995, down from \$228 billion estimated for 1994.<sup>45</sup>

Nevertheless, feelings persist that federal spending ought to be pared back still further. Numerous proposals to cut "discretionary" spending have been put forward, but many members of Congress believe that discretionary programs have been tapped to the hilt. Even top priorities of the Clinton administration are being severely underfunded as a result of the budget tightening.

What remain in the federal budget for budget cutters to tackle are the "entitlement" programs—Medicare, Medicaid, Social Security, and federal pensions. At 54 percent of the budget, these programs represent the most substantial store of potential savings. And, indeed, no fewer than three ongoing initiatives are taking aim at reductions in entitlement programs. The Concord Coalition, headed by former senators Paul Tsongas and Warren Rudman (and buttressed by Peter Peterson's critically acclaimed book *Facing Up*), proposes scaling down the total dollar amount of entitlements eligible individuals receive as their outside income rises.

A second proposal, by Senators Sam Nunn and Pete Domenici, would apply caps to entitlement programs to gradually reduce their level of spending. A third effort, the Entitlement Commission established by the president after the 1993 deficit reduction battle, is chaired by Senators John Danforth and Bob Kerrey. The commission issued an interim report and a final report is forthcoming in December with recommendations for entitlement program cuts. Cognizant of the rising pressure to cut spending, congressional leadership has publicly pledged to tackle caps on spending, limits on cost-of-living increases, and reductions of benefits to wealthier individuals.

The movement to cut entitlement programs is beginning to take on a life of its own. So it is reasonable to ask the question: What will be done with the resulting resources? I believe that relegating the funds freed up solely to reduce the budget deficit would have constricting and counterproductive effects on the economy. Adapting the phrase coined by Robert Shapiro of the Progressive Policy Institute, I recommend instead the notion of "cut and invest."<sup>60</sup> Harking back to the original plan of the Clinton campaign, the idea is to shift the federal budget away from its overemphasis on immediate consumption toward a more balanced mixture of consumption and investment. In this approach, some of the savings from entitlement cuts would be directed toward long-term produc-

### **From Consumption to Investment**

In December 1992, the Levy Institute sponsored a critically praised *Firing Line* debate on deficit spending, pitting a team led by William F. Buckley, Jr., against one led by Lester Thurow on the resolution: Reducing the National Deficit in the Next Four Years Is a Top Priority.

Thurow's team praised the positive aspects of deficit spending, while the Buckley team accused it of crippling the economy. Nevertheless, both teams were in agreement that shifting spending from consumption purposes to investment in America's assets would go a long way toward solving the underlying economic problems of the country. Thurow offered this thought: "What we really ought to be focusing on, right across the American economy . . . is how do we 'twist the dials' of the American economy so investment goes up and consumption . . . eventually ends up being a smaller part of the total." The response from his debating opponent, former Senator Warren Rudman: "We agree on that."

tive investments, with an emphasis on infrastructure; of course, other savings would be used to reduce the deficit.

#### *State and Local Funding Sources*

Although this proposal includes federal reimbursement of interest charges, state and local bond issuers would still be required to find the money to pay back the principal on the bonds. As any fiscally prudent official will admit, bonds are a financing option, not a revenue source. How will this proposal help states and localities that have made very different political choices up to now or that have been unable to maintain their infrastructure properly because of revenue shortfalls?

First, not every state or locality will take part in this proposal. This is a limited pilot program, partly to elucidate the level of interest of states and local jurisdictions. It is worth noting that, with the marked improvement in the national economy, as of mid-1994 state budgets are in the best financial shape in years.<sup>67</sup>

Second, even cities with serious financial difficulties seem able to pursue large projects such as new sports stadiums or convention centers, often

with questionable financing. Where the will exists, the revenue seems forthcoming. The object of this proposal is to present states and localities with enough incentive to find the necessary revenues to do what must be done.

Third, as noted earlier, the impetus from numerous directions is leading many localities to realize that they must begin to devote attention to neglected maintenance. This proposal saves them a significant part of the cost and produces an almost immediate economic benefit in terms of better roads, transit, and bridges.

Finally, it should be pointed out that there is a slight windfall for state and local governments participating in this program, if they levy an income tax. For while the federal government would fully reimburse states and localities for their interest payments on the bonds, state and local governments can still tax the interest paid to resident bondholders. For example, Missouri has a 6 percent income tax, and St. Louis a 1 percent income tax.<sup>68</sup> If a St. Louis resident were to purchase a Missouri taxable infrastructure bond, the city would receive \$1 and the state \$6 for every \$100 of interest paid on the bonds.

## **V. Effects on the Economy**

Recent economic trends have given cause for considerable encouragement. The U.S. economy grew at a 4 percent rate during 1993. Productivity recovered from a low of 0.8 percent average annual growth rate in the 1980s to 1.6 percent in 1990–1993.<sup>69</sup> Net private investment is beginning to expand from the unprecedented low levels of the early 1990s. Despite signs of improvement, a large program of infrastructure maintenance and upgrading can still benefit the economy by creating jobs, particularly for the relatively unskilled, and by raising productivity, thereby contributing to long-term economic growth.

### *Job Creation*

The current economic recovery has been clouded by continuing downsizings and business restructurings that show few signs of abatement. With over 8 million people unemployed, and many more involuntarily



working part-time, questions have been raised about the ability of the economy to generate sufficient jobs at a range of skill levels to meet the needs of the American work force.

Observers of the U.S. labor market are beginning to note a split between skilled and unskilled workers and their prospects for job security. Secretary of Labor Robert Reich noted in a recent article, "the American work force is becoming divided. Part is moving very rapidly into a world of new work, where skills and flexibility are paramount. . . . But another part of the work force, anchored to outdated structures and styles of production, is being left behind. . . . Economic statistics combine the two economies and obscure the distinction. But jobs and incomes in the two economies are diverging."<sup>70</sup>

Whether or not a heavy emphasis on job retraining and skills development will suffice to meet the needs of the relatively unskilled segment of the work force, public investment has the ability to do so. Infrastructure maintenance is one type of public investment that not only creates jobs immediately, but is likely to create jobs for the relatively unskilled. One estimate is that \$1 billion spent on road maintenance will generate jobs for 25,000 people directly and another 15,000 people indirectly.<sup>71</sup> New construction puts fewer people to work (although at higher wages). According to one study, the records of the Port Authority of New York and New Jersey show that "maintenance employs 40 percent more workers than new building projects or major reconstruction."<sup>72</sup>

#### *Productivity and Growth*

In addition to jobs, infrastructure plays a vital role in productivity advances. Intuitively, fixing roads and bridges means less axle damage to trucks, fewer road mishaps and congestion, lowered cost of goods, and increased transportation productivity. Congested and deteriorated highways, broken water mains, inadequate sewage treatment, reduced transit services—all of these infrastructure deficiencies reduce productivity, drive up the cost of goods and services, and inhibit people's access to employment. Any state or local government official who has tried to attract business facilities to a particular area and has watched business decision makers turn up their noses at cracked concrete and rusting bridges knows the practical meaning of those statements.

While common sense would indicate that a solid infrastructure aids the economy, quantifying the costs of infrastructure deterioration and the benefits of its revitalization is more complex. Some studies have examined the effect of pavement conditions on the operating costs of a vehicle (including the costs of fuel, oil, tires, maintenance, repairs, and depreciation). For example, the difference between a "good" pavement and a "poor" pavement could mean an increase of from 24 to 42 percent in the costs of operating an automobile.<sup>73</sup> But many of the benefits of improved infrastructure are simply not accounted for in standard economic measures. Lower commuting times would benefit workers who are currently spending an estimated 11 percent of all labor force work hours on the highways.<sup>74</sup> Other costs and impacts—such as the effects of improved infrastructure on congestion, commuting time, and business-related travel time—are harder to determine and quantify.

Statistical modeling of the role of infrastructure in spurring economic output has been the subject of a substantial body of work over the last five years, with divergent results. Various studies have estimated the effects of increasing the value of the nation's infrastructure by 1.0 percent on total national output (GDP) as ranging from 0.02 percent to 0.44 percent.<sup>75</sup> Critics have charged that the effects estimated in these studies depend heavily on the statistical method used, the data base considered, and the scope of the regional or national effects analyzed.

However, even critics who dismiss any linkage between infrastructure investment and private sector productivity are willing to concede that a program of infrastructure maintenance may be a useful economic tool.<sup>76</sup> The effect would not necessarily be uniform across all public infrastructure programs. But well-selected public investments in infrastructure can play an important role in furthering economic growth. That common-sense understanding is supported by a widely reported 1988 study by the Congressional Budget Office of cost-benefit studies of individual transportation projects. The CBO estimated that investments to maintain the current quality of the highway system would have provided a real rate of return of 30 to 40 percent as a national average; selective expansion of the system in congested urban areas would have yielded returns of 10 to 20 percent.<sup>77</sup>

In August 1994, a National Bureau of Economic Research working paper, "Infrastructure and Public R&D Investments and the Growth of

Factor Productivity in US Manufacturing Industries," reported on a comprehensive analysis that examined the effects of publicly-financed infrastructure and research and development on productivity growth. Authors M. Ishaq Nadiri and Theofanis P. Mamuneas conclude that although the measured effects on productivity vary across industries, "publicly financed [infrastructure] capital affects industry significantly."<sup>79</sup>

Critics might still charge that a large program of public investment could "crowd out" private investment, since both types of investment draw on the same funds available in the economy. Private investment is believed to have a more direct effect on spurring economic growth than public investment. However, Sharon Erenburg, at the Levy Institute, has recently shown that the "crowding out" effect of public capital spending on private sector investment is outweighed by the positive "crowding in" effects of public investment. Her research indicates that each one percentage point increase in public infrastructure spending would yield an estimated 0.6 percent increase in private sector equipment investment per year in the short run (and 0.4 percent annual increase on the private side over the long run). Her findings suggest a complementary relationship between public and private investment, "with additions to public capital acting as a catalyst for private equipment spending."<sup>80</sup>

Private investment—particularly on equipment—has been identified as one of the most important and direct influences on productivity and economic growth. J. Bradford DeLong and Lawrence H. Summers have found that among OECD countries, a causal relationship between machinery investment and economic growth exists: higher equipment investment fuels faster growth. Their results show that every one percentage point of GDP investment in equipment is associated with a one-third percentage point increase in GDP growth.<sup>81</sup>

The recent boost in private equipment investment is a most welcome development; for the first time since early 1990, gross private fixed investment exceeded 14 percent of GDP in the fourth quarter of 1993, placing it back in the normal postwar range.<sup>82</sup> Nevertheless, this surge appears to be responding to pent-up demand for new technologies and efficiency-improving equipment following the lingering recession of the early 1990s, rather than an increase in capacity and new plant in response to a widespread business expansion. Far from becoming irrelevant, a commitment to public infrastructure could serve as a catalyst for

sustained equipment investment, a sure harbinger of steadily rising levels of productivity and, ultimately, of our standard of living.

## **VI. Conclusion**

This proposal for public investment in infrastructure can help both to strengthen prosperity and to restore existing facilities to good condition. As a nation, we have always placed great stock in the efficacy of public investment, through a long history of building harbors, canals, rails, roads, and water and sanitation systems. Underlying this proud record was the public's belief that it is possible to make investments today that will build a better tomorrow.

Americans understood how investment in the public sphere was not so different from investing in our own households and businesses: families, after all, set up separate savings accounts for a child's college education; businesses take out loans to pay for new machinery. We believed that the purpose of long-term investments was to change things for the better for the next generation—to make possible sustained growth, improved productivity, and a strengthened private sector.

That belief has been severely shaken, but not destroyed. The surest way to achieve better jobs and a stronger economy is to create the conditions for business investment spending and productivity improvements. Government has a vital, if limited, role to play in achieving this goal: a program to quickly upgrade the nation's infrastructure that will lay the basis for a prosperous, competitive twenty-first century.

## APPENDIX A

### Inefficiencies of Tax-Exempt Financing

The tax exemption on income from municipal bonds is a subsidy to states and municipalities provided by lowering federal tax collections on the payments to bondholders. The inefficiencies of the subsidy, however, have long been noted. One analyst stated:

Because the interest rate on tax-exempt bonds typically must be sufficiently generous to attract investors in lower tax brackets, purchasers of bonds in higher tax brackets receive higher interest rates (larger tax savings) than is necessary to induce them to buy tax-exempt bonds.<sup>43</sup>

To illustrate the inefficiency, assume that \$100 billion of tax-exempt bonds will be issued at 6 percent.<sup>44</sup> Alternatively, if these bonds were taxable, at an average interest rate of 7.5 percent, the holders would receive \$7.5 billion in interest. Using an average tax rate of 28 percent, the federal government would collect \$2.1 billion in tax revenues each year (28 percent tax x \$7.5 billion). Because state and local governments would be paying 7.5 percent instead of 6 percent, they would be losing \$1.5 billion per year. So with tax exemption, states and localities get a subsidy of \$1.5 billion, at a cost (in this example) to the federal government of \$2.1 billion, 40 percent more! I estimate that from 1989 to 1993 the federal government lost \$22 billion because of the tax exemption; states and localities only benefited from half that amount.

This is not the only problem associated with tax exemption. Some have suggested that by lowering the cost of borrowing, conceivably the federal government provides a perverse incentive to states and municipalities to defer maintenance so as to create capital projects. If they had to borrow at normal rates, they might be more diligent at maintaining their assets. Similarly, one writer has noted:

By abstaining from the taxation of interest on state and local bonds, the federal government buys down the rate on all such bonds. In such an artificial market, there is an incentive to do more borrowing than a free market would countenance.<sup>45</sup>

The Congressional Budget Office has inveighed against the practice of permitting tax-exempt bonds for private purpose activities, noting that even if some of these activities merit federal support, "tax-exempt financing is not the most efficient way to provide assistance."<sup>85</sup> The CBO's concerns are twofold: first, that the benefit being provided by the federal government goes not just to the borrower but to the investors in the bonds as well and, second, that "because tax-exempt financing is not a budget outlay, the Congress may not routinely review it as part of the annual budget process."<sup>86</sup>

## APPENDIX B

## Calculating the Federal Share

An alternative structure of principal and interest payments is shown in this appendix.<sup>47</sup> Tables B1 and B2 show payments for a \$10 billion pilot program, with a level debt service arrangement. With "level debt service," the total debt on the bond paid each year remains the same; Table B1 shows this arrangement with interest payments decreasing; Table B2 shows it with interest payments increasing. Tables B3 and B4 show the corresponding schedules for a \$25 billion program.

**Table B1** Hypothetical Principal and Interest Payments at 7.5% Interest Rate, \$10B Pilot Program, Level Debt Service, Interest Decreasing (\$COOs)

Year	Principal	Interest	Total
1	382,872	750,000	1,132,872
2	411,588	721,285	1,132,872
3	442,457	690,415	1,132,872
4	475,641	657,231	1,132,872
5	511,314	621,558	1,132,872
6	549,663	583,210	1,132,872
7	590,888	541,985	1,132,872
8	635,204	497,668	1,132,872
9	682,844	450,028	1,132,872
10	734,058	398,815	1,132,872
11	789,112	343,577	1,132,872
12	848,295	284,577	1,132,872
13	911,918	220,955	1,132,872
14	980,311	152,561	1,132,872
15	1,053,835	79,038	1,132,872
Total	10,000,000	6,993,085	16,993,085

**Table B2** Hypothetical Principal and Interest Payments at 7.5% Interest Rate, \$10B Pilot Program, Level Debt Service, Interest Increasing (\$000s)

Year	Principal	Interest	Total
1	1,061,667	81,118	1,142,785
2	986,307	156,478	1,142,785
3	916,297	226,489	1,142,785
4	851,255	291,530	1,142,785
5	790,831	351,954	1,142,785
6	734,696	408,090	1,142,785
7	682,545	460,241	1,142,785
8	634,096	508,689	1,142,785
9	589,086	553,699	1,142,785
10	547,271	595,514	1,142,785
11	508,424	634,361	1,142,785
12	472,335	670,450	1,142,785
13	438,807	703,978	1,142,785
14	407,660	735,126	1,142,785
15	378,723	764,063	1,142,785
Total	10,000,000	7,141,780	17,141,780



**Table B3** Hypothetical Principal and Interest Payments at 7.5% Interest Rate, \$25B Pilot Program, Level Debt Service, Interest Decreasing (\$000s)

Year	Principal	Interest	Total
1	957,181	1,875,000	2,832,181
2	1,028,969	1,803,211	2,832,181
3	1,106,142	1,726,039	2,832,181
4	1,189,103	1,643,078	2,832,181
5	1,278,286	1,553,895	2,832,181
6	1,374,157	1,458,024	2,832,181
7	1,477,219	1,354,962	2,832,181
8	1,588,010	1,244,171	2,832,181
9	1,707,111	1,125,070	2,832,181
10	1,835,144	997,037	2,832,181
11	1,972,780	859,401	2,832,181
12	2,120,739	711,442	2,832,181
13	2,279,794	552,387	2,832,181
14	2,450,779	381,402	2,832,181
15	2,634,587	197,594	2,832,181
Total	25,000,000	17,482,714	42,482,714

**Table B4** Hypothetical Principal and Interest Payments at 7.5% Interest Rate, \$25B Pilot Program, Level Debt Service, Interest Increasing (\$000s)

Year	Principal	Interest	Total
1	2,654,168	202,795	2,856,963
2	2,465,768	391,195	2,856,963
3	2,290,741	566,222	2,856,963
4	2,128,138	728,825	2,856,963
5	1,977,077	879,886	2,856,963
6	1,836,739	1,020,225	2,856,963
7	1,706,362	1,150,601	2,856,963
8	1,585,240	1,271,723	2,856,963
9	1,472,715	1,384,248	2,856,963
10	1,368,178	1,488,785	2,856,963
11	1,271,061	1,585,902	2,856,963
12	1,180,838	1,676,126	2,856,963
13	1,097,018	1,759,945	2,856,963
14	1,019,149	1,837,814	2,856,963
15	946,807	1,910,156	2,856,963
Total	25,000,000	17,854,450	42,854,450

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## Notes

1. New York City Department of Transportation (1988), 19, 31.
2. Winston and Bosworth (1992), 269. An alternative estimate places the value of the capital stock of the nation's roads, bridges, mass transit, airports, ports and waterways, water supply, wastewater treatment, and solid waste disposal facilities at \$2.7 trillion, slightly over 20 percent of the country's total public and private capital stock. Alicia Munnell 1992 estimate, reported in U.S. Army Corps of Engineers (1993), 53.
3. Winston and Bosworth (1992), 268.
4. Congressional Budget Office (1991), Table 1.
5. Slater (1994).
6. U.S. Department of Transportation, Office of the Secretary (1994), 20.
7. U.S. General Accounting Office (1994), 48-50.
8. Strategic Highway Research Program (1991), 1.
9. Slater (1994), 2.
10. Oberstar (1993).
11. Oberstar (1993).
12. Statement of Bob Cuellar, Texas DOT, cited in U.S. DOT (1994), 21.
13. Wieman, (1993), 43.
14. McDermott (1992), 20.
15. *Financial World* (1992), 54.
16. *Intermodal Surface Transportation Efficiency Act* (1991), Laws of 102nd Congress-1st Session, December 18, 1991, P.L. 102-240, Section 1002.
17. Further, if the 90-day deadline is not met, the Department of Transportation must withhold approval of additional federal-aid highway projects until proper maintenance is carried out. According to a recent study by the U.S. General Accounting Office, "FHWA has no measurable standards for determining the adequacy of maintenance." In the absence of these standards, "FHWA will have difficulty making any meaningful determination of maintenance adequacy or inadequacy." (U.S. GAO (1994), 52.) In responding to GAO, FHWA agreed that it should continue working with states to improve maintenance practices and techniques; but disagreed that additional guidance or standards were needed.
18. Taken from a memo from Ronald S. Young, Executive Director, Federal Accounting Standards Advisory Board (FASAB), to all FASAB Board Members, July 13, 1994.
19. *Federal Register* (1994).
20. U.S. GAO (1994), App. II et seq. The GAO study notes that in a 1993 AASHTO survey of 38 states, 27 states reported using life-cycle cost analysis in making new highway construction decisions; however, only 16 of the states used life-cycle costing for evaluating rehabilitation designs (66).
21. U.S. GAO (1994), 21-26.
22. Governmental Accounting Standards Board (1994) and Ives (1992), and subsequent conversations with Mr. Ives.
23. Hatry, Morley, and Liner (1993), 125.
24. Hatry, Morley, and Liner (1993), 123.
25. While this paper focuses primarily on surface transportation (highways, bridges, transit), it may be equally applicable to non-transportation applications, such as environmental infrastructure. Water and wastewater bonds currently make up a sizable portion of the municipal bond market, and the upkeep and upgrading of environmental infrastructure pose problems for numerous municipalities. In one major city, the Congressional Office Of Technology Assessment found that lining the aged water supply pipes could have prevented a leakage rate of almost 40 percent of treated drinking water over a period of several decades.
26. Statement by Dean Carlson, Executive Director of the Federal Highway Administration, reported in Federal Highway Administration (1993), 11.

27. "Bridge condition" refers to the physical condition of the bridge and is perhaps the closest to a measure of safety. Structural deficiencies and functional obsolescence, as shown in Table 1, are more a matter of performance than the level of maintenance. According to the Department of Transportation: "Most bridges that are structurally deficient are not in danger of collapse, but they are likely to be load-posted so that heavier trucks will be required to take an alternative, longer route. Functionally deficient bridges are those that do not have the lane widths, shoulder widths, or vertical clearances adequate to serve the traffic demand." U.S. DOT, Report to Congress (1994), 119.
28. AASHTO (1987), 8. Historically, the "3R" activities—resurfacing, rehabilitation, and restoration—were considered "heavy maintenance;" more recently, 3R activities have tended to be classified as capital improvements.
29. U.S. DOT (1993), 160.
30. U.S. General Accounting Office (1991), 26.
31. U.S. Advisory Commission on Intergovernmental Relations (1993).
32. U.S. General Accounting Office (1991), 26–28.
33. U.S. GAO (1994), 46.
34. U.S. DOT (1993), Exhibit 4.
35. U.S. DOT (1993), Exhibit 5.
36. U.S. DOT (1993), 150.
37. U.S. DOT (1993), 193. The American Public Transit Association estimates that transit agencies need an annual average of \$29.7 billion from 1995 through 2004 (constant 1993 dollars) to maintain current service; and \$37 billion annually to implement planned service expansion. The shortfall is estimated at \$15.3 billion annually. APTA (1994).
38. See, for example: Federal Highway Administration (undated), and Strategic Highway Research Program (undated).
39. U.S. DOT (1993), 160.
40. 1993 Trust Agreement, Massachusetts Turnpike Authority and Shawmut Bank, N.A., as Trustee, March 1.
41. *United States Trust Co. of New York, Trustee v. New Jersey et al.*, 431 U.S. 1 (1977) at 27.
42. *Idem.* The author is grateful for the assistance of Eugene Harper of Mudge Rose Guthrie Alexander & Ferdon on this point.
43. Apogee Research, Inc. (1993), 27.
44. Bloomberg's AAA 20-year municipal GO bonds averaged 6.025 in July 1994.
45. Individual state or local entities would, of course, sell bonds based on their own credit ratings. Municipal bond experts, such as William Cobbs of the Public Resources Advisory Group, New York, assume that the federal promise of reimbursement would have little or no impact on the interest rate needed to sell the bonds, since it is not a guarantee. But intense bidding for these bonds by pension systems and other investors could lower the rate that has to be offered.
46. The author would like to thank Mr. Cobbs for debt service figures and advice on financing concepts.
47. Of the tax-exempt interest reported to the IRS in 1991, 79 percent was reported by taxpayers with adjusted gross income (AGI) over \$40,000. The 28 percent tax bracket begins at \$36,900 for married persons filing jointly and at \$22,100 for single persons. About 50 percent of the tax-exempt income was reported by taxpayers with AGIs over \$100,000, most of whom would be in the 36 percent or 39.6 percent tax brackets. (Internal Revenue Service (1994), Table 1.4.)
48. Federal Credit Reform Act of 1990, Section 502(3).
49. Federal Credit Reform Act of 1990, Sections 501(1), (2), and (4).
50. Federal Credit Reform Act of 1990, Section 503(a).
51. Congressional Budget Office (1994a), 21.
52. According to the Public Securities Association, between 1980 and 1990, the municipal bond market had an average annual default rate of 0.4 percent, compared to 5.5 percent in the corporate bond market. A report by J. J. Kenny Co.

- found that between 1980 and 1991, only 53 municipal bond issues defaulted out of 69,656 that were rated. Cited in *Washington Post* (1994), H1.
53. Congressional Budget Office (1991), 47, fn. 9.
  54. Congressional Budget Office (1991), 3.
  55. Limbacher (1994).
  56. See, for example, Vise (1994).
  57. Infrastructure Investment Commission (1993), 2-3. Following national hearings, the proposal was criticized as cumbersome and ultimately too expensive for pension funds.
  58. Vise (1994). These Labor Department guidelines do not directly apply to public pension plans, which are exempt from the portions of the Employee Retirement Income Security Act that the guidelines interpreted. Public plans are, however, subject to fiduciary and investment requirements under state law and, if they are "qualified" plans under section 401(a) of the Internal Revenue Code, they are also subject to prohibitions on certain transactions with certain related persons under IRC section 503(b).
  59. Romano (1994), 20.
  60. "Bond Buyer 1993 Yearbook" (undated), 11, 22.
  61. *Idem*.
  62. Internal Revenue Code of 1986, as amended, Sections 141, 146, and 147.
  63. Apogee Research (1993), 20.
  64. Surface Transportation Policy Project (1993), and materials supplied by Project for Public Spaces, Inc.
  65. Congressional Budget Office (1994b), Table A-6.
  66. Shapiro (1994). Shapiro's use of the term refers to cutting spending and tax subsidies to particular industries, while investing the money in education, worker training, and basic research, as well as transportation infrastructure.
  67. Only 4 of the 50 states took in less revenue in fiscal 1994 than they had budgeted for. *Governing* (1994), 37.
  68. Consumer Clearing House (1994).
  69. Competitiveness Policy Council (1993), 2.
  70. Reich (1994).
  71. Montgomery and Wyss (1992), 46.
  72. Cited in Wieman (1993), 45.
  73. This is true for speeds of 35 miles per hour; at 55 MPH, the costs would be 29 to 50 percent higher. See U.S. Department of Transportation (1992), Table 4-9.
  74. Rebuild America Coalition (undated), 10.
  75. Hulten and Schwab (1991).
  76. Holtz-Eakin (1993).
  77. Congressional Budget Office (1988).
  78. From National Bureau of Economic Research working paper no. 4845, "Infrastructure and Public R&D Investments, and the Growth of Factor Productivity in U.S. Manufacturing Industries," by M. Ishaq Nadiri and Theofanis P. Mamuneas.
  79. Erenburg (1994).
  80. DeLong and Summers (1991).
  81. Jerome Levy Economics Institute (1994), 1.
  82. Michael (1990), 1672.
  83. The author wishes to thank Stuart Opatowsky of Loew's Corporation for assistance in developing this section of the appendix.
  84. Donlan (1994).
  85. Congressional Budget Office (1944b).
  86. Congressional Budget Office (1994b), 331.
  87. The author wishes to thank William Cobbs of the Public Resources Advisory Group for assistance in developing this appendix.

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## About the Author

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