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# **SURFACE TRANSPORTATION: THE CASE FOR GROWTH**

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## **ABSTRACT**

This paper reviews the history and background of the development of our surface transportation system, and the salient issues surrounding investment in the system. Surface transportation investments have demonstrable economic and social benefits that go well beyond the sums invested. These benefits include net increases in economic output and productivity, improved national security and disaster response, and equitable access to economic and social opportunities for our citizens. There is widespread consensus that public investments in surface transportation have been lagging needs for several decades, to the point where our crumbling and congested infrastructure threatens our economic and social well being and our competitiveness in world markets. While some gains can be made through better use of existing revenue, rehabilitating the existing system and investing in our future will require spending that is tens of \$billions per year above recent levels. How to raise the required revenue is a more complex and controversial issue. Federal and state revenues are primarily derived from liquid fuel taxes, and the combined effects of greater vehicle fuel efficiency and the tax structure have severely eroded purchasing power in real dollar terms. Over the long term we must face up to the inevitable conclusion that the fuel taxes, by themselves, are not sustainable as our primary revenue source. The pending shortfall in the federal Highway Trust Fund has forced the issue. It is urgent that we get on with the process of identifying and analyzing acceptable alternative or supplemental funding methods.

## **INTRODUCTION**

Surface transportation policy in the U.S. comes down to answering some rather simple and straightforward questions:

- What role does transportation play in the economy and society?
- What are the benefits of investing in transportation?
- What role should government have in providing and investing in surface transportation, and what is the private sector's role?
- What levels of government investment are appropriate, and how should the money be spent?
- What mechanisms should government use to raise public funds to pay for justified transportation projects?

This paper takes up each of these questions, relying on both the writer's knowledge of the development of the U.S. surface transportation system, and an array of recent papers on this topic sparked by the current debate over the future of the federal government's role in funding the system. Hence this paper serves primarily as a survey and summary of the most salient issues, but some brief policy conclusions are offered at the end.

Before turning to the questions some definitions are needed. By “surface transportation” we mean all systems for moving people and goods across the earth’s surface, including highways, railroads, and marine systems, and intermodal systems and services utilizing two or more of the surface modes. Included within the foregoing are public transportation—also called public transit—services, which make use of all three of the surface modes. We deliberately exclude the somewhat specialized topics of air and pipeline transport, which may be dealt with in separate papers later.

“Government” includes public bodies at all levels—local, state, and federal. Both elected and appointed officials, and their various operating agencies and entities, are included.

Now, let’s go on to the questions.

## **WHAT ROLE DOES TRANSPORTATION PLAY IN THE ECONOMY AND SOCIETY?**

The basic role of transportation is to connect people and places, so as to support economic and social activity. Expanding on this are some classic statements about the nature and purpose of transportation systems. The purpose of transportation is to move people and goods safely, efficiently, economically, and in an environmentally sensitive and sustainable manner. Transportation demand is a derived demand, arising from society’s need and desire to accomplish other activities.

Since ancient times transportation routes have enabled communication and commerce. From the network of chariot roads that facilitated the conquest and control of the Roman Empire, to the Silk Road and modern oil tanker ocean routes, and on to the worldwide marine container shipping network of today, transportation has been a key factor in the development of civilization. It can be argued that the history of the U.S. is largely the history of its transport systems. The first settlements were limited to coastal cities with favorable harbors (Boston, New York, Philadelphia). The country’s vast interior natural resources could be tapped only when they were reached by rivers, canals, and later railroads. Major cities were located at inland ports and railroad hubs (Pittsburgh, Chicago, Memphis, St. Louis, Atlanta). The national highway network connected rural and urban America, and fostered urbanization and the creation of auto-dominated megacities (Houston, Los Angeles).

The role of transportation in modern agricultural and industrial societies is well known, and stems from the economic concepts of specialization of labor and efficient utilization of natural resources, sometimes studied under the rubric of “location theory.” In simplistic terms, there are virtually no locations on earth that have in abundance all of the natural resources and labor supply needed to support the agriculture, industry, and commerce of modern settlements. Hence efficient production requires transport of people and resources to locations that allow maximum output at minimum cost, and subsequent movement of that output to demand points. Transportation cost also puts a cap on prices in local markets, equal to the cost of producing something at a low cost production point plus the cost of transporting it to the local market.

## WHAT ARE THE BENEFITS OF INVESTING IN TRANSPORTATION?

Transportation has a definite and provable link to economic development. A vacant piece of land will be developed to its best and highest use only to the extent that it is accessible to potential users. Other things being equal, locations that are more accessible to more people and businesses have higher economic value, as reflected in land prices and rents, than other properties that are less accessible. To see this one needs only to look at virtually any modern large metropolitan area, where development density and building heights are the highest at the area's central point and other highly accessible nodes of development.

More formally, using input-output analysis and other economic models it can be shown that lowering production costs through investments in transportation makes an economy more efficient, permitting more output and a higher gross regional product than would otherwise occur. For example, a recent study by Fuller (2011) for the Virginia Secretary of Transportation showed that investing in 16 proposed Virginia Public Private Transportation Act projects would expand Virginia's post-construction economy by \$4.1 billion annually and support more than 56,000 additional jobs in the Commonwealth.

A review of highway economics studies published by the American Road and Transportation Builders Association (ARTBA, 2011) found that:

The benefits of highway investment to private sector productivity and economic activity are well documented in the economics literature. There are numerous studies that have found a positive correlation between transportation infrastructure investment and economic development. Although exact impact of the investment has varied among studies, the fact that there is a positive relationship is widely accepted.

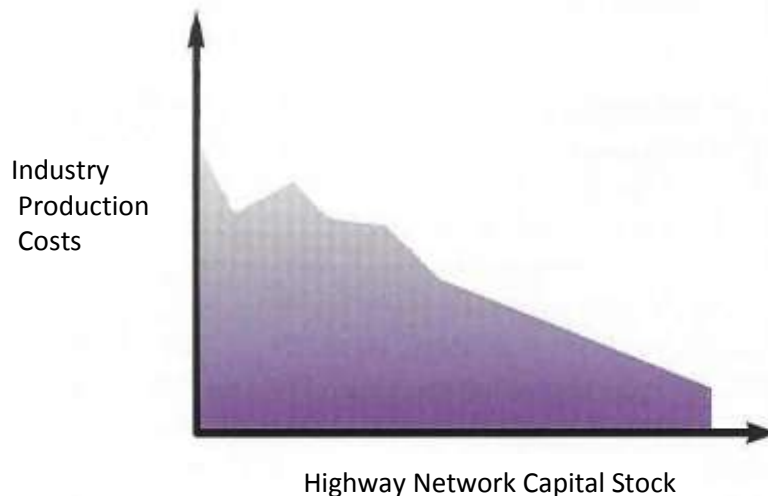
A recent RAND (2011a) study reached the same conclusion.

Some specific findings reported by ARTBA, and reviewed by the writer, include:

- Locations near transportation investments have higher land values than other sites (TRB, 1995).
- Investments in non-local roads over the period 1950 to 1989 yielded annual production cost savings to industry of 24 cents for each dollar of investment (FHWA, 1996). Figure 1 illustrates the general nature of this relationship.
- During the 1980s the net social rate of return on investment in the road network was 10 percent. For non-local roads the return was an even higher 16 percent. (FHWA, 1996)
- The rates of return quoted above were significantly higher than the returns to private capital and the long-term interest rate (FHWA, 1996), although the RAND (2011a) study reached the opposite conclusion for the years since 1980.

Another way to measure the economic impact of transportation is to count up the losses to an economy that occur when a major transportation asset suffers a service disruption. Some recent such impacts documented in the ARTBA (2011) report are as follows:

- The collapse of the Minnesota I-35W Bridge over the Mississippi River in 2007 cost the Minnesota economy \$60 million in economic activity before the replacement bridge opened in 2008.



**Figure 1. Relationship Between Production Costs and Highway Investment.**

Source: Federal Highway Administration (1996).

- New York’s subways and buses suffered a two and a half day worker strike in December 2005. The city lost approximately \$400 million the first day and \$300 million each of the next two days, largely due to cancellations of economic activity and lost productivity as the city adjusted to alternative means of transportation.
- Analysis by the U.S. Congressional Budget Office in 2006 estimated that a one week shutdown of just the Los Angeles and Long Beach ports would cost between \$65 million and \$150 million per day. The daily cost of a three-year shutdown for those two ports, as would occur under certain terrorism scenarios, would be higher—between \$125 million to \$200 million per day. That translates into a reduction in real GDP of \$45 billion to \$70 billion per year.

The highway system has a major role in national defense and homeland security. We sometimes overlook the fact that the official name of the interstate highway system is the “National System of Interstate and Defense Highways.” The defense benefits of the system became evident in the military mobilization leading up to Operation Desert Storm. Use of the highways for emergency evacuation and response has occurred with every recent hurricane, and is a major element of the emergency response plan of every metropolitan area.

Transportation also provides social benefits. In more primitive times a person’s social interactions were limited to the small circle of individuals who could easily be reached by walking, or by occasional trips on horseback or in animal-drawn carts and wagons. It was not uncommon for a person to spend his or her entire life within a few miles of their place of birth. Modern transportation and communication systems have greatly enlarged one’s interaction sphere, to the point where information and other cultural resources are available almost instantly from all over the globe. People apparently place high value on this enlarged interaction ability, as evidenced by how heavily they make use of it and how much they are willing to pay for it. Efficient urban transportation systems allow families to choose housing locations which provide desired open space and lifestyle amenities, while still being within reasonable commuting

distance and time to their employment locations. In fact easy access to shopping choices, schools, and social and recreation facilities dominate urban transportation, where less than 25 percent of trips are now work-related.

Urban transit systems, including commuter rail, rapid transit or “heavy rail,” streetcars and trolleys or “light rail,” and bus have their own unique benefits. It is an observable fact that every major city in the world has successful public transit. Rail transit systems running on their own separate guideways carry significantly more passengers per hour than urban expressway lanes, and often have faster peak-period travel times as well. Public transit also has equity benefits, in providing mobility to urban residents who lack access to automobiles, and to those who cannot drive due to age or physical limitations. In some cities transit permits low-income inner city residents to commute to good jobs in suburban locations. Finally, urban transit resources can be an important security asset in responding to natural disasters or terrorist threats. Many city emergency response plans call for heavy use of transit and school transportation assets. Transit has a unique role in evacuating the carless and special-needs populations—such as the disabled, the elderly, and the medically homebound—in an emergency (TRB, 2008).

Investments in public transit also have economic benefits. A study by Weisbrod and Reno (2009) showed that each \$1 spent on transit generates an increase in Gross Domestic Product (GDP) of \$1.80. Properties near rail transit stations sell for 10 to 25 percent more than other comparable properties. A study of transportation projects by the University of Utah (Nelson, et al., 2009) reported that public transportation investments generate 31 percent more jobs per dollar than new construction of roads and bridges. Putting or keeping public transportation in communities with high unemployment produces up to 2.5 times more jobs than putting public transportation in communities with low unemployment. Similarly, a Smart Growth America (2011) report on the impacts of ARRA project spending found that public transit investments produced 1.7 times as many jobs per dollar as did investments in highways and bridges.

The National Surface Transportation Policy and Revenue Study Commission (NSTPRSC, 2008) nicely summarized the importance of good transportation as follows:

A modern, smooth-functioning national surface transportation system is essential for economic success in a global economy and is also a key determinant of the quality of life enjoyed by citizens throughout America.

They also proposed as a fundamental goal that “the United States should create and sustain the preeminent surface transportation system in the world.” Now, how do we get and maintain such a system?

## **WHAT ROLE SHOULD GOVERNMENT HAVE IN PROVIDING AND INVESTING IN SURFACE TRANSPORTATION, AND WHAT IS THE PRIVATE SECTOR’S ROLE?**

Considered as a whole, the U.S. surface transportation system is a joint public-private enterprise, with the roles of each sector varying by mode. Highway system infrastructure (roads, bridges, tunnels) is designed, built, operated, and maintained by governments at all levels. The national highway network includes over 4 million miles of public roads, and total lane-miles are more than double that, at 8.2 million miles (FHWA, 2009). The vast majority of the total highway mileage, 77.5 percent, is owned and operated by units of local government. States own 19.3

percent and the federal government owns only 3 percent. The Interstate highway system, comprising 47,011 miles, accounts for only 1.2 percent of total miles but carries 24 percent of annual vehicle-miles of travel. State arterial highways that are part of the federal aid system, including the interstates, are designed, constructed, and operated by state governments, but following federal standards and guidelines and making use of federally-sponsored research results. Other state and local highways also benefit from various forms of federal assistance. Another important subsystem is the National Highway System (NHS), a Congressionally-designated system that includes the Interstate highways and 117,084 miles of additional arterial roadways. The NHS includes about 4 percent of roadway miles and 7 percent of lane miles, but carries over 44% of total vehicle-miles of travel (FHWA, 2008). Highways are by far the dominant mode of passenger travel in the U.S., and trucks operating on the vast highway system carry 29 percent of domestic freight ton-miles (BTS, 2010b). Within this largely government-provided highway system there are some toll roads, bridges, and tunnels that are operated by private or quasi-public agencies, usually under concession agreements with government agencies. While the infrastructure is predominately in the public sector, the vehicles that use it are nearly all privately owned and operated.

In contrast with the highway system, the U.S. railroads, including both infrastructure and rolling stock, are nearly all privately owned and operated. The Class I railroad network in the U.S. presently consists of 94,082 miles. This mileage has been decreasing over the past 50 years; in 1960 the Class I railroads owned 207,334 miles of track (BTS, 2010a). Railroad mergers, rail line abandonment, and sales to short line operators account for the decrease. While this mileage is limited, the rail mode continues to provide vital transportation services to the U.S. economy. For example, railroads carry 39 percent of domestic freight ton-miles, which exceeds total truck ton-miles, and Amtrak provides passenger service over 21,178 miles of track (BTS, 2010a). The public role in freight rail is largely limited to safety and some state funding programs of the Federal Railroad Administration, and limited economic regulation by the Surface Transportation Board. Intercity passenger services are primarily provided by Amtrak, a U.S. government-owned corporation, in partnership with the freight railroads who own most of the track over which Amtrak operates.

The inland waterway system comprises 25,320 miles of navigable channels. Of this total, about 12,600 miles are commercially significant shallow-draft waterways (BTS, 2010a), consisting primarily of the Mississippi River and its principal tributaries (notably the Ohio River system and the Gulf Intracoastal Waterway). To this could be added thousands of miles of coastal deep-draft shipping routes serving domestic intercoastal shipping (e.g., routes such as New York to Miami), and providing access to U.S. harbors by international marine shipping. The water mode carries about 12 percent of domestic freight ton-miles (BTS, 2010b). Public and private roles in the marine sector vary by function. The inland waterway channels, including those connecting coastal ports to the oceans, and navigation locks are constructed and maintained by federal and state agencies, with the U.S. Army Corps of Engineers normally the lead agency. Ports and terminals are owned, built and operated under a variety of agreements involving state and local governments, port authorities, and private companies. Commercial vessels that use the system are nearly all privately owned and operated.

The foregoing describes the essential makeup and organization of the U.S. surface transportation system, as it has evolved since colonial days. An intriguing policy question is whether or not this structure should be maintained as is, or modified in significant ways. It might be noted that most of this structure, particularly in the highway and maritime modes, is much the same worldwide, especially in the developed countries, which lends credence to the conclusion that this assignment of public and private roles may be in some sense optimal. There are differences in other countries, particularly in Europe, in how rail transport is organized, with governments taking on a more prominent role than in the U.S. Much of the organizational policy issue is bound up in the funding and financing issues, so we will come back to this later.

Is government involvement in the surface transportation system necessary? Historically the answer worldwide has been "yes." The basic reason is that private enterprise will not, on its own, provide the needed systems and services. A full network of highways, for example, is needed to provide the desired inter-regional service. Were these roads all to be toll roads many segments would not have sufficient traffic to pay for themselves, so private operators would not choose to build them. Only state and federal governments have the capitalization, long-term outlook, and broad span of control required to build and operate the highway network. Also transportation routes have the characteristics of natural monopolies. It would not be efficient for rival highway operators to provide competing parallel links in densely populated corridors. Finally, safety considerations dictate that highways be built to the same standards over wide areas, which requires government involvement at least at the level of setting and implementing design standards. While government is necessarily involved in transportation there is room for debate about the relative roles of federal, state, and local governments and the private sector.

## **WHAT LEVELS OF GOVERNMENT INVESTMENT ARE APPROPRIATE, AND HOW SHOULD THE MONEY BE SPENT?**

Recent national panels appointed to the task of assessing our surface transportation investment needs have all reached roughly the same conclusions—investment has not kept pace with needs. The National Surface Transportation Policy and Revenue Study Commission (2008) stated:

Conditions on America's surface transportation systems are deteriorating. In some cases, the physical infrastructure itself is showing the signs of age. In almost all cases, the operational efficiency of our key transportation assets is slipping.

This was echoed in some observations of the National Surface Transportation Infrastructure Finance Commission (NSTIFC, 2009):

- Our surface transportation system has deteriorated to such a degree that our safety, economic competitiveness, and quality of life are at risk.
- Real highway spending per mile traveled has fallen by nearly 50 percent since the federal Highway Trust Fund was established in the late 1950s.
- From 1980 to 2006, the total number of miles traveled by automobiles increased 97 percent and the miles traveled by trucks 106 percent. Over the same period, the total number of highway lane miles grew a scant 4.4 percent—meaning that over twice the traffic was traveling on essentially the same roadway capacity.
- Over half of the miles that Americans travel on the federal-aid highway system are on roads that are in less than good condition, more than one-quarter of the nation's bridges



are structurally deficient or functionally obsolete, and roughly one-quarter of the nation's bus and rail assets are in marginal or poor condition.

- An ever-expanding backlog of investment needs is the price of our failure to maintain funding levels—and the cost of these investments grows as we delay.

If the Finance Commission's third observation is true (and it is) there can only be two possible explanations: either we had excess highway capacity in 1980, or we are not expanding the system so as to keep up with demand. The remarkable run up in highway congestion nationwide since 1980 suggests that the latter is true.

What level of surface transportation investment is needed? The American Society of Civil Engineers (2009), in its report card on U.S. infrastructure, gave grades of "D" to roads, transit, and inland waterways, and pegged the annual spending need for highways alone at \$186 billion (versus current spending of only \$76 billion). The other annual modal spending needs were estimated at \$53 billion for transit and \$10 billion for inland waterways (no estimates were made for other maritime transport facilities). The Policy and Revenue Commission set the total annual surface transportation investment need in the range \$133 billion to \$250 billion. The American Association of State Highway and Transportation Officials (AASHTO, undated) has estimated average annual federal funding needs over the next four years (2012-2015) to be \$68 billion for highways, \$15 billion for transit, and \$10 billion for intercity passenger rail. Finally, the FHWA (2008) biennial report to Congress, *2008 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance*, estimated annual capital investment needs of \$175 billion for highways and \$21 billion for transit. While these estimates come from various sources and cover different time periods and subsets of total transportation funding, they are all within the same general neighborhood, and show spending needs well above current expenditure levels.

There is more agreement on how to spend surface transportation funds. Preservation and rehabilitation of the existing physical plant should receive top priority, that is, quit deferring maintenance of existing highways, bridges, and transit systems and restore them to first class condition. Next in line on most lists are projects to add capacity for congestion reduction and service of newly developed areas; enhance safety; and provide needed public transit upgrades. Underlying this is recognition of a need to put in place better project selection criteria, such as those founded on economic analysis, to ensure that public funds are expended only on the best performing projects. Congressional earmarking of transportation improvement funds increased from 10 projects in 1982 to more than 6,300 projects in 2005 (NSTPRSC, 2008). Merit-based project selection following accepted economic and other benefit evaluation principles would decrease substantially the role of Congressional earmarking of funds for projects that have not been subject to such scrutiny, and also end the practice of diverting transportation revenues to non-transport uses.

Intercity passenger rail has been a matter of some controversy recently. As noted earlier the core service is provided by Amtrak, but high ridership exists in only a few high volume corridors, mostly in the Northeast. While the Amtrak service network does span the U.S., the network is not dense—many states have a single Amtrak line passing through, and two states have no service at all. The combination of a sparse service network, limited train frequencies, and schedule disruptions is such that it might be said that the U.S. lacks a truly effective intercity rail system that is on par with our highway and air transportation systems, or is comparable to

passenger rail service in Europe. The geography and population density of the U.S. make providing a high-quality and truly national service by a capital-intensive mode like rail a major challenge.

Like intercity rail systems throughout the world Amtrak requires public funding to stay in business, most of which comes from the federal government. Amtrak has been under constant Congressional scrutiny, and has had to fight each year for its appropriation. As a result federal funding has been uneven over the years, ranging from \$600 million to \$2 billion. In comparison, federal funding for highways has been consistent, and presently stands at about \$43 billion. Critics argue that other modes do a better job and require less subsidy. So far Congress has deemed maintaining intercity passenger rail to be in the public interest and has continued funding Amtrak's capital needs, and some operating costs, albeit at levels that keep Amtrak continually on the verge of financial failure. Despite these difficulties Amtrak ridership has risen from 21 million passenger trips in 2000 to 28.7 million trips in 2010 (Amtrak, 2011).

High Speed Rail (HSR) has drawn interest as a means of revitalizing the intercity passenger rail mode and providing the U.S. with a world class system. High speed trains operate at top speeds of 180 to 220 miles per hour in Europe and Asia, notably in France, Japan, and China. The immediate high speed goal in the U.S. is a more modest 150 mph, although speeds as high as 250 mph have been mentioned as longer range goals. Even proponents agree that the costs of providing such a system are formidable, since it would require a new and separate right of way and tracks. Capital costs for the Northeast Corridor alone would exceed \$100 billion, and a national system would run several hundred \$billion. This would be a long term project similar in magnitude to development of the interstate highway system. Congress has thus far provided about \$10 billion for intercity and high speed rail projects, and the administration has proposed a program of \$53 billion spread over Fiscal Years 2012 through 2017, with the ultimate goal of providing HSR access to 80 percent of the population within 25 years. A few states are also planning HSR systems using their own funds to supplement anticipated federal grants. The funding path has not been smooth, however. The governors of Florida, Ohio, and Wisconsin have turned back several \$billion of federal funds awarded to their states for HSR projects, on the grounds that those projects would saddle state taxpayers with long term costs to keep those systems in operation, and Congress has dropped HSR funding from the FY 2012 federal budget. Many observers feel that the high costs and worsening federal budget problems will at least delay the HSR program, if not kill it entirely.

Freight transportation programs also deserve mention as possible government investments. Freight transportation is primarily a private sector business, though it does make use of highways and waterways provided by governments at all levels. Efficient, safe, and secure freight operations benefit the public in the form of lower prices for goods, so federal and state (and some local) transportation programs are beginning to include a freight component. Recent federal surface transportation program legislation has provided some modest funding for freight projects, such as improving connector roads serving freight terminals and removing bottlenecks that impede freight flow. The argument for government involvement is that the benefits of freight projects are diffuse, while most of the costs are local. For example, projects to improve highway and rail access to marine ports in Southern California provide benefits to shippers located in far

flung locations such as Chicago, Columbus, OH and New York, hence there may not be enough local benefits for state and local agencies in California to fund such projects.

The public will support government investment in the transportation system if that spending meets certain criteria. The paramount one is economic efficiency, that is, the benefits of the project must exceed its costs. This should be analyzed over a broad geographic area, particularly when federal and state funds are being spent, since (as noted above) the benefits may not accrue only at the location of the expenditure. Benefits should also be broadly defined, to include improvements in mobility, safety, security, land development, economic productivity, environmental quality, public services, and so on. A second widely accepted criterion is equity, where public resources are expended to insure that all citizens have reasonable access to transportation services.

Surveys, such as a recent one by the Rockefeller Foundation (Hart Research Associates and Public Opinion Strategies, 2011), have consistently shown that the public will support funding of transportation projects if it can be shown that the money is being spent on needed improvements such as better highways and public transit, and that government funds are being expended efficiently and wisely. Other surveys have also shown public support for increased transportation taxes if the proceeds are used to fund identified transportation improvements. For example, in a survey by the Mineta Transportation Institute (Agrawal, et al., 2011), 62% of respondents supported a gas tax increase of 10 cents per gallon to improve road maintenance. However, "for tax options where the revenues were to be spent for undefined transportation purposes, then support levels varied considerably by what kind of tax would be imposed, with a sales tax much more popular than either a gas tax increase or a new mileage tax." The Rockefeller Foundation survey was one of the first to show resistance to increased taxation, despite the support shown for investments in transportation infrastructure.

## **WHAT MECHANISMS SHOULD GOVERNMENT USE TO RAISE PUBLIC FUNDS TO PAY FOR JUSTIFIED TRANSPORTATION PROJECTS?**

Any discussion about how to fund surface transportation must begin with federal motor fuel taxes and the Highway Trust Fund. The federal government first imposed a tax on motor fuel in 1932, at the rate of 1 cent per gallon. The revenue from this tax went to the General Fund, which was also the source of federal highway aid at the time. In 1956, spurred by the desire to establish a stable source of funding for the interstate highway system, the Highway Trust Fund was established as the repository of federal highway taxes, and the proceeds from the tax were dedicated to the federal highway program. The fuel tax rate was set at 3 cents per gallon. Congress has periodically raised the tax rate since then, most recently in 1993 to the present rates of 18.4 and 24.4 cents per gallon for gasoline and diesel fuel, respectively. The higher tax on diesel fuel, which is primarily used by large trucks, is an attempt to recognize the extra costs of construction, maintenance, and rehabilitation that large trucks impose on the highway system. The HTF also derives revenue from three separate taxes on heavy trucks.

The states were actually ahead of the federal government in imposing fuel taxes. By 1932 all states and the District of Columbia had enacted motor fuel taxes (Talley, 2000). Today the state taxes on motor fuel range from 8 to 37.5 cents per gallon on gasoline, and 8 to 39.6 cents per

gallon on diesel fuel (Federation of Tax Administrators, 2011). The fuel tax is dedicated to highways in 30 of the states (U.S. PIRG Education Fund, 2011).

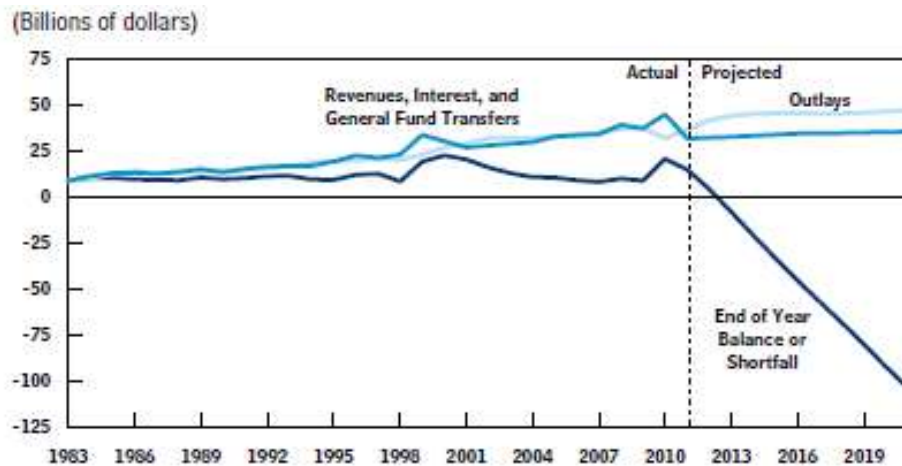
Originally all HTF revenue was dedicated to the federal-aid highway program, but there have been and continue to be "diversions" of the funds to other purposes. The Mass Transit Account of the HTF was created in 1983, to fund public transit projects, and 2.86 cents per gallon of the fuel taxes (both gasoline and diesel) are dedicated to this account. In 1986 Congress created the Leaking Underground Storage Tank Trust Fund and diverted 0.1 cents per gallon of the fuel taxes to that account, which funds related enforcement and cleanup activities administered by the Environmental Protection Agency. The remainder of the fuel tax revenue and all of the truck taxes are deposited in the Highway Account.

Just as the original federal motor fuel tax was levied for deficit reduction, twice in recent years the fuel tax was increased and dedicated to that purpose for a few years, but subsequently those increases were redirected to the HTF. In recent years Congress has diverted HTF revenue to a wide variety of non-highway purposes, including community preservation, scenic byways, recreational trails, and an array of public buildings (Utt, 2008). While some of these diversions are arguably transportation-related, critics feel that projects such as these should be funded from general tax revenues rather than the HTF.

One reason for the controversy about diversion of HTF revenue is that since ever since the first gasoline tax was introduced in Oregon in 1919 and dedicated to road improvement motor fuel revenues have been considered to be a user fee. That is, the more you drive the more you pay, but what you pay is plowed back into the highway system to fund roadway construction, operation, and maintenance. Purists argue (U.S. PIRG Education Fund, 2011) that motor fuel taxes are not strictly a user fee, since the taxes you pay may not go to support the roads that you use. For example, the federal portion of fuel taxes goes primarily to support interstate and other primary highways, but a particular driver may mostly use local streets. Also many drivers rarely use the public transit systems funded by the HTF, and much of the gas tax money paid by urban residents goes to support rural highways. Nonetheless the consensus view is that motor fuel taxes are a user fee that should remain dedicated to surface transportation. As noted in a recent RAND (2011b) report:

"For decades, taxpayers have considered gasoline and diesel taxes to be "user fees" for roads and transportation. Through these taxes, those who use the roads bear their costs. When roads and public transportation are funded out of general revenues, they compete for funding against schools, police, and parks at the state level, and against defense, health care, and other expenditures at the federal level."

A second reason for the diversion concern is that the HTF no longer covers the cost of the federal surface transportation program. In fact three transfers from the General Fund since 2008 totaling some \$34.5 billion have been needed to keep the fund solvent (Kile, 2011). Again from the RAND (2011b) report: "As a consequence of the effects of inflation and improved fuel economy, federal fuel taxes are no longer sufficient to cover the costs of federal highway programs. In 2008, HTF revenues ran \$36.4 billion; expenditures ran \$49.2 billion." The long term outlook is for continued shortfalls. Figure 2 illustrates the recent history and projected future of the



**Figure 2. Status of the Highway Account of the Highway Trust Fund**  
Source: Congressional Budget Office.

Highway Account balances and shortfalls. As noted by the National Surface Transportation Infrastructure Finance Commission (2009): "The current federal surface transportation funding structure that relies primarily on taxes imposed on petroleum-derived vehicle fuels is not sustainable in the long term and is likely to erode more quickly than previously thought."

Despite the shortfalls in the HTF, which have been predicted for some time, legislators have been unwilling to increase fuel taxes. If these taxes were ad valorem taxes rather than excise taxes the present HTF shortfalls would likely not exist. As noted earlier, the federal fuel tax rates have not increased since 1993. In the 1990s the federal tax constituted about 14 percent of the fuel price (RAND, 2011b). With the recent run-up in gasoline prices to around \$4.00 per gallon the federal tax of 18.4 cents is now only 4.6 percent of the price. So increasing the fuel tax is one possible means of dealing with the funding issue. As noted in the report of the NSTIFC (2009), an increase in the fuel tax of 10 cents per gallon that would maintain the federal program at current funding levels represents \$5 a month per vehicle, or about \$9 a month per household. Obviously those who drive more than the average number of miles or who use less fuel efficient vehicles would pay more than this.

Looking beyond the fuel tax, other funding means that have been proposed include greater reliance on toll roads, public-private partnerships to develop new capacity, and innovative financing mechanisms. Some of the latter that are already available include the Transportation Infrastructure Finance and Innovation Act (TIFIA) program credit assistance, Grant Anticipation Revenue Vehicles (GARVEES), Private Activity Bonds, and State Infrastructure Banks. TIFIA credit assistance is typical of these financing sources. It provides federal credit assistance in the form of direct loans, loan guarantees, and standby lines of credit to finance surface transportation projects of national and regional significance. TIFIA credit assistance provides improved access to capital markets, flexible repayment terms, and potentially more favorable interest rates than can be found in private capital markets for similar instruments.

In considering innovative financing mechanisms it is worth remembering what the Finance Commission noted, that "financing approaches—as distinct from revenue-raising mechanisms—are not a substitute for solving the underlying problem of insufficient funding." That is, financing deals with the timing of capital expenditures and repayments, and the interest rates charged. There must still be an underlying revenue stream, in the form of some mix of tolls, taxes, and user fees, to pay the bills.

Both of the national commissions whose reports have been referenced concluded that, in the long run, the motor fuels taxes must be replaced with some other user fees, and the most likely candidate is some type of a vehicle miles traveled (VMT) user fee. In the words of the Policy and Revenue Study Commission: "The motor fuel tax continues to be a viable revenue source for surface transportation at least through 2025. Thereafter, the most promising alternative revenue measure appears to be a vehicle miles traveled (VMT) fee, provided that substantial privacy and collection cost issues can be addressed."

The VMT tax has proven to be a controversial proposal. Many do not like the prospect of being charged by the mile for driving their cars, even though this is not, in reality, much different than the fuel tax which most drivers grudgingly accept. Consider, for example, a vehicle with an average fuel efficiency of 25 miles per gallon. If the combined federal and state fuel tax is 40 cents per gallon, the driver of that vehicle is, on average, paying a mileage tax of 1.6 cents per mile. The difference is that the tax is paid periodically, when the gas tank is filled, and it is buried in the price of the fuel so is not as obvious as would be a monthly tax bill for the miles driven. The second, and perhaps strongest, objection for most people is the privacy issue. VMT tax collection mechanisms rely on methods like GPS transceivers or license plate identification systems to measure and report miles driven. In some schemes the miles by specific location or type of road and time of day can be recorded, to allow for differential pricing. There are strong concerns about unauthorized access to and uses of such data, and the accompanying personal privacy violations.

An AASHTO forum in September 2010 on surface transportation financing options considered an array of funding options in detail, and the forum report (AASHTO, 2011) is worth a look. Figure 3 provides the forum's summary of the illustrative fee levels and resulting revenue potential of these various funding options. Some conclusions stated in the conference report are: "Some of the highlights of the alternatives discussed include: conversion of the current volume-based excise tax on gasoline to a sales tax levied proportionately to the price of fuel, more efficient use of federal-aid highway apportionments to leverage every dollar of federal investment, value capture-based public-private partnerships, use of the tax code to accelerate financing of transportation investments, and expansion of existing programs such as TIFIA."

It is interesting that of the 28 funding mechanisms identified in Figure 3 only two of them, the dedicated personal and business income taxes, come from non-transportation related sources. This reflects the widespread mindset in the U.S. that transportation investment should be funded from user fees rather than from the general treasury. This "user pay" principle has become an almost sacrosanct feature of U.S. surface transportation policy. The motive seems to be that by fencing off transportation funds from other government spending the program will largely be shielded from the vagaries and instability of the annual legislative appropriations process. While

## Surface Transportation Funding Options Matrix

(all revenue estimates in \$ millions)

Funding Mechanisms	Mechanism Yield (2011)	Illustrative Rate	Revenues 2011	Average Revenues 2011–2016	Total Revenues 2011–2016
Annual Drivers License Surcharge	\$1.00 Surcharge = \$ 222	<b>\$5.00</b>	\$ 1,110	\$ 1,165	\$ 6,993
Annual Highway Miles Traveled Fee (All Light Duty Vehicles)*	1¢/VMT = \$ 6,538	<b>2.0¢</b>	\$ 13,075	\$ 13,474	\$ 80,843
Annual Highway Miles Traveled Fee (All Trucks)*	1¢/VMT = \$ 977	<b>3.0¢</b>	\$ 2,931	\$ 3,020	\$ 18,120
Annual Registration Fee (Light Duty Vehicles)	\$1.00 Fee = \$ 261	<b>\$10.00</b>	\$ 2,613	\$ 2,741	\$ 16,448
Annual Registration Fee (Trucks)	\$1.00 Fee = \$ 44	<b>\$15.00</b>	\$ 66	\$ 66	\$ 399
Container Tax	\$1 per TEU = \$ 605	<b>\$15.00</b>	\$ 9,076	\$ 10,658	\$ 63,946
Dedicated Income Tax—Personal	1% of current taxes = \$ 1,130	<b>1.0%</b>	\$ 11,301	\$ 11,881	\$ 71,286
Dedicated Income Tax—Business	1% of current taxes = \$ 383	<b>1.0%</b>	\$ 3,832	\$ 4,029	\$ 24,172
Diesel Tax Increase	1¢/gal = \$ 386	<b>15.0¢</b>	\$ 5,794	\$ 6,052	\$ 36,309
Gas Tax Increase	1¢/gal = \$ 1,379	<b>10.0¢</b>	\$ 13,795	\$ 14,030	\$ 84,183
Harbor Maintenance Tax	0.1% Tax = \$ 1,236	<b>0.5%</b>	\$ 6,181	\$ 6,581	\$ 39,485
HVUT Increase	10% Increase = \$ 97	<b>15.0%</b>	\$ 146	\$ 169	\$ 1,017
Imported Oil Tax	\$1.00/Bbls = \$ 4,217	<b>\$1.00</b>	\$ 4,217	\$ 4,356	\$ 26,138
Sales Tax on Auto-related Parts & Services	1.0% of Sales = \$ 2,567	<b>1.0%</b>	\$ 2,567	\$ 2,823	\$ 16,938
Sales Tax on Gas	1.0% of Sales = \$ 2,987	<b>8.4%</b>	\$ 25,091	\$ 30,945	\$ 185,671
Sales Tax on Diesel	1.0% of Sales = \$ 868	<b>10.6%</b>	\$ 9,198	\$ 11,484	\$ 68,903
Sales Tax on New Light Duty Vehicles	1.0% of Sales = \$ 2,337	<b>1.0%</b>	\$ 2,337	\$ 2,571	\$ 15,427
Sales Tax on New and Used Light Duty Vehicles	1.0% of Sales = \$ 3,515	<b>1.0%</b>	\$ 3,515	\$ 3,837	\$ 23,021
Share of US Customs Revenues	1% of Receipts = \$ 333	<b>1.0%</b>	\$ 333	\$ 381	\$ 2,288
Tire Tax on Light Duty Vehicles	\$1.00 Fee = \$ 1,960	<b>\$3.00</b>	\$ 5,880	\$ 6,168	\$ 37,009
Ton Freight Charge—All Modes	1¢/ton = \$ 164	<b>25.0¢</b>	\$ 4,111	\$ 4,432	\$ 26,592
Ton Freight Charge—Truck Only	1¢/ton = \$ 113	<b>25.0¢</b>	\$ 2,835	\$ 3,057	\$ 18,340
Ton-Mile Freight Charge—All Modes	1¢/ton-mile = \$ 43,497	<b>0.5¢</b>	\$ 21,748	\$ 23,446	\$ 140,678
Ton-Mile Freight Charge—Truck Only	1¢/ton-mile = \$ 12,731	<b>0.5¢</b>	\$ 6,365	\$ 6,862	\$ 41,174
Truck/Trailer Sales Tax Increase	1% of Sales = \$ 219	<b>5.0%</b>	\$ 1,095	\$ 1,529	\$ 9,174
Truck Tire Tax Increase	10% Increase = \$ 33	<b>10.0%</b>	\$ 33	\$ 48	\$ 286
US Freight Bill—All Modes	1% of Sales = \$ 7,612	<b>1.0%</b>	\$ 7,612	\$ 8,206	\$ 49,236
US Freight Bill—Truck Only	1% of Sales = \$ 6,608	<b>1.0%</b>	\$ 6,608	\$ 7,124	\$ 42,745
<b>Total Revenues</b>			<b>\$ 173,465</b>	<b>\$ 191,137</b>	<b>\$1,146,819</b>

\*VMT fee estimates refer to miles traveled on Interstate System.

**Figure 3. Summary of Options for Federal Surface Transportation Funding**  
Source: AASHTO.

this has worked well in the past it has become obvious that maintaining user pay funding will require user fee increases. It is also worth noting that the user pay system does not exist in most of the rest of the world, where motor fuel and other transportation taxes are deposited in the general treasury and transportation investment must compete with other government programs for its share of spending. Perhaps it is time reconsider the merits and drawbacks of user pay funding of surface transportation.

Finally, in thinking about how to fund the system in the long run, the Finance Commission suggested the following guiding principles:

- The funding and finance framework must:
  - support the overall goal of enhancing mobility of all users of the transportation system;
  - generate sufficient resources to meet national investment needs on a sustainable basis.



- The funding and finance framework should:
  - cause users and direct beneficiaries to bear the full cost of using the transportation system to the greatest extent possible;
  - encourage efficient investment in the transportation system—recognizing the inherent differences between and within individual states—such that investments go toward projects with the greatest benefits relative to costs;
  - incorporate equity considerations—for example, with respect to generational equity, equity across income groups, and geographic equity;
  - support the broad public policy objectives of energy independence and environmental protection.

It's pretty hard to argue with most of these principles as design guidelines, even with the implied continued reliance on user pay financing.

## **A NEW STATEMENT OF NATIONAL TRANSPORTATION POLICY IS NEEDED**

This paper has often referred to the history of the development of our national transportation system. Early transportation links were developed to connect our towns and cities and to open up the country's vast interior, and highway programs were driven by basic needs such as postal service and getting farm products to urban markets, sometimes characterized as "get the farmer out of the mud." The 1950s ushered in the interstate highway system and other major expressway building programs as the focus of highway policy. Since the interstate system was largely completed in the 1990s, many argue, our surface transportation program has lost focus, and it certainly has not been articulated effectively.

The Revenue and Policy Commission offered the following recommendation as a starting point for surface transportation policy:

- The federal government must continue to be a major part of the solution, in partnership with states, local governments, and the private sector.
- The federal program should be performance-driven, outcome based, generally mode-neutral, and refocused to pursue objectives of genuine national interest.
- The 108 existing surface transportation programs in SAFETEA-LU and related laws should be consolidated and streamlined, essentially replaced by 10 new federal programs focused on areas such as infrastructure rehabilitation, global competitiveness, mobility, safety, and energy security.

We should take advantage of the Commission's deliberations and continue the dialog.

## **SOME POLICY CONCLUSIONS**

Based on the foregoing survey of the current surface transportation policy issues and discussion of the history and forces that have brought us to this point we offer the following policy conclusions:

- Surface transportation has a significant—even vital—role in supporting and facilitating modern industrial and agricultural societies, so fostering cost-effective transportation systems should be a national priority.
- Surface transportation investments have demonstrable economic and social benefits that go well beyond the sums invested. These benefits include net increases in economic



output and productivity, improved national security and disaster response, and equitable access to economic and social opportunities for our citizens.

- Governments at all levels are the primary providers and maintainers of most of the highway, public transit, and maritime surface transportation infrastructure, and that role must continue since the private sector will not on its own provide the necessary national and regional interconnected networks of transportation services. That being said, the private sector does have an important and increasingly larger role in financing (and sometimes operating) critical infrastructure projects, and governments need to form effective public-private partnerships to better leverage their surface transportation financial resources.
- Public investments in surface transportation have been lagging needs for several decades, to the point where our crumbling and congested infrastructure threatens our economic and social well being and our competitiveness in world markets. While some gains can be made through better use of existing revenue, rehabilitating the existing system and investing in our future will require spending that is tens of \$billions per year above recent levels.

How to raise the required revenue is a more complex and controversial issue. Federal and state revenues are primarily derived from liquid fuel taxes, and the combined effects of greater vehicle fuel efficiency and the tax structure have severely eroded purchasing power in real dollar terms. One often discussed near-term option is to increase the fuel tax rates to restore real revenues to at least the 1993 levels, which was the year of the last increase in the federal fuel tax. Whether increased or not fuel taxes should be converted from excise (per gallon) to ad valorem (percentage of price) taxes, in order to preserve future purchasing power. Equally as important, any changes in the fuel tax structure must be combined with improved performance-based project selection criteria, to ensure that public funds are being spent only on truly beneficial projects. Currently only federal navigation projects are subject to a requirement that national economic development benefits must exceed project capital and operating costs, and the freight railroads, being private rather than public, employ return on investment and profitability criteria to justify their expenditures. Appropriate performance metrics and economic analysis methods for highway projects have been available for many years, and it is high time that we begin to apply them.

In a recent blog Patrick Natale (2011), Executive Director of the American Society of Civil Engineers, nicely summed up the required action as follows:

"It is clear from public opinion polls and focus groups that the American public's faith in the federal government's ability to deliver transportation solutions is waning. Surface transportation authorization legislation must clearly define the federal role and responsibilities, and from that definition, the framework for a performance-based and fully accountable system can emerge. By introducing a new authorization bill that establishes a set of specific performance standards in areas such as congestion relief, asset protection, safety and financial stewardship and then imposing tangible enforcement mechanisms, these standards can be achieved. Congress would therefore be responsible for incorporating reliable units of measurement, in order to ensure that the best projects are selected by the Department of Transportation."

It may take some years to get the performance measures, selection criteria, and funding levels right, but we need to surmount these challenges and insist on near-term improvement. That is, we must not allow the search for perfection to delay immediate improvement. Almost anything that we can do along these lines will be better than what we are doing now.

Longer term we must face up to the inevitable conclusion that the fuel taxes, by themselves, are not sustainable as our primary revenue source. Beyond looking for new user pay and innovative financing mechanisms, it may be time to recognize that investing in surface transportation is one of the most productive uses of tax revenue, hence citizens should expect their legislators to accord this high priority. If non-productive spending on other programs is eliminated or at least reduced there should be funds available for maintaining and improving our surface transportation system. This, of course, raises the policy issue of whether or how much to continue to rely on dedicated transportation user fees. That is, what portion, if any, of the surface transportation program should be funded from the HTF and how much from general tax revenue? The pending HTF shortfall has forced the issue. It is urgent that we get on with the process of identifying and analyzing acceptable alternative or supplemental funding methods.

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