

# Fix It First, Expand It Second, Reward It Third: A New Strategy for America's Highways



## MISSION STATEMENT

The Hamilton Project seeks to advance America's promise of opportunity, prosperity, and growth. The Project's economic strategy reflects a judgment that long-term prosperity is best achieved by fostering economic growth and broad participation in that growth, by enhancing individual economic security, and by embracing a role for effective government in making needed public investments. We believe that today's increasingly competitive global economy requires public policy ideas commensurate with the challenges of the 21st century. Our strategy calls for combining increased public investments in key growth-enhancing areas, a secure social safety net, and fiscal discipline. In that framework, the Project puts forward innovative proposals from leading economic thinkers — based on credible evidence and experience, not ideology or doctrine — to introduce new and effective policy options into the national debate.

The Project is named after Alexander Hamilton, the nation's first treasury secretary, who laid the foundation for the modern American economy. Consistent with the guiding principles of the Project, Hamilton stood for sound fiscal policy, believed that broad-based opportunity for advancement would drive American economic growth, and recognized that “prudent aids and encouragements on the part of government” are necessary to enhance and guide market forces.





# Fix It First, Expand It Second, Reward It Third: A New Strategy for America's Highways

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NOTE: This discussion paper is a proposal from the authors. As emphasized in The Hamilton Project's original strategy paper, the Project was designed in part to provide a forum for leading thinkers across the nation to put forward innovative and potentially important economic policy ideas that share the Project's broad goals of promoting economic growth, broad-based participation in growth, and economic security. The authors are invited to express their own ideas in discussion papers, whether or not the Project's staff or advisory council agrees with the specific proposals. This discussion paper is offered in that spirit.

**BROOKINGS**

# Abstract

The roads and bridges that make up our nation’s highway infrastructure are in disrepair as a result of insufficient maintenance—a maintenance deficit that increases travel times, damages vehicles, and can lead to accidents that cause injuries or even fatalities. This deficit is in part due to a prioritization of new projects over care for existing infrastructure and contributes to a higher-cost, lower-return system of investment. This paper proposes a reorganization of our national highway infrastructure priorities to “Fix It First, Expand It Second, and Reward It Third.” First, all revenues from the existing federal gasoline tax would be devoted to repair, maintain, rehabilitate, reconstruct, and enhance existing roads and bridges on the National Highway System. Second, funding for states to build new and expand existing roads would come from a newly created Federal Highway Bank, which would require benefit-cost analysis to demonstrate the efficacy of a new build. Third, new and expanded transportation infrastructure that meets or exceeds projected benefits would receive an interest rate subsidy from a Highway Performance Fund to be financed by net revenues from the Federal Highway Bank.

# Table of Contents

ABSTRACT	2
INTRODUCTION	5
CHAPTER 1: FIX IT FIRST: NEW PRIORITIES FOR THE HIGHWAY TRUST FUND	8
CHAPTER 2: EXPAND IT SECOND: INTRODUCING THE FEDERAL HIGHWAY BANK	16
CHAPTER 3: REWARD IT THIRD: PERFORMANCE STANDARDS AND INTEREST RATE SUBSIDIES	19
CHAPTER 4: PROJECTING BENEFITS AND COSTS	21
QUESTIONS AND CONCERNS	23
CONCLUSION	26
APPENDIX 1: METRICS FOR JUDGING EXISTING ROAD INFRASTRUCTURE QUALITY	27
AUTHORS AND ACKNOWLEDGMENTS	29
ENDNOTES	30
REFERENCES	31



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# Introduction

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**M**ore than five decades ago, the federal government built an excellent interstate highway network that connects all large metropolitan areas, ports, and airports within the contiguous United States. This network that connects places is foremost a network that connects people: it allows people (and firms) to interact, creating opportunities for trade and economic activity. Places that have the greatest accessibility, that enable more people to interact in less time, produce the greatest wealth (Glaeser 1998). Workers face less risk of unemployment in cities where they can easily commute to many possible employment centers. These economies of agglomeration drive the formation of cities and regions, and require transportation of all kinds: passenger and freight; local and intercity; highway and transit; and rail, air, and water. Transportation infrastructure is crucial for facilitating trade within, between, and across states. In addition, this infrastructure is a crucial determinant of quality-of-life issues, including the length of our commutes, the quality of our air, and the livability of our neighborhoods.

Unfortunately, we fail to realize the full benefit of our system of infrastructure and risk losing what we have because we are not investing enough to maintain aging bridges and highways and because we do not use the system as efficiently as we could. The existing transportation network represents long-lived capital: highways, bridges, and tunnels last for decades. Moreover, much of our existing highway network was built many years ago. For example, the average age of a bridge on the U.S. Interstate Highway system is more than forty-five years old; most bridges were designed for a lifespan of forty to fifty years. Over time, infrastructure deteriorates. Most of the time this deterioration is unheeded, but salient disasters remind us of the importance of updating aging infrastructure. The fatal collapse of the I-35W Mississippi River Bridge in Minneapolis brought needed attention to the question of the state of repair of America's bridges. Roads have similar, though not nearly as dramatic, issues: poor roads impose wear and tear costs on vehicles, can lead to accidents, and require further costs in packaging to avoid damaged freight.

To continue to enjoy the level of network performance that we often take for granted, maintenance, repair, rehabilitation, reconstruction and enhancement of this existing system is urgently needed. Based on previous studies, we estimate that an annual expenditure of \$145 billion is needed to maintain highways and bridges at current performance levels.<sup>1</sup> Other studies have much higher estimates, up to \$194 billion.<sup>2</sup>

In addition to the threat of losing the benefits we have from previous investments because of lack of maintenance, we are getting less value from our system because we are using it inefficiently. Time is our scarcest asset. In cities, though, the high population density that facilitates the economic benefits of living and working in close proximity also imposes costly delays from congestion.

According to the 2010 Texas Transportation Institute (TTI) Urban Mobility Report, in 1982 each commuter lost 14.4 hours in congestion, while in 2009 each commuter lost 34 hours (or 4.8 billion hours lost in traffic nationwide) (TTI 2010, Exhibit 2, National Congestion Measures, 1982 to 2009). For the five most congested metropolitan areas for auto commuters (Chicago, Houston, Los Angeles, San Francisco and Washington, DC) the annual monetary cost of time lost per commuter varied between \$1,110 and \$1,738. Recent total congestion costs for urban areas are approximately \$120 billion a year (TTI 2010). At least as important as recurring (and predictable) delay, is the unreliability of travel times, which leads travelers to leave early to guarantee being on time.

The fundamental causes of these problems—underinvestment in existing infrastructure and the inefficient use of infrastructure that contributes to congestion—are misaligned incentives in our process for investing in infrastructure and a mispricing of use.

Our system of federal grants matched to state funds puts no value on benefit-cost analysis. As a result, new, often inefficient, infrastructure investments are preferred by policymakers at the expense of more mundane repair and maintenance of existing infrastructure that may have higher

returns. There is an odd juxtaposition with respect to our investments in improving existing transport infrastructure versus building new highways. Many of the transportation infrastructure projects in the news have nothing to do with maintenance and repair. Earmarks such as the proposed (and ultimately canceled) Gravina Island Bridge in Alaska (the infamous “Bridge to Nowhere”), while a small share of the federal transportation budget, garner outsized attention. At the same time, research shows that, in general, rates of return to new transportation infrastructure investments have been falling in recent decades.<sup>3</sup>

Similarly, as a nation we have collectively chosen not to use market incentives to signal scarcity at times of peak use (rush “hour”). This lack of clear price signals leads roads to be overused: there is too much congestion (and pollution) at the peak, since people do not fully account for the delay and pollution they cause. Consequently, the scarce resource of road space during peak times is misallocated.

To summarize the policy challenge, transportation is critical. The United States has benefited greatly from the investments made, especially starting with the Interstate Highway Act in 1956, and saw large economic gains for decades. However, as that infrastructure has aged, the United States is currently underinvesting in maintaining existing transportation infrastructure and overinvesting in other, less-productive areas.

Such skewed investment patterns would be less likely to take place if states were given appropriate incentives to use benefit-cost analysis and were rewarded for meeting performance standards tied to social goals such as safety, lowered pollution levels, and avoiding cost overruns. States also need to be incentivized and enabled to implement innovative road pricing strategies in order for them to curb the problem of traffic congestion and system unreliability. As different states undertake alternative strategies, the best strategies will be emulated, and all states will learn from the experience.

We propose an infrastructure transportation policy that we call “Fix It First, Expand It Second, and Reward It Third.” This policy reforms federal transportation financing to alter the incentives facing states and cities as they plan their transportation infrastructure.

- **Fix It First.** All revenues from the existing federal gasoline tax would be redirected away from new construction and instead used primarily to repair, maintain, rehabilitate, reconstruct, and enhance existing roads and bridges.
- **Expand It Second.** Funding for states to build new and expand existing roads would come from a newly created Federal Highway Bank (FHB). The funding would be contingent on meeting strict performance criteria and demonstration of an ability to repay the loan through direct user charges and capture of some of the increase in land values near the transportation improvement.
- **Reward It Third.** New and expanded transportation infrastructure that meets or exceeds preset performance targets—including targets for an on-time completion date, and social goals such as environmentally responsible investment—will receive an interest rate subsidy from a newly created Highway Performance Fund that would be financed by net revenues from the FHB.

A key innovation inherent in each of these proposals is ensuring that funding for investment and maintenance be firmly tied to those who benefit from the use of that infrastructure through user fees, and by providing state and local officials with the correct incentives to invest only in high-value projects. New capacity will be funded via the FHB and the Highway Performance Fund. Introducing performance standards for infrastructure investments will lead to prioritizing higher-quality infrastructure projects.

It is politically infeasible to coerce states into taking actions that they may view as detrimental, or uncertain and risky. The narrow version of our proposal will not change the general formula that dictates how federally collected highway user fees are redistributed to states, which is largely a political matter. In the more comprehensive form of our proposal, the formula to allocate funds to states would be revised to correspond with the priorities of the new program so that all states would receive funds proportionate to the size and condition of their infrastructure.



Importantly, our proposal encourages pricing of major roads. Examples include the ability to build new toll lanes that guarantee reliable travel times, such as today's high occupancy toll (HOT) lanes, or conversion of existing roads or lanes from being unpriced to being priced. Under our proposal, no new federally financed road expansion will be unpriced. Expansions will be financed through the FHB. Projects that meet performance standards will be rewarded by the Highway Performance Fund. The knowledge generated from the implementation of road pricing in different forms and different locations will provide crucial insights, through the introduction of information technology and off-peak price discounts, about how to reduce the costs of congestion in metropolitan areas.

Imposing performance standards on infrastructure investments gives incentives to states to prioritize the most efficient infrastructure projects. More-efficient infrastructure investment means better industrial organization that promotes trade and competition. For instance, evidence shows that the benefits of agglomeration economies—the benefits that

business and workers derive from locating near each other—are choked off by congestion. More efficient investment means that more people will have greater access to employment and spend less time stuck in traffic. Properly done, these standards would mean safer roads and bridges, fewer accidents, and more environmentally friendly investment.

This proposal focuses on highway infrastructure. Highway and transit infrastructure are different animals. Although highway funds to states have comparatively fewer strings, federal funds allocated for transit are more highly regulated by the U.S. Department of Transportation (DOT) and each project competes in a federal selection process. Whereas transit funding also needs reform, the way highway funds are allocated are the “low-hanging fruit” with large opportunity for short-term, implementable reform. Ultimately, it is our hope that this proposal will prove successful for highway infrastructure, and encourage more-stringent performance standards across a broader range of infrastructure investments.

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# Chapter 1: Fix It First: New Priorities For The Highway Trust Fund

*“To meet expected needs in the coming years, MnDOT [the Minnesota Department of Transportation] will need to direct virtually all available funds to preservation projects.”*

*Minnesota Office of the Legislative Auditor  
(Office of the Legislative Auditor, State of Minnesota 2008)*

Our first substantive proposal, Fix It First, directs revenue from the federal gasoline tax away from new highway construction. Under the narrow form of our proposal, the remaining funds would be allocated across states via existing formulas. A more-comprehensive form of our proposal would see this money allocated based on national maintenance needs. Benefit-cost analysis conducted by each

state’s Department of Transportation would be used to ensure that funds are allocated efficiently.

Presently, maintenance, repair, and rehabilitation of existing infrastructure, as well as safety and environmental enhancements, compete with new infrastructure for priority, and often come up short as the priorities of politicians and the electoral cycle differ from the life cycle of infrastructure. Most states do not use any type of stringent benefit-cost analysis to determine the allocation of these federal dollars within the state.

Currently, of the \$38.5 billion Federal Highway Program, approximately 30 percent is used for capacity adding investments.<sup>4</sup> The FY2010 allocation of total federal highway spending is shown in Table 1.

**TABLE 1**  
**FY2010 Federal-aid highway fund apportionments**

Spending Category	Dollars (thousands)	Percentage of total
Interstate maintenance	7,040,519	18
National Highway System	8,704,980	23
Surface Transportation Program	9,010,263	23
Bridges	5,726,448	15
Congestion mitigation and air quality improvement	2,372,787	6
Highway Safety Improvement Program	1,502,675	4
Appalachian Development Highway System	470,000	1
Recreational trails	84,160	0
Metropolitan planning	303,967	1
Railroad highway crossings	220,000	1
Coordinated border infrastructure	210,000	1
Safe routes to schools	180,000	0
Equity bonus	2,692,857	7

Source: FHWA 2010a

Note: The Equity Bonus provides funding to States based on equity considerations. These factors include low population densities, median household income of less than \$35,000, high mortality, and high fuel tax rates (FHWA [1])

BOX 1

### The Major Programs Financed by Federal Highway Funding

Many of the programs listed in Table 1 have overlapping funding:

**Interstate Maintenance (IM).** This program provides funding for resurfacing, restoring, rehabilitating, and reconstructing most routes on the interstate system.

**National Highway System (NHS).** The NHS includes approximately 160,000 miles of roadway—principally the interstate highway system—as well as other roads that are important to the nation’s economy, defense, and mobility.

**Surface Transportation Program (STP).** This program provides flexible funding that may be used by states and localities for projects on any federal-aid highway, including the NHS, bridge projects on any public road, transit capital projects, and intracity and intercity bus terminals and facilities.

**Highway Bridge Program (HBP).** This program provides funding to enable states to improve the condition of their highway bridges through replacement, rehabilitation, and systematic preventive maintenance.

Examining the NHS program, we observe 35 percent of funds go to added capacity (either new facilities or reconstruction that adds capacity). Similarly, 23 percent with the Surface Transportation Program (STP) goes to added capacity.<sup>5</sup> Note that there is also a significant share of these funds (about one third) in the “other” category, which includes transit improvements. We recognize that this broad category funds some valuable projects, but we recommend that these funds be directed to enhance the “Fix it First” core goals. To illustrate, Figures 1a and 1b show pie charts of the current allocation of the NHS and STP. This allocation is in addition to the Congestion Mitigation and Air Quality Improvement Program, which is largely capacity adding.

FIGURE 1A

### Federal Spending on the National Highway System

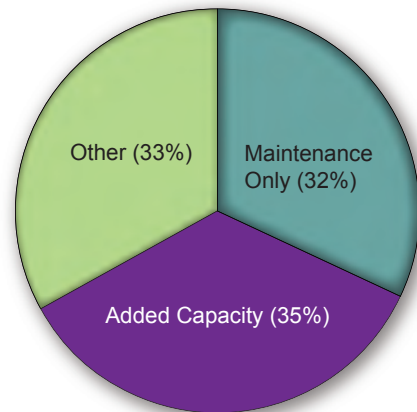
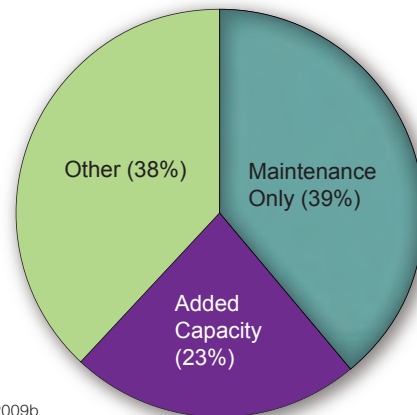


FIGURE 1B

### Federal Spending on the Surface Transportation Program



Source: FHWA 2009b

In addition, the balance in the Federal Highway Trust Fund has shrunk from \$23 billion in 2000 to an estimated deficit of \$8.1 billion in 2010, requiring a taxpayer bailout. At the same time that the federal government is budgeting less money for maintenance and repair, state and local governments also are cutting back. Opposition to new auto registration fees and higher state gasoline taxes has reduced these revenue sources (Schoen 2007).

#### RATIONALE

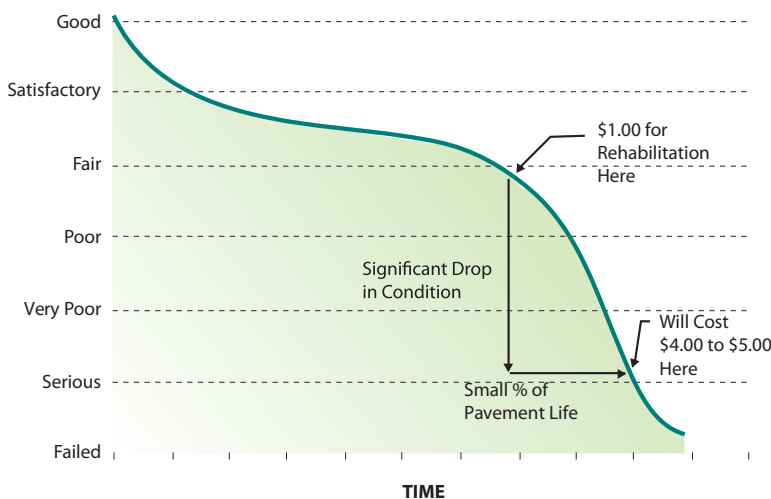
The Interstate Highway System has been the backbone of our transportation system since its inception. Both residential communities and economic employment centers have arisen

around its interchanges. Local productivity is higher in areas where the highway was completed earlier (Fernald 1999). Such highways have led to new suburban population centers (Baum-Snow 2007). On the cost side, several factors arise.

Although there is no transparent top-line number that shows the scope of our maintenance deficit, the weight of the evidence indicates we are not allocating enough to maintenance. The extreme case of the collapse of the I-35W Mississippi River Bridge in Minneapolis illustrates the point (Box 2). The cost of retrofitting the bridge with new gusset plates, while not free, and improving bridge redundancy (the bridge was designed as fracture critical, and so failure at a single point would result in failure of the whole), would have been far less than the cost of rush building a new bridge (estimated at \$250 million), much less the toll in thirteen lives and 145 injuries, in addition to the anxiety caused for millions who learned about the August 1, 2007, tragedy. The bridge had been rated “structurally deficient” in 2005 (and this observation was corroborated subsequently when inspections found further cracking and fatigue), indicating it was in need of a major overhaul or replacement (DOT 2008). Despite its poor condition, according to Minnesota Governor Tim Pawlenty, the bridge was not scheduled to be replaced until thirteen years later, in 2020 (Elsen and Sander 2007).

The same logic applies, in a less spectacular fashion, to pavements. Figure 2 shows the extent to which pavements deteriorate over time, and suggests there is a cost-minimizing point of intervention before the pavement deteriorates too much. Research from scholars at Michigan State University suggests that for every \$1 spent on preventive pavement maintenance, between \$4 and \$10 is saved on rehabilitation (CTC & Associates 2003, Baladi et al. 2002).

**FIGURE 2**  
**Typical Pavement Lifecycle Curve**



Source: Federal Aviation Administration (FAA) 2010.

According to the American Association of State Highway and Transportation Officials (AASHTO), the NHS comprises only 4.1 percent of the nation’s total road mileage but carries 44.8 percent of vehicle traffic. Despite its importance, much of the system is not in good repair; approximately 37 percent of NHS miles are in fair, poor, or very poor condition (FHWA 2008b).

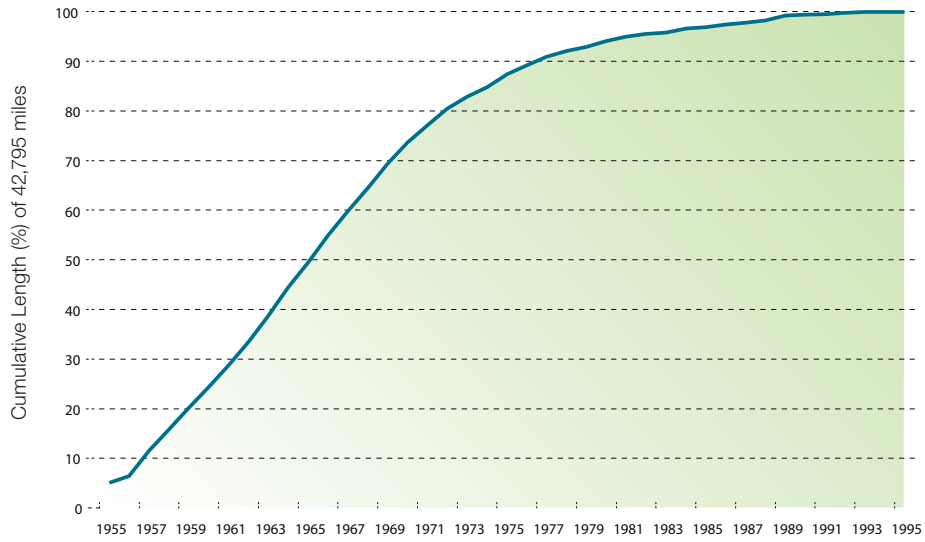
Figure 3 shows the average age of infrastructure on the U.S. Interstate Highway system is more than forty-five years old. While there has been some progress in reducing the number of structurally deficient bridges and in replacing fracture-critical bridges, there is much to be done, and the problem worsens each year as unreplaced and unrepaired bridges age.

To illustrate, the Southeast Michigan Council of Governments (a planning organization including the Detroit region) reports that the percent of lane miles in poor condition has increased from less than 10 percent in 2004 to more than 30 percent in 2009, showing just how quickly roads can deteriorate with even a short deferral of maintenance due to the economic downturn (Southeast Michigan Council of Governments 2011).

There are 115,104 bridges on the NHS, which includes interstate bridges. Of these, 5.6 percent are considered structurally deficient, down from 7.9 percent in 1995.<sup>6</sup> AASHTO estimates that a \$5.1 billion average annual investment would clear the NHS bridge investment backlog by 2024. This is in addition to the cost to maintain, repair, and rehabilitate bridges that are not on the backlog. Figure 4 shows just how many bridges DOT considers “structurally deficient.”

Judging from sources such as the American Society of Civil Engineers (ASCE) Report Card and state performance management systems, evidence abounds that preservation is underfunded; without new revenue sources, or, as in our proposal, a greater share of existing revenues, this problem will magnify.

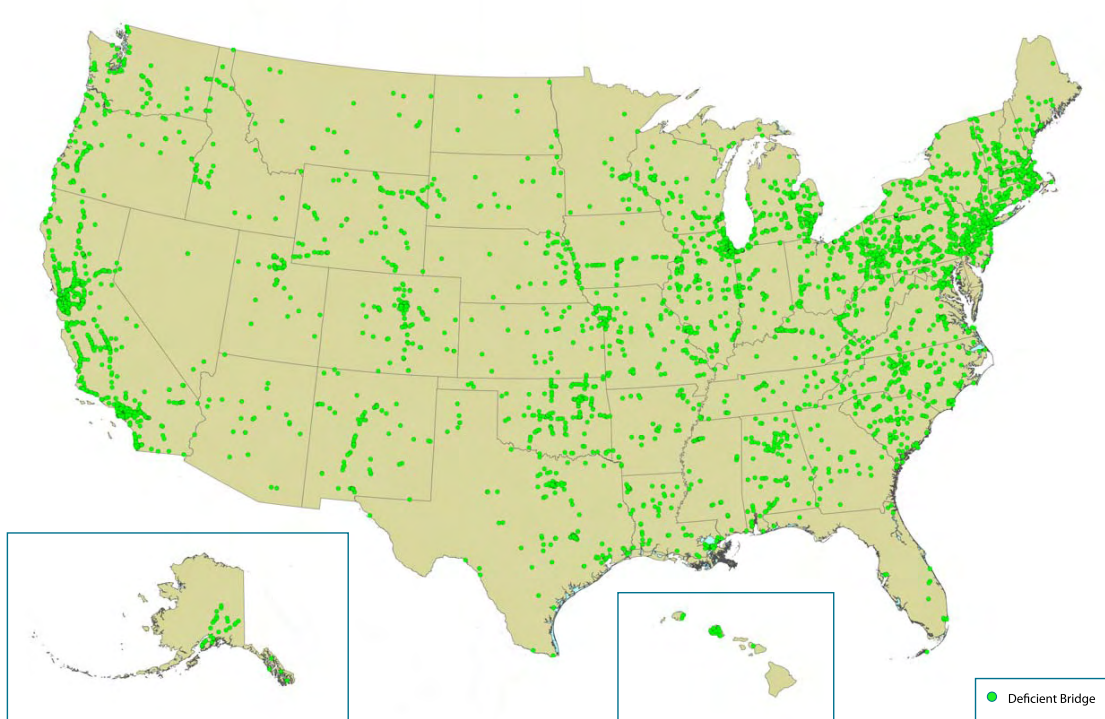
**FIGURE 3**  
**Deployment of the U.S. Interstate Highway System**



Source: FHWA

Note: Half of the interstate highway system is from 1965 or before. Unless something is done, failure will be more frequent, the Interstate system is aging and nearing the end of useful life for many components.

**FIGURE 4**  
**Structurally Deficient Bridges on the U.S. National Highway System**



Source: DOT 2007b

Highway repair has lagged in part because of rising construction costs. The prices of basic building materials such as concrete and steel have increased globally. Higher oil prices have translated into a higher cost of asphalt. At the same time that the costs of construction have risen, federal funding for maintenance and improvements has declined.<sup>7</sup>

There are other system enhancements that can be made to improve the efficiency of the existing highway system. These system enhancements include targeted safety enhancements, traffic control improvements, and environmental improvements. Evidence suggests that safety improvements such as guardrails or shoulder rumble strips can have high benefit-to-cost ratios. Shoulder rumble strips have estimated benefit to cost ratios ranging from 30:1 to more than 60:1 in the appropriate context (DOT).

With national annual congestion costs in the ballpark of \$120 billion, states also need to be given the ability to experiment with new forms of pricing and means to lower congestion. Pricing unpriced roads, for instance, by converting existing lanes to HOT lanes, as discussed in the Introduction above, can help lower congestion and reduce the need for added capacity.

#### **PROPOSAL 1: RESTRICTING THE HIGHWAY TRUST FUND TO SUPPORT THE EXISTING SYSTEM**

To shift the investment focus to “Fix It First,” we would restrict the use of the federal Highway Trust Fund (collected from highway user fees, including the federal gas tax) from adding capacity to the existing system. Instead, the funds primarily would be dedicated to maintain, repair, rehabilitate, reconstruct, replace, and enhance existing transportation infrastructure that is part of the NHS. Reserving the federal Highway Trust Fund for system preservation and enhancement would mean a boost in federal highway investment for these purposes of close to \$12 billion per year. Combined with any additional revenues that states raised from increasing their gas taxes, these funds would put us on the right path toward repairing our nation’s aging infrastructure.

Implicitly, items such as the Highway Bridge Program (HBP) and Interstate Maintenance (IM) would be expanded, while the NHS, STP, and Congestion Mitigation and Air Quality Programs would be reshaped so that funds would no longer be spent to add capacity.

We also propose that the remaining funds be allocated within a state by using benefit-cost analysis whenever possible. We envision allocating 1 percent of a state’s Highway Trust Fund disbursements, ranging from \$1.5 million to \$33 million per state, depending on their current allocation (FHWA 2009a), to be used to expand and build this analysis capability into each state’s Department of Transportation. Realistically, this may apply only to projects that are above some minimum price tag. The federal government should develop criteria to estimate benefit-cost tests for different types of projects and provide resources for states to conduct these analyses above a threshold cost (such as \$1 million), and require states to work down the list of projects starting with those with highest return.

We envision two different versions of how our proposal could be implemented. The narrower version of the proposal would be to use the existing federal-state formula for allocating funds, simply restricting these funds for preservation and enhancement investments that do not add capacity. This restriction alone would serve to increase the amount of funding used to support existing infrastructure in each state. Given the political nature of much of existing highway spending, this would be the easiest way to implement this proposal.

A broader version of our proposal would reallocate funding across states based on the condition of existing infrastructure. Roads and bridges in the worst state of repair would be given priority for funding. Such a formula would allocate funds via a weighted average of the state’s bridge deck by condition and road surface area by condition. To illustrate, a road in very poor condition might garner five times as much funding as an otherwise equivalent road in very good condition. Similarly, a bridge in very poor condition might be weighted five times as high as an identically sized bridge in very good condition. To develop a funding formula that combines roads and bridges, we need to understand the costs of each. While more research is required to ascertain appropriate weights, to a first approximation, a bridge is on the order of one hundred times as expensive as a road, per unit area.

It is unlikely that this more-comprehensive proposal would be palatable to all states. One way this could be made more acceptable would be to allow states to opt in. We envision that states with the most need will opt in. Under an opt-in style implementation, the states that do opt in to the program would receive collectively as much money as they otherwise would, but some opt-in states might get more in Year 1 and others would get more in Year 10, depending on the size and condition of their NHS network. In Year 1, the state with the worst roads would receive more funds, but those funds, which would have to be spent to restore existing roads, means that in Year 2 that state may no longer still have the worst roads,

...the funds primarily would be dedicated to maintain, repair, rehabilitate, reconstruct, replace, and enhance existing transportation infrastructure that is part of the NHS.

and another state would get more funds. Over time, all states will get a fair share of the funds, because infrastructure will cyclically deteriorate and be renewed on different cycles in different states.

Under the existing system, most states and localities need to supply only 20 percent of the funds for projects involving federal funds (Congressional Budget Office [CBO] 2011). However, there are other projects on the NHS with primarily local benefits for which states receive no federal funding. On average, we estimate state spending on NHS roads is approximately 55 percent federal and 45 percent state (see American Public Transportation Association [APTA] 2010, 18, for a discussion of match rates).

Here we also present alternatives, one that minimizes budget disruptions, another that addresses the problem more comprehensively. Although increasing the match rate will increase the total amount of funds allocated for maintenance, we do not want this to deter states from supporting the program. To minimize disruption to current budgets, the existing match rates will stay the same as they are now.

Down the road, if remaining funds prove to be insufficient to support current infrastructure, increasing the match rate, along with increasing the gas tax, could help close this gap. According to the CBO, evidence suggests that if federal spending decreased, then spending by states would increase to some extent (CBO 2011). To more fully address infrastructure problems, a more comprehensive version of our proposal would increase the state match rate. Based on usage of facilities, the match should be a much smaller share of federal funding, since most traffic on the NHS is local. Funds could be “recaptured” by pricing the roadway accordingly.

We recognize that this proposal on its own, by spending more on existing infrastructure, is likely to reduce the overall investment in new highway capacity across the United States. Our second proposal presented below will present a new financing option for states that seek to build new highways. From society’s perspective, we do not

believe that we sacrifice much by focusing investment efforts on preserving existing transportation infrastructure. As the declining returns to infrastructure investment indicate, the best projects have already been built (Nadiri and Mamuneas 1996).

Investing in preserving existing infrastructure is a less-risky investment than constructing new highways. Past investments in highways have influenced the locational decisions of households and firms. In this sense, the existing urban form is shaped by past investments in highways. Land use decisions are based on the accessibility of existing facilities. In contrast, a new transit or highway project, especially one built to serve a greenfield site or one that hopes to spur development, is based on speculative expectations of future demand, rather than on known existing demand.

A useful definition for the links eligible to be funded from federal sources is the NHS, shown in Figure 5. The NHS is a network including the U.S. interstate highway system as well as other important routes generally comprising the most traveled 4 percent of total mileage in the United States carrying more than 40 percent of highway traffic and 75 percent of truck traffic (Slater 1996). These are routes that have already been agreed upon as being a national priority. We argue that if these roads were a priority to build, they remain a priority to maintain. The Highway Trust Fund would not be usable for highway capacity expansions, but highway organizations could borrow money to finance such capacity, described below in Proposal 2.

The flow chart of this proposal is illustrated in Figure 6. Revenue from highway user fees funds the program. The program funds states to repair, rehabilitate, replace, and enhance existing highways. These highways enable travel. A user fee on that travel is collected and returned to the program.

Fix It First guarantees an upgrade of the nation's existing transportation infrastructure. In a probabilistic sense, this will sharply reduce the number of future bridge collapses and closures, lower the cost of future pavement repair and rehabilitation, and upgrade safety. The maintenance improvements will lead to higher-quality roads and bridges operating at modern standards, that will both improve safety and allow freight traffic and people to move directly at high speeds, which will save time. The capacity of bridges and roads, when upgraded consistently along routes will allow heavier trucks to travel on them, thus lowering the labor cost of freight shipments.

To increase the efficiency of the system, we propose allowing and encouraging states to implement electronic road pricing on the Interstate Highway System (pricing that is generally prohibited currently, with a few exceptions) provided the funds are used in the corridor in which they are raised to maintain, repair, replace, reconstruct, or enhance the existing system, without seeking federal permission. This includes both general tolls and HOT lanes. Road pricing is a necessary first

**FIGURE 5**  
The National Highway System

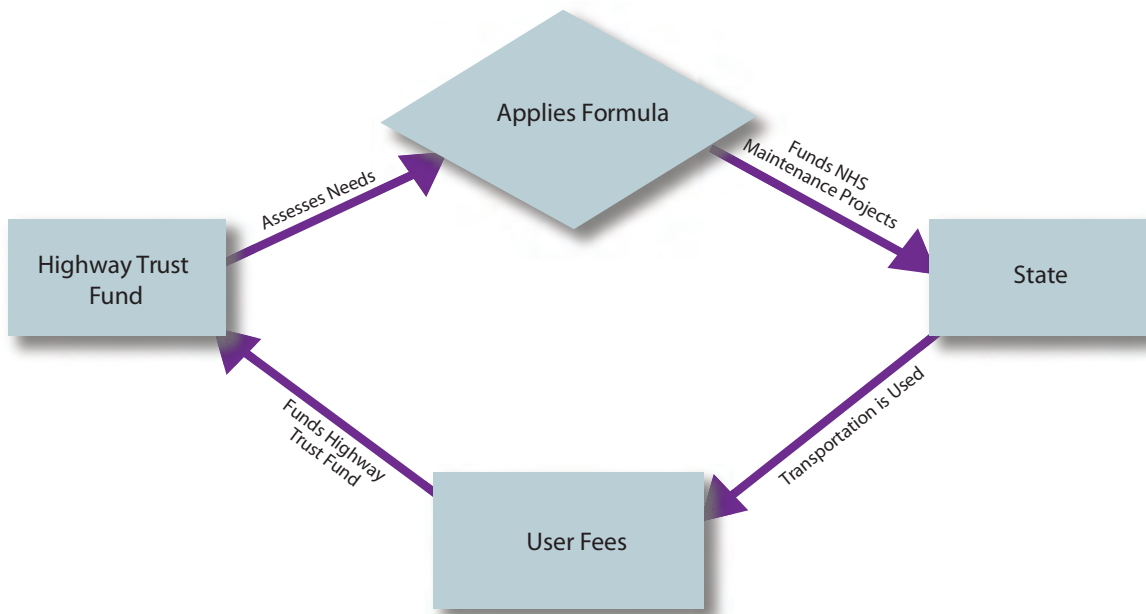


Source: FHWA 2010b



FIGURE 6

## Flowchart of Resources in the “Fix It First” Proposal



Note: This is a flowchart of resources in the “Fix it First” proposal, which show how the funds from the the Highway Trust Fund are distributed by formula to states who repair, rehabilitate, replace and enhance existing facilities infrastructure. Use of those facilities generates user fees (gas taxes now, perhaps vehicle mileage taxes in the future) that are added to the Highway Trust Fund.

step in properly allocating the scarce resource of peak-period road capacity. We anticipate prices will vary with demand, so peak tolls would be higher than off-peak.

There are a number of reasons to move toward pricing, which this proposal facilitates. First is simply revenue. The revenue collected using the gas tax has been declining and will continue to decline with increased fuel efficiency and electrification of the fleet. Some alternative source of funds is required, and a user fee is a reasonable selection here, as pricing is the most direct user fee. Second is allocation of scarce road space. By charging a different amount at different times and locations, a price signal is sent to travelers about when and where to travel to account for the congestion they impose on others. Prices in the off-peak would be lower than prices in the peak, thereby encouraging many travelers who have flexibility about when to travel to choose a different period. Surprisingly, most trips at the peak hour are not work trips (FHWA 2007a). This suggests significant discretion on the part of travelers about time of travel, and a great deal of promise for general time-of-day

road pricing. Third, the value of shorter travel time depends on the traveler and the nature of his or her trip. A network of HOT lanes that guarantee travel times offers a solution to the problem now faced with lack of choices in travel.

There is increasing cumulative international experience with area congestion charges in cities ranging from London, to Stockholm, to Singapore, and HOT lanes are becoming more common in the United States (e.g., SR-91 and I-15 in California, I-394 in Minnesota, and the Katy Freeway in Texas). Such programs are generally popular and reduce congestion. For example, the city of Stockholm introduced a toll system for seven months in 2006, after which citizens voted on its permanent adoption (Harsman and Quigley 2010). In this vote, 52 percent of the Stockholm voters approved continuing the system. Evidence from HOT lanes suggests they are more popular after than before they are opened, and that they are just as popular among low-income groups as they are among and high-income groups (though in general they are used somewhat more by those with higher incomes) (Zmud 2008).

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## Chapter 2: Expand It Second: Introducing The Federal Highway Bank

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We recognize, moving forward, that states and localities will want to implement promising transportation investments but will need funds to do so. Economic research has documented that highway construction contributes to local economic growth and to suburban growth in population and employment (Baum-Snow 2007, Duranton and Turner 2010). Those localities that anticipate that there could be large local economic benefits from increasing their highway capacity need financing to allow these projects to proceed.

States currently rely on the Federal Highway Trust Fund to pay for part of many capacity-expanding projects; the Fix It First proposal restricts those funds to be used for existing infrastructure, leaving a hole in state budgets to pay for new projects. Since those projects are long-lived capital investments, long-duration financing is an appropriate source of revenue.

We propose that new capacity-adding projects would be funded by the states themselves or by borrowing from the Federal Highway Bank (FHB), rather than by statutory grants allocated by formula. Loans would be contingent on meeting a stringent performance test and demonstrating the ability to repay the loan.

In contrast to grants, loans help to align incentives in several ways. Borrowing jurisdictions would have much stronger incentives to consider whether they truly value a specific project. Local taxpayers, landowners, or system users would recognize that they are on the hook for the loan and will monitor how politicians spend the money. This should lead to additional caution about spending because it is no longer, from the perspective of localities, “other people’s money.”

### RATIONALE

At the onset of the highway era, the federal government wanted to ensure there would be a well-connected intercity highway system, but recognized that there also would be local benefits. Early federal aid programs had a matching requirement; although the percentage of the local match has varied over time (as low as 10 percent in the interstate era), that match

requirement was there. In 1916, the first Federal-Aid Road Act (PL-64-355) set a precedent by allocating \$5 million in federal funds to be matched 1:1 by the states for construction of rural roads. The Bureau of Public Roads (BPR), then part of the U.S. Department of Agriculture, administered federal aid to state highway departments.

The interstate is now complete. Very little additional new intercity highway construction is anticipated. (Although existing facilities need to be maintained and rebuilt, that is the provenance of the gas tax or other user charges.) A rationale for grants is that there are spatial spillovers to transportation investment, without which localities underinvest in transport infrastructure. However, most new highway and transit investments today serve within-metropolitan travel, where the benefits are primarily local. Accordingly, the emphasis on spillovers as a rationale for federal intervention in the year 2011 is misplaced.

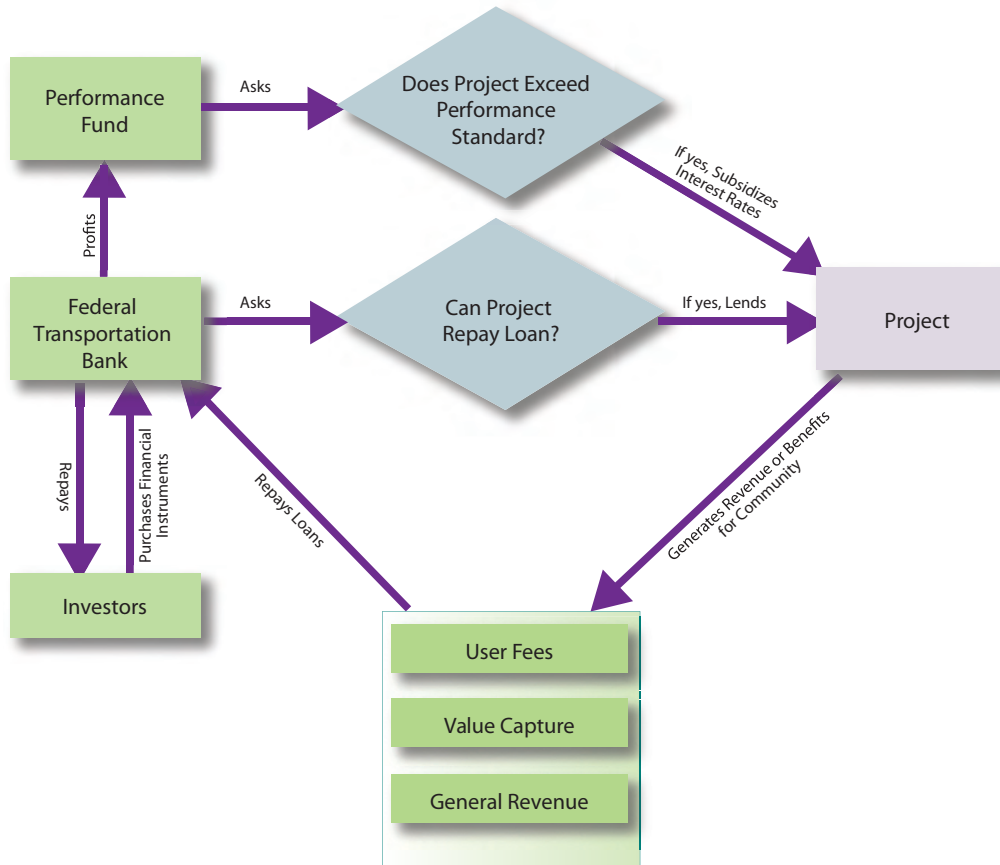
### PROPOSAL 2: REPLACING GRANTS WITH LOANS FROM THE FEDERAL HIGHWAY BANK

We propose that projects should have the option to borrow money from a new organization, a Federal Highway Bank (FHB), and repaid principally with a dedicated revenue stream from user charges, and with land value capture on benefitting properties if user charges are insufficient. Guarantees of such funding would depend on the road-owning jurisdictions’ general funds: this should be viewed as insurance, rather than as funds of first resort. User charges include tolls, gas taxes, and other sources in which the user directly pays for use of the network.<sup>8</sup> Land value capture includes land value tax, special assessments, impact fees, joint development, tax increment financing, transportation utility fees that assess properties based on the benefit gained from new infrastructure investments or the cost incurred of providing transportation infrastructure.

The flow chart of this proposal is illustrated in Figure 7. This bank will match the supply and demand for highway capital investments.

FIGURE 7

## Flowchart of Resources in the “Expand It Second” and “Reward It Third” Proposals



Note: This is a flowchart of resources in the “Expand It Second” and “Reward It Third” proposals, which show how the funds from the FHB are distributed to projects based on ability to repay, and funds from the Highway Performance Fund are given in the form of interest rate subsidies to projects that exceed performance standards after they open. The project generates benefits, which are capitalized in user fees, value capture, or general tax revenue, to repay loans. The FHB repays investors, while profits go to the Highway Performance Fund.

There are three primary reasons to tie user charges to new capacity.

- First, we seek to ensure there is a source of revenue from beneficiaries, and users are the foremost beneficiaries of any project. Tying costs to the people who benefit from using new infrastructure is both a more fair and a more efficient way to finance new capacity. There are many ways to ensure goals of equity. We discuss some examples in “Questions and Concerns” below.
- Second, we seek to use pricing as an instrument to manage capacity. With demand-varying road prices, some discretionary travelers will switch from the peak to the off-peak travel periods. Since (as noted above) most travel in the peak is non-work-related, there is good reason to believe that even small differences in the price by time of day will have large effects on congestion.
- Third, by pricing selected facilities (or selected lanes) to ensure free-flow conditions (thereby creating the same vehicular throughput as congested conditions at a faster speed, overall a win-win), we can provide facilities (and ultimately a network) that allows travelers to pay extra and thereby avoid congestion, introducing choice, and addressing the reliability problems we raised in the Introduction above. These routes, now in limited deployment as HOT lanes, can see much wider use, but require new capacity in places to be able to bypass bottlenecks. HOT lanes benefit more than just motorists: they can also be used to provide rapid bus transit networks throughout metropolitan areas. These express buses will face freely flowing travel conditions throughout the peak period, and thus have a time advantage over buses running on surface streets and cars not paying the toll.

An independent bank appraiser would assess whether the stream of revenue is adequate to repay the loan and whether the project costs are properly estimated. The federal government would insure loan repayment, but borrowers would have to purchase this insurance proportionate to their risk of failure as determined by the appraiser.

Interest rates would vary based on the expected ability of the borrower to repay and would be subsidized by the federal government based on meeting performance criteria outlined in the next section, “Reward It Third.” In addition, successful past borrowers would see their credit scores improve, and borrowers who had trouble with repayment would face higher future rates. Projects whose loan repayments were funded directly and entirely by users (e.g., tolls and parking charges) would be preferred to those funded through dedicated charges on nonuser beneficiaries (e.g., some form of land value capture, such as tax increment financing, special assessments, impact

fees, joint development, or transportation utility fees), and that stream is preferred to projects that rely in part on general revenue for repayment. Public acceptability for user charges will increase when people understand the need to repay loans.

The bank would be self-financing, and would be initially capitalized by the federal government; as the first set of loans are repaid, subsequent capitalization would be raised from markets. The bank could raise funds in a variety of ways, including selling bonds backed by loans, or combining and repackaging loans that would be sold off to pensions, life insurers, and others in the global marketplace seeking low-risk investments. The bank’s cost of capital must be lower than the interest rate it charges projects in order to be self-sufficient. Profits could be returned to taxpayers or deposited into the Highway Performance Fund to further reward successful projects with lower interest rates, as described in the next section, “Reward It Third.”

**Tying costs to the people who benefit from using new infrastructure is both a more fair and a more efficient way to finance new capacity.**

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# Chapter 3: Reward It Third: Performance Standards And Interest Rate Subsidies

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**W**e propose that projects that meet or exceed performance targets receive an interest rate subsidy from a Highway Performance Fund, and that projects that fail to meet targets not receive that subsidy. The subsidy would be funded from the profits of FHB operations, but be administered separately to ensure the bank is not incentivized to seek out projects that fail to meet performance objectives.

## RATIONALE

By embracing performance standards, states and localities will be judged on whether their projects deliver on clear criteria. Projects that do meet these goals will be financially rewarded. Under these new “rules of the game,” politicians will have stronger incentives to embrace cost-effective projects and to monitor the construction because their voters will be able to track whether the projects are achieving clear goals. In this sense, the introduction of transport financing reform (see the section “Expand It Second”) and performance standards are complementary policies.

Transportation investments enable people and goods to move safely and efficiently between places; by doing so, these investments make those places more connected and valuable. They have a variety of performance objectives:

- Speed
- Throughput
- Safety
- Accessibility
- Economic development
- Durability
- Equity
- Environment

With scarce federal resources, we want to reward objectives that would otherwise not be satisfied—that is, where there is some failure in markets or governmental decisionmaking that results in some objective not being fully considered. We also want to reward excellent performance that exceeds standard practice.

The residents of the locality that implements the project capture most of the benefits of the above objectives. Users, who are mostly local residents, gain directly from the speed and throughput when they travel from place to place (Levinson and Zhu 2011). That is thus mostly an internal benefit, and rewarding it could double-count the gains. Similarly, local landowners generally gain from the accessibility that is created by new infrastructure. The value of useful infrastructure, which reduces the travel time between places, is capitalized in land—that is, it results in an appreciation of land values. Rewarding accessibility gains could again be double-counting. Agencies benefit in the long run from the durability provided by higher-quality construction, lowering future maintenance costs.

What is generally not considered in project appraisal is a project’s implications on equity—how the project affects the transportation disadvantaged—and its effects on the environment (aside from satisfying environmental impact statement requirements).

Reward It Third aims to reward project benefits that were not otherwise considered in local decisionmaking, including environmental externalities, equity effects, positive economic spillovers, and performance of the facility from both a user and infrastructure perspective far beyond what was anticipated. Project sponsors are permitted to share these rewards with contractors to encourage better construction and management in Design-Build and Design-Build-Operate frameworks.

## PROPOSAL 3: EX POST EVALUATION AND THE HIGHWAY PERFORMANCE FUND

The FHWA has invested resources into designing models for benefit-cost analysis.<sup>9</sup> We are not aware of any formalized performance standards rewarding projects on ex post criteria. We propose that each project funded by the FHB should be judged by ex post benefit and cost criteria.

We recognize that it will take technical expertise and access to high quality data to provide rigorous ex post evaluations of recent transport investments. This capacity must be built into the existing system and the federal government and states

must work together to develop standardized performance criteria.

In our first proposal, Fix It First, we proposed each state budget about 1 percent of their Highway Trust Fund revenues to build this evaluative capability into their state's Department of Transportation. This performance evaluation group would be responsible for analyzing national performance criteria at the state and project levels. States already have some staff doing these types of evaluations, but they are not systematically or consistently conducted, which makes national comparisons more difficult than they otherwise should be. These state evaluations will allow national comparisons and give citizens the ability to judge the performance of their state transportation agencies against national competitors.

Speed, capacity utilization, and safety are already widely evaluated performance measures. For instance, many cities have traffic sensors for the purposes of real-time traffic management and/or traveler information. The Texas Transportation Institute has already shown these data can be used for performance monitoring (FHWA 2011). Highway safety statistics are compiled from accident reports. New accessibility and equity measures should be determined at a national level. Accessibility measures include, for instance, the number of jobs reachable by workers in thirty minutes by car and by public transit, and the number of low-wage jobs reachable by low-income workers. Equity measures could include poverty levels in congested and polluted areas, among other criteria.

For cities that invest in new highways, we propose that verifiable data on ambient air pollution levels in the neighborhood of the project be tracked relative to previous historical trends for the area (prior to construction) and relative to comparable neighborhoods within that city that have not seen new highway construction. If congestion duration and ambient air pollution decline in areas supported by the new investments more than they do in the control areas, and if transit use or carpooling increase, then such projects should be rewarded with an interest rate subsidy. Each state's Department of Transportation will be responsible for providing these data to the administrators of the Performance Fund, under rules drawn by the Performance Fund, and subject to audit and verification.

While it might not be obvious how a new road can reduce the economic and health costs of pollution, and in fact people may drive more because of the increase in road capacity, there are several ways these benefits are possible.

- First, pollution due to engine idling in congested conditions can be reduced: achieving the same trip at an optimal speed results in less emissions than one that is too fast (requiring burning a lot of fuel to overcome resistance), or one that is in stop-and-go traffic, wasting energy due to braking and accelerating. Peak-period pricing, along with selected capacity expansions, both have roles to play here, as does improved traffic management.
- Second, new projects that increase the use of modes such as bus rapid transit, carpooling, and HOT lanes may also reduce pollution. HOT lanes and HOT networks provide uncongested networks that express buses can take advantage of.
- Third, projects that reduce exposure to pollution by taking the pollution (and the concomitant health effects) away from populated areas also may have beneficial effects.

We further want to incentivize the project to be finished on time. At the start of a proposed project, the borrower would announce the project's expected completion date, total cost, and expected use. Once the project is finished, the first performance standard would be to check if the project was completed on time. Any cost overruns incurred by the borrower would need to be financed without additional federal loans. For projects that are significantly late in terms of time to completion, there would be a borrowing fee increase (e.g., a twenty-five basis point increase). Starting within one year of an opening of a new piece of transportation infrastructure, analysts could evaluate if the usage of the infrastructure exceeds initial forecasts, in which case an interest rate subsidy would be offered.

Performance evaluation (and thus the continuance of the federal infrastructure interest rate subsidy) would be annual, so projects that continue to meet or exceed performance standards retain that subsidy. Projects that fall below performance targets (those claimed *ex ante*) would lose part or all of the subsidy for that year. This active monitoring and thus management of the project will keep everyone's incentives aligned in ensuring performance. By spreading the local payment out over time (e.g., twenty years), the locality would have a continued incentive in retaining the subsidy.

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## Chapter 4: Projecting Benefits And Costs

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**T**ogether, our three proposals represent a sweeping change in current transportation financing policy. We anticipate that our proposals would cause a discernable increase in the quality of existing transportation infrastructure. Because states that implement these reforms would no longer have access to highly subsidized grants for building new highways, they would have strong incentives to carefully consider the costs and benefits of new highway construction. We anticipate that such states would only build highways if they expect them to be crucial infrastructure investments. This “selection” effect will raise the economic returns to new highway investments in the sense that only the best projects would likely be implemented. Our introduction of performance standards will offer beneficial effects in terms of incentivizing politicians to tackle projects that offer social gains.

While we are confident about these qualitative statements, it is very difficult to predict the likely benefits and costs of our set of policies. We can look back to recent cases that highlight the net benefits of investment in maintenance (Box 2).

### BOX 2

#### The I-35W Bridge.

An ex post analysis of the traffic effects of the collapse of the I-35W Mississippi River Bridge in Minneapolis by Zhu et al. (2010) suggests costs in time savings alone on the order of \$49,000 per day. That savings alone is enough to justify the reconstruction of a replacement bridge (\$250 million), though it is far less than the early ex ante estimates: the Minnesota Department of Transportation, for instance estimated \$400,000 per day costs, while Xie and Levinson (in press) estimated \$71,000 to \$220,000 per day.

After the collapse, Mn/DOT implemented a number of quick response projects, most notably restriping the detour route (I-94) from four to five lanes by converting

Of course, most of the network is not congested most of the time, and so travelers can reliably predict how long many trips will take, and plan schedules to maximize useful time at destinations, wasting a minimal amount of time in travel. However, there are no guarantees, and some roads are congested for part of the day, with a high degree of unpredictability about the ultimate point-to-point travel time, increasing costs to consumers and businesses. Achieving on-time performance on demand produces many benefits: from a willingness to travel farther on the part of the individual, increasing the size of the labor pool for employers, to just-in-time production processes and larger distribution areas on the part of firms, lowering costs that are passed on to consumers in the form of lower-priced and higher-quality goods. There is, at present, no way to systematically guarantee on-time performance. Unlike freight packages (which can be “absolutely, positively” guaranteed for next-day delivery), for road travel between or within cities, most travelers have no choice but to try their luck with traffic. There is no option to pay more to avoid delay at peak times, or save money and suffer delay. This fact presents frustrations to travelers and

what had been a bus-only shoulder into part of a travel lane. This change alone was estimated to save travelers \$28,000 per day, at a cost of about \$1,162,000. While the bridge reconstruction would pay off in more than fourteen years (depending on the discount rate), the restriping paid off in just over a month.

While this case is not typical because of the tragic nature of the collapse and the political nature of the response, it illustrates that simple maintenance and enhancement of existing infrastructure can have large benefits relative to costs.

economic losses to shippers, who have to settle for arriving late or who must leave early to ensure being on time. Freight costs are directly related to travel time and reliability (see, e.g., Smalkoski and Levinson 2005, Carrion-Madera and Levinson 2010). As discussed by David Lewis (2008) in a previous Hamilton Project discussion paper, price signals can function to improve the efficiency of new investments as well as existing infrastructure.

Our proposal provides incentives for states and localities to experiment with versions of road pricing. Such innovative policies offer a number of benefits along several dimensions. First, such policies will send correct scarcity signals to potential road users and will help to efficiently allocate this scarce resource. Second, such road pricing will provide a new source of revenue to these local governments. Road pricing will promote bus rapid transit deployment in these cities, which will enable public transit to better compete with the auto. As shown by the recent case of Stockholm, another benefit of adopting congestion pricing early is educational; as the public becomes aware of the benefits and costs of congestion pricing, this information will diffuse across cities. In a sense, the states and cities that are willing to be “guinea pigs” in committing to road pricing will teach the rest of the nation valuable lessons for how to refine this policy to achieve a “win-win.” Although we are confident that learning and improvements will occur, we cannot put a precise dollar value on how large these benefits will be.

On the cost side, our core proposal will raise the share of the cost of constructing new highways borne by states and localities. Under our proposals, states and localities will be expected to use more of their own resources and fewer federal dollars. As we have discussed above, this policy regime change will provide local decisionmakers with strong incentives to carefully consider the merits of specific new projects.

To implement our third proposal will require a significant investment to properly conduct ex post project evaluations. These costs would be approximately 1 percent of each state’s federal support.

As we have discussed above in the section “Expand It Second,” we seek for the FHB to be self-financing. The money to pay for performance bonuses comes from the profits of the FHB. The FHB borrows money from the federal government and the private sector at interest, and lends it to worthy projects at a higher interest rate. The difference between these rates generates profits that are used to reward projects that outperform expectations. To illustrate, if the cost of capital to the bank is 4 percent and it lends at 5 percent, it earns a profit of 1 percent (minus expenses). Borrowers still get a better interest rate than the market provides, and those capitalizing the bank receive a steady rate of return. So, in this example, the magnitude of the interest rate subsidy is as much as 1 percent per annum of total loans outstanding. These funds are not distributed uniformly (some projects are rewarded while others are not), so if a rewarded project receives a 1 percent discount on the interest rate (from 5 to 4 percent), for example, its cost of capital declines 20 percent.

...this policy regime change will provide local decisionmakers with strong incentives to carefully consider the merits of specific new projects.



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# Questions And Concerns

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## 1. WILL STATE AND LOCAL GOVERNMENTS CONTINUE TO BUILD NEW ROADS?

Our proposal seeks to direct scarce resources to those projects that are likely to yield social benefits ranging from improved safety, to increased speed, to less pollution. If a new highway proposal is likely to offer such benefits, then it certainly makes sense to make such an investment. Under our new “rules of the game,” a state will have access to financing that will allow it to construct the new road. Upon completion, the state will pay a lower interest rate on its loan if the project yields the benefits that it promised. There will be cases in which a state’s leaders are uncertain about whether building such a new road is “worth it” under these new financing rules. Given that highways are irreversible investments, we believe that such “in between” cases are exactly the ones in which it is prudent to delay investment until policymakers can be reasonably sure that the benefits will be high relative to the costs. Our proposal actually incentivizes the local decisionmakers to delay “pulling the trigger” until it is clear that the project has significant merit. In this sense, we are confident that our proposal will yield a higher return on public investment per tax dollar.

## 2. IF THE RATIONALE FOR PRESERVATION IS SO STRONG, WHY IS SO MUCH EFFORT STILL SPENT ON NEW CONSTRUCTION AND SO LITTLE ON MAINTENANCE AND REHABILITATION?

This is a classic problem in transportation funding. Constituents often give more credit to policymakers for new projects than the less-noticeable upgrades of existing infrastructure. One of the reasons it is called “infrastructure” is that it is hidden from us in a way that we generally cannot see. Roads and transit are perhaps the most visible aspect of infrastructure, but even with these there is a bias to building the fresh and new over maintaining the existing. Most politicians and voters are simply unaware of the true state of deterioration of their local infrastructure.

## 3. THIS PROPOSAL ELIMINATES FEDERAL GRANTS FOR PROJECTS THAT ADD CAPACITY. ISN'T THERE TOO MUCH NETWORK CAPACITY ON THE NHS IN SOME DEPOPULATING PLACES AND NOT ENOUGH IN OTHERS?

We agree that the NHS, which was designed at a particular time more than five decades ago, needs to keep up with changes in market conditions. If there is too much in some places and not enough in others, an NHS review may be required. However, local and state governments have an incentive to right-size networks as well, because they don’t want to pay for improvements to unnecessary links.

## 4. WON'T ROAD PRICING DISPROPORTIONATELY HURT THE POOR?

The surplus revenue from pricing can be used to ameliorate economic inequities. Direct cash grants are the most obvious solution, but if those aren’t desired, electronic vouchers can be established. For example, households whose income is below a given threshold can receive a preloaded electronic device with the right to a given number of free trips at peak times. Many jurisdictions with pricing use surplus funds for transit; the problem is that most low-income individuals in the United States still drive, and many transit users are not low income. For a general review of issues, see Levinson (2010). Relative to other means of raising revenue, there is evidence of public support for road pricing. Dill and Weinstein (2007) cite Lawrence (2006) in finding that Washington state residents (and lower income groups in particular) felt that tolls were a fairer means to raise revenues than increasing the gas tax.

## 5. WHY USE LOANS OVER GRANTS?

Switching from a system of federal grants to a system of federal loans will sharply change the calculus over which highway projects are pursued by state and local government. We anticipate that this regime shift will discourage weak projects from being implemented. In this age of budget deficits, such a reform has real value.

A secondary potential benefit from this proposal will be that metropolitan areas that accept loans for transportation projects will now engage in road pricing and parking pricing to collect revenue to repay the loans. This bundling of policies would allow metropolitan areas to use their existing infrastructure more efficiently and could help to reduce congestion on key highways. We expect that metropolitan areas and states will experiment with different ways to cover their loan obligations and that metropolitan areas and states will learn from each other's experiences.

#### **6. WHY IS AN FHB NEEDED AT ALL? DON'T MUNICIPAL BOND MARKETS ALREADY PROVIDE THE TYPE OF FINANCING DESCRIBED?**

The municipal bond market is seemingly the natural solution to the lack of current funds to financing infrastructure. However, the market is not working as well as it might. In part, the problem is that tax exemption does not appeal to nonprofits, federal government, pension funds, or international lenders. The tax exemption is an implicit subsidy (relative to taxable corporate bonds) that bond markets take into account when pricing bonds. Those not needing the exemption do not play in this market, suggesting it has less capital than it would if the subsidy given by the tax exemption were more broadly based. On the flip side, there is a lack of infrastructure-backed debt that bond-purchasers can buy. There is a demand for low-risk debt for insurers, annuities, and others. User-fee backed infrastructure bonds are a natural solution to this problem, but we have not capitalized many U.S. facilities.

Furthermore, there is the risk of default in municipal bond markets. An advantage of an FHB is that it is a way to diversify the risk of infrastructure investment across metropolitan areas and states; the FHB will directly or indirectly securitize bundles of loans and sell them off. Road agencies will be required to purchase some insurance against default proportional to the size of the loan and the risk, so that the insurance pool will be able to pay back if a borrower defaults. If every borrower defaults, clearly the insurance pool will be in trouble. Reinsurance is a possibility; the federal government will likely be the insurer of last resort.

More importantly, the municipal bond market has no incentive to provide an interest discount for metropolitan areas that meet performance standards. Each bondholder simply wants to maximize its return and doesn't care about these social goals. Nevertheless, the municipal bond market will remain open to local and state governments seeking funding there instead of with the FHB.

#### **7. DOESN'T THIS PROPOSAL PUT ADDITIONAL RISK ON THE TAXPAYER?**

We recognize the problems associated with previous loan repackaging organizations (Fannie Mae and Freddie Mac), and want to emphasize that our FHB is different in a number of ways. First, the FHB would originate the loans rather than buy loans from banks. This is an important distinction: unlike bundled home mortgages, the FHB will have full knowledge of the underlying risks associated with each loan. Second, the magnitude of the loans, and the inspections and audits, suggests that the problems of borrowers being unable to repay will be avoided.

#### **8. HOW DOES THIS COMPARE WITH OTHER INFRASTRUCTURE BANK PROPOSALS?**

We believe this should be a "highway" bank rather than a general "infrastructure" bank because the needs of transportation differ from those of water and sewerage systems, dams, transit, and so on. In addition, the specialization required to assess highway projects precludes too broad a mandate. Other infrastructure investments face similar problems, and similar but separate institutions should be established to address those problems.

Unlike the current administration's proposal for a National Infrastructure Bank, or the Dodd-Hagel proposal from 2007, this FHB would be a sound, publicly owned, financial institution aiming to achieve a return on investment, not a government agency for distributing grant funds. The current Transportation Infrastructure Finance and Innovation Act (TIFIA) program, and the proposed National Infrastructure Bank both conflate loans and grants, and are thus handouts without any clear mechanism or necessary requirement for direct repayment of loans. We believe this missing feedback loop, the lack of a pre-specified payback mechanism, is a fatal flaw in the design of other National Infrastructure Bank proposals. By requiring user fees as the primary repayment mechanism, we move toward more-efficient allocation of scarce roads than currently exists; in addition, these user fees will help ensure reliable networks and give travelers the option to avoid congestion.

Deshpande and Elmendorf (2008) suggest that insulating infrastructure decisions from the political process might prove difficult. We agree, but we also think it is necessary for state and local governments to achieve efficient transportation investments. We believe the bank should not originate projects, but should function as a capital allocator based on the best evidence of prospects for repayment subject to projects having benefits in excess of costs.

### 9. HAVEN'T WE REACHED PEAK TRAVEL? IS ANY NEW CONSTRUCTION REQUIRED?

Some evidence suggests we have reached peak travel; congestion and travel per capita has not increased in the last decade (Millard-Ball and Schipper 2010). This plateau in congestion increases, although a positive sign for travelers, does nothing to relieve today's problems. Rather, it suggests those problems aren't getting worse in the way many "scare" forecasts project. There is still much that has not yet been done to address existing problems. This finding does provide support for the notion that preservation is a higher priority than new investment.

### 10. SHOULD USER FEES PAY THE ENTIRE COST OF THE LOAN?

If user fees were sufficient to generate the revenue to pay off the loan, they should be the primary or even sole source of funds. There may be good projects where that is not the case, however. This is in part because in a transition period of some roads priced and others not priced, the former would have to compete against the latter. Furthermore, there are benefits the toll roads give to nonusers, which have value (such as reducing congestion elsewhere). This is why we suggest value capture as the second source of revenue, and general funds as a last resort.

### 11. WHY DOESN'T YOUR PROPOSED PERFORMANCE BONUS REWARD ACCESSIBILITY BENEFITS FROM NEW HIGHWAYS?

Economic theory predicts that improved roads will raise nearby land prices. If a new fast highway is built, land nearby will be more valuable because residents can have easy access to desired destinations. Local land prices will rise to reflect the value of those residents' time savings (and these price increases will be captured by government from local land or property taxes). Under the textbook assumptions that land markets are perfectly competitive and bidders are fully informed, then rewarding accessibility would "overcompensate" a state for investing in new highways. It is important to note, though, that our overall proposals shift significant costs to states in their implementation of new highway construction. There are also real world institutions such as zoning that mean that the textbook predictions do not play out perfectly. However, it is for this reason that we do not want to reward accessibility benefits. What is generally not considered in project appraisal is a project's implications on equity—how the project affects the transportation disadvantaged. Equity is a performance consideration under our proposal.

By requiring user fees as the primary repayment mechanism, we move toward more-efficient allocation of scarce roads than currently exists; in addition, these user fees will help ensure reliable networks and give travelers the option to avoid congestion.

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# Conclusion

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**D**uring an era of large budget deficits, the United States faces a serious infrastructure gap. Our proposals seek to redirect our scarce resources to help us to achieve some fundamental goals. The net effect of these three proposals will be to improve the state and efficiency of our nation's infrastructure, the benefits of which will translate into improvements in the well-being of American families through reduced travel times, safer roads, and higher standards of living.

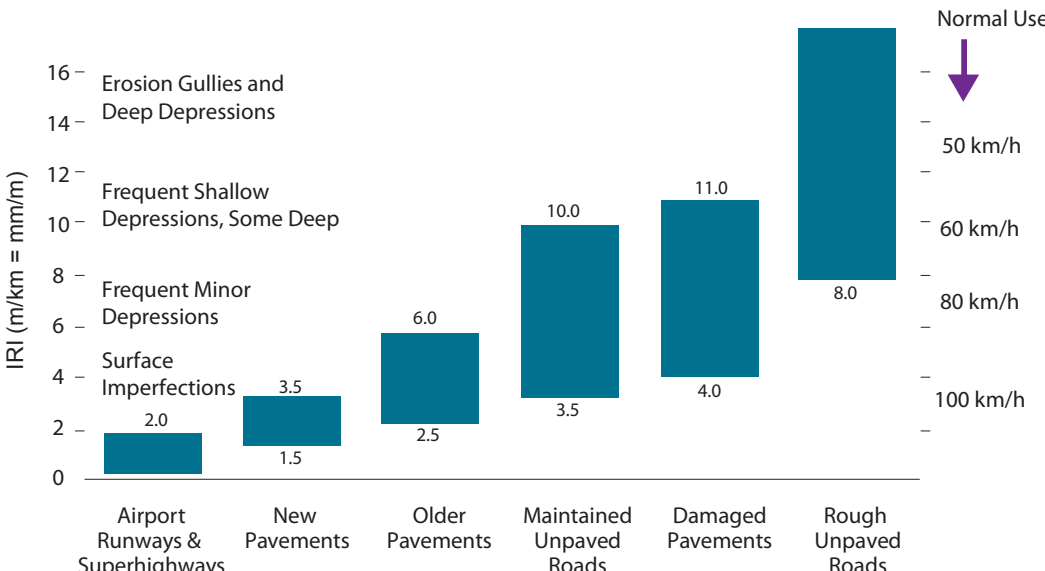
All three of our proposals provide incentives to states to move toward systematic road pricing. The Fix It First proposal removes federal restrictions on tolling the interstate; the FHB, a key component of Expand It Second, requires direct user fees from tolls to repay loans; and the performance fund of the third pillar of our proposal, Reward It Third, subsidizes projects that improve performance and reduce pollution.

# Appendix 1: Metrics For Judging Existing Road Infrastructure Quality

Road infrastructure conditions can be described by many different measures; a widely applied index is the International Roughness Index (IRI), which is computed by a trailing fifth wheel on a test vehicle that measures how many inches vertically are displaced per mile of road. An IRI of 60 would imply 60 inches of displacement per mile. This measure is reported for the NHS in Highway Statistics series compiled by the FHWA each year (e.g., FHWA 2008b, Table HM-47). Typically, these are summarized into five categories: Very Good, Good, Fair, Poor, and Very Poor. Unfortunately, data are not publicly reported by lane miles by IRI category for the NHS, which would be more useful for our purposes. We believe, however, that the underlying data could be analyzed by DOT staff to produce such a measure. Table 2 suggests that the urban NHS is in far worse condition than the rural NHS. Figure 8 shows how IRI varies by road type and how speed is affected by IRI. Other measures of pavement performance consider cracking and rutting.

Bridge conditions can be similarly described by many different measures. These are tracked in the National Bridge Inventory (NBI), which includes a structural evaluation of each bridge. The most important from a public policy perspective are structural deficiency and functional obsolescence. A structural deficiency means the bridge includes a significant defect, and often that weight or speed limits must be placed on the bridge to ensure safety. This means the deck, superstructure, or substructure of the bridge is in poor condition or worse, as defined by the NBI. Collectively, a bridge sufficiency rating is used to determine whether a bridge is eligible for federal funds. The sufficiency rating formula result varies from 0 to 100. The formula includes factors for structural condition, bridge geometry, and traffic considerations. The sufficiency rating formula is contained in the December 1995 Edition of the *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges*. A bridge with a sufficiency rating of 80 or less is eligible for Federal bridge rehabilitation

FIGURE 8  
International Roughness Index



Source: Pavement Interactive 2006  
 Note: Compares the IRI with various qualities of roads, and the effect of the IRI on speed. Even an IRI of 2.5 may result in driver's slowing because of discomfort and concern about vehicle or payload damage at higher speeds. Source: <http://pavementinteractive.org/index.php?title=Image:Iri.jpg>

funding. A bridge with a sufficiency rating of 50 or less is eligible for Federal bridge replacement funding (Minnesota State Department of Transportation).

Bridges that are in poor condition but that remain open may have weight limits, which restrict heavy trucks, increasing the distance trucks must travel. Ultimately, such bridges will be declared unsafe and closed to traffic. As with pavements, keeping a bridge in good repair may save costly major repairs or defer the need for replacement.

Functional obsolescence means the bridge does not meet current design standards (e.g., for sight distance, lane widths, heights, shoulders, etc.), or that it lacks capacity to handle current demands, but there is no implication the bridge structure is unsafe to travel on given restrictions on speed and weight (FHWA 1996). Those restrictions are costly to travelers and end users of freight.

**TABLE 2**  
**International Roughness Index, Rural and Urban Miles**

Rating	International Roughness Index		Total U.S. Rural NHS Miles in Category	Total U.S. Urban NHS Miles in Category
	(in/mi)	(m/km)		
Very Good	<60	<0.95	25,317	6,075
Good	60–94	0.95–1.5	53,314	17,576
Fair	95–170	1.5–2.7	30,190	20,786
Poor	171–220	2.7–3.5	2,279	4,101
Very Poor	>220	>3.5	475	2,515

Source: FHWA 2008b.

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# Endnotes

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1. A National Cooperative Highway Research Program report finds an annual need of \$188.4 billion in 2007 dollars to maintain existing infrastructure, of which \$109.8 billion is capital and the remainder (\$78.6 billion) is operations and maintenance costs (National Cooperative Highway Research Program [NCHRP] 2006). Given that approximately 40 percent of capital expenditure adds capacity (see Federal Highway Administration [FHWA] 2008a, Chapter 6 Finance, Exhibit 6-12), we calculate that the total need is \$145 billion (\$79 billion plus \$66 billion [ $66 = .6 \times 109.8$ ]) to maintain and operate existing roads at current performance levels (condition and level of service), without improving level of service
2. For instance, the National Surface Transportation Infrastructure Financing Commission estimated \$172 billion annually, and the National Surface Transportation Policy and Revenue Study Commission estimated \$194 billion annually.
3. For instance, see Nadiri and Mamuneas (1996). Also, Duranton and Turner (2010) use data across 227 major U.S. metropolitan areas and find that metropolitan areas that experienced slower population growth between 1980 and 2000 have growing road-building sectors. New road investment is more likely to be cost effective if such roads are being built in growing areas.
4. Some of the “added capacity” is “preservation” and some of the “preservation” is “added capacity,” so it is difficult to disentangle. Levinson, Montes de Oca, and Xie (2006, 13) found that Minnesota would spend 79 percent on preservation in 2001. Minnesota is growing slower than the national average, and probably spends more on preservation than the average state. However, the Minnesota Office of Legislative Auditors Report on State Highways and Bridges (2008) says, “Although the Minnesota Department of Transportation (MnDOT) has a ‘preservation first’ policy, over half of trunk highway construction spending since 2002 has gone toward system expansion, leaving important preservation needs unmet.” The Minnesota Department of Transportation and the Metropolitan Council’s most recent plans for the Minneapolis-St. Paul region diminish the amount of new highway construction and expansion, suggesting the state road construction program (2013–2030) should be allocated 50 percent to bridges, 29 percent to road preservation, and 17 percent to capacity and major safety investments (Metropolitan Council 2010).
5. Author’s calculations based on FHWA 2009b, Table FA-6.
6. In addition, 12.6 percent of all U.S. bridges are structurally deficient (FHWA 2008a, Chap. 7 Potential Capital Investment Impacts: Highways and Bridges).
7. In 2005, the FHWA estimated that it needed \$375 billion (over four years) for its maintenance and repair projects, but Congress authorized just \$286 billion for the four next years (DOT 2007a).
8. As new user-fee technology comes online that is directly aligned with use by time of day and location (e.g., mileage-based user charges), the system can become more precise.
9. The FHWA suggests a model called STEAM 2.0: Surface Transportation Efficiency Analysis Module for project assessment (FHWA [2]). See FHWA 2007b for other tools. See also ECONorthwest (2002).



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## Fast Facts:

1. Approximately one-third of federal highway spending goes to expand our existing system, but the economic return to these new investments has been falling. One reason is that funding for new projects is not based on a stringent assessment of the benefits or costs of a project.
2. The United States currently has a formidable infrastructure deficit. According to the American Society of Civil Engineers, we are currently spending \$110 billion per year less than the amount needed to maintain the system at current performance levels. Without new revenue sources, this problem will only get worse.
3. Residents of states and cities across the United States are getting less from our existing transportation system because of congestion, which costs drivers \$120 billion a year in the monetized cost of delays. Furthermore, the poor condition of many roads and bridges imposes wear and tear costs on vehicles and increases accident rates, causing injuries and even fatalities.
4. Reserving the federal Highway Trust Fund to maintain, preserve, and enhance existing infrastructure would boost federal highway investment on existing infrastructure by close to \$12 billion per year. Combined with any additional revenues that would result from raising state match rates on projects involving federal funds or from increasing user fees, these funds would put America on the right path toward supporting its aging infrastructure.
5. States would expand existing roads and finance new construction through loans that would entirely replace today's system of matching federal grants. A newly created and independent Federal Highway Bank would provide loans to state and local governments whose projects had projected benefits greater than costs and that had demonstrated an ability to repay with user fees.
6. New and expanded transportation infrastructure that meets or exceeds performance targets would receive an interest rate subsidy from a Highway Performance Fund financed by revenues from the Federal Highway Bank. Performance objectives would include on-time completion and improvements in safety, environmental conditions, access to transportation for groups and locations that are transport disadvantaged, and outperformance of initial expectations.
7. The proposal provides opportunities for states and localities to experiment with versions of road and congestion pricing. Congestion pricing would reduce traffic delays and provide a new source of revenue to state and local governments.



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