

Defining the Legacy for Users: Understanding Strategies and Implications for Highway Funding

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EXECUTIVE SUMMARY



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Introduction

In 1956, a series of federal objectives, ranging from national defense to population mobility, were realized with the signing of the \$25 billion Federal Aid Highway Act. That initiative ultimately funded more than 55,000 miles of strategic highway, augmenting and connecting a 3 million mile system of roads that still remains today as the world's most complex and productive. Much of the nation's growth and prosperity can be attributed to the U.S. surface transportation and distribution network; a system of roads, bridges and facilities that link the 50 states, its 300+ million citizens, and 7.5 million business establishments with markets throughout the world.

The success of this transportation system is predicated on a stable and adequate revenue stream needed to maintain and expand the system to meet the needs of the various system users. When this essential revenue stream is undermined, serious direct and indirect consequences will accrue.

Research Objective and Approach

While much research has been devoted to the issue of paying for highway infrastructure, inadequate attention has been paid to critical funding and infrastructure issues from the transportation system user perspective. This study attempts to address this gap in the research by providing rational benefit-cost assessments for transportation investment levels and priorities.

The central objective of this research is to define and understand the current state of transportation needs and finance in the United States, with particular attention paid to the financing of highway infrastructure maintenance and expansion. A variety of data was collected and analyzed with an emphasis on publicly available data sources including state and federal Department of Transportation (DOT) datasets, as well as academic and private sector datasets. Using the literature, data and expert input, analyses were conducted on the current transportation funding environment, system needs and a range of finance methods. Through this approach, the research team sought to determine true cost and benefit assessments of existing funding mechanisms, new alternative finance strategies, and their relative impacts on transportation system revenue and users.

Executive Summary of Analyses

For more comprehensive analyses, citations and documentation, please see ATRI's full report: Defining the Legacy for Users: Understanding Strategies and Implications for Highway Funding.

There is a large body of available research on transportation funding which focuses on transportation finance trends, issues and strategies. Much of this analysis offers evidence and support for changes to current transportation revenue streams and/or collection tools. Under the worst case scenarios described by the research, maintaining current levels and methods of transportation finance will lead to major revenue deficiencies, with deficit figures at least in the tens of billions of dollars annually (Cambridge Systematics, 2005a&b). In the best case scenario, core highway finance revenue sources – those related to motor fuel taxes – will not be viable in the long-term due to increasing utilization of alternative fuels, improving fuel efficiency, inflationary impacts, and inappropriate diversion of transportation funds (TRB, 2006).

While it is important to understand transportation finance from the perspective of public sector entities responsible for maintaining transportation infrastructure, there is currently a dearth of research that examines transportation finance from the perspective of a key stakeholder – the transportation system end-user. From an equity standpoint, system end-users arguably are the most appropriate body for conducting rational benefit-cost assessments for transportation investment levels and priorities. In cases where research has included a consideration of system end-user interests, findings suggest that system end-users do not typically support alternative financing approaches.

Consequently, this report attempts to develop a national discussion on transportation finance with a system end-user perspective, including those users that conduct commercial activities on U.S. highways and roadways.

Defining Transportation

The U.S. surface transportation system is critical to the nation's economy. The direct beneficiaries of this system can be defined as vehicle operators, while secondary and tertiary beneficiaries might include all U.S. citizens who consume goods and services, shippers and employers, and government services such as transit and paratransit, fire departments and police.

Roadways are, for the most part, public goods that provide free, public access. At the federal level, roadways are supported by the U.S. Department of Transportation under the following mission statement:

“Serve the United States by ensuring a fast, safe, efficient, accessible and convenient transportation system that meets our vital national interests and enhances the quality of life of the American people, today and into the future.”

In addition to its mission statement, the U.S. DOT identified several high-priority objectives in its existing Strategic Plan, including ensuring “global connectivity,” improving “safety” and targeting “congestion reduction” initiatives. Typically, the public sector seeks to provide a public good when an essential product is not sufficiently produced by private sector markets or where the government is legislatively compelled to provide for the public’s general welfare. In the United States, examples of public goods include the military, primary and secondary education, public welfare programs, police and fire services and, as previously mentioned, the U.S. system of surface transportation.

Infrastructure Issues

There is little argument that highway congestion is a pressing concern for this country. It is predicted that, over time, physical bottlenecks will become more prevalent and create delays of longer duration; estimates are that national “vehicle miles traveled” (VMTs) for all road vehicle types will increase 72 percent by 2025. Such increases in demand will require major improvements in infrastructure capacity, as well as requisite increases in revenue to fund the development of such infrastructure. Many strategies have been proposed for addressing new infrastructure demand, including innovative designs for multi-layer highways, elevated and tunneled highways, and advanced arterial intersections (Samuel & Poole, 2006). Solutions such as these, even if politically and environmentally acceptable, are not feasible in the current finance environment because of the unprecedented costs associated with such projects.

While most transportation planners and managers agree that infrastructure capacity increases are needed, the financial challenges associated with simply maintaining the current infrastructure system are considerable. The U.S. Chamber of Commerce Phase I Study found the following:

To “maintain” the current condition of the nation’s pavements, bridges and transit infrastructure, expenditures by all levels of government of \$222 billion is needed in 2005 and \$295 billion (annually) by 2015 (Cambridge Systematics, 2005a).

The study finds that spending levels below this will not meet demand and system deterioration will exacerbate. Furthermore, it concludes that there will be a \$415 billion shortfall associated with maintaining the existing infrastructure over the years 2005-2015.

Funding Issues

It is challenging to separate funding issues from infrastructure issues as adequate funding is central to transportation system maintenance and increased capacity.

The issue of paramount concern for the future of the federal Highway Trust Fund, as well as the myriad state transportation funding mechanisms that are modeled after the federal system, is the declining purchasing power of the fund. Key problem areas that affect the future of the federal Highway Trust Fund include:

- Federal motor fuel taxes have not increased since 1993.
- Inflation has decreased the purchasing power of the static motor fuel tax.
- Increasing vehicle fuel efficiency reduces revenue (on a per-mile or per-vehicle basis).
- Highway user fees are diverted to non-highway programs.
- Tax exemptions reduce user-based revenues.
- Project “earmarking” can divert funding from critical projects.

Highway Finance Strategy #1: State & Federal Fuel Tax Revenues

Federal HTF

The federal Highway Trust Fund (HTF), established through the Federal Highway Act of 1956, provides revenue to states for building and maintaining transportation infrastructure. Approximately 90 percent of the federal Highway Trust Fund (hereafter referred to as the federal HTF) is derived from excise taxes on gasoline, diesel and other fuels (Marron, 2007). Though federal tax rates on gasoline and diesel fuel have remained unchanged at 18.4 cents per gallon and 24.4 cents per gallon respectively since 1993, some growth in federal HTF receipts has occurred due to increases in consumption of taxable motor fuels.

State-Generated Revenues

States receive funds from multiple sources, including the federal HTF by way of the Federal-aid Highway Program, a federally assisted, state administered means for funding transportation improvements.

In 2004, states on average relied on federal funding for more than 25 percent of state highway receipts (FHWA, 2004c). Over the last decade many states have experienced sizeable budget shortfalls which either resulted in spending decreases or led to diversions from transportation accounts for non-transportation purposes. As the primary funding mechanism for state

transportation funds, motor fuel taxes are critical. Since 1993, however, the average state motor fuel tax rate has changed only slightly, following a similar pattern of stagnation found with federal motor fuel taxes (see Figure E1).

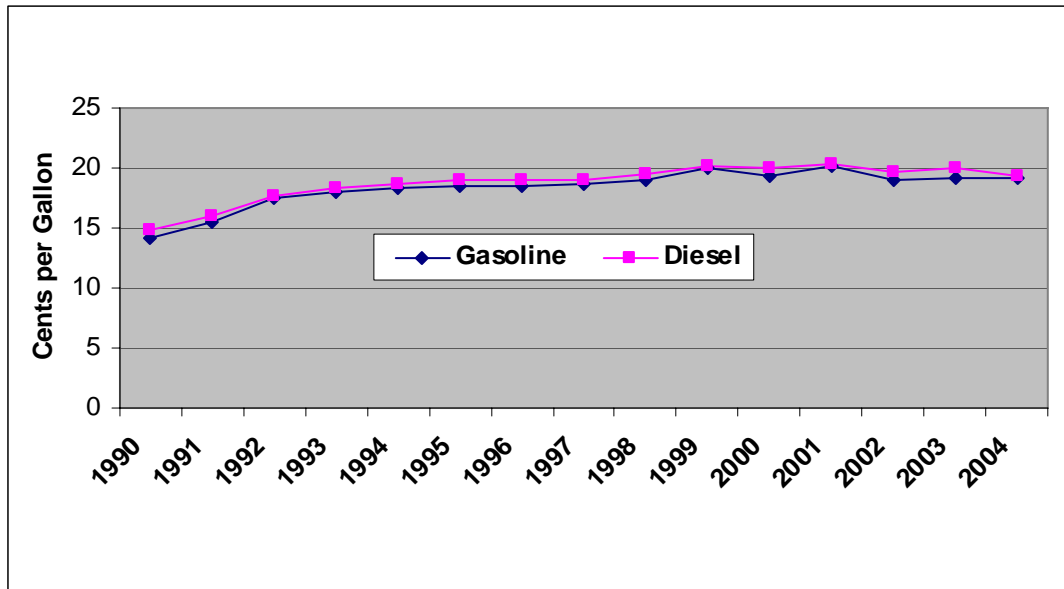


Figure E1: State Motor Fuel Tax Rates 1990 – 2004

Source: FHWA, Office of Highway Policy Information, Federal Highway Statistics Table MF-205, 2006. Available at: <http://www.fhwa.dot.gov/policy/ohim/hs04/htm/mf205.htm>.

As previously described, increased fuel consumption typically results in higher revenue to the state and federal highway trust funds. This, in turn, increases available funding to the states by way of federal HTF distributions. However, nominal increases are insufficient to fund necessary surface transportation system capacity and maintenance. The funding shortfall is further exacerbated by a number of impacts to the HTF revenue stream, including:

- Exemptions
- Diversions
- Tax Evasion
- Inflation
- Earmarks
- Federal & State Policy Conflicts
- Alternative Fuels and Increasing Fuel Efficiency

Resolving these issues is a critical first step in fully and transparently understanding the scale of the transportation funding predicament. Many of these issues readily undermine the argument that the transportation system is under-funded and/or that users are not paying their “fair share” of costs.

Fuel Tax Exemption Implications – Federal HTF

The Internal Revenue Service (IRS) exempts various entities from paying federal excise taxes on motor fuels for on-highway use (the largest revenue source for the HTF) including vehicles that fall into the following categories (IRS, 2006):

- Vehicles exclusively used by a state, political subdivision of a state (i.e. county or municipal governments), or the District of Columbia;
- School buses;
- Qualified intercity and local buses;
- Vehicles exclusively used by a nonprofit educational organization.

Government Use Vehicles: Documented fuel consumption by state, local and municipal government fleets approaches 2 billion gallons of gasoline (diesel not included) each year (FHWA, 2006). A conservative estimate of lost HTF revenue from this exemption, using only the 18.4 cents per gallon tax on gasoline, is **\$363 million** annually.

School Buses & Transit Vehicles: There are approximately 480,000 school buses in the United States with combined travel mileage of approximately 4.3 billion miles per year. The EPA estimates that more than 90 percent of school buses use diesel fuel. If a conservative average consumption rate of 7 miles per gallon (mpg) is used, school buses therefore consume approximately 615 million gallons of fuel each year, of which approximately 552 million gallons (90%) are diesel (EPA, 2006; School Transportation News, 2006).

When appropriate distributions of diesel and gasoline are calculated, school bus exemptions constitute a combined loss of revenue of **\$146 million** annually to the HTF.

According to the National Transit Database (NTD), mass transit systems in the 50 states and the District of Columbia consumed more than 500 million gallons of diesel in 2004 (NTD, 2004). When used for public transportation, the federal government either exempts or refunds the diesel excise tax (IRS, 2006). Assuming only half of the diesel consumed by the transit systems is exempt from the federal diesel tax, the exemption figure equates to a loss of more than **\$61 million** per year.

Eliminating federal exemptions for transit, school buses and state and local government use would conservatively add more than **\$570 million** to the federal HTF annually. The \$570 million exemption was calculated by summing the federal exemptions for state, county and local gasoline use, transit diesel use and the diesel and gasoline use estimates by school buses. This estimate does not include diesel used by state and local governments, fuel used by charitable

organizations or gasoline used by public transit systems. If these exemptions were included the demonstrated diversion of funds from the HTF would increase considerably.

Fuel Tax Exemption Implications – State HTFs

In reference to *state fleets*, there are laws that exempt entities from paying state fuel taxes. There are also states that exempt charitable organizations. These exemptions, while noble, produce a misrepresentation of user cost and subsidies.

Of the states that exempt or refund excise tax for state, county and local government use, approximately 740 million gallons of gasoline were consumed by these fleets at an annual loss of **\$155 million**.

School Buses: Applying the previous analysis and using the percentages listed above with a mean state diesel and gasoline tax of 20.47 cents and 20.30 respectively, approximately **\$126 million** in excise tax revenue is lost to school bus tax exemptions, assuming all school buses are exempt from or entitled to a refund of the state fuel tax (FHWA 2003; FHWA 2006b).

Federal Fleets: In the 36 states that exempt federal fleets from paying the state gasoline tax, the federal government consumed approximately 210 million gallons of gasoline (FHWA, 2003; FHWA, 2005). The analysis indicates that state fuel tax exemptions for federal fleets conservatively total **\$29 million** annually in lost revenue. Not included in this figure is the 65 million gallons of diesel fuel consumed by federal vehicles annually (FHWA, 2003; U.S. GSA, 2004).

U.S. Postal Service: As the operator of the largest fleet of government-owned vehicles, the United States Postal Service (USPS) is required to pay all federal fuel taxes. However, 47 states and the District of Columbia exempt postal vehicles from state fuel taxes (CA, OR and WY are the exceptions). USPS vehicles consumed 27.9 million gallons of diesel and 105.7 million gallons of gasoline in 2005, taxed at an average 2005 state rate of 20.47 cents and 20.30 cents respectively.

The result is an annual \$5.7 million exemption associated with diesel and a \$21.4 million exemption associated with gasoline, combining for an overall diversion of just over **\$27 million per year**.

Documented losses due to federal and state fuel tax exemptions and refunds therefore total more than **\$907 million** annually.

Once exemption figures are fully documented, the overall loss of motor fuel tax exemptions will conservatively range from **\$1 billion to \$1.5 billion annually, and may exceed \$2 billion** per year when state fuel tax exemptions for transit are ascertained.

Diversion Implications

In 1983 Congress formed two units within the Highway Trust Fund, the Highway Account (HA) and the Mass Transit Account (MTA), the latter of which was to receive 11.1 percent of the HTF under the new legislation. The percent allocated to transit has grown since 1983, totaling nearly **\$50 billion** in cumulative growth from 1994 through 2005.

While some feel that the diversion of funds to the MTA is inappropriate since federal HTF revenue levels, which are ostensibly inadequate, are generated by and for highway users, there are also strong benefit-oriented arguments for maintaining such expenditures. Public transit has some potential for reducing highway capacity demand, which supports the transportation system through congestion mitigation and decreased maintenance requirements.

However, there is a nearly complete void of analysis on the pavement impacts associated with transit vehicles, or on net HTF revenue losses – beyond existing operating subsidies – associated with transit fuel tax exemptions or rebates. Gross vehicle weights for loaded 40-foot buses exceed 40,000 pounds (Orion Bus Industries, 2007; AC Transit, 2006). Moreover, this issue is not unique to transit buses. In many states, trucks owned by public agencies or utilities (e.g., snow plows, garbage trucks and other municipal vehicles) are exempt from weight limits. Plow trucks fully loaded with salt and sand weigh approximately 31 tons (Yates County Highway Department). The average excess weight of these trucks is estimated at three tons (Transportation Association of Canada, 1995). As a result, these trucks cause similar or greater damage to roads as equivalent private sector vehicles without any commensurate revenue contribution for the damage generated.

Like the MTA, the U.S. Environmental Protection Agency (EPA) has also benefited from unique access to revenue collected by the Highway Trust Fund. A 1996 amendment to the Resources Conservation and Recovery Act allowed for the allocation of 0.1 cent per gallon of the motor fuel excise tax to be dedicated to enforcing anti-pollution laws and cleaning up sites related to leaking underground fuel storage tanks. The program, named the Leaking Underground Storage Tank (LUST) Trust Fund receives income from the federal motor fuel excise tax of approximately **\$70 million** per year; revenue that would otherwise be directed into the federal HTF.

While there is some nexus between motor fuels and leaking tanks, it would be more cogent to fund this program in the same manner as EPA Superfund programs, since: 1) EPA has strong precedent for making responsible parties clean-up polluted sites (i.e. brown fields); and when not feasible, 2) EPA relies on Superfund revenues for clean-up, which has been sourced from general taxpayer funds since 1995.

The federal HTF maintains billions of dollars generating a significant amount of interest. This potential revenue, however, was directed to the general fund instead of to transportation under the Transportation Efficiency Act for the 21st Century (TEA-21) reauthorization in 1998 (GAO, 1999). It is estimated that recapturing the interest on HTF balances could add an average of **\$2.0 billion** to the HTF annually (Cambridge Systematics, 2005a).

Tax Evasion Implications

Motor fuel taxes represent the second most common form of tax evasion in the U.S., accounting for a loss of at least 6.5 percent of total fuel tax revenue (Council of State Governors/Council of Governors' Policy Advisors, 1996). While a conservative estimate of the scope of federal and state taxes lost due to fuel tax evasion may be as low as \$1 billion annually, upper estimates suggest 25 percent of otherwise taxable fuel sold, nearly \$9 billion, is illegally withheld from the HTF (FHWA, 2005d). Legislation during the mid-1990s moved tax collection to bulk distributors which scaled back the evasion problem, but the ongoing impact of evasion today is still viewed as considerable.

One proven tool for reducing tax evasion is greater criminalization of the evasion offense. In practice, increasing criminal penalties for tax evasion has broad support. During the mid-1990s, the federal government assigned a minimum \$1,000 fine for using tax-exempt dyed fuel for taxable purposes. As a result, diesel fuel tax revenue increased over \$1 billion, \$700 million of which was attributed to improved compliance (FHWA, 1999). However, the relative relationship of a \$1,000 penalty to the quantities and cost of fuel sold by tax evaders is likely inadequate. Both the FHWA and IRS found criminal prosecutions and jail sentences particularly effective in deterrence and overall compliance over the past decade (FHWA, 1996; IRS, 2007).

Inflation Implications

While the cost of gasoline and diesel has undergone dramatic fluctuations over the last five years, the overall price trend is clearly upward, in part reflecting the decrease in buying power. This same inflationary impact has considerably eroded the value of the static per-gallon tax. Federal excise taxes on motor fuels have not increased in nearly 15 years. The last increase in the federal motor fuel tax in 1993 coincided with a major political power shift in the U.S. Congress, and

public debate has continued in recent years on the efficacy of raising the tax, with some congressional leaders and the White House suggesting the tax should be eliminated altogether.

It is not surprising that the buying power of federal fuel tax revenue has decreased since 1993. Table E1 indicates 28.3 percent erosion in buying power per gallon sold when adjusted using the Consumer Price Index (CPI). In theory, to maintain revenue buying power by offsetting the effects of inflation since 1993, gasoline and diesel were under-taxed 7.27 cents and 9.64 cents per gallon respectively in 2006.

Table E1: Consumer Price Index Adjusted Fuel Tax Rates per Gallon

	1993 tax/gal	2006 tax/gal	CPI adjusted tax/gal	Lost Revenue (¢)/gal	Decrease in Buying Power
Gasoline	18.4¢	18.4¢	25.67¢	7.27¢	-28.3%
Diesel	24.4¢	24.4¢	34.04¢	9.64¢	

While some economists and transportation planners have proposed indexing the fuel tax to tie it more closely to inflation, the concept is arguably regressive in that fuel costs would increase at the same time – and inverse rate – of the decreased buying power of money.

Earmark Implications

Many of the “investments” made through the SAFETEA-LU reauthorization of 2005 took the form of earmarks, representing more than 5,000 special state- and district-based projects – most authored by specific members of Congress. The central tenet of earmarking is it allows members of Congress to return investment money to district constituents. While many programs that are funded through earmarked HTF money may be worthy programs that directly benefit the surface transportation system, there are a number that have little to do with transportation, as well as those that patently ignore a utilitarian approach to assisting a reasonable number of system users. A well documented example is the \$320 million proposal to build a bridge in Alaska that would serve an extremely small number of users (Utt, 2005).

State and Federal Policy Conflict Implications

In the current public finance environment, the U.S. Department of Transportation – as the recipient of federal HTF revenues – financially benefits from increases in gasoline and diesel consumption. At the same time, other federal agencies such as the Department of Energy encourage decreased use of fossil fuel energies such as gasoline and diesel. Other federal agencies such as the Environmental Protection Agency advocate solutions such as heavier idle reduction

technologies that can incrementally reduce fuel efficiency. Although the U.S. DOT does not encourage increased use of fuels, its budget is currently predicated on fossil fuel consumption. Ultimately, the ideal solution is the creation of a national (multi-agency) energy plan that balances and prioritizes transportation management and finance with air quality enhancement and alternative fuel development.

Alternative Fuel and Fuel Efficiency Implications

In March 2006 General Motors announced it will have hydrogen-powered vehicles in showrooms within 3 to 8 years (Spacemart, 2006). Hybrid vehicles that rely to some degree on electrification currently exist. While a large-scale deployment of such vehicles is still years away, the trend for a sustained rollout of vehicles that do not (primarily) rely on fossil fuel for energy raises important questions on the long-term viability of the motor fuel tax. Recent price spikes in motor fuel costs, along with ongoing environmental issues, have spurred research and development in alternative fuels technology. These developments have led many to believe that in the longer term the Highway Trust Fund will need to be revised, overhauled or phased out.

Highway Finance Strategy #2: State Debt Financing

All states currently use bonding as a source of revenue and, in recent years, many have increased reliance on borrowing (through bonding) to finance transportation improvements. The advantages of financing transportation infrastructure improvements through bonding are twofold:

- When borrowing costs are low, financing projects may be relatively cost-effective.
- Many large projects are on a scale that prohibits “pay-as-you-go” financing.

Debt Financing Implications

The criticism of bond financing derives from the potentially large interest costs over the long-term, with total costs of financing often reaching 140 percent of the actual project cost. Figure 7 shows a timeline of how states have increased reliance on bonding over the last 10 years, possibly in response to stagnant fuel excise taxes. The Brookings Institution reported that the amount of revenue generated through state borrowing increased 92.3 percent between 1995 and 1999, for a total increase of just less than \$4 trillion (Wachs, 2003).

Highway Finance Strategy #3: Credit Assistance to States

Rather than “granting” money to states, the federal government can loan states money through the Transportation Infrastructure Finance and Innovation Act (TIFIA) program. States and other organizations can use the funds to undertake transportation projects of national or regional significance, and the repayment revenues can be reinvested in other projects in the future.

State Infrastructure Banks (SIBs) were established as a pilot project in 1995 in the National Highway System Designation Act (NHS Act). Participating states can direct up to 10 percent of annual federal appropriations to the SIB and are required to match 25 percent of the federal funds. TIFIA financing and SIBs are both considered revolving fund mechanisms. The money received must be repaid and is then reallocated to other transportation projects. TIFIA accomplishes this at a national level and SIBs allow states to establish similar methods at the state level.

Credit Assistance Implications

TIFIA financing and SIBs do not generate additional revenue but rather ensure that the granting source is regularly replenished. The result is that the burden of locating additional revenue sources is shifted to a more localized level. Funding pools at the state or national level are preserved as the recipients are effectively taking out loans that will be repaid.

Highway Finance Strategy #4: Tolls

The concept of tolled transportation has been a contentious issue in the U.S. for many years. After a period of decline in tolling popularity, a recent trend indicates a willingness within the federal government to allow states to further investigate and implement tolling as a revenue collection method.

In the past, with few exceptions, new tolling was not legislatively permitted on interstate highways. However, the potential for increased use of tolling on interstate highways has gained momentum with the addition of new tolling provisions in the last two reauthorizations. SAFETEA-LU includes allowances for interstate tolling pilot projects and designates some funding for value-added pricing pilot projects. These provisions reflect the underlying urgency to identify additional funding sources to bridge the gap in highway funding.

The U.S. DOT may also benefit from the tolling of interstate highways because it relieves the agency of sourcing additional funds at the national level. Toll critics, however, do not believe that tolling aligns with stated U.S. DOT goals of increased user access, mobility and system efficiency, nor is tolling as efficient a

revenue collection method as excise taxes on fuels. Lastly, it can be rationally argued that tolling may balkanize the existing transportation system by creating myriad and disparate toll authorities and schemata.

The full report discusses in greater detail three different tolling approaches and reviews the pros and cons that are typically associated with each strategy.

Traditional Tolling. Traditional tolling assesses static user fees on a single facility (road, bridge, tunnel). This method collects revenue under the same user-pays terms as does the motor fuels excise tax, though it does so for use of a specific facility.

A central criticism of highway tolling within the literature is the inefficient means by which payment is exchanged for use of a service. Additionally, a wide range of indirect transaction costs exist at toll plazas, including the following (Woo & Hoel, 1991; Peters & Kramer, 2003; Mulshine, 2002):

- Increased travel time due to congestion at toll plazas.
- Decreased fuel economy and increased wear and tear on automobiles due to frequent stopping.
- Increased pollution due to acceleration and deceleration and congestion-related slow-downs.
- Increased accidents at or near tolling areas.
- Revenue theft.

Labor and technology inputs both add costs to the tolling process. Employees of many toll authorities, for instance, have been criticized for having relatively high salaries. In New Jersey eleven toll authority employees earned more than \$100,000 in annual salary (Public Affairs Department, New Jersey Highway Authority, 2002).

In comparison to staffed toll booth systems, electronic payment designs do have the potential to reduce certain labor costs, but require large initial expenditures in toll booth redesign and ongoing capital outlays to repair and replace collection equipment. This was the experience of the “E-Z Pass” system in New Jersey. Though the system did increase efficiency – both in decreased labor costs and decreased delay for E-Z Pass users – by 2004 the initial construction costs (including \$100 million in interest on bonds not paid off on schedule) and operating expenses (which came in 37 percent over budget) resulted in the New Jersey E-Z Pass system generating a **\$469 million deficit**.

Additionally, a survey of FHWA's *State Administered Toll Road and Crossing Facilities* (FHWA, 2005b) reveals that many U.S. toll administrations are operating at a loss.

Congestion Pricing Tolls. Some urban areas with high levels of congestion have developed High Occupancy Toll (HOT) projects, one of several “variable/value-pricing” products, which are free-flow lanes reserved for drivers that pay a variable fee based on changing congestion levels. Toll lane usage is often voluntary and drivers ostensibly only use the toll lanes if the value of their time is greater than the amount of the toll (and the driver can bear the cost). The variable cost to use HOT lanes, based on the time of day and the amount of traffic on the road, in theory creates supply-demand equilibrium.

Price changes, however, may not have any effect; a Georgia study showed that delivery time, and thus the time at which trucking operations occur are strongly driven by shipper/manufacturer requirements (Short, 2007). Consequently, the attempt to “price” trucks (that have no choice in delivery schedules) out of the commuter traffic mix becomes regressive and inflationary.

P3-oriented Toll Systems. Highway tolling also has the potential to be a revenue source for the private sector. For example, in 2006 foreign-owned Cintra-Macquarie initiated a long-term lease with the State of Indiana to operate and maintain more than 150 miles of U.S. interstate highway. Through this 75-year lease agreement, a payment of \$3.85 billion was made to Indiana for which Cintra-Macquarie will receive toll revenue, as well as have the ability to adjust toll rates.

To support these efforts, the U.S. DOT has released P3 “model legislation.” However, there is growing criticism of the P3 model legislation since it does not provide clear direction on system performance requirements, capacity enhancements, reasonable revenue formulas, or non-compete clauses.

Tolling: Financial and Administrative Implications

Tax revenue “efficiency” can be defined as the percentage of gross revenue that is returned to the physical transportation system. In that regard, motor fuel taxes – in relation to other revenue collection mechanisms – represent an extremely efficient means of revenue collection, partly because they take advantage of large economies of scale and low marginal cost structures.

Under the federal HTF model for revenue collection it is estimated that the cost for collection of federal motor fuel excise tax revenue is approximately 0.2 percent of the revenue collected (Peters & Kramer, 2003).

Based upon available public financial data, tolling appears to be a far less efficient means of raising transportation revenue than motor fuel taxes.

Analysis of a sample of publicly available toll authority financial reports found that costs most closely associated with revenue collection ranged from 21.9 percent of revenue to 30.3 percent or more of revenue. These are considered conservative estimates, and a more detailed analysis of available financials, however, will likely show higher revenue collection cost ratios.

The cost of collecting state fuel taxes is a greater proportion than the reported cost of collecting the federal excise tax on fuels, and ranges from approximately 1 to 2 percent; still considerably lower than that for the toll authorities analyzed.

Political Implications

Public toll authorities and private tolling companies generate institutional issue concerns in several ways. First, tolling in general, and Public-Private Partnership (P3) tolling schemata in particular, may fragment the national transportation system since toll revenue collection and disbursement systems do not directly accommodate or support national transportation system funding or objectives. Organizations and businesses that toll are focused on a single segment of roadway within the national infrastructure, and often appear to be in competition with other portions of that same infrastructure.

Second, there is a lack of political accountability and public support for tolling and P3 tolling schemata.

Safety Implications

The impact of tolling on safety has not been studied extensively. However, there is strong evidence that commercial vehicles often divert to secondary roads to avoid tolls when toll fees are viewed as excessive. Compared to interstates and toll roads, these parallel roads are almost always under-built for heavier trucks in larger numbers.

Between 1995 and 1999, the Ohio Turnpike Commission increased tolls on the Ohio Turnpike by 82 percent. As a result of this rate increase, commercial vehicle traffic diverted to alternate, non-tolled routes. Despite the toll rate hike, the revenues collected by the Ohio Turnpike Commission actually decreased. In 2004, a crash involving a commercial truck and several SUVs resulted in the death of six people. This crash occurred along one of the alternate routes and highlighted the need to move trucks back to the turnpike.

Implications for Rural America

While road tolling is finding some favor in metropolitan areas, it may be an unfeasible option in rural America. Tolls are designed for discrete segments of

high-volume roadway funded directly by the users of a particular road. Most rural areas, while providing essential commodities and connectivity between corridors, lack the necessary population densities and financial base to support tolled facilities. Combined with increasing unemployment and stagnating incomes, rural areas face considerable transportation funding challenges (Johnson, 2006; Kirschner et al, 2006). The result is a tax and population base that is increasingly unable to support the cost of maintaining infrastructure that is vital to the nation as a whole.

There is a backlog of rural maintenance and preservation needs, and a high percentage of county roads and bridges are deficient. Outside of the federal-aid system, funding is often scarce for improvements on local roads and bridges since the limited tax base is vulnerable to cost overruns without support from stable state or federal funds (FHWA, 2001). Moreover, private infrastructure investment is risky in rural areas, making P3 options highly unlikely.

Public Participation Process Implications

The U.S. surface transportation system is traditionally a publicly provided good; as such, citizens provide input through various public and political processes which, ultimately, guide investment and policy programs.

When highway management responsibilities are transferred, in whole or in part, from elected officials to autonomous transportation agencies (as is the case of many toll authorities and private sector entities), public approval and/or feedback mechanisms are disrupted or eliminated. The most critical concern when analyzing the adoption of toll mechanisms and public-private partnerships is accountability. Politicians are held accountable for the decisions made while in office; toll entities, however, may not face such accountability.

Highway Finance Option #5: Mileage-Based User Fees

There are additional alternative/creative finance strategies, including technology-based programs for tracking and costing vehicle mileage, with the potential to levy fees according to trip length, duration, time of day, and location.

A test of a high-tech approach to mileage-based user fees is currently underway in the State of Oregon. The state of Minnesota is also considering such a system. As with most new concepts, many questions arise when contemplating how a new and innovative collection system would be instituted. It is clear that transparent and reasonable answers should precede any large-scale deployment. The cost of adding a GPS device to every vehicle in the nation is uncertain, but undoubtedly high. Equity issues may also emerge if such a system has different prices for travel in different areas. A conceptual scenario

would allow “exclusive” communities to price specific socio-economic classes out of the market by placing relatively expensive per-mile charges within neighborhood boundaries.

Key Recommendations

An overall analysis of the transportation funding environment clearly shows that the current funding model is not adequate to meet increasing infrastructure needs. A holistic program of strategies is needed to strengthen and preserve the federal Highway Trust Fund while minimizing or mitigating the various negative impacts previously described. Recommendations for doing so are detailed below.

Recommendation #1 – Increase the Federal Motor Fuel Tax

Assuming that future demand remains at the same level as it was in 2004, a conceptual 20 cent per-gallon tax increase on both gasoline and diesel fuel would create additional HTF revenues of **\$35.1 billion** in one year. These user funds would be collected in an efficient and equitable manner at little to no additional cost since the existing fuel tax administration “infrastructure” would be utilized.

Therefore it is recommended that a national effort to increase the motor fuel tax be explored and instituted.

Recommendation #2: Eliminate Fuel Tax Exemptions

The basic rationale behind fuel tax exemptions is that government should not have to pay itself taxes. The HTF and state level transportation funds, however, were designed so that user impacts are appropriately calculated, managed and compensated through an equitable fuel excise tax system. Tax exemptions on motor fuels, therefore, allow other tax accounts (e.g. the general fund) to essentially take money from the HTF.

This is the basis for the HTF which is set up to collect money in a user-pays approach. However, tax-exempt vehicles use and impact highways and roadways in the same manner as tax-paying vehicles yet do not compensate the specific trust funds created to manage vehicle impacts. The additional **\$907 million or more** in annual fees that are lost due to federal and state exemptions could be used to maintain and improve the roadways used by vehicles that are tax exempt.

It is recommended that the use of motor fuel tax exemptions be discontinued so as to appropriately allocate resources to the federal HTF and state transportation funds.

Recommendation #3: Decrease Diversions

Diversions, especially at the state level, should be scrutinized and minimized. Under the current user-pays system, transportation tax funds are meant to be collected from system users and distributed back to the system. Allocations to special projects or non-transportation-related efforts undermine the user-pays principle and weaken the argument that transportation is subsidized by non-users.

Recommendation #4: Safety impact audits should be required for new toll systems and privatization proposals on publicly owned roadways.

Safety is still a paramount concern for transportation users and a primary objective for transportation managers, but is patently missing from the research, analyses and public discourse on different transportation funding strategies. Public and private entities should be required to analyze potential safety implications that may arise including increases in crash risk/exposure; traffic diversion impacts; and any decreases in safety program funding levels.

Recommendation #5: Tolling is a relatively inefficient revenue-generating tool, and should be considered only as a last resort for system maintenance or expansion.

While toll systems may generate gross revenue, they are relatively inefficient mechanisms for addressing road maintenance or infrastructure capacity needs. Furthermore, as a congestion-reduction tool, toll systems have not been proven to be effective at a system level. The concept behind tolls as a congestion-reduction tool is relatively myopic: at certain toll levels, people will leave that road segment for a free or lower cost alternative. However, without broad changes in zoning, business models and recreational patterns, congestion-reduction initiatives will become inflationary and regressive for the vast majority of people and businesses that do not have control over travel routes or work hours.

Recommendation #6: Privatization is an untested social experiment in revenue generation. Consequently, the federal government should increase, not decrease, oversight of the concept.

The existing P3 “model legislation” has generally been deemed as lacking true guidance in areas of corridor connectivity, technology standards, system maintenance requirements, public participation processes and reasonable revenue generation expectations.

Based on existing business and contract models, there is no compelling reason to believe that managers of privatized road systems will maintain the corridors

being leased or purchased since performance requirements are minimal or non-existent; ill-defined “non-compete” clauses limit government’s ability to maintain surrounding networks; and private sector profit margins do not presently exist in publicly managed toll facilities.

Recommendation #7: Focus on Taxation of New and Emerging Energy Sources

Over the next 50 years, it is a near certainty that surface transportation vehicles will run on some type of energy source, which presumably is measurable and therefore taxable. The fuels or energy should be viewed as a commodity that is purchased in some increment and use of the commodity will likely be relatively similar from vehicle to vehicle. Public debate should not preclude the taxation of these alternative fuels with funds directed to the current highway trust fund.

Financing Transportation – A Total Package

In summary, the ATRI research confirms that there is a substantial, growing transportation funding gap that impacts local, state and national networks. Solutions must be developed that ensure both the short- and long-term viability of the nation's transportation system. Most analyses, including ATRI's, indicate that to maintain the existing transportation system, the next federal transportation bill must provide a minimum of \$500 billion over a six-year funding cycle. In excess of that amount, some capacity improvements could also be realized.

Consequently, ATRI has scrutinized a range of funding approaches that claim to address the financial needs identified throughout the literature. The ATRI research team believes that, in applying a series of litmus tests or tenets, a rational, equitable package can be developed. These tenets include:

- 1) A holistic funding package must provide short- and long-term strategies for ensuring system viability;
- 2) Recognizing that the transportation finance model must be modified, the funding package should be equitable to all users, and disregard historical "sacred cows." Equitable should be operationally defined as a fair distribution of benefits *and* costs;
- 3) The package must recognize the diffused societal and economic benefits of transportation, hence its classification as a "public good;"
- 4) Both system users and government managers of transportation have different financial resources and limitations, so funding approaches must be socially responsible; approaches should recognize and address the synergies that derive from funding strategic connectors, rural networks and commuter transportation options.
- 5) Applying economic litmus tests to discern the effectiveness of the nation's transportation and distribution systems, the philosophy of developing and maintaining a national network of transportation corridors has been sound since the initiation of the Interstate system in 1956. This is the clear mission of the U.S. government; state and local governments do not profess to hold the mandate or resources to ensure that a national system is seamless and provides both local and global connectivity;
- 6) Despite ominous prognostications relating congestion, gridlock and revenue shortfalls to declines in our nation's economic vitality, most relevant indicators – including economic growth and freight tonnage moved – have increased over time at rates that exceed both inflation and public expectations. The implication is that changes in our transportation funding model should be rational versus overly dramatic or momentous; return on investment benefits associated with funding strategies must be tangible and positive.

Accepting this, ATRI proffers the following financial package, which addresses many of the needs identified by various stakeholders (e.g. managers, builders, investment beneficiaries, policy-makers), but which puts primary emphasis on the needs and perspectives of system users. This, of course, includes the commercial carriers that rely heavily on the transportation system.

The following finance strategies ostensibly meet the requirements identified in the six ATRI tenets, as well as those promulgated in many other transportation funding analyses.

- **Increase fuel taxes to offset inflation and address unmet needs through the life of a six-year transportation bill.**
- **Eliminate fuel tax exemptions.**
- **Eliminate federal HTF diversions.**

When the various recommendations are consolidated, the ATRI-proposed funding package conservatively raises an additional \$60 billion to \$229 billion for a total highway funding package of \$346 billion to over \$515 billion over a six-year funding cycle (see Table E2).

Table E2: 6-Year Highway Funding Proposals (millions)

Government Fleet Fuel Tax Exemptions	\$2,178	\$2,178	\$2,178	\$2,178
School Bus Fleet Fuel Tax Exemptions	\$876	\$876	\$876	\$876
Transit Fleet Fuel Tax Exemptions	\$366	\$366	\$366	\$366
LUST Funds	\$420	\$420	\$420	\$420
Subtotal	\$3,840	\$3,840	\$3,840	\$3,840
<i>Additional Revenue From:</i>	5 cent increase	10 cent increase	15 cent increase	20 cent increase
6-year Gas Tax	\$44,155	\$88,210	\$132,364	\$176,519
6-year Diesel Tax	\$12,211	\$24,433	\$36,614	\$48,876
Subtotal	\$56,366	\$112,643	\$168,979	\$225,395
Existing SAFETEA-LU Bill	\$286,000	\$286,000	\$286,000	\$286,000
TOTAL	\$346,206	\$402,483	\$458,819	\$515,235

Clearly the U.S. transportation system is essential to the country's economic vitality and quality of life. Transportation funding and policy direction must be made a national priority, whereby all jurisdictions are able to provide essential travel with, and across boundaries. Few argue that the impetus for such a goal lies with the federal government; all indications are that local and state jurisdictions are seeking national guidance and support.

A substantial increase in transportation revenue applied efficiently and in support of national objectives and policies will ensure that our nation's transportation system and economy remain strong.



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