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## A Quiet Crisis in Transportation Finance

### Options for Texas

MARTIN WACHS

CT-260

April 2006

Testimony presented before the Texas Study Commission on Transportation Finance on April 19, 2006.

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Published 2006 by the RAND Corporation  
1776 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138  
1200 South Hayes Street, Arlington, VA 22202-5050  
201 North Craig Street, Suite 202, Pittsburgh, PA 15213-1516

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**The RAND Corporation**

**A Quiet Crisis in Transportation Finance:  
Options for Texas**

**Before the Texas Study Commission on Transportation Finance**

**April 19, 2006**

**Introduction**

The American transportation system, among the most advanced in the world, is the product of a delicately balanced partnership of federal, state, regional, and local governments, the private sector, and hundreds of millions of system users and customers. Responsibility for this enormous, complex system is divided among many organizations and jurisdictions. These collectively finance, build, operate, and maintain local streets and roads, intercity highways, and public transit systems that provide the mobility essential to modern economic and social life. This division of responsibility has evolved gradually over more than a century.

Transportation investments are often highly political and sometimes subject to vigorous debate. The planning and funding of transportation systems has always had to balance the priorities of many competing interests, including motorists, builders, truckers, shippers, taxpayers, and many others. It took literally decades of planning and debate, for example, to arrive at an agreement that specified the extent of and funding arrangements for the Interstate Highway System. Once the commitment was made to undertake the Interstate system, however, it benefited from the support of a broad spectrum of interests and its completion has deeply influenced the nation.

Amid this environment of carefully crafted agreements and gradual evolution, a crisis in transportation finance has quietly emerged. Longstanding approaches to finance are being abandoned, often with little public notice or debate. But the changes have been profound, and it is now clear that during the coming decade policymakers at all levels of government will be forced to rethink the fundamentals of American transportation finance.

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## **Background: How We Got Here**

### ***Local Transportation Finance***

A century ago almost all roads were local, and our rudimentary intercity roads, many of which were privately owned toll facilities, were completely inadequate to serve the rapid growth in vehicle travel that accompanied the widespread adoption of automobiles. Neighborhood streets and most county roads have long been and still are the responsibility of local governments. Although they make up the vast majority of the road system's lane miles, neighborhood streets carry only a small proportion of traffic by volume. Despite their generally low traffic levels, local streets are critically important because they provide private, commercial, and emergency vehicle access to residential and commercial property. In addition to being essential to residents and employees, the access provided by local streets imparts significant value to private property by allowing postal trucks, fire engines, police cars, ambulances, trash collectors, plumbers, and many others to reach individual land parcels. Streets are also the most common channels for electric wires, gas mains, and water and sewer pipes. For these reasons, local governments have long provided and maintained such roads, financing them primarily by levying taxes on the properties that benefit so directly from the access they provide.

### ***State Highways and User Fees***

Over time, states assumed a different, complementary transportation mission to that of local governments. In the early part of the Twentieth Century, Americans wanted to get farmers out of the mud and to connect them to regional markets. At the same time, rapid growth in automobile use created traffic jams on existing, mostly underdeveloped roads. Gradually, states (with strong incentives from the federal government in the form of matching grants) augmented local roads by creating major routes designed for heavy longer-distance traffic. These arterials—the state highways—were expensive, and they quickly strained state treasuries. In the early nineteen twenties, for example, California was devoting more than forty percent of all its state revenues to maintaining roads and paying interest on bonds it had issued to build the roads. Despite these high levels of spending, congestion was getting worse because appetites for highway travel were growing so rapidly.

In contrast to the accessibility focus of extensive, lightly-traveled local street networks, travel on state highways is more about mobility. This network serves longer-distance trips traveling at higher speeds and in greater volumes. Accordingly, the principal beneficiaries were seen to be

the users of the system – motorists, truckers, shippers, and so on, rather than adjacent property owners. So from this period of financial exigency came the revolutionary concept of “user fees.” Because the need for and costs of state roads varied in rough proportion to traffic levels, it made intuitive sense to cover the costs of those roads by charging the users. While tolls were considered at the time the fairest way to charge users, they had a major drawback. The cost of collecting tolls (constructing toll booths, paying toll collectors, revenue losses from graft and pilfering, and delays imposed on travelers) absorbed such a large a proportion of toll revenues that that they often exceeded the revenues generated. Further, developing interconnected road networks required the construction and maintenance of expensive-to-build links (over waterways or through mountain passes) and some lightly used links that could not be financed entirely by locally generated toll revenues.

The solution to this dilemma came when states, starting with Oregon in 1918, adopted an alternative form of user fee - motor fuel taxes. Although they charged for road use in rough proportion to motorists’ travel, and heavier vehicles paid more because they used more fuel per mile of travel, fuel taxes didn’t quite match tolls for equity because they didn’t levy charges at precisely the time and place of road use. However, fuel taxes cost much less to collect and administer than tolls, and soon they became the principal means of financing America’s main roads. Because they were user fees, most states reserved fuel taxes exclusively for transportation expenditures; this link between state fuels taxes and transportation expenditures has been mandated by federal law since the 1930s. When the federal government decided in 1956 to finance intercity highways on a national scale, it increased federal fuel taxes and created the Federal Highway Trust Fund, emulating the “user pays” principle that had been so successful in the states.

For better than eight decades, motor fuel taxes have paid most costs of building and operating major roads in the U.S. As public policy gradually came to favor a transportation system balanced to some extent between private cars and public transit, highway user fees were also used to construct and operate transit systems. Of course, this change was objectionable to some interests because it was seen as a “diversion” of road user fees to other purposes and thus a violation of the principle that user fees were to be reserved only for the benefit of those who paid them. But, in order to keep together an effective coalition of highway, transit, construction, and environmental interests, and recognizing that some automobile users benefit by the presence of transit in their communities, the funding of public transit in part with highway user fees has become institutionalized.

## ***Erosion of User Fees***

Amid this elaborate system of federal and state user-fee finance, a major change in the way we finance transportation systems is now underway, yet most of the motoring public, and even many public officials, are not even aware it is happening. Federal and state fuel taxes, though still the largest source of revenue for transportation, are rising far more slowly than either traffic volumes or transportation system costs. They no longer come close to covering the costs of building, operating, and maintaining the transportation system. Because it is levied per gallon, and not per dollar or per mile, inflation and improved fuel efficiency combine to erode the buying power of the motor-fuel tax. To keep pace with rising costs and increasing travel, the per-gallon fuel tax levy needs to be increased regularly – a significant political liability to an otherwise simple and elegant finance mechanism. But while fuel taxes have risen a few times since the early 1980s, they have fallen far short of keeping pace with the combined effects of inflation, improved vehicle fuel efficiency, and new program responsibilities.

In 1957, as America was starting in earnest to build the Interstate Highway system, the average state motor fuel tax stood at 5.7 cents per gallon. If we apply the consumer price index to that rate of taxation it would be equivalent to an average rate of 39.6 cents per gallon in the year 2005. But the actual average state motor fuel among the fifty states today stands at only 20.3 cents per gallon. In other words, in order to simply match the per-gallon buying power of the motor fuel tax in 1957, states would have to raise their gas taxes today by an average of 19.3 cents per gallon. It is beyond the realm of possibility that they would do so. The federal gasoline tax in 1957 stood at 3 cents per gallon, and it would have to be raised to 20.8 cents per gallon to have the same per-gallon buying power today that it had in that year. Since the federal gasoline tax is today 18.4 cents per gallon, it comes closer than the states do to keeping pace with inflation, but it also falls short of staying even.

These figures on motor fuel tax rates only consider the effect of inflation on the buying power of the per gallon motor fuel tax. The fuel tax's eroding purchasing power has been compounded by increasing vehicle fuel efficiency. The average passenger car traveled 13.5 miles per gallon in 1970, and this had risen to about 22 miles per gallon by the year 2000, an improvement in fuel efficiency of 63 percent. Of course, this improvement is highly desirable and happened partly in response to American energy policy initiatives, including the Energy Policy and Conservation Act, which specified Corporate Average Fuel Economy (CAFÉ) standards. Nevertheless, improved fuel economy directly reduces per-mile revenues from motor fuel taxes. In other words, we drive

many more miles per penny contributed to trust funds today than we did when we started building the interstate system.

At the very same time that transportation programs have faced this relentless and systematic reduction in inflation-adjusted revenues per mile of travel, the cost of roads and other transportation facilities has risen dramatically, further straining the faltering revenue stream. Building and maintaining roads and transit facilities require spending on land, labor, capital equipment, and materials, all of which cost much more than they once did. The Engineering Newsrecord Construction Cost Index, for example, tracks over time the average cost in 20 cities of a mix of major ingredients in the cost of transportation facilities: common labor, steel, lumber, and concrete. Between 1957 and 2005 the index rose by nearly 850 percent. Although there was a gain in construction expenditures' productivity during this time period, it is nonetheless clear that revenues have declined dramatically in relation to costs.

Despite declining revenues and rising costs, transportation programs also have been called upon to broaden highway program expenditures to address societal demands. One important example of the growth of programmatic responsibility in transportation has been increased spending on the mitigation of environmental impacts of transportation investments. For example, new highway construction projects often incur additional costs to achieve context sensitive design. Highway projects often must incorporate facilities to collect and treat surface water runoff if they interfere with natural watercourses, and much more transportation program money is spent today on sound walls and other noise attenuation strategies than was typical thirty or forty years ago. While increased sensitivity to aesthetic and environmental impacts of transportation is clearly in the public interest, the increased costs associated with these activities further reduce the transportation services that can be provided per dollar of expenditure, further shrinking the buying power of motor fuel tax revenues. Beyond environmental mitigations, highway projects also typically incorporate costs for job training programs for local residents in communities through which highways pass, and for replacing businesses and residences displaced by construction; such costs per mile of road construction are growing dramatically in many metropolitan areas.

It is also worth noting that, as the transportation system grows in extent and as it ages, an ever increasing share of expenditures is needed to operate, maintain, and renew the existing system, meaning that even less money is available for system growth. The Interstate system has now matured to the point that many states face increasing financial burdens related to the replacement of pavement, bridges, and other structures that have deteriorated over decades of often heavy use. In some locations, it has also become necessary to strengthen existing facilities as new information has come to light about the impacts of earthquakes on roads and bridges.



### ***Worsening Congestion a Product of these Trends***

Traffic congestion is clearly worsening in many places, and surely declining real revenues combined with rising costs for maintenance, operations, and system expansion are among many factors that explain rising traffic delays. Between 1985 and 1999, vehicle miles of travel on U.S. roadways grew by 76 percent, whereas lane miles increased by only 3 percent. During that same period, average daily vehicular volumes on urban interstates rose by 43 percent. The Texas Transportation Institute (TTI) issues an annual Urban Mobility Report that, despite some significant limitations in its ability to accurately measure congestion, shows that metropolitan traffic congestion, especially in the largest metropolitan areas, is worsening. While the annual delay per peak hour traveler stood at twelve hours in 1982, it had grown to 46 hours by 2002. Given the trends in rising vehicle travel and limited road capacity expansion described above, this trend toward increasing congestion is likely to continue. The Federal Highway Administration expects vehicle miles of travel to increase by another 42 percent by 2020, with the growth rate for heavy trucks increasing faster than that for lighter vehicles. Congestion will surely worsen at some locations, especially at key bottlenecks in the transportation system.

While the recent ramp up in fuel prices may slow some of the projected growth in travel in the short term, history suggests that drivers are more likely to respond by shifting to more fuel-efficient vehicles than by curtailing driving; so unless fuel prices were to climb much higher, vehicle travel is likely to continue growing in the years ahead.

### ***Further Erosion of User Fees Likely***

There is every reason to believe that the trends described above are likely to continue, and probably to intensify. The political climate is one of wariness for any kind of tax increase – even increases to transportation user fees. While a transportation user fee can arguably be seen as something other than a tax – President Reagan made this argument when the federal motor fuel tax was last raised – the distinction between a user fee and a tax is too subtle a point to sway many legislators today. During the recent debate over reauthorization of the federal surface transportation program there was a strong consensus among legislators that motor fuel taxes should not be increased in order to expand the federal transportation program. And, while a few states like Wisconsin and Washington have chosen to increase their gasoline and diesel fuel taxes, they have without exception failed to raise their levies at a sufficient rate to keep pace with the combined effects of inflation and improving motor fuel economy.

Compounding this general aversion to tax increases are rising motor fuel prices. While such price increases typically have only modest effects on driving behavior, most legislators do not wish to incur the wrath of their constituents by even discussing possible increases in the motor fuel tax rate while the pump price of gasoline is fluctuating between \$2.50 and \$3.50 per gallon. This is despite the fact that gasoline and diesel prices in the United States remain well below retail prices in most other industrial nations, and tax rates here are well below those in other countries. While the effects of wars and natural disasters on fuel prices are likely to ebb and flow over time, the long-term trend toward higher fuel prices is likely to continue, due to continuing growth in international demand for petroleum and the actions of international oil production cartels. Here in the U.S., relatively fixed refinery capacity coupled with the need for particular “boutique” fuel mixes in some regions for different seasons of the year to comply with federal air quality standards contribute further to the upward pressure on fuel prices. It is worth noting that when confronted with rising gasoline prices in recent years, several state legislatures and the U.S. Congress held hearings to investigate the possibility of *lowering* motor fuel taxes in an effort to compensate for the rising retail price of fuel at the pump.

### ***Longer Term Energy Issues***

Some might dismiss current reluctance to raise motor fuel taxes as a matter of political will that could change over time, but there are additional reasons to think that the motor fuel tax is not a viable revenue base for transportation over the long term. The recent introduction of hybrid vehicles is an indication of what may well be a long-term transition away from petroleum-based fuels. While one could view the explosive growth of gasoline-electric hybrid vehicles as just another step in improved fuel economy, hybrids still make up only a small proportion of the vehicle fleet, so their effects to date on fuel tax revenues collected per vehicle mile have been minimal. But at the federal level and in some states incentives are being put into place to accelerate the shift to hybrids. Federal tax credits and state programs allowing hybrid vehicles carrying a single occupant to use high-occupancy vehicle (HOV) lanes are early indications of even more aggressive incentives that could follow; though rising fuel prices likely will do far more to motivate motorists to purchase hybrids and other high-mileage vehicles than federal or state incentives. In addition to hybrids, advances in conventional engine technologies – such as variable cylinder management systems and increasingly sophisticated variable timing control systems – are ushering in a new wave of fuel efficiency improvements. Eventually the long promised breakthrough in electric battery technology could occur, making purely electric vehicles more feasible than they have been heretofore. And hydrogen fuel-cell technology, seen by many to be promising over a longer time horizon of twenty or more years may one day be

commonplace. Thus, the list of emerging clean, efficient motor vehicle propulsion technologies over both the short- and longer-term is long and growing.

It is impossible to anticipate with precision the likely market penetration of hybrid, electric, or hydrogen fuel cell vehicles. More important than any particular technology is increasing concerns with global warming and the links between the use of carbon-based fuels of all sorts and the concentration of greenhouse gases in the atmosphere. What is likely to be a growing national commitment to the reduction of the production of greenhouse gases is foreshadowed by the California Energy Commission's current program aimed at automobile engines. It could become national policy to reduce the burning of fossil fuels in order to slow growing concentrations of greenhouse gases. Should this happen, basing our system of transportation finance on the sale of carbon-based fuels at both the federal and state levels via the motor fuels tax will be increasingly problematic. A national policy requiring reduction in the use of fossil fuels and a fuel-tax based system of transportation finance are inherently in conflict, since growth in revenue for the highway program comes only through increasing use of fossil fuels. This conflict between environmental and fiscal policy objectives is likely to dominate federal transportation policy debates during the coming two decades.

Traditional federal and state motor fuel taxes will undoubtedly produce many billions of dollars in transportation revenues in the years ahead, but we are necessarily in a transition to a new system or systems of transportation finance. Despite its many virtues, all evidence suggests that the fuel tax's days are numbered, though what that number might be remains the subject of considerable debate. Whether it is ten years or twenty, the successors to the fuel tax should be reflectively and deliberately chosen.

### **Possible Future Policy Directions**

If motor fuel tax revenues will become increasingly inadequate to support the operation, maintenance, and expansion of the transportation system in coming decades, we must begin to consider alternative ways of establishing a strong and stable financial base for that system. Included in consideration of the alternatives must be attention to the transition from the current system to any future system.

### ***Increased Reliance on Borrowing***

One response to decreasing production of revenue through motor fuel taxes has been increased borrowing. Often referred to as "innovative finance," debt financing of capital facilities for

transportation has increased over the last decade. Reliance on loans takes two forms. First, federal and state programs are making it easier to borrow public funds. For example, “grant anticipation revenue vehicles” (GARVEEs) and “grant anticipation notes” (GANs) are short-term loans of federal funds to transportation agencies that commit future federal and state trust fund distributions in advance of when they would normally be received in order to complete funding packages needed to build projects today. State infrastructure banks also have been created to provide “revolving funds” that enable projects to be built through borrowing, and funds to accumulate in the banks through the repayment of the principal plus interest. Second, efforts to interest international sources of private capital – from banks, retirement funds, and the like – to invest in highways and bridges are growing. In most cases, these projects commit to repaying the borrowed capital over twenty or thirty years or more, usually from the proceeds of tolls or other fees charged to users.

Borrowing is good way to finance large public capital investments with high up-front costs that provide benefits to users for years, even generations. Debt financing makes sense when the annual stream of expected benefits from a project (discounted to the present) exceeds the annual principal and interest payments for the project (also discounted to the present). Common examples of bond-financed projects are schools, dams, and sewage treatment plants. Borrowing money by issuing low-interest, tax-exempt bonds spread the cost for a new public facility over time in rough proportion to the actual benefits from that facility. The low interest costs of tax-exempt bonds and the rough matching of costs and benefits to users over time make borrowing to finance public facilities appealing in many respects. Paying off the loans floated to build transportation projects is, of course, a long-term financial obligation that requires agencies to acquire revenue throughout the life of the project to repay the capital and to meet interest obligations.

A century ago most states relied heavily on bonds to develop their road infrastructure. As the road system expanded, however, the cost of new road projects constituted a smaller and smaller share of the ongoing cost of building and maintaining the entire system. The cost of the road system became more regularized from year to year and less like the irregular, “lumpy” expenditures on schools or water treatment facilities traditionally financed with bonds. In addition, there emerged in the 1920s a simple, straightforward way to directly charge drivers for their use of the expanding road system: motor-fuel taxes. Thus, in the 1920s the large scale and regular, continuous nature of road expenditures and the opportunity to directly charge road users led to the adoption of a “pay-as-you-go” philosophy in road finance discussed earlier. So, between the introduction of the gas tax in 1920s and the 1980s, the states and federal government largely

held to this pay-as-you-go user-fee approach, using bonds only to pay for tolled bridges and tunnels and a few “turnpikes.”

But as money for transportation improvements has grown increasingly tight over the past two decades, states have increasingly turned to borrowing to pay for non-bridge and tunnel road projects. This is because borrowing is a politically appealing way to finance transportation. Bonds raise revenues without directly increasing taxes (though, of course, long-term debt service obligations do increase) and they generate this revenue starting immediately. Also, the large, visible public capital projects paid for with bonds tend to be popular among voters.

Because the states and federal government mount large and approximately equal-sized transportation capital programs each year, the benefits of debt financing are more immediate than on-going because debt service obligations in subsequent years reduce the funds available to pay for new projects. In other words, while borrowing to pay for transportation projects can be a good idea (such as when the debt can be retired directly from facility tolls or other user fees), it can also simply be a way to put off for a few years the politically difficult task of restructuring transportation finance. And, unfortunately, many recent decisions to debt finance transportation projects have been motivated by a desire to get needed projects off of the ground as traditional revenue sources have run dry rather than by dispassionate calculations of expected benefits and costs.

The long-established pay-as-you go system provides a useful fiscal discipline that bonds do not; it is all too easy for public officials to promise popular projects without specifically committing the tax revenues needed to retire the bonds. And, despite the advantages of tax exemption, interest payments make bond-financed projects considerably more expensive than those paid for with current revenues. One evaluation of the benefit of financing roads with bonds in Texas found that overall benefit to the state would be reduced if bonds were issued. Bonds were expected to improve pavement and operating conditions during the few years just after issue, but conditions were then expected to deteriorate later when available highway revenues were reduced to cover debt service obligations. In California, bond issues have recently been accompanied by lists of projects. These lists often include economically inefficient projects chosen for political reasons. Thus, while loan financing may have merit for selected and specific projects like major toll bridges, borrowing is often a costly way to finance transportation.

## ***Electronic Toll Collection***

While tolls were considered by many observers at the dawn of the automobile era to be ideal user fees, they were rejected, as noted above, because of their high costs of administration. But nearly a century later, rapid and dramatic advances in technology have revived the potential and promise of tolls. A new breed of information technologies – including on-board computers, global positioning systems (GPS), digital maps, and wireless communications – now make it relatively easy and cheap to measure and record vehicle travel by road segment and time of day, even across different states and jurisdictions. Such technologies effectively open the door to numerous tolling options long proposed by transportation economists but never before deemed feasible or practical. There are today over ninety projects underway around the world in which innovative electronic tolling applications are already in place or in the advanced stages of development. They incorporate a variety of pricing schemes, ranging from facility congestion tolls to area congestion tolls to weight- and distance-based user fees and insurance charges. Of these, by far the most technically advanced plans with the greatest revenue potential are proposals to replace the fuel tax with a general-purpose, network-wide, distance-based user fee for automobiles and trucks.

Although exact implementation details for distance-based user fee proposals vary, the technical strategy, in its simplest form, works as follows. To determine and record travel information, each vehicle must be equipped with an on-board unit that integrates these components: a GPS receiver, a set of digital maps showing jurisdictional boundaries, an odometer feed, a rate table for computing distance charges, and some form of wireless communication technology for reporting billing data. During each trip, the computer repeatedly checks the GPS receiver to determine geographic location, and then it compares this information with digital maps to establish the current jurisdiction. Each mile traveled (based on the odometer feed) is then sorted and stored by jurisdiction, and the computer uses this information, along with the rate table, to keep a running total of fees owed to different authorities (for example, different states).

Periodically, this information is transmitted to a billing agency so that charges can be levied and fees paid. This can occur, for example, via dedicated short-range communications when the driver refuels, in which case the fees could be simply added to the fuel bill. Alternatively, data could be uploaded to a billing agency such as a credit card company on a monthly basis, and the vehicle owner could be billed electronically. To prevent toll evasion, on-board equipment must be tamper-resistant; some units are programmed to perform regular checks against the odometers to ensure that the units have not been turned off during any period of operation. Jurisdictions may

also choose to mount roadside devices that can communicate with passing cars to verify that on-board units are installed and operational.

Such distance-based fee proposals are without question ambitious, yet several states in the U.S. have already launched efforts to evaluate the feasibility of per-mile electronic tolling. In 2001, the Oregon legislature commissioned the state's Department of Transportation to develop a long-term vision for road finance, which resulted in a detailed proposal for a mileage-based road fee, now being tested in and around the city of Eugene. The Minnesota Department of Transportation pooled resources with fourteen other states (California, Connecticut, Iowa, Kansas, Michigan, Missouri, North Carolina, Ohio, Oregon, South Carolina, Texas, Utah, Washington, and Wisconsin) and the Federal Highway Administration to fund a proposal, developed by researchers at the University of Iowa, for a multi-jurisdictional (state-to-state) mileage fee.

While these American proposals are just now being tested, distance-based electronic tolling has already gained considerable traction in other parts of the world, most notably Europe. Austria, Switzerland, and Germany have all recently launched automated weight-distance truck tolls across their national highway networks, and the United Kingdom is planning to develop a similar system in the next few years. The Netherlands had developed plans to implement a distance-based fee applying to both trucks and passenger cars, but the idea was shelved in 2002 with the election of a more conservative government. More recently, the cities of Copenhagen, Gothenburg, and Helsinki have experimented with distance-based user fees, while the European Space Agency, eager to find applications for its upcoming Galileo global satellite system, has begun to lay out specifications for a pan-European distance-based road tolling system. While many of these European experiments have cited fiscal shortfalls as a central motivation, they have also explicitly focused on other important objectives such as accommodating increased travel among European Union member countries, managing congestion, encouraging shifts away from single-occupant autos, tracking burgeoning truck travel, and providing incentives for the purchase of cleaner-emission vehicles.

The move towards electronic tolling is well short of a juggernaut. The idea continues to be met with considerable skepticism, and in some cases outright hostility, among some transportation interest groups, voters, and elected officials. The most common objections are related to privacy and environmental issues. For those concerned with privacy, the prospect of on-board equipment that could allow the government to track and monitor drivers without their consent or knowledge is chilling indeed. Meanwhile, environmental advocates worry that distance-based pricing schemes would take the form of flat mileage fees accounting for neither fuel economy nor emissions differences among vehicles. Replacing the existing fuel tax with such a flat fee would

effectively eliminate one of the few tax-related policy incentives for purchasing more fuel-efficient vehicles. California Assemblywoman Fran Pavley neatly summed up both of these objections saying:

*People who drive fuel-efficient, less polluting cars would have exactly the same tax burden as people driving huge gas guzzlers... Allowing the government to track Californians' movements everywhere they drive is a totally unacceptable Big Brother-type intrusion.... Invading our privacy and providing a disincentive for people to drive clean-air vehicles would be a terrible U-turn in public policy. This one belongs in the scrap heap.*

Such concerns are understandable, and public suspicions are certainly not allayed by sometimes histrionic press coverage. A recent *Los Angeles Times* article discussing the Oregon pilot test, for example, reported that “tracking devices send a signal to a GPS satellite following the car.” Such language paints an alarming image for anyone concerned about privacy, but GPS satellites don’t follow cars at all. Rather, a GPS receiver in the car uses signals from the satellite to determine its own location. Such misrepresentations aside, it becomes evident, when one digs a little deeper into the details of distance-pricing proposals, that both privacy and environmental concerns can be addressed through appropriate technological and programmatic design. Each of the distance-based pricing proposals currently being tested or in operation ensures that users’ privacy can be protected, and several ingenious strategies seek to achieve this aim. In the University of Iowa proposal, for example, drivers would periodically download billing data from the onboard unit onto a smart card, and then upload the data to the billing agency via a card reader at a filling station or on a home computer. The transfer process would be divided into two transactions. The first would upload user identification and total amount owed. Then a second, anonymous connection would report the division of the bill to different jurisdictions. Jurisdictions would thus receive the appropriate revenues, but the government would never know *where* or *when* any individual had traveled, only the total amount owed.

To address environmental concerns, mileage-based tolls could be set to vary by vehicle-emissions class. This approach has already been employed in the German weight-distance truck-toll system, where the distance charge is fifty percent higher for the most polluting vehicles than for the least polluting ones within any given weight class. Such adjustments could be applied to passenger vehicles as well as trucks. Many transportation analysts are intrigued by electronic tolling because it permits variable charges to reflect the numerous costs—congestion delays, damage to road beds, vehicle emissions, etc.—that users impose on the system. Such variable pricing strategies are already being explored in many places. The Puget Sound Regional



Council, for example, is currently performing a trial of network-wide congestion tolls using on-board computers equipped with GPS receivers and digital road network maps.

Another common objection to tolling – electronic or otherwise – is that motorists already pay for the roads through user fees, mostly in the form of motor fuel taxes. Asking drivers to then pay electronic tolls to drive on some facilities or in some areas thus constitutes “double taxation.” This salience of this argument depends on how narrowly or broadly one defines transportation system costs. Here we can consider both the direct costs of building and maintaining a roadway, and the indirect costs – noise, emissions, delays imposed on other drivers, etc. – that users impose on the system. With respect to direct costs, building a roadway can vary dramatically from place to place. Bridges and tunnels, for example, can be vastly more expensive per mile to construct than roadbeds on dry, flat land. But, absent tolls on bridges, the revenues generated through fuel taxes don’t vary from facility to facility. Further, heavy vehicles typically impose many times the wear and tear on roads per mile traveled than passenger vehicles, yet fuel taxes paid per mile tend to vary far less. Likewise, when motorists squeeze their vehicles onto crowded freeways during rush hour, they can impose surprisingly large levels of additional delay on the vehicles backed-up behind them. While delay costs imposed on other drivers are not directly linked to the cost of building or maintaining the road system, they are nonetheless quite significant. Tolls set to account for vehicle weight, emissions, or use of congested facilities may thus increase the equity of transportation fees across users and increase efficiency in the use of the system as well. For example, truck weight fees that vary by axle weight can encourage truckers to purchase vehicles with more axles in an effort to reduce their fees, and substantially reduce the damage that trucks do to roadways in the process.

Concerns over double-taxation from tolls is also allayed when electronic tolls are placed on new or added highway capacity rather than on existing highways, since the electronic charges can clearly be aligned with the incremental costs of those new roads (although fuel taxes for other roads are also paid while using new toll roads). Perhaps more significantly, when electronic tolls are used to *replace* existing motor fuel taxes rather than charged *in addition* to fuel taxes, this issue of double payment is moot. For example, travelers can be billed at lower rates to cover maintenance and operating costs when traveling on roads whose capital costs were borne by fuel taxes in the past, while paying higher rates per mile to drive on roads for which debt is currently being repaid.

Switching to a distance-based user fee system would require a major investment in new technology, as well as developing new administrative capabilities within government, or through private contractors, to manage the program. Should the transition to electronic tolling be revenue

neutral, or should fees be set to fund the backlog of existing maintenance and construction needs? Should fees vary by vehicle weight and/or emissions class? Should heavy trucks be charged more to travel on secondary roads – where they do the most damage – than on more heavily-engineered highways? Should urban areas be allowed to layer congestion tolls on top of base fees? Which of these ideas is the public prepared to accept? In London and Southern California, less sophisticated congestion pricing programs have successfully increased vehicle flows and reduced delays with little or no public outcry. But whether network-wide schemes would be received as calmly is far from clear.

Finally, depending on how these policy questions are answered, tolls could be structured to increase transportation system efficiency, effectiveness, and equity – or they could be set to disproportionately benefit powerful entrenched interests. Indeed, while some are promoting the potential to improve efficiency, effectiveness, and equity, others oppose electronic tolling precisely because it opens the door to variable fees that address these issues. Trucking interests, for example, could be expected to push for flat, per-mile tolling to avoid paying higher variable tolls for operating heavier or more-polluting vehicles. At the same time, manufacturers of large sport utility vehicles, already stinging from lagging sales due to recent increases in fuel prices, might be expected to lobby against the inclusion of per-mile emissions or fuel-efficiency fees.

In short, while distance-based pricing offers the *potential* to price for a variety of indirect costs like vehicle weight, emissions, or delays imposed on other drivers, whether or not such strategies would survive the political bargaining process is very much in doubt. Reopening the long-settled questions of who should pay for roads and how they should pay entails considerable risk and uncertainty for nearly everyone. If raising the motor-fuel and other established transportation taxes had not become so difficult politically, it's likely that the development of electronic tolling systems would be moving along much more slowly.

### ***Local Option Transportation Taxes: Moving Away from User Financing***

A potential shift to electronic road charges in proportion to distance traveled, modified by vehicle weight or fuel efficiency, is an example of a strategy that builds upon our long history of financing transportation facilities through user fees. While these approaches appear to be advancing rapidly in Europe, they are being implemented far more rarely in the U.S. – though they are starting to be considered in many places. Meanwhile, it is fair to say that our country has gradually been shifting the financial burden for transportation away from user fees and toward general taxes and fees, such as sales taxes, that fall upon all citizens regardless of the extent to

which they use the transportation system. In contrast to the “drive less, pay less” fuel tax user fee, with sales taxes light or occasional users of the transportation system tend to pay far more per mile traveled, while frequent, heavy users of the transportation system tend to pay far less.

A surge in local ballot measures has been taking up at least some of the slack caused by the relative drop in fuel tax revenues at the state and federal levels. Before 1980, few states encouraged or even permitted their cities or counties to levy their own transportation fees, except for the property taxes traditionally used for neighborhood streets and county roads. In the 1970s, major metropolitan areas adopted permanent sales taxes to support the development of new transit systems; in the 1980s, several states authorized local jurisdictions to use ballot measures to raise revenues for transportation purposes. The pace accelerated during the 1990s as 21 states either adopted new laws authorizing local option transportation taxes or saw dramatic expansion in their use.

During calendar year 2002, American voters considered 44 separate general transportation tax ballot measures and in calendar year 2003 they considered 43 more. About half of these measures were approved, and some of the measures were the second or third attempt to pass a measure in a given jurisdiction. Only a few of these measures involved user fees like fuel taxes. Local sales tax increases were by far the most common taxes considered in these measures, but some voters also enacted vehicle registration fees (arguably a user fee, but more accurately a form of personal property taxation), taxes on real estate sales, local income or payroll taxes earmarked for transportation, and taxes on new real estate developments.

These sales taxes are the fastest growing source of money for transportation in California, and in many other states as well. The popularity of local sales taxes for transportation can be attributed to four important characteristics:

1. *Direct local voter approval:* These measures typically result in projects and services near voters' homes and work places, so they personally can appreciate them and anticipate their benefits. In an era of growing distrust of politicians, these measures provide tangible direct local benefits.
2. *The taxes have finite lives:* Voters enact transportation taxes that will persist typically for fifteen or twenty years unless specifically reauthorized by another popular vote. Voters thus have a sense of control over their money. If projects don't live up to their expectations or if they fully accommodate growth and reduce congestion, the taxes could end.

3. *Specific lists of transportation projects:* The taxes may be used only to build certain projects or fund specific programs named in the ballot measures, and politicians' discretion to spend the money is severely limited.
4. *Local control over revenues:* The money raised locally is spent locally and for local benefit, under the control of a local transportation authority, assuring citizens that the money will not leak into other jurisdictions.

These provisions give citizens more direct control over the transportation investments they pay for than is typical with motor-fuel taxes, though this direct control stems from the local voter approval process and not the fact that the funds are typically raised from non-transportation sources. Nonetheless, surveys of voters and interviews of local politicians regarding these measures find that local control is the single most politically attractive aspect of local option transportation taxes.

Sales taxes are also lucrative because they have a broad base. While fuel taxes are paid only by motorists on fuel purchases, sales taxes are paid by many more people purchasing a much wider range of goods. Thus, even small sales tax increases can generate significant sums of money. One county, for example, estimated that a one-percent general transportation sales tax produces as much revenue as a motor fuel tax increase of sixteen cents per gallon. While the annual tax paid by households might be the same between these taxes, small increases to a frequently paid tax has proven much more palatable politically.

The most consistent trend in sales-tax expenditures shows operations and maintenance of existing facilities receiving far less funding than new capital projects. Voters are believed to favor measures that create new rail lines or highway bypasses; while many believe that they are unimpressed by plans to restripe pavement or repave deteriorating road surfaces. However, the content of expenditure plans varies widely from county to county and from measure to measure, reflecting differences in local priorities. Rural counties are more likely than urban ones to put control of sales tax revenues in the hands of local jurisdictions and to spend most of their revenues on highway projects, streets, and roads rather than on public transit.

Each county that collects and administers a transportation sales tax has a designated transportation authority to oversee use of the funds. Thus, the creation of county transportation authorities has significantly expanded the planning and delivery of transportation improvements at the county level. But stronger county-level decision-making may also weaken the regional

planning mandate, particularly where counties are part of larger multi-county metropolitan planning organizations. Indeed, poorly coordinated transportation planning among local governments is what prompted the federal government to mandate the creation of metropolitan planning organizations (MPOs) back in the 1960s. But during the current era of rising local control over transportation funding, state and federal funds may be diverted to build projects that complement county projects, rather than addressing priorities of metropolitan planning organizations. Opportunities to plan regionally also suffer where a large proportion of sales tax revenue is returned directly to local jurisdictions within a county.

Supporters of local transportation taxes tout the benefits of enumerating specific projects in the ballot measures. But in approving project lists voters limit the transportation agencies' flexibility to respond to changes in conditions or needs during the life of the measures. Revenue shortfalls, cost escalations, or changing political sentiments about projects may mean that over time agencies will want to deviate from the list of voter-approved projects. Transportation authorities face pressure to expend funds in accordance with the ballot measures and to deliver on the commitments made by local political leaders regardless of changing budgets or shifting political priorities. This pressure can have serious drawbacks. There can be many obstacles to the completion of projects administered by transportation authorities, and the transportation authorities are not usually required to base their implementation priorities on project cost-effectiveness, or to spend sales tax revenues on mitigating potentially damaging environmental consequences of voter-mandated projects.

Transportation tax referenda around the nation are often assumed to be nothing more than a new and politically expedient way of raising needed revenue – of filling the gap in revenue created by slowing increases in motor fuel taxes coupled with improved vehicle fuel efficiency. But, local option transportation taxes may be doing much more than that. In addition to raising money, they are gradually but inexorably changing the way we plan and finance transportation systems in several fundamental ways:

1. The growing popularity of sales taxes is gradually but steadily shifting the financial base of our transportation system from user fees to general taxes paid by all citizens, regardless of their direct reliance on the transportation system. Economists have long argued that user fees have at least some tendency to induce more efficient use of the transportation system; higher fuel taxes might, for example, encourage motorists to acquire more fuel-efficient vehicles. In contrast, general taxes provide no incentive for greater transportation efficiency of any sort. And, while sales taxes and fuel taxes are both income regressive (meaning that people having lower incomes pay a higher

proportion of their incomes in each of these taxes than do people having higher incomes), the effects on the poor of user fees are tempered by the fact that those who pay them always benefit from them, while sales taxes burden non-users as well as users. On the other hand, it can also be argued that in 1920 only ten to fifteen percent of all citizens were highway users, while in 2005 almost everyone is a transportation system user. If nearly all citizens are system users, some argue that it is no longer as useful as it once was to distinguish between user fees and general fees.

2. The rising use of county transportation sales taxes and the growing role of metropolitan transportation planning are consistent with a national trend toward devolution of transportation decision-making authority, but federal policy and the rise of county tax measures are in fundamental conflict. While Congress and many states are devolving transportation decision making to the regional level by enhancing the powers of metropolitan planning organizations, county sales taxes can actually undermine the influence and authority of those organizations by focusing resources and decision-making on counties and other smaller units of government.
3. Local transportation taxes are increasingly limiting the transportation policymaking authority of elected officials by requiring that transportation funds be spent strictly in accord with the language of the ballot measures over fairly long periods of time. And project lists are gradually eliminating the flexibility necessary to adapt to changing needs.
4. While transportation planners and engineers often apply analytical procedures like benefit-cost analysis to determine which investments should be selected, ballot measures proposing local transportation taxes substitute election campaigns —sometimes derisively called “beauty contests”— for such systematic analysis. Many believe that greater reliance should be placed on analysis of project cost effectiveness, but by listing popular projects in the sales tax measures, we are gradually limiting the relevance of systematic analysis in project selection. While local control and direct democracy are American ideals, it is probably not appropriate for voters to preempt the application of technical expertise in the design and management of transportation systems.
5. Raising transportation revenues through local tax measures creates clear incentives to support projects that produce local benefits while giving lower priority to projects within local jurisdictions for which benefits accrue largely to through travelers. For example, one of the factors resulting in the defeat of a local transportation sales tax measure in Northern Virginia in 2003 was the argument that people would be taxing themselves to

alleviate the impacts of congestion caused largely by heavy trucks passing through Northern Virginia on trips taking them between Atlanta and New York.

### **Considering the Possibilities**

Motor vehicle travel continues to grow even faster than the population. But even as the demand for roads continues to increase, the road system has expanded little in recent decades. The buying power of the principal source of revenues to operate, repair, and expand the road system – the motor fuels tax – continues to wane. Despite sometimes strong political support for increased spending on transportation, the fuel tax is unlikely to make a major comeback anytime soon. This is because both popular and political unhappiness with unstable and seemingly ever higher fuel prices, political anxiety over increasing reliance on foreign oil, and growing concerns over the link between fossil fuel use and global warming make broad-based support for reestablishing substantially higher fuel tax levies as the mainstay of surface transportation finance unlikely.

Further, the central role of the federal government in surface transportation planning and finance is also faltering over time. For most of the 20<sup>th</sup> Century, transportation (mostly highway) planning was the product of a close partnership between the federal government (first the Bureau of Public Roads and later the Department of Transportation) and the state departments of transportation. The federal government contributed expertise and funding in the form of matching grants to build, operate, and maintain projects favored by federal officials, while the states contributed local funding and were responsible for actually building, operating, and maintaining the systems. Over time, similar matching grant programs led to federal partnerships with metropolitan planning organizations and public transit agencies.

As the joint federal and state commitment to building the great Interstate Highway System has been replaced by a more scattershot program of highway system maintenance, limited capacity expansion, environmental mitigation, and alternative travel modes, federal transportation leadership has faltered. In each of the post-Interstate transportation bills passed since 1990, the number of special funding categories has increased, while the number of earmarked projects has skyrocketed (to more than 6,300 in the 2005 legislation). Many of these projects would not survive the benefit/cost scrutiny to which program-funded projects are typically subjected. In addition, the “strings” attached to federal matching grants, in the form of procedural and environmental rules and regulations, have increased over the years, while the relative federal contributions of highway revenues and public transit subsidies have fallen. This, in no small part, has led to the rise of county transportation taxes and transportation agencies described above.

So while the federal government remains today the central player in surface transportation planning and finance, the federal program is far less focused, and less compelling, than it once was.

We are thus in a difficult situation to be sure, but not an irresolvable one. There are a wide variety of public policies available that elected officials – at the federal, state, and local levels – can use to address the chronic cost/revenue squeeze in transportation finance. These include greater reliance on borrowing, shifts to alternative forms of user fees, such as electronic tolls or mileage based charges, greater reliance on general taxes and fees that are not directly linked to use of the transportation system, or some combination of these approaches. Forging consensus on who should pay for transportation systems, and how they should pay, will be necessary to avoid a prolonged period of instability and crisis in American transportation finance.

**NOTE:** *My testimony was based on scholarly publications that in many cases were co-authored by my colleagues and with graduate students, whose contributions I gratefully acknowledge. In preparing this testimony I drew heavily upon the following published and soon-to-be published works.*

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