RESEARCH & DEVELOPMENT

Economic Performance Measurements

Volume 2

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NCDOT Project 2013-19

FHWA/NC/2013-19

September 2015

Technical Report Documentation Page

1. Report No. **FHWA/NC/2013-19**	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle **Economic Performance Measurements Volume 2**		5. Report Date **September 2015**
		6. Performing Organization Code
7. Author(s) **Leigh B. Lane, Senior Research Associate, ITRE** **with Larry R. Goode, PhD, P.E.**		8. Performing Organization Report No.
9. Performing Organization Name and Address **Institute for Transportation Research and Education (ITRE)** **Campus Box 8601** **North Carolina State University** **Raleigh, NC 27695-8601**		10. Work Unit No. (TRAIS)
		11. Contract or Grant No.
12. Sponsoring Agency Name and Address **North Carolina Department of Transportation** **Research and Development Unit** **104 Fayetteville Street** **Raleigh, North Carolina 27601**		13. Type of Report and Period Covered **Final Report** **March 1, 2013 through August 31, 2015**
		14. Sponsoring Agency Code **NCDOT Project 2013-19**

Supplementary Notes:

16. Abstract

North Carolina is undergoing record setting population growth, and experiencing unprecedented underinvestment in its transportation infrastructure. Currently, North Carolina faces a transportation funding shortfall ranging from $86.3 billion to $148.2 billion by 2040. If current spending levels continue, the state's overall infrastructure health is expected to fall from a 'C' to a 'D' rating. At the same time, the motor fuels tax, which has been the mainstay of North Carolina highway funding since 1921, is no longer a secure, reliable funding source. Tax receipts continue to erode due to purchasing power losses and vehicle fuel efficiency gains, and this trend is expected to intensify in the near-term. This report provides a combination of short-term and long-term transportation funding mechanisms available for state policymakers to avert an infrastructure crisis.

17. Key Words **Economic Development, Revenues, Fees, Equity, Economic Analysis, Infrastructure Investment.**	18. Distribution Statement		
19. Security Classif. (of this report) **Unclassified**	20. Security Classif. (of this page) **Unclassified**	21. No. of Pages **158**	22. Price

Form DOT F 1700.7 (8-72) **Reproduction of completed page authorized**

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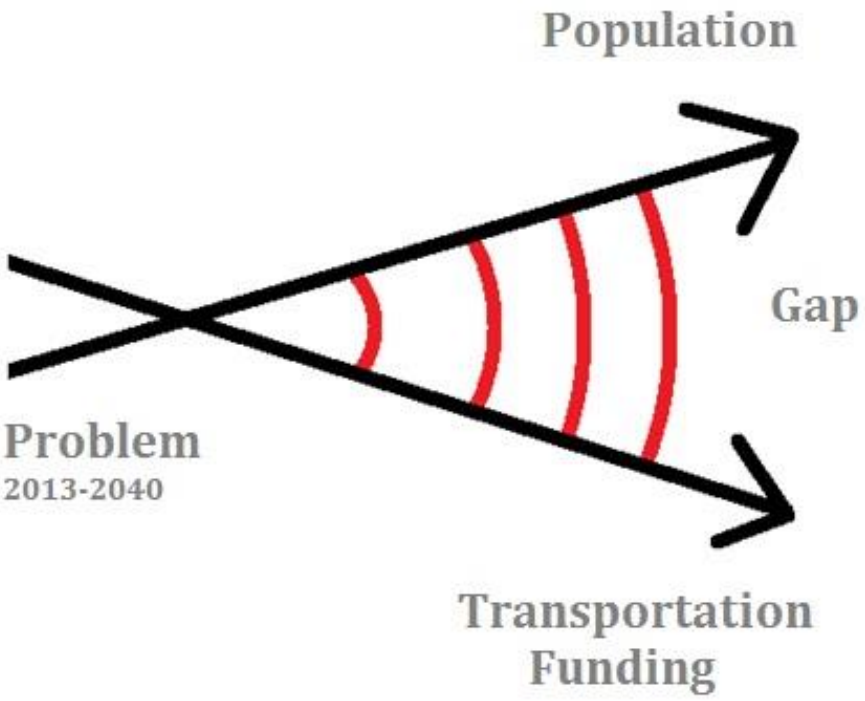
NC STATE UNIVERSITY

Revenue Enhancement Options Study



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NC STATE UNIVERSITY

REVENUE ENHANCEMENT OPTIONS STUDY

Synthesis Report

Prepared for
North Carolina Department of Transportation

Prepared by
Institute for Transportation Research and Education
North Carolina State University
with
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December 03, 2013

ITRE

Contents

Preface

This report was prepared by the Institute of Transportation Research and Education (ITRE) at North Carolina State University as a quick turnaround study. This study explores a menu of high-yield options for funding future transportation projects in North Carolina. The literature on revenue enhancement options agrees that the fuel-based tax mechanism is reaching the end of its life as a viable, reliable revenue source. Federally-mandated fuel efficiency standards, the absence of a national indexed fuel tax, and the increasing use of alternative-fuel vehicles are diminishing the income stream that has historically been associated with fuel-based taxes.

The 2040 plan recently developed for NCDOT suggests replacement of the motor fuels tax with a new user fee system by as early as 2020. At the time of this writing, 2020 is a short six years away and no legislation has been introduced to implement the 2040 plan's recommendations. The 21st Century Committee also suggested a menu of funding options. (The 21st Century Transportation Committee was established by the state to study ways to improve the transportation system in order to promote economic growth.[1]) The Committee recognized that "the State needs an alternative or supplement to the motor fuels tax." Our roadways are suffering from lack of maintenance and new construction - conditions that result from the slow growth of motor fuels tax revenues due to improvements in fuel economy and changing driving patterns. One solution is to base our tax on how much we drive, not how much fuel we consume.

A growing consensus among national organizations and transportation industry leaders supports shifting transportation funding from a pay-by-the-gallon to a pay-by-the-mile framework. This report analyzes the exiting body of literature studying such a paradigm shift, including work from the National Surface Transportation Infrastructure Financing Commission (2009), the Government Accountability Office (2012), The National Conference of State Legislatures (2012), the Congressional Budget Office (2011), and more than 30 other organizations and industry leaders. Both domestic and international alternatives are examined for revenue yield potential, long-term financial security, implementation potential, and geographic equity.

The revenue mechanisms discussed in this report are not simply ways to generate revenue; they are ways to preserve North Carolina's economic vitality in the face of an unprecedented transportation funding shortfall. While many revenue-generating mechanisms have been studied, and other states may be pursuing different options (for more information, see the bibliography section titled 'Issues and strategies in transportation funding: National perspective'), this report focuses on long-term, high-yield funding solutions that are appropriate to North Carolina—and might ultimately be used to replace the gas tax. It does not include financing mechanisms such as Public Private Partnerships (PPPs) that are sometimes misconstrued as tools that can generate revenue. Instead, PPPs should be viewed as tools that can expedite projects, reallocate risk from the public to private sector, or provide more efficient service delivery. Certainly, short term funding strategies including financing options are part of the solutions to building, maintaining and operating transportation infrastructure but alone cannot solve the transportation funding crisis.

[1] Brad Wilson, 2007, "21st Century Transportation Committee Final Report," *21st Century Committee,* http://www.wral.com/asset/traffic/2008/12/10/4111058/20081210172911021.pdf

Executive Summary

North Carolina's infrastructure is suffering as a result of the nationwide transportation funding crisis. The state's overall infrastructure rating is expected to fall from a C- to a D rating,[2] while transportation shortfalls are projected to range from $86.3 billion to $142.2 billion by 2040.[3]

A confluence of factors is challenging the state's ability to meet its transportation system maintenance and improvement requirements. The Federal motor fuels tax has not been increased in 20 years, which has effectively lowered its cumulative purchasing power by over 33 percent.[4] The erosion of federal tax receipts severely impacts North Carolina's transportation system as federal funds have accounted for 27.2 percent ($1.2 billion) of the state's total funds this fiscal year.[5] The state's own fuel tax has also significantly eroded. While North Carolina is one of twelve states to have successfully implemented an indexed tax rate, this tax rate has undergone different caps since 2007 that have led to a cumulative loss of $559 million in revenue.[6]

Fuel tax receipts have also declined as a result of fuel efficiency improvements in vehicles. Efficiency improvements have allowed vehicles to travel further on a gallon of gasoline, resulting in a decreased demand for gasoline and lower fuel tax receipts. Since 1980, vehicle miles traveled has doubled while fuel consumption has increased by only 50 percent.[7] Efficiency gains are projected to acutely affect North Carolina by 2018.[8]

While motor fuels tax revenues are declining, construction costs are on the rise. The same construction project undergone in 2001 will cost the state department of transportation 50 percent more today.[9] These increases in construction cost put tremendous pressure on the budget of state DOTs.

The result of this declining revenue is underinvestment and a loss of competitiveness. Underinvestment in the state and national infrastructure has resulted in declining wages, loss of jobs, and loss of international competitiveness; these effects are projected to intensify in the future. In 2010, it was estimated that deficiencies in America's surface transportation systems cost households and businesses nearly $130 billion.[10] If transportation

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[2] McKinsey & Company, 2007. "Laying the Foundation for a Successful Transformation." *NCDOT,* *http://www.ncdot.gov/download/performance/Volume8.pdf*

[3] "NCDOT From Policy to Projects 2040 Plan: Financial Plan and Investment Strategies," 2012, *NC Department of Transportation,* http://www.ncdot.gov/download/performance/2040_FinanceReport.pdf

[4] Atkinson et. al, 2009, "Paying Our Way", *National Surface Transportation Infrastructure Financing Commission,* http://financecommission.dot.gov/Documents/NSTIF_Commission_Final_Report_Advance%20Copy_Feb09.pdf

[5] "NCDOT Sources of Funds 2013-14 by Major Funding Source," *NCDOT,* *http://www.ncdot.gov/download/about/finance/2014SourcesofFundspiechart.pdf*

[6] 2013 "Historical Information: NC Motor Fuels Tax."

[7] Sorenson et. al, 2009, "Implementation Strategies for Shifting to Direct Usage-Based Charges for Transportation Funding," NCFRP, http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_w143.pdf

[8] "NCDOT From Policy to Projects 2040 Plan: Financial Plan and Investment Strategies," 2012, *NC Department of Transportation,* http://www.ncdot.gov/download/performance/2040_FinanceReport.pdf

[9] Tom Nicholson, March 26 2012, "Higher Oil Prices Push Asphalt Up 11.2% from a Year Ago," *Engineering News Record,* *http://enr.construction.com/economics/quarterly_cost_reports/2012/0326-65279higher-oil-prices-hit-asphalt.asp*

[10] Economic Development Research Group, 2011, "Failure to Act: The Economic Impact of Current Investment Trends in Surface Transportation Infrastructure," *American Society of Civil Engineers*,

spending continues as usual, it is estimated that American households will experience a loss of wages equal to $252 billion.[11] In North Carolina, underinvestment (the 'business as usual' approach) along the I-95 Corridor would result in a $44 billion loss in wages by 2050, and a loss of 16,530 jobs statewide.[12]

North Carolina's transportation funding crisis is exacerbated by population growth. Currently, 9.8 million people live in North Carolina, and this number is expected to grow to 13.5 million by 2040.[13] A per capita estimate shows that, this year, North Carolina will spend around $365 per resident on its transportation system, and in 2040, the state is projected to spend only $120 per resident (see page 16). Transportation spending levels are already failing to meet this year's maintenance and infrastructure needs, and as the population continues to grow, that funding gap will become more and more apparent.

With an expanding population and weakening economy, the state will be more vulnerable to congestion and other symptoms of the system distortion created by shortcomings in the fuel tax. As motor fuels tax receipts have eroded over time, so has the user-pays principle. The federal government and state transportation agencies have relied increasingly on other revenues to support transportation systems, including large transfers from tax receipts not associated with vehicle use. Road users are not internalizing the costs they pay for the transportation system, which encourages users to overuse transportation resources. Congestion is a symptom of this, and the costs are climbing. Adjusting for inflation, the annual cost of congestion for the average commuter was $342 in 1982, and has climbed to $818 in 2011.[14]

The broken user-pays principle also results in disproportionate roadway damage. In the United States, trucks pay as little as 50 cents for every dollar's worth of damage they impart on the roadway.[15] The problem is acute when heavy trucks are overloaded. For example, increasing a truck's weight from 80,000 pounds to 90,000 pounds will result in a 42 percent increase in road wear.[16] Pavement designed to last 20 years will wear out in seven.[17] As of 2007, it was estimated that heavy trucks cost North Carolina an extra $78 million in damages per year.[18] Yet, trucking industry professionals understand the costs heavy vehicles impose on the roadway and are ready to shoulder a greater burden. In an interview with the McClatchy Washington Bureau,[19] Bill Graves, president and CEO of the American Trucking Associations stated, "We want to pay more. We're ready to pay more, in some type of user

http://www.asce.org/uploadedfiles/infrastructure/report_card/asce-failuretoactfinal.pdf

[11] Economic Development Research Group, 2011, "Failure to Act: The Economic Impact of Current Investment Trends in Surface Transportation Infrastructure," *American Society of Civil Engineers*, http://www.asce.org/uploadedfiles/infrastructure/report_card/asce-failuretoactfinal.pdf

[12] Cambridge Systematics, 2013, "North Carolina I-95 Economic Impact Assessment," *NCDOT*, http://www.driving95.com/assets/pdfs/_I-95_Economic_Assessment_FinalReport_May2013.pdf

[13] Alta Planning + Design, 2013, "WalkBike NC: North Carolina Statewide Pedestrian and Bicycle Plan," *NCDOT, http://www.ncdot.gov/bikeped/download/WalkBikeNC_FullPlan_Draft.pdf*

[14] David Schrank et. al, 2012. "Urban Mobility Report," *Texas Transportation Institute, http://d2dtl5nnlpfr0r.cloudfront.net/tti.tamu.edu/documents/mobility-report-2012.pdf*

[15] "Addendum to the 1997 Federal Highway Cost Allocation Study," May 2000, Federal Highway Administration, http://www.fhwa.dot.gov/policy/hcas/addendum.htm

[16] Zach Patton, July 2007, "Too Big for The Road," *Governing*, http://www.governing.com/topics/transportation-infrastructure/Too-Big-The-Road.html

[17] Ibid

[18] Ibid

[19] Curtis Tate, 2013. "More states to raise taxes to pay for transportation." *McClatchy Washington Bureau,* http://www.kansascity.com/2013/11/27/4654675/more-states-raise-taxes-to-pay.html

Short term options (2014-2020) required to raise over $1 billion annually transportation needs

Mechanism	Revenue Potential
Liability fee: 20 percent surcharge ($6.67/user per month)	$525 million
Highway use tax: 1 percent increase (3-4%; $4.16/user per month)	$170 million
Transfer of short term lease rentals from General Fund to Highway Fund (no user impact)	$50 million
Discontinue General Fund transfers from Highway Fund (no user impact)	$255 million
Mileage-based user fee on passenger vehicles: (0.5 cents/mile; $6.25/user per month)	$495 million
Mileage-based user fee on IRP commercial vehicles: (1 cent/mile)	$5 million
Remove the motor fuels tax cap	$35 million

fee, whatever Congress can agree to." A mileage-based user fee, where trucks pay by the mile instead of by the gallon, would allow trucks to equitably pay for their road impacts. Mileage-based user fees for commercial vehicles are discussed in section three of the report.

A paradigm shift in transportation funding is essential to eliminate systematic distortions and secure transportation funding over the long-term. To accomplish this, we explore a number of options that would return transportation funding to the user-pays principle, and return to a system that encourages the user to pay in proportion to their use of the resource. Such a framework would offer long-term funding security for the transportation network.

This report evaluated revenue enhancement options with an emphasis on high-yield, long-term funding security, and the user-pays principle. It also discusses how these revenue enhancement options meet criteria for implementation and geographic equity. Since this report focuses on revenue enhancement, it does not include financing strategies. Though financing strategies are important for the procurement of capital investments, they do not provide the state with any additional revenue. The immediate and continued needs of North Carolina's transportation system depend on an infusion of additional revenue; therefore, this report focuses on revenue enhancement solutions and not on financing strategies. The report examined both short-term and long-term revenue enhancement options.

Short-term revenue enhancement options (up to 2020) that met our criteria can be found in the table above.[20] A more in-depth review of these

[20] For Liability fee calculations see page 56. For the mileage-based user fee on passenger vehicles calculation see page 36. Highway use tax figures and the transfer of short term lease rentals come from: "North Carolina Highway Use Tax Net Collections. 2012, North Carolina Department of Revenue," http://www.dornc.com/publications/abstract/2011/table40.pdf. Uncapped motor fuels tax figures come from: 2013 "Historical Information: NC Motor Fuels Tax." For mileage-based user fee on IRP commercial vehicles, the calculation is derived from two sources: Bureau of Transportation Statistics and NCDOT. By taking the average fuel economy of commercial vehicles - 5.85 mpg (BTS) - and multiplying it by the amount of gallons used by the IRP fleet in North Carolina (NCDOT) – 88,189,496 – it can be determined that commercial vehicles travel about 5.16 million miles in North Carolina. Thus, a 1-cent per mile fee could generate about $5.2 million per year in revenue.

options can be found in the 'What are Our Next Steps?' section of this report. Short-term revenue enhancement mechanisms will need to be enacted as a stop-gap to shore-up existing revenue losses. By 2020, the state will need to shift away from the motor fuels tax to a funding strategy that is secure in the long-term.

Long-term revenue enhancement options (beyond 2020) are summarized under the bold headings on the following page. The options that met our criteria include mileage-based user fees, targeted congestion pricing, and general pricing (tolling).

Mileage-based user fees. Mileage-based user fees (MBUFs) are per-mile charges that drivers pay to use the road network. By charging drivers by vehicle weight, type, and distance traveled, it will be possible to more accurately allocate system costs to system users.

Eleven locations in the United States (Arizona, Colorado, Florida, Minnesota, Maryland, Massachusetts, New Jersey, New York City, Oregon, Texas, and Washington) have investigated MBUFs as a funding strategy for passenger vehicles. This has included trials, focus groups, and surveys – all geared toward developing a system for implementing a state-wide (or in some cases, regional) system that could be used to either replace or supplement the motor fuels tax.

The greatest barriers to implementation center on how MBUFs will be recorded and collected – especially, whether or not fees can be assessed without an invasion of privacy. GPS technology, for instance, has the potential to charge drivers based on both distances and route selection. However, tracking aspects of GPS technology are widely unpopular and often viewed as an invasion of privacy. Oregon completed two pilot programs demonstrating that a range of recording and collection methods are available that uphold the needs of privacy-sensitive road users. Options include simple odometer readings, collection from onboard units that do not track vehicle route selection, and calculations based on vehicle fuel economies.

Building user familiarity and trust with these options is essential for advancing an MBUF system. A recent evaluation of MBUFs found that prior to a trial, 60 percent of trial participants expressed a negative view of mileage-based user fees.[21] After the trial, however, 70 percent of participants expressed a favorable view.[22]

North Carolina's annual vehicle inspections provide the state with the necessary infrastructure to pilot an MBUF program. During an inspection, a vehicle's odometer can be read and a fee assessed without requiring much additional investment, or raising privacy concerns. A 0.5 cent per mile fee would generate roughly $495 million in revenue annually (see page 36).

Mileage-based user fees can also be charged to commercial vehicles, which impart substantial pavement damage on the roadway. In the United States, four states use manual reporting MBUF systems (OR, KY, NM, NY) for commercial vehicles. Though this is a good first step, manual reporting systems may result in millions of dollars of lost revenue due to underreporting – New York State loses $150 million annually as a result of its truck drivers underreporting the mileage and weight of their vehicles.[23]

[21] Paul Hanley and John Kuhl, 2011, "National Evaluation of Mileage-Based Charges for Drivers," *Transportation Research Board*, http://trb.metapress.com/content/llq5560865m71256/?genre=article&id=doi%3a10.3141%2f2221-02

[22] Cambridge Systematics, 2013, "North Carolina I-95 Economic Impact Assessment," *NCDOT*, http://www.driving95.com/assets/pdfs/_I-95_Economic_Assessment_FinalReport_May2013.pdf

[23] Government Accountability Office, 2012, "Highway Trust Fund: Pilot Program Could Help Determine the Viability of

Where GPS tracking is a deterrent for passenger vehicle drivers, it may be a boon for commercial drivers. GPS tracking could provide an extra-layer of security for shippers, making their delivery process more transparent and reliable. Germany, Switzerland, Austria, Czech Republic, Slovakia, and New Zealand have already implemented GPS MBUF systems.

Targeted Congestion Pricing. From 1990 to 2011, urban areas such as Greensboro, Raleigh/Durham, and Charlotte have experienced peak period congestion level increases from 7-18 percent, 26-50 percent, and 39-59 percent, respectively.[24] As congestion becomes more acute, targeted congestion pricing methods, such as managed lanes and cordon pricing, could offer congestion relief and generate transportation revenue.

Managed lanes regulate congestion by charging users a fee for entry into specified lanes. The fee effectively reduces the willingness for all drivers to use these lanes, which results in improved travel speeds for drivers who qualify either by paying the fee or by special exemption.[25] North Carolina has one facility (I-77 near Charlotte's central business district) that has been proposed to provide managed lanes through public-private partnership procurement. Raleigh, Durham, Winston-Salem, Greensboro, Asheville, Fayetteville, and Wilmington regions are all expected to expand, and all could likely benefit from managed lanes.

Cordon pricing (also known as area or zone pricing) involves charging drivers to access a specific cordon by collecting tolls upon entry. Cordon pricing manages congestion through a system of variable toll charges. During morning and evening peak periods, toll charges are higher to reduce the willingness of drivers to pay for entry into a specific cordon. This, in turn, manages traffic by decreasing the number of vehicles in the congestion-prone areas. These systems annually generate approximately $54 million in Singapore, $237 million in London, and $116 million in Stockholm.[26]

General Pricing (Tolling). Transportation funding shortfalls can be alleviated through general pricing (tolling) strategies. In 2006, general pricing facilities raised a total of $9.3 billion, or the equivalent of 9.9 percent of total federal, state, and local highway user fee revenues.[27] North Carolina currently uses, or has proposed, general pricing in six pieces of its road network, including the following:

- Triangle Expressway (Research Triangle Park)
- Complete 540 Triangle Expressway Southeast Extension (Research Triangle Park)
- Monroe Bypass (Mecklenburg County)
- Mid-Currituck Bridge (Currituck County)
- Garden Parkway (Gaston County)
- Cape Fear Crossing (Brunswick and New Hanover Counties)

The Triangle Expressway serves as an illustrative example of the revenue generation potential of general pricing facilities. In fiscal year 2013, use of the expressway has generated over $13 million in state transportation revenue (this includes the sale of vehicle toll transponders).[28]

Mileage Fees for Certain Vehicles," GAO, http://www.gao.gov/assets/660/650863.pdf

[24] "Urban Mobility Report," 2012, Texas Transportation Institute, http://mobility.tamu.edu/ums/

[25] Shinkle, et. al, July 2012, "On the Move: State Strategies for 21st Century Transportation Solutions," National Conference of State Legislatures, http://www.ncsl.org/documents/transportation/on-the-move.pdf

[26] Atkinson et. al, 2009, "Paying Our Way", National Surface Transportation Infrastructure Financing Commission, http://financecommission.dot.gov/Documents/NSTIF_Commission_Final_Report_Advance%20Copy_Feb09.pdf

[27] Ibid

[28] "Financial Statements." 2013, North Carolina Turnpike Authority.

North Carolina could dramatically increase this revenue base by introducing fare collections on all freeways and expressways. This would allow for the most vital pieces of the road network to be self-sustaining. In order to do so, the North Carolina Turnpike Authority would require legislative approval to explore and implement as many general pricing projects as necessary.

North Carolina has four interstates (I-95, I-40, I-85, I-77) that would be the main focus for tolling strategies. Tolling these interstates would provide an effective way to charge out-of-state travelers for the use of North Carolina's road network. The *North Carolina I-95 Economic Assessment* found that tolling I-95 could yield $1.2 billion to $1.7 billion over a ten-year period (2015-2024).[29] This revenue yield range depends on a rural toll rate of $0.0975 per mile, an urban toll rate of $0.195 per mile, and whether or not a local mitigation option (50 percent discount for all local trips) were used.[30]

Liability Insurance Fee. As of 2012, approximately 6.6 million licensed drivers in North Carolina paid approximately $33.43 per month on liability insurance.[31,32] If a 20 percent surcharge were added to liability insurance, the additional $6.67 would generate nearly $526 million each year – enough to fund 15.8 percent of North Carolina's annual transportation needs.[33]

Next Steps. As North Carolina faces an unprecedented transportation funding shortfall, implementing strategic revenue enhancement options will require bold decision making and swift action. Short-term revenue enhancement mechanisms will need to be enacted as a stop-gap to shore-up existing revenue losses from a declining motor fuels tax base. By 2020, the state will need to shift away from the motor fuels tax to a funding strategy that is secure in the long-term.

[29] Cambridge Systematics, 2013, "North Carolina I-95 Economic Impact Assessment," *NCDOT*, http://www.driving95.com/assets/pdfs/_I-95_Economic_Assessment_FinalReport_May2013.pdf

[30] Ibid

[31] Note that this number has been estimated using premium data from 2012 and licensed driver data from 2011. The Office of Highway Policy Information (FHWA). Online: http://www.fhwa.dot.gov/policyinformation/statistics/2011/xls/dl22.xls

[32] North Carolina Department of Insurance, December 2012, "Summary of North Carolina Property and Casualty Business," North Carolina Financial Evaluation Unit, http://www.ncdoi.com/FA/Documents/StatisticalData/2012/Volume%20I%20-%20Property%20and%20Casualty%20Business/2012_P1_Property%20and%20casualty%20summary.pdf

[33] This range of fees is based on the transportation shortfall projections of $86.3 billion to $148.2 billion by 2040, found in NCDOT's 2040 Plan, and drivers license data provided by the Office of Highway Policy Information (FHWA).

Introduction

North Carolina is undergoing record setting population growth, and experiencing unprecedented underinvestment in its transportation infrastructure. Currently, North Carolina faces a transportation funding shortfall ranging from $86.3 billion to $148.2 billion by 2040.[34] If current spending levels continue, the state's overall infrastructure health is expected to fall from a C- to a D rating.[35] At the same time, the motor fuels tax, which has been the mainstay of North Carolina highway funding since 1921, is no longer a secure, reliable funding source. Tax receipts continue to erode due to purchasing power losses and vehicle fuel efficiency gains, and this trend is expected to intensify in the near-term.

North Carolina is at a crossroads. It can either provide new transportation investment, or allow its infrastructure to fall into disrepair. If the state continues down its current path, transportation funding levels will likely lead to statewide economic degradation. The N.C. I-95 corridor study revealed that if present funding levels continue along the I-95 corridor, it would result in a $44 billion loss in wages in that region by 2050.[36] This is only one corridor; statewide underinvestment would be far more economically damaging.

This report provides both the context for North Carolina's shortfall and funding options available for its recovery. To build context, the report discusses the critical links between transportation funding, infrastructure health, and the overall performance of North Carolina's economy. It also discusses the allure of steering North Carolina into a fundamentally new direction for transportation funding, where user fees are collected by the mile instead of by the gallon. This direction would allow for long-term funding security while providing a more efficient user fee than the motor fuels tax.

If state policymakers choose to invest in North Carolina's transportation system, great urgency is required. By 2015, the federal Highway Trust Fund balance will be exhausted and federal funding will become questionable.[37] By 2018, improvements in vehicle fuel efficiencies will start to significantly impact North Carolina's motor fuels tax receipts.[38]

This report provides a combination of short-term and long-term transportation funding mechanisms available for state policymakers to avert an infrastructure crisis. It does not include financing mechanisms such as public-private partnerships (PPPs) that are sometimes misconstrued as tools that can generate revenue. (PPPs should be viewed as tools that can expedite projects, reallocate risk from the public to private sector, or provide more efficient service delivery, but not as tools for revenue generation.) Funding options that provide lower-yield returns, which would not solve the sizeable funding crisis faced by NCDOT, are not explored in this report. However, information on these can be found in the bibliography resources. This report steers away

[34] "NCDOT From Policy to Projects 2040 Plan: Financial Plan and Investment Strategies," 2012, *NC Department of Transportation,* http://www.ncdot.gov/download/performance/2040_FinanceReport.pdf

[35] McKinsey & Company, October 2007, "Laying the Foundation for a Successful Transformation," *NCDOT*, http://www.ncleg.net/documentsites/committees/21stCenturyTransportation/Prioritization-Best%20Practices-Efficiency/Presentations/mckinsey.pdf

[36] Cambridge Systematics, 2013, "North Carolina I-95 Economic Impact Assessment," *NCDOT*, http://www.driving95.com/assets/pdfs/_I-95_Economic_Assessment_FinalReport_May2013.pdf

[37] "Status of the Highway Trust Fund," July 2013. Congressional Budget Office, http://www.cbo.gov/sites/default/files/cbofiles/attachments/44434-HighwayTrustFund_Testimony.pdf

[38] "NCDOT From Policy to Projects 2040 Plan: Financial Plan and Investment Strategies," 2012, *NC Department of Transportation,* http://www.ncdot.gov/download/performance/2040_FinanceReport.pdf

from quick, temporary fixes that do little to solve the root issues of funding North Carolina's transportation system, It instead focuses on funding options that would benefit the state in the long-term.

The findings in this report are synthesized from an extensive literature review, a Transportation Research Board consult, and interviews of industry experts. A combination of over 110 resources including academic journals, industry reports, transportation department and agency studies, and news articles were analyzed for this report. Forty-five of the most relevant resources were summarized and included in an annotated bibliography that supplements this report. The bibliography includes sources that discuss transportation funding issues from a national and state perspective, it includes individual state funding plans and strategies, comprehensive mileage-based user fee studies and trials, targeted congestion pricing, general pricing (tolling), financing, and other strategies. This report was prepared by the Institute of Transportation Research and Education (ITRE) at North Carolina State University as a quick turnaround study (45-day report) that explores a menu of high yielding options for funding future transportation projects in North Carolina.

The report is organized into the following four sections and includes an annotated bibliography.

Section 1: Do we have a crisis?

This section discusses infrastructure issues facing North Carolina and the nation. It details a body of literature that demonstrates a transportation infrastructure crisis is occurring. It also highlights the role transportation investment plays in supporting economic growth as well as travel reliability and safety considerations.

Section 2: Do we need a paradigm shift?

This section discusses the efficiency advantages of a user-pays system. It discusses transportation costs in the context of a utility fee framework. By shifting North Carolina's motor fuels tax system to a mileage-based user fee paradigm, efficiency gains and equitable transportation funding revenues can be realized.

Section 3: What are our best options?

This section discusses available revenue enhancement mechanisms and focuses on comprehensive mileage-based user fees, targeted congestion pricing (e.g. managed lanes and cordon pricing), general pricing, and a liability insurance surcharge. These options are high-yielding and secure in the long-term, and also conform to three other criteria (e.g. upholds the user pays principle, implementation potential, geographic equity) that are consistent in the literature.

Section 4: What are our next steps?

The fourth section describes the revenue enhance mechanisms that will enable the state to generate over $1 billion annually in the short-term. It organizes these mechanisms into a table of viable short-term funding solutions. This section also describes the need for quick policy decisions as the federal Highway Trust Fund will be insolvent in 2015 and vehicle fuel efficiency gains will acutely impact North in 2018. A combination of short- and long-term revenue enhancement options are discussed.

Annotated Bibliography Supplement

The bibliography includes sources that discuss transportation funding issues from a national and state perspective, it includes individual state funding plans and strategies, comprehensive mileage-based user fee studies and trials, targeted congestion pricing, general pricing (tolling), financing, and other strategies.

"In 2010, it was estimated that deficiencies in America's surface transportation systems cost households and businesses nearly $130 billion." - *American Society of Civil Engineers*

Section 1 – Do we have a crisis?

The American Society of Civil Engineers (ASCE) predicts that **if infrastructure spending continues as usual a loss of jobs, international competitiveness, reduced wages, and less value added by American business will result.**[39] These effects would stem from the infrastructure deterioration resulting from disinvestment. ASCE estimates that disinvestment of this magnitude would cause a loss of wages for American households equal to $252 billion by 2040 and create a shift in the job market.[40] Some sectors would gain from infrastructure deterioration; however, these sectors would provide annual income levels 28 percent lower than the sectors expected to lose jobs.[41] Meanwhile, infrastructure conditions would cause households to spend an extra $54 billion on transportation by 2040.[42]

American businesses would also be affected by infrastructure deficiencies. By 2040, ASCE estimates that American businesses will add $232 billion less in value to the economy due to deteriorating infrastructure conditions. These conditions would also adversely affect the international competitiveness of the United States. By 2020, ASCE predicts the United States will have $28 billion fewer exports and $72 billion fewer exports by 2040.[43]

Infrastructure deterioration at the national level is also occurring at the state level. Currently **North Carolina faces a transportation funding shortfall ranging from $86.3 billion to $148.2 billion**[44] and, if current spending levels continue, North Carolina's overall infrastructure health is expected to fall from a C- to a D rating.[45] Similar to the federal government and many other states, North Carolina is in a position where inaction may result in dire consequences. For example, without additional investment in its I-95 corridor, North Carolina is projected to lose 16,530 jobs throughout the state.[46] Counties along the I-95 corridor would feel the brunt of these job losses (9,730), while other counties in Eastern North Carolina (1,610) and the rest of the state (5,010) would suffer job losses as

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[39] Economic Development Research Group, 2011, "Failure to Act: The Economic Impact of Current Investment Trends in Surface Transportation Infrastructure," *American Society of Civil Engineers*, http://www.asce.org/uploadedfiles/infrastructure/report_card/asce-failuretoactfinal.pdf

[40] Ibid

[41] Ibid

[42] Ibid

[43] Ibid

[44] "NCDOT From Policy to Projects 2040 Plan: Financial Plan and Investment Strategies," 2012, *NC Department of Transportation,* http://www.ncdot.gov/download/performance/2040_FinanceReport.pdf

[45] McKinsey & Company, October 2007, "Laying the Foundation for a Successful Transformation," *NCDOT*, http://www.ncleg.net/documentsites/committees/21stCenturyTransportation/Prioritization-Best%20Practices-Efficiency/Presentations/mckinsey.pdf

[46] Cambridge Systematics, 2013, "North Carolina I-95 Economic Impact Assessment," *NCDOT*, http://www.driving95.com/assets/pdfs/_I-95_Economic_Assessment_FinalReport_May2013.pdf

well.[47] Job losses resulting from business-as-usual transportation infrastructure investment, equate to a $44 billion loss in wages along the I-95 corridor by 2050.[48] Residents in other eastern counties would lose $7 billion, and residents in the rest of the state would lose $22 billion.[49] North Carolina could also expect significant impacts to its gross regional product. The I-95 counties would lose $41 billion, other eastern counties $7 billion, and the rest of the state $30 billion.[50] And these impacts come from the disinvestment of only part of the state – just the I-95 corridor.

While estimates of the costs of inaction are sobering, state-level projections show that transportation investment can stimulate economic activity. To date, at least nine states (Virginia, Maine, Kansas, Missouri, Michigan, Indiana, Florida, Colorado, and Maryland) have completed economic investment assessments, which demonstrate how infrastructure investment impacts their state economies. Virginia, our neighbor to the north, recently conducted an economic impact analysis of building all projects in their six-year investment plan (2009-2014). Virginia's analysis showed that investing $33 billion to build out the six-year plan would generate $56 billion additional business sales in the state, $29 billion extra income for workers in Virginia, create 23,500 jobs per year over 26 years, and generate $2.3 billion in additional state and local tax revenue. In total, it is estimated the benefits of investing to build-out the six-year plan outweigh the costs by a factor of four and the total economic return outweighs the costs by a factor of 3.8.[51] Key findings from other states can be summed as follows:

- Michigan STIP: full build-out would increase gross state product by $5.1 billion[52]
- Missouri STIP: every $1 invested will bring a return of $3.64[53]
- Kansas case studies: five projects created 51,000 jobs and produced $6.1 billion in additional economic value added[54]

Economic Impact of Infrastructure Investment: Virginia's Six-Year Plan

Investing $33 billion to build out the six-year plan would generate:

- $56 billion additional business sales
- $29 billion extra income for workers
- 23,500 jobs per year over 26 years
- $2.3 billion in additional state and local tax revenue

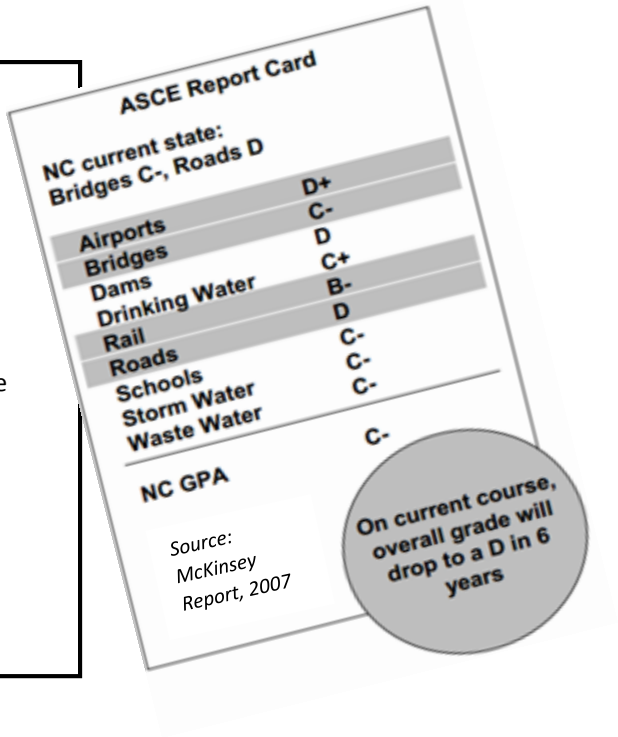
The six-year plan would outweigh the costs by a factor of 4 and the total economic return outweighs the costs by a factor of 3.8.

[47] Cambridge Systematics, 2013, "North Carolina I-95 Economic Impact Assessment," *NCDOT*, http://www.driving95.com/assets/pdfs/_I-95_Economic_Assessment_FinalReport_May2013.pdf
[48] Ibid
[49] Ibid
[50] Ibid
[51] Office of Intermodal Planning and Investment, January 2010, "Virginia's Long-Range Multimodal Transportation Plan," *VTRANS.org,* http://vtrans.org/resources/VTrans_2035_Report.pdf
[52] MDOT, 2010. "Economic Benefits of the Michigan Department of Transportation's FY 2010-2014 Highway Program" http://www.michigan.gov/documents/mdot/MDOT_economicbenefitreport_202828_7.pdf
[53] MoDOT, 2012. "TRACKER: Measures of Departmental Performance" http://www.modot.org/about/tracker_archive/documents/Tracker_PDF_Oct12/Tracker_Oct12.pdf
[54] Kansas Department of Transportation, 2007. "Transportation Infrastructure Investment and the Kansas Economy." http://www.ksdot.org/PDF_Files/Transportation%20Infrastructure%20Investment%20and%20the%20Kansas%20Economy%20Final%2011-12-08.pdf

Economic impact projections have also been conducted at the corridor level for several I-95 build scenarios, assuming sufficient revenue to build-out the project as envisioned by NCDOT. The best performing scenario – tolling all traffic but charging local residents a reduced rate – would create 11,000 jobs, increase income by $50 billion, and increase gross regional product by $45 billion for residents of I-95 counties.[55] For other eastern counties, the project would produce 1,230 jobs, increase income by $5 billion, and increase gross regional product by $6 billion; for the rest of the state, the project would generate 5,370 jobs, increase income by $23 billion, and increase gross regional product by $32 billion.[56]

NCDOT: One of the Largest in the U.S.

- NCDOT maintains 79,478 miles of highway statewide. It is second only to Texas in terms of total center line miles.(McKinsey Report, NCDOT condition assessment)
- NCDOT owns 78 percent of total lane miles in the state. It is second only to Virginia in percent of total lane miles.(McKinsey Report)
- North Carolina has 18,165 bridges (12th highest state), where 5,488 are structurally deficient (9th highest state).(FHWA Bridges and Structures)



North Carolina population and underinvestment meet

Today, North Carolina is the tenth most populous state in the country with 9.8 million people.[57] By 2040, it will be home to an estimated 13.5 million people, surpassing Michigan, Ohio, and Georgia to become the seventh most populous state.[58,59] This is the equivalent of adding the entire population of South Carolina to the state.[60] Over that same time period, North Carolina is projected to have an unprecedented underinvestment in its transportation system. The North Carolina Department of Transportation (NCDOT) expects

[55] Cambridge Systematics, 2013, "North Carolina I-95 Economic Impact Assessment," *NCDOT*, http://www.driving95.com/assets/pdfs/_I-95_Economic_Assessment_FinalReport_May2013.pdf

[56] Ibid

[57] Winston-Salem Journal, 2011. "North Carolina drops to 15th in population growth rate." http://www.journalnow.com/news/local/article_1256ea0e-4ae8-11e2-a829-0019bb30f31a.html?mode=image&photo=0

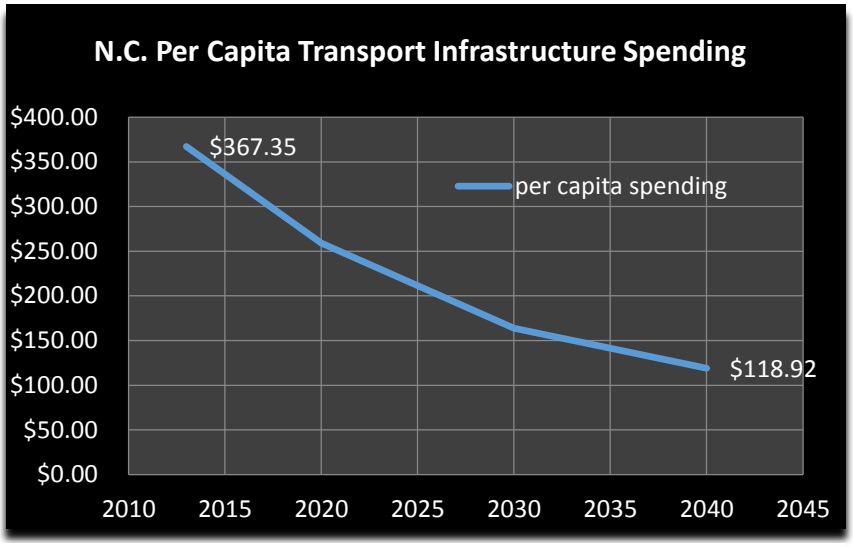
[58] Ibid

[59] Alta Planning + Design, 2013, "WalkBike NC: North Carolina Statewide Pedestrian and Bicycle Plan," *NCDOT,* *http://www.ncdot.gov/bikeped/download/WalkBikeNC_FullPlan_Draft.pdf*

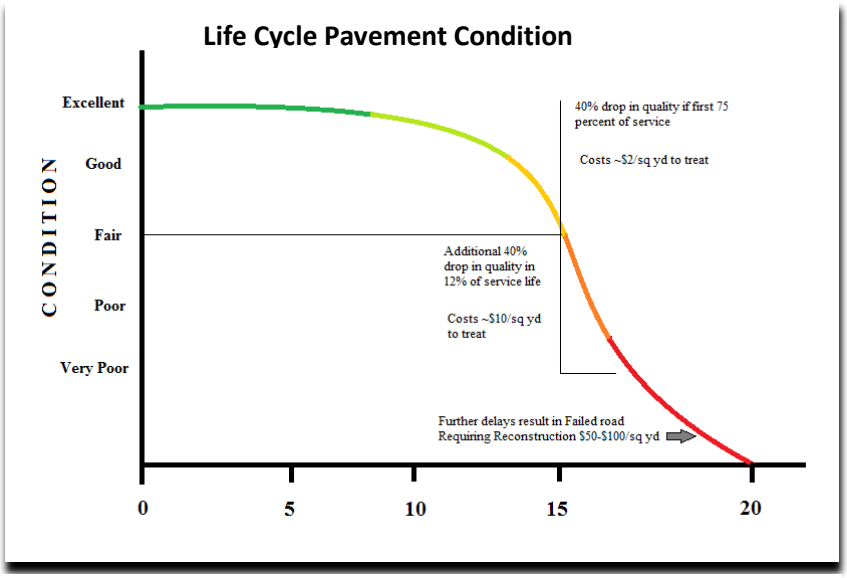
[60] Brad Wilson, 2007, "21st Century Transportation Committee Final Report," *21st Century Committee,* http://www.wral.com/asset/traffic/2008/12/10/4111058/20081210172911021.pdf

a budget shortfall ranging from $86.3 billion to $148.2 billion. [61] This is not by choice, but rather as a reaction to inadequate transportation funding.

One way to understand the magnitude of austerity that faces North Carolina is to consider transportation funding on a per capita basis. This year, the state is home to around 9.8 million people and NCDOT's capital budget is around $3.6 billion (after administrative costs have been accounted for).[62] Using these numbers, a simplistic estimate can be made to show that, this year, NCDOT will spend around $365 per person for North Carolina's transportation system. In contrast, by 2040, North Carolina is projected to have 13.5 million people. By then, the state is projected to undergo losses in total transportation revenues (due to stagnant motor fuel tax revenues and increased fuel efficiencies of vehicles) so that NCDOT will have around $1.6 billion to spend on transportation.[63] Thus, a per capita estimate shows that in 2040, NCDOT will spend around $120 per person (in 2012 dollars) – the equivalent of a 309 percent decrease in per capita spending (see graph to the upper right). It should be noted that this year's spending levels are not sufficient to meet this year's needs. Thus a spending reduction of 309 percent per capita, as illustrated above, could significantly worsen travel conditions in North Carolina.



Source: North Carolina State University Institute for Transportation Research & Education



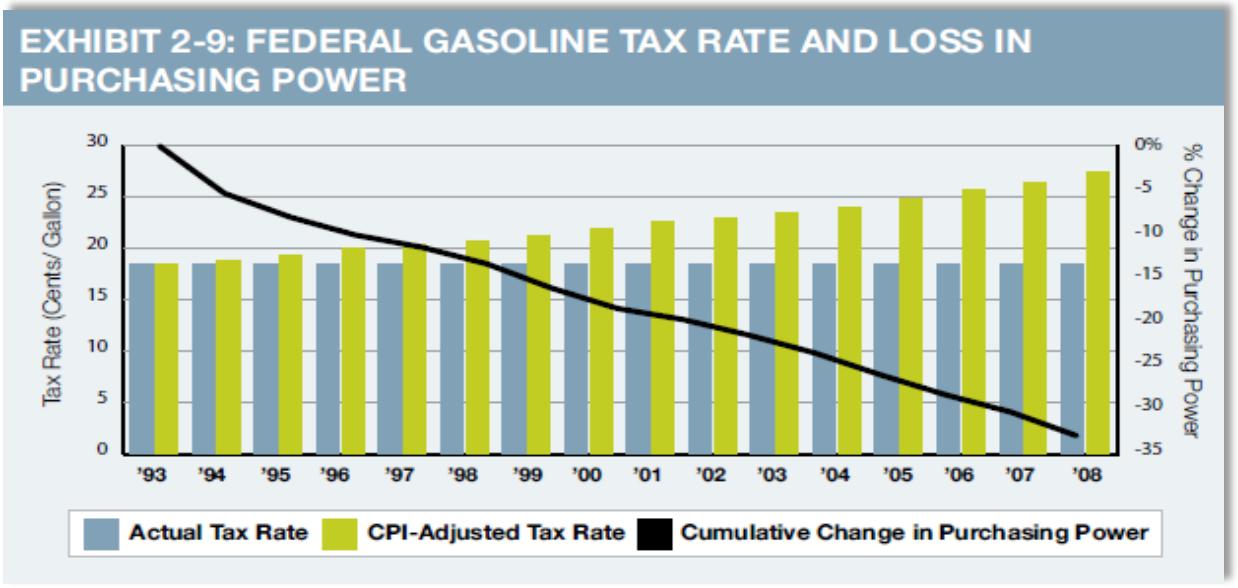
Source: "What is Pavement Management?" Capitol Asset & Pavement Services, Inc.

One of the most critical issues pertaining to under investment deals with quickly mounting maintenance costs for North Carolina's transportation assets. For example, when

[61] "NCDOT From Policy to Projects 2040 Plan: Financial Plan and Investment Strategies," 2012, *NC Department of Transportation,* http://www.ncdot.gov/download/performance/2040_FinanceReport.pdf

[62] "NCDOT From Policy to Projects 2040 Plan: Financial Plan and Investment Strategies," 2012, *NC Department of Transportation,* http://www.ncdot.gov/download/performance/2040_FinanceReport.pdf

[63] Ibid



Source: "Paying Our Way." 2009

pavement reaches about 15 years into its 20-year life-cycle, maintenance costs climb exponentially (see lower right image on the previous page). If caught before this deterioration threshold, maintenance costs are around $2 per square yard to treat. If caught right around the 15-year mark pavement costs around $10 per square yard to treat. And if not caught until after the threshold, maintenance costs are around $50-100 per square yard because the road will need to be reconstructed. Maintenance costs are also mounting for North Carolina bridges. Twenty-nine percent of them are structurally deficient or functionally obsolete.[64]

Congestion levels rise

In North Carolina, travel demand has greatly outpaced road capacity and **congestion levels have been climbing even relative to other states**. As of six years ago, 57 percent of all urban interstate miles in North Carolina and 47 percent of all rural interstate miles were congested.[65] Urban congestive effects have been especially noteworthy in the state, and the Raleigh-Durham (RDU) region is an illustrative example of this. From 1982 to 2011, the region moved from the 72nd to the 61st most congested region in the United States.[66] During that time period, congested lane miles grew from 22 percent to 52 percent in the region.[67] Meanwhile, in 2011, the average RDU driver spent $338 dollars (in travel time costs) stuck in 23 hours of traffic.[68] As population continues to increase at record-setting rates and transportation revenues continue to slowly decline, the result will likely be statewide congestion and complete gridlock along major transportation corridors.

Gas tax values decline

Similar to other states and the Federal government, North Carolina has and continues

[64] Grady Barbaccia. "The State of the Nation's Bridges," 2013, *Better Roads,* http://www.betterroads.com/the-state-of-the-nations-bridges/

[65] Brad Wilson, 2007, "21st Century Transportation Committee Final Report," *21st Century Committee,* http://www.wral.com/asset/traffic/2008/12/10/4111058/20081210172911021.pdf

[66] "Performance Measure Summary – Raleigh-Durham NC," 2012, *Texas Transportation Institute,* http://d2dtl5nnlpfr0r.cloudfront.net/tti.tamu.edu/documents/ums/congestion-data/ralei.pdf

[67] Ibid

[68] Ibid

to rely on revenues from the motor fuels tax to fund the bulk of its construction needs. Revenues generated by State and Federal fuel taxes represent nearly 75 percent of total transportation funding in North Carolina.[69] Yet, the value of motor fuels taxes has eroded significantly over time due to inflation, especially at the federal level. The federal motor fuels tax has not been adjusted since 1993. Since then, **federal motor fuels tax receipts have experienced a cumulative loss in purchasing power of over 33 percent** (see the chart on the previous page).[70]

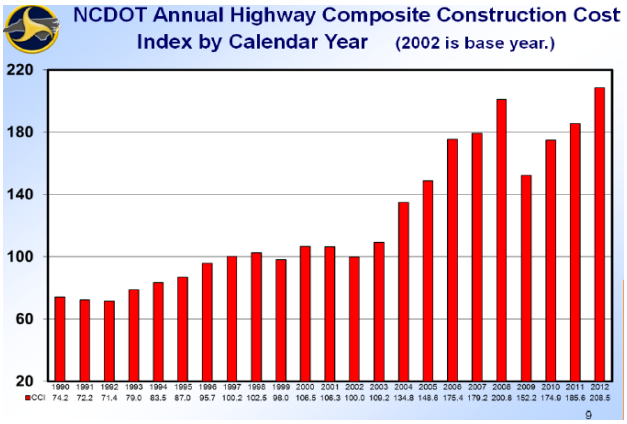
North Carolina, is one of twelve states that have successfully implemented an indexed tax rate, which automatically adjusts for changes in purchasing power over time.[71] However, this tax rate has undergone different caps, or price ceilings, since 2007 that have prevented the tax rate from keeping pace with inflation.[72] Over the past six years, the state's motor fuels tax experienced $559 million in revenue losses due to capping.[73]

Fuel Efficiency depletes revenue base

The U.S. Energy Information Agency estimates that the average fuel efficiency for all light-duty vehicles on the road will grow from 20.4 MPG (in 2008) to 28.9 MPG by 2030, an increase of 42 percent.[74] Though fuel efficiency gains have yet to noticeably affect state and federal transportation funding streams, the effect is projected to become substantial in the short to medium term. In North Carolina, these effects will result in fuel consumption levels that are 96 percent and 81 percent of current trends by 2020 and 2035.[75]

Construction costs rise

Rising construction costs have increased budgetary pressures in the face of declining transportation revenues. It currently costs state departments of transportation approximately 50 percent more to undergo the same amount of construction, relative to costs incurred in 2001.[76] This is primarily due to a substantial rise in the price of asphalt pavement, which is largely tied to the price of crude oil, and a moderate increase in the price of concrete. Since 2008, asphalt



Source: NCDOT. "Annual Highway Composite Construction Costs"

[69] "NCDOT From Policy to Projects 2040 Plan: Financial Plan and Investment Strategies," 2012, *NC Department of Transportation,* http://www.ncdot.gov/download/performance/2040_FinanceReport.pdf

[70] Atkinson et. al, 2009, "Paying Our Way", *National Surface Transportation Infrastructure Financing Commission,* http://financecommission.dot.gov/Documents/NSTIF_Commission_Final_Report_Advance%20Copy_Feb09.pdf

[71] Shinkle, et. al, July 2012, "On the Move: State Strategies for 21st Century Transportation Solutions," *National Conference of State Legislatures,* http://www.ncsl.org/documents/transportation/on-the-move.pdf

[72] 2013 "Historical Information: NC Motor Fuels Tax."

[73] Ibid.

[74] Atkinson et. al, 2009, "Paying Our Way", *National Surface Transportation Infrastructure Financing Commission,* http://financecommission.dot.gov/Documents/NSTIF_Commission_Final_Report_Advance%20Copy_Feb09.pdf

[75] "NCDOT From Policy to Projects 2040 Plan: Financial Plan and Investment Strategies," 2012, *NC Department of Transportation,* http://www.ncdot.gov/download/performance/2040_FinanceReport.pdf

[76] Tom Nicholson, March 26 2012, "Higher Oil Prices Push Asphalt Up 11.2% from a Year Ago," *Engineering News Record,* *http://enr.construction.com/economics/quarterly_cost_reports/2012/0326-65279higher-oil-prices-hit-asphalt.asp*

prices have increased nearly 37 percent, while concrete prices have increased around 4 percent.[77]

NCDOT's Highway Construction Cost Index offers an illustrative example of how construction costs have affected the state (see chart on previous page). From 2001 to 2008, North Carolina's Highway Construction Cost Index has increased by 13 percent each year and from 2009 to 2012, costs have increased 11 percent each year. These increases have effectively shrunk NCDOT's budget.

[77] "The New Paving Realities – The Impact of Asphalt Cost Escalator Clauses on State Finances," February 27 2012, *Portland Cement Association,* http://www.cement.org/econ/pdf/escalator_report_2-27-12.pdf

Section 2 - Do we need a paradigm shift?

For almost 100 years in North Carolina, damages imposed on the road by vehicle owners were generally recuperated by the motor fuels tax.[78] However, within the last decade the link between the motor fuels tax and road use has been broken. The result has been system-wide distortions. Drivers are paying less and driving more than the system can handle. For example, drivers are paying relatively less in gas taxes, today, than they did 20 years ago;[79] meanwhile, congestion levels are climbing rapidly. In 1982, congestion cost the nation $24 billion (in 2011 dollars) and in 2011, congestion cost the nation $121 billion.[80] This cost is expected to grow to $199 billion by 2020.[81] Because drivers are paying drastically less for their road system, critical funding has dried up for system maintenance and expansion – which helps alleviate congestion.

The recession of 2007 and the political stalemate in Washington have exacerbated revenue losses. Today, there is almost a zero tolerance for raising critical revenues to pay for vital infrastructure needs.[82] A symptom of this is the Highway Trust Fund's likelihood to become insolvent by 2015.[83] States, which are already shouldering an increasing burden, will be required to manage enormous infrastructure funding burdens in just two years. North Carolina, for example receives 27.2 percent, or about $1.2 billion from the federal government each year.[84] In 2015, it is unclear as to how much funding North Carolina may receive from the federal government, but large cuts are likely.

In North Carolina, the biggest transportation system impacts that are being felt come from heavy vehicle damage on the roadway, the loss of purchasing power of the motor fuels tax exacerbated by increase construction costs, and fuel economy improvements. Combined, these factors have heavily contributed to North Carolina's transportation funding shortfall of $86.3 billion to $148.2 billion by 2040.[85] These factors are likely to intensify in the near term as vehicles continue to become more efficient due to higher fuel economy standards, commercial haulers continue to impose more roadway damage to fulfill an increasing number of just-in-time shipments, and motor fuels tax revenues continue to stagnate as tax increases remain politically unpopular.

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[78] James Harrington, 1989, "Planks, pavement & progress: A review and analysis of North Carolina's highway system," *NCDOT.*

[79] Atkinson et. al, 2009, "Paying Our Way", *National Surface Transportation Infrastructure Financing Commission,* http://financecommission.dot.gov/Documents/NSTIF_Commission_Final_Report_Advance%20Copy_Feb09.pdf

[80] "Urban Mobility Report," 2012, *Texas Transportation Institute,* http://mobility.tamu.edu/ums/

[81] Ibid

[82] "Insolvency Threatens Highway Trust Fund," 2013, *The Concord Coalition* http://www.concordcoalition.org/publications/budget-reports/updates/2013/0730/insolvency-threatens-highway-trust-fund

[83] Sarah Puro, April 24 2013, "Statement for the Record: Status of the Highway Trust Fund," *Congressional Budget Office*, http://www.cbo.gov/sites/default/files/cbofiles/attachments/44093-HighwayTrustFund.pdf

[84] "NCDOT Sources of Funds 2013-14 by Major Funding Source," 2013, *NCDOT,* http://www.ncdot.gov/download/about/finance/2014SourcesofFundspiechart.pdf

[85] "NCDOT From Policy to Projects 2040 Plan: Financial Plan and Investment Strategies," 2012, *NC Department of Transportation,* http://www.ncdot.gov/download/performance/2040_FinanceReport.pdf

"The reasoning behind transportation utility fees holds that the transportation system functions as a public utility comparable to municipal water and sewer systems. Those utilities are funded by charging users based on how much they use the systems, and transportation funding can be approached in a similar way."

– Jason R. Junge, Minnesota Department of Transportation and David Levinson, University of Minnesota

A complete paradigm shift is crucial for North Carolina's transportation system, as well as the state's economy, to endure. A substantial body of literature has been devoted to transportation revenue generation, with a large share of this literature focusing on how to fundamentally transform the way revenue is generated. This section pulls from that literature and discusses how a fundamental shift in the way we think about transportation funding could allow our transportation system to survive today's unprecedented funding shortfalls.

A study conducted by Texas Transportation Institute in 2008 provides a good example of how to start rethinking "how we pay" for transportation. The study focused on key issues surrounding the development of an entirely new funding paradigm for three communities in Northeast Texas. As part of the study, a Community Advisory Committee (CAC) (a group of 16 members who represented a broad range of the three communities) was educated on the transportation funding crisis in Texas. The CAC was presented with six new frameworks that could potentially be used to pay for the transportation network:

Amusement Parks – If paying for transportation were like paying to visit an amusement park, then one would have the option of paying per visit (or per trip) or could elect to purchase a season pass and visit as they please (or travel as they please).

Hunting and Fishing Licenses – If paying for transportation were like purchasing hunting and fishing licenses, the traveler would purchase a customized permit that would allow them to travel for one year, or "season." The permit price might vary depending on when one drives, where one drives and type of vehicle. "Stamps" could be purchased to allow for limited uses outside of the permit restrictions.

Postal Service – If paying for transportation were like paying for postage, then one flat rate would allow the traveler to go anywhere, anytime.

Cellular Phone Service – If one elected to pay for transportation like a cellular phone service, then travelers might have two options. The first would be to purchase a travel plan with a certain fee set for certain amount of miles to be traveled. Traveling outside of the allotted miles or outside of the contracted zones would cause the user to incur additional fees. The second option might be to simply pay on a trip-by-trip basis. The fee per trip might be higher, but the system would allow travelers to tailor their use and not pay for trips they do not intend to make.

Internet Service – Under an internet service type payment plan, travelers might pay one monthly fee for unlimited use of roadways.

***Utility Services* – Paying for transportation in a manner similar to utilities would mean that the traveler would only pay for what they actually**

travel. Utility payment plans are the most similar to mileage-based fee system.

A utility services framework offers concrete rationale for system users and conforms to transportation objectives in the long-term. Similar to municipal water and sewer system users, transportation system users can easily grasp that they should pay for what they use – no more, no less. This idea is not new – users have paid their respective share for decades, before the motor fuels tax became delinked with system use.

A utility framework has the potential for more efficient road usage. The idea of paying a fee for every mile traveled is traditionally referred to as 'marginal pricing' in economic terms. Because drivers have better information about the cost of each mile of driving, they are more likely to drive at a level that promotes the best use of the road. People will drive the amount they are willing to pay for, but no more. In economic terms, this is what is known as 'maximum efficiency.' Instead of substituting fuel efficient cars with long commutes, users will bear some of the costs associated with having many drivers on the same stretch of road.

A transportation utility fee system paradigm sends clear price signals to drivers. Because transportation users will understand that each mile of road costs money to use and maintain, they will make choices that promote the most efficient use of transportation—for all modes. Following implementation of a user fee system in Norway, users found that they experienced a reduction in bottlenecks, a reduction in overall traffic, an increase in transit ridership, reduced noise, better air quality, and safer streets.[86]

A transportation utility fee paradigm also naturally lends itself to mileage-based user fees (MBUFs). (MBUFs will be discussed in-depth in section 3 of the report.) The Congressional Budget Office (2011)[87] recently released a study that evaluated the most efficient way to receive funds—from the standpoint of the suppliers providing the infrastructure. In that study, they found that MBUFs were better at paying for pavement damage, congestion, accidents, noise, and even local vehicle emissions. The study also found that most costs of highway use are related to miles driven, which further supports the logic of charging drivers by the mile.

Many drivers are already prepared to pay for their use of the road—particularly if it meant that the road would be less congested. In Houston, a study revealed that drivers were willing to pay $22/hour for travel time savings.[88] Another study reported that drivers in Minnesota were willing to pay an average of $78/hour in the morning, and $116/hour in the afternoon—and these users were experiencing very modest time savings.

In some instances, though, people do not seem to make decisions that keep their best interests in mind. For instance, a 2013 HNTB survey, as shown on the following page, illustrates that the average person is more willing to pay for a bundled cable television package than they are willing to pay in motor fuels taxes. Yet, motor fuel taxes fund the transportation network - the lifeline of our economy.

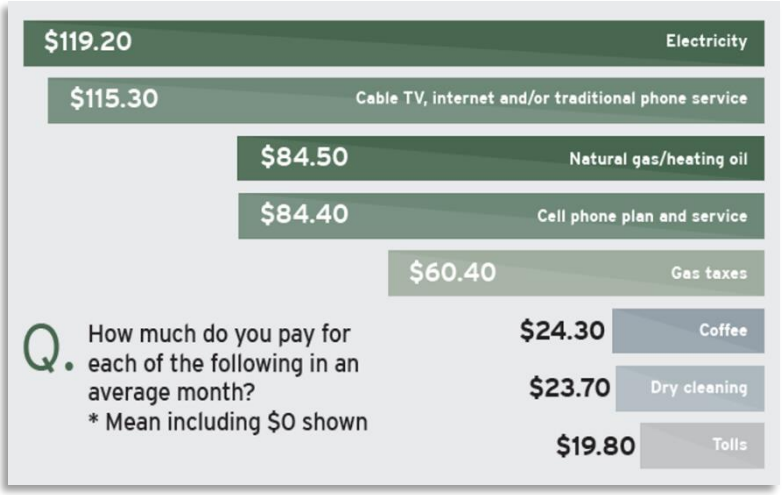
One of the best examples of misunderstood "willingness to purchase" phenomena is present in bottled water consumption. In 2012, the average American consumed 30.8 gallons of

[86] Astrid Fortun and Erik Furuseth, 2007, "Road Tolling in Norway: A brief introduction," http://www.hhh.umn.edu/centers/slp/transportation/congestion_pricing/pdf/Norway_Cordon_Charging_Jan07.pdf

[87] Beider et. al, 2011, "*Alternative Approaches to Funding Highways*," *CBO,* http://www.cbo.gov/publication/22059

[88] Burris et. al, 2012, "Willingness to Pay of HOT Lanes – Empirical Analysis from I-15 and I-394," *Transportation Research Board,* https://ceprofs.civil.tamu.edu/mburris/Papers/VOT%20on%20I-394%20and%20I-15%20-%20TRB%202012.pdf

bottled water.[89] This equates to Americans spending around $43 for a product that would normally cost them around 30 cents.[90] And it's not as if bottled water were a better product. According to Food and Water Watch, tap water is subject to more stringent regulation and is often safer than bottled water.[91] While this is not a one for one comparison between the use of bottled water and the use of transportation facilitates it does blatantly reveal the importance of helping users make the critical connections between the access to transportation services and facilities and their quality of life. Though bottled water consumption does not directly relate to transportation infrastructure crisis, it does shed light on human behavior. It is important to understand these types of behaviors in order to facilitate an efficient, effective paradigm shift.



Source: Think. "America THINKS 2013 Tolling Survey."

A change in the transportation funding paradigm can be expected to come with challenges; however, significant groundwork has already been laid to ease the transition to a utility fee framework. Eighteen cities in Oregon, one in Florida, and one in Texas have already implemented a utility fee framework.[92] These cities demonstrate that a utility framework can be realized and help build a case to make such a framework acceptable in North Carolina. A political boon of this type of framework is that it relies on a fee structure instead of a tax structure.[93] As Junge and Levinson (2012) point out, "the visible connection between the fee and its purpose can also make it more acceptable to the public and easier to levy than a new tax. [94]"

The difference between fees and taxes helps to underscore the rationale behind a transportation utility framework—and explains why mileage-based user fees (MBUFs) would be attractive even if states were not facing declining tax revenues and increasing construction costs. MBUFs address issues of fairness in a way that the gas tax does not. The state of Oregon

[89] "Bottled Water Market," 2013, *BottledWater.Org*, http://www.bottledwater.org/economics/bottled-water-market

[90] "The Story of Drinking Water," 2013, *American Water Works Association*, http://www.fcwa.org/story_of_water/html/costs.htm

[91] "Bottled Water: Illusions of Purity", 2013, *Food & Water Watch*, http://www.foodandwaterwatch.org/water/bottled/bottled-water-illusions-of-purity/

[92] Junge et. al, 2012, "Prospects for transportation utility fees," *Journal of Transport and Land Use*, https://www.jtlu.org/index.php/jtlu/article/view/141/209

[93] An important distinction between a fee structure and a tax is that, with a fee, the relationship between the user's costs and benefits has been established**.** The Supreme Judicial Court of Massachusetts created three standards that distinguish fees from taxes: (1) they must be assessed in exchange for a particular benefit, (2) they are avoidable by not using the service, and (3) they exist to compensate the government for the costs of providing the service. Additional standards at the state and federal level (including the 'rational nexus test') have further expanded upon the responsibility to provide a reasonable service directly to those bearing the cost. This rationale is found in: Prospects for transportation utility fees.

[94] Junge et. al, 2012, "Prospects for transportation utility fees," *Journal of Transport and Land Use*, https://www.jtlu.org/index.php/jtlu/article/view/141/209

developed a mileage-based user fee program because of the high number of fuel-efficient and alternative-fuel vehicles in that state—not because of declining revenues. Today, Oregon has the most highly-advanced MBUF program, and vehicles that were paying almost nothing to drive on roads will now pay to support the infrastructure they use.[95]

In order for North Carolina's transportation system to survive it requires a shift from a pay-by-the gallon to a pay-by-the-mile paradigm. Such a shift, consistent to a utility fee framework, will enable users to better pay for pavement damage, congestion, accidents, noise, and local vehicle emissions. As this section focused on the importance of a transportation paradigm shift, the following section will discuss revenue enhancement mechanisms that coexist with that paradigm shift. Comprehensive mileage-based user fees, as well as other revenue enhancement mechanisms will be explored.

[95] Tara Snyder, September 24, 2013, "Ten Questions (and Answers) About Oregon's New VMT Charge," *DCStreetsBlog,* http://dc.streetsblog.org/2013/09/24/ten-questions-and-answers-about-oregons-new-vmt-charge/?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+streetsblog%2Fehob+%28Streetsblog+Capitol+Hill%29

Section 3 – What are our best options?

North Carolina's transportation revenues are increasingly falling short of the state's transportation needs. One way to address this issue is by finding new revenue sources that are capable of paying for these needs. There is an enormous body of literature that aims to confront exactly this issue – providing revenue enhancement mechanisms and case studies at the local, state, national, and international level. This section pulls from that body of literature and does the following:

- Briefly discusses existing revenue sources implemented or being considered by other states.
- Provides a summary of previous North Carolina revenue enhancement recommendations.
- Identifies and discusses four categories of long-term funding approaches based upon revenue yield, long-term funding security, implementation potential and geographic equity.

What are other states doing?

Within the last two years 38 states have considered or attempted 121 different revenue enhancement mechanisms (calculation does not include public-private partnerships or bonding).[96] State level efforts have led to the successful adoption or reinstatement of a combined 30 revenue enhancement mechanisms (calculation does not include public-private partnerships or bonding). The revenue enhancement mechanisms that have been most commonly considered are:

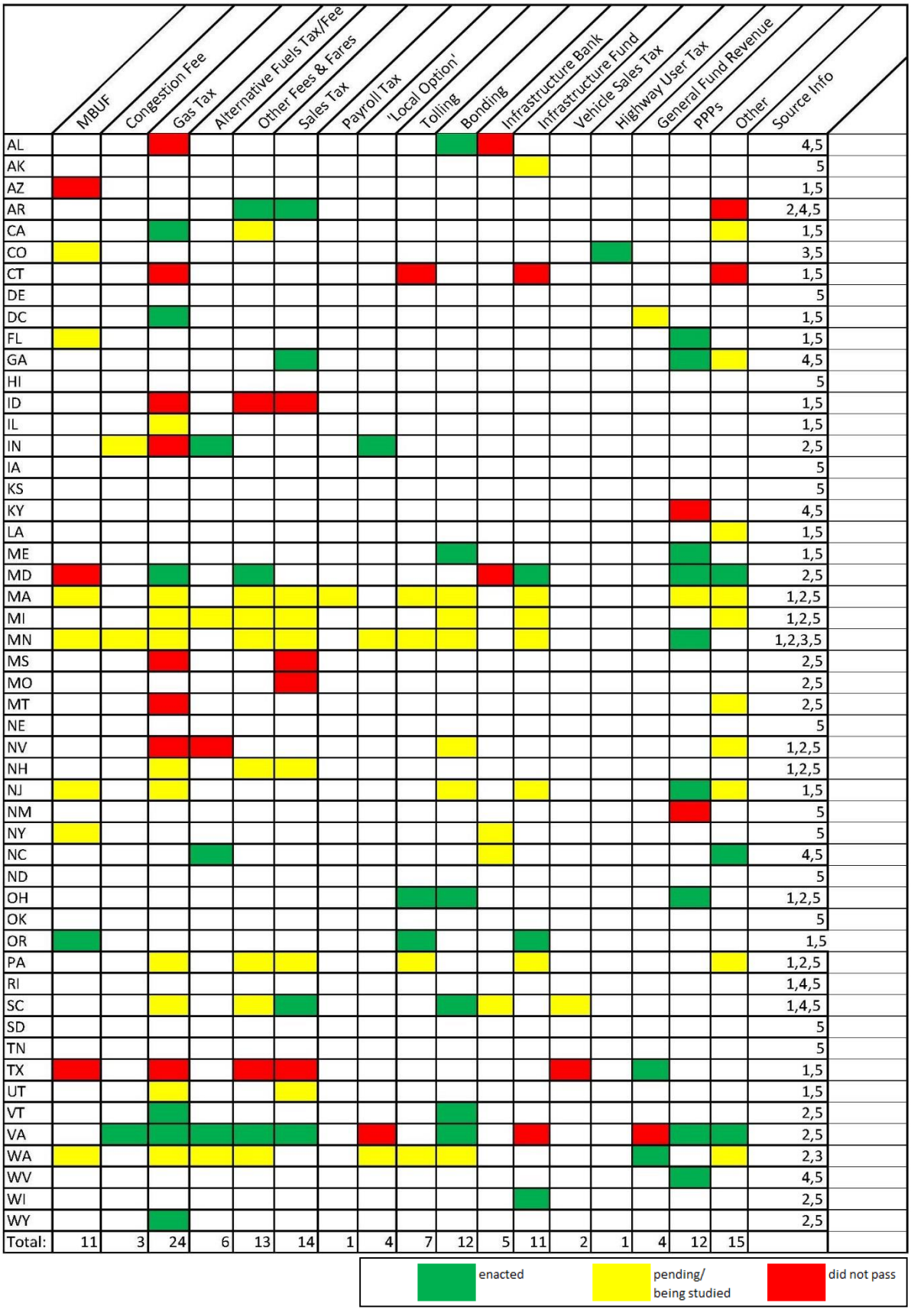
- Gas tax increases or indexing (24 states)
- Sales tax (14 states)
- Other fees and fares (13 states)
- Mileage-Based User Fees (11 states)
- Tolling (7 states)

For a more complete listing of the enhancement mechanisms that have been strongly considered see the table on the following page. The table shows revenue and financing options that have been considered in each state from January, 2012 to October 2013. Though financing options are not discussed in the report, they are included in the table for reference. The revenue and financing options included in the table were pulled from the following five sources:

1) AASHTO State Funding Proposals (2013)
2) Tracking State Transportation Plans (2013)
3) Mileage-based User Fees For Transportation Funding: A Primer For State Transportation Programs (2012)
4) 2013 Comparative Data Report on State Transportation Programs (2013)
5) NCSL Transportation Funding and Finance Legislation Database (2013)

[96] Data was collected from a combination of the following five sources: AASHTO State Funding Proposals (2013), Tracking State Transportation Funding Proposals (2013), Mileage-Based User Fees For Transportation Funding – A Primer for State and Local Decision Makers (2012), 2013 Comparative Data Report on State Transportation Programs (2013), and NCSL Transportation Funding and Finance Legislation Database (01 October 2013). Bonding and Public Private Partnerships were included in the table, but because they are instruments for financing, not revenue generation, they are not considered revenue enhancement mechanisms.

Revenue and Financing Options by State



Previous Options Considered by NCDOT

North Carolina's Department of Transportation (NCDOT) 2040 Plan and the 21st Century Committee Report provides specific recommendations about revenue enhancement options that can be adopted in the short, medium, and long-term to address the **$86.3 billion to $148.2 billion transportation funding gap** that North Carolina is facing come 2040.[97] These options are consistent with what other states have been considering, proposing and enacting.

NCDOT details 10 revenue enhancement mechanisms in its 2040 Plan.[98] These revenue enhancement mechanisms and their proposed revenue generation (in 2011 dollars) by 2040 are included below.

- **Continue Gas Tax Indexing without cap:** $18.9 billion
- **Redirect Short Term Vehicle Lease Fee to NCDOT:** $0.6 billion; if redirected starting 2016
- **Increase Registration and Licensing Fees with inflation:** $6.1 billion; starting 2016
- **Eliminate Transfers from the Highway Fund:** $4.3 billion; if redirected starting 2016
- **Additional 1% Highway Use Tax**: $3.3 billion; starting 2016.
- **Auto Insurance Surcharge:** 10% charge would yield $12.2 billion; starting 2020
- **Local Vehicle Property Tax**: 5% increase would yield $500 million; starting 2016
- **Wholesale Motor Fuel Tax**: 8% tax would yield $12.2 billion; starting 2020
- **Interstate Highway Tolling**: $41.9 billion; starting 2020
- **Mileage-Based User Fee**: 2 cent/mile fee would yield $26.6 billion; starting in 2020

The 21st Century Transportation Committee was established by the President Pro Tempore of the Senate and the Speaker of the House of Representatives to study ways to improve the transportation system in order to promote economic growth and ensure that the state could compete and participate in the global economy. [99] The committee provided state-specific revenue enhancement proposals to achieve those purposes. Similar to the 2040 Plan, the report recommended indexing fees to inflation, expanding tolling, implementing a mileage-based user fee system, eliminating budget transfers, and increasing the highway use tax. The following options were also discussed by the committee:

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[97] "NCDOT From Policy to Projects 2040 Plan: Financial Plan and Investment Strategies," 2012, *NC Department of Transportation,* http://www.ncdot.gov/download/performance/2040_FinanceReport.pdf

[98] "NCDOT From Policy to Projects 2040 Plan: Financial Plan and Investment Strategies," 2012, *NC Department of Transportation,* http://www.ncdot.gov/download/performance/2040_FinanceReport.pdf

[99] Brad Wilson, 2007, "21st Century Transportation Committee Final Report," *21st Century Committee,* http://www.wral.com/asset/traffic/2008/12/10/4111058/20081210172911021.pdf

- **Vehicle Registration Fees**: Increase from $28 to $30 = $195 million annually. Increase other staggered registration fees by 25% = $50 million annually.

- **Vehicle Registration Fees based on weight**: passenger weight fees and revenue yields below:

Vehicle Weight	Option 1	Option 2	Option 3
< 2,499lbs	$27.60	$33	$37
2500-3499	$35.60	$43	$47
3500 and up	$45.60	$55	$60
Revenues	$70 Mill	$121 Mill	$150 Mill

- **Local Option Sales:** authorize a local option sales tax of up to 1% for transportation

- **Differential Fuel Tax Rates**: adopt differential fuel tax rates for diesel and gasoline.

- **Enhance mobility and reduce congestion**: accelerate investment of all planned urban loops

- **Expand use of tolling and congestion pricing**: include HOT lane projects and any newly authorized tolling projects.

All of the options presented by other states, NCDOT and the 21st Century Transportation Committee offer the potential to generate revenue for the state. However, several of these options provide low- to medium-yield returns which would not solve the sizeable funding crisis faced by NCDOT. Nevertheless, many of these funding options and strategies could be utilized in the short (intermediate) term to manage the funding crisis while long-term funding strategies undergo additional policy evaluation for future implementation. This report is not focused on quick, temporary fixes; therefore, low- to medium-yield options are not studied at length as they do little to solve the root issues of funding North Carolina's transportation system in the long-term.

This report focuses on the high-yield revenue enhancement mechanisms that enable North Carolina to meet a variety of policy objectives over the long-haul. These mechanisms can achieve a variety of goals including congestion reduction, accurately capture maintenance costs, preserve or augment road use revenue, and accurately apportion road use revenue.[100]

In order to identify long term funding solutions, the following five criteria were used to evaluate the literature review resources (see bibliography) to identify four long-term, viable funding approaches (Mileage-Based User Fees (MBUF), Targeted Congestion Pricing, General

[100] Sorenson et. al, 2009, "Implementation Strategies for Shifting to Direct Usage-Based Charges for Transportation Funding," NCFRP, http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_w143.pdf

Pricing (Tolling) and Liability Insurance) for North Carolina:

- **Revenue yield** – assesses the quantity of revenue generated by a mechanism.
- **Long-term funding security** – assesses the reliability of a revenue enhancement mechanism determining whether incoming revenues are stable and secure over the plan period and over the long-term.
- **Implementation potential** – assesses the likelihood of implementing a revenue enhancement mechanism based on implementation costs, public acceptance, and political will.
- **Geographic equity** – assesses the degree to which a revenue enhancement mechanism impacts a rural or urban area.
- **User-pays principle** – assesses the degree to which a revenue enhancement mechanism upholds the user-pays principle, in which a system user pays directly for system use.

Revenue Enhancement Definitions

This section of the report will evaluate revenue enhancement mechanisms that currently exist and are well documented in the literature. These mechanisms fall under four broad categories: comprehensive mileage-based user fees, targeted congestion pricing, general pricing, and a liability insurance fee. For the purposes of this literature review:

- **Comprehensive mileage-based user fees** are defined as fees that are assessed to road-users based on the amount of miles they have traveled. These fees are assessed on a cents per mile basis. They are considered comprehensive because fees can be charged to road users on every road in the state of North Carolina.

- **Targeted congestion pricing** is defined as a pricing scheme in which a fee is assessed to road users in a specific or targeted area of North Carolina's road network, with the ultimate purpose of reducing congestion. There are subcategories of targeted congestion pricing, including cordon pricing and managed lanes. Cordon pricing is a form of congestion pricing where a road user is charged a fee for entering a congested area or cordon (usually found in urban areas). Managed lanes are a form of congestion pricing in which specific lanes on a road network (that are typically prone to high levels of congestion) are assessed a fee for access. High-Occupancy Toll (HOT) lanes and express lanes are two common types of managed lanes.

- **General pricing** is defined as a pricing scheme in which a fee is assessed to road users with ultimate purpose of generating revenue. It is similar to targeted congestion pricing; however, fees are not assessed with the intention of regulating congestion, but instead simply to generate revenue to support transportation operations and maintenance costs.

- **A liability insurance fee** is defined as a surcharge that is added to the existing liability insurance rate.

Comprehensive Mileage-Based User Fees

Since 1980, vehicle miles traveled has doubled, while fuel consumption has increased by only 50 percent.[101] Gains in vehicle fuel economies and road user shifts to alternative fuel vehicles are resulting in losses of motor fuels tax receipts. As the motor fuels tax loses its efficacy, mileage-based user fees (MBUFs) gain their allure.

An MBUF is a per-mile charge that drivers pay to maintain and build roads. Drivers pay by the mile, instead of by the gallon. An MBUF can be modified to charge drivers based on vehicle weights in order to more accurately assess road damage. There are limited applications in the United States, and many abroad, where trucks are assessed mileage-based user fees based on their weight and miles driven.

Depending on the policy goals of NCDOT, an MBUF could be used to meet a range of objectives including: reducing congestion, preserving or augmenting road use revenue, accurately apportioning road use revenue, and accurately capturing maintenance costs.[102]

There is a growing consensus among transportation experts and economists that a mileage-based user fee system should be viewed as the leading alternative to fuel taxes as a source to fund highways.[103]

This section will begin with a discussion about mileage-based user fees for passenger vehicles. It will then transition into a discussion about MBUFs for trucks.

Passenger Vehicles

New Zealand, the Netherlands, and nine locations in the United States (Arizona, Colorado, Florida, Minnesota, New York City, Oregon, Texas, Washington, and Wisconsin) have investigated MBUFs as a funding strategy. This has included trials, focus groups, and surveys—all geared toward developing a system for implementing a state-wide (or, in some cases, regional) system that could be used to either replace or supplement the motor fuels tax. All of the systems under consideration have two features in common:

1. **A method of reporting the number of miles traveled**. Options include odometer readings, estimates based on fuel consumption, a simple on-board unit (capable of calculating number of miles traveled), an on-board-unit with cellular location (capable of determining location, jurisdiction, and time of day—this option includes GPS), a smartphone application,[104] and radio-frequency identification (RFID) tolling on a road network.[105]

2. **A method for collecting the revenue.** States are currently investigating their role in data collection and charging; many users prefer to have a private company administer mileage data

[101] Sorenson et. al, 2009, "Implementation Strategies for Shifting to Direct Usage-Based Charges for Transportation Funding," NCFRP, http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_w143.pdf

[102] Ibid

[103] James Whitty, 2007, "Oregon's Mileage Fee Concept and Road User Fee Pilot Program: Final Report," *Oregon Department of* Transportation, http://www.oregon.gov/ODOT/HWY/RUFPP/docs/rufpp_finalreport.pdf

[104] Sorenson et. al, 2012, "Mileage-Based User Fees For Transportation Funding – A Primer for State and Local Decision Makers," *RAND,* http://www.rand.org/content/dam/rand/pubs/tools/TL100/TL104/RAND_TL104.pdf

[105] Sorenson et. al, 2010, "System Trials to Demonstrate Mileage-Based Road Use Charges," *National Cooperative Highway Research Program,* http://www.rand.org/content/dam/rand/pubs/reprints/2011/RAND_RP1423.pdf

and billing. Systems for payment include paying at the pump, paying during registration, wireless transmission to a billing authority, and using prepaid debit cards.

Depending on the technology used, some states will also investigate considering evasion prevention measures (including odometer inspections and fuel consumption redundancy checks) and additional privacy protections (including encryption, on-board data aggregation and fee computation, and prepaid debit cards).[106]

A National Cooperative Highway Research Program report (2009) identified nine ways in which MBUFs could be implemented, based on five criteria.[107] The nine implementation types and criteria are below. The three bolded implementation types were those that the NCHRP report (2009) considered to be most promising.

Implementation Types:

- Self-reported odometer readings
- Annual odometer inspections
- Assumed annual mileage with optional odometer inspections
- **Fuel consumption-based mileage estimates**
- OBD II-based mileage metering
- **OBD II / cellular-based mileage metering**
- **Coarse-resolution GPS-based mileage metering**
- High-resolution GS-based mileage metering
- RFID-based tolling on a partial road network

Implementation Criteria:

- Full road network metering
- Cost vs. metering capabilities
- Enforceability
- Minimal required state support
- Minimal burden on users

[106] Sorenson et. al, 2010, "System Trials to Demonstrate Mileage-Based Road Use Charges," *National Cooperative Highway Research Program,* http://www.rand.org/content/dam/rand/pubs/reprints/2011/RAND_RP1423.pdf

[107] Sorenson et. al, 2009 "Implementation Strategies for Shifting to Direct Usage-Based Charges for Transportation Funding." *National Cooperative Highway Research Program*, http://www.rand.org/content/dam/rand/pubs/reprints/2009/RAND_RP1395.pdf

Explanations of the three options that showed the greatest promise for implementation, as well as their advantages and limitations are pulled directly from the report and provided below:

NCHRP 143 Report: Three Most Promising MBUF Options with Advantages and Limitations

Fuel consumption-based mileage estimates. Under this approach, fuel consumption would serve as the basis for estimating travel distance. All vehicles would be equipped with some form of automated vehicle identifier, or AVI, device (likely a radio-frequency identification, or RFID, tag embedded in the license plate or registration sticker). When a vehicle visits a gas station to purchase fuel, electronic readers installed at the pump would detect the vehicle ID and use this information to determine the vehicle's fuel-economy rating (and, optionally, other characteristics such as weight or emissions class) based on the make and model. The expected mileage could then be estimated based on the number of gallons purchased. The corresponding charge could then be added to the fuel purchase price, while fuel taxes (already paid at the wholesale level and therefore built into the retail price) would be subtracted. Vehicles not yet equipped with an AVI device (including foreign vehicles) would continue to pay the existing fuel taxes rather than mileage charges. The administration for this option would involve a significant expansion of the existing fuel tax system to include retail fuel stations along with wholesalers. Specifically, it would be necessary to account for the difference between fuel taxes (paid at the wholesale level) and mileage fees (collected at the retail level) and interact with fuel retailers to either collect or refund the difference.

Though offering limited metering flexibility, this option would likely prove the least expensive to develop and operate, given the low cost of RFID technology and the ability to expand the existing fuel tax system to encompass fuel retailers rather than developing an entirely new revenue system. It would also provide a fallback revenue system – existing fuel taxes – to charge vehicles lacking the required AVI device for road use. Finally, the pay-at-the-pump model could still be used to collect fees for most vehicles if a transition to more sophisticated metering equipment were pursued over the longer term.

OBD II / cellular-based metering. For this approach, vehicles would be equipped with an on-board unit (OBU) that serves as the mileage metering device. The OBU would be connected to the on-board diagnostics port (second generation, or OBD II, available on vehicles manufactured since 1996), which provides data on vehicle speed that can be integrated over time to compute travel distance. The per-mile fee could be modified, if desired, by vehicle characteristics such as weight, fuel economy, or emissions class. Fees could be collected through the pay-at-the-pump model described above, or the OBU could transmit (via cellular) mileage data to a central collections agency that would subsequently bill for mileage fees.

While the technology remains to be demonstrated in the context of road pricing, this option could provide significant metering flexibility at lower cost than the GPS option.

(Continued on the following page)

Three Most Promising MBUF Options with Advantages and Limitations (continued)

Coarse-resolution GPS-based metering. From the perspective of metering capabilities, this option, employed in the Oregon trials, is identical to the previous approach. The only difference is that the OBU would rely on a coarse-resolution GPS receiver, rather than cellular-based location, to identify the jurisdiction or area of travel (the term "coarse-resolution" implies that the device could determine the general location of travel, but not the specific route). GPS could also be used to measure travel distance – by interpolating between subsequent location points – or the OBU could include a connection to the OBD II port for this purpose. This configuration would also enable similar payment mechanisms, including the pay-at-the-pump model, cellular transmission of mileage data to a central billing agency, and pre-paid debit cards inserted into the OBU.

This option also provides flexible metering options, and the technology has been demonstrated in real-world trials. If the price of the equipment can be reduced through large scale production, and if current privacy concerns associated with the use of GPS can be overcome, this would be a promising option.

Oregon currently has the most detailed information related to the expected cost of a statewide MBUF system, in the form of a proprietary economic model. Jim Whitty, Manager of ODOT's Innovative Partnerships and Alternative Funding Program, estimates that approximately 5 to 6 percent of the revenue collected with the new MBUF will be dedicated to paying administration costs. These costs are incurred as a result of the involvement of third-party private vendors.[108]

To date, no state has successfully implemented a state-wide MBUF system; though the subject has received considerable attention from state DOTs, AASHTO, Congress, USDOT, the Department of Treasury, and other stakeholders. In 2010, a National Cooperative Highway Research Program Project included interviews with many of these stakeholders to uncover the following overarching issues related to implementation of MBUF:[109]

- Implementation efforts are held back by the lack of a clear policy direction
- Federal leadership on MBUF is needed
- Trials should be structured to transition to implementation
- The federal government should invest in trials
- An MBUF system should be designed to address additional goals beyond revenue
- The main obstacle to implement an MBUF systems is public acceptance and cost
- A secondary obstacle is building public trust in the government
- New trials should be built on previous trials
- Authorizing legislation for trials should not be overly prescriptive

While there is no established procedure for implementing a state-wide MBUF system, establishing a trial requires considerable

[108] Jim Whitty, September 30, 2013, Conversation with Adrienne Heller.
[109] Sorenson et. al, 2010, "System Trials to Demonstrate Mileage-Based Road Use Charges," *National Cooperative Highway Research Program,* http://www.rand.org/content/dam/rand/pubs/reprints/2011/RAND_RP1423.pdf

investment in time. A number of issues must be decided (or, at a minimum, addressed) during a period of consensus building and policy-setting, a period Jim Whitty estimates can take no less than a year.[110] Prior to the trial a number of issues must be addressed, including the cost of enabling these technologies (which, explained above, are still only estimates), establishing the correct jurisdiction for collection, public acceptance, overcoming privacy issues, and establishing the framework for administration and billing.[111]

Privacy protection has emerged as a primary concern of MBUF system users over the course of different MBUF studies and trials. System users require that their personal information is well guarded. Privacy concerns have implications for both the technology used and the administration of the billing. For lawmakers, it is critical that the process be transparent, demonstrate a commitment to privacy, and be messaged well.

During Minnesota's policy period, the state invited the American Civil Liberties Union to participate on its mileage fee task force.[112] Both Oregon and Minnesota included members of the legislative body on the task force as well; this helped to build institutional knowledge and helped later with the messaging process.[113]

Trials have been an important part of the messaging process, both for individual users and for building knowledge within the legislative bodies. In Oregon and Minnesota, MBUF trials have included elected officials. This provided the legislators with intimate knowledge of the MBUF system, and allowed the officials to bring experience to bear on the decision-making process.[114] Jim Whitty, in conversation on the subject, explained that it was important that the legislative body "learn to respect the topic and respect the people involved."[115] Individual users also respond favorably to trials. A recent national evaluation of mileage-based user fees found that, prior to the study, more than 60 percent of the participants expressed a negative or neutral view of MBUFs. Following the study, 70 percent of the participants expressed a favorable view.[116]

The choice of technology may also help overcome certain objections, but will raise others. For example, GPS systems may be used to provide mapping services to users, collect anonymous data that may provide for more efficient use of roadways, and overcome jurisdiction concerns. However, GPS is also associated with more significant privacy concerns, and also carries higher initial and ongoing costs.[117,118] Pay-at-the-pump and prepaid manual systems are less efficient and prone to evasion, but carry lower administrative

[110] Jim Whitty, September 30, 2013, Conversation with Adrienne Heller.
[111] Sorenson et. al, 2010, "System Trials to Demonstrate Mileage-Based Road Use Charges," *National Cooperative Highway Research Program,* http://www.rand.org/content/dam/rand/pubs/reprints/2011/RAND_RP1423.pdf
[112] Sorenson et. al, 2012, "Mileage-Based User Fees For Transportation Funding – A Primer for State and Local Decision Makers," *RAND,* http://www.rand.org/content/dam/rand/pubs/tools/TL100/TL104/RAND_TL104.pdf
[113] Sorenson et. al, 2012, "Mileage-Based User Fees For Transportation Funding – A Primer for State and Local Decision Makers," *RAND,* http://www.rand.org/content/dam/rand/pubs/tools/TL100/TL104/RAND_TL104.pdf
[114] Ibid.
[115] Jim Whitty, September 30, 2013, Conversation with Adrienne Heller.
[116] Paul Hanely and John Kuhl, 2011, "National Evaluation of Mileage-Based Charges for Drivers," *Transportation Research Board*, http://trb.metapress.com/content/llq5560865m71256/?genre=article&id=doi%3a10.3141%2f2221-02
[117] Sorenson et. al, 2012, "Mileage-Based User Fees For Transportation Funding – A Primer for State and Local Decision Makers," *RAND,* http://www.rand.org/content/dam/rand/pubs/tools/TL100/TL104/RAND_TL104.pdf
[118] Government Accountability Office, 2012, "Highway Trust Fund: Pilot Program Could Help Determine the Viability of Mileage Fees for Certain Vehicles," *GAO*, http://www.gao.gov/assets/660/650863.pdf

costs and come with fewer privacy concerns.[119] While using simpler systems may be preferable to users wary of privacy concerns, the more sophisticated systems do allow for more sophisticated revenue collection based on jurisdictions, mapping services, and travel data that may be useful to travel planners.[120] This reinforces the need for clear policy goals to guide the technology choices. For example, if an MBUF is being implemented to reduce congestion then the technology should include the capability to track location, route and time of travel.

Privacy concerns as mentioned earlier are considered a major impediment to implementing more sophisticated systems. A 2009 NCHRP report included on the following page discusses MBUF system users' main privacy concerns.[121]

NCHRP 143 Report: Privacy Concerns:

1) **Data may be shared for secondary purposes** (e.g. marketing). Many entities operating in the United States have the legal authority to share private data unless customers make an explicit request to keep their data confidential.

2) **Law enforcement may be able to make use of stored travel data** to support traffic enforcement activities, such as the detection of speed limit violations.

3) **Detailed travel data may be used against a driver in the case of litigation.** Toll road operators have reported, for instance, that customer records are often subpoenaed in marital disputes.

4) **It is possible that travel data may be linked with additional customer information** to develop much more detailed profiles of individuals and households.

5) **There is concern that data will not be stored in a secure manner** and thus subject to security breaches.

[119] Government Accountability Office, 2012, "Highway Trust Fund: Pilot Program Could Help Determine the Viability of Mileage Fees for Certain Vehicles," *GAO*, http://www.gao.gov/assets/660/650863.pdf

[120] Sorenson et. al, 2012, "Mileage-Based User Fees For Transportation Funding – A Primer for State and Local Decision Makers," *RAND,* http://www.rand.org/content/dam/rand/pubs/tools/TL100/TL104/RAND_TL104.pdf

[121] Sorenson et. al, 2009 "Implementation Strategies for Shifting to Direct Usage-Based Charges for Transportation Funding." *National Cooperative Highway Research Program*, http://www.rand.org/content/dam/rand/pubs/reprints/2009/RAND_RP1395.pdf

While not all citizens are especially concerned about these issues, a reasonably large minority of the population holds strong views regarding privacy.[122] Thus finding ways to uphold privacy without impairing system performance are crucial for MBUF success. Oregon seemed to walk this fine line, by gaining experience through its two trials. In Oregon's first trial, MBUF system administration was handled by the state. In the most recent trial, Oregon involved a private partner to conduct the data processing and maintain the account, with the state capable of serving as backup if necessary. Though this added cost to the program, it was philosophically preferable to many users.[123]

To date, the bulk of the research on mileage-based user fees has largely been driven by the state of Oregon. In 2001, the Oregon Legislative Assembly created the Road User Fee Task Force (RUFTF), which considered 28 different potential revenue sources. MBUFs were chosen from that list of sources for more investigation because they reduce the amount of subsidy required for transportation projects, and instead introduce a "fee for service" approach. Over the course of two pilot projects, the task force emphasized systems that would be affordable, enforceable, easy to use, and respectful of privacy.[124] The State Senate has authorized the Oregon Department of Transportation to charge 5,000 cars and light commercial vehicles to pay 1.5 cents per mile starting July 2015, in a permanent program called the Road Usage Charge Program (RUCP).[125] This will be the largest application of an MBUF system in the United States to date. RUCP, together with the two trials preceding it,

N.C. Vehicle Emission and Safety Inspection: MBUF System Trial

North Carolina currently requires all vehicles to pass an annual inspection before a license is renewed. This provides an efficacious opportunity for NCODT to pilot an MBUF program because the implementation infrastructure already exists. Based on the current number of registered vehicles in the state and average annual mileage rates per vehicle a 0.5 cent/mile fee could generate roughly $495 million in annual revenue. This would equate to a monthly fee of $6.25 for the average driver. This option could be combined with an option to lower the gas tax in the interim as an incentive to test the new program.

Advantages and Limitations

The main advantage of using the annual inspection process is to significantly reduce implementation costs. Other advantages include no additional in-vehicle equipment and this option does not raise privacy concerns. Limitations include the lack of pricing flexibility as this option does not allow for time or location of travel to be accounted as part of the implementation technology. Another concern is that out of state traveler would not have to pay this fee.

* Calculations were based on average annual miles per user that were cited to be 15,000 by NCDOT and the number of drivers insured in North Carolina cited to be 6.6 million by the Office of Highway Policy Information.

[122] Sorenson et. al, 2009 "Implementation Strategies for Shifting to Direct Usage-Based Charges for Transportation Funding." *National Cooperative Highway Research Program*, http://www.rand.org/content/dam/rand/pubs/reprints/2009/RAND_RP1395.pdf

[123] Jim Whitty, September 30, 2013, Conversation with Adrienne Heller.

[124] James Whitty, 2007, "Oregon's Mileage Fee Concept and Road User Fee Pilot Program: Final Report," *Oregon Department of* Transportation, http://www.oregon.gov/ODOT/HWY/RUFPP/docs/rufpp_finalreport.pdf

[125] Oregon Department of Transportation, August 2013, "Road Usage Charge Program (RUCP) Fact Sheet," *ODOT,* http://www.oregon.gov/ODOT/HWY/RUFPP/docs/RUCP_Facts_Aug2013.pdf

will likely play a significant role in the development of MBUFs in the future.

How well do MBUFs meet the five revenue enhancement criteria?

Mileage-based user fees were developed to shift road infrastructure funding away from a subsidy model to a direct fee model – allowing drivers to pay for infrastructure as it is used.[126] Because drivers would pay fees directly based on miles driven the **user-pays principle** would be more directly upheld than it currently is under a motor fuels tax paradigm.

Since 1980, vehicle miles traveled has doubled while fuel consumption has increased by only 50 percent.[127] Alternative fuel vehicles, and vehicles with higher fuel efficiencies, are challenging the long-term viability of the motor fuels tax. MBUFs on the other hand, would promote the **long-term funding security** of North Carolina's transportation system by ensuring that all drivers pay a fee equivalent to their use of the road network. Potential **revenue yield** could be very high with a mileage-based system. In 2020, if North Carolina were to implement a two cents per mile MBUF adjusted with inflation, it could generate $26.64 billion by 2040 or about 31 percent of its funding needs.[128]

Geographic equity under a mileage-based user fee paradigm is very similar to that under a motor fuels tax paradigm. However, rural drivers, who tend to own less fuel-efficient vehicles, can expect to pay slightly less in MBUFs than they would spend on motor fuels taxes.[129]

MBUF revenue enhancement criteria

- **User-pays principle:** more directly upheld than with a motor fuels tax
- **Long-term funding security:** ensures all drivers pay a fee equivalent to road usage
- **Revenue yield:** 2 cent/mile fee = $26.64 billion by 2040, or about 31 percent of its funding needs. [3]
- **Geographic equity:** slightly benefits rural drivers
- **Implementation potential:** depends on MBUF system type (basic vs. sophisticated)

It is very difficult to assess the **implementation potential** of mileage-based user fees. To date, no state has successfully implemented a statewide MBUF system. Thus, determining the implementation costs of such a system is difficult. Oregon has the most detailed information related to the expected cost of a statewide MBUF system in the form of a proprietary economic model.[130] Jim Whitty, Manager of ODOT's Innovative Partnerships and Alternative Funding Programs, estimates approximately 5 to 6 percent of the revenue collected will be dedicated to paying administration costs.[131] Public acceptance for such a system is also difficult to assess. If issues of privacy can be overcome, MBUFs can be

[126] James Whitty, 2007, "Oregon's Mileage Fee Concept and Road User Fee Pilot Program: Final Report," *Oregon Department of* Transportation, http://www.oregon.gov/ODOT/HWY/RUFPP/docs/rufpp_finalreport.pdf

[127] Sorenson, Paul et al., 2009, "Implementable Strategies for Shifting to Direct Usage-Based Charges for Transportation Funding," NCHRP, http://www.trb.org/Publications/Blurbs/162252.aspx

[128] NCDOT's 40 year plan

[129] Brian Weatherford, 2012, "Mileage-Based User Fees: Winners and Losers," *Rand Corporation*, http://www.rand.org/content/dam/rand/pubs/rgs_dissertations/2012/RAND_RGSD295.pdf

[130] Jim Whitty, September 30, 2013, Conversation with Adrienne Heller.

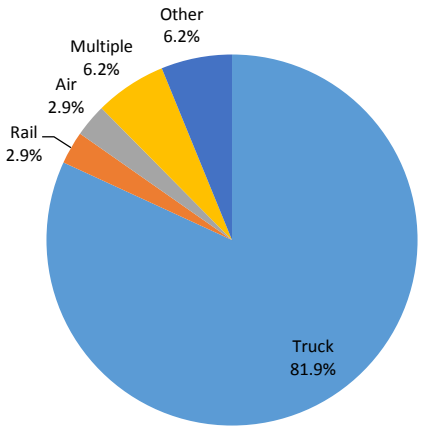
[131] Ibid.

indexed to inflation, and administration costs can be kept to an acceptable threshold, than such a system holds promise. Trial periods are also an essential step of the implementation process. A recent evaluation of MBUFs found that, prior to the trial, more than 60 percent of the participants expressed a negative view of MBUFs.[132] After the trial, though, 70 percent of participants expressed a favorable view.[133]

Commercial Vehicles

In the United States, not all road users pay equal damages. Where most passenger vehicles pay their full share of pavement damages, trucks pay as little as 50 cents for every dollar's worth of damage they impart on the roadway.[134] Furthermore, the pavement damage trucks cause is a function of weight per axle, so heavier trucks with fewer axles cause more damage than other trucks do.[135]

North Carolina is intimately acquainted with the pavement damage caused by trucks. Eighty-two percent of all products leaving North Carolina for domestic or international destinations are transported by truck (see pie chart to the right).[136] In 2006, an in-depth series of articles in the Raleigh News & Observer detailed the damage that heavy, overloaded trucks caused to the roads. The articles explained that trucks designed to bear a total weight of 80,000 pounds were often overloaded to 90,000 pounds.[137] This 10,000 pound increase in weight corresponded to a 42 percent increase in damage on North Carolina roads.[138] It was estimated that heavy trucks were costing the state an extra $78 million in damages per year, while pavement originally designed to last 20 years would wear out in seven. [139]



Source: Freight Analysis Framework Version 3.4, Center for Transportation Analysis

Within a mileage-based user fee framework, trucks would be charged based on the amount miles they drive and the amount of weight they carry to more equitably and accurately assess the damages imposed on the roadway. Such a system would address issues of fairness, as drivers would pay the true value of their respective pavement damages. On first thought, the added expense would seem to only harm truck drivers. However, a more efficiently-maintained road network actually supports the freight industry by providing revenue for better infrastructure, which could lead to decreased logistics and inventory costs. In fact, a study

[132] Paul Hanley and John Kuhl, 2011, "National Evaluation of Mileage-Based Charges for Drivers," *Transportation Research Board*, http://trb.metapress.com/content/llq5560865m71256/?genre=article&id=doi%3a10.3141%2f2221-02

[133] Ibid.

[134] "Addendum to the 1997 Federal Highway Cost Allocation Study," May 2000, Federal Highway Administration, http://www.fhwa.dot.gov/policy/hcas/addendum.htm

[135] Beider et. al, 2011, "Alternative Approaches to Funding Highways," CBO, http://www.cbo.gov/publication/22059

[136] "Freight Analysis Framework Version 3.4", 2013, *Center for Transportation Analysis*, http://www.ops.fhwa.dot.gov/freight/freight_analysis/faf/

[137] Zach Patton, July 2007, "Too Big for The Road," *Governing*, http://www.governing.com/topics/transportation-infrastructure/Too-Big-The-Road.html

[138] Ibid.

[139] Ibid.

conducted by Global Insights found that if freight in Minnesota could increase its average speed from 30 mph to 35 mph, the cost savings would be 7.32 cents per mile.[140] The Texas Transportation Institute's Urban Mobility report puts the total cost of congestion at $121 billion in 2012, with the freight bearing fully $27 billion dollars. This number only accounts for lost time and fuel costs, but does not include indirect costs including depreciation of goods.[141]

Currently, four states have experience with commercial vehicle MBUFs. In Oregon, a system commonly known as the weight-mile tax has been in place since 1947, and similar systems in Kentucky, New Mexico, and New York have more recently come into existence.[142] Truck drivers using these states' roadways are charged a weight-mile tax every month or quarter-year based on their combined vehicle/load weight and miles driven. Oregon's commercial MBUF system generates $300 million in transportation revenue each year.[143]

Although these systems generate a significant amount of revenue to pay for road damages, they are not as effective as they otherwise could be. Their primary flaw is that these systems rely on self-reporting. A Delcan Corporation study (2011) revealed that New York State loses $150 million annually as a result of truck drivers underreporting the mileage and weight of their vehicles.[144]

Additionally, an efficiency problem stems from assessing trucks every month or quarter. Charging for mileage fees over such a large chunk of time, creates a disconnect between the distance truckers have traveled and the fees associated with that travel. Charging on a per trip basis, on the other hand, provides truckers with a more concrete price signal, which allows them to more accurately internalize their vehicle miles traveled. Trip-by-trip charging creates a stronger incentive for truck drivers to change behavior so that their travel distances are minimized. Examples of MBUF systems that can address both self-reporting and adequate price signaling issues can be found in the European experience.

Where are commercial MBUF systems being implemented?

- United States (OR, KY, NM, NY)
- Germany
- New Zealand
- Switzerland
- Austria
- Czech Republic
- Slovakia

A number of European countries, such as Germany, Czech Republic, and Austria have advanced mileage-based user systems that are capable of achieving a range of objectives. For example, the objectives of Germany's Heavy Goods Vehicle Tolling (HGVT) system were to "create incentives to shift freight truck traffic to rail and waterways, promote the use of cleaner truck technologies, encourage more efficient

[140] Ferrol Robinson, David Coyle, Gerard McCullough, 2012, "Potential Benefits of Mileage-Based User Fees to the Freight Industry and Industry Concerns," Minnesota Department of Transportation, http://ntl.bts.gov/lib/47000/47800/47894/2012-19.pdf

[141] Texas Transportation Institute, 2012, *"Urban Mobility Report," Texas Transportation Institute,* http://mobility.tamu.edu/ums/

[142] Atkinson et. al, 2009, "Paying Our Way", National Surface Transportation Infrastructure Financing Commission, http://financecommission.dot.gov/Documents/NSTIF_Commission_Final_Report_Advance%20Copy_Feb09.pdf

[143] "Oregon Road Use Tax and Fee Changes," 2013, ODOT http://www.oregon.gov/ODOT/MCT/pages/2010changes.aspx

[144] Government Accountability Office, 2012, "Highway Trust Fund: Pilot Program Could Help Determine the Viability of Mileage Fees for Certain Vehicles," GAO, http://www.gao.gov/assets/660/650863.pdf

routing and scheduling of trucks, and provide funding for maintenance and expansion of transportation infrastructure.[145]" After the HGVT system was implemented in 2005, its objectives were soon realized. By 2008, truck traffic declined 7 percent, there was a 58 percent shift from dirtier to cleaner trucks, and the system generated $5 billion in revenues.[146]

The German system uses GPS technology to assess domestic trucks and offers manual booking to assess foreign trucks that are not equipped with the technology. (A schedule of heavy fines has kept manual booking violation rates under 2 percent.[147]) Another system benefit is that mileage-based fees vary based on the time of day. This variable pricing scheme incentivizes commercial operators to drive on the roads when it is least costly, during periods of off-peak travel. As a result, the German MBUF system helps mitigate congestion on the 7,700 miles of roads in the German MBUF network.

A pilot program similar to the German MBUF system was tried in Oregon in 2010. The Oregon Truck Road Use Electronics (TRUE) pilot program tested GPS units in 25 trucks operated by three trucking firms to automate the collection of Oregon's truck weight-mile tax. Oregon officials reported that the devices successfully tracked the miles traveled in their state and sent the data to Oregon DOT to produce a monthly weight-mile tax.[148] Though the pilot program was a technical success, institutional barriers still exist prior to implementing such a system in the United States. Gaining the support of the trucking industry and fostering a widespread acceptance for GPS technology are the main obstacles that have to be overcome.

Janet Kavinoky, Executive Director of Transportation & Infrastructure at the U.S. Chamber of Commerce, explained in a phone interview that an enormous resistance to mileage-based systems lies embedded in the trucking industry.[149] She stated that it is critical to "sit down with truckers and operators to try to understand what their issues are. This is where [MBUF] efforts will run into bigger problems. Trucking associations are still very anti-tolling and anti-congestion pricing." She felt that a balanced conversation with the North Carolina Trucking Association, where industry needs are truly understood and considered, was an imperative first step toward implementing a commercial MBUF system in North Carolina. Recently, the trucking industry has become more open to the idea of paying fees for road use. Bill Graves, president and CEO of the American Trucking Associations in an interview with the McClatchy Washington Bureau said, "We want to pay more. We're ready to pay more, in some type of user fee, whatever Congress can agree to."[150] This is a promising sign that the trucking industry is ready to talk about how to fund transportation as they clearly understand the connection between infrastructure investment and economic development.

In other countries, special caveats were created, which allowed MBUFs to succeed politically. Other nations' truck industries saw some benefits from their MBUF programs. In Switzerland, trucks were allowed to carry

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[145] Arnold et. al, 2010, "Reducing Congestion and Funding Transportation Using Road Pricing in Europe and Singapore," Federal Highway Administration, http://international.fhwa.dot.gov/pubs/pl10030/pl10030.pdf

[146] Ibid.

[147] Ibid.

[148] Government Accountability Office, 2012, "Highway Trust Fund: Pilot Program Could Help Determine the Viability of Mileage Fees for Certain Vehicles," GAO, http://www.gao.gov/assets/660/650863.pdf

[149] Janet Kavinoky, 20 September 2013, conversation with Steve Bert.

[150] Curtis Tate, 2013. "More states to raise taxes to pay for transportation." *McClatchy Washington Bureau,* http://www.kansascity.com/2013/11/27/4654675/more-states-raise-taxes-to-pay.html

heavier loads over the Swiss Alps in order to facilitate more efficient goods movement operations.[151] In Germany, revenues were dedicated to maintenance and enhancement of the highway network, and rates were structured such that truckers could reduce the charge by up to 50 percent by upgrading to the least polluting vehicles.[152]

In *Potential Benefits of Mileage-Based User Fees to the Freight Industry and Industry Concerns,* the authors identify a number of potential benefits that could be expected with an MBUF system, addressing both the quality of the roads and the technology itself. These benefits include decreased congestion on roadways, improved travel time predictability, improved quality of roads (reducing the amount of necessary vehicle maintenance and reducing damage to cargo), providing cost savings to customers, better data collecting and reporting of mileage, and secondary benefits of travel time and improved reliability. The same report also highlights common concerns among the freight industry including the perception that the industry is already paying its fair share in the form of fuel taxes, the difficulties of changing cost calculations, and the sense that automobiles are responsible for a greater share of the declining fuel revenues. Many of the other issues are shared with private passenger vehicles.

Anticipating some of these issues may be a useful method for overcoming the industry's resistance to the idea. For instance, in Germany, the trucking and logistics community offered support for the proposed mileage-based fees because it was known that the new fees would close the infrastructure gap currently faced by that country. Some of the funds were also used to subsidize other freight modes, including rail and waterways.[153]

Capturing some of the costs associated with a congested, deteriorating infrastructure in a way that is relatable to the trucking and logistics industries will be critical, particularly in the face of so many unknowns. As of yet, the full cost of mileage-based fees in the trucking and logistics industries is relatively unknown. In Germany, it was estimated that toll charges would result in a 0.15 percent increase in the price of consumer goods, but no increase has actually been documented.[154] It is likely that the freight industry would absorb these costs during the first years of a new MBUF system, later passing these costs to consumers. A report for the National Freight Research Council on the economic impacts of a new MBUF system assumes that it would take three years for costs to be fully passed to consumers. Three points are noteworthy in that report: First, an MBUF system is likely to affect for-hire fleets more than private fleets, particularly when compared to other revenue-generating mechanisms. Secondly, estimating the long-run economic impact to US industries, long-run tax and cost accrual falls most heavily to the US manufacturing sector (this is also true under a fuel tax or registration fee increase), followed by the service sector. Third, no long-run employment impacts are predicted--only lower GDP growth and lower incomes.[155]

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[151] Sorenson et. al, 2009 "Implementation Strategies for Shifting to Direct Usage-Based Charges for Transportation Funding." *National Cooperative Highway Research Program*, http://www.rand.org/content/dam/rand/pubs/reprints/2009/RAND_RP1395.pdf

[152] Ibid

[153] Ferrol Robinson, "Heavy Vehicle Tolling in Germany," 2008, *University of Minnesota,* http://blog.lib.umn.edu/slpp/regionalities/Heavy%20Vehicle%20Tolling%20in%20Germany.pdf

[154] Ibid.

[155] Transportation Research Board, 2012, "Dedicated Revenue Mechanisms for Freight Transportation Improvement," *National Cooperative Freight Research Council (NCFRC) Report 15*. http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp_rpt_015.pdf

It is, however, possible that the German lack of increase in consumer costs is the result of unexpected benefits that accompany strong incentives to change travel behavior. For example, an economic impact analysis for the Chicago area showed that, by shifting 20 percent of truck traffic from 7pm to 6am could reduce total travel times by 5.5 percent, creating a regional economic benefit of $2.1 billion per year in direct savings, and ultimately lead to the creation of more than 9,000 jobs.[156]

How well do Commercial MBUFs meet the five revenue enhancement criteria?

In the U.S., trucks pay as little as 50 cents for every dollar's worth of damage they impose on the road.[157] A commercial MBUF could potentially solve or go a long way toward fixing the **user-pays principle**, by providing a mechanism for trucks to pay the full costs they impose. A commercial MBUF has the potential of providing a substantial **revenue yield**. Oregon's MBUF system generates $300 million in transportation revenue each year.[158]

Outside of Oregon and three other pioneering states, commercial MBUFs do not exist in the United States. If North Carolina were to implement a commercial MBUF system it would establish a direct mechanism for trucks to pay for the damages they impose on the state's road network. It would also establish a source capable of **long-term funding security** assuming that commercial MBUFs were indexed to inflation. The **implementation potential** of a commercial MBUF system depends on a variety of factors. There are relatively basic commercial MBUF systems, like those operating in Oregon, Kentucky, New Mexico, and New York, that rely on self-reporting and have low implementation costs.[159] There are also systems that are technology-based, like Germany's Heavy Goods Vehicle Tolling System or Oregon's Truck Road Use Electronics Program, which have higher implementation costs. It should be noted that technology-based systems offer more precision and can achieve a broader range of policy objectives.[160] However, technology based systems are often associated with an invasion of privacy due their tracking capabilities. In a commercial setting, though, tracking may be acceptable or even preferred. Since GPS tracking can identify truck locations en route, it

Commercial MBUF criteria

- **User-pays principle:** trucks pay the full costs they impose
- **Revenue yield**: Oregon's MBUF system generates $300 million each year.[10]
- **Implementation potential:** depends on buy-in from the trucking industry
- **Long-term funding security**: stable source if indexed to inflation
- **Geographic equity:** depends on freight composition

[156] Chicago Metropolis 2020, December 2004, "The Metropolis Freight Plan: Delivering the Goods." Chicago Metropolis 2020, http://edrgroup.com/library/freight/the-chicago-metropolis-freight-alternatives.html

[157] "Addendum to the 1997 Federal Highway Cost Allocation Study," May 2000, Federal Highway Administration, http://www.fhwa.dot.gov/policy/hcas/addendum.htm

[158] "Oregon Road Use Tax and Fee Changes," 2013, ODOT http://www.oregon.gov/ODOT/MCT/pages/2010changes.aspx

[159] Atkinson et. al, 2009, "Paying Our Way", National Surface Transportation Infrastructure Financing Commission, http://financecommission.dot.gov/Documents/NSTIF_Commission_Final_Report_Advance%20Copy_Feb09.pdf

[160] Arnold et. al, 2010, "Reducing Congestion and Funding Transportation Using Road Pricing in Europe and Singapore," Federal Highway Administration, http://international.fhwa.dot.gov/pubs/pl10030/pl10030.pdf

effectively adds a layer of security for shippers. In a setting where business depends on reliability, tracking capabilities may actually be an economic benefit.

Getting the approval of the trucking industry is a crucial part of the implementation process as well. Industry concerns center around the distribution costs and benefits of an MBUF system.[161] A balanced conversation with the North Carolina Trucking Association, where industry needs are understood and considered, is a critical step toward implementing a commercial MBUF system in North Carolina.[162]

Geographic equity is difficult to assess because trucks use both urban and rural roads to meet a variety of different aims. However, under a technology-based MBUF system, roads could be priced based on regional considerations. Thus if rural regions were being more heavily impacted by truck traffic, a technology-based MBUF could allow prices to fluctuation to cover the costs of damage trucks impose.

Moving Forward

Both commercial and passenger mileage-based user fees provide high revenue yields. Unlike the motor fuels tax, MBUFs account for all system costs that users impose on the roadway. Once initiated, the transition to vehicle miles traveled fees may occur more rapidly than expected. *NCHRP 143*, *Implementation Strategies for Shifting to Direct Usage-Based Charges for Transportation Funding* explains MBUF implementation opportunities in the box below.

Implementation Opportunities

"Researchers and analysts have developed several intriguing options, involving both carrots and sticks, that would promote more rapid adoption of the required metering equipment on a voluntary basis. It may also be helpful to develop a set of minimum standards for the required in-vehicle equipment and then allow vendors to compete – on the basis of price and desirable add-on end-user features (navigation, real-time traffic and parking information, etc.) – for market share. This would lead to the development of devices that are more attractive to users, fostering voluntary adoption in the near term, while simultaneously driving down equipment costs. It would also open the door for the adoption of more advanced technology as innovations occur."

Source: *NCHRP 143, Implementation Strategies for Shifting to Direct Usage-Based Charges for Transportation Funding*

When political and industry leaders are looking to move forward with mileage-based user fees, there are five key considerations that they should keep in mind. *NCHRP 143*, *Implementation Strategies for Shifting to Direct Usage-Based Charges for Transportation Funding* suggests five coordinated activities to prepare for successful implementation. These include the following:

- **Planning Investments**: The task of designing and implementing a new user pay system will require the oversight of a designed entity to oversee research efforts, interpretation of results,

[161] Sorenson, Paul et al., 2009, "Implementable Strategies for Shifting to Direct Usage-Based Charges for Transportation Funding," NCHRP, http://www.trb.org/Publications/Blurbs/162252.aspx

[162] Janet Kavinoky, 20 September 2013, conversation with Leigh Lane and Steve Bert.

programmatic design decisions including technical and functional system requirements as well as legislative and administrative actions. An advisory body in the form of a commission or committee comprised of a broad range of stakeholder is desirable to oversee all implementation activities.

- **Analytic Studies**: Depending on the policy goals developed by the agency studies that evaluate behavioral response to alternate forms of pricing could be useful to identify appropriate pricing constructs. An evaluation of cost for alternate in-vehicle equipment configurations as well for different payment and collection approaches are important considerations.
- **Technical Research and Development**: While numerous studies have been completed to test technologies for tracking mileage there are still gaps in understanding how best to utilize cellular equipment to meter travel by location. Other areas for further real-world testing including evaluating alternate AVI configurations to support pay-at-the-pump collections and enforcement options to prevent tampering with the OBU.
- **MBUF system trials:** System trials are critical to properly evaluate technical options, understand user response and cost and reliability of alternate collection and enforcement mechanisms.
- **Public Education and Outreach:** There are two primary challenges related to the public. One is a lack of general understanding about transportation funding challenges and the second involves privacy concerns. Both these issues must be addressed through a concerted effort to first educate state and local elected officials and later the press.

Targeted Congestion Pricing

Targeted congestion pricing is defined as a pricing scheme in which a fee is assessed to road users in a specific or targeted area of North Carolina's road network, with the ultimate purpose of reducing congestion. There are subcategories of targeted congestion pricing, including managed lanes and cordon pricing. Managed lanes are a form of congestion pricing in which specific lanes on a road network (that are typically prone to high levels of congestion) are assessed a fee for access. High-Occupancy Toll (HOT) lanes and express lanes are two common types of managed lanes. Cordon pricing is a form of congestion pricing where a road user is charged a fee for entering a congested area or cordon (usually found in urban areas).

Managed Lanes

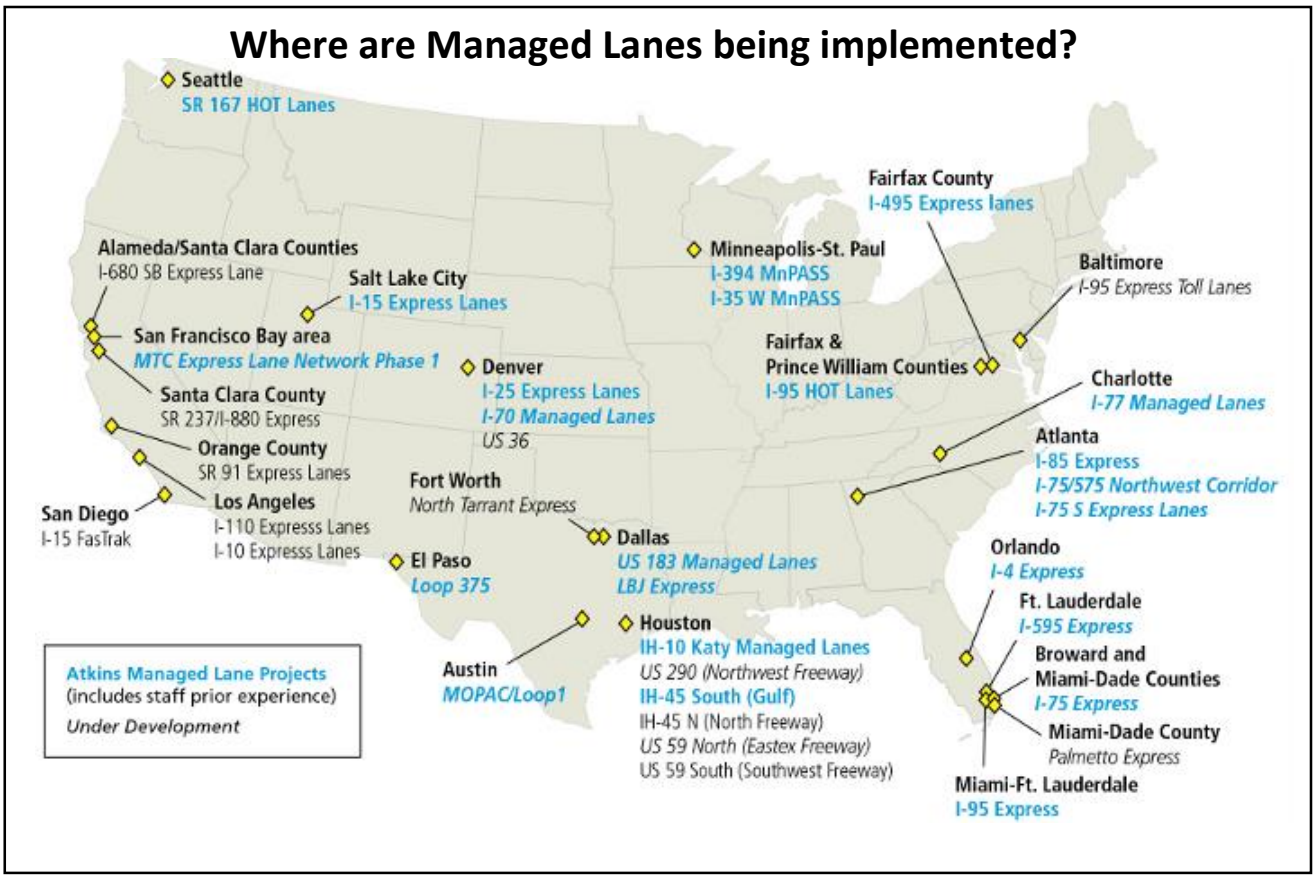
Managed lanes (or priced lanes) regulate congestion by charging users a fee for access. The fee effectively reduces the willingness for all drivers to use these lanes. Travel speeds thereby improve in the priced lanes for drivers willing to pay a fee, or for drivers that qualify for lane use through an exemption. High-Occupancy Toll (HOT) lanes are the most common type of managed lanes. HOT facilities are lanes that offer free access to motorcyclists, carpoolers, and transit vehicles, but charge a toll to single occupancy vehicles (SOVs). The fee effectively reduces the willingness for solo drivers to use HOT lanes. As a result, there is less traffic to congest HOT lanes and travel speeds improve for carpoolers, transit riders, and the SOVs willing to pay for HOT lane use. Express lanes are another type of managed lanes. They operate under the same principles as HOT lanes; however, they were not necessarily originally converted from High Occupancy Vehicle (HOV) lanes. The literature uses these terms interchangeably. This report does not attempt to redefine these types of pricing strategies; therefore, the terminology used in this report reflects the terminology used in the referenced reports.

As of 2012, at least 10 states operate managed lanes.[163] These facilities are primarily a tool for state DOTs to manage congestion, but they also generate substantial revenue. For instance, an MnPASS System Study (2010) estimated revenue for Minnesota's I-394 managed lanes to be about $5,342 for the a.m. peak, and $9,440 for the p.m. peak, for a total of $14,782 daily.[164] This equates to over $3.84 million annually in tolls collected that can then be used to operate and maintain the corridor. An additional benefit is that any excess revenues could go to fund other parts of the transportation system.

North Carolina currently has one HOV facility comprised of two lanes that total 15 miles. There is a 5-mile HOV lane heading northbound and a 10-mile HOV lane heading southbound on I-77 in Mecklenburg and Iredell counties, near Charlotte's central business district. This facility, plus 6.7 miles of lane extensions, has been

[163] Shinkle, et. al, July 2012, "On the Move: State Strategies for 21st Century Transportation Solutions," National Conference of State Legislatures, http://www.ncsl.org/documents/transportation/on-the-move.pdf

[164] Cambridge Systematics, August 2010, "MnPASS System Study Phase 2," MnDOT, http://www.mnpass.org/pdfs/MnPassSystemStudy2.pdf



Source: Atkins Managed Lanes.

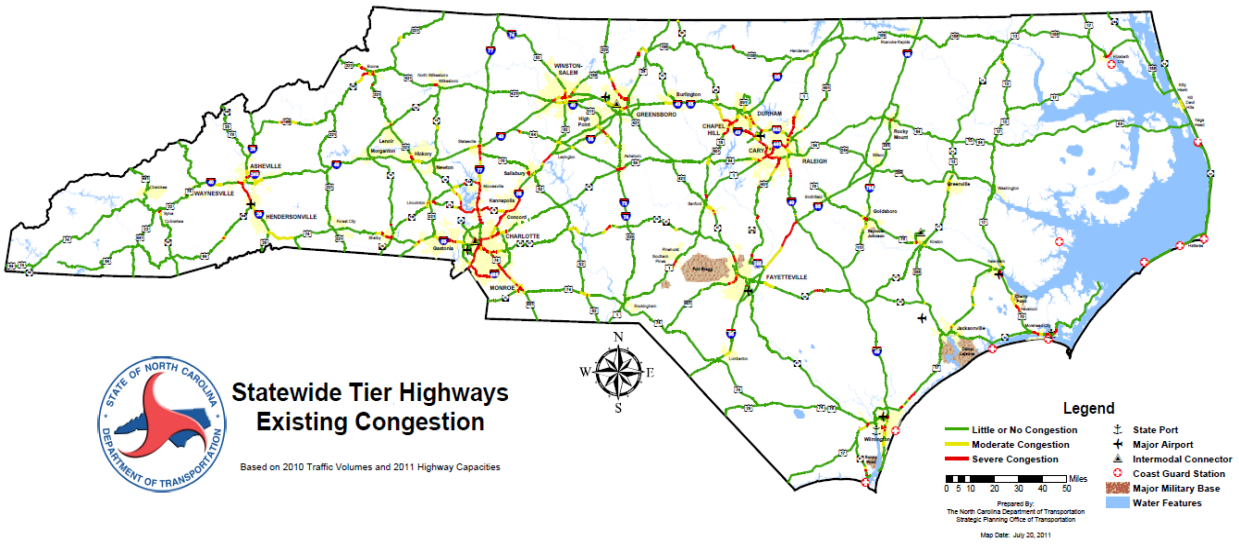
proposed to be converted to a HOT lane facility through public-private partnership procurement. Parsons Brinckerhoff conducted a financial analysis in 2010, in which the facility was projected to net $2.2 million in annual revenue if it were to operate in 2013 and it would net $5.4 million in annual revenue in 2030.[165] (These earnings take into consideration the annual costs associated with the operation and maintenance of the facility.)

For a number of reasons, the Charlotte region is a logical choice for HOT lane conversion. The region's population has more than doubled from 1990 to 2011, and total congested lane miles in the region have risen by 15 percent.[166] These conditions have increased the region's throughput, leading to additional wear and tear on its road network. Being able to pay for the additional damages incurred and curtailing congestion, are apparent benefits of high occupancy tolling in the region. These areas in North Carolina could also benefit from managed lane use. In addition to Charlotte, Raleigh/Durham, Greensboro, Winston-Salem, Asheville, Fayetteville and Wilmington will grow en masse from 69 to 74 percent of the state's population by 2040.[167] As congestion will likely

[165] Parsons Brinckerhoff, November 2010, "I-77 HOT Lanes Implementation", North Carolina Section Institute of Transportation Engineers, http://www.ncsite.org/meeting_archives/documents/AM_2010/Session-3B-Topic-i-I-77-HOT-Lanes-Purnell-PB.pdf

[166] "Urban Mobility Report," 2012, Texas Transportation Institute, http://mobility.tamu.edu/ums/

[167] "NCDOT From Policy to Projects 2040 Plan: Financial Plan and Investment Strategies," 2012, NC Department of Transportation,



Source: NCDOT Strategic Prioritization Office

The map above shows state congestion levels in 2010, based on traffic volumes and highway capacities. Raleigh-Durham, Greensboro, Winston-Salem, Fayetteville, Wilmington, and Asheville show severe congestion conditions.

increase in these areas (see map above), managed lanes could become effective tool to manage traffic. It is important to remember, however, that managed lanes are most successful when converted from HOV lanes or are added as new lanes to existing corridors. To date, no managed lane projects have been developed by converting non-specified, general purpose lanes into priced lanes.

The need for continual monitoring and evaluation of system performance is imperative for managed lanes to be effective. For instance, prices drivers pay to access managed lanes will likely need to be raised or lowered in order to achieve optimal traffic flows. (A price that is too high will result in too few cars choosing to drive in managed lanes, and a price that is too low will result in too many drivers choosing them.) An ideal traffic flow should be determined from the outset, so that prices can fluctuate to meet that aim.

Technology considerations for congestion pricing strategies are similar to those used for MBUF systems that include variable fees. Most importantly agency policy goals as well as business and functional requirements should guide technology selection. The most innovative technology is not always the best answer as it may not be practical or publically acceptable; however, convenient user payment options are universally accepted as a key criterion for garnering public support. Another key technological consideration is the use of open-source system designs to leverage market competition, allow for interoperability between different fee systems such as transit and parking as well as banks and retail. The major technological approaches being used to date include automated number plate recognition (ANPR); dedicated short-range communications (DSCR) in-vehicle units with removable stored-value smart card for payment; GPS for vehicle location and Global System for Mobile

http://www.ncdot.gov/download/performance/2040_FinanceReport.pdf

Communications (GSM) for data transmission, transponder-based DSCR system with gantries on mainline highways, and manual booking system via kiosk terminals and internet for those with on-board units. NCDOT utilizes the ANRP and transponder-based DSCR system for the Triangle Parkway in Wake County.

How well do Managed Lanes meet the five revenue enhancement criteria?

The primary purpose of managed lanes is to reduce congestion, so **revenue yield** is more of a secondary consideration. However, managed lanes offer significant revenue yield. Minnesota's I-394 managed lanes generate over $3.84 million annually.[168] Since managed lanes aim to reduce congestion, their cost burden generally falls on urban drivers. **Geographic equity** concerns must be weighed against system objectives to reduce congestion.

Managed lanes also provide **long-term funding security** because they are essentially self-financing. Revenue generated by managed lane use can be utilized to pay the operation and maintenance costs of those facilities. The **implementation potential** of a managed lanes system depends heavily on public outreach. In the Washington D.C. metro area, public perceptions of managed lanes were studied during five deliberative forums. After an initial discussion, 51 percent of the public supported managed lanes; and by the end of the deliberative forums, 60 percent of the public supported them.[169]

Drivers impose a congestion cost on the roadways. Generally in urban areas this cost becomes significant as a greater density of drivers fills the road network, causing bottlenecks or gridlock. Because managed lanes permit system users to more directly pay for their system costs, these facilities help to better uphold the **user-pays principle**.

Managed Lanes Criteria

- **Revenue yield:** can provide substantial funding. Example: Minnesota' I-394 managed lanes generate over $3.84 million/year
- **Geographic equity:** usually impacts urban drivers
- **Implementation potential**: depends on public outreach
- **Long-term funding security:** can be a dedicated, self-financing revenue

[168] Cambridge Systematics, August 2010, "MnPASS System Study Phase 2," MnDOT, http://www.mnpass.org/pdfs/MnPassSystemStudy2.pdf

[169] Swanson et. al. "What Do People Think About Congestion Pricing?" Metropolitan Washington Council of Governments, http://www.mwcog.org/uploads/committee-documents/ZV1cWFZb20130117170347.pdf

Cordon Pricing

Cordon pricing, also known as area or zone pricing, involves charging for access into a specific, usually heavily congested area. Tolls are collected when drivers enter that area. The charge lowers drivers' willingness to enter that area or cordon. Similar to HOT lanes, cordon pricing is primarily a tool for congestion management, but it also generates significant revenue. Revenues of around $54 million in Singapore, $237 million in London, and $116 million in Stockholm are generated each year from these areas' respective pricing systems.[170]

Cordon pricing manages congestion through a system of variable toll charges. During morning and evening peak periods, toll charges are higher to reduce the willingness of drivers to pay for entry into a specific cordon (usually the city's core). This, in turn, manages traffic by decreasing the number of vehicles in these congestion-prone areas. During off-peak hours, when congestion is less of an issue, toll charges are kept lower. This creates less of a deterrent for drivers to enter the cordon when congestion is not an issue. In Stockholm, Sweden cordon toll rates vary from about US$1.50 during off-peak hours to US$3.00 during peak periods. Vehicles are charged each time they cross a control point, up to a maximum of US$9 per day.[171]

Cordon pricing provides substantial congestion relief, coupled with other side benefits. In Stockholm, cordon toll charges led to a 20 percent reduction in traffic, a 10 to 14 percent reduction in vehicle emissions and a 2 to 10 percent improvement in air quality.[172] In London, traffic reductions ranged from 19 to 25 percent depending on the cordon region.[173] Additionally, in Singapore, cordon prices allowed for traffic managers to achieve target roadway speeds of 45-65 km/h on expressways and 20-30 km/h on arterials.[174] Though still in the planning stages, San Francisco predicts that it would net $60 million to $80 million and reduce peak-period trips by 12 percent, if it were to implement a $3 peak-period cordon charge.[175]

Where is cordon pricing being implemented?

- Stockholm, Sweden
- London, U.K.
- Durham, U.K.
- Znomjo, Czech Republic
- Riga, Latvia
- Valleta, Malta
- Milan, Italy
- Singapore
- Planning phases in San Francisco

[170] Atkinson et. al, 2009, "Paying Our Way", National Surface Transportation Infrastructure Financing Commission, http://financecommission.dot.gov/Documents/NSTIF_Commission_Final_Report_Advance%20Copy_Feb09.pdf

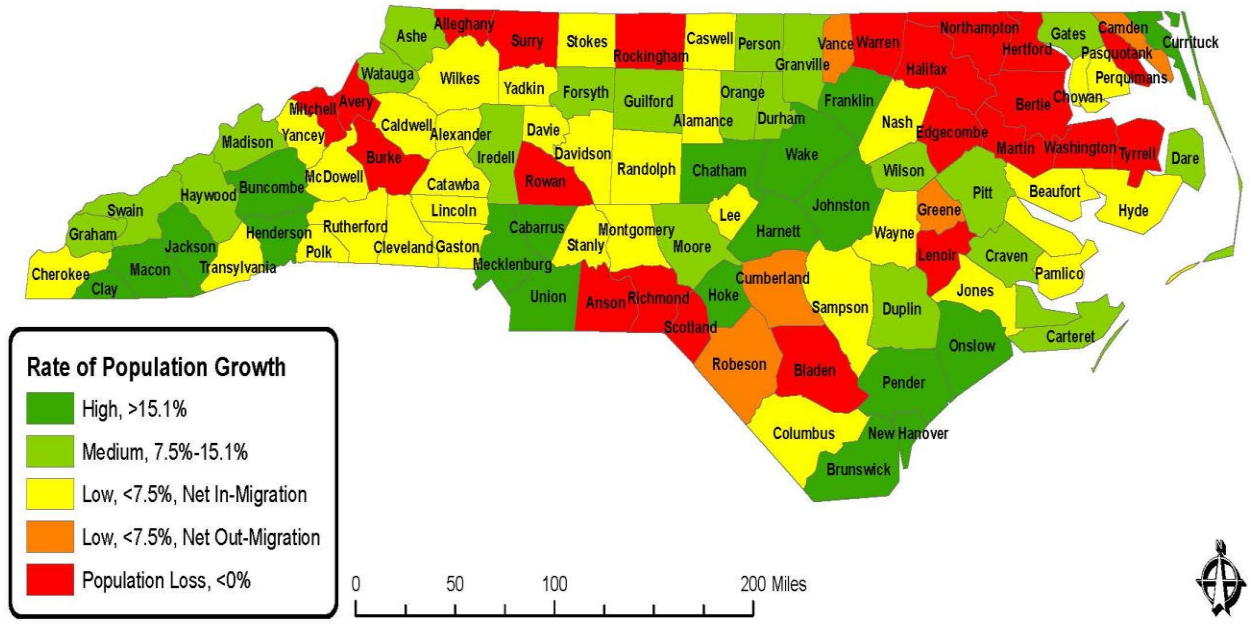
[171] Arnold et. al, 2010, "Reducing Congestion and Funding Transportation Using Road Pricing in Europe and Singapore," Federal Highway Administration, http://international.fhwa.dot.gov/pubs/pl10030/pl10030.pdf

[172] Arnold et. al, 2010, "Reducing Congestion and Funding Transportation Using Road Pricing in Europe and Singapore," Federal Highway Administration, http://international.fhwa.dot.gov/pubs/pl10030/pl10030.pdf

[173] Ibid.

[174] Ibid.

[175] San Francisco County Transportation Authority, 2010, "San Francisco Mobility, Access, and Pricing Study," http://www.sfcta.org/sites/default/files/content/Planning/CongestionPricingFeasibilityStudy/PDFs/mapsfinalrpt_ta-board_2010-12-14.pdf



Source: OSBM. "Population Growth."

Cordon pricing systems have significant operational costs. Experiences from Singapore, Stockholm, and London demonstrate costs that are 20, 37, and 50 percent of these areas' respective gross revenues.[176] Though operational costs are significant, each location has benefitted substantially from congestion reduction and revenues have easily covered these costs.

In North Carolina, high levels of congestion are becoming more of an acute problem. As of 2006, 57 percent of all urban interstate miles in North Carolina and 47 percent of all rural interstate miles are congested.[177] From 1990 to 2011, urban areas such as Greensboro, Raleigh/Durham, and Charlotte have experienced peak period congestion level increases from 7-18 percent, 26-50, and 39-59 percent, respectively.[178] These urban areas as well as Fayetteville, Wilmington, and Asheville are projected to experience substantial population growth by 2040, likely exacerbating congestion issues.[179] These six areas could benefit from the congestion relief and transportation revenue that cordon pricing offers. Green areas on the map above show areas experiencing medium or high population growth. These regions could benefit potentially from cordon pricing as well.

In the initial stages of a cordon pricing system, there is a general belief shared among city planners and the general public that cordon pricing, "will not work in my city." Skepticism must be overcome with discussions that provide clear targets and ways to meet those targets. In San Francisco, public doubt for cordon pricing

[176] Arnold et. al, 2010, "Reducing Congestion and Funding Transportation Using Road Pricing in Europe and Singapore," Federal Highway Administration, http://international.fhwa.dot.gov/pubs/pl10030/pl10030.pdf

[177] Brad Wilson, 2007, "21st Century Transportation Committee Final Report," 21st Century Committee, http://www.wral.com/asset/traffic/2008/12/10/4111058/20081210172911021.pdf

[178] "Urban Mobility Report," 2012, Texas Transportation Institute, http://mobility.tamu.edu/ums/

[179] "NCDOT From Policy to Projects 2040 Plan: Financial Plan and Investment Strategies," 2012, NC Department of Transportation, http://www.ncdot.gov/download/performance/2040_FinanceReport.pdf

has centered on the idea that there would not be adequate travel options available besides driving, and that the government would not be effective in implementing such an undertaking.[180] The international experience, however, shows that people not only change their behavior, but their approval for cordon pricing grows as well. Before Stockholm implemented its cordon pricing system, approval ratings were around 25 percent. After its demonstration program, approval grew to just over 50 percent, and has recently climbed to about 65 percent.[181]

How well does Cordon Pricing meet the five revenue enhancement criteria?

The primary purpose of cordon pricing is to reduce congestion, so **revenue yield** is more of a secondary consideration. However, cordon pricing does offer significant yield. Around $54 million in Singapore, $237 million in London, and $116 million in Stockholm are generated each year from these areas' respective pricing systems.[182]

Since cordon pricing systems aim to reduce congestion in heavily traveled areas, their cost burden is felt almost exclusively by urban drivers.

Geographic equity concerns must be weighed against system objectives to reduce congestion. In the case of cordon pricing, **long-term funding security** is difficult to assess and somewhat subjective. For example, in the long-term, if a city is able to curb congestion through different means, a cordon pricing may no longer be warranted. So, if it were to become no longer rational to implement cordon pricing to reduce congestion, the long-term funding security could dissolve. However, in North Carolina, population projections forecast rapid growth. It is more likely that a cordon system would offer long-term funding security as a revenue enhancement mechanism.

Cordon pricing criteria

- **Revenue yield**: can provide substantial funding. Example: Stockholm generates around $116 million/year
- **Geographic equity**: costs felt by urban drivers
- **Long-term funding security:** depends on congestion conditions in cordon
- **Implementation potential:** depends on demonstration programs and outreach

The **implementation potential** of a cordon pricing system depends heavily on the public's experience with demonstration or outreach programs. Before Stockholm implemented its cordon pricing system, approval ratings were around 25 percent.[183] After its demonstration program, approval grew to just over 50 percent,

[180] San Francisco County Transportation Authority, 2010. "San Francisco Mobility, Access, & Pricing Study." http://www.sfcta.org/sites/default/files/content/Planning/CongestionPricingFeasibilityStudy/PDFs/mapsfinalrpt_ta-board_2010-12-14.pdf

[181] Arnold et. al, 2010, "Reducing Congestion and Funding Transportation Using Road Pricing in Europe and Singapore," Federal Highway Administration, http://international.fhwa.dot.gov/pubs/pl10030/pl10030.pdf

[182] Atkinson et. al, 2009, "Paying Our Way", National Surface Transportation Infrastructure Financing Commission, http://financecommission.dot.gov/Documents/NSTIF_Commission_Final_Report_Advance%20Copy_Feb09.pdf

[183] Arnold et. al, 2010, "Reducing Congestion and Funding Transportation Using Road Pricing in Europe and Singapore," Federal Highway Administration, http://international.fhwa.dot.gov/pubs/pl10030/pl10030.pdf

and has recently climbed to around 65 percent.[184]

Drivers impose a congestion cost on the roadways. Generally in urban areas this cost becomes significant as a greater density of drivers fills the road network, causing bottlenecks or gridlock. Because cordon pricing permits system users to more directly pay for their system costs, these facilities help to better uphold the **user-pays principle**.

[184] Arnold et. al, 2010, "Reducing Congestion and Funding Transportation Using Road Pricing in Europe and Singapore," Federal Highway Administration, http://international.fhwa.dot.gov/pubs/pl10030/pl10030.pdf

General Pricing

As the motor fuels tax continues to generate less revenue for the operation and maintenance of roadways, tunnels, and bridges, general pricing strategies can be implemented to alleviate this financial burden. General pricing (tolling) strategies usually involve charging a fee to road users, which in turn allows them access to the road network. Revenues generated are then used to pay for the operations and maintenance of the road network. California's Golden Gate Bridge, Alaska's Whittier Tunnel, and the Ohio Turnpike, are just a few examples of facilities that use general pricing. As of 2009, there were 277 state and local roads, bridges, and tunnels in 32 states (totaling nearly 5,000 miles of roadway), in which general pricing has been implemented.[185] In 2006, **general pricing facilities raised a total of $9.3 billion, or the equivalent of 9.9 percent of total federal, state, and local highway user fee revenues.[186]**

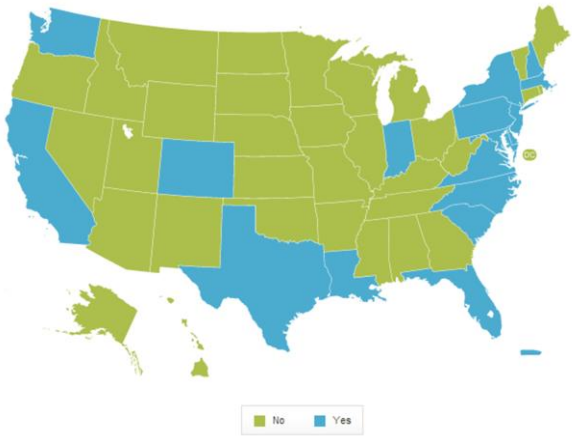
North Carolina currently uses, or has proposed, general pricing in six pieces of its road network including the following:

- Triangle Expressway (Research Triangle Park)
- Complete 540 Triangle Expressway Southeast Extension (Research Triangle Park)
- Monroe Bypass (Mecklenburg County)
- Mid-Currituck Bridge (Currituck County)
- Garden Parkway (Gaston County)
- Cape Fear Crossing (Brunswick and New Hanover Counties)

The Triangle Expressway serves as an illustrative example of the revenue generation potential of general pricing facilities. The expressway features multiple gantries, which collect fares for road use. In fiscal year 2013, the expressway generated over $13 million in state transportation revenue (this includes the sale of vehicle tolling transponders).[187] North Carolina could vastly expand its general pricing strategy to include fare collections on all freeways and expressways. This strategy would allow for the most traveled and, therefore, most vital pieces of the road network to be self-sustaining.

Current legislation permits the North Carolina Turnpike Authority (NCTA) to "study, plan, develop, construct, operate and maintain up to nine [general pricing] projects.[188]" This legislation is well-intended; yet, it severely restricts the state's ability to generate transportation revenue and move toward a more self-sustaining road network. If the NCTA

Where is general pricing being implemented?



16 States: WA, CA, CO, TX, LA, IN, NY, NH, MA, NJ, DE, MD, VA, NC, SC, FL

Source: AASHTO Transportation Finance, 2011. 50 State Database & Maps

[185] Atkinson et. al, 2009, "Paying Our Way", National Surface Transportation Infrastructure Financing Commission, http://financecommission.dot.gov/Documents/NSTIF_Commission_Final_Report_Advance%20Copy_Feb09.pdf

[186] Ibid.

[187] "Financial Statements." 2013, North Carolina Turnpike Authority.

[188] NC Turnpike Authority, July 2013, "2013 Operations Statistics Report", NCDOT, http://www.ncdot.gov/projects/triangleexpressway/download/NCTAQuarterlyOperRprtQ2.pdf

were granted the authority to explore and implement as many pricing projects as necessary, the state's major roads would potentially be able to pay for themselves.

A study by the Reason Foundation (2013) found that general pricing implementation costs for the interstate highway system are around $250,000 per mile.[189] A fare of 3.5 cents per mile for cars and 14 cents per miles for trucks (adjusted annually by the Construction Cost Index) would generate enough revenue to cover implementation costs and allow for the interstate system to be self-sustaining.[190] It should be noted that such a large-scale tolling system would allow for cost-savings through economies of scale. For example, the gantries, transponders, and surveillance systems would be uniform and produced on a large scale, which would result in reduced costs. Thus, toll charges to maintain North Carolina's road network would likely be higher.

How well does General Pricing meet the five revenue enhancement criteria?

General pricing (tolling) offers the potential for high **revenue yield**. In 2006, general pricing facilities raised a total of $9.3 billion, or the equivalent of 9.9 percent of total federal, state, and local highway user fee revenues.[191] The **long-term funding security** of general pricing depends on legislation. Current legislation permits the North Carolina Turnpike Authority (NCTA) to "study, plan, develop, construct, operate and maintain up to nine [general pricing] projects.[192]" The long-term security of general pricing will depend on how many facilities will be permitted to exist in the state.

General pricing criteria

- **Revenue yield**: In 2006, general pricing facilities raised a total of $9.3 billion
- **Long-term funding security:** depends on how many facilities are permitted in the state.
- **Geographic equity** depends on the locations of priced facilities.
- **Implementation potential:** relatively high; N.C. already has experience with general pricing
- **User-pays principle** is upheld, but with limited precision

General pricing has a long history of implementation success. In the United States, the first turnpike was chartered in 1792.[193] North Carolina already has experience implementing general pricing along the Triangle Expressway. Thus it seems to reason that the **implementation potential** of general pricing in the state is quite high. If general pricing facilities were set up at equal intervals along the road network, this would likely impose a stronger cost burden on rural system users because they tend to drive more.[194] Thus, **geographic equity** considerations

[189] Robert Poole, Jr, September 2013, "Interstate 2.0: Modernizing the Interstate Highway System via Toll Finance," Reason.org, http://reason.org/files/modernizing_interstates_toll_finance.pdf

[190] Ibid.

[191] Atkinson et. al, 2009, "Paying Our Way", National Surface Transportation Infrastructure Financing Commission, http://financecommission.dot.gov/Documents/NSTIF_Commission_Final_Report_Advance%20Copy_Feb09.pdf

[192] NC Turnpike Authority, July 2013, "2013 Operations Statistics Report", NCDOT, http://www.ncdot.gov/projects/triangleexpressway/download/NCTAQuarterlyOperRprtQ2.pdf

[193] Klein et. al, February 2010, "Turnpikes and Toll Roads in Nineteenth-Century America," Economic History Services, http://eh.net/encyclopedia/article/klein.majewski.turnpikes

[194] Brian Weatherford, 2012, "Mileage-Based User Fees: Winners and Losers," *Rand Corporation*,

depend on the spacing and locations of priced facilities.

General pricing facilities usually charge a fee schedule that differentiates costs by vehicle weight. For example, North Carolina's Triangle Expressway charges for vehicles with two-axles ($0.82), three-axles ($1.64), and four or more axles ($3.28). The road-user does pay for pavement damage imposed on the roadway; however, the user fee is not as precise as it could be because vehicle weights are determined by the number of axles. The actual weight – and corresponding roadway damage imposed – may vary substantially. This becomes especially apparent with heavy trucks; for instance, a truck bearing 90,000 pounds would impose 42 percent more damage on the roadway than the same truck would if it were bearing 80,000 pounds.[195]

Additionally, general pricing usually involves flat-fee charges that do not account for time-of-day travel. Since these charges do not account for time of day travel, they are unable to capture the high congestive costs users impose on the roadway during peak travel periods. General pricing still covers a portion of user costs, allowing the **user-pays principle** to be upheld. However, the principle is upheld with slightly less precision than it could be under dynamic charging system offered through managed lanes or cordon pricing.

http://www.rand.org/content/dam/rand/pubs/rgs_dissertations/2012/RAND_RGSD295.pdf

[195] Zach Patton, July 2007, "Too Big for The Road," *Governing*, http://www.governing.com/topics/transportation-infrastructure/Too-Big-The-Road.html

Liability Insurance fee

The state of North Carolina requires that all drivers carry liability insurance. In 2011, nearly 6.6 million drivers were licensed in the state with the average driver paying $33.43 per month on liability insurance.[196,197] If a 20 percent surcharge were added to liability insurance, it would allow North Carolina to make up significant ground in funding its transportation needs. A fee of $6.67 per month would generate nearly $526 million each year – enough to fund 15.8 percent of North Carolina's annual baseline transportation needs.[198]

Though a surcharge on insurance premiums may not single handedly solve North Carolina's transportation funding shortfall, it would go a long way toward accomplishing that aim. A liability insurance surcharge, in combination with other revenue enhancement mechanisms, could allow the state to meet its transportation needs.

The benefit of using liability insurance as a tool to generate revenue is that every driver in the state would be subject to it. Thus a certain amount of fairness would inherently be upheld. Additionally, because drivers in the state of North Carolina are required to carry liability insurance, a surcharge placed on top of insurance premiums would not negatively affect insurance companies.

An interesting potential benefit of a liability surcharge is that it could be implemented to transition North Carolina toward a voluntary mileage-based user fee system. With adequate planning, the state could allow insurance agencies exemptions on the surcharge if drivers instead opted into pay-as-you drive (PAYD) insurance plans. This may seem counterintuitive, but due to the manner in which PAYD insurance plans are covered, the state could charge drivers mileage-based user fees (MBUFs) instead of the surcharge. Essentially the state would be offering drivers the chance to pay a flat fee (the surcharge) or a variable fee in the form an MBUF. North Carolina would be able to achieve this administratively, because in pay-as-you-drive insurance plans, drivers are charged their monthly or biannual premiums based on the number of miles they drive. Thus an insurance agency could simply add a cents-per-mile MBUF on insurance premiums and have the revenue already collected for the state. North Carolina does not yet offer PAYD insurance; however, 35 other states do provide this type of insurance and could potentially be used as a model.

How well does a liability insurance fee meet the five revenue enhancement criteria?

North Carolina law requires every driver to carry liability insurance. This creates great **revenue yield** potential if a fee were added to liability insurance premiums. A fee of $6.67 per month would generate over $526 million each year – enough to fund 15.8 percent of North Carolina's baseline transportation needs.[199] The **long-term**

[196] Note that this number has been estimated using premium data from 2012 and licensed driver data from 2011. The Office of Highway Policy Information (FHWA). Online: http://www.fhwa.dot.gov/policyinformation/statistics/2011/xls/dl22.xls

[197] North Carolina Department of Insurance, December 2012, "Summary of North Carolina Property and Casualty Business," North Carolina Financial Evaluation Unit, http://www.ncdoi.com/FA/Documents/StatisticalData/2012/Volume%20I%20-%20Property%20and%20Casualty%20Business/2012_P1_Property%20and%20casualty%20summary.pdf

[198] This range of fees is based on the transportation shortfall projections of $86.3 billion to $148.2 billion by 2040, found in NCDOT's 2040 Plan, and drivers license data provided by the Office of Highway Policy Information (FHWA).

[199] [199] This range of fees is based on the transportation shortfall projections of $86.3 billion to $148.2 billion by

funding security of this fee would depend on if it were indexed to inflation. If so, a relatively small fee could fund a substantial portion of North Carolina's revenue shortfall.

Both urban and rural users would be subject to the same fee so it would be **geographically equitable** from that standpoint. However, urban drivers generally drive less than rural drivers do,[200] so they would pay proportionally more with a flat liability insurance fee. Since all users would pay the same fee regardless of their driving behavior, a liability insurance fee would only loosely uphold the **user-pays principle**. However, if insurance agencies were to adopt Pay-As-You-Drive (PAYD) insurance plans, then drivers could be assessed a liability fee based on the amount of miles they have driven. Thus, with a PAYD insurance plan, the user-pays principle would be directly upheld.

Since liability insurance fees would cost all insured drivers the same, it would have no net impact on insurance agencies. This would help the **implementation potential** for such a fee.

Liability Insurance fee criteria

- **Revenue Yield:** A fee of $6.67/month would generate over $526 million/year
- **Long-term funding security** of this fee would depend on if it were indexed to inflation.
- **Geographic equity:** essentially affects both urban or rural users the same
- **User-pays principle**: loosely upholds the principle; would do better with a PAYD insurance plan
- **Implementation potential**: relatively easy to implement

2040, found in NCDOT's 2040 Plan, and drivers license data provided by the Office of Highway Policy Information (FHWA).

[200] Brian Weatherford, 2012, "Mileage-Based User Fees: Winners and Losers," *Rand Corporation*, http://www.rand.org/content/dam/rand/pubs/rgs_dissertations/2012/RAND_RGSD295.pdf

Projections of Highway Trust Fund Accounts Under CBO's May 2013 Baseline

(Billions of dollars)

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Highway Account												
Start-of-Year Balance	14	10	5	4	a	a	a	a	a	a	a	a
Plus: Revenues and Interest[b]	35	33	33	34	35	35	36	36	36	36	36	36
Plus: Intragovernmental Transfers[c]	2	6	10	0	0	0	0	0	0	0	0	0
Minus: Outlays[c]	42	44	45	45	45	46	46	46	47	48	48	48
End-of-year balance	10	5	4	a	a	a	a	a	a	a	a	a
Cumulative shortfall[a]	n.a.	n.a.	n.a.	-7	-18	-28	-39	-49	-61	-73	-85	-97
Transit Account												
Start-of-Year Balance	7	5	3	2	a	a	a	a	a	a	a	a
Plus: Revenues and Interest[b]	5	5	5	5	5	5	5	5	5	5	5	5
Plus: Intragovernmental Transfers[c]	0	0	2	0	0	0	0	0	0	0	0	0
Minus: Outlays[d]	7	7	8	8	8	9	9	9	9	10	10	10
End-of-year balance	5	3	2	a	a	a	a	a	a	a	a	a
Cumulative shortfall[a]	n.a.	n.a.	n.a.	-1	-5	-8	-12	-16	-21	-25	-30	-35

Source: Congressional Budget Office.

Section 4 – What Are Our Next Steps?

When the current transportation authorization act "Moving Ahead for Progress in the 21st Century (MAP-21)" expires on September 30, 2014, the federal Highway Trust Fund (HTF) will not be able to cover transportation expenditures on the horizon. The HTF has been running deficits since 2008 and has remained solvent only through large transfers from the U.S. Treasury's General Fund ($41 billion in General Fund Transfers since 2008).[201] Those deficits are projected to grow as a result of increased vehicle fuel efficiencies, a higher prevalence of alternative vehicles that do not pay the motor fuels tax, and the loss of purchasing power of the motor fuels tax relative to inflation. These factors are projected to intensify in the future, so without a motor fuels tax increase, or other forms of revenue generation, the Congressional Budget Office projects that the Highway Trust Fund will experience an $8 million deficit in 2015 and a $132 million deficit by 2023 (see the table above).[202]

A number of political and economic factors are greatly straining the federal government's ability to meet its fiscal obligations. The Great Recession has resulted in a strong public and political aversion to infrastructure investment.[203] Where infrastructure spending has hovered around 5 percent of U.S. output historically, it now lies around 3.5 percent – the lowest level since 1947.[204] Meanwhile, General Fund transfers have lost their palatability as a result of

[201] "Status of the Highway Trust Fund," July 2013. Congressional Budget Office, http://www.cbo.gov/sites/default/files/cbofiles/attachments/44434-HighwayTrustFund_Testimony.pdf

[202] Ibid

[203] "U.S. Public investment in schools, highways, and other infrastructure at lowest levels since 1947," November, 2013. PBS, http://www.pbs.org/newshour/rundown/2013/11/us-public-investment-in-schools-highways-and-other-infrastructure-at-lowest-level-since-1947.html

[204] Ibid

their heavy use in MAP-21, motor fuels tax increases have been met with widespread opposition in Congress, and long-term funding solutions, including mileage-based user fees, are out of reach for the near-term.[205]

The exhausted Highway Trust Fund, will likely have drastic impacts on individual states. By 2015, states around the country will likely experience funding cuts ranging from tens of millions up to nearly $3.5 billion.[206] As many states are already incapable of paying for their transportation system obligations, a loss of federal funds would be devastating.

North Carolina is one of the states that finds itself in this difficult situation. It cannot meet its present maintenance or construction obligations, nor come close to meeting the future needs of its growing population. North Carolina's transportation shortfalls are expected to range from $86.3 to $142.2 billion by 2040.[207] Waiting to invest will have negative consequences to business growth and attraction as well as to the mobility needs of one of the fastest growing states in the country. A recent I-95 corridor study revealed that if present funding levels continue along the I-95 corridor, it would result in a $44 billion loss in wages in that region by 2050.[208] This is only one corridor; statewide underinvestment would be far more economically damaging (for more state economic impacts see Section 1 of the report). In order to avert statewide economic degradation, a combination of short-term and long-term transportation funding solutions could be adopted.

Short-term funding solutions

For the purposes of this report, short-term funding solutions are considered to be revenue enhancement measures that are adopted for the period leading up to 2020. These revenue enhancement measures follow an implementation rationale that is consistent with what is described in section three of the report. Each measure upholds the user-pays principle and is relatively easy to implement. It should be noted, however, that the short-term funding solutions only serve as a stop-gap measure for state transportation funding. In other words, they are presented only as a temporary fix for North Carolina's current transportation funding shortfalls, and are not sustainable in the long-term.

Short-term funding solutions can be viewed in the table on the following page. Collectively these investments would bring the state over $1.4 billion annually.[209] These solutions would

[205] Ken Orski, "How to Avert a Transportation Funding Crisis." September, 2013. http://www.innobriefs.com/

[206] Curtis Tate. "Federal Highway Funding Crisis Will Hurt States, Lawmakers Told." September, 2015. McClatchy Washington Bureau, http://www.mcclatchydc.com/2013/09/25/203253/federal-highway-funding-crisis.html.

[207] "NCDOT From Policy to Projects 2040 Plan: Financial Plan and Investment Strategies,"2012, NC Department of Transportation, http://www.ncdot.gov/download/performance/2040_FinanceReport.pdf

[208] Cambridge Systematics, 2013, "North Carolina I-95 Economic Impact Assessment," *NCDOT*, http://www.driving95.com/assets/pdfs/_I-95_Economic_Assessment_FinalReport_May2013.pdf

[209] For Liability fee calculations see page 56. For the mileage-based user fee on passenger vehicles calculation see page 36. Highway use tax figures and the transfer of short term lease rentals come from: "North Carolina Highway Use Tax Net Collections. 2012, North Carolina Department of Revenue, http://www.dornc.com/publications/abstract/2011/table40.pdf and conversations with NCDOT. Uncapped motor fuels tax figures come from: 2013 "Historical Information: NC Motor Fuels Tax." For mileage-based user fee on IRP commercial vehicles, the calculation is derived from two sources: Bureau of Transportation Statistics and NCDOT. By taking the average fuel economy of commercial vehicles - 5.85 mpg (BTS) - and multiplying it by the amount of gallons used by the IRP fleet in North Carolina (NCDOT) – 88,189,496 – it can be determined that commercial vehicles travel about 5.16 million miles in North Carolina. Thus, a 1-cent per mile fee could generate about $5 million per year in revenue.

Short term options (2014-2020) required to raise over $1 billion annually transportation needs

Mechanism	Revenue Potential
Liability fee: 20 percent surcharge ($6.67/user per month)	$525 million
Highway use tax: 1 percent increase (3-4%; $4.16/user per month)	$170 million
Transfer of short term lease rentals from General Fund to Highway Fund (no user impact)	$50 million
Discontinue General Fund transfers from Highway Fund (no user impact)	$255 million
Mileage-based user fee on passenger vehicles: (0.5 cents/mile; $6.25/user per month)	$495 million
Mileage-based user fee on IRP commercial vehicles: (1 cent/mile)	$5 million
Remove the motor fuels tax cap	$35 million

take legislative action, and it is recommended that the positive impacts of each funding solution is well understood by both the general public and North Carolina policymakers.

Long-term funding solutions

For the purposes of this report, long-term funding solutions are those that are adopted in the time-period beyond 2020. These solutions provide the state with substantial transportation revenue and would be secure in the long-run. They meet the criteria that is outlined in section three of this report. Each measure upholds the user-pays principle and offers long-term funding security.

The following long-term solutions are recommended for the state:

- Implement a user-friendly mileage-based user fee (MBUF) system (page 30)
- Establish the widespread use of general pricing on interstates (interstate tolling, page 53)
- Expand managed lanes (page 45)
- Implement cordon pricing in the state's congested urban centers (page 49)

The long-term solutions recommended above offer a range of benefits. For example, an MBUF system could be used to supplement or entirely replace the motor fuels tax. As cited in NCDOT's 2040 Plan, a fee of 2 cents per mile (adjusted for inflation) would generate enough revenue to replace a 35 cents/gallon motor fuels tax.[210] The value of this fee could be adjusted upward or downward, depending on the state's funding needs.

The use of widespread general pricing (tolling) on North Carolina's interstates, could also generate substantial transportation revenue. A 6-cents/mile rural charge and a 12-cents/mile

ies,"2012, NC Department of Transportation, http://www.ncdot.gov/download/performance/2040_FinanceReport.pdf

[210] "NCDOT From Policy to Projects 2040 Plan: Financial Plan and Investment Strategies,"2012, NC Department of Transportation, http://www.ncdot.gov/download/performance/2040_FinanceReport.pdf

urban charge (increased by 3.5 percent annually) would generate nearly $42 billion in revenue by 2040.[211] These charges could also be adjusted upward or downward depending on the state's funding needs.

Managed lanes could also generate significant revenue for the state, though their primary benefit is congestion reduction. North Carolina's first managed lanes project (the I-77 High Occupancy Toll Lanes) is in development, and it is recommended that other projects of this type are brought forward. Parsons Brinckerhoff conducted a financial analysis in 2010, in which the facility was projected to net $2.2 million in annual revenue if it were to operate in 2013 and it would net $5.4 million in annual revenue in 2030.[212] (These earnings take into consideration the annual costs associated with the operation and maintenance of the facility.)

Cordon pricing also has the primary benefit of congestion reduction, but could offer substantial transportation revenue for the state. Revenues of around $54 million in Singapore, $237 million in London, and $116 million in Stockholm are generated each year from these areas' respective pricing systems.[213] Heavily populated areas that experience high levels of congestion, such as Charlotte or Raleigh/Durham, could benefit from the implementation of cordon pricing systems.

As North Carolina aims to preserve its transportation system in the future, a combination of short-term and long-term funding solutions will need to be utilized. Short-term solutions will help shore-up the most immediate impacts of inadequate funding, before a long-term source of transportation funding can be enacted. While state policymakers take their next steps, they must move with focused resolve to ensure that North Carolina's transportation infrastructure continues to support economic growth and improved quality of life for its citizens.

By 2015, the federal government, which currently funds 27.2 percent ($1.2 billion)[214] of North Carolina's transportation budget, will no longer be able to be relied on. Meanwhile, motor fuels tax receipts are continuing to decline relative to inflation and are falling due to vehicle fuel efficiency improvements. By 2018, efficiency improvements are projected to significantly decrease North Carolina's motor fuels tax receipts.[215] Though it will take great precision, if North Carolina's short-term and long-term funding solutions are enacted, the state would be able to meet its transportation system obligations. Success as such, would allow North Carolina to provide the surface transportation infrastructure required to remain economically viable; it would allow congestion to be maintained at publically acceptable thresholds; and it would permit North Carolina's transportation system to survive the deep transportation funding cuts that are likely to come from the federal government in 2015.

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[211] "NCDOT From Policy to Projects 2040 Plan: Financial Plan and Investment Strategies,"2012, NC Department of Transportation, http://www.ncdot.gov/download/performance/2040_FinanceReport.pdf

[212] Parsons Brinckerhoff, November 2010, "I-77 HOT Lanes Implementation", North Carolina Section Institute of Transportation Engineers, http://www.ncsite.org/meeting_archives/documents/AM_2010/Session-3B-Topic-i-I-77-HOT-Lanes-Purnell-PB.pdf

[213] Atkinson et. al, 2009, "Paying Our Way", National Surface Transportation Infrastructure Financing Commission, http://financecommission.dot.gov/Documents/NSTIF_Commission_Final_Report_Advance%20Copy_Feb09.pdf

[214] "NCDOT Sources of Funds 2013-14 by Major Funding Source," *NCDOT,* *http://www.ncdot.gov/download/about/finance/2014SourcesofFundspiechart.pdf*

[215] "NCDOT From Policy to Projects 2040 Plan: Financial Plan and Investment Strategies,"2012, NC Department of Transportation, http://www.ncdot.gov/download/performance/2040_FinanceReport.pdf

Bibliography Table of Contents

Other Financing Strategies

(1)

21st Century Transportation Committee Final Report				
Author(s):	Wilson, Brad			
Publisher:	21st Century Committee			
Year	2007			
Source Info:	A summary report of findings and recommendations from 13 committee meetings			
Web link:	http://www.wral.com/asset/traffic/2008/12/10/4111058/20081210172911021.pdf			
Study Region:	North Carolina			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

The 21st Century Committee was established by the state of North Carolina's President Pro Tempore of the Senate and its Speaker of the House in an effort to address the transportation infrastructure challenges occurring in the state. The committee issued a report showing that in order to meet transportation needs outlined in North Carolina's Long-Range Multimodal Transportation Plan **for the next 25 years, the state will need to plug an estimated $65 billion shortfall**. Four main factors are causing the shortfall:

- A 35 percent growth in population over the last 20 years
- A 40 percent growth in vehicle-miles travelled over the last 10 years
- An increase in construction costs of 124 percent over the past six years
- Increasing pressures on transportation funds primarily supported by motor fuels taxes

In the report, **a menu of 15 revenue generating options are explained and evaluated**. In addition, other policy objectives such as mobility & connectivity, preservation, safety, performance & accountability, and increased cooperation & collaboration at all levels of government are explored.

In the appendix of the report, the committee puts forth six proposals:

1. Transfer Elimination - Highway Trust Fund transfers to the General Fund of $172 million should be eliminated
2. Turnpike Authority should receive $75 million annually from the Highway Trust Fund
3. The highest amount possible available should be obtained in bonds to speed up project construction
4. New bonds could be paid for by a portion of the money recaptured through transfer elimination
5. The legislature should create an entity to monitor and provide oversight for the expenditure of already issued bond and new bond funds
6. NCDOT must take needed actions to clear regulatory hurdles and prepare for letting to construction of a new bridge at I-85/Yadkin River

The committee also recommends legislation to:

1. Create the Congestion Relief and Intermodal Transportation 21st Century Fund
2. Set out a framework for urban transit, rail freight, and other multimodal grants, including standards for eligibility
3. Authorize local option revenue options for major urban areas to match these grants
4. Authorize local option revenue options for other urban counties or counties contiguous to urban counties to allow them to raise additional revenues for public transportation systems
5. Extend the State Ports Tax Credit for five years

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(2)

NCDOT From Policy to Projects 2040 Plan: Financial Plan and Investment Strategies				
Author(s):	(none given)			
Publisher:	Atkins			
Year	2012			
Source Info:	Prepared for the North Carolina Department of Transportation			
Web link:	http://www.ncdot.gov/download/performance/2040_FinanceReport.pdf			
Study Region:	North Carolina			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [ ]	Geographic Considerations [ ]

Abstract:

This report shows that significant changes in revenue generation are required for North Carolina to meet its mobility, safety, and economic needs. It focuses on revenue sources and investment strategies for the State's current 2040 Plan period. During that period, the North Carolina Department of Transportation (NCDOT) will need to invest at least $86.3 billion (in 2011 dollars) to maintain existing Level of Service (LOS) C conditions. Without changes in policy for revenue generation, the State will experience a shortfall of $32.3 billion. This shortfall will be largely due to the erosion of the federal and state motor fuel taxes, which account for nearly 75 percent of total transportation funding in North Carolina. The report explains that motor fuel taxes have not kept pace with inflation, nor will they in the future. Furthermore, **motor fuel tax receipts are expected to decline with the adoption of Federal fuel efficiency standards**. Fuel efficiency standards are expected to result in fuel consumption levels that are 96 percent and 81 percent of current trends by 2020 and 2035, respectively.

The report explains that the motor fuels tax, North Carolina's primary source of revenue, is unsustainable. It assesses the feasibility of a wide-range of options for new revenue based on the six following characteristics:

1. Revenue generation potential
2. Long-term sustainability
3. Financial risk of implementation
4. Ease of technical implementation
5. Ease of political implementation

6. Social equity

Alternatives such as replacing the motor fuels tax with a vehicle miles travelled (VMT) fee by 2020, tying interstate tolling to inflation, eliminating transfers from the Highway Trust Fund, enacting an auto insurance surcharge, and increasing the auto sales tax by 1 percent are chosen as the most feasible solutions, and they would enable NCDOT to meet its investment needs to maintain LOS C conditions.

Target Level of Service Investment Strategy Funding Scenario (billions of 2011 Dollars)

Target LOS Funding Needs	114.11
Funding From Existing Sources	54.03
Baseline Funding Gap	(60.08)
Removal of Motor Fuel Tax in 2020 (@ 35 cents/gallon)	(24.66)
Gap to be Closed by Additional/Increased Revenues	(84.74)
Additional/Increased Revenue Options:	
VMT Implemented in 2020 (2 cents/mile adjusted with inflation)	26.64
Interstate Tolling (6 cents/mi Rural, 12 cents/mi Urban increase by 3.5% annually)	41.93
Eliminate Transfers from Highway Fund	4.25
Auto Insurance Surcharge	12.16
Additional 1% Highway Use (Auto Sales) Tax	3.25
Total Additional/Increased Revenues	88.23
Remaining Gap/Surplus	3.49

The chart to the left is exhibited in the report; it illustrates how the state can meet its mobility, safety, and economic needs at existing LOS C conditions. The report also includes options for meeting higher LOS thresholds, provides a rationale for federal funding level projections, and gives explanations of NCDOT's Highway Fund, Highway Trust Fund, Mobility Fund, the North Carolina Turnpike Authority, and Federal apportionments.

(3)

National Conference of State Legislatures' Top Issues of 2013				
Author(s):	Reed et. al			
Publisher:	NCSL			
Year	2013			
Source Info:	Webinar produced by National Conference of State Legislatures to discuss the top issues of 2013			
Web link:	http://www.ncsl.org/documents/environ/NCSL-top-Issues-2013-EET.pdf			
Study Region:	United States			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [ ]	Geographic Considerations [X]

Abstract:

This webinar conducted by the National Conference of State Legislatures delves into the energy trends, transportation priorities, and financial climate facing the United States in 2013. Technical advances in hydraulic fracturing and horizontal drilling have freed up natural gas resources that were previously inaccessible or uneconomical. As a result, the **U.S. is projected to be a net exporter of natural gas by 2020**. Fourteen states have enacted legislation regarding the following issue areas:

- State level regulation
- Severance taxes
- Fluid additive disclosure
- Environmental protection
- Permitting

At the federal level, ongoing studies are being conducted to determine the environmental impacts and economic outlook of natural gas production through hydraulic fracturing. Other energy topics such as renewable energy, energy efficiency, and energy reliability were also explored.

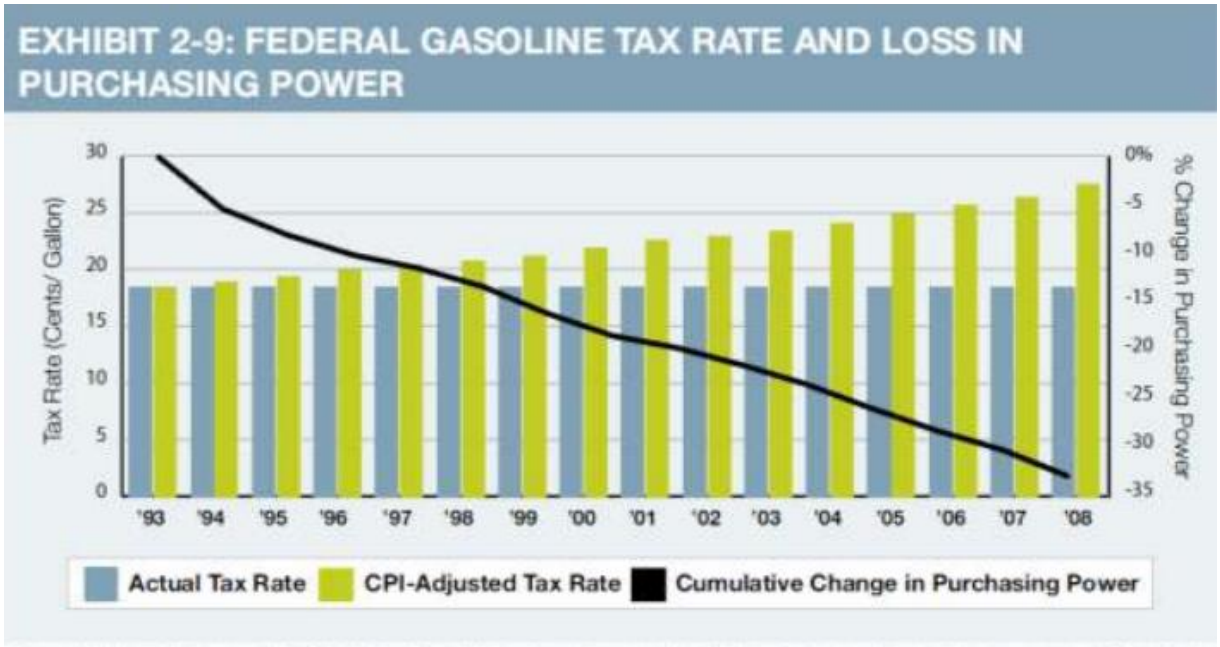
Funding and safety were two transportation priorities that were examined thoroughly in the webinar. Transportation funding issues have become extremely acute in many states due to:

- Chronic funding gaps
- Years of underinvestment
- Aging infrastructure
- Growing transportation demand
- Declining tax revenues
- Political reluctance to raise gas tax
- National recession
- State budget shortfalls
- Uncertainty of federal program

The declining value of state gas taxes are at the heart of funding issues. The webinar explains:

- As of Jan. 2013, **17 states had not raised gas taxes in more than 20 years**
- After accounting for rising construction costs, the average state's gas tax has fallen by 20 percent since last increase
- **State gas taxes have fallen by a combined $10 billion each year**

The real purchasing power of the federal fuel tax is depicted in the graph below:



Source: FHWA 2006 Highway Statistics, Table FE-21B, indexed using CPI-U as reported by the Bureau of Labor Statistics.

The NCSL webinar looked at a vehicle miles travelled fee, fees for alternative fuel or electric vehicles, and taxes on alternative fuels as ways to replace the fuel tax.

Traffic safety in rural areas was another issue discussed in the webinar. In 2010, 19 percent of the U.S. population lived in rural areas, but rural fatalities accounted for 55 percent of all traffic fatalities. Safety improvements through new seatbelt laws, the graduated driver's license law (implemented in Kansas), and strategic traffic enforcement programs were discussed.

(4)

Failure to Act: The Economic Impact of Current Investment Trends in Surface Transportation Infrastructure				
Author(s):	Economic Development Research Group			
Publisher:	American Society of Civil Engineers			
Year	2011			
Source Info:	This report, prepared by EDRG for ASCE, uses TREDIS to forecast the economic impact of "business-as-usual" transportation funding to 2040.			
Web link:	http://www.asce.org/uploadedfiles/infrastructure/report_card/asce-failuretoactfinal.pdf			
Study Region:	United States			
Revenue Enhancement Criteria	Revenue Yield [ ]	Long-term financing [ ]	Implementation Strategies [X]	Geographic Considerations [ ]

Abstract:

The American Society of Civil Engineers (ASCE) assesses the economic implications of deteriorating transportation infrastructure in the United States. Assuming "business as usual" conditions, ASCE considers economic impacts in several broad themes: wages, value added, industrial output, jobs, and international competitiveness. By 2040, ASCE estimates that deteriorating infrastructure will cost the American economy more than 400,000 jobs – and reduce overall job quality by shifting jobs away from higher-paying sectors, such knowledge-based industries, to lower-paying sectors, such as transportation service providers and automobile repairs (Chart on page 14). ASCE provides additional detail regarding this structural shift, noting that "industry sectors gaining jobs as a result of infrastructure deficiencies in 2040 have an average annual income level of 28% less than the income level of those sectors losing jobs." (page 15). This is estimated to result in a loss of wages for American equal to $252 billion by 2040. Despite predicted losses in income American households are estimated to spend an extra $54 billion on transportation by 2040. Businesses will also be affected by infrastructure deficiencies, and ASCE estimates that they will $232 billion less in value to the economy by 2040. ASCE stresses that deteriorating infrastructure in the United States adversely affects the country's competitiveness internationally, reducing total exports. By 2020, ASCE predicts the United States will have $28 billion fewer exports and, by 2040, $72 billion fewer exports. The most affected export commodities include finance and insurance, wholesale trade, aerospace, motor vehicle parts, communications equipment, and agriculture, forestry, and fishery products (Table on page 18).

TABLE 1 ★ The Mounting Cumulative Cost of Deficient and Deteriorating Surface Infrastructure Imposed on Americans*

PERFORMANCE AREA	COST OF DEFICIENCIES IN 2010	BY 2020	BY 2040
Pavement and Bridge Conditions	$10	$58	$651
Highway Congestion	$27	$276	$1,272
Rail Transit Conditions	$41	$171	$370
Bus Transit Conditions	$49	$398	$659
Inter-City Rail Conditions	$2	$10	$20
TOTAL COST TO SYSTEM USERS	**$130**	**$912**	**$2,972**

**Present value of cost stream in billions of constant 2010 Dollars*

SOURCE EDR Group analysts using Transportation Economic Impact System (TREDIS), 2011 NOTE Totals may not add due to rounding.

TABLE 2 ★ Summary of Impacts on Economic Performance Over Time *(billions of 2010 dollars)*

IMPACT OF DEFICIENCIES	CUMULATIVE IMPACT BY 2020	CUMULATIVE IMPACT BY 2040
Personal Income	–$930	–$3,135
US Value Added (Impact on GDP)	–$897	–$2,662

SOURCE LIFT/INFORUM model, University of Maryland. Calculations by University of Maryland using the personal consumption expenditure deflator. Income loss exceeds GDP because the deterioration of infrastructure has a disproportionately negative effect on high-wage industry sectors.

(5)

Paying Our Way				
Author(s):	Atkinson et. al			
Publisher:	National Surface Transportation Infrastructure Financing Commission			
Year	2009			
Source Info:	Prepared by the National Surface Transportation Infrastructure Financing Commission for Congress			
Web link:	http://financecommission.dot.gov/Documents/NSTIF_Commission_Final_Report_Advance%20Copy_Feb09.pdf			
Study Region:	United States			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [X]	Geographic Considerations [X]

This report analyzes the root causes of the United States' transportation funding crisis and details an exhaustive menu of options that could individually or collaboratively bring funding back to necessary levels to maintain or improve the transportation system. This report was produced by the National Surface Transportation Infrastructure Financing Committee as a response to Congress's charge to evaluate the future of the federal Highway Trust Fund and explore alternative funding and financing mechanisms for surface transportation.

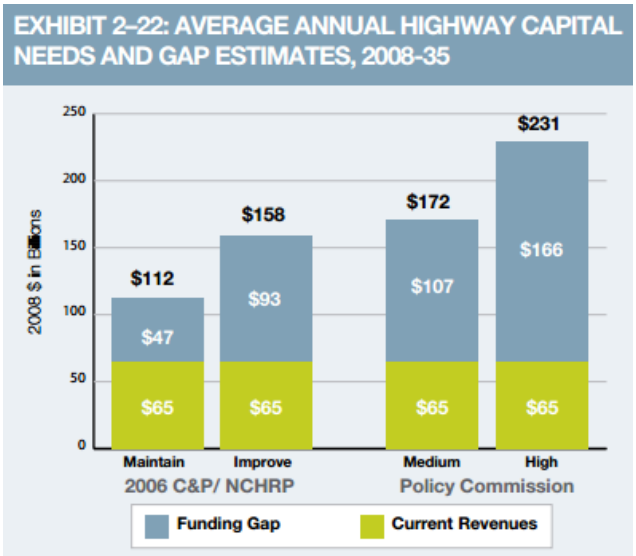
It was the result of a two-year effort led by 15 commissioners and it holds their unanimous consent. The report is divided into eight main sections:

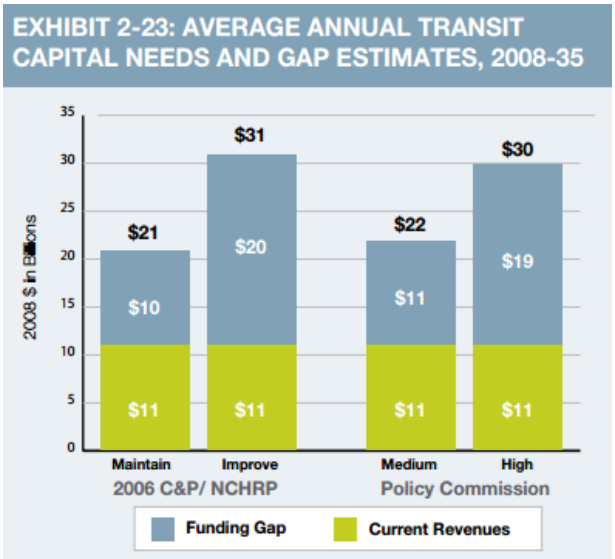
1. The Commission's Charge
2. The Widening Investment Gap
3. Existing Funding Sources and New Revenue Options
4. The Motor Fuels Tax
5. Freight-Related Charges
6. Tolling and Mileage-Based User Fees
7. Financing Projects and Policies
8. Policy Recommendations

(1) The Commission's Charge. The Commission lays out a set of criteria to enhance the transportation system so that it is safe, effective, efficient, fair, and sustainable. These factors are used to determine the viability of revenue options, which are discussed later in the report.

(2) The Widening Investment Gap. All levels of government in the U.S. are failing to keep pace with the demand for transportation investment and increasingly must use existing revenues simply to attempt to preserve and maintain an aging system. As explained by the Commission, "the debate over transportation investment needs is not whether there is a gap in funding, but rather how big that gap

is." The graphs below depict how large cumulative transportation funding deficits are projected to be from the year 2008 to 2035.





Estimates range from $112 billion to $231 billion for highway capital needs and from $21 billion to $30 billion for transit capital needs.

The declining purchasing power of the gas tax is the primary cause for funding shortfalls. The federal gas tax has not been raised since 1993. By not adjusting the tax rate for general inflation, gas receipts have experienced a cumulative loss in purchasing power of about 33 percent over the last 15 years. At the same time, average light-duty vehicles are beginning to realize fuel-efficiency gains, which result in less fuel purchases and thus less federal tax receipts. This issue is expected to become substantial by 2020.

Transportation investment has not been able to keep pace with transportation system use. Real highway spending in constant dollars divided by vehicle miles travelled has actually declined by 7 percent since 1988 and has fallen nearly 50 percent since the beginning of the Highway Trust Fund in the 1950s.

Another way to look at transportation investment is in relation to GDP. Total combined highway and transit spending as a share of GDP has fallen about 25 percent since the beginning of the Highway Trust Fund.

Maintaining adequate transportation investment into the future is an enormous challenge. The Commission explains in the report that applying a 2 percent long-term average annual inflation rule, the combined highway and transit funding level of $53.6 billion would need to grow to $91.6 billion by 2035 for current program purchasing power to be maintained.

(3) Existing Funding Sources and New Revenue Options. This section provides an exhaustive look at new and existing revenue sources. It develops criteria to evaluate the viability of those sources including the following:

- **Funding Stream considerations**, including the overall revenue-raising potential, sustainability, and flexibility of the funding approach

- **Implementation and administration considerations**, including the political and legal viability of a particular approach as well as the ease and relative cost of initial implementation, ongoing administration, and enforcement

- **Economic efficiency and impact considerations**, such as the ability of the mechanism to promote efficient use of the system and internalize any adverse side effects

- **Equity considerations**, including application of the user/beneficiary pays principle and consideration of equity across income groups and geography

- **Applicability to other levels of government**, focusing on the potential applicability of various funding approaches beyond the federal level to state and local government. This section then analyzes 37 options other than the gas tax for generating revenue. The chart below summarizes the overall potential of these mechanisms at the federal level.

EXHIBIT 3–8: REVENUE OPTION EVALUATION SUMMARY*

Strong	Moderate	Weak	Not Applicable/ Seriously Flawed**
Federal Options			
• Vehicle miles traveled fee • Automobile tire tax • Motor fuel tax • Carbon tax/cap and trade • Customs duties • Truck/trailer sales tax • Vehicle registration fee • Heavy Vehicle Use Tax • Container fee • Tariff on imported oil • Sales tax on motor fuels • Truck tire tax	• Freight waybill tax • Vehicle sales tax • Harbor maintenance tax • General fund transfer	• Freight ton-mile tax • Driver's license surcharge • Bicycle tire tax • Dedicated income tax • Auto-related sales tax • Freight ton-based tax • General sales tax	• Vehicle inspection and traffic citation surcharge • Vehicle personal property tax • Windfall profits tax • Petroleum franchise tax • Minerals severance tax • Federal tax on local transit fares • Federal tax on local parking fees
State and Local Options Benefiting from Federal Action			
• Facility level tolling and pricing	• Proceeds of asset sales, leases, and concessions	• Cordon area pricing • Passenger facility charges	• Development and impact fees • Tourism-related taxes • Tobacco, alcohol, and gambling taxes

It is noted in the chart on the previous page that some options, such as facility level tolling and cordon pricing are better mechanisms at the local and state levels of government.

(4) The Motor Fuels Tax. This section discusses revenue generation potential and trends of the federal motor fuel taxes. In 2007 and 2008, the contribution of federal motor fuel taxes to the Highway Trust

Fund averaged $35.7 billion. The Commission explains that due to a combination of travel growth, system deterioration, increasing construction costs, and lack of indexing, fuel tax revenues are becoming increasingly inadequate to meet investment needs. This inadequacy will likely be compounded as improved fuel efficiency and the development of alternative fuel vehicles will likely reduce fuel consumption.

Despite its shortcomings, the Commission comes to the conclusion that the motor fuel taxes are currently the most viable federal funding source for surface transportation investment and will likely remain so for several years.

(5) Freight-Related Charges. This section explores revenue mechanisms that can be employed to fund the freight industry's share of the Highway Trust Fund. It evaluates ton-mile taxes that are used in Oregon, Kentucky, New Mexico, and New York, as well as other options to generate revenue from truck use. The table below shows current options for generating revenue:

EXHIBIT 5-1: ILLUSTRATIVE COSTS TO TRUCKERS

Freight Tax Option	Tax Unity/ Yield	Rate to Raise $5 Billion	Impact on Typical Long Haul Truck		Impact on Typical Local Distribution Truck	
			Annual Cost	% of Revenue	Annual Cost	% of Revenue
Diesel Tax	1¢/gal = $404 million	12¢/gallon	$2,500	1.1%	$1,200	1.0%
Tire Tax	1¢/10 lbs = $45 million	$1.11/ 10 lbs	$2,088	0.9%	$1,044	0.8%
Heavy Vehicle Use Tax	10% = $103 million	490% increase	$2,695	1.2%	$2,695	2.2%
Freight Way Bill Tax	1% tax = $5,972 million	0.84%	$1,890	0.8%	$1,050	0.8%
Ton Tax	1¢/ton = $113 million	44¢/ton	$619	0.3%	$2,475	2.0%
Ton-Mile Tax	0.1¢/ton-mile = $4,020 million	0.124¢/ton-mile	$2,616	1.2%	$698	0.6%

The Commission believes the best way the best way to increase funds from freight in the short term is by increasing the fees that the trucking industry currently pays into the federal Highway Trust Fund and in the medium term by moving to a vehicle miles traveled fee structure.

(6) Tolling and Mileage-Based User Fees. This section presents two approaches of charging road users by the mile. The first, targeted tolling, pertains to charging a toll on a specific facility, such as a highway, tunnel, or bridge. The second approach, comprehensive pricing, refers to the imposition of direct user fees that apply on all roads and all driving in the form of mileage-based pricing (also known as vehicle miles traveled (VMT) fees).

Targeted tolling has grown in recent years. In the decade preceding this report, about one-third of all new limited access lane miles built in the U.S. were tolled. At the time of this report, there were 277 state and local toll roads, bridges, and tunnels in 32 states, tolling near 5,000 miles of roadway. In 2006, these facilities raised a total of $17.2 billion in revenue.

This section discusses the Oregon VMT Priding Pilot Project, the University of Iowa Public Policy Center Study, the Puget Sound Regional Council Study as well as the international truck pricing programs in

Germany, Austria, and Switzerland in the context of comprehensive pricing. The Commission then evaluates the advantages of comprehensive pricing and targeted tolling.

Some of the advantages discussed are included below:

- **Shifts some vehicle trips from peak to off-peak periods**—Oregon's road pricing pilot project, for example, resulted in a 12 percent decrease in VMT even though the charge per mile was, on average, equivalent to what a person would pay for the same travel through motor fuel taxes.
- **Reduces total vehicle trips and trip distances**—Increased cost transparency could lead drivers to combine trips (e.g., running several errands per trip rather than taking several trips) and plan their trips more carefully (e.g., consider closer destinations).
- **Increases mode shift**—Pricing can lead drivers to choose different modes of travel, including carpooling, transit, and bicycling/walking, or to increase telecommuting.
- **Improves reliability**—Pricing that proves to actually reduce demand in a meaningful way can improve travel time predictability and reliability by reducing the uncertainty of delays.
- **Reduces commercial services travel time**—While road pricing could add to the direct cost of commercial services travel (depending on the relative prices paid through road pricing versus current fees and fuel taxes), improved infrastructure and reduced congestion likely would more than offset these added costs through higher productivity. The Eddington Commission in the United Kingdom estimated the effects of congestion pricing on freight and found commercial services industries would be net beneficiaries.

Equity considerations are also discussed in this section. Some of the key issues are addressed below:

- If a VMT charge were imposed with no offsetting charges for carbon or other emissions, lower-income households would benefit, since they would be paying the same to drive as higher-income individuals with more fuel-efficient cars.
- The same would likely be true for rural residents who tend to drive vehicles that are less fuel-efficient, on average.

Privacy issues related to comprehensive pricing are also discussed in this section. The Commission emphasizes the need for privacy safeguards and explains that options exist, such as providing an administering agency with information that does not include trip origins, destinations, routes, or travel times, but instead just bulk charges due. The Commission notes that, "such a system would provide considerably more privacy than other information technology systems in our society, such as credit card and cell phone systems…"

(7) This section explores innovative financing methods to accelerate project development. It is important to remember. The following excerpt describes the limited role of innovative financing:

> "Financing approaches—as distinct from revenue raising mechanisms—are not a substitute for solving the underlying problem of insufficient funding. Properly structured financing techniques and government financial programs, including those focused on facilitating partnerships with the private sector, can play an

> important supplementary role. Their success, however, will depend on their ability to leverage new revenue streams to repay upfront capital investments.
>
> Even with this, financing approaches will have limited positive impact if not coupled with substantial net new resources."

(8) Policy Recommendations. This section explores the policy options available**.** The Commission recommends increasing the gas-tax in the short and intermediate term, while taking steps necessary to implement comprehensive pricing and targeted tolling in the medium and long-run.

(6)

The Forum on Funding and Financing Solutions for Surface Transportation In the Coming Decade				
Author(s):	Basso et. al			
Publisher:	American Association of State Highway and Transportation Officials			
Year	2011			
Source Info:	Produced as a conference report resulting from the September 30, 2010 "Forum on Funding and Financing Solutions for Surface Transportation in the Coming Decade"			
Web link:	http://www.transportation-finance.org/pdf/featured_documents/sep_30_report_final_2011_02_02.pdf			
Study Region:	United States			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [X]	Geographic Considerations [ ]

Abstract:

This report synthesizes research and discussions from a September 30, 2010 forum on funding and financing solutions for surface transportation. It evaluates the factors contributing to the increasing disparity between transportation revenue and transportation investment needs, and offers solutions to close the widening funding gap. **This report demonstrates a great urgency to establish a sustainable funding source to pay for both short-term and long-term transportation needs.**

The report explains that the traditional user fees (motor fuel taxes, truck and trailer sales taxes, truck tire tax, and heavy vehicle use taxes), which generate revenue for the Highway Trust Fund (HTF), have lost their purchasing power over time because they have not kept pace with inflation. Currently, HTF revenues fund only 44 percent of the necessary requirements to maintain the surface transportation system. (HTF revenues fund only 36 percent of the costs to improve the system.) **If adjustments are not made, by 2035 the purchasing power of HTF funds will decline by 25.5 percent, or the equivalent of $27.1 billion.**

The report also explains that, **improvements in vehicle fuel-efficiency are leading to less motor fuel tax revenues**. Vehicles with better fuel efficiency drive further on a gallon of gasoline and, therefore, do not need to refuel as often. This issue is just starting to affect fuel tax receipts; however, it is projected to substantially affect motor fuel tax revenue in the long-term. For this reason, **the report advises Congress to index the motor fuels tax to inflation for the short term and transition into a mileage-based user fee for the long-term**. (In a mileage-based user fee system, a driver pays a fee based on the amount of miles driven.)

Session summaries from the forum are documented in the report. A number of topics were discussed during breakout sessions of the forum, including:

- Converting an excise tax to a sales tax on motor fuels to enable the HTF to generate sufficient revenue over the next 5-6 years
- The difference between funding and financing –funding offers new revenue potential and financing offers new ways to borrow. It was emphasized that innovative finance could not replace reliable funding sources.

- Transportation investment should be communicated in terms of economic development and productivity
- **Comprehensive road pricing through mileage-based user fees was discussed as the most viable methodology for revenue generation**. In such a system, users could be charged a flat fee or a variable fee based on road usage. Numerous policies and pilot projects that demonstrated the feasibility of implementing a mileage-based system were analyzed in the report.

(7)

AASHTO Update on Funding and Authorization				
Author(s):	Joung H. Lee			
Publisher:	AASHTO			
Year	2010			
Source Info:	Developed as part of a webinar for the National Association of Regional Councils			
Web link:	http://www.transportation.org/Documents/Lee-2010-01-20.pdf			
Study Region:	United States			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [X]	Geographic Considerations [ ]

Abstract:

During a National Association of Regional Councils (NARC) webinar, Joung H. Lee, Associate Director for Finance and Business Development of the American Association of State Highway and Transportation Officials (AASHTO), provided an update on Federal Funding and Authorization. The discrepancy between Highway Trust Fund outlays and receipts was discussed, bringing to light an $11.4 billion disparity in FY2010. In other words, **the amount of revenue being brought into the Highway Trust Fund through the motor fuels tax and other user fees fell $11.4 billion short of paying for transportation outlays in FY2010.** This trend was estimated to continue so that, without infusions from the General Fund, **the Highway Trust Fund would be around $60 billion short of paying for necessary transportation outlays by FY2015.**

In his presentation, Lee explained that a declining federal contribution of transportation funding was especially dire due to the fiscal climate facing many states. Nineteen states experienced transportation funding cuts in FY2010.

Lee also explained that in order to maintain economic competitiveness the U.S. needs to invest around $500 billion over a six year period. That funding reality could be met with a combination of funding mechanisms used to generate revenue. AASHTO presented a Surface Transportation Funding Options Matrix, which can be seen on the following page.

Surface Transportation Funding Options Matrix (all revenue estimates in $millions)						
Funding Mechanisms	**Mechanism Yield (2010)**		**Illustrative Rate**	**Annual Revenues 2010**	**Average Annual Revenues 2010-2015**	**Total Revenues 2010-2015**
Annual Highway Miles Traveled Fee (Cars Only)	1¢/VMT =	$ 17,298	1.0¢	$ 17,298	$ 17,616	$ 105,696
Annual Highway Miles Traveled Fee (All light duty vehicles)	1¢/VMT =	$ 27,610	1.0¢	$ 27,610	$ 28,682	$ 172,094
Annual Highway User Vehicle Fee	$1.00 Fee =	$ 263	$1.00	$ 263	$ 275	$ 1,652
Carbon Tax or Cap And Trade Auction Proceeds	1¢/gal or equiv =	$ 553	30.0¢	$ 16,594	$ 17,250	$ 103,501
Container Tax	$1 per TEU =	$ 57	$20.00	$ 1,137	$ 1,336	$ 8,013
Diesel Tax Increase Plus Indexing	1¢/gal =	$ 411	13.0¢	$ 5,337	$ 5,976	$ 35,856
Existing Highway Trust Fund Sources				$ 40,566	$ 42,569	$ 255,413
Gas Tax Increase Plus Indexing	1¢/gal =	$ 1,380	10.0¢	$ 13,796	$ 15,082	$ 90,489
General Fund Support for Intercity Passenger Rail				$ 3,000	$ 3,000	$ 18,000
General Fund Transfers for Transit				$ 3,167	$ 3,167	$ 19,000
Index Existing Highway Trust Fund Sources Beginning in 2010				$ 791	$ 3,032	$ 18,192
Index Heavy Vehicle Use Tax Retroactively to 1997				$ 411	$ 536	$ 3,217
Interest on Highway Trust Fund Balances				$ 200	$ 200	$ 1,200
Motor Fuel Tax Exemption Reimbursement (Retroactive and Future)				$ 1,057	$ 1,099	$ 6,593
Sales Tax on Motor Fuels	1.0% of Sales =	$ 6,136	2.5%	$ 15,340	$ 15,658	$ 93,949
Share of US Customs Revenues	1% of Receipts =	$ 314	5.0%	$ 1,570	$ 1,817	$ 10,904
Tax Credit Bonds for Highways and Transit				$ 8,333	$ 8,333	$ 50,000
Tax Credit Bonds for Intercity Passenger Rail				$ 4,167	$ 4,167	$ 25,000
Ton Freight Charge -- All Modes	1¢/ton =	$ 162	10.0¢	$ 1,617	$ 1,801	$ 10,804
Ton Freight Charge -- Truck Only	1¢/ton =	$ 111	10.0¢	$ 1,115	$ 1,242	$ 7,452
Ton-Mile Freight Charge -- All Modes	1¢/ton-mile =	$ 42,763	0.1¢	$ 4,276	$ 4,763	$ 28,579
Ton-Mile Freight Charge -- Truck Only	1¢/ton-mile =	$ 12,516	0.1¢	$ 1,252	$ 1,394	$ 8,365
US Freight Bill -- All Modes	1% of Sales =	$ 7,708	1.0%	$ 7,708	$ 8,585	$ 51,513
US Freight Bill -- Truck Only	1% of Sales =	$ 6,497	1.0%	$ 6,497	$ 7,237	$ 43,420
Vehicle Sales Tax on New Passenger Cars/Light-duty Trucks	1% of Sales =	$ 4,853	2.0%	$ 9,707	$ 10,812	$ 64,870
Vehicle Sales Tax on New/Used Passenger Cars/Light-duty Trucks	1% of Sales =	$ 9,012	2.0%	$ 18,024	$ 20,077	$ 120,461
Total Revenues				**$ 210,831**	**$ 225,705**	**$ 1,354,232**

(8)

SSTI Survey of State and Local Transportation Revenue Sources				
Author(s):	Ebeling et. al			
Publisher:	SSTI			
Year	2013			
Source Info:	Developed in cooperation with the North Carolina Department of Transportation (NCDOT), which provided information and guidance on potential revenue strategies			
Web link:	http://www.ssti.us/wp/wp-content/uploads/2013/02/SSTI_Revenue-Rpt_FINAL.pdf			
Study Region:	United States, Canada, Europe			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

The SSTI report provides a comprehensive menu of options that can be used to generate revenue for transportation projects. It was written to address the transportation funding crisis that has resulted from the waning purchasing power of the fuel tax. The report explains that a combination of the following four factors is necessitating a transition from a fuel tax to other sources of funding:

- For decades in the U.S., travel per person increased steadily, bringing in more fuel tax revenue. But the **last decade has seen a decline in per capita highway travel**. Even with population increases, aggregate driving has flattened or even declined in some years.

- Political leaders at the state and national level have been less willing in recent decades to increase fuel taxes with inflation, or to index them for automatic increases. However, the **costs for construction and maintenance of roadways have continued to increase**.

- Vehicle **fuel efficiency is improving**, as a result of higher gasoline and diesel costs, more stringent federal regulations, and new technologies. **These improvements erode the motor fuel tax base, as vehicles refuel less frequently**.

- The major highway building era in the United States occurred about 50 years ago. **It is becoming increasingly expensive to maintain and reconstruct facilities built during that period**, and there is no obvious source of funds available to do so.

The SSTI report offers 34 different options for a locality, state, and the federal government to employ to generate revenue. Some of these options offer minimal potential, whereas others, like a vehicle miles travelled fee, have the potential to replace the fuel tax altogether.

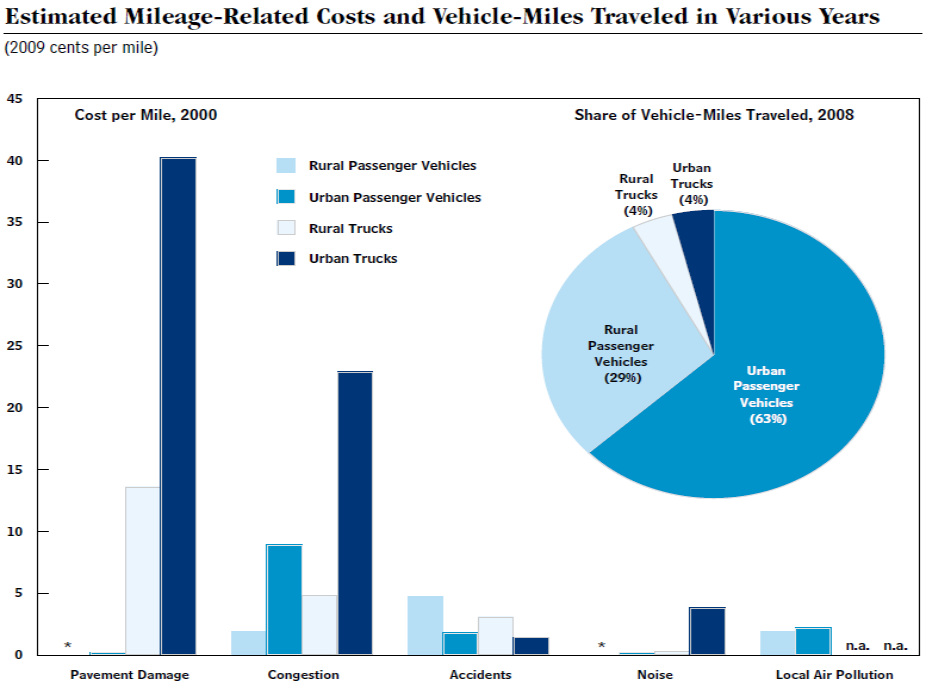
(9)

Alternative Approaches to Funding Highways				
Author(s):	Beider et. al			
Publisher:	CBO			
Year	2011			
Source Info:	Prepared at the request of the Chairman of the Senate Budget Committee			
Web link:	http://www.cbo.gov/publication/22059			
Study Region:	United States			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

This Congressional Budget Office Report evaluates the inefficacy of the fuel tax as a method to pay for highway costs, because it does not cover the costs of pavement damage, congestion, accidents, or noise. This report looks at the potential of using mileage-based user fees (MBUFs) to pay for highway costs, because they more accurately pay for costs associated with road usage than fuel taxes do. However, the report shows that **the most efficient way to pay for highway use involves both fuel taxes and MBUFs, because both methods operate to capture different highways costs.** Fuel taxes are an efficient payment method to cover the costs associated with vehicle emissions at the national level. MBUFs are an efficient method to pay for pavement damage, congestion, accidents, noise, or local vehicle emissions.

The report also illustrates that classes of vehicles contribute to the costs of highway use in different ways and to varying degrees. For example, nationally, passenger vehicles account for almost all of the costs associated with accidents. Cost per mile for congestion and noise are higher for trucks. A breakdown of costs per mile based on vehicle type is depicted in the image to the right.



The report states, "A consensus view of many transportation experts and economists is that a **system of taxes on vehicle-miles travelled should be viewed as the leading alternative to fuel taxes as a source of funding for highways**." In order to express the costs and benefits of using MBUFs instead of fuel taxes, the report compares the implications of equity, efficiency, privacy, and implementation costs across both revenue generation methods. The findings in the report can be found in the table below:

Implication	Fuel Tax	Mileage-based User Fees (MBUF)	Advantage of MBUF or fuel tax
Equity	- Satisfies user-pays criterion - Imposes greater-relative burden on low-income households	- Satisfies user-pays criterion - Imposes greater-relative burden on low-income households - helps rural or low-income households that drive less fuel-efficient vehicles	- **MBUF offers a concession to rural and low-income road users**
Efficiency	- promote better fuel economies	- most costs of highway use are related to miles driven; MBUFs address this - has the potential to be a variable fee providing incentives to reduce congestion - has potential to account for weight of vehicles providing incentives to reduce pavement damage	- Fuel taxes better promote fuel-efficient vehicles - variable MBUFs have potential to account for more user-costs
Privacy	- none	- GPS systems used to monitor road usage harbor data about vehicle users - safeguards would be required to ensure data was protected (i.e. through periodic payments, anonymous payments, or restricted information)	- no potential privacy issues arise with the fuel tax - MBUF system use could result in privacy abuses if safeguards are not put in place - aggregate data transmission helps protect privacy
Operational Costs	- about 1% of total revenue collected	- estimates of 1.7% to 4% of total revenue collected - however, could be much higher: Czech Republic has 30% of total costs and London experienced 50% of total costs	- operational costs of MBUF systems are higher than the costs associated with fuel collection - electronic metering and billing technology today makes MBUF costs practical

(10)

Highway Trust Fund: Pilot Program Could Help Determine the Viability of Mileage Fees for Certain Vehicles				
Author(s):	Government Accountability Office			
Publisher:	GAO			
Year	2012			
Source Info:	Developed by the U.S. Government Accountability Office (GAO), as a report to the Subcommittee on Transportation and other related agencies to provide information and guidance on vehicle miles travelled (VMT) fees			
Web link:	http://www.gao.gov/assets/660/650863.pdf			
Study Region:	United States			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

This report was prepared by the United States Government Accountability Office (GAO) to determine the viability of a mileage-based user fee (MBUF) fee for replacing the motor fuels tax. It explains that revenue in the Highway Trust Fund has eroded over time partially due to federal fuel tax rates that have not increased since 1993 and partially due to improvements in vehicle fuel efficiency. As a result, drivers are not bearing the full costs of using the road, and the Highway Trust Fund is becoming further removed from being self-financing. **Congress has transferred $52.8 billion in general revenues over the past six years in effort to close funding gaps**. GAO explains that a VMT fee would preserve the user-pays principle and promote more efficient road usage. The fee sends clear price signals to road users and provides incentives for drivers to consider alternatives such as public transit or carpooling, which can reduce congestion, vehicle emissions, and overall spending on fossil fuels.

The report examines highway wear and mileage fee solutions based on vehicle weight. For example, road damage increases exponentially with the weight of a vehicle's axel load, and a commercial truck with five axels weighing 80,000 pounds imposes roadway damage equivalent to the damage imposed by 24,000 passenger cars. The report explains that **charging mileage fees to commercial trucks may be easier to implement than passenger vehicle fees, because there are less concerns regarding privacy and fewer challenges with initial and ongoing costs.**

Five American pilot programs and six international mileage fee programs are analyzed in this report. GPS, pay-at-the-pump, and prepaid manual systems emerged as options for policy-makers to gather mileage data and charge drivers users fees. GPS systems are more socially equitable and provide for more efficient use of roadways; however, they raise significant privacy-related concerns and require high start-up and ongoing costs. Pay-at-the-pump and prepaid manual systems are less efficient, because they are unable to gather driving data required for variable pricing; yet, they alleviate privacy-related concerns and limit administrative costs. The table below compares and contrasts each mileage-based system.

Table 1: Benefits and Challenges of Mileage Fee Systems

Mileage fee systems	Benefits	Challenges
GPS systems	Opportunity to improve the efficiency of road use through variable pricing, or charging road users a higher rate during peak traffic times and a lower rate during times with light traffic. Ability to improve equity by accurately pricing road use for all users and vehicle types consistent with the costs imposed.	Perception of government intrusion on privacy by tracking privately owned vehicles and risk of data being compromised or disclosed for unauthorized uses. High start-up and ongoing costs associated with unit installation, implementation, billing, revenue collection, and enforcement.
Pay-at-the-pump systems	Alleviates some privacy-related concerns of tracking privately owned vehicles by not requiring the use of a GPS system.	Cost and logistical challenges associated with the installation and management of equipment at gas stations nationwide and installation of transponders in vehicles. Unable to gather driving data needed to implement variable pricing based on congestion to encourage efficient road use. Not compatible with alternative fuel vehicles that do not use gas stations.
Prepaid manual systems	Alleviates privacy-related concerns of tracking privately owned vehicles by not requiring the use of GPS system. Limits administrative costs by eliminating the need to outfit vehicles or fuel pumps with the necessary technology to collect total miles traveled.	Unable to gather driving data needed to implement variable pricing to encourage efficient road use. Increased risk of evasion through odometer tampering creates equity issues.

This report also analyzes potential pitfalls of an MBUF fee. For example, a system that charges all passenger vehicles the same rate would lead to drivers of more fuel efficient vehicles paying proportionately more in mileage fees. For example, a hybrid with a fuel efficiency of 40 mpg would pay over twice its current fuel costs in a scenario where an MBUF fee replaces the federal fuel tax.

(11)

2013 Comparative Data Report on State Transportation Programs				
Author(s):	John Snyder			
Publisher:	Legislative Research Commission			
Year	2013			
Source Info:	Prepared for Fiscal Affairs and Government Operations Committee for the Council of State Governments at the Southern Legislative Conference			
Web link:	http://www.slcatlanta.org/Publications/cdrs/2013/2013_CDR_TRANSPORTATION.pdf			
Study Region:	Southern Legislative Conference (15 southern states: AL, AK, FL, GA, KY, LA, MS, MO, NC, OK, SC, TN, TX, VA, WV)			
Revenue Enhancement Criteria	Revenue Yield [ ]	Long-term financing [X]	Implementation Strategies [ ]	Geographic Considerations [ ]

Abstract:

This report synthesizes the responses of an email survey that was sent to the 15 southern states that comprise the Southern Legislative Conference. The states in the SLC were surveyed on a range of topics, one being whether or not they had implemented any extraordinary measures to generate funds for transportation topics. **Eight of the 15 states surveyed have passed recent legislation regarding ways to generate revenue.** The results can be seen in the table below:

State	Legislative Action
Alabama	• Authorized up to $25 million in **bonds** as part of a program to provide state matching funds for GARVEE bond-backed funding that will allow local governments to replace local bridge and road projects
Arkansas	• Passed a special temporary ½ cent **sales tax** for certain transportation projects • Increased the annual **registration fee** for trucks between 73,281 and 80,000 pounds by $203, from $1,350 to $1,553
Georgia	• Approved temporary **sales tax** increases dedicated to fund transportation projects
Kentucky	• Authorized the KYTC to enforce **toll collections** and use design-build procurement procedure for up to five projects each year
North Carolina	• Allowed its previous **motor fuel tax cap of 37.5 cpg sunset** on June 30, 2013 and rose to 37.6 cpg July 1, 2013 (however, the gas cap was reinstated at 37.5 cpg effective Oct. 1)
South Carolina	• Passed an **omnibus highway financing bill** to generate almost $600 million of one-time money, with $41 million of recurring funds
Virginia	• Passed an **omnibus transportation funding bill** • Changed the maximum amount of **bonds** the Commonwealth Transportation Board may issue from $704.3 million to $1.3 billion • Changed proposal requirements for the **Public-Private Transportation Act** (PPTA)
West Virginia	• Revised the **Public-Private Partnership** code to eliminate the requirement for legislative concurrence prior to the execution

This report also includes survey findings relating to fuel taxes. **Only three SLC states** (Texas, South Carolina, and Louisiana) **saw an increase in the net volume of motor fuel taxed from 2010 to 2011**. Additionally, topics such as bridges, public transit, fatalities, road mileage, and administration and operation of state departments of transportation are covered in this report.

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(12)

Changing North American vehicle-price sensitivities: Implications for transport and energy policy				
Author(s):	Litman, Todd			
Publisher:	Transport Policy			
Year	2012			
Source Info:				
Web link:	http://www.sciencedirect.com/science/article/pii/S0967070X12000947			
Study Region:	North America			
Revenue Enhancement Criteria	Revenue Yield [ ]	Long-term financing [ ]	Implementation Strategies [X]	Geographic Considerations [ ]

Abstract:

The article begins with a definition of elasticity as it relates to transportation. Lower transport elasticities imply that transport pricing reforms have little effect and consumers find it difficult to change their activity; higher elasticities imply that changes have been very beneficial because consumers significantly change their behavior. **This article reviews evidence that elasticities are increasing and consumers are becoming far more responsive to changes in vehicle-related price increases.**

The main factors that may explain some of the changes include:

- Price change magnitude relative to household income (as transportation costs form a higher percentage of transportation costs, price changes have a larger effect)
- Perceived durability (as prices changes are perceived to be more permanent than temporary, consumers are more responsive)
- Type of travel and traveler (travelers who do not have access to an automobile or are traveling for work tend to be less responsive to changes in price)
- Quality of alternatives (with high-quality public transit, price changes related to automobile transportation have a greater impact)
- Time period analyzed (over a longer period of time, consumers have more choices with regard to fuel efficient cars, and fuel price changes will have a greater effect)

The study includes a literature review of studies that generally show that price elasticities are lower in the short run and higher in the long run, and that the elasticities began to increase after 2005. It continues with a discussion of factors that may have contributed to some of these changes. These changes include a leveling off in the rise of per capita median income, a decline in workforce participation rates, recent rise in fuel prices, a high level of saturation rate in the vehicle travel, the

increase in multi-modal transportation, the declining rate of roadway expansion, and consumer preferences.

(13)

When the Road Price is Right: Land Use, Tolls, and Congestion Pricing				
Author(s):	Sarah Jo Peterson and Rachel MacCleery			
Publisher:	Urban Land Institute (ULI)			
Year	2013			
Source Info:	Reports the findings of an expert workshop convened by the Urban Land Institute to discuss the land-use implications of various road and congestion pricing strategies.			
Web link:	www.uli.org/wp-content/uploads/2013/03/When-the-Road-Price-is-Right_web_F.pdf			
Study Region:	United States			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

The authors begin with a brief overview of tolling, VMT charges, and congestion pricing in the context of decreasing transportation revenue forecasts and increasing transportation needs in the future. However, the authors consider a few broader issues not often considered in other literature: the ultimate land-use implications of road pricing mechanisms and the use of road pricing mechanisms as a congestion management approach to enable reliable, congestion-free travel for long distances for certain classes of road users (i.e., those that can and are willing to pay). In this context, land markets react to road pricing mechanisms, increasing the value of some land while reducing the value of other land bases on the accessibility of the land to free and priced travel lanes and the ability and willingness of the landowner(s) to pay for congestion-free travel. Theoretically, the authors note that land market feedbacks could further segregate urban areas based on income level.

The authors continue to present the findings of a workshop that brought together real estate developers, economists, transportation researchers and practitioners, and other parties to discuss the land-use implications of five different revenue enhancement strategies, implemented on a large scale: bus toll lanes, optional toll lanes, increased federal gas tax, a federal VMT tax, and federal tolling of the Internet Highway System. Generally, the experts believed that across all scenarios revenue enhancement mechanisms would impact land-use decisions over the medium- to long-term; however, these impacts would vary greatly based on contextual factors at the municipal level (e.g., availability of modal substitutes, nature and density of the existing street and freeway network, existing land-use patterns, etc.) The experts also agree that increasing the cost of driving will enhance the market for walkable, compact urban forms; however, this effect varies across scenarios. For Scenario 1 (bus toll lanes), the experts conclude that this revenue enhancement mechanism will “help meet demand for and foster development in compact, mixed-use, walkable nodes.” The experts conclude that Scenario 2 (optional toll lanes) is likely to support sprawling land-use patterns by enabling individuals to pay a premium for congestion-free travel in exchange for access to cheaper land on the urban periphery.

(14)

Tracking State Transportation Funding Plans				
Author(s):	(none listed)			
Publisher:	Transportation for America			
Year	2013			
Source Info:	Website tracks current, active and enacted state/regional transportation funding plans			
Web link:	http://t4america.org/resources/state-plans-tracker/			
Study Region:	AK, AR, IN, MD, MA, MI, MN, MS, MO, MN, MT, NV, NH, OH, PA, VA, WA, WI, WY			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [ ]	Geographic Considerations [X]

Abstract:

This website includes a **chart** that lists information and relevant detail on any of the following: **state and source of plan**, **expected revenue**, **sales tax**, **local option**, **gas tax**, **fees/fares**, **mileage-based user fees (reported here as 'VMT'), tolling**, **bonding**, **other**, and modes. The chart is compiled from sources including press releases, Governors' budget documents, news clippings, and actual legislation.

The projects range in size. A sales tax increase in MO is currently expected to raise the greatest expected revenue ($7.9B over ten years from a 1 penny sales tax increase). A commission in MN proposes a combination of strategies (sales tax, local taxes, gas tax increase, and tolling) that would raise $1B annually. The smallest listed expected revenue is VT's $28 M annual increase (from a gas tax increase).

Only 5 of the entries on the list have been enacted: A sales tax increase in AR (half a penny, to raise $1.3 B in general obligation bonds); indexing gas taxes and transit fees to inflation in MD (to raise $4.4B over 6 years); a diesel tax increase in VT (to raise $28M annually); a restricting of the gas tax, redirecting of sales tax, and creation of a hybrid vehicle fee in VA (to raise $3.5 B over 5 years); and a 10 cents per gallon gas tax increase in WY (to raise a surprisingly low $70 M annually).

Out of 27 entries (some states have multiple entries), 19 strategies involve changing the gas tax (most are flat rate increases; VT successfully reduced the gas tax but raised the diesel tax by 3 cents, PA would eliminate a cap on a wholesale gas tax paid by stations, MD successfully indexed the gas tax to inflation).

12 entries involve increasing fees and fares. Only two of the 12 entries involve raising transit fees; most fees would affect vehicle registration and licensing fees. The only mileage-based user fee on the list is in WI, where a commission recommends instituting a mileage-based registration fee to raise $2.28B over ten years. MD and PA are the only states indexing fees to inflation (MD for transit fares, PA for vehicle registration fees).

11 entries address a sales tax option. In AR, voters approved a ½ penny sales tax increase to repay $1.3B in new general obligation bonds.

6 entries are for a 'local option'—allowing communities to increase vehicle licensing fees or a combination of taxes.

5 entries address tolling, though they are less specific—Commissions in MN and PA recommend 'possible expansions.' The MA Governor's 2013 budget recommends increases tolls by 5 percent every two years beginning FY2015.

5 entries address bonding, though most in combination with one of the other strategies. NV is the only exception to this rule, where the state Governor proposes issuing a $58M bond to be repaid with liquor tax receipts.

2 entries fall under 'VMT': WI, with a mileage-based fee of 1.5 cents a mile (to raise $390 M per year); and WA, with a 15 percent increase in weight fees on large trucks and an increase in certain vehicle fees (expected revenue not listed).

10 entries fall under 'Other', though all are used in combination with a number of other strategies. 'Other' includes items like increasing taxes on cigarettes (MA), income tax increases (MA), increasing traffic violation charges (PA), shifting cost of the state police to the general fund (PA), enabling public-private partnerships for toll0financed construction (MI), redirecting internet sales tax receipts if the Congressional ban is lifted (MD and VA), and a $25 fee on the purchase of premium bicycles to fund the complete streets programs (WA).

(15)

AASHTO State Funding Proposals				
Author(s):	(none given)			
Publisher:	AASHTO			
Year	2013			
Source Info:	Summary document found through AASHTO Center for Excellence in Project Finance			
Web link:	http://www.transportation-finance.org/pdf/featured_documents/state%20transportation%20funding%20proposals%202013_09_02.pdf			
Study Region:	AZ, AR, CA, CT, DC, FL, ID, IL, IN, KY, LA, ME, MD, MA, MI, MN, MO, MT, NV, NH, NJ, OH, OR, PA, SC, UT, VT			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [ ]	Geographic Considerations [X]

This document provides a **state-by-state description of transportation funding needs and proposed revenue tools**. It also provides the status of each proposal.

Of the 27 states listed, 11 have successfully implemented all or part of the proposed revenue tools. Briefly:

- AR has implemented a half-cent sales tax increase
- CA has successfully raised the state gas tax
- District of Columbia has eliminated its gas tax with taxes on wholesale gas and diesel
- IN has established a metropolitan transit district in Indianapolis and nine surrounding counties
- KY has established tolls on Ohio River Bridges
- MD has indexed the gas tax and transit fares to the CPI (along with a 3% increase on wholesale gas sale tax)
- MA indexed the gas tax to inflation (the state also expanded the sales tax base to include previously excluded industry and increased vice taxes)
- OR successfully completed its mileage-based fee pilot program
- PA has earmarked natural gas impact fees to counties
- TX has diverted oil and gas revenues from the state's rainy day fund (will need voter approval—scheduled for 2014—to pass)
- VT will raise the price of diesel by 3 cents per gallon, but modify its gas tax by decreasing the cent per gallon tax by .8 and assessing a 2% tax on the price

States considering mileage-based user fees include WA, which has passed legislation authorizing a pilot study; AZ, which is currently in discussion to form a study committee; WI, which is considering a mileage-based user fee of 1.02 cents per mile for cars and light trucks; FL, which is in preliminary discussions around mileage-based user fees,

States considering a variety of fee changes include WA, which has established an electric car fee; WV, which is considering increasing registration fees; WI, which is considering increasing registration fees for

heavy trucks and international registration program vehicles; ID, which is considering a registration fee increase; MI, which is considering raising registration fees; MN, considering raising registration fees; NH, considering raising vehicle registration fees; PA, considering raising registration and licensing fees; TX, which has successfully increased registration fees; UT, considering increasing public transportation fees; VA, successfully increased vehicle registration fees and implemented an Alternative Fuel Vehicle Fee.

The only states considering a congestion fee is VA, which successfully implemented a regional congestion fee.

A detailed description of each state's needs (when listed), proposed revenues, and status is below:

	Needs	**Proposed Revenue Tools**	**Status**
AZ	· $63 billion gap over 25 years, which, if averaged, equals $2.52 billion annually.	· Framework for a study committee to look at a VMT fee.	· Under preliminary discussion.
AR	(none listed)	· Half-cent sales tax increase (from 6 to 6.5%) to fund $1.8 billion in highway improvements over the next ten years. The sales tax increase will be rescinded after ten years after the bonds used from the proceeds are repaid. · Increase the truck registration fee by 15% to raise $6 million.	· Half-cent sales tax increase: Passed statewide ballot in November 2012, collection starts July 1, 2013.
CA	(none listed)	· Raising the state gas tax by 3.5 cents. · Allocation of $333 million in new funding to 91 projects from bond revenue.	· Raising state gas tax: Passed by California Board of Equalization, will take effect July 1, 2013. · Allocation of funding from bond revenue: Allocated March 5, 2013.
CT	(none listed)	· Proposal to place tolls at Connecticut's borders. · Implement a lockbox for transportation funds.	· Tolls in general discussion. · Lockbox passed state legislature unanimously.
DC	(none listed)	· 23.5 cpg gas tax replaced with an 8.3% tax on wholesale gas and diesel purchases.	· Approved by DC Council May 22.
FL	(none listed)	Beginning exploration of possibly moving to a mileage-based user fee.	Under preliminary discussion.
ID	(none listed)	· Increasing the sales tax to 7%. · Registration fee increase. · Taxing rental cars. · Increasing Idaho's existing 25-cpg gasoline tax.	· Expected to come before lawmakers in 2014.
IL	(none listed)	· Replace the current 19-cpg motor fuel tax with a 9.5% wholesale tax. Would add about 14 cents to today's price of a gallon of gas.	· In general discussion.
IN	· Indiana DOT says it needs $200 million more per year.	· Setting aside half of the revenue collected by sales tax on gasoline purchase for transportation would raise $286 million.	· First three bulleted tools in general discussion.

		· Pulling the Indiana State Police, the Bureau of Motor Vehicles and the Department of Revenue out of the list of recipients of shares of Indiana's 18 cpg gas tax and devoting that money entirely to roads would raise up to $144 million a year. · The extra cash would be split between Indiana DOT and counties, cities and towns. · HB 1011: Would establish a metropolitan transit district in Indianapolis and nine surrounding counties, with the adoption by the participating counties of a local income tax of 0.3% dedicated to funding the new regional transit system. · HB 1292: Increases the gas tax by 2 cpg for gasoline with an octane number greater than 87, with the revenue going to bridge repair.	· HB 1011 passed House and Senate. Awaiting being signed into law. · HB 1292 in general discussion.
KY	(none listed)	· Institution of tolls on the Ohio River bridges	· Passed, awaiting final details to be discussed.
LA	(none listed)	· Bill which would allow businesses to sponsor state-owned assets, such as ferries and rest stops. The proceeds from this would be cycled back into the asset.	
ME	· American Society of Civil Engineers Report card states Maine has 53% of roads in poor or mediocre quality, 356 structurally deficient bridges and 77 high-hazard dams.	· Proposal for $100 million in bonds for transportation that would trigger approximately $154 million in federal and other matching funds.	· In general discussion.
MD	· $700-800 million per year is needed to address congestion problems in the state.	· Index the current 23.5-cent-per-gallon state gasoline tax to the Consumer Price Index (CPI) to adjust for inflation, but also limit the index increase to the gas tax rate so that it cannot exceed 8% a year.	· Primary bill passed by Legislature. Signed by Governor May 16, 2013.
	· Maryland DOT's capital fund will bring in about $2 billion less than forecast over	· Apply 1% of the state sales tax on the price of gasoline (before federal and state taxes), with that increasing to 2% on January 1, 2015 and to 3% on July 1, 2015.	· Companion bill for lockbox passed House and Senate and will be on the ballot for voters in November 2014.

	the next six years.	· In 2014, State Treasury to issue General Obligation Bonds for federally required environmental improvements undertaken by the State Highway Administration. · In 2014, index transit fares charged by the Maryland Transit Administration to the CPI.	
		· Effective January 1, 2016, state transportation to receive revenue generated by implementation of thefederal Marketplace Fairness Act (provided passage by Congress – enables states to require Internet sellers to collect sales taxes.) As a safeguard, and only if the Marketplace Fairness Act does not pass, the 3% state sales tax on gasoline increases to 4% on January 1, 2016 and 5% on July 1, 2016. · 3% sales tax on gasoline at the wholesale level to help fund state transportation projects. · Will generate an average of $800 million annually at full implementation. · Companion bill with a constitutional amendment that would put a "lockbox" on the state's Transportation Trust Fund that would protect it from diversions of money to other purposes.	
MA	· The state transportation system needs $1 billion-plus in new annual revenue.	· Raise the income tax rate to 6.25% from 5.25%, while lowering the sales tax rate to 4.5% from 6.25%, including closing some business tax loopholes, resulting in a net revenue increase to fund transportation as well as education. · Raises $1.1 billion in additional transportation funding annually.	· Final version raises the state gas tax 3 cents per gallon and indexes to inflation for the future, raises the cigarette tax $1 per pack and imposes the state sales tax on computer software on computer software and services. Provides $500 million in new taxes. Enough votes in legislature to override Governor's veto. Taxes took effect at beginning of August 2013.
		· Raise the income tax rate to 6.25% from 5.25%, while lowering the sales tax rate to 4.5% from 6.25%, including closing some business tax loopholes, resulting in a net revenue increase to fund transportation as well as education.	

		· Raises $1.1 billion in additional transportation funding annually. Proposed Revenue Tools and Yield Potential – Joint House/Senate Proposal · State gasoline tax would be raised 3 cents per gallon, and then would be indexed to inflation beginning in 2015. This would generate $110 million in the next fiscal year. · $165 million total increase in tobacco taxes on cigarettes, cigars, and smokeless tobacco, with the money going to transportation.	
		· Change the state's tax code to apply the sales tax to computers system design services and modification of prewritten software, along with another business tax change regarding utility classification, would generate about $248 million, with the money going toward transportation. · Raises $500 million total. · Raise the gas tax 3 cpg and index to inflation. · Raise cigarette taxes by $1 per pack. · Increase the excise tax on cigars and smokeless tobacco. · Raise roughly $250 million in new taxes on businesses. · Goal would be to raise $500 million in new revenue while spreading the burden. · Reinstatement of tolls for passenger vehicles on the Massachusetts Turnpike between Exits 1 and 6. · Revenues would be spent only on road, rail and transit projects in the four counties of Western Massachusetts. · Would raise $12 million/year	
MI	· $1.2 billion annual shortage in road funding.	· Raise the state's gasoline and diesel tax to 33 cpg (from 19 cpg and 15 cpg, respectively). · Increase registration fees by 60% for passenger vehicles and light trucks and 25% for large trucks. · Devote some sales tax revenue to transportation.	· In general discussion.
		· Allow counties to raise additional money for local roads and public transportation via a tax on the price of vehicles. · Raises $1.2 billion additional per year.	

MN	(none listed)	· In the seven-county Twin Cities metro area, increase the sales tax 0.5% in five counties and 0.25% in two counties to provide a permanent stream of money to expand LRT construction, add bus rapid transit lines and make up transit operating deficits, which would raise $250 million per year. · Increase sales tax by half a cent in Twin Cities metro area to raise $200 million annually for transit. · Enable county sales, vehicle, and other optional taxes.	· Sales tax increase taken out of bill by Senate Tax Committee.
		· Increase gas tax to raise $15.2 billion over 20 years. · Increase vehicle fees by 10% to raise $1.1 billion over twenty years.	
MO	· $600 million to $1 billion annually.	· Increase the state sales tax by one cent, with all revenue going to transportation (10% to cities and counties for local transportation needs). · The sales tax would not be levied on medicine, groceries and gasoline. During the ten years after an enaction date, the gas tax rate would be frozen and existing roads could not be turned into toll roads. After the ten years, voters could decide whether to extend the tax. · Supporters estimate it could generate $790 million annually.	· Did not make it out of the General Assembly. Governor is supportive of additional transportation funding, however, as long as it is put the public for a vote.
MT	(none listed)	· Raising the state gas tax 2 cpg: one cent for road maintenance and one cent for transit funding. · Creating a new oil-and-gas impact fund that would make available at least $85 million over the next seven years to fund projects that are needed "as a direct consequence of an increase in oil-and-gas development activity," with the preference given to infrastructure projects. The funds would come from a portion of federal mineral lease payments that go into the state treasury.	· Raising gas tax rejected. · Oil-and-gas impact fund passed Senate, awaiting House action on revised bill
NV	· $4 billion over next decade.	· State lawmakers discussing a bill that would raise the gas tax 2 cents per year for the next decade.	· In general discussion.
		· Would raise $300 million in the first year and about $3 billion over the course of the next decade.	

NH	· $12 million/year just to maintain the current level of good- and fair-rated roads (63% of road system, with 37% being rated poor), and another $15 million to keep the number of state-owned red-listed bridges flat.	· Increase the gas tax by 12 cpg and raise vehicle registration fees by $15 over the next three years. · Would raise $100 million/year for the state and $15 million for towns and cities.	· Passed House, awaiting Senate action.
NJ	(none listed)	· Proposed bill to allow private companies to sponsor highway rest stops. · Marketing the New Jersey Turnpike logos.	· In general discussion.
OH	· $1.2 billion.	· Issuance of bonds by the Ohio Turnpike Commission to fund transportation projects, which would be backed by future toll revenue. Would raise $1.5 billion, with possibly another $1.5 billion from local and federal matching. Would be funded by raising tolls on Ohio Turnpike by 2.7%/year over 10 years – about 30% over the next decade.	· Turnpike Commission scheduled to vote in July.
OR	(none listed)	· Instituted a VMT pilot program. Drivers paid the state 1.6 cents per mile and were refunded the state taxes they pay on fuel. · 9% of Oregon Lottery proceeds towards the construction and operation of mass transit, passenger rail, bicycle and pedestrian projects, with another 9% toward air, marine and some rail projects. This 18% combined would equal roughly $100 million every two years.	· VMT pilot program ran from November 2012 to January 2013. · Lottery proceeds: In general discussion.
PA	· $2.5 billion needed to fix aging roads and bridges, as well as supporting mass transit.	· Do away with the cap on the "oil company franchise tax" part of the gas tax to allow it to rise by about 28.5 cents over five years in three installments, while reducing the liquid fuels tax portion of the gas tax by one cpg each of the next two years.	· Difference in amount per year of funding between House and Senate versions.
		· Raise fees on driver's licenses, vehicle registration, and traffic tickets. · Would raise approximately $2.5 billion.	· Natural gas impact fee money earmarked.

		· Nearly $18 million being distributed to counties from natural gas impact fees for bridge repair.	
SC	· 1,000 structurally deficient bridges, along with needed spending on roads. A task force created by the state Department of Transportation Board estimated last year the state needs to spend $29 billion over 20 years to bring the condition of roads and bridges to an adequate level.	· Governor would like to spend $137 million of $163 million that was added to state's budget on bridges. · South Carolina House of Representatives wants 80% of vehicle sales taxes to be set aside for road repair. Governor would like this money to be in addition to $137 million. · House/Senate Joint Panel approved a plan which provides up to $141 million in state taxes toward infrastructure, puts $50 million from the current year's surplus toward bridge repair and transfers $41 million from the state sales tax on vehicles to the state DOT for repairing secondary roads. These proposals along with borrowing and federal highway matches could push the total to more than $798 million.	· A Transportation Funding Special Subcommittee has been formed to consider all proposed plans and concerns from the public.
TX	· $1 billion/year for maintenance, additional $3 billion/year to expand.	· Consideration of rededicating all motor vehicle taxes for transportation. · Leaders including Gov. Rick Perry have advocated taking some money from the state's Rainy Day Fund to set up a revolving loan fund for transportation and water. · Texas Senate Finance Committee Chairman has discussed increasing the motor vehicle registration fee, an idea also under discussion in the Texas House.	· Final version approved a constitutional amendment that would boost transportation spending by about $1.2 billion per year by diverting oil and gas revenues from the state's Rainy Day Fund. This will be put on the ballot for voters in 2014 and require the Legislature to set a minimum balance for the Rainy Day Fund every two years.

		· Coalition of business groups including the Texas Association of Business, the Texas Oil and Gas Association, the Texas Motor Transportation Association and the Texas Association of Realtors endorsed a multi-pronged plan that would raise $3.6 billion. The plan includes using money from the Rainy Day Fund, ending some diversions from the gas tax, raising vehicle registration fees statewide by $50 and dedicating a portion of sales tax revenue already collected from vehicle sales to highway projects. · House bill would ask voters to approve amending the constitution in order to raise about $800 million for the state's highway fund through a complicated shifting of different revenue streams including oil and gas production taxes and the gas tax.	
UT	· $11 billion over current revenue levels through 2040.	· Imposing a standard sales tax on gasoline. · Raising the gas tax. · Increasing fees for public transportation users. o Some combination of these measures. · Applying the standard state sales tax to gasoline purchases would raise the most out of the above options, raising an estimated $10-20 billion through 2040. · Periodically raising the gas tax would contribute $3-7 billion between now and 2040.	· Proposal submitted by the Utah Foundation; action not taken up by lawmakers as of yet.
VT	· $35 million annually.	· Net increase of gas tax by 5.9 cpg (2% assessment on the price of gas while the cpg price drops 0.8) · Increase diesel tax by 3 cpg over two years. · Would raise $36.5 million the first year, with a greater amount in following years.	· Signed into law by Governor April 29, 2013. Tax took effect on May 1.

(16)

North Carolina I-95 Economic Impact Assessment				
Author(s):	Cambridge Systematics/NCDOT			
Publisher:	NCDOT			
Year	2013			
Source Info:	This report, prepared for NCDOT by Cambridge Systematics, investigates the economic impacts of "business-as-usual" funding for the I-95 corridor in North Carolina, along with several non-traditional funding schemes.			
Web link:	http://www.driving95.com/assets/pdfs/_I-95_Economic_Assessment_FinalReport_May2013.pdf			
Study Region:	North Carolina			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [ ]	Geographic Considerations [X]

Abstract:

After NCDOT reccommended tolling to provide funding for improvements in the I-95 corridor in an EA, the state legislature instructed NCDOT to conduct an economic impact anlaysis of various revenue enhacment options along the corridor. Without additional investment beyond "spot treatments" (business-as-usual), predicted impacts are detailed in the table below (taken from report, page 3-50):

Table 3.15 Economic Impacts of Business as Usual Compared to the Baseline Economic Forecast
2014 to 2050

Metric	Constr.	%	Long-term	%	Total	%
I-95 Counties						
Business Transportation Costs ($billions 2012)					**$51.70**	
Gross Regional Product ($billions 2012)	$0.23	0.0214	($41.10)	(2.57)	**($40.80)**	(2.550)
Personal Income ($billions 2012)	$0.22	0.0179	($44.30)	(2.33)	**($44.10)**	(2.314)
Jobs (average annual full-time)	132	0.0345	(9,858)	(2.26)	**(9,727)**	(2.222)
Eastern NC						
Business Transportation Costs ($billions 2012)					**$6.00**	
Gross Regional Product ($billions 2012)	$0.04	0.0012	($7.30)	(0.305)	**($7.20)**	(0.304)
Personal Income ($billions 2012)	$0.04	0.0019	($6.90)	(0.306)	**($6.80)**	(0.304)
Jobs (average annual full-time)	10.00	0.0013	(1,620)	(0.274)	**(1,610)**	(0.272)
Rest of State						
Business Transportation Costs ($billions 2012)					**$9.20**	
Gross Regional Product ($billions 2012)	$0.15	0.0012	($30.50)	(0.206)	**($30.40)**	(0.205)
Personal Income ($billions 2012)	$0.11	0.0014	($21.80)	(0.182)	**($21.70)**	(0.181)
Jobs (average annual full-time)	34	0.0013	(5,048)	(0.177)	**(5,014)**	(0.176)

Source: Cambridge Systematics analysis using the REMI economic model. ( ) denotes negative vales

The report also details how several revenue enhancement options affect the same economic outcomes, and selects mitigated tolling (local residents pay a 50% reduced rate) as the best alternative. The predicted impacts are presented below, once more taken from the report (page 3-53).

Table 3.18 Economic Impact of Build with Mitigated Tolls Compared to Business as Usual
2014 to 2050

Metric	Constr.	%	Long-term	%	Total	%
I-95 Counties						
Business Transportation Costs ($billions 2012)					($49.3)	
Toll cost ($billions 2012)					**$4.20**	
Gross Regional Product ($billions 2012)	$2.80	0.244	$42.50	2.573	**$45.30**	2.818
Personal Income ($billions 2012)	$2.80	0.216	$47.20	2.420	**$50.00**	2.636
Jobs (average annual full-time)	1,706	0.431	9,297	2.300	**11,003**	2.731
Eastern NC						
Business Transportation Costs ($billions 2012)					($4.20)	
Toll cost ($billions 2012)					**$0.37**	
Gross Regional Product ($billions 2012)	$0.38	0.014	$5.50	0.392	**$5.80**	0.406
Personal Income ($billions 2012)	$0.45	0.021	$4.60	0.462	**$5.00**	0.483
Jobs (average annual full-time)	120	0.014	1,140	0.365	**1,234**	0.379
Rest of State						
Business Transportation Costs ($billions 2012)					($8.80)	
Toll cost ($billions 2012)					**$0.48**	
Gross Regional Product ($billions 2012)	$2.20	0.014	$29.30	0.212	**$31.50**	0.226
Personal Income ($billions 2012)	$1.80	0.020	$20.80	0.193	**$22.60**	0.213
Jobs (average annual full-time)	589	0.015	4,782	0.183	**5,371**	0.199

Source: Cambridge Systematics analysis using the REMI economic model. ( ) denotes negative value

The key findings of the study are:

- Business as Usual on I-95 will cost the state an average of more than 16,000 jobs annually compared to baseline economic forecast
- Making the full set of improvements recommended in the I-95 Corridor Planning and Finance EA leads to a significant net increase in statewide economic benefits over Business as Usual regardless of the funding option used to pay for the improvements
- Counties along the I-95 corridor bear the greatest burden in terms of economic losses arising from tolls, but they also benefit the most from the improvements.
- Of the scenarios examined, Build with Mitigated Tolls gives rise to the greatest economic benefit, locally and statewide.

(17)

Revenue Enhancement Alternatives for The Alabama Department of Transportation				
Author(s):	Lindly et. al			
Publisher:	University Transportation Center for Alabama			
Year	2012			
Source Info:	Developed in cooperation with the Alabama Department of Transportation to investigate various revenue enhancement mechanisms for the state			
Web link:	http://utca.eng.ua.edu/files/2012/12/11403-Final-Report.pdf			
Study Region:	Alabama			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

A number of revenue enhancement options are compared for the Alabama Department of Transportation. Seven alternatives (increased gas/diesel sales tax, increased gas/diesel excise tax, increased tax on hybrid and electric vehicles, increased tax on all vehicle sales, and application of a road use tax) are compared qualitatively and a separate option – tolling the interstate highway system – is modeled explicitly. A telephone survey of Alabama residents is also conducted to gauge the public opinion of various revenue enhancement strategies.

The authors begin with an overview of the context of revenue enhancement options at state DOTs, including relevant federal and state policies. **An important point is the general aversion of the federal government to allow tolling on previously free travel lanes**; however, state-built infrastructure and new capacity added to existing infrastructure built with federal funds are relatively easy to toll. A second critical point is that the roles and responsibilities of the tolling agency, as established by enabling state legislation, have implications on types of revenue enhancement options that can be pursued. For example, some state tolling authorities (like North Carolina) are legally allowed to toll only if a parallel free facility is available. Several technical implementation issues, including collection options, back office customer service requirements, capital outlays, collecting payments from out-of-state drivers, tolling schemes, etc. are reviewed in Chapter 2 but not discussed here.

The authors evaluate each of the seven revenue enhancement options mentioned earlier. It is noted that the options to increase taxes may be viable funding sources in the medium- and long-term, but do little to address immediate funding gaps. A vehicle miles travelled (VMT) fee option is discussed briefly, and it is noted that billing consumers once per year (e.g., at a yearly vehicle inspection) to collect VMT charges is problematic. The authors also present the results of a survey comparing the options considered. Public perception is generally quite negative for most options, although taxing hybrid and electric vehicles is relatively more popular (taxing someone else for the majority of the population) as are tolls on interstate trips longer than 100 miles. The least popular option is to raise the gas tax and the second least popular option is a VMT fee.

The authors conclude the study with a revenue projection model for an open tolling system on the Interstate highway system in Alabama. The modelled system includes 16 tolling locations across the

state, and tolls all drivers who pass through these points. Trucks are tolled at a substantially higher rate than personal vehicles. The model maximizes revenue by predicting the number of drivers who will choose an alternate route to avoid tolls (based on a $15 value of time and modeled travel time savings) and adjust the price to maximize revenue. This approach is very short-sighted in that it does not account for additional wear increased maintenance costs on routes that drivers will divert to in order to avoid paying tolls. Further, this model assumes that Alabama DOT would be able to receive federal permission to levy new tolls on Interstate highways previously built with federal funds – including interstate trucking routes. The model predicts net annual revenues ranging from $240-455 million, with nearest estimates ranging from $249-390 million. The report suggests that tolling is the preferred option for the state, but suggests additional research on the feasibility of implementing a tolling scheme as modeled.

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(18)

The Way Forward: A 21st Century Transportation Plan				
Author(s):	Jenkins et. al			
Publisher:	MassDOT			
Year	2013			
Source Info:	Document produced by MassDOT's Board of Directors			
Web link:	http://www.boston.com/news/local/breaking_news/The%20Way%20Forward%20FINAL.pdf			
Study Region:	Massachusetts			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

This report written by the Massachusetts Department of Transportation (MassDOT) Board of Directors describes the positive aspects of MassDOT agency reform as well as the funding challenges MassDOT still faces. Under current transportation spending levels, the Regional Transit Authorities, Massachusetts Bay Transit Authority, and MassDOT are unable to maintain their existing Levels of Service. The Board of Directors addresses this issue in the report by detailing its transportation plan. The plan calls for $13 billion of additional investment over a 10-year period, effectively doubling the current transportation spending.

The Board explains that without additional investment, by 2023 drivers will experience a 23 percent increase in daily delay and regional bus, rail, and subway services will be cut or eliminated to a threshold where less than one-third of the estimated demand for public transit will be met. The Board then proposes a menu of programmatic changes and revenue enhancement mechanisms that could generate $13 billion over a 10-year period. The following options are proposed in the report:

Mechanism	Effect
All-electronic tolling	Reduces operating costs by $50 million per year

Online RMV services	Online Registry of Motor Vehicle services or at insurance agencies and AAA branches allows for RMV branch offices to be closed and staffing costs to be reduced
Utility Reimbursements	Utility relocations are one of the top reasons for project delay. MassDOT will again file legislation to extend utility relocation reimbursements to projects funded by state revenues.
Leveraging Real Estate Assets	MassDOT is now beginning the process of identifying all non-essential, non-transportation parcels that are eligible for disposition, including transfer to municipalities, lease or sale to third parties, and use as part of a public/private partnership.
State Infrastructure Bank	Allows public funds to match private capital for the purpose of making loans to support the construction of infrastructure with a public purpose.
MBTA retirement changes	Important for long-term cost savings.
Vehicle Miles Travelled – Pilot Program	This pilot program will be coupled with the establishment of a joint administration/legislative committee to study and recommend a framework for a more comprehensive program.
Partnerships with Massport	Massport, MassDOT, and the MBTA have partnered in numerous ways to reduce costs and improve customer service.
Increase or index fuels tax	To raise $1 billion, consumers would need to pay an additional thirty cents per gallon, resulting in a total gas tax of 51 cents per gallon, which would be the highest in the nation. The Commonwealth could also index the fuel tax to inflation and/or other adjustments in the price of gas, which would allow the Commonwealth to benefit from increases in the per-gallon cost of gas.
State Sales Tax	To raise an additional $1 billion in sales tax in calendar year 2013, the sales tax rate would need to increase from the current 6.25 percent to 7.75 percent.
Income Tax	To raise $1 billion in the personal income tax paid by residents of the Commonwealth in CY2013, the existing income tax rate would have to be increased from 5.25% to approximately 5.66%. This would be approximately an 8% increase over the existing income tax rate.
Green Fee	Under a 'green fee,' existing vehicle registration and title fees would be assessed additional fees based on a vehicle's level of carbon emissions.
Vehicle Miles Travelled Tax	A 2.4 cents-per-mile fee on vehicle miles travelled would produce $1 billion in annual revenue. The fee could be collected at a vehicle's annual safety inspection or through an onboard device that would record miles travelled but protect user privacy by not collecting location information.
Regular Increases in Fees, Fares, and Tolls	MassDOT could enact a series of modest, regular increases to transportation fares, fees, and tolls to keep pace with the cost of inflation. MBTA fares could increase 5% every two years beginning in FY2015, yielding an estimated $145 million in cumulative new revenues by 2023.
New Tolling Mechanisms	Dedicate existing toll revenue differently than it is done today, implementing high-occupancy/express lane tolls (so-called "HOT" lane tolling), developing congestion pricing policies, or introducing tolls on new facilities such as I-93, I-95, or I-84 as a way to fund ongoing maintenance and capacity improvements.

Western Turnpike Tolls	MassDOT proposes maintaining tolls on the Western Turnpike after the bonds reach maturity in 2017 in order to continue to dedicate sufficient resources to this important corridor, and to use a portion of those tolls for transportation projects off the Turnpike in the region in which they were collected.
Commonwealth Payroll Tax	A 0.16% payroll tax would provide revenue in the range needed to close the MBTA's annual operating deficit ($140 million to $207 million, depending on how the tax is levied in overlapping RTA districts).

The report also includes information about listening sessions held to discuss MassDOT's transportation plan. A summary of public comments and meeting notes are included in the report.

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(19)

Minnesota Moving Ahead: Transportation Funding and Financing For the Next 20 Years				
Author(s):	Minnesota Transportation Finance Advisory Committee			
Publisher:	Minnesota Transportation Finance Advisory Committee			
Year	2012			
Source Info:	Developed to inform the Governor's Office regarding future transportation funding options in Minnesota, this report considers strategies to address identified funding gaps for the state's transportation infrastructure needs.			
Web link:	http://www.dot.state.mn.us/tfac/docs/final-report.pdf			
Study Region:	Minnesota			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

This report starts with a projection of transportation revenues and infrastructure spending needs with Minnesota for the next 20 years, focusing on three spending scenarios: status quo, maintain current performance, and build an economically competitive/world class transportations system. The authors consider revenue enhancement mechanisms in a very simple matter, and propose addressing funding gaps through a combination of an increased state gas tax (for roads), increased dedicated transit sales tax at the local level (for local transit), increased county wheelage taxes, enabling legislation for a number of local funding options (Transportation Improvement Districts, Local Option Sales Taxes, etc.), for local transportation funds, and expanding the existing tolling system (MnPass), exploring value capture mechanisms, and exploring tolling new capacity for project-level revenue options. Overall, this report contains little rationale for selecting the revenue enhancement options selected other than political and constitutional considerations at the state level, greatly limiting the applicability of the report's conclusions to North Carolina.

(20)

Implementable Strategies for Shifting to Direct Usage-Based Charges for Transportation Funding				
Author(s):	Sorenson, et. al			
Publisher:	NCHRP			
Year	2009			
Source Info:	Study on MBUF prepared at the request of AASHTO, conducted as part of NCHRP Project 20-24(69)			
Web link:	http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_w143.pdf			
Study Region:	United States			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [X]	Geographic Considerations [X]

This report is the product of a National Highway Cooperative Research Program project, and was prepared at the request of the American Association of State Highway and Transportation Officials (AASHTO), and is the first in a series to help transportation managers consider revenue-generating options to support the country's infrastructure. This report takes a national perspective, and considers strategies for implementing a mileage-based user fee (MBUF) system by 2015.

The report outlines a number of advantages to an MBUF system. The report observes that, since 1980, vehicle miles traveled (VMT) have doubled, although fuel consumption has increased by only 50 percent. The system also allows administrators to address other transportation goals, including reducing traffic congestion or reducing harmful emissions (by varying fees based on time and location, or by charging based on vehicle characteristics). Finally, MBUF fees, by operating on a user-pays system, improves equity by charging users in line with the benefit derived by use of the system.

The report finds that the motivation for an MBUF system is strong, but deviates from similar reports on MBUF systems in a few important ways. In particular, the report questions whether MBUFs will be easier to implement than an increase in the fuel tax. Technically, an MBUF system could be implemented within a few years, particularly if it is included in federal transportation legislation. The report highlights the possibility to implement weight-distance truck fees immediately.

The team (led by the RAND Corporation) used national VMT and fuel consumptions forecasts provided by the Energy Information Agency (EIA) to examine the revenue effects of a 1.1 cents-per-mile MBUF. The report finds that, even conservatively figuring that growth in VMT is 10 percent less than expected, a national MBUF system would generate 20 percent greater revenue by 2030.

The report reviews trials that had been conducted up to this point (including the first of the ODOT trials, the Puget Sound Regional Council, and the University of Iowa), weight-distance truck tolls, and Pay-As-You-Drive (PAYD) insurance systems. From this body of evidence, the authors categorize several high level observations:

- Many different technologies are possible
- The different technologies vary considerably in terms of metering ability
- Technology choice is heavily influenced by policy goals

- There is no such thing as a 'low cost' MBUF option.
- Privacy is a significant concern to overcome—particularly with regard to GPS
- For weight-distance truck tolls, it is possible to forestall resistance by structuring the fee such that it provides specific benefits to the freight industry—in the form of dedicated infrastructure investment, or by allowing the trucking industry larger loads on certain corridors
- Drivers can be expected to respond to price signals.

The research team conducted interviews with transportation officials in state Department of Transportation, Department of Motor Vehicles, or Motor Vehicle Administration in four states: Texas, South Carolina, Minnesota, and Vermont. Researchers also received written feedback from panel members in Oregon, California, New York, and Virginia. This group's comments led to the following broad observations:

- States are interested in MBUF systems.
- States would like the federal government to take the lead.
- Odometer-based systems are not viewed favorably; the administrative load would require major changes to DMVs and databases.
- Privacy barriers are the main obstacles to public acceptance.
- States are considered about the potential for fraud and evasion (particularly states sharing an international border).

The report considers nine potential options for implementing an MBUF system, but highlights the following three for their potential to be implemented in the near-term:

- Mileage-based metering based on fuel consumption. By combining RFID technology with a pay-at-the-pump system. This system would be cheap to implement, and it would allow fuel taxes to charge vehicles lacking an Automated Vehicle Identification (AVI) system.
- Using an OBD-II or cellular-based metering, many of the advantages of more advanced metering options could be realized without incurring additional costs.
- Using coarse resolution GPS-based metering, administrators would gain all the benefits of flexible metering options. This option also has the advantage of having been tested in trials.

The report concludes with a list of preparatory tasks that would be useful to implement a national MBUF system by 2015. These steps include:

- Planning, which would likely include designating an agency with a high level of authority
- Conducting analytic studies, to better understand the costs and benefits of an alternative system, including more detailed cost estimates
- Technical research and development, including the use of cellular data and different AVI systems
- Additional MBUF trials, which would involve additional trials involving more participants
- Public education and outreach

(21)

System Trials to Demonstrate Mileage-Based Road Use Charges				
Author(s):	Sorenson, et. al			
Publisher:	NCHRP			
Year	2010			
Source Info:	Study on MBUF prepared at the request of AASHTO, conducted as part of NCHRP Project 20-24(69)A			
Web link:	http://www.rand.org/pubs/reprints/RP1423.html			
Study Region:	OR, WA, GA, MA, TX, IA, NC, Switzerland, Austria, Germany, the Czech Republic, Slovakia, Netherlands, New Zealand, South Africa, Canada, England, Australia			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:
This report presents an analysis of factors that will be useful to state DOTs as they consider designing and implementing large-scale mileage-based user fee (MBUF) trials. It includes criteria for designing trials; a list of common concerns around MBUF systems that these trials may be useful in addressing; and a list of options for financing, organizing, structuring, managing, and conducting the trials. The paper builds primarily on trials in the United States, international evidence, and interviews and workshops with key transportation stakeholders.

This study is the second phase of a previous NCHRP study: *NCHRP Web-Only Document 143: Implementing Strategies for Shifting to Direct Usage-Based Charges for Transportation Funding.* It varies significantly from that study, however; where the other focused on strategies that could be implemented between 2010-2015, the political realities associated with MBUF would likely delay system trials until at least 2015-2020 (five years after this report was published). Also, the earlier study focused on a national system for deploying MBUF fees, where this report focuses on options relevant for states.

The report conducts a survey of trials and research conducted up to 2010. A number of automated truck tolls based on travel distance and vehicle size or weight (referred to as weight-distance tolls) have been developed internationally: in Switzerland, Austria, Germany, the Czech Republic, and Slovakia. The Netherlands has completed planning for a national system that would apply to all vehicles, and New Zealand recently introduced a system that applies to trucks and diesel-fueled cars. The report also examines the implementation of Pay As You Drive (PAYD) insurance programs. The systems examined are included in the next three sections.

The report provides detailed information on **general purpose distance-based road use charges (including MBUF)**, with information on number of participants, time period, technology used, rates for more and less fuel efficient vehicles, changes in driver behavior, parties responsible for maintaining the system, and details of implementation. This includes:

- ODOT Road User Fee Pilot Program (the first of ODOT's two trials)
- University of Iowa Mileage-Based User Charge Study, involving 2700 participants in 12 locations around the country—including the Research Triangle in North Carolina

- Puget Sound Regional Council Traffic Choices Study, which found that drivers do in fact change travel behavior in response to charges
- Georgia Tech Commute Atlanta study and trials
- Planned Vehicle Kilometers Traveled (VKT) system in the Netherlands, a planned series of trials that were derailed by the collapse of the governing coalition
- New Zealand's road user charges, a system in place since the 1970s for charging vehicles whose fuel is not taxed at the source (mainly diesel) or vehicles that weigh over 3.5 tons. Since 2010, vehicle operators have the option of installing in-vehicle equipment and is privately administered.

The report also provides information on countries currently using **weight-distance truck tolls**, with information on the types of trucks included in the toll, company managing the system, technology used, toll assessed, revenue collected, details of implementation, and basics of operation. These programs include:

- The Austrian GO program
- The Swiss Heavy Goods Vehicle Fee (HVF)
- The German Toll Collect program, which provides evidence that drivers respond to mileage-based fees--because truck toll levies are much higher per kilometer for heavily polluting trucks, the rate with which the freight industry has adopted less polluting trucks has greatly increased.
- The Slovakia truck toll
- The Oregon Truck Road Use Electronic pilot project

The report also details **pay-as-you-drive (PAYD) insurance leasing systems**, with information on when the systems were implemented, the discount offered at different levels of mileage, technology used, and billing details. These systems include:

- Massachusetts, multiple companies
- GMAC, offers mileage-based discounts for OnStar customers in 34 states
- MileMeter, a Texan PAYD system
- Aviva, a Canadian PAYD system
- CoverBox, offering PAYD insurance in England
- Hollard Insurance, offering PAYD insurance in South Africa
- Nedbank, offering PAYD insurance in South Africa
- Real Insurance, offering PAYD insurance in Australia

The report focuses on summarizing some of its findings with respect to the various technologies according to each system's key limitations and capabilities (see following two tables).

Table S.3. Key Limitations of VMT-Fee Implementation Options

Metering Approach	Tough to Enforce	Extensive Required State Support	Burden on Users	Privacy Concerns	Vehicle Equipment Cost	Other Capital & Operating Costs
Self-reported odometer readings	●	●				
Required odometer checks		●	●			●
Optional odometer checks		●				●
Fuel consumption-based estimates				○		●
RFID tolling on partial road network				●		●
OBU with OBD II	○				●	●
OBU with OBD II / cellular	○			○	●	●
OBU with GPS	○			●	●	●

Table S.2. Capabilities of VMT-Fee Metering Options

Metering Option	Metering Capabilities				
	Meters Entire Road Network	Vehicle Emissions Class or Weight	Mileage by Area or Jurisdiction	Route or Specific Location of Travel	Time of Travel
Self-reported odometer readings	●	●			
Required odometer checks	●	●			
Optional odometer checks	●	●			
Fuel consumption-based estimates	●	●		○	○
RFID tolling on a partial road network		●		○	○
OBU with OBD II	●	●		○	●
OBU with OBD II / cellular	●	●	●	○	●
OBU with GPS	●	●	●	●	●

Authors also interviewed a broad group of stakeholders to identify main considerations in the design of trials. Stakeholders include US Congressional staff, USDOT, the US Department of the Treasury, state DOTs, MPOs, technology providers, automobile insurance companies, managers of previous pilot tests, and others. The following common themes surfaced:

- The lack of a clear policy direction is holding back implementation efforts
- Federal leadership on MBUF fees is needed
- Trials should be structured to prepare for implementation
- The federal government should be prepared to invest in the trials
- An MBUF systems should be designed to address additional goals beyond revenue
- The main obstacle to MBUF is public acceptance and cost
- A secondary obstacle is building public trust in the government
- Trial development should build on previous trials
- Authorizing legislation for the trials should not be overly prescriptive

The group was strongly divided on the following issues:

- The number of drivers that should participate in the trials (anywhere from a few thousand to more than a million)

- Is it more desirable or likely for the initial implementation of MBUFs to occur at the state or federal level?
- Could MBUFs be implemented in a few years, or would it take a decade or more?
- Could the transition begin with a mandatory phase-in process, or should it rely on opt-in strategies?

The report finally recommends three broad frameworks for implementing trials: A state framework, national framework, or market framework. A summary of options for system trials is then compiled in the three tables below:

Table S.4. Summary of Options for Comprehensive System Trials

Issues	Frameworks		
	State	Federal	Market
Overseeing, Managing, and Conducting the Trials			
Overseeing the trials	Decision makers designate an oversight panel to provide guidance on the trials and related activities. The panel includes, at minimum, representation from Treasury, U.S. DOT, Federal Highway Administration (FHWA), American Association of State Highway and Transportation Officials (AASHTO), and individual states.		
Managing the trials	Decision makers designate the Transportation Research Board (TRB) to manage the overall effort in a program similar to the Strategic Highway Research Program (SHRP II). Alternatively decision makers assign this role to FHWA, Research and Innovative Technology Administration (RITA), or Volpe, or delegate the choice to the Secretary of Transportation.		
Conducting the trials	States assemble teams to bid for trial funding, including technology vendors (to provide metering and billing services) and possibly cities or counties (to test local VMT fees and/or automated payment of parking fees), auto insurers (to test PAYD insurance), and MPOs or research organizations (for education, outreach, and/or analysis).		Technology vendors, states, auto insurers, local jurisdictions, and research institutions are separately funded for their distinct roles in conducting the trials.
Organizing, Funding, and Coordinating the Trials			
Number and location of trials	Trials are conducted in 3 to 6 states or groups of adjacent states. Ideally the selected trial locations span different geographic regions of the country, include predominantly urban and predominantly rural states, include several large urban regions, include "red" and "blue" states, and include one or more multi-state trial configurations.		
Awarding trials	Trial funding is awarded on a competitive basis. Subject to meeting certain proposal requirements, criteria for judging bids could include cost, number of participants, capacity of the proposing entity, provision of value-added services with the in-vehicle equipment, intent to explore more advanced forms of pricing, intent to collect actual revenue, and intent to explore the use of travel data from the system to support improved planning. Additionally, a modest amount of funding might be set aside for any state that wishes to conduct a preliminary investigation of VMT fees (i.e., studies, not trials).		
Coordinating multiple trials	Trials are loosely coordinated. Main unifying theme is the examination of interoperability standards.	Trials are more carefully coordinated to address all issues relevant to developing a national system.	
Size, Duration, and Cost of the Trials			
Size (number of participants)	10K – 20K per trial 50K – 100K total		100K – 200K per trial 500K – 1M total
Duration of the trials	4-6 years total, including 1-2 years for initial preparation, 2-3 years for conducting the trials, and 1 year for evaluation		
Cost of the trials	$100M – $400M		$1B – $4B
Federal share of funding	Federal government either fully funds trials or requires a modest state match of ten to twenty percent. The latter would help ensure that states that apply are committed to the concept, but it might prevent the participation of otherwise interested states given current economic conditions.		

Table S.4. Summary of Options for Comprehensive System Trials (cont)

Issues	Frameworks		
	State	Federal	Market
Metering and Pricing Policies to Examine in the Trials			
Metering VMT on all public roads	Yes (by definition)		
Tolling on a partial road network	Only if viewed by policymakers as a potential alternative to VMT fees		
VMT fees for passenger cars	Yes		
VMT fees for trucks	Yes		
Fees that vary by jurisdiction	Yes		
Congestion tolls	Optional (desirable but potentially too controversial)		
Emissions-based fees	Optional (desirable but potentially too controversial)		
Weight-distance truck tolls	Optional (desirable but potentially too controversial)		
Technical Issues to Examine in the Trials			
Metering options	Optional (acceptable if GPS is only option evaluated)		
Fee collection options	Yes (evaluate multiple options)		
Options for preventing evasion	Yes (evaluate multiple options)		
Options for protecting privacy	Yes (evaluate multiple options)		
Interoperability standards	Yes if envisioned that trials might evolve directly to state implementation, otherwise optional	Optional	Yes
Use of travel data from system	Optional		Yes
Institutional Issues to Examine in Trials			
Actual revenue collection	Yes if envisioned that trails might evolve directly to state implementation, otherwise optional	Optional	Yes
Collect federal and state fees	Optional	Yes	
Parallel auto / truck systems	Optional		
Alternate billing arrangements	Yes		
Competition among firms	Optional		Yes

Table S.4. Summary of Options for Comprehensive System Trials (cont)

Issues	Frameworks		
	State	Federal	Market
Implementation and Phase-In Issues to Examine in Trials			
Integration with toll systems	Yes		
Different vehicle classes	If envisioned that retrofits would someday be mandated		
Charging foreign vehicles	Optional		
Rebating fuel taxes	If envisioned that VMT fees would replace rather than augment fuel taxes		
Voluntary adoption incentives	Yes		
User Acceptance Issues to Examine in Trials			
Concept of VMT fees	Yes		
Alternate fee structures	Optional		
Alternate privacy protection	Yes		
Privacy vs. auditability	Optional		
Value-added services	Optional		
Detailed Strategies for Implementing the Trials			
Interoperability standards	Standards encompass accuracy requirements, privacy protection, support for preventing evasion, data storage and communication protocols, data security, and related functionality. Standards development involves device manufacturers and service providers, related industry consortia, the International Bridge, Tunnel, and Turnpike Association (IBBTA), ITS America, IntelliDrive program representatives, and academic institutions. Effort references ISO/CEN 17575 and related efforts as initial starting point.		
Privacy protection	Privacy advocacy organization enrolled to verify privacy protection methods.		
Preventing evasion	Firm with telecommunications and security expertise enrolled to probe for vulnerabilities related to fee evasion or system security.		

(22)

National Evaluation of Mileage-Based Charges for Drivers				
Author(s):	Hanley, Paul F. and Jon G. Kuhl			
Publisher:	Transportation Research Board			
Year	2011			
Source Info:	Describes the mileage-based user charge study undertaken at Iowa Public Policy Center			
Web link:	http://trb.metapress.com/content/llq5560865m71256/?genre=article&id=doi%3a10.3141%2f2221-02			
Study Region:	United States			
Revenue Enhancement Criteria	Revenue Yield [ ]	Long-term financing [ ]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

This report illuminated several things about mileage-based charging:

1. As users gain comfort with a mileage-based system they begin to prefer it more than fuel taxes
2. Privacy concerns are traded for ease of system use
3. Mileage-based charging systems should be flexible to capture as much public acceptance as possible

This report details the findings of the National Evaluation of Mileage-Based Road User Charge, a 2-year field study conducted by the University of Iowa Public Policy Center. It evaluates the technical feasibility and user acceptance of mileage-based charging as a potential replacement for the current motor fuel tax. The report demonstrates striking changes in public attitudes from the outset of the study to the conclusion of the study. **Before enrolling in the study, more than 60 percent of the participants expressed a neutral or negative view of a mileage-based user charge system. Whereas after their experience in the study, the mileage-based system was rated favorable by 70 percent of the participants.**

Unlike a traditional focus group, where responders are fairly uniformed regarding the details of a system, the participants in this study had time to learn and become familiar with a road charging system. In effect, this study was able to accurately measure the changes in attitudes of the informed subjects – which showed an overwhelming shift in opinion toward system acceptance.

For the study, drivers were equipped with onboard units (OBUs) that had the capability of communicating with Global Positioning System (GPS) receivers. When operating in an unrestricted capacity, the OBU and GPS would communicate to calculate hypothetical charges for federal, state, and local jurisdictions. The hypothetical charges were then uploaded periodically over a cellular communications link to a billing center. The billing center would then create monthly invoices that were sent to participants to simulate how a mileage-based system would operate.

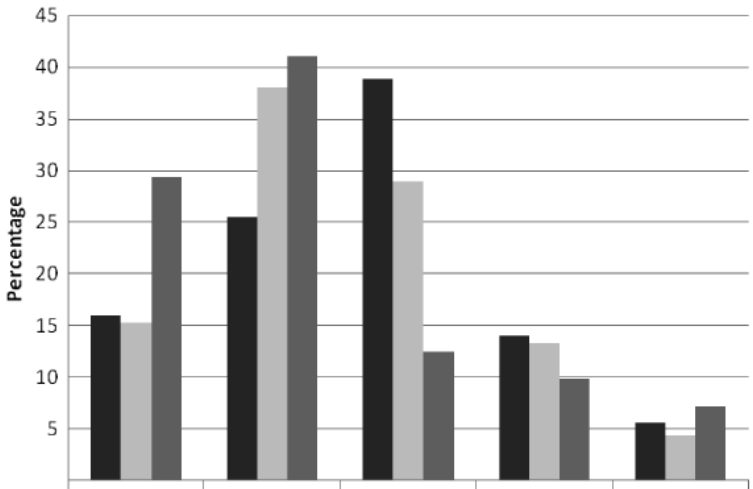
Throughout the study, planned system changes were made and the participants' perceptions to these changes were recorded. For example, in the beginning of the study, maximum privacy protection was a predominant consideration. Under this scenario the only figure that could be tied to a certain vehicle

was a single dollar amount for total user charges. Thus, when data were transferred from the vehicle, it was only the sum of user charges, and nothing more.

The first scenario protected user privacy, but it did not provide for "auditability" – a way for users to see how much they were driving on a day-to-day basis. Under a second scenario, privacy protection was no longer accounted for and the OBU and GPS communicated in an unrestricted manner. Users could see charges accrue on a mile-by-mile basis based on their daily travel. **After being exposed to both scenarios, participants shifted their desire from privacy protection toward system auditability.**

One final scenario that fell between complete privacy and complete auditability was tried. Instead of documenting a daily travel log for users, this scenario limited data collection to a monthly summary of travel. This system was even more widely accepted by study participants. In other words, **participants preferred a scenario that balanced privacy protection and auditabililty.**

The graph below depicts changes in user acceptance from the outset to the conclusion of the study.



	Very positive	Somewhat positive	Neutral	Somewhat negative	Very negative
Baseline	16.0	25.5	38.8	14.1	5.6
Interim	15.3	38.0	29.0	13.4	4.3
Exiting	29.4	41.1	12.5	9.9	7.2

FIGURE 3 Participants' responses to "How do you feel about the idea of replacing the gas tax with a mileage-based road user fee?"

(23)

Mileage-Based User Fees For Transportation Funding – A Primer for State and Local Decision Makers				
Author(s):	Sorenson et. al			
Publisher:	RAND			
Year	2012			
Source Info:	Part of the RAND Corporation tool series			
Web link:	http://www.rand.org/content/dam/rand/pubs/tools/TL100/TL104/RAND_TL104.pdf			
Study Region:	United States			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

This report examines the feasibility and benefits of implementing a mileage-based user fee (MBUF) system for generating transportation revenue. It looks at the recent local and state initiatives that advance mileage-based revenue enhancement. It also analyzes some of the implementation challenges associated with transition and operation of an MBUF system. Furthermore, the report presents 15 strategies for reducing mileage-based system costs and increasing MBUF support.

Some noteworthy policy suggestions emerge in the report. The following are policy suggestions for implementing an MBUF system:

1. Provide drivers with the choice to begin with a simple odometer based system – Let drivers choose between metering options that provide no location information. The odometer provides a simple approach that provides no information about the location of travel, thus reducing privacy concerns.
2. Enroll privacy watchdogs – Minnesota included a member of the American Civil Liberties Union on its mileage fee task force
3. Include elected officials in trials – Minnesota has included elected officials as ex officio participants in its trials. Oregon is planning to include several legislators as actual participants who will pay mileage fees and receive fuel tax rebates in its upcoming trials.
4. Work with other states to provide a multijurisdictional system – The I-95 Corridor Coalition demonstrated that implementing a multi-state system still provides states the opportunity to tailor elements of a mileage-fee system to their needs.

The report provides a summary of the mileage-based initiatives and programs that have been developed. These can be seen in the table on the following page.

Region	Initiative
University of Iowa 2005	More than 2,500 drivers in 12 cities throughout the country tested mileage-based issues related to privacy protection. They tested mileage-based systems with complete, intermediate, and very limited privacy. By the end of the study, 80 percent of the participants preferred an intermediate level of privacy and **support for mileage fees among participants rose from 41 to 71 percent.**
Puget Sound Regional Council 2005-06	A trial in which metering equipment configured with GPS and cellular communications was used to implement congestion pricing across the urban road network. Study demonstrated **that drivers changed their behavior in response to the charges**.
Oregon 2006-07	Oregon DOT conducted a 12-month pilot study of mileage fees involving almost 300 participants. Vehicles were equipped with GPS-based metering equipment. The study showed that **drivers respond to mileage-fee pricing structures by reducing travel, especially during peak periods**.
Oregon 2012	State is now planning a **more flexible and innovative approach to mileage fees**. At least one option would exclude the ability of any outside party to determine the location of vehicle's travel.
Minnesota	A mileage-fee **smartphone app is being tested** with 500 smartphone users. Drivers using the app could qualify for certain discounts, such as no fees for out-of-state miles and reduced fees for rural or off-peak. Otherwise, the odometer would serve as the default measure for mileage fees owed.
New York City	The **DriveSmart Initiative** is being developed so that mileage-based fees may be **coupled with an array of travel services** such as pay-as-you drive insurance, automated parking payment, and automated toll payment.
I-95 Corridor	The coalition sponsored recent research on how a **multistate mileage-based fee system** might work, using Delaware, Maryland, and Pennsylvania as examples.
Colorado 2008-12	Colorado DOT conducted a mileage-based fee **feasibility study** in response to gaps between revenue and needs. Variable and flat fee and various metering systems were discussed.
Nevada 2008-12	Nevada DOT conducted a mileage-based fee **feasibility study** in response to gaps between revenue and needs. Seven possible fee structures have been developed.
Texas	Texas DOT conducted a mileage-based fee **feasibility study** in response to gaps between revenue and needs. Several mechanisms for metering and collecting fees, ranging in sophistication from odometer readings to GPS.
Washington	The Transportation Commission conducted a **study to establish a policy framework**, assess institutional readiness, and examine the fairness implications of mileage fees.

(24)

Mileage-Based User Fees: Prospects and Challenges				
Author(s):	Zupan et. al			
Publisher:	Regional Plan Association			
Year	2012			
Source Info:				
Web link:	https://www.dot.ny.gov/divisions/engineering/technical-services/trans-r-and-d-repository/C-10-22-21144%20Mileage%20Based%20User%20Fees%20Final%20Report%2029June12.pdf			
Study Region:	United States			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

This report analyzes the implementation challenges and presents the potential benefits of a mileage-based user fee (also known as a vehicle miles travelled (VMT) fee) for the state of New York. It identifies the annual capital investment needs of the New York Department of Transportation (NYSDOT) and the Metropolitan Transit Authority (MTA) to be around $16 billion combined. Despite capital needs, the recent average expenditure has been less than $8 billion with the fuel tax covering only $3 billion. The report explains that **a more than $2 per gallon increase in the fuel tax would be required to meet NYSDOT and MTA needs. A 9-cent VMT fee, however, would meet the full capital needs of NYSDOT and MTA.**

The report provides some problems that may arise when implementing a VMT fee system. The table below documents potential problems with their potential solutions.

Problems	Solutions
Privacy issues with collection and transmission of VMT data	- Process data using an onboard unit and transmit aggregate data only - Use a simple system that relies on manual odometer readings - Put legislative privacy safeguards in place
Public distaste/distrust for added tax	- Earmark VMT revenues beforehand, so the public knows where they will be spent - Explain congestion relief and environmental benefits
Collection costs for a VMT fee are much higher than that for fuel taxes	- Combine vehicle registration fees with VMT fee collection - Use credit card companies and banks to lower collection costs
Multiple jurisdictions create implementation barriers	- Federal government or state coalitions can coordinate standards to ensure technical interoperability

(25)

Pay-As-You-Drive Vehicle Insurance				
Author(s):	(none listed)			
Publisher:	Victoria Transport Policy Institute			
Year	2013			
Source Info:	A chapter extracted from the Transportation Demand Management Encyclopedia of the Victoria Transport Policy Institute			
Web link:	http://www.vtpi.org/tdm/tdm79.htm			
Study Region:	United States: AZ, CA, CO, MD, ME, MN, NH, NM, RI, TX, VA, and VT; Australia; Israel; South Africa; The Netherlands; Spain; Italy; Japan; Canada: British Columbia			
Revenue Enhancement Criteria	Revenue Yield [ ]	Long-term financing [ ]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

Under a Pay-As-You-Drive (PAYD) insurance paradigm, motorists are charged based on how much they drive – assessed on a cent per mile basis. This chapter of the Transportation Demand Management Encyclopedia of the Victoria Transportation Policy Institute discusses the consumer and network benefits of PAYD insurance. It also discusses implementation barriers and strategies, travel impacts, equity impacts, and PAYD case studies in the United States and abroad.

In a PAYD insurance system, mileage-based reporting is crucial for the success of the insurance program. The chapter sites two simple solutions: prepaid coverage and odometer audits, as well as a GPS-based technical solution to record vehicle mileage. The three coverage types are explained below:

- **Prepaid coverage**: motorists prepay for the miles they expect to drive during their term of coverage, either in lump sum or several payments. The total premium is calculated at the end of the term based on recorded mileage, and vehicle owners are credited for any used miles, or pay any outstanding balance.
- **Odometer audits**: motorists' odometers are read and recorded when a vehicle's insurance is renewed or during other vehicle servicing. Motorists pay a lump sum based on their miles driven.
- **GPS-pricing**: motorists' vehicle miles traveled are calculated in real time as motorists drive. Insurance agencies can be billed in real time or motorists can receive an invoice for monthly payments.

The first two coverage types (prepaid and odometer audits) allow vehicle owners to partake in a mileage-based insurance program without divulging their travel locations. The third coverage type (GPS-pricing) would expose a third party to vehicle travel times and locations, which could be considered an invasion of privacy by some drivers. Nevertheless, this chapter demonstrates that multiple options are available for a mileage-based insurance system, depending on an individual motorist's privacy considerations.

A PAYD insurance system has specific user and road network benefits. These benefits are summarized o:

- **Driving reductions**: motorists who that switch to PAYD insurance are inclined to reduce their annual vehicle miles by 8 to 10 percent. PAYD insurance conveys to drivers the true costs of driving and allows them to reduce those costs.
- **Cost savings**: an average motorist saves $64 annually in insurance costs if vehicle travel declines 10 percent as expected. (However, a high mileage motorist pays $331 more per year, a 4.7 percent increase in insurance expenditures.)
- **Much larger congestion relief impact**: a 2-cent per mile vehicle fee applied to all vehicle travel in the Los Angeles region would reduce vehicle trips by 4.1 percent, but congestion delay would decline by a much larger 10.5 percent.

There are also equity considerations that are discussed in this chapter and included below:

- **Rural equity**: under such a system, only rural residents who drive more than average among rural residents would pay more, and about half of all rural residents would pay less. For example, if rural vehicles are driven an average of 18,000 miles a year, a rural motorist who drives their car 15,000 miles annually would save money.
- **Income equity**: since lower-income motorists drive their vehicles significantly less on average than higher-income motorists, insurance is generally regressive. Distance-based insurance is fairer than current pricing because prices more accurately reflect insurance costs.

This chapter also discusses case studies where PAYD insurance has been successfully implemented. The following regions are where PAYD insurance has been in existence:

- United States: AZ, CA, CO, MD, ME, MN, NH, NM, RI, TX, VA, and VT
- Australia
- Canada: Vancouver, British Columbia
- Italy
- Israel
- Japan
- The Netherlands
- South Africa
- Spain

(26)

Mileage-Based User Fees: Winners and Losers				
Author(s):	Brian A. Weatherford			
Publisher:	RAND Corporation			
Year	2012			
Source Info:	This document was prepared with funding from the FHWA, Rand foundation, and Bradley Corporation.			
Web link:	http://www.rand.org/content/dam/rand/pubs/rgs_dissertations/2012/RAND_RGSD295.pdf			
Study Region:	United States			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [ ]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

This study examines changes in annual household demand following the theoretical replacement of fuel taxes with mileage-based user fees (MBUF). Using National Household Travel Survey (NHTS) data, the author examines three different MBUF rate structures: a 1-cent MBUF fee added to the current fuel tax, a tiered rate MBUF based on vehicle fuel economy, and a much increased MBUF rate. The study does not include freight.

Broadly, the study describes the '**winners' of MBUF to be retired and rural households**; '**losers' of MBUF schemes include households in urban and suburban areas**. The author warns that any equity benefits of MBUF may be overwhelmed by increases in the overall tax rate to cover the costs of collecting or administering the new fees.

The study does observe that a flat-rate MBUF would increase the cost of a high MPG vehicle relative to a low MPG vehicle, and that **the cost of administering MBUF makes it impossible to set MBUF at the equivalent fuel tax rate**.

(27)

Oregon's Mileage Fee Concept and Road User Fee Pilot Program: Final Report				
Author(s):	James M. Whitty			
Publisher:	Oregon Department of Transportation			
Year	2007			
Source Info:	This report represents the final deliverable related to the first of Oregon's pilot programs to implement mileage-based user fees.			
Web link:	http://www.oregon.gov/ODOT/HWY/RUFPP/docs/rufpp_finalreport.pdf			
Study Region:	OR			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [ ]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

This report details the results of the first of two pilot programs designed to evaluate mileage-based user fees (MBUF). This pilot program began in April 2006 and took place over 12 months. ODOT installed on-vehicle devices to 285 vehicles; the devices allocated miles driven by participant vehicles in a number of different zones over the period of the field test. The program was designed to be revenue-neutral; in order to provide revenues equivalent to the state's 24 cents per gallon gas tax, ODOT found a flat 1.2 mileage flat rate fee would be appropriate. While the study found that congestion and other pricing options are viable, they did not establish separate mileage fees for those options in this study. **The study found that the mileage fee would provide a dollar-for-dollar replacement of the state fuel tax.**

The study's listed key findings include:

- **91 percent of participants said they would agree to a mileage fee**
- **Mileage fees could be paid at the pump with very little difference in process or administration** on the part of drivers
- **The program could be phased in gradually**, with vehicles equipped with mileage tracking equipment (GPS or OBDII) to pay the mileage fee while non-equipped vehicles would continue to pay the gas tax
- **MBUF can be integrated to existing systems** (service station point-of-sale systems and the current system of gas tax collection)
- **Congestion and other pricing options are also viable**—including different pricing zones or time-specific pricing schemes
- **Privacy is protected** (no specific vehicle point location or trip data was stored, all on-board vehicle device communication was short range, and only data relevant for the program was kept)
- **The system would place minimal burden on business**
- **The potential for evasion is low**
- **Cost of implementation and administration is low**

The pilot program evaluation criteria were as follows:

- Administration (including ease and cost of enforcement, utility, and integration with existing systems)
- Cost (including start-up costs: capital and retrofitting, operating and maintenance, enforcement and auditing, cost of collection relative to fuel tax)
- Net revenue generation potential
- Hardware and software (availability, feasibility, accuracy, reliability, security, expandability, interoperability)
- System precision
- Evasion potential
- Usefulness for phasing and partial implementation
- Adaptability to congestion pricing
- Public acceptance (including costs to vehicle owners/operators, ease and convenience to vehicle owners, privacy protection, fairness, transparency, and aversion/attraction)

The study concludes by observing that Oregon is unlikely to implement the Oregon Mileage Fee concept alone. **The technologies necessary to make this viable would cost several millions of dollars, and would require either embedding the technology into existing vehicles or the cooperation of vehicle manufacturers.** The study also recommends additional work with the fuel distribution industry to improve collection methods for mileage fee transactions occurring at the pump, expanding its scope to include home fueling collections and multi-state integration, and **develop complete cost estimates for full integration**.

(28)

Road Usage Charge Pilot Program Preliminary Findings				
Author(s):	D'Artagnan Consulting LLP			
Publisher:	Oregon Department of Transportation			
Year	2013			
Source Info:	Report on pilot program prepared for ODOT to inform implementation of mileage-based user fees.			
Web link:	http://www.oregon.gov/ODOT/HWY/RUFPP/docs/RUCPilotPrelimFind_Feb13.pdf			
Study Region:	OR, WA, NV			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [ ]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

This paper outlines the activities of the Road Usage Charge Pilot Program (RUCPP), the most recent pilot program designed to demonstrate several alternatives for measuring and paying a road usage charge. This represents the second of Oregon's two pilot programs conducted thus far. The paper focuses on system performance and participants' perception of the program.

The program measured mileage and distributed invoices to 93 participants over a 2-month period. Ultimately, the program was found to score well in terms of **ease of use**, **motorist choice**, and **open, interoperable private sector administration**. Users were offered five mileage collection and reporting plans. None of the plans required the use of GPS; three of the plans involved a private sector partner to manage driver accounts:

1. Flat rate plan, administered by ODOT (unlimited mileage purchased for a high flat fee or monthly fee—no technology required)
2. Basic plan, administered by ODOT (wireless reporting of mileage data, no vehicle location data)
3. Basic plan, administered by a private service provider (same as above, managed by a private sector partner)
4. Advanced plan, administered by a private sector partner (wireless reporting of mileage data with vehicle location to avoid charging out-of-state and off-road travel)
5. Smartphone plan, administered by a private sector partner (same as above, with data transferred using a smartphone)

The private partners, referred to as 'Certified Service Providers', stored mileage data, maintained user accounts, sent monthly invoices, collected road usage charges, and remit charges to ODOT. None of the three vendors answered questions concerning capital and retrofitting costs related to the Road Usage Charge system, or expected cost increases as the program expands.

The evaluation team found that a Help Desk was particularly successful in making the pilot program run smoothly, and recommended including it in future versions of the program. The websites established by ODOT and one of the private vendors (Sanef) was also important.

The study was found to meet its objectives (ease of use, administered by interoperable private sector vendors), found that a private market exists for road usage charge collection and administration, giving participants a choice of plans was possible, perception of user charging plans is possible, **1.56 cents per mile was an acceptable price point**, and a road usage charge was seen as equitable.

A final report on this project is forthcoming.

(29)

Equity Evaluation of Vehicle Miles Travelled Fees In Texas				
Author(s):	Larsen, Lisa; Burris, Mark; Pearson, David; Ellis, Patricia			
Publisher:	Transportation Research Board			
Year	2013			
Source Info:	Presented at the Transportation Research Board Meeting in January, 2012			
Web link:	https://ceprofs.civil.tamu.edu/mburris/Papers/VMT%20Fee%20Equity%20in%20Texas%20-%20Submit%20to%20TRB%20March%2012.pdf			
Study Region:	Texas			
Revenue Enhancement Criteria	Revenue Yield [ ]	Long-term financing [ ]	Implementation Strategies [ ]	Geographic Considerations [X]

This paper examines the impact of four vehicle miles travelled (VMT) scenarios on both vertical and horizontal equity within Texas. Vertical equity is concerned with the distribution of impacts between individuals with different abilities and needs presented by different income and social classes. Horizontal equity is concerned with distribution of impacts between individual and groups considered equal in ability and need. Horizontal equity portends that "public policies should avoid favoring one individual or group over others." The research utilizes Texas data from the 2009 National Household Travel Survey (NHTS). The analysis was run both statically (no change in travel patterns from implementing the new VMT fee) and dynamically (changes in travel resulting from changes in cost of travel). All scenarios where based on keeping the federal gas tax unchanged while replacing the Texas state gas tax with the proposed VMT scenarios for all gasoline-run vehicles.

The four scenarios evaluated include:

- **Scenario 1** includes a flat VMT fee that replaces the state gas tax but does not include additional funds.
- **Scenario 2** includes a flat VMT fee that provides additional revenue to meet infrastructure needs identified by the 2030 Committee on Texas Transportation Needs which totaled an additional $14.3 billion annually (2008 total $2.3 billion).
- **Scenario 3** includes a VMT structure that encourages the use of fuel efficient vehicles. Vehicles with fuel economy less than the median would be charged .20 cents/mile; vehicles with fuel efficiency between the median and the mean would be charged .15 cents/mile and vehicles with fuel efficiency greater than the mean would be charged .10 cents/mile. The overall fees were scaled to meet the $14.3 billion needed revenue.

- **Scenario 4** includes a different mileage fee for urban verses rural roads because of the different costs, characteristics and travelers on these two different types of roadways. Because information detailing the percent of urban (rural) households and urban (rural) roadways was not available research conducted by Mark Ojah was used that confirms estimates for 80/20 and 70/30. This means that 80 percent of urban households and 20 percent of rural households are expected to be on urban roadways while 20 percent of rural households are expected on urban roadways. The additional assumption included the same construct but at 70/30.

Lorenz Curves, the Suite Index and Gini Coefficients are common methods to evaluate vertical equity. This type of analysis support policies that are considered "progressive" in nature with lower income individuals paying a smaller portion of their incomes than the portion paid by higher income individuals. While there are differences between the four scenarios in terms of vertical equity they are minor and indicate that essentially all scenarios are as equally equitable as the current gas tax. In absolute terms where burden as a percentage of household income is applied all scenarios are regressive in nature as is the current gas tax. As for horizontal equity scenario 4 was designed to achieve this outcome because all vehicles, regardless of rural or urban household paid the designated fees for urban roadways and rural roadways. Consequently the intention of horizontal equity: "equal treatment of equals." This scenario was compared against the other three. Scenario 3 was shown to be more horizontally equitable than the current gas tax.

Overall findings suggest that most of the scenarios are equal to or better than the current gas tax in terms of vertical and horizontal equity with the exception of the "fuel efficient" scenario which was less horizontally equitable compared to the existing gas tax.

(30)

Implementing Marginal-Cost Vehicle Mileage Fees on the Maryland Statewide Road Network				
Author(s):	Zhang, Lei and Lu, Yijing			
Publisher:				
Year	2013			
Source Info:	Presented at the Transportation Research Board Meeting in January, 2013			
Web link:	http://www.google.com/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&ved=0CCwQFjAA&url=http%3A%2F%2Fsites.kittelson.com%2FIUHUserFee%2FDownloads%2FDownload%2F21831&ei=r-MtUsHtA4zw8ASj0oHgAw&usg=AFQjCNFdX2ZNYGe1MHZlVyUbwhLbmimEfA&sig2=8BGwKNO95pJx4XiSjOhnCw&bvm=bv.51773540,d.eWU			
Study Region:	Maryland (and surrounding states of Delaware, Pennsylvania, Virginia, West Virginia, and Washington, DC)			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [ ]	Implementation Strategies [ ]	Geographic Considerations [X]

Abstract:

This paper examines the full marginal cost of auto and truck travel in different time periods on all roads in Maryland and compares the new user-based road charge with current revenue policy in terms of travel behavior, revenue generation, equity, pollution, and GHG emissions. The premise of the paper is that vehicles should be charged a user fee which takes into account the impacts of the vehicles on environment, road congestion as well as the damage to the infrastructure. A distance-based user charge can be used as a good gauge for optimal road pricing. The authors contend that a vehicle miles travelled (VMT) tax will emerge over time but there are many political, financial, and technological issues to resolve before implementing nationwide. It is supposed by the authors that state and local jurisdictions will first implement such taxes. The paper outlines several research reports that find a mileage fee to be more effective than gasoline tax in terms of approximating an optimal per-mile fee. Other research cited in the paper revealed less of a tax burden on low-income households, rural households and retired households.

The researchers use pavement maintenance, travel time, emissions, safety, vehicle operation and noise as the key variable for determining the optimal mileage-based fee for Maryland. The Highway Economic Requirements Systems (HERS) is utilized to calculate all costs except noise and utilizes the Highway Performance Monitoring System (HPMS) database for specific roadway conditions necessary to run the analysis. Seven types of vehicles (small automobiles, medium-large automobiles, pickups and vans, six-tire single unit trucks, three and four axle single-unit trucks, four axle combined trucks, and five axle combined trucks) are evaluated during peak and off-peak periods to determine the optimal mileage-based fee. Noise costs are developed based on original research conducted in 1997 by Haling and Cohen along with noise generation and hedonic cost modeling. The results of the analysis reveal a VMT of 0.20 cents/mile to 12.16 cents/mile for autos during peak travel and 3.91 cents/mile to 45.33 cents/mile for trucks during peak travel. The VMT for almost all interstate roadways is larger than that of freeways and expressways.

In order to evaluate the new mileage-based fees against the existing toll for Maryland and surrounding states the Maryland Statewide Transportation Model (MSTM) is utilized to generate link-level assignment for personal travel and freight travel. The marginal costs VMT fee for both auto and truck are applied during different time periods as a supplement to the fuel tax. Based on the results of the analysis auto travel distance decreased by up to 8 percent (variable by county from 1.24 to 2.7 percent) while truck distance decreased by 3 percent. Neighboring states experience a slight decrease in vehicle miles travelled with the greatest being experienced in Washington, DC (1.352 percent). Consequently, air pollution and GHG emissions in all states is reduced under the marginal VMT tax (Maryland results: 7.621 to 9.419 percent reduction). Interestingly, while miles travelled are reduced revenue generation reaches as high as 2.68 times the current tolling policy. Consumer surplus as a percentage of household income during time periods per year were examined to evaluate equity effects. As expected the higher income households are hurt the least with the middle income experiencing the greatest consumer surplus decrease by 0.9 percent.

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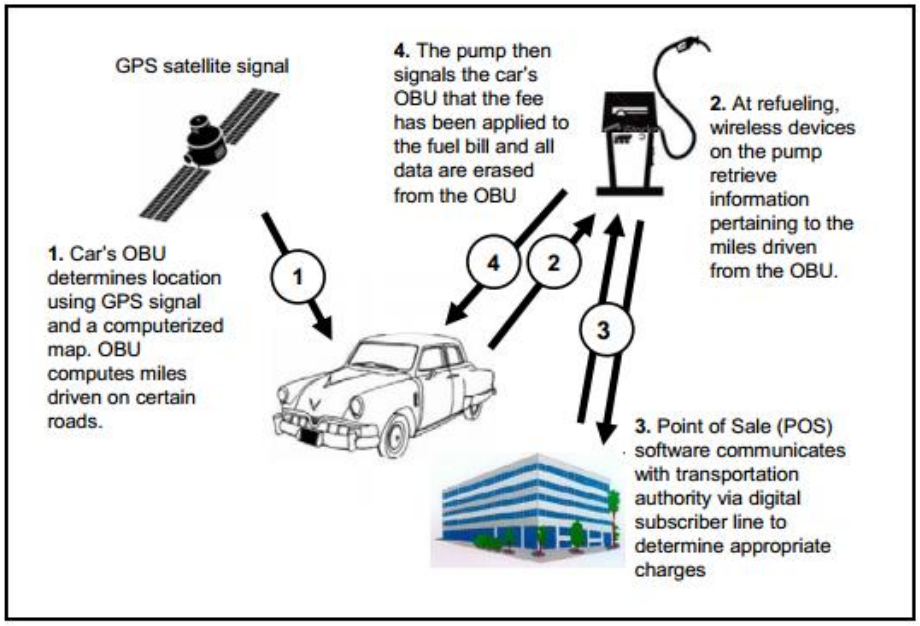
(31)

Feasibility of Mileage-Based User Fees: Application in Rural/Small Areas of Northeast Texas				
Author(s):	Baker, Richard; Goodin, Ginger; Lindquist, Eric; Shoemaker, David			
Publisher:	University Transportation Center for Mobility, Texas Transportation Institute (TTI)			
Year	2008			
Source Info:	UTCM Project #08-11-06 (TTI and North East Texas Regional Mobility Authority			
Web link:	http://utcm.tamu.edu/publications/final_reports/Goodin_08-11-06.pdf			
Study Region:	Texas			
Revenue Enhancement Criteria	Revenue Yield [ ]	Long-term financing [ ]	Implementation Strategies [X]	Geographic Considerations [X]

This research project funded by the University Transportation Center's program identified key issues associated with implementing a mileage-based user fee within northeast Texas (Small cities of Tyler, Longview and Texarkanan). This area was selected due to the local interest in a new transportation revenue source as well as its small population size and geographic isolation. The Region examined includes 29,248 lane miles, 69 percent of which are county roads or roads that lie within city limits while 19 percent are U.S. Highways route, 24 percent are on state highways (i.e. 49 percent farm-to-market or ranch to market roads). Population is expected to grow 17.3 percent by 2030 and VMT growth is expected to increase by 61 percent.

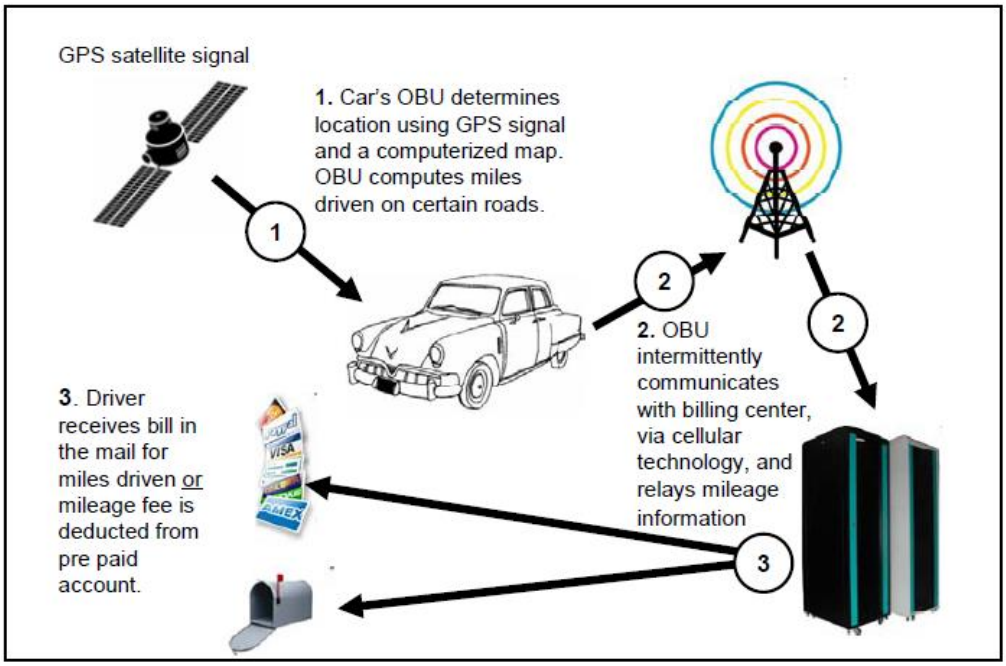
The researchers used several outreach techniques to understand public acceptance associated with implementing a mileage-based fee system. The outreach included a series of meetings as well as focus groups that drilled down on issues relative to implementation of a mile-based user fee. Efforts began by educating Community Advisory Group (CAG) on the transportation funding crisis in Texas. Most members of the CAG as well as focus groups participants did not even know how much they were currently paying in gas tax (Federal and State).

One the most interesting areas explored in this study included a review of different technologies for collecting fees and operating a mileage-based user fee system. Three configurations were presented to the CAC for comment:

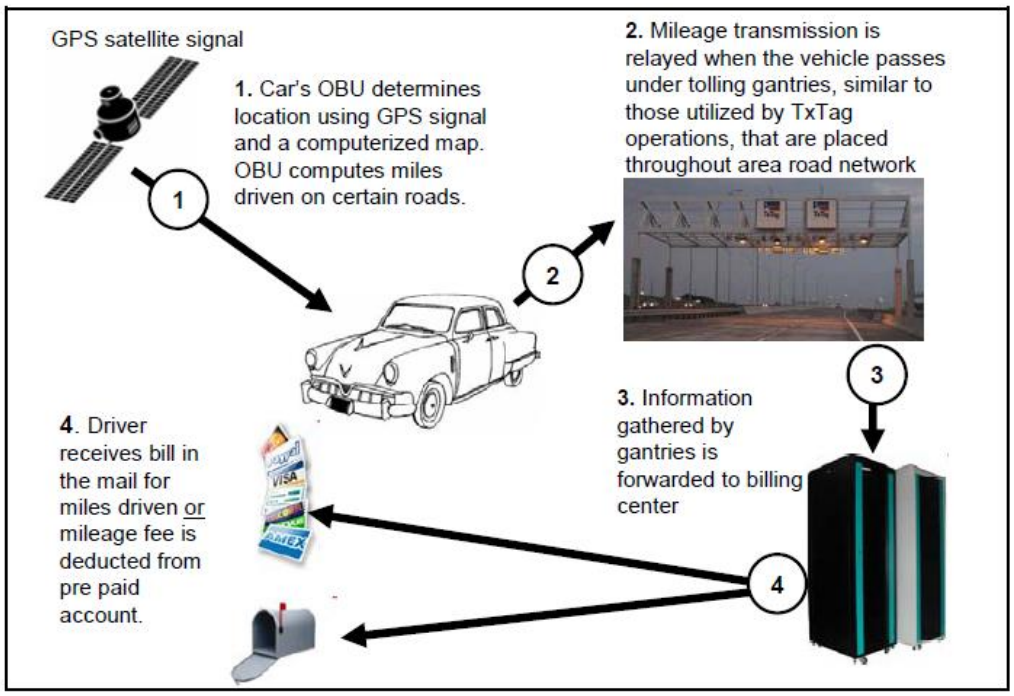


The image above shows the **Oregon model**. This approach requires cars to be equipped with an on-board mileage-counting unit (OBU) that communicates with readers at specific service station gas pumps. When a connection is made between the fuel pump and the OBU, the mileage information is transferred from the OBU to fuel pump which contacts a billing office to determine the mileage charges for each zone or facility. The total fee is included in the fuel bill.

The image below shows a **cellular model**. The cellular model applied in Germany for freight trucks utilities a GIS-equipped OBU similar to the Oregon model; however, this model tallies mileage usage is communicated to a central billing center via cellular signal. Drivers are billed for charges or fees are deducted from a pre-paid account.



The image below depicts the **gantry model**. The difference in technology is the use of tolling gantries or other roadside sensing equipment to communicate mileage usage to a central billing center. Again as the cellular model drivers are billed or fee deducted from paid account.



The CAG was also presented with a fourth model similar to the gantry model but utilizing a flat fee which addressed the GPS/satellite-related privacy issues. This technology would utilize the same technology as the TxTag tolling gantry. Drivers would pay by bill or fee deducted from pre-paid account. The consensus from the CAG is that a simpler model is better.

As part of educating the CAG on funding for transportation, they were asked to think about using and paying for highways in new ways. The following examples were provided to demonstrate different payment frameworks:

Amusement Parks – If paying for transportation were like paying to visit an amusement park, then one would have the option of paying per visit (or per trip) or could elect to purchase a season pass and visit as they please (or travel as they please).

Hunting and Fishing Licenses – If paying for transportation were like purchasing hunting and fishing licenses, the traveler would purchase a customized permit that would allow them to travel for one year, or "season." The permit price might vary depending on when one drives, where one drives and type of vehicle. "Stamps" could be purchased to allow for limited uses outside of the permit restrictions.

Postal Service – If paying for transportation were like paying for postage, then one flat rate would allow the traveler to go anywhere, anytime.

Cellular Phone Service – If one elected to pay for transportation like a cellular phone service, then travelers might have two options. The first would be to purchase a travel plan with a certain fee set for certain amount of miles to be travelled. Travelling outside of the allotted miles or outside of the contracted zones would cause the user to incur additional fees. The second option might be to simply pay on a trip-by-trip basis. The fee per trip might be higher, but the system would allow travelers to tailor their use and not pay for trips they do not intend to make.

Internet Service – Under an internet service type payment plan, travelers might pay one monthly fee for unlimited use of roadways.

Utility Services – Paying for transportation in a manner similar to utilities would mean that the traveler would only pay for what they actually travel. Utility payment plans are the most similar to mileage-based fee system.

A questionnaire was provided to the CAG asking them to identify the most likely alternative financing mechanism that could be implemented in the next 10 to 20 years. Tolling new facilities and mileage-based user fee were the most likely candidates according to survey results with property taxes being the lowest.

CAG members were also asked as part of this study to identify the major issues facing the region, state and nation and discuss how transportation policies affect these issues. The economy was cited as being the biggest issue facing both the region and state. Transportation infrastructure was seen by the group as critical to connect housing to job markets as well as to attract educated workers by improving access to the local workforce. The CAG suggested that a mileage-based user fee should be framed to the public as a mechanism that can attract businesses and out of region workers. The CAG also discussed the linkages between how transportation infrastructure investments can improve education and healthcare.

The CAG also identified potential opposition groups to a mileage-based user fee which included trucking organizations, farmer and ranchers. The CAG suggested gaining broad-based support for a mileage-based user fee by first educating local officials to gain support from them and country governments.

The overall themes of public reaction from the CAG meetings, stakeholder interviews and focus groups included the following:

- The fuel tax is not well understood, the transportation financing and funding processes even less so
- Gasoline prices are driving most of the discussion on transportation-related issues
- There is an overall perception that rural areas have not received their fair share of funds
- Any new system should be simple with minimal administration, transparent money flow and clear added value
- Privacy concerns are an issue, but are also individualized
- There is concern for commercial motor vehicles paying their "fair share"
- Any new system should account for rural needs: higher mileage in remote areas and limited public transportation options

Based on public input and other relevant data both technological and user fee criteria were proposed as follows:

Technological Criteria

- Privacy and data security
- Low-cost administrative functions
- Simplicity and customer-friendly features
- Reliability
- Tamper-proof and enforceable funding options
- Accommodation for future vehicle propulsion technologies (e.g., will we be plugging in our vehicles to recharge, or connecting to our natural gas lines at home?)

User Fee Criteria

- Charges appropriately for distance travelled by individual road types
- Accounts for multiple household vehicles and limited public transportation options
- Charges appropriately by vehicle class to cover maintenance and needed expansion, including public transportation options (passenger rail and bus)
- Addresses out-of-state/out-of-region travelers
- Does not drive transportation-dependent businesses from the region
- Allows for local retention of revenue
- Is transparent and demonstrates clearly the value added by the user fee

The North East Texas Regional Mobility Authority (NET RMA) is interested in submitting a grant proposal to conduct experimental pilot in the region as a follow up to this research effort. Many questions continue to need answers particularly related to how technology can address public and political

concerns; roles of different layers of government (local, state and federal), and incremental approaches to allow a smooth transition between a gas tax and mileage user tax.

(32)

Road Pricing for High Performance Transportation: What Can American Local and Regional Authorities Learn from Experience Abroad?				
Author(s):	Andreas Kossak			
Publisher:	n/a (presentation)			
Year	2007			
Source Info:	Presentation given at the Urban Partnerships Workshop, Washington, D.C., January 25th, 2007			
Web link:	http://www.hhh.umn.edu/centers/slp/transportation/congestion_pricing/pdf/Germany_Truck_Tolls_Jan07.pdf			
Study Region:	Germany			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [ ]	Geographic Considerations [ ]

Abstract:

Kossak presents an overview of the truck tolling program in Germany. Historically, Kossak notes that Germany has moved from a time-based tolling system to a distance-based tolling system using GPS technology, placing a heavier emphasis on user financing over time. He also notes that the **GPS-based approach enables both revenue generation and traffic management**. As of 2007 (the date of the presentation), the average toll for trucks in Germany is $0.20 per vehicle-kilometer (~$0.32 per vehicle mile), leading to gross revenues of around $4 billion USD in 2006.

Tolls are differentiated by vehicle emissions standards and number of axles. The revenue is split 50/50 for roadways and rail/inland waterway improvements in Germany. The system uses GPS units, gantries with license plate recognition, and point of sale manual tolling for collection. Beyond revenue generation, the system has led to a higher average load for trucks, a small shift of truck traffic to non-tolled routes, a shift to trucks with higher environmental standards, and a shift to new trucks in the 10-12 ton category. Looking forward (from 2007), Germany was considering time of day variations, increasing average tolls, and tolling trucks with lighter loads.

(33)

Potential Benefits of Mileage-Based User Fees to the Freight Industry and Industry Concerns				
Author(s):	Ferrol O. Robinson, David D. Coyle, and Gerard J. McCullough			
Publisher:	Minnesota Department of Transportation			
Year	2012			
Source Info:	Report published by UMN on the trucking industry's potential response to MBUF			
Web link:	http://ntl.bts.gov/lib/47000/47800/47894/2012-19.pdf			
Study Region:	UK, US, Germany, MN			
Revenue Enhancement Criteria	Revenue Yield [ ]	Long-term financing [ ]	Implementation Strategies [X]	Geographic Considerations [ ]

Abstract:

This study provides lessons for the freight industry from pilot programs to implement mileage-based user fees (MBUF). The study focuses on freight for two reasons: in the first case, trucks occupy more of the roadway in terms of their physical size and operating characteristics; in the second, trucks cause disproportionately more wear on roadways because of the loads the trucks carry.

This paper presents benefits to the freight industry that result from MBUF, the results of a willingness-to-pay analysis focused on the freight industry, and freight industry concerns from around MBUF.

Benefits to shippers include:

- **Decreased congestion on roadways** (annual estimated congestion costs are estimated at $7B)
- **Improved travel time predictability** (and reduce costs associated with travel delays)
- **Improved quality of roads** (resulting primarily in reduced maintenance to trucks and damage to fragile cargo)
- **Providing cost savings to customers** (a German study found that roadway improvements resulted in decreased costs to consumers)
- **Better data collection and reporting of mileage** (which would be useful to meet requirements in the International Fuel Tax Agreement and International Registration Plan)
- **Secondary benefits to travel time and improved reliability** (which could result in downward pressure on wages, reduce maintenance costs)

The study explores potential cost savings and willingness-to-pay (WTP) models for the freight industry in light of increase travel times. A study conducted by Global Insights examining the freight industry in MN estimates that, **if freight in MN could increase its average speed from 30 MPH to 35 MPH, the cost savings or WTP would be 7.32 cents per mile.** Different savings amounts are calculated for additional increases in average speeds. Other studies (discussed in less detail here) report even higher WTP for average speed increases.

Industry concerns include:

- Studies show that **the freight industry feels it is already paying taxes** in the form of fuel taxes (although the same study reports that autos and light trucks are overpaying, where most heavy trucks pay less than their cost responsibilities)
- The **trucking industry has historically been opposed to weight-distance taxes**, and has successfully lobbied to have weight-distance taxes removed in 20 states (only 4 states still had these laws at the time of this article)
- **Concerns over enforcement** (an industry leader observed that the IRS's history of enforcing excise taxes has not been as consistent as its record enforcing income tax; furthermore, odometer tampering and other measures may make these taxes more avoidable than fuel taxes)
- **Privacy issues and costs of new technology**
- Concerns that the revenue will not be spent on infrastructure investment
- Because automobiles' fuel efficiency has increased at a higher rate than the trucking industry, **automobiles are responsible for the greater share of declining fuel tax revenues**
- **Changing cost calculations** (industry leaders expressed concern that the new MBUF fees would no longer allow the companies to pass cost increases to consumers; these leaders also reported that the American Trucking Industry favors a fuel tax increase)

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(34)

HOT Lane Policies and Their Implications				
Author(s):	Burris, Mark; Goel, Rahul			
Publisher:	Springer Science + Business Media, LLC			
Year	2011			
Source Info:	Published on-line November 13, 2011			
Web link:	https://ceprofs.civil.tamu.edu/mburris/Papers/HOT%20Lane%20Policies%20-%20Transportation%20-%20as%20published.pdf			
Study Region:	Miami, Florida; Los Angeles and San Diego, California; Denver, Colorado, Minneapolis, Minnesota and Seattle, Washington			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [ ]	Implementation Strategies [X]	Geographic Considerations [ ]

This study examined similar corridors to conduct pairwise comparisons of high occupancy/tool (HOT) lanes (as knows as express lanes) in six metropolitan cities in the U.S. HOT lanes have been gaining interest among transportation agencies as a way to reduce congestion during peak hour traffic as well as raise revenue. However, for these HOT lanes to be effective they must be used. Over the last 15 years the U.S. has observed 10 high occupancy vehicle lanes (HOV) converted to HOT lanes. Los Angeles opened the first HOT lane (91 Express) in December, 1995. Like most HOT lanes, carpools with 2/3 or more passengers can use the lane for free. This study reviews the following six of the 10 implemented HOT lanes due to their similarities including geometric configurations, operational characteristics and usage eligibility requirements:

- Comparison of I-95 in Miami to SR 91 in Los Angeles
- Comparison of I-15 in San Diego to I-25 in Denver

- Comparison of I-394 in Minneapolis to SR 167 in Seattle

The study evaluates effects on a range of travelers including carpoolers (HOV 2 and HOV 3+ travelers), transit ridership as well as the HOT lanes usage. The results show that in the case of I-95 and Express 91 after a year of implementation there was 10 to 40 percent transfers from HOV 3+ travelers to the HOT lanes. There was smaller increase overall in HOV2 travelers that converted. Transit usage was not affected by Express 91 because buses do not use the HOT lane but in the case of I-95 there was a 30 percent increase of ridership as the afternoon peak period was reduced from 25 minutes to 8 minutes because buses were able to use the express lane. For the I-15 and I-25 corridors carpool usage on the express lanes did increase on I-15 but changed very little on I-25. Difference in usage can potentially be linked to I-15 dynamic pricing structure while I-25 has a fixed toll value during peak hour travel. For SR 167 and I-394 economic factors related to gas prices and recession appear to be affecting usage of the HOT lanes. Carpool usage (no toll charge) increased on both corridors rather than increases in utilization of the HOT lanes. The table on the following page provides some detailed information on the characteristics and impacts of the pairwise comparisons.

Table 3 Characteristics of different HOT lanes (pair-wise comparison)

HOT lane	Number of lanes	Separation	Intermediate access points	Free travel eligibility	Impacts
SR 91X, Los Angeles	2 HOT lanes and 4 GPLs per direction	Painter buffer and pylons	None	HOV3+	– HOV2+ traffic volumes in the corridor remained relatively stable – HOV3+ traffic volumes increased by 40% in PM peak after the Express Lanes started (but this is starting from a small baseline). – 40% of the survey respondents mentioned driving comfort and safety in the Express Lanes as the reasons to use the Express Lanes other than travel time savings
I-95, Miami	2 HOT lanes and 4 GPLs per direction	Double White Stripes with breakable poles	None	HOV3+ registered carpools	– For those who mentioned HOV3+ as their usual mode, 81% of them previously used the HOV lanes as carpools. However, with the opening of the Express Lanes, only 33% are registered HOV3+ users while 61% are toll paying LOVs (SOV/HOV2). – Daily transit ridership increased 30% due to travel time improvement onthe Express Lanes. This was despite a bus fare increase, a decrease in gas prices, reduced service and an economic recession
I-15, San Diego (until May 2008)	2 Reversible HOT Lanes and 4 GPLs per direction	Concrete Barrier	None	HOV2+	– Total weekday usage of Express Lanes increased from 7,685 (pre-Express Lanes) to 15,000 in three years after the Express Lanes started – Congestion on the GPLs was alleviated by directing the increasing traffic on corridor to HOT lanes
I-25, Denver	2 Reversible HOT Lanes and 4 GPLs per direction	Concrete Barrier	None	HOV2+	– Express lane users indicated more use of transit due to the Express Lanes – Little change in carpooling after the lanes opened – Large increase in transit ridership seen with an increase in gas price (2008) and vice versa (2009)
I-394, Minneapolis (Diamond Section)	1 HOT Lane and 2 GPLs (most of the time) per direction	Double White Stripes	6 in each direction	HOV2+	– Bus ridership increased after the HOT lanes, significantly higher than in the control corridor. – User surveys indicated no negative impact on carpooling due to the Express Lanes – Carpoolers decreased in peak periods. Attributed to the increase in operational hours
SR 167, Seattle	1 HOT Lane and 2 GPLs per direction	Double White Stripes	6 Northbound and 4 Southbound	HOV2+	– Carpool usage decreased by more than 25% in one year with an increase in bus ridership. Increasing gas prices seem to be the primary reason – A 42% increase in carpooling. More carpools than on I-394. Both possibly due to greater GPL congestion

(35)

Willingness to Pay of HOT Lanes – Empirical Analysis from I-15 and I-394				
Author(s):	Burris et. al			
Publisher:	Transportation Research Board (TRB)			
Year	2012			
Source Info:	For presentation and publication at TRB, March 2012			
Web link:	https://ceprofs.civil.tamu.edu/mburris/Papers/VOT%20on%20I-394%20and%20I-15%20-%20TRB%202012.pdf			
Study Region:	CA, MN, and survey results from Houston, TX			
Revenue Enhancement Criteria	Revenue Yield [ ]	Long-term financing [ ]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

This report evaluates the willingness of road users to pay for High Occupancy Toll (HOT) lanes. After evaluating stated preference surveys of drivers who use the Katy managed lanes in Houston, Texas; the SR-91, I-15, and 91-X lanes in California; and the I-394 HOT lanes in Minnesota, it became apparent that travel time savings were only part of the decision-making calculus for drivers choosing to use HOT lanes. Reduced variability in commute times (trip reliability), as reported in shared preference surveys, was also be a probable factor that compelled drivers to use HOT lanes.

This report compared stated preference survey results to empirical evidence of driver behavior collected from Minnesota's I-394 and California's I-15 HOT lanes. Evidence from I-394 and I-15 revealed that the average travel times on both the I-394 and I-15 general purpose lanes, during peak and off-peak periods, was not much higher than on adjacent HOT lanes. This indicated that **HOT lanes users are willing to pay large amounts for even a relatively small amount of travel time savings**.

For access to Minnesota's I-394 HOT lanes:

- Users paid an average of $78/hour in the morning and $116/hour in the afternoon.
- 35 percent of users paid for an average travel time savings of less than one minute

This conforms to the stated preference survey results of the Katy managed lanes in Houston. In the survey, drivers showed a willingness to pay $22/hour for travel times savings and $28/hour for reduced variability.

Report takeaways:

- For HOT lane access, drivers are willing to pay a very large amount relative to their travel time savings
- Reliable commute times (in other words, those with less variability) may be equally or even more important than travel time savings for drivers using HOT lanes

(36)

A Value Pricing Education and Outreach Model: The I-394 MnPASS Community Task Force				
Author(s):	Buckeye, Kenneth R. and Lee W. Munnich, Jr.			
Publisher:	Transportation Research Board			
Year	2006			
Source Info:	A partnership effort by the Minnesota Department of Transportation and Hubert H. Humphrey Institute of Public Affairs			
Web link:	http://trid.trb.org/view.aspx?id=777347			
Study Region:	Minnesota			
Revenue Enhancement Criteria	Revenue Yield [ ]	Long-term financing [ ]	Implementation Strategies [X]	Geographic Considerations [ ]

Abstract:

This report discusses the efforts of the I-394 Express Lane Community Task Force to help citizens and stakeholders fully understand the purpose of converting I-394 HOV lanes to HOT lanes. It analyzes two previously unsuccessful attempts at introducing road pricing in Minnesota and determines that these attempts were ineffective in large part "because decision-makers failed to attend to interests and information held by key stakeholders."

the I-394 Express Lane Community Task Force played a crucial role in Minnesota's successful implementation of road pricing in 2005. The report details that the collaboration between MnDOT and the Humphrey Institute on research as well as outreach and education – through a grant from FHWA's Value Pricing Pilot Program. This collaboration helped build the political and institutional support for the MnPASS Express Lane project.

After years of discussion and deliberation the project gained support. Below are the seven lessons learned by the I-394 Express Lane Community Task Force, pulled directly from the report:

1. **The make-up of an advisory task force is important** when trying to achieve informed consent on complex and controversial projects. Legislators working alongside community representatives, citizens, interest groups, and technical experts can provide a productive and meaningful deliberative opportunity.

2. **An advisory task force can be a highly effective way of getting key players as well as interested citizens at the table during the design and implementation of a project**. While support may exist for moving forward, the "devil is in the details," and a task force of a corridor's key stakeholders can help the project team in sifting through those that are most important to the public, and addressing them before they generate political opponents.

3. It is significant that no organized opposition emerged during the design and implementation phase of the project. While there were critics who spoke out about the project in city council meetings and other forums, **the task force became an important vehicle for assuring that**

public concerns were addressed, and helped in assuring elected officials that their interests were represented in the design of the project.

4. **Transportation agencies must address problems quickly when they occur**. There were significant points of controversy during the project, in particular the 24/7 operation of the diamond lanes west of Highway 100. While most of the members agreed to go along with the project team's recommendation to charge tolls at all times rather than just the peak periods, there was a clear understanding that Mn/DOT would observe how the 24/7 operation worked and make changes if necessary. One legislative member of the task force chose to submit a minority report on this issue. When the project opened in May 2005, there was an unexpected increase in congestion in the morning in the westbound, reverse peak direction. After a few weeks of negative public reaction, a Minnesota Senate action to reverse the 24/7 decision, and exploration of various alternatives, Mn/DOT decided to reverse the 24/7 tolls and only apply them in the peak direction during peak periods, and to open an auxiliary lane utilizing existing shoulders.

5. The selection of the right chair and task force members is very important. **Skillful and respectful leadership increases the confidence and trust of committee members in the process** and that their concerns would be heard and addressed.

6. **Site visits to other HOT lane and express lane projects played a critical role in increasing the task force understanding of how value pricing works.** Early in the task force deliberations, six of the members visited the SR 91 and I-15 projects in California. The six came back with an increased understanding of how these projects work as well as the differences in the two projects. They reported what they learned to the other members of the task force, and frequently referenced these projects during the course of the task force deliberations.

7. **The project team brought all details to the task force and took every problem raised by a task force member very seriously, making special efforts to provide good analysis and answers to every question**. For example, in response to concerns about additional bottlenecks at the Lowry Hill Tunnel with more traffic in the HOV lane, after it was converted to a HOT lane, the project team produced a computer simulation of just how merging would occur with increased traffic in the HOT lane, and why it would not lead to increased congestion in the general purpose lanes.

(37)

Empirical Evidence from the Greater Toronto Area on the acceptability and impacts of HOT lanes				
Author(s):	Finkleman et. al			
Publisher:	Transport Policy			
Year	2011			
Source Info:	Transport Policy 18 (2011) 814-824			
Web link:	http://www.sciencedirect.com/science/article/pii/S0967070X11000771			
Study Region:	Greater Toronto Area			
Revenue Enhancement Criteria	Revenue Yield [ ]	Long-term financing [ ]	Implementation Strategies [ ]	Geographic Considerations [X]

Abstract:

Highways 401 and 407 run parallel through the city of Toronto, where highway 407 is tolled and Highway 401 is not. This system feature allows for unique research to be conducted in which drivers' willingness-to-pay can be measured in a high-occupancy toll (HOT) lane context.

This report discusses how drivers' willingness-to-pay (WTP) for tolled lanes is related to various factors such as trip attributes, traveler characteristics, and travel environment. It analyzes the responses of 255 survey respondents who were spread throughout the Greater Toronto Area. It also analyzes weekday and weekend traffic volumes on Highway 407 and Highway 401.

This report brought forth four significant findings:

1. Travelers who had previous exposure to Highway 407 (at least one trip,) compared to those who did not, possessed a higher WTP for HOT lanes
2. WTP for HOT lanes increases as income levels rise
3. Travelers have a much higher WTP for HOT lanes during the weekday peak periods than on the weekends (see graph below)
4. Travelers stated a willingness to carpool or a willingness to use transit on HOT lanes based on their income and age

The graph to the right depicts eastbound throughput for highway 407 on both weekdays and weekends. The higher values in weekly peak-period throughput illustrate that drivers have a higher WTP for toll roads to meet work obligations.

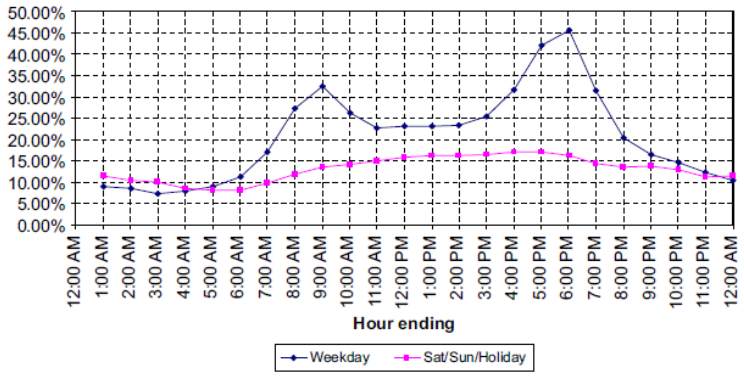


Fig. 12. Percentage of total eastbound throughput using Hwy 407 at the screenline.

What do People Think About Congestion Pricing? A Deliberative Dialogue with Residents of Metropolitan Washington				
Author(s):	Swanson, John and Benjamin Hampton			
Publisher:	Federal Highway Administration			
Year	2013			
Source Info:	The National Capital Region Transportation Planning Board carried out the research in partnership with the Brookings Institution			
Web link:	http://www.mwcog.org/uploads/committee-documents/ZV1cWFZb20130117170347.pdf			
Study Region:	Washington D.C. Metropolitan Area			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

This report examines the lack of public support for congestion charges and discusses the role information and education on pricing plays on influencing attitudes. It expands on a decade of regional studies that show the technical viability and potential benefits of road pricing, but had not addressed the political viability of implementation.

The report includes survey results of 6,629 randomly selected employed residents of the Washington D.C. region who were surveyed on transportation topics regarding system characteristics and funding. The report also includes a conference call made with U.S. and international congestion price practitioners. Then, as a central focus, the report details findings from five deliberative forums, held in the Washington D.C. region. Over 300 people were present at these forums and utilized as a large focus group. They were asked to provide their opinions about congestion charging use in three scenarios: (1) priced lanes on all major highways, (2) pricing on all roads and streets, (3) pricing in specific zones.

Major themes emerged from the survey, practitioner conference call, and forum. They are:

- **People are much more likely to support priced lanes and priced zones (scenarios 1 and 3) than pricing on all roads and streets**
    - People are very opposed to pricing on all roads and streets due to invasion of privacy issues; the phrase “big brother” and discussions around invasion of privacy were persistent in the deliberative forums.
    - People are more likely to support priced lanes and priced zones because they present users with choices, are easier to grasp, and when framed in the right context public attitudes have shifted toward their approval.
    - Approval for priced lanes and zones increases with increased transparency of revenue use, especially if revenues are dedicated to useful transportation alternatives

- **People lack confidence in the government’s ability to solve transportation problems.**
    - In the deliberative forum participants cited the lack of transit options as indicative of the government’s inability to meet the region’s transportation needs.

- The phone survey substantiated that claim as three out of four respondents said more transportation funding should be allocated to expanding transit.
- Participants were also dissatisfied with the concept of replacing the gas tax with a mileage-based fee. Participants voiced that they would actually prefer to keep the gas tax as well as experience a VMT fee, because removing it entirely seemed too risky.

- **Education and outreach about transportation funding and system performance really does matter**
  - Survey respondents and forum participants were both skeptical about decisions being made about the transportation system; once funding shortfalls were explained people were more receptive to proposals to increase the gas tax
  - Once congestion pricing scenarios were explained, public acceptance grew for priced lanes and pricing zones, but decreased for pricing on all roads and streets. This can be seen below:

The figures to the right show changes in public opinion for scenario 1 (priced lanes), scenario 2 (pricing on all roads and streets), and scenario 3 (pricing in specific zones).

Figure 11: Change in Support for Scenario 1

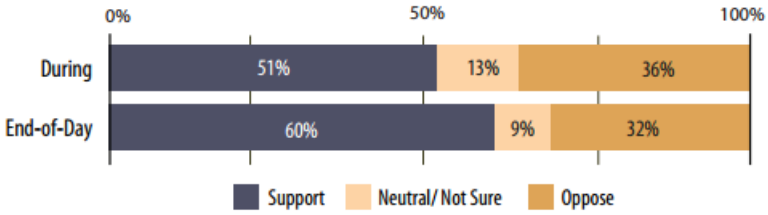


Figure 12: Change in Support for Scenario 2

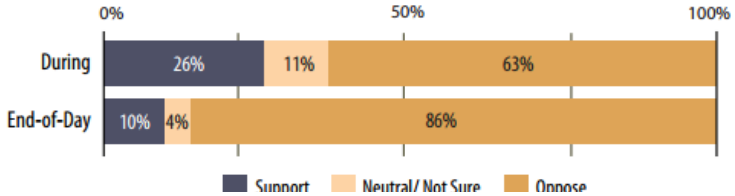
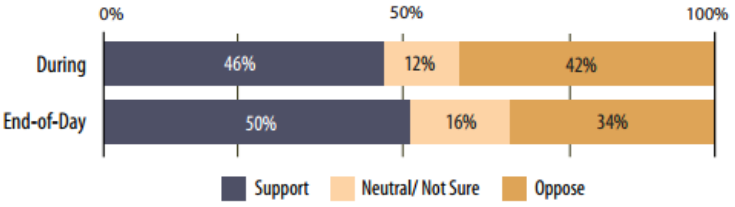


Figure 13: Change in Support for Scenario 3



(39)

Accuracy of congestion pricing forecasts				
Author(s):	Eliasson et. al			
Publisher:	Transport Research			
Year	2013			
Source Info:	Evaluates the accuracy of a Sampers model linked with the EMME/2 model			
Web link:	http://www.sciencedirect.com/science/article/pii/S0965856413001006			
Study Region:	Stockholm			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [ ]	Implementation Strategies [X]	Geographic Considerations [ ]

Abstract:

This report evaluates the **accuracy of Stockholm congestion charge forecasts** to their actual outcomes. It analyzes the precision of the *Sampers* model linked with the EMME/2 network assignment model. The report states that the composite model constitutes best practice for large-scale transport models and is **similar to most operational, large scale multi-modal transport models**. The congestion pricing forecasts on traffic reduction, travel behavior changes, revenue generation, transport ridership and air quality are compared with their actual results. The forecasts and outcomes can be seen in the table below:

Characteristic	Forecast	Outcome	Analysis
Congestion Level	Reduction of 16% during peak period, with variation across the day	Reduction of 20% during charged time periods	Outcome was more desirable than forecasted
Behavior Changes	2/3 traffic reduction from work trips; 1/3 reduction from leisure trips	1/2 of reduction came from travel; 1/2 reduction came from leisure trips	Model underestimated the effect pricing would have on leisure trips
Revenue Generation	4.72 Million SEK/day	4.06 Million SEK/day	- Exemptions were higher than predicted in model - traffic reduction was larger than predicted
Transport Ridership	Expected increase of 6% transit ridership (model was adjusted)	Increase of 4-7% depending on travel survey or passenger count data.	It took foresight to initially adjust the model, but after the adjustment the forecast was accurate.
Air Quality	decrease in air pollution related to 7% reduction in VMT	Best measure of air quality is seen by VMT reductions estimated at 10-15%	Outcome was more desirable than forecasted

At the implementation phase there was much skepticism that the congestion charge would have no effect at all. Common arguments were:

- "Car drivers choosing to drive in spite of heavy congestion do so because they have no alternatives."
- "It is already so expensive to drive and park that an extra charge will not make a difference."

Despite these initial hesitations, the congestion charge did have a dramatic effect on the transport system. **Traffic across the cordon decreased over 20 percent**, bringing traffic down to pre-1970 levels and **reducing queuing times by 30-50 percent**.

Congestion charges initially meet substantial resistance from policy-makers, the general public, and planners, alike. However, much of this resistance is due to skepticism. For example, even as many cities around the world desire to replicate Stockholm's experience, a common reaction cited in the report is "it would not work in our city."

This report brought two major findings to light:

1. Best-practice transport models seem to be reliable as decision support and design tools even for substantial changes of the transport system

2. If a congestion charging system is predicted to "work" in a given city – that is, reduce peak traffic in bottlenecks without unacceptably adverse side-effects or having to use unacceptably high charge levels – then it is likely to be true in reality as well

The report also iterated that the model was not perfect. It did have difficulty dealing with vehicle exemptions. It was unable to predict the characteristics of traffic flow in terms of vehicles eligible for discounted fares, making revenue prediction very difficult. The model over-predicted revenue by 14 percent, 5 percent of which was attributable to over-predictions in traffic flow across the congestion charging barrier and the rest due to time-of-day and vehicle exemptions.

(40)

Reducing Congestion and Funding Transportation Using Road Pricing in Europe and Singapore				
Author(s):	Arnold et. al			
Publisher:	Federal Highway Administration			
Year	2010			
Source Info:	A scanning study sponsored by the Federal Highway Administration, American Association of State Highway and Transportation Officials, and National Cooperative Highway Research Program			
Web link:	http://international.fhwa.dot.gov/pubs/pl10030/pl10030.pdf			
Study Region:	Stockholm, Sweden; London, U.K.; Singapore; Germany; Czech Republic; U.S.			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

The Federal Highway Administration, American Association of State Highway and Transportation Officials, and National Cooperative Highway Research Program sponsored this study to identify best practices from the international experience for road pricing strategies. Experiences in Stockholm, London, Singapore, Germany, Czech Republic, and the Netherlands were analyzed by a study team, which documented significant findings after meeting with practitioners from these locations. The team found: **programs that could demonstrate improvements to travel conditions, quality of life, or offer other enhancements to the transportation system could overcome low approval ratings and gain public acceptance after their implementation**. For instance, Stockholm's congestion tax and London's congestion charge had initial approval ratings of 25 percent and 40 percent, respectively. However, after program implementation, approval ratings grew to over 50 percent in both cities.

This study examines road pricing projects that were implemented for revenue generation and demand management. It offers a comprehensive evaluation of the costs and benefits associated with these road pricing programs in Europe and Singapore. Some noteworthy benefits/costs were pulled from the study and included below:

Benefits

- Congestion rates fell significantly – 25 percent in London's central business district
- Improvements in air quality arose – Up to 10 percent in Stockholm
- Public-Private Partnerships (P3s) could be used to overcome high start-up costs – Germany used P3s and the Netherlands proposed their use
- New Revenue became available to fund transportation system improvements – Stockholm, London, Singapore, Germany, and Czech Republic

Costs

- Operating costs are substantial – Up to 50 percent of gross revenue in London

- Start-up costs are significant – microwave, global positioning system (GPS), automated number plate recognition (ANPR), and dedicated short-range communications (DSRC) systems used for toll collection and monitoring have high installation costs

The study also includes lessons learned from the six international experiences and provides implementation recommendations for road pricing strategies in the United States. It identifies the key economic, political, and social factors that enabled comprehensive road pricing programs to be implemented in Europe and Singapore, including:

- Overcoming high start-up and operational costs (through use of public-private partnerships in some instances),
- Providing public outreach through educational programs to impacted populations, and
- Allowing flexible options for fee and data collection to navigate privacy concerns

A summary table of the six road pricing projects evaluated in this study is included below.

	Location	Purpose/Objective	Approval Rate Before/After Implementation	Technology	Measured Impacts	Annual Revenues & Cost
Demand Management	Stockholm, Sweden Congestion Tax	Manage congestion (1) Promote transit and protect environment (2)	25% before / 50% after Recently approval rating near 65%	ANPR to assess tax to vehicle owner	20% less traffic congestion in CBD; 10-14% decrease in emissions	(2009) Gross: $118.5 Mil. Net: $74 Mil Costs: 37% of revenue
	London, U.K. Congestion Charge	Manage congestion (1) Promote transit and protect environment (2)	40% before / 50% after	ANPR to track compulsory payment compliance & identify violators	Initial traffic reductions of 25% and 19% (CBD & Western ext.)	(2008) Gross: $435 Million Net: $222 Mil. Costs: 50% of revenue
Revenue Generation	Singapore Electronic Road Pricing (ERP)	Manage congestion (1) Promote transit (2)	Not given	DSRC in-vehicle units w/ removable smart cards; ANPR for enforcement	Free-flow road speed targets of 45-65km/h on expressways	(2008) Gross: $90 million Net: $72 Mil. Costs: 20% of revenue
	Germany Heavy Goods Vehicle (HGV) Charging on Highways	Generate revenue and promote user-pays principal (1) Protect environment and encourage mode shift to rail & water (2)	Not given	GPS for vehicle location GSM for data transmission DSRC & ANPR to enforce; & manual	58% shift from dirtier truck models to cleaner trucks	(2008) Gross: $5 billion Costs: 15-20% of revenue
	Czech Republic Truck Charging on Highways	Generate revenue and promote user-pays principal (1) Advance environmental objectives (2)	Not given	Transponder-SRC system with gantries on mainline highways; ANPR for enforcement	Average toll rate of $0.35 per mile on freeways	(2008) Gross: $340 million Costs: 30% of revenue
Planned	The Netherlands National Distance-Based Tax	Planned to manage congestion, replace vehicle tax revenue, and promote user-pays principal (1) Promote transit and protect environment (2)	Not applicable	Under development, likely GPS for vehicle location, GSM-based data communication, and DSRC interrogation w/ ANPR enforcement	Not applicable	Not Applicable

(41)

Congestion Pricing: A Primer on Institutional Issues				
Author(s):	Samdahl et al. (Fehr & Peers)			
Publisher:	FHWA			
Year	2013			
Source Info:	Developed for the Federal Highway Administration, focusing on institutional issues and barriers that may affect the feasibility of revenue enhancement options at state DOTs			
Web link:	http://ops.fhwa.dot.gov/publications/fhwahop13034/			
Study Region:	Europe, United States			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

The authors present an overview of institutional issues that may influence the ability of state DOTs to adopt and implement revenue enhancement mechanisms. The report is broken in to seven issues area: leadership, legislation, planning process, public involvement, managing cost and revenues, and implementation. Several key points span across a number of issue areas, including defining the goals and objectives of revenue enhancement programs and strategically defining uses for revenue. Each issue area is considered from a different perspective for **five revenue enhancement options: priced lanes, tolls on entire roadways, zone-based charges, area-wide charges, and parking pricing**. Within the state policy context, priced lanes, tolls on entire roadways, and a specific case of area-wide charges (the "area" being the entire state) are relevant; zone-based charges, smaller area-based charges, and parking pricing are relevant at the local or regional scale only. Thus, for NCDOT's purposes, only the sections of the report considering revenue enhancement options relevant at the state level will be reviewed here.

In terms of leadership, the authors stress the importance of having an internal policy champion that can lobby for support from political leaders as well as within the DOT. The DOT should also form strategic alliances early on in the implementation of revenue enhancement programs, including local transportation agencies, transit agencies, tolling authorities, and any operational partners. Considering legislative factors, the authors stress the need for enabling legislation to clearly define the goals, objectives, powers, and responsibilities of the entity given the authority to toll. There is also stress placed on developing a continued relationship with the legislature to build trust and seeking legislation that grants broad tolling authority so that the legislature will not have to approve routine operations as the tolling scheme matures.

Organizationally, key points include clearly defining the roles and responsibilities of all parties involved in tolling, adequately staffing the tolling authority, ensuring objectives are uniformly understood and ensuring that the organization that designs the tolling scheme is not the same organization that operates it. Considering the planning process, a point that receives significant discussion is that revenue enhancement programs can have multiple objectives, and that partners can interpret objectives differently if they are not very clearly defined. For example, some revenue enhancement options are designed to collect revenue only to pay for facility construction (i.e., to repay bonds) while others may

collect revenue more generally and share revenues with other agencies to offset some of the costs put on the public (e.g., sharing some percentage of revenues with transit agencies to provide additional transit service along the tolled corridor). Revenue enhancement options may have much broader goals as well – for example, improving traffic flow or encouraging certain land-use patterns – however, it is very important that these goals are defined and understood by all partners initially. A point of contention mentioned in several case studies is the degree to which value-priced lanes are free flowing for transit vehicles versus for private automobiles. Unless defined, a transit agency may assume that the free-flowing value-priced lane will allow bus service at all traffic flows; however, a transportation agency may assume that above a certain level buses van be "kicked out" of the lane to improve traffic flow. While the authors note that the goals and objectives of every revenue enhancement program will be different, it is critical that they are defined (if possible, in conjunction with partners) at the beginning of the program and that all partners understand the goals and objectives clearly. Given the relative newness of revenue enhancement for transportation agencies in the United States the authors also place a heavy emphasis on embedding continual improvement processes into tolling authority operations to make adjustments in response to lessons learned. The authors also stress that equity issues are an important consideration and that prescribed revenue sharing can help address equity issues. For example, earmarking revenues for transportation alternatives in the corridor (transit and bike ped) sharing revenues with appropriate agencies can help provide mobility for those who may be priced out of the tolled lanes. Citing experiences in Seattle tolling State Route 520, the authors also mentioned the need to plan and prepare for the possibility of tolls added to existing facilities displacing traffic to other routes – which may also be tolled to counter this effect.

Regarding public involvement, the authors note that there will likely be public resistance to revenue enhancement programs. However, public support may be built be clearly defining goals and objects early in the planning process, dedicating revenue to support transportation alternatives for a larger portion of the population (to counter the "Lexus Lanes" perception of tolled facilities) and incorporate education into public involvement early in the process. The authors conclude with insights on managing revenues and costs and implementing programs. Regarding revenues, the authors once more stress that it is critical to define the goals and objectives of the program – which should guide how revenues are managed – and define up-front revenue sharing mechanism with appropriate partners. They also note that tolling authorities are often constrained with regards to how revenues may be spent by enabling legislation. A good example of revenue sharing is the I-15 HOT lane project in San Diego. All revenues must be spent in the corridor, and historically about 25 percent have been spent improving transit service in the corridor. This revenue sharing scheme aligns with the goals and objectives of the program, and address equity issues to help build broader support for the program. Finally, the authors stress the importance of using a "pilot project" approach to implementation – although **framing the project as a "first phase" project or an initial component of a larger tolling program may be more effect in garnering public support**. The authors also note the importance of balancing risk with the desire to use the newest technology for tolling. The benefits of new technology may be outweighed by the risk of the technology not working correctly. Considering the generally poor public perception of tolling, technologic issues that may arise during implementation may undercut public support carefully built during the planning phase.

The authors conclude with several lessons learned, listed verbatim below:

- **Strong leadership** – The newness of congestion pricing and typical skepticism by the public puts the onus on a project champion to guide the project though planning, design and implementation. Leaders can emerge from the political, civic, or private-sector.
- **Clear authority** – Most congestion pricing projects need some form of enabling legislation that should clearly identify who is in charge and what outcomes are expected. Clear authority is also needed within the project team.
- **Many Partners** – Pricing brings many new players to the transportation scene, including private sector investors. Traditional agencies and these new partners must be melded into a cohesive team. The organization should be structured to fit the needs of the project, not vice versa.
- **Know the objectives** – Agreeing to specific project goals and objectives up front in the process keeps everyone focused and creates a consistent message for the public and decision-makers.
- **Educating the Public** – The public knows they will need to pay for something new, but what will they get in return? Educating the public on the purpose of the pricing scheme and what benefits they can receive is crucial to gaining support.
- **Know where the Money is Going** – Keeping the revenues “close to home” usually provides the most benefits to the people who are paying.
- **Get it Right** – Money is involved and the public is unsure, so work out the technology, accounting, and design issues before turning on the switch.
- **Flexibility** – There will likely be some crises with every project, but staying flexible helps to avoid surprises and allows for a more effective response.

(42)

Operational Performance Management of Priced Facilities				
Author(s):	Goodin et. al			
Publisher:	Texas Transportation Institute			
Year	2011			
Source Info:	Developed to support tolling efforts at the Texas Department of Transportation, this report focuses on the use of priced facilities for congestion management versus for revenue generation			
Web link:	http://d2dtl5nnlpfr0r.cloudfront.net/tti.tamu.edu/documents/0-6396-1.pdf			
Study Region:	California			
Revenue Enhancement Criteria	Revenue Yield [ ]	Long-term financing [ ]	Implementation Strategies [X]	Geographic Considerations [ ]

Abstract:

The authors focus on priced lanes principally for congestion management rather than for revenue generation and briefly review case studies across the nation that have implemented performance management principles into priced lane facilities. The most mature example given is State Route 91 in California, although a number of other facilities are described which incorporate performance management into facility pricing. Generally, facilities will use real-time traffic information to vary tolls based on pre-established criteria (i.e., if the facility is at 90 percent capacity, then raise the toll by some amount; if the facility is below some other threshold capacity decrease the toll by some amount). While conceptually simple given sufficient data capabilities, and proven quite effective in real-world applications, several common implementation issues are discussed. The authors stress that it is important to maintain flexibility regarding who qualifies for free passage in tolled HOV lanes. Some facilities allow HOV3+ vehicles to pass freely while other allow HOV2+ vehicles to pass freely. This difference can lead to significant differences in facility usage; thus, operators should maintain flexibility regarding this characteristic of the facility and change policy in response to facility usage. The authors discuss to the role of multiple goals in defining operational procedures and appropriate facility metrics to be used for performance measurement. While mentioned only in passing a number of times, the authors also note that establishing uses for revenues generated is important – and can be used to support goals in addition to congestion management (i.e., increased safety, increased transit use, reduced emissions, etc.) Overall, the authors demonstrate that priced lanes can be important not only from a revenue generation perspective but also from a congestion management perspective – which may enable transportation agencies to make better use of facilities (i.e., use assets more efficiently) and thereby increase revenue while potentially decreasing the cost of meeting future transportation needs.

(43)

NCHRP Report 722: Assessing Highway Tolling and Pricing Options and Impacts				
Author(s):	Perez et al.			
Publisher:	National Cooperative Highway Research Program (NCHRP)			
Year	2012			
Source Info:	NCHRP produced this report as the first of a two-volume series			
Web link:	http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_722v1.pdf			
Study Region:	United States			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

This report aids state departments of transportation (DOTs) and other transportation agencies in the decision-making process of instituting user-based fees or tolling on segments of their system. The process used in the report is more extensive than traditional methods and is supported by five detailed case studies. The process evaluates the policy implications, performance expectations, and financial impacts of tolling and pricing solutions.

The report opens with the pricing basics for transportation planners. It discusses two concepts underlying the primary goals of road pricing, which are:

- Creating a new income stream that can be used to pay for transportation improvements; and
- Using roadway pricing as a means to manage congestion.

The report also discusses a decision-making framework in the context of project-specific (specific corridor studies) and cooperative approaches (region-wide studies). It promotes the formulation of pricing alternatives through two orders of decision-making:

- First-order relates to the choice of a basic unit of price (per trip, per mile, or per day) and consideration of congestion (flat or variable)
- Second-order considerations involve further refinements such as pricing differentiation, eligibility by vehicle type and occupancy

There are a number of goals cited in this part of the report, with time savings offered through congestion relief being extremely noteworthy. The report explains that **congestion results in 3.7 billion hours of delay per year for motorists in the United States. These delays waste 2.3 billion gallons of fuel and cost $63 billion a year to the nation's economy.**

The different types of facilities on which pricing can be used are explained. A list of the different types can be seen as follows:

- A new "Greenfield" toll facility
- A widening extension of an existing toll facility
- The addition of new priced lanes to an existing non-toll facility

- The conversion of an existing non-priced facility to a priced facility. The most frequent example is the conversion of an HOV lane to a HOT operation.
- The conversion of a fixed-toll facility to a variable toll facility.

It should be noted, however, that the **most publically accepted projects tend to be those where pricing is placed on a new facility or one that was previously tolled. The most unpopular projects tend to be those where pricing is added to previously non-tolled facilities.**

Public benefits of pricing are also explained. Faster traffic flows and less auto emissions are commonly cited, but this report explains new capacity benefits as well. For instance, by providing a new free-flow passage through congested corridors, managed toll lanes present opportunities to launch new Bus Rapid Transit services.

This report also discusses how to foster public acceptance through outreach strategies, such as using respected leaders to serve as champions of road pricing. The following five case studies are examined:

1. Harris County Toll Road Authority
2. Minnesota's HOT Lanes on I-394
3. Oregon's Innovative Partnerships Program to implement public-private partnerships
4. San Diego's Association of Governments conversion of the I-15 HOV lanes to HOT lanes
5. Virginia's new greenfield toll road facilities

Lessons from these case studies are distilled and their decision-making strategies are discussed.

(44)

Road Tolling in Norway: A brief introduction				
Author(s):	Astrid Fortun and Erik Furuseth			
Publisher:	n/a (presentation)			
Year	2007			
Source Info:	Presentation			
Web link:	http://www.hhh.umn.edu/centers/slp/transportation/congestion_pricing/pdf/Norway_Cordon_Charging_Jan07.pdf			
Study Region:	Norway			
Revenue Enhancement Criteria	Revenue Yield [X]	Long-term financing [X]	Implementation Strategies [X]	Geographic Considerations [X]

Abstract:

Fortun and Furuseth review Norway's experience in tolling both roads and bridges and urban toll systems. Norway uses exclusively open tolling systems, allowing for cost effective revenue collection. They emphasize that tolling in Norway is used to finance infrastructure construction and not to regulate traffic flows (clearly defined goals and objectives). Use charges are based on local input and approved by the Parliament for a set number of years, normally limited to 15 years.

Typically, 50 percent of construction costs are covered by tolling. Urban tolling is relatively new in Norway, but revenues from urban tolling have outpaced revenues from traditional tolling since it began in 1990. In 2006, Norway was able to fund 40 percent of national transportation infrastructure investments through revenues collected via tolling. While the goals of tolling are clearly financing in Norway, Fortun and Furuseth present the **ancillary benefits of urban tolling in Oslo, including a reduction in bottlenecks, a reduction in overall traffic, an increase in transit ridership, availability of road space for other uses** (toll revenues were used to fund a tunnel under downtown to alleviate congestion on surface streets), **reduced barrier effect from surface streets reduced street noise, air quality improvements, and improved safety.**

System-wide, **Norway typically tolls heavy trucks at twice the rate of private automobiles**, offers a 50 percent discount for pre-paid tolls, thresholds for free trips above a certain time/length and a certain number per month, and exemptions for emergency vehicles and certain users. Starting in 2004, an automatic tolling system has been integrated into the tolling program using gantries and EZ-Pass-like technology. Given that a toll system was already in place, this new technology has enabled increased throughput at toll collection facilities without traditional capacity expansion (i.e., no new road space has been required to increase the flow of vehicles per hour at tolling facilities).

Overall, Norway's experience demonstrates how large-scale tolling can finance a significant portion of transportation infrastructure investments while offering ancillary benefits related to increasing the cost of driving – even if they are not a primary focus of the tolling program. Experience in Oslo also

demonstrates how local conditions (i.e., availability of other transportation modes, existing network conditions, etc.) can affect the response to use charges.

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(45)

Public-Private Partnerships for Transportation				
Author(s):	Rall et. al			
Publisher:	National Conference of State Legislatures			
Year	2010			
Source Info:	NCSL Partners Project on Public-Private Partnerships for Transportation			
Web link:	http://www.ncsl.org/documents/transportation/PPPTOOLKIT.pdf			
Study Region:	United States			
Revenue Enhancement Criteria	Revenue Yield [ ]	Long-term financing [X]	Implementation Strategies [ ]	Geographic Considerations [X]

Abstract:

In this report, the NCSL seeks to bring a realistic and balanced understanding of the role of public-private partnerships (PPPs or P3s). The goal of this report is to serve as a toolkit to help state legislators as they consider whether and how to pursue PPPs within the context of their broader responsibility to the public interest.

It is acknowledged in the report that public-private partnerships are wide-ranging and somewhat difficult to grasp, so the U.S. Department of Transportation's definition of PPPs is used to provide the reader clarity. The U.S. DOT definition is as follows:

> A public-private partnership is a contractual agreement formed between public and private sector partners, which allows more private sector participation than is traditional. The agreements usually involve a government agency contracting with a private company to renovate, construct, operate, maintain, and/or manage a facility or system. While the public sector usually retains ownership in the facility or system, the private party will be given additional decision rights in determining how the project or task will be completed.

The report explains that PPPs are sometimes misconstrued as tools that can generate revenue. Instead, PPPs should be viewed as tools that can expedite projects, reallocate risk from the public to private sector, or provide more efficient service delivery. However, the extent to which PPPs are successful in any of those endeavors is dependent on contract terms.

The tables below and to the right show, the benefits, concerns, and controversies associated with PPP use.

Potential PPP Benefits

- Private financing and project acceleration
- Monetization of existing assets
- Cost and time savings
- Lifecycle efficiencies
- Improved project quality
- Risk transfer
- Public control and accountability

Potential PPP Concerns and Controversies

- Loss of public control and flexibility
- Private profits at the public's expense
- Loss of future public revenues
- Risk of bankruptcy or default
- Accountability and transparency
- Environmental issues
- Labor concerns
- Foreign companies
- Toll road controversies
- Specific contract terms

States vary on whether or how they allow PPP projects. Some have enabled legislation on a project-by-project basis, while others have authorized ongoing PPP programs. State legislators are responsible for PPP provisions which include:

- Authorization to mix public and private funding
- Bidding procedures
- A process for awarding contracts based on best value or other factors, not just low price
- Unsolicited proposals
- Tax provisions
- Authority to collect tolls or fares
- Bonding and debt
- Transparency and public participation
- Contract provisions such as term lengths or noncompete clauses

The report also explains that after PPP legislation is passed, it is up to the authorized executive agency – such as a state or local transportation department – to implement PPP projects.

To guide legislators in the process of making important policy decisions about PPPs, nine principles for decision-making are discussed in the report. The decisions are summarized in the report as follows:

Principles for State Legislators

Principle 1: Be informed.
State decision makers need access to fact-based information that supports sound decisions.

Principle 2: Separate the debates.
Debates about the PPP approach should be distinct from issues such as tolling, taxes or specific deals.

Principle 3: Consider the public interest for all stakeholders.
State legislators will want to consider how to protect the public interest throughout the PPP process.

Principle 4: Involve and educate stakeholders.
Stakeholder involvement helps protect the public interest, gain support and mitigate political risk.

Principle 5: Take a long-term perspective.
State legislators will want to approach PPP decisions with the long-term impacts in mind.

Principle 6: Let the transportation program drive PPP projects—not the other way around.
PPPs should be pursued to support a state's transportation strategy, not just to raise revenue.

Principle 7: Support comprehensive project analyses.
Before pursuing a PPP, it should be shown to be a better option than traditional project delivery.

Principle 8: Be clear about the financial issues.
States will want to carefully assess financial goals, an asset's value and how to spend any proceeds.

Principle 9: Set good ground rules for bidding and negotiations.
Legislation should promote fairness, clarity and transparency in the procurement process.