



ENERGY TECHNOLOGY INNOVATION POLICY RESEARCH GROUP

TRANSPORTATION REVENUE OPTIONS: INFRASTRUCTURE, EMISSIONS, AND CONGESTION

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Transportation Revenue Options: Infrastructure, Emissions, and Congestion

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Summary Report

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ENERGY TECHNOLOGY INNOVATION POLICY (ETIP)

The overarching objective of the Energy Technology Innovation Policy (ETIP) research group is to determine and then seek to promote adoption of effective strategies for developing and deploying cleaner and more efficient energy technologies, primarily in three of the biggest energy-consuming nations in the world: the United States, China, and India. These three countries have enormous influence on local, regional, and global environmental conditions through their energy production and consumption.

ETIP researchers seek to identify and promote strategies that these countries can pursue, separately and collaboratively, for accelerating the development and deployment of advanced energy options that can reduce conventional air pollution, minimize future greenhouse-gas emissions, reduce dependence on oil, facilitate poverty alleviation, and promote economic development. ETIP's focus on three crucial countries rather than only one not only multiplies directly our leverage on the world scale and facilitates the pursuit of cooperative efforts, but also allows for the development of new insights from comparisons and contrasts among conditions and strategies in the three cases.

PREFACE

Over the past sixty years, the United States has taxed gasoline and diesel consumption to pay for the costs of building and maintaining its highway infrastructure. There is mounting evidence that this mechanism may be insufficient to meet the nation's future needs. In recent years, tax revenues have been unable to cover the costs of maintaining and improving the existing system. The federal Highway Trust Fund, after being financially independent for more than fifty years, now relies on transfers from the General Fund to stay solvent. As new vehicles become more fuel-efficient, and the costs to build and maintain transportation systems increase, this funding gap will only widen.

Although there is a growing consensus that the present situation is not sustainable, there is little agreement on how to respond. As the debate intensifies, some basic tenets of the existing funding mechanism are being questioned. To what extent should fuel taxes be used to fund other modes of transportation such as public transit? What role should the federal government take in planning and funding the nation's transportation system when projects are increasingly driven by local and regional needs as opposed to federal concerns? In light of these questions it is not clear that a funding system primarily based on fuel taxes will meet our transportation needs in this new century.

Present concerns involve more than the problem of insufficient revenues to pay for roads, bridges, and public transit. Research has shown that transportation taxes and fees can influence motorists' behavior. For example, congestion pricing can encourage drivers to carpool, travel during off-peak hours, and switch to public transit – all of which promote efficient use of the existing transportation system and alleviate the need to raise more revenue for system expansion. Future funding schemes for transportation can affect the ways Americans drive or choose where they live.

If the nation is concerned about energy security and increased consumption of imported oil, then how we design fuel taxes and congestion or mileage fees will have measurable impacts on our efforts to address these concerns. Similarly, if the nation is determined to cut carbon emissions from the transportation sector – which account for 30% of the nation's carbon dioxide emissions – then both the design of transportation fees or taxes and how the revenues are spent will have significant implications for future emissions. Therefore, it is not surprising that parties

concerned about the environment and national security are invested in the debate on the scope and future of transportation revenue options.

On May 13 and 14, 2010, twenty-seven experts from various backgrounds and institutions gathered at the Harvard Kennedy School. The workshop took place at such a time when transportation finance policies evoke scrutiny from many new dimensions, and while the world is in economic recession. This report summarizes the discussions.

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Introduction

For more than half a century, the United States adhered to the user fee principle in financing its transportation infrastructure; designing systems in which users, not the general public, paid for the construction and maintenance of roads. Under this principle, the federal government relied heavily on a fuel tax to support the cost of its highway system.¹ Revenues from the tax go into the federal Highway Trust Fund, which is independent of the General Fund; and every five years or so Congress passes an authorization bill to allocate these revenues. At the state level, similar mechanisms have been in place for decades, though tax rates vary from one jurisdiction to the next.

In recent decades, this funding mechanism has faced a variety of challenges. Increased awareness of local air pollution and traffic congestion has given rise to the accusation that motorists do not pay for the higher health and economic costs that they incur. Increasingly the U.S. transportation sector, as a major contributor to greenhouse gas emissions and consumer of oil imports, is also under pressure to shoulder its fair share of the costs to mitigate climate change and promote energy security.

In the meantime, federal and state transportation funds financed by fuel taxes have been unable to cover the expenses necessary to keep the highway system from deteriorating. The demand for new roads and the cost of expanding and maintaining the transportation system have increased with population and economic growth. But fuel tax revenues have not kept pace because the federal government and most states have not increased gasoline tax rates since early 1990s, while inflation has eroded their real buying power. In the meantime, cars and trucks have become more fuel-efficient. Although this is a favorable trend for the environment and energy security, it poses challenges for transportation finance because motorists consume less fuel per mile traveled and thus pay fewer tax dollars for the same amount of road use.

Policymakers have dealt with funding gaps in various ways, though rarely by raising gasoline taxes and other user fees, which is perceived as politically unpopular. Instead, despite growing budgetary problems, state and federal governments have reached into their general funds to fill

¹ There are other user taxes and fees (e.g., diesel fuel tax, registration fees) though they generate smaller revenues than taxes on gasoline purchases. The federal gasoline tax, for example, brought in \$24.6 billion (66% of all tax receipts) for the Highway Trust Fund in FY2009 (see http://www.fhwa.dot.gov/policyinformation/statistics/2008/fe10_2009.cfm).

this gap. Some states have also issued bonds or raised sales taxes through local referenda approved by voters. As a result, an increasing share of transportation funding comes from nonusers and, to some extent, from future citizens who will have to repay the money borrowed to cover today's transportation costs.

Recognizing the tradition of the user fee principle, numerous studies (e.g., National Surface Transportation Infrastructure Finance Commission 2009; Transportation Research Board 2006) have proposed alternatives to replenish transportation funds, such as raising gasoline taxes or, in light of rising fuel economy, charging motorists according to the number of miles they drive. Meanwhile, a growing number of stakeholders advocate funding options that also advance other objectives such as congestion fees (to make the most of existing highway capacity) or carbon taxes (to promote electric and alternative fuel vehicles). While these other objectives are important, they inevitably complicate – and politicize – the debate on how to fund the nation's transportation infrastructure.

This summary report examines three main categories of user charges: charges based on fuel consumption, on distance traveled, and on congestion levels. It explores the financial and environmental advantages and disadvantages of each option and then discusses a number of pressing policy questions. As with the workshop, this report does not strive for consensus. Rather it articulates different perspectives on the problems and the various options to address them.

1. Overview of Transportation Revenue Options

1.1. User Charges Based on Fuel Consumption (Gasoline and Carbon Taxes)

Ease of Collection and Strong Links to Carbon Emissions: User charges based on fuel consumption – most notably gasoline taxes – have two main advantages. First, the collection mechanism is already in place and is relatively simple and inexpensive. Gasoline wholesalers transfer the gasoline taxes they collect from fuel sales to federal and state treasuries, which then deposit the revenues into corresponding transportation funds. The process involves several thousand wholesalers rather than hundreds of millions of U.S. motorists, which reduces transaction costs and the risk of tax evasion while avoiding any loss in consumer privacy. The

second advantage is that a fuel tax is effectively a carbon tax because a vehicle's carbon dioxide emissions are largely determined by the amount of fuel it burns. As a result, a fuel tax would be a useful instrument for motivating motorists to reduce their vehicles' emissions.

Revenue Adequacy and Local Externalities: Gasoline taxes may be inadequate to pay for transportation infrastructure as fuel economy improves and the link between fuel consumption and road usage weakens. Current gasoline taxes, for example, do not apply to cars running on electricity or most alternative fuels, which raises concerns about revenue generation and equity among road users. Moreover, since fuel consumption cannot be traced by time and location, it is impossible to adjust the taxes in real time to internalize the costs of congestion and local air pollution emissions (two large externalities that motorists impose on others). It is also politically difficult to increase gasoline taxes, as policymakers must go on record to vote for increases.

Contradiction between Policy Objectives: Gasoline taxes also create a contradiction between energy, environmental, and revenue goals. For energy security and the environment, motorists are encouraged to consume less gasoline. Less gasoline consumption, however, reduces revenues from gasoline taxes, causing shortfalls in transportation funds that support the nation's mobility. These conflicting effects divide stakeholders, each seeking to advance different policy objectives.

1.2. User Charges Based on Distance Traveled (VMT Fees)

Strong Links to Infrastructure Costs: Studies have shown that traffic volumes and vehicle axle weights are two critical factors that determine pavement wear. User charges based on distance travelled and weight can closely approximate user responsibility for highway construction and maintenance costs. Weight-based distance charges are already imposed on most toll roads since tolls typically vary by both distance travelled and the number of axles (an imperfect proxy for axle weight).² Given the advancement in global positioning, billing, and communications technologies, it may be possible to apply weight-based distance fees more widely, replacing gasoline taxes and even highway tolls. Such vehicle-miles-traveled (VMT) fees would not only track maintenance costs of roads more closely, but also provide a more stable revenue stream, immune to changes in vehicle fuel economy.

² Using the number of axles, however, could encourage truckers to use fewer axles for the same load, increasing the weight on each axle and causing more severe road damage.

External Costs: VMT charges would not reflect the environmental damage from carbon emissions as well fuel taxes would, but studies show that some other external costs, such as vehicle accident costs, are strongly correlated with total VMT. Hence, VMT fees can be designed to reflect accident costs, as large amounts of transportation funding goes to public safety measures. In fact, several private insurance agencies now offer auto insurance based on VMT, or Pay-As-You-Drive (PAYD) insurance. Their experiences show that motorists are motivated to drive less when they save on insurance premiums (see Bordoff and Noel 2008). To the extent that VMT fees discourage driving there are additional concomitant environmental benefits.. The incentive to buy fuel-efficient vehicles will decrease, however, if the charge per VMT does not vary with vehicle size and fuel consumption.

Privacy and Transaction Costs: Several concerns about switching to distance-based charges remain. Perhaps the most obvious is the threat of invasion of privacy from the monitoring and reporting of vehicle travel. Other concerns arises from the transaction costs to equip old and new vehicles with monitoring devices, operate a billing network, and enforce VMT fee evasion. These transaction costs are likely much higher the costs of collecting fuel taxes from gasoline wholesalers.

1.3. User Charges Based on Congestion (Congestion Pricing)

Promoting Efficient Use of Existing Capacity: Congestion charges vary not just with distance travelled but also with the level of congestion encountered. Studies show that increasing driving costs during peak hours encourages motorists to carpool and shift their travel to other routes, times, and modes. These shifts promote more efficient use of the transportation infrastructure as motorists spend less time idling in traffic – saving time and fuel. And by exploiting motorists' willingness to pay, congestion fees can often bring in substantial revenues that can be used to improve the existing infrastructure, to subsidize other modes of transportation, and to sponsor environmental initiatives.

Equity and Environmental Concerns: Congestion-based revenue options share some of the same concerns as distance-based options, such as privacy and high transaction costs. Another concern is that congestion charges may fall disproportionately on low-income users, but this problem might be addressed by providing subsidies (see Ecola and Light 2009 for literature review). As

for environmental impacts, fuel consumption and air pollution emissions per mile decrease as speeds increase until they reach 50 miles per hour or so when fuel consumption starts to increase again (e.g., Beevers and Carslaw 2005). Some drivers, however, may choose longer routes to avoid the charges and consume more fuel. And the reduction in congestion may re-attract drivers to the roads and in the long run prompt urban sprawl. To date, the literature does not have a definite account of the overall environmental effects of congestion pricing.

2. Policy Issues Surrounding These Revenue Options

2.1. Making the Most of Gasoline Taxes

Most of the workshop participants anticipated that gasoline taxes will continue to be a major source of transportation funding for the next decade. But there was a range of opinions on how quickly other alternatives might emerge. Some were optimistic that VMT fees will soon augment or replace gasoline taxes since the technology is readily available and the results from several pilot projects demonstrate that such fees are technically practical. Others, however, did not agree; pointing out that programmatic shifts of this magnitude take a long time, especially if they involve substantial investments in new equipment and procedures.

Setting aside these differences in opinions, the participants agreed that in the short-term gasoline taxes will still bring in billions of tax dollars, buying time for policymakers to evaluate a range of options. Proponents of the existing tax system provided three additional reasons to maintain the status quo – at least in the short and mid-term:

Gasoline Taxes Are Reasonable Proxies for Most Driving Costs: Taxes on fuel consumption seem an appropriate way to internalize the environmental costs of emissions and to promote more fuel-efficient vehicles.³ And as long as electric and alternative fuel vehicles do not have significant market shares, fuel consumption will still be positively correlated with VMT, so at the aggregate level, gasoline taxes can track VMT-based costs – such as road maintenance costs – relatively well.

³ Note that the damage of emissions may also relate to driving conditions and locations. For example, driving in a traffic jam in an inner city imposes much more serious noxious externalities, especially to health, than in a free flow condition in rural areas.

Gasoline Taxes Can Be Indexed to Grow Automatically: Traditionally, gasoline taxes have taken the form of fixed dollar amounts per gallon that can be increased only through state and federal legislative actions. Because elected officials do not like to vote for tax increases, especially taxes that draw significant media attention, fuel taxes have often failed to keep pace with inflation or transportation expenditures. Some workshop participants proposed that fuel taxes should be indexed to inflation and/or to the average fuel economy of vehicles, thus offsetting two factors responsible for the potential future erosion of transportation revenues. But such a policy initiative has not gained traction with the public.

Immediate Alternatives May Jeopardize Transportation Planning: Some participants were less concerned that policymakers rely on general funds, sales taxes, and other revenue sources to supplement the Highway Trust Fund. Given that most people own cars and that everyone, even those without cars, benefits from the economic activity supported by the transportation infrastructure, broad-based taxes and other general revenue sources might distribute the costs of the transportation system in an equitable and politically acceptable manner. But other participants cautioned that without gasoline taxes and a dedicated Highway Fund, the transportation sector would have to compete annually with other programmatic priorities and it is far from certain that it would do as well as it has in the past. Keeping the Highway Trust Fund solvent and independent allows for multiyear commitments, which are necessary for large projects.

Framing Gasoline Taxes

Studies show that gasoline taxes in the United States are too low to reflect even basic transportation infrastructure costs, much less external costs such as accidents, the economic and national security costs of importing fuels, and environmental damage from fuel production and use (e.g., Parry and Small 2005; Cambridge Systematics 2009). This implies that modest gasoline tax increases would generate large economic benefits. This argument is poorly understood or accepted by the general public – especially during a recession. Some workshop participants proposed three other ways to frame an increase in gasoline taxes to make it more politically acceptable:

For Deficit Reduction: The last two times Congress raised the federal gasoline tax (by 5 cents per gallon in 1990 and 4.3 cents in 1993) the justification was the need to reduce deficits (Lazzari 2008). As state and federal transportation funds borrow more and more from general funds, adding to public debts, the public might again be willing to pay a few more cents per gallon to reduce deficits or avoid cuts in transportation and other large programs such as health care and social security. Indeed, policymakers seem to be shifting their priorities from economic stimulus to deficit reduction as the economy begins to show some intermittent signs of improvement.

For Energy Security: Many members of Congress are concerned that the United States is importing more oil than any time in its history, making the nation more vulnerable to fuel price volatility while sending large sums of money to politically sensitive regions and potentially hostile regimes. Higher gasoline taxes can directly cut fuel consumption and reduce dependence on foreign oil.

For Emission Reductions: Climate change will remain a major concern for the nation and the world for the foreseeable future, and there will be growing pressure from interest groups and governments to reduce greenhouse gas emissions from the transportation sector. To achieve this goal, some workshop participants suggested that an economy-wide carbon tax is the optimal policy choice because it instigates a search across the entire economy for the most cost-effective ways to reduce emissions. Since carbon emissions are linked to fuel consumption, a carbon tax could be administered as a premium on top of existing gasoline taxes. In fact, the administrative costs of adding a carbon tax for the road transportation sector would be quite small while generating significant public revenues.

Although these alternative frames may build support for higher taxes, some participants expressed concern that they would complicate the public debate. For example, quantifying the cost of energy security is difficult and thus setting the optimal “security surcharge” on gasoline is controversial. There is also a concern that the revenues generated by these additional fees may be diverted. For example, the revenues of the 1993 federal gas tax increase were diverted into the General Fund for deficit reduction for the first five years and not captured by the Highway Trust Fund until 1998.

2.2. Developing VMT Fees as a Potential Long-Run Option

The workshop participants were generally supportive of VMT charges in principle, but disagreed about how and when they should be introduced. Some argued that VMT fees should replace gasoline taxes as the primary source of funds to maintain road infrastructure by 2020, while others argued that to avoid high transition costs governments should start slowly by promoting voluntary and pilot programs. If governments are to implement VMT fees, they must address four concerns:

Technology and Privacy: The key concern is whether the technology is ready to accurately track and bill the movements of hundreds of millions of vehicles, while protecting motorist privacy and detecting fraud. Some participants argued that these tasks are manageable, citing several small-scale tests of VMT fees that have worked successfully and pointing out that the banking industry has decades of experience processing complicated and sensitive data.

Transition and Transaction Costs: Assuming that VMT fees are technically feasible, some participants worried that the extra costs to equip vehicles and run the new collection system would be excessive and difficult to justify. Others argued that the transition would be a one-time investment that would have a large long-run payoff in the form of higher revenues, especially if expected improvements in fuel efficiency and alternative fuels erode the gasoline tax base. In addition, the devices used to track motorists' VMT can also enable other agencies to charge bridge tolls, congestion fees, insurance premiums, and even parking fees, thus improving the overall cost-effectiveness of the collection mechanism.

Effects on Environment and Energy Security: Another concern is whether VMT fees will provide fewer incentives to conserve gasoline and purchase fuel-efficient vehicles than the gasoline taxes they replace. Proponents argued that environmental and energy objectives could be advanced by adopting a schedule of VMT fees that varied with the fuel economy or fuel type of the vehicle.

Public Support: Given the political difficulties of raising gasoline taxes, some participants doubted there would be much public support for a rapid, nation-wide transition to VMT. They worried that the public lacks confidence in the government to implement such a complicated, technically demanding system. But other participants were more optimistic about VMT fees,

predicting that they will soon be adopted in several states. For example, Oregon has successfully implemented VMT fees on commercial trucks.

2.3. Exploring VMT Fees in the Short-Run

Many workshop participants supported three approaches for exploring the possibilities of VMT fees:

Expanding VMT Pilot Programs: Thus far, there have only been a handful of VMT fee pilot studies, and lack of funding has restricted their scope and scale. Given that the findings from such studies have national implications, both state and federal governments should provide more funding and legislative support for pilot studies. A wider range of technologies should be tested and the social and economic impacts of the fee should be evaluated, including behavioral responses and environmental effects. Some participants noted that the government could mandate VMT fees for non-petroleum fueled vehicles, which are not subject to gasoline taxes, and use the adoption of these vehicles as a wedge for a wider rollout of VMT fees.

Expanding Similar Initiatives: Recognizing that the number of accidents is a function of VMT, a handful of auto insurance companies already offer policies with premiums based on VMT. Their experiences provide practical examples of how a VMT fee system might work; allowing the public to assess concerns over privacy and the reliability of the monitoring and collection systems. Encouraging these alternative policies may require substantial changes in insurance regulations in states where insurance premiums are closely regulated.

Building Public Support: Although VMT fees are likely to be viewed as a new tax, it may be possible to frame them in ways that make them more acceptable. For example, VMT fees can track motorists more accurately, so revenues can reach the jurisdictions that actually incur the costs as opposed to those where the fuel pump is located. In addition, bundling value-added services into the monitoring devices (e.g., navigation, real-time traffic advisories, emergency assistance, and parking locations) could result in greater public acceptance for in-vehicle monitoring devices.

2.4. Promoting Congestion Pricing at the Local Level

Congestion pricing induces motorists to use road capacity more efficiently, reducing the time that they are delayed in traffic. The extra revenues can then be used to expand and maintain infrastructure, improve alternative transportation modes, and even fund other social programs. In practice, however, there are more examples of failed proposals to levy congestion fees than successful ones. Drawing from these examples, proponents identified the following three factors that could determine a proposal's outcome and effectiveness (see Altshuler 2010 for more examples and discussion):

The Notion of "Doing No Harm" to the Status Quo: Motorists often quickly reject congestion pricing proposals if they perceive them as sophisticated schemes to add a new tax. But if motorists are ensured that their status quo will be maintained or improved, they are more willing to consider such proposals. Under the principle of "doing no harm", motorists have supported tolls on high-occupancy lanes, since they retain the choice of either paying the toll or using the no-fee parallel lanes that are more congested.

Equity Concerns: Although congestion fees promote efficiency, they may impose a disproportionate burden on low-income motorists especially if their travel schedules are less flexible. Studies have shown, however, that a large percentage of low-income motorists choose to use toll lanes even when slower no-fee lanes are still available (e.g., Burris and Hannay 2003; Schweitzer and Taylor 2008). Another equity concern arises in cordon pricing schemes where motorists pay a surcharge to enter a designated area during particular hours (e.g., Stockholm and London). Residents and businesses just within or outside the cordon boundary may be more adversely affected by these schemes. Both kinds of equity concerns, however, can be reduced to some extent with subsidies to those more adversely affected.

Democratic Process: Some participants pointed out that a multi-stage process that involves several layers of government reduces the prospects for congestion fee proposals. In essence, opponents can halt any proposal at one of several stages during the approval process. And to address equity concerns and gain political support, policymakers often have to make concessions, such as exemptions or deep discounts to certain stakeholders. These concessions often dilute the effectiveness of the proposal.

Facilitating Local Congestion Pricing

In light of the above factors influencing a proposal's outcome, the workshop participants suggested the following three tactics that may help local authorities introduce congestion pricing:

From "Doing No Harm" to Showing Benefits: Most participants expected motorists to prefer a proposal that allows them to keep their travel routines (in terms of time, cost, and convenience). Building on the "do no harm" principle, it would be advantageous if a proposal could be designed to generate tangible benefits as well. For example, given that congestion pricing has the potential to yield large revenues, these revenues can be allocated for specific projects that provide tangible benefits for the motoring public.

Minimizing Legal Barriers: Congestion tends to be a local problem and often requires localized solutions. The decisions of local authorities to implement congestion fees, however, are often subject to state and federal laws and regulations, which can present complicated and costly barriers to introducing congestion pricing at the local level. Some participants believe that a streamlined set of application rules should be developed so that local authorities understand what factors must be in place if they are to successfully pursue congestion pricing.

Building Public Confidence with Transparent Accounting and Planning: Exploiting motorists' willingness to pay to save time, congestion pricing may generate large, additional revenues. How these revenues are spent may influence public support. And in the long run, these revenues might bring fundamental change to a region's transportation system. For example, if congestion fee revenues are used to improve public transit, then the region may become less dependent on motor vehicles, reducing emissions and energy use. Thus, to keep the public informed, some participants suggested that an independent commission be created to oversee and publish information about the collection and expenditure of the revenues so that the public understands the connection between the fees they pay and the benefits they receive.

3. Future Roles of Governments and Research Needs

The circumstances that led to the present allocation of responsibilities between the federal and state governments have changed substantially. Fifty years ago the primary mission of national

highway policy was to increase interstate connectivity by building new roads. Today the emphasis has shifted to maintaining the existing system, integrating regional networks, and designing urban growth to reduce congestion, pollution, and sprawl. The workshop participants discussed the roles of state and federal government in this new context.

3.1. Clear Definitions of State and Federal Roles

Most participants agreed that it is time to redefine the roles of the federal and state governments in transportation funding and planning. Appropriations of federal funds among states will likely be contentious as ever, but fifty states dealing with transportation finance problems jointly, and individually, can also create opportunities.

The Role of State Governments: As history shows, it takes decades – not years – to switch from one method of transportation funding to another. In the first half of the last century, states were unable to meet the costs of growth in vehicle use through their general tax revenues. To combat this problem, Oregon introduced the nation’s first gasoline tax, which spread to other states. Two decades later, gasoline taxes became the main transportation revenue source for all states as well as the federal government. Many participants speculated that the adoption of VMT fees – or any alternative revenue proposal – will take a similar path. In fact, some participants argued that gradually building on state initiatives will provide time for technology and expertise to develop and for the public to become more comfortable with these different options.

Thus, states should be encouraged to explore alternative schemes, especially those clearly within their authority, such as indexing state gasoline taxes to inflation or fuel economy. Allowing Pay-As-You-Drive insurance, though it will not produce public revenues for transportation, can also familiarize motorists with mileage-based fees. By sharing information, states may find technically and politically feasible solutions more quickly than if they worked alone or simply waited for federal guidance. The same activist approach should apply to cities and counties within states. As local jurisdictions face different and diverse challenges in transportation – particularly congestion – states should encourage local governments to experiment with new tactics, which may eventually apply to and benefit other parts of the state.

The Role of the Federal Government: In light of the economic, environmental, technical, and political uncertainties surrounding the various revenue options, most workshop participants

believed that the federal government should empower states to explore some or all of these options rather than endorsing or mandating one specific option. In fact, the 2005 federal authorization bill⁴ funds several pilot programs of VMT fees and congestion pricing, and most participants recommended that the size and scope of these demonstrations be increased in subsequent authorization bills.

As states explore new revenue options, the federal government should not hinder such initiatives by threatening to restrict funding or withdraw support. Moreover, the federal government should encourage states to use open technology platforms and actively work towards integrating pricing systems between states. In other words, the new federal role should emphasize improving the flow of information, removing programmatic barriers, setting technical standards, and mediating interstate conflict.

3.2. Research Needs: Transportation, Society, and Environment

The workshop participants agreed that transportation is vital to society and that without adequate funding the nation's infrastructure will slowly deteriorate, hindering mobility and the economy. At the same time, the participants acknowledged that transportation has externalities, including accidents, pollutants, energy security, and congestion and often these externalities are not included in the price of fuels. As a result, transportation finance policies can only be successful if they strike a balance among conflicting goals. To this end, the participants emphasized the importance of practical research, the results of which can inform and facilitate policymaking.

Research on Societal Impacts of Deteriorating Infrastructure: Many officials have pointed out that the nation's infrastructure is rapidly deteriorating, but there have been few studies that have calculated the rate of deterioration and the cost to the country of failing to address this problem. Verifiable and credible data could significantly influence future authorization and appropriation decisions.

Research on Funding Needs: While estimates of the funding needed to support our transportation infrastructure in coming decades are available, they are often based on maintaining historic spending levels rather than careful analysis of what is necessary to operate the system safely and

⁴ Safe Accountable Flexible Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)

effectively. These unconstrained projections cannot be taken for granted in a tighter fiscal environment. Options such as congestion pricing or new technologies for controlling traffic flows could improve the use of many of our existing roads.

Research on Interactions among Transportation, Environmental, and Energy Policies: Climate and energy security concerns are not going to disappear. Research on specific transportation policies that will reduce these concerns should be given priority. Possibilities include higher parking fees in congested urban areas, programmatic initiatives to encourage smarter growth policies, and greater reliance on mass transit and more use of Hot Lanes and congestion fees. Evaluations of pilot programs in these areas would inform other jurisdictions and could lead to greater deployment of these options. It is important to remember that decisions to pursue these programs are not made in Washington, DC, but by state and local governments across the country.

Conclusion

With the declining balances in federal and state transportation funds, motorists in the United States will need to pay higher taxes and fees if we are to improve road conditions, reduce congestion, and mitigate environmental impacts. In the short run, the current system of fuel taxes still has the potential to generate large sums of revenues while reflecting many of the infrastructure and environmental costs of driving. But this is only true if fuel tax rates can be indexed to reflect changes in inflation, fuel economy, and environmental externalities such as greenhouse gas emissions. In the long run, however, this system is unlikely to be sustainable and VMT fees will be needed as gasoline tax revenues decline. Congestion pricing, which heretofore has been limited by political opposition, may become more acceptable as we realize that we cannot deal with congestion and associated emission problems simply by building new highways, especially in situations where high costs and/or local opposition to land takings make highway construction impractical and inefficient. Changing policies is difficult, especially while the economy is weak. Policymakers, however, should take some initial steps, such as redefining the roles of federal and state governments and promoting research and demonstrations of VMT and congestion fees, to ensure that these options are well understood and, when chosen, ready to succeed.

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