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Road-use Pricing: How Would You Like to Spend Less Time in Traffic?

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"The national capital region should serve as an example of what truly sustainable transportation policy looks like for the rest of the nation."

Severe congestion and underfunded public transportation systems in the Washington, D.C. region and nationwide call for a more sustainable way of pricing transportation. This brief proposes replacing state gas taxes with regional road-use pricing that takes into account the effects of vehicle travel while simultaneously providing incentives to reduce traffic congestion and pollution and improve public transportation.

To achieve this, a demonstration project should be launched in the Washington region that uses GPS transponders to categorize motorists' travel based on distance, level of congestion, and type of vehicle. The transponder would calculate the totals for each category and drivers would be charged accordingly when they purchased gas. Tourists and other motorists lacking the GPS device would continue to pay the full gas tax. At an average price of between 9 and 15 cents per mile, such a policy could reduce congestion by 75 to 80 percent.

I. Introduction

According to the Texas Transportation Institute, Washington D.C. area commuters on average wasted a workweek and a half (60 hours) due to traffic congestion in 2005, the second worst in the nation.[1] The cost to the average commuter in terms of time and gas wasted was the equivalent of almost $1100. Since 2000 this delay has increased by an entire workday. For comparison, in 1982 area commuters were only delayed 16 hours, amounting to barely $143 (in 2005 dollars) in losses.

Additionally, over a quarter of area workers 16 or older not working at home had one way commutes longer than 45 minutes in 2007. Three percent had commutes longer than 90 minutes.

More recently, traffic has eased slightly as vehicle miles traveled fell three percent in the spring of 2008 versus a year earlier in a study conducted by the Metropolitan Washington Council of Governments. However, this reduction was due to the poor economy and last year's record gas prices. The price of gas has since fallen and the recession will not last forever; therefore the decrease in traffic is almost certainly temporary.

And there are more of us every year. From 2005 to 2007 the Washington area added 88,877 people over the age of 16 to the commuting labor force (those who do not work from home). The Metropolitan Washington Council of Governments projects that the metropolitan area as a whole will add 1.6 million new residents by 2030, working 1.2 million new jobs—a recipe for ever-increasing congestion.

The traditional response to traffic congestion has been to build more and bigger roads. Increasing road capacity seemed like a reasonable response, and yet congestion kept getting worse. The problem was that the demand for roads always rose to meet (and quickly exceed) capacity and congestion kept getting worse.

Economists suggest the reason: Except for a few toll roads, motorists do not directly pay to use the road. If something is free—or appears to be—demand tends to outstrip supply. Motorists do pay gas taxes, which roughly relate to the miles they drive, but once they have a full tank the price of using any road is zero, whether it is a country lane or a congested commuter route. However, as roadways reach capacity each additional motorist imposes costs on everybody else. A motorist who enters I-95 at rush hour, thereby adding to traffic

congestion, does not pay more for imposing this cost on others. In a very real sense our transportation policy has been to subsidize ever worsening congestion.

Moreover, the gas tax is proving to be an inadequate source of revenue for transportation needs. As vehicles become more fuel-efficient, revenue from gas taxes falls. A more sustainable solution to financing transportation, both here and in the nation as a whole, is road-use pricing.

II. What is Road-Use Pricing?

Road-use pricing is a way of charging motorists both for distance traveled and for the costs they impose on others, especially by using heavily traveled roads at times of high congestion. Charging for vehicle miles traveled (VMT) is straightforward. VMT tolling schemes charge motorists a set fee for each mile traveled. The price per mile may vary with the weight or other characteristics of the vehicle to reflect wear and tear on the road and environmental impact. Road use pricing adds congestion fees to VMT charges. Congestion pricing is a form of tolling in which people pay more to drive on congested roads. The combination of VMT charges and congestion fees provides motorists and other travelers with information about the total costs they impose on the transportation system and other travelers (including increased congestion, pollution, likelihood of accidents, and infrastructure maintenance) by adding another vehicle to the roadway. In principle, travelers then are able to decide which mode and time of travel is really the best option.

There are several different ways to implement congestion pricing (see table below for specific examples). Individual roads (or lanes) may be tolled; or individual facilities. Vehicles might be charged to enter a specific cordoned off area (an idea which has been successfully implemented in central London, while New York rejected a similar idea for downtown Manhattan). Or a comprehensive pricing plan can be introduced covering an entire regional road network.

Types of Congestion Pricing	Description (all four types of tolls may vary by level of congestion and type of vehicle)	Examples
Road pricing	Toll is charged to drive along a specific road or lane at specific times; adjacent roads or lanes are free. Similar to VMT pricing, tolls are calculated based on the distance traveled.	Virginia HOT lanes (under construction) New Jersey Turnpike California State Route 91
Facility pricing	Toll is charged to pass through a point. Tolls do not consider the distance which the vehicle travels to get to the facility or after leaving it.	Delaware Memorial Bridge
Cordon pricing	Toll is charged to enter a specific area. Does not vary by distance traveled	Central London New York City proposal
Comprehensive pricing	All roads are tolled. Similar to a cordon charge, in that it only applies to a specific (though usually much larger) region. Tolls may include distance traveled calculations.	Singapore

A comprehensive road-use pricing initiative in the Washington metropolitan area would be an extremely ambitious experiment. It would require Maryland, Virginia, and the District's transportation authorities to work closely together—never an easy assignment. Leadership and upfront investment from the federal government would also be essential to get the experiment off the ground and ensure comprehensive implementation. Some recent indications of interest at the federal level suggest that this might be possible. Transportation Secretary Ray LaHood has recently stated that, due to the failure of the Manhattan congestion pricing initiative, the U.S. Department of Transportation still has funds available for pilot congestion pricing programs. He has also floated the possibility of transitioning from the gas tax to a VMT tax (though this met with White House resistance). Rep. James Oberstar (D-MN), chairman of the House Committee on Transportation and Infrastructure, has also come out in favor of switching to a VMT tax—and soon. Other members of Congress,

notably Rep. Earl Blumenauer (D-OR), also appear favorably disposed toward alternative transportation financing mechanisms.

The Congressional Budget Office (CBO) recently published a report weighing the benefits and costs of congestion pricing at the national level. CBO found that congestion could be substantially reduced (by as much as 30 percent in the London cordon example). Reduced congestion in turn would produce shorter and more reliable travel times (particularly benefiting delivery, freight, and other logistics companies, as well as individuals). Finally, governments are able to make more efficient infrastructure investments: As VMT falls so do maintenance costs, while persistent demand along certain routes in the face of pricing provides planners with information about which roads are most in need of future investment.

CBO also found that congestion pricing creates serious challenges. Foremost among these is the unequal distribution of benefits (prior to any mitigating use of the revenues generated). Higher-income drivers are most able to afford the peak charges, and the time saved is more valuable to those drivers with higher incomes (because their hourly wage is higher). Lower income drivers are more likely to have to change their behavior so that they drive when charges are less, or switch to other modes of travel. Low-income motorist are also more likely to own less-fuel efficient vehicles, so any congestion pricing policy that takes vehicle type into consideration will fall upon them disproportionately.

Other challenges include protecting drivers' privacy, the cost and difficulty of implementation (though the Oregon example discussed below suggests that the cost need not be prohibitive), and the operating costs associated with toll collection (these are falling all the time as technology improves and becomes more widespread).

The CBO suggested four broad areas of opportunity where the federal government could make it easier for local jurisdictions to implement congestion pricing.

First, states could be allowed to toll federally-financed highways (they are currently barred, with a few exceptions), and specifically allowed to introduce congestion pricing outside of the extremely limited Value Pricing Pilot Program of the U.S. Department of Transportation. Second, the mechanism through which federal transportation funds are disbursed could be modified to promote congestion pricing. Third, Congress could establish a framework for mitigating inequality issues. This could be accomplished through requiring that toll revenues from federally-funded roads be used to support alternate modes of travel—especially transit—or by reimbursing low-income users directly. Finally, the federal government could take the lead in reducing toll collection costs by mandating electronic toll collection and supporting a national standard for transponder toll collection systems.

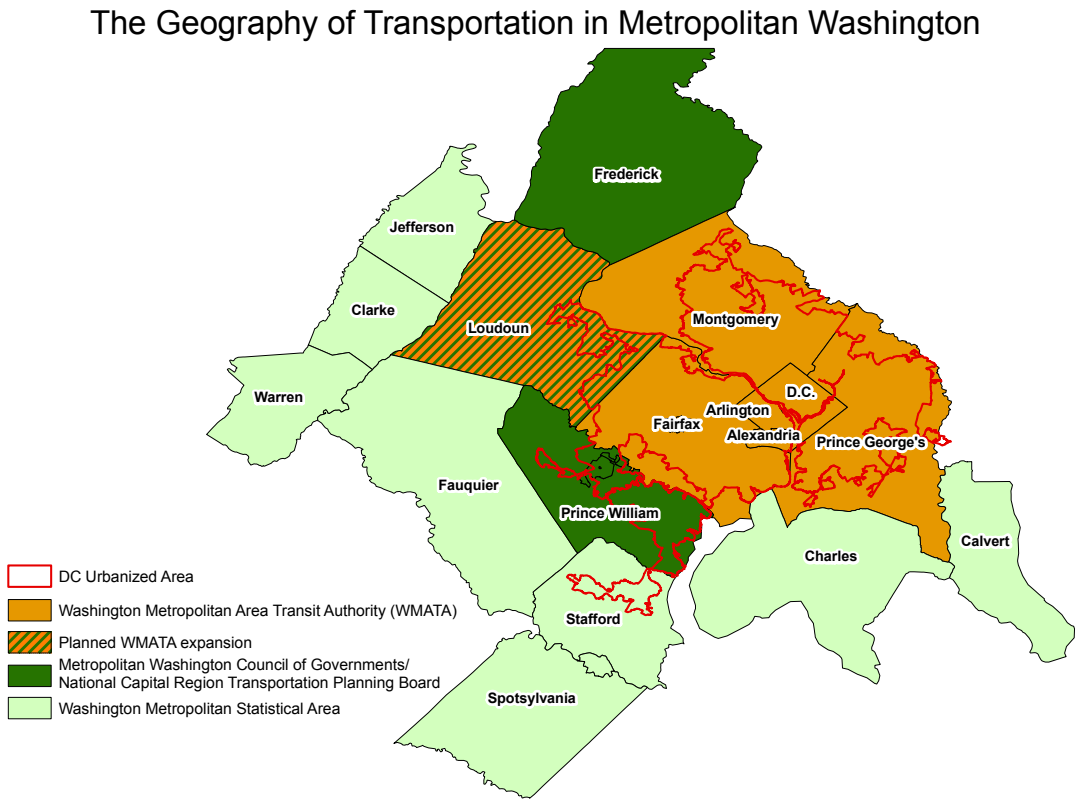
Congress will have a chance to consider new ways of pricing transportation this fall, when the surface transportation bill is up for reauthorization. Given Congress and the administration's interest in greener, more efficient transportation policies (as demonstrated in the stimulus package and budget proposals), road-use pricing is likely to figure in the debate. A national shift to road-use pricing would be far too radical a change to evoke wide support, but trying the idea out in a major metropolitan area with serious congestion problems would have substantial appeal, and the large federal presence in the Washington area makes it a natural venue. The Washington region has an opportunity to lead the way toward improved transportation for the rest of the nation by taking steps now to plan a comprehensive road pricing pilot in our area.

This idea might seem radical, but it is not new. Fifty years ago the economist William Vickrey, in testimony before Congress, called for the introduction of comprehensive congestion pricing in metropolitan Washington using radio transmitters. New technologies such as GPS and E-ZPass make this idea far more feasible today than it was fifty years ago—and the growth of traffic congestion in the area has made it far more appealing. In fact, according to analysis by Resources for the Future (RFF), a D.C.-based think tank, a road-use pricing system that incorporated all of the external costs of congestion would be the most effective and efficient way to reduce its effects in the national capital region—more effective than a simple tax on vehicle miles traveled, and far more effective than freeway tolls or a London-style cordon.

III. Implementing Road-Use Pricing In the DC Area

RFF modeled the effects of congestion pricing in the Washington area and found very significant reductions in congestion. They estimated that almost all (94 percent) of the reduction in vehicle miles traveled would be attributable to individuals shifting from cars to mass transit. If this is true, using toll revenues to improve transit in this region would be well targeted toward those who are forced to change their behavior. We therefore propose that a pilot introduction of road-use pricing should

first encompass the 1,500 square mile Washington Metropolitan Area Transit Authority (WMATA) service area. Contingent areas served by other transit systems could also be added on a case by case basis. As transit service expanded the tolled area could be enlarged.



Motorists registered within this area would be charged based on how far they drove, how congested the roads were when they were driving, and what type of vehicle they drove. Vehicles would be classified in terms of fuel efficiency, safety, and how much wear and tear they cause the roadway (i.e. trucks would be charged more than compact cars).[2] RFF calculated that charges over the larger metropolitan area as defined by the federal government would likely average 9.3 cents per mile. The Federal Highway Administration's own analysis of congestion pricing along several freeways in the Washington region suggested charging 15 cents per mile. Charges in the smaller, more congested, area proposed here would likely be within that range. It should be noted that motorists driving at peak times on highly congested roads would face a higher price. At the same time, charges for driving in uncongested parts of the region would be much lower, perhaps approaching zero in rural areas for certain types of vehicles.

Vehicles would be fitted with a GPS transponder device similar to an E-ZPass, perhaps as part of the registration process. If the program expanded nationally, manufacturers might even integrate transponders into new vehicles, similar to General Motors' OnStar system. Insurance companies could also encourage motorists to use transponders as the companies transition to their own VMT-based risk model, as some have already begun to do.

This device would record the type of vehicle, the distance traveled, and the time and location of travel. The transponder would sort the data into various toll categories (peak/off-peak, car/truck, highway/arterial/rural, etc.). Patterned after the recent Oregon pilot program (see box below), when the motorist refueled the transponder would transfer these totals (not the actual location tracking data) to the gas pump. The pump would calculate the amount owed by comparing the vehicle totals with a periodically updated rate schedule. The pump would then deduct the state gas tax charged and add the appropriate road-use fees to the fuel bill. Private motorists lacking the transponder, such as tourists or commuters from further afield, would pay the full gas tax. Travel outside the area would not be recorded by the GPS transponder. Implementation costs would likely be close to Oregon's $33 million estimate for expanding their pilot program to the entire state. These costs could be partially offset by charging vehicle owners a small fee for each transponder.

Oregon's Road User Fee Pilot Program

In April of 2006, Oregon began its year-long Road User Fee Pilot Program.[i] While designed to test a VMT-based replacement for the gas tax, the program model is highly applicable to congestion pricing as well and therefore to road-use pricing.

The Road User Fee Pilot Program installed GPS devices in volunteers' cars that tracked how far they drove, as well as in which of two zones. This information was stored on the device itself; no location information was transmitted while driving. When refueling at participating gas stations, the devices communicated the total mileage within each zone to the fuel pumps. The pump computer deducted the state gas tax from the bill, replacing it with the appropriate VMT charge.

Oregon found that replacing the gas tax with the VMT tax was relatively seamless and that revenues collected were roughly the same as they would have been using the gas tax. Survey results showed that 91 percent of pilot participants supported expanding the VMT tax statewide. While the participants overwhelming support for expanding the program is likely partly due to selection bias, it does suggest that participating in the program was a positive experience. The Oregon Department of Transportation estimated that the cost of implementing the program statewide would be roughly $33 million, far less than the $440 million London's camera-based congestion cordon cost.[ii] Though the Oregon program focused on charging for vehicle miles traveled within the two zones, the devices could be modified to also record time of travel and type of vehicle. It demonstrates the viability of an innovative comprehensive pricing infrastructure that also provides particular benefits in terms of protecting motorists' privacy.

[i] Whitty, J. M. (2007). Oregon's mileage fee concept and road user fee pilot program: Final report. Salem Or: Oregon Department of Transportation. Retrieved April 7, 2009, from http://www.oregon.gov/ODOT/HWY/RUFPP/docs/RUFPP_finalreport.pdf.

[ii] Santos, G. (2008). London congestion charging. In G. Burtless & J. R. Pack (Eds.), Brookings-Wharton Papers on Urban Affairs 2008 (pp. 177-234). Washington D.C.: Brookings Institution Press.

RFF found that a similar comprehensive congestion pricing policy in the Washington metropolitan area would result in 19.4 million fewer vehicle miles traveled per day, a reduction of more than 11 percent. The Federal Highway Administration found that a reduction in traffic on congested freeways in the Washington region of 10 to 14 percent would result in a 75 to 80 percent reduction in travel delay. RFF also found that emissions of volatile organic compounds would be reduced by 18.7 percent and of carbon monoxide by 16.8 percent. When RFF calculated and priced all of the social welfare benefits (time saved as well as reduced congestion, pollution, accidents, climate change, oil dependency, noise, etc.) of this reduction in driving, they found that residents of the metropolitan area as a whole would gain the equivalent of $1.1 billion in value—even before the revenues were disbursed.

IV. Privacy

One of the most common criticisms of road-use pricing plans (whether they use cameras or a GPS based system) is that they are intrusive and violate motorists' right to privacy. This is a valid concern as tolling systems do collect significant information about where individuals are, but not an insurmountable one. Part of the solution lies in extending the current legal framework for tolling systems. At a minimum the information collected should receive the same privacy protections as E-ZPass records. While these vary by state, in general E-ZPass records are only released upon court order. Individuals should be allowed to access their own travel records, both for bill auditing purposes and to defend themselves in court.

In general, motorists should be given as much control over their own data as reasonably possible. Cameras (particularly in the numbers required for an area-wide system such as this) are inherently more invasive than transponders; they tell you not only where the vehicle was and when, but who was driving it and what was going on nearby. Transponders are a much better choice, but their use must also be well thought out. As mentioned above the only data communicated to the governing agency via the pump should be the totals in each category. Motorists should be able to download the underlying location specific data through a physical connection so that they can audit their travel and charges. Law enforcement should be able to do this as well—but only if they have a warrant. Neither party should be able to upload or delete data from the device.

The device will likely have to automatically delete the data periodically to free up memory, but should not do so too frequently. Updating the maps would be handled by the governing agency and would require opening up the device so as to connect to an internal input—possibly achieved by exchanging the transponder so as to minimize inconveniencing motorists. Paired with tamper-detection technology, cheating should be minimized and personal information protected.

V. Revenues

State gas taxes raise approximately $420 million in the Washington urbanized area every year. Revenues from the road-use pricing scheme described above would be between $2.96 billion and $4.79 billion, depending on the average fee. While this seems wildly out of proportion to the gas tax it is very much in line with total local and state transportation spending in the region, which amounts to $3.75 billion annually (not counting transit fare revenue or the federal contribution). If road-use pricing revenue replaced the property and sales taxes used to pay for local roads, jurisdictions could reduce the local tax burden or redirect the funding to education or other purposes. Intriguingly, replacing property and sales taxes with road-use pricing could improve equity, as motorists are more able to control this expense through their own behavior.

The revenue generated should be used to mitigate road-use pricing's inequitable distribution of benefits and improve transit options. Net revenues could be split between improving mass transit (particularly buses), a need-based refund or discount, and roadway maintenance. Improving the frequency, convenience and quality of transit is particularly important. Secure funding would also reduce WMATA's vulnerability to fluctuations in state and local government funding (which currently accounts for 42.4 percent of its annual budget).

The need-based refund for low-income motorists could be administered in a number of ways. Low-income motorists could receive a tax credit, which might plausibly be extended to all low-income travelers regardless of mode. Alternatively, low-income motorists could pay a discounted road-use fee. Another option might be to help them upgrade to lighter, more fuel efficient vehicles that qualify for lower road-use rates. Such a program could build on federal and state programs, or local nonprofits that already help low-income households purchase vehicles.

Regardless of how they are spent, a significant portion of the revenues should be returned to the jurisdictions in which they were incurred. Not only is this more equitable, it is also more politically viable—especially if revenues from road-use pricing are intended to replace local transportation revenue. Revenue transfers could take the form of cash transfers to those jurisdictions so that they could disburse them in the ways outlined above. However, jurisdictions might reallocate the funds to uses unrelated to transportation. A better policy would be to return the funds in-kind; using them to directly improve mass transit, assist low-income motorists or travelers, and maintain roadways and bridges within the jurisdiction.

VI. Conclusion

A full-scale regional pilot of road-use pricing in the Washington area would be a bold, ambitious undertaking that would test the ability of public leaders to work together and of citizens to adapt to change. However, if successfully implemented, the pilot might demonstrate to the nation the potential road-use pricing has to reduce travel times, decrease greenhouse gas emissions, and make public transportation more convenient. Over time, residential patterns in the area might shift in ways that produce denser, more walkable neighborhoods and reduce sprawl.

The region is already implementing or planning some innovative solutions based on congestion pricing principles, including Virginia's HOT lanes and Maryland's Inter-county Connector. Perhaps the most familiar example is the Metro system, which already charges fares determined by the time of day and distance traveled. These are good ideas, but they must be expanded if the region is to continue to grow and be a leader in sustainable development. The nation's capital region should serve as an example of what truly sustainable transportation policy looks like to the rest of the nation. Piloting the implementation of road-use pricing would do just that.

Notes

[1] The Annual Mobility Report looks at the Washington, DC-VA-MD Urbanized Area, which is roughly 185 miles across. The American Community Survey data reported here also uses this geography.

[2] While a complete technical discussion of tolling by type of vehicle is beyond this paper, it should be noted that setting appropriate toll levels for large trucks and tractor-trailers can be tricky. In many tolling systems these vehicles are charged based on the number of axles they have in an attempt to charge for the additional damage their greater weight does to the road surface. Yet charging per axle gives truck drivers an incentive to minimize the number of axles on their vehicles, resulting in the opposite effect of that intended. As the vehicle's weight is concentrated on fewer axles the road surface is subjected to ever greater pressure. A better policy would be to charge trucks based on their average weight per wheel. Better built roads could also improve this situation.
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