



The Benefits of Replacing Federal Fuel Taxes with a National Vehicle Miles Traveled Fee*

America's roads and highways are becoming more congested and structurally deficient. Since the 1920s, fuel taxes have been the primary source of funding for federal highway projects. But as the fuel efficiency of vehicles has improved, combined with increased commercial use of highways and the rise of electric vehicles, revenues from fuel taxes have stagnated, endangering the solvency of the Highway Trust Fund. To achieve long-term revenue sustainably, one possible alternative to the fuel tax is a "vehicle miles traveled" (VMT) fee, which charges drivers a rate based on the number of miles they travel rather than on the amount of fuel they use. Economic analysis reveals that a VMT is a more effective and efficient mechanism for generating highway funding than the current gas tax. Congress should launch a pilot program to study the feasibility of transitioning to a national VMT fee.

A Crisis in Highway Funding

For more than a century, America has been a country on wheels. Well-built and properly-maintained roads, highways, and bridges – the centerpiece of an effective surface transportation system – helped catalyze prosperity in the 20th century, spurring economic growth and transforming how Americans lived and worked. But while it is easy to take our highway infrastructure for granted, the challenges of the 21st century will require new, innovative public policies to keep the U.S. at the forefront of global infrastructure development.

The costs of maintaining the world's largest highway network are high and growing.¹ In 2014 alone, federal, state, and local governments spent \$165 billion to build, operate, and maintain highways.²

¹ Praveen Duddu, "The world's biggest road networks," *Road Traffic Technology*, January 12, 2014, <https://www.roadtraffic-technology.com/features/featurethe-worlds-biggest-road-networks-4159235/>.

² Chad Shirley, "The Status of the Highway Trust Fund and Options for Paying for Highway Spending," Congressional Budget Office, June 17, 2015, http://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/50298-TransportationTestimony_1.pdf.

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Yet, past and current investments have proven to be insufficient to keep up with system deterioration, much less to finance the upgrades and expansions needed to accommodate the growing demand for surface transportation. As of 2017, the U.S. had a \$836 billion backlog of highway and bridge capital needs.³ In some states, nearly 3 in 4 roads are in poor or mediocre condition.⁴ Nationwide, the annual costs in vehicle expenses were estimated to be an additional \$66.6 billion in 2013, due to driving on roads in need of repair.⁵

In its 2017 Infrastructure Report Card, the American Society of Civil Engineers gave U.S. roads and highways a “D” letter grade, saying:

“America’s roads are often crowded, frequently in poor condition, chronically underfunded, and are becoming more dangerous. More than two out of every five miles of America’s urban interstates are congested, and traffic delays cost the country \$160 billion in wasted time and fuel in 2014. One out of every five miles of highway pavement is in poor condition and our roads have a significant and increasing backlog of rehabilitation needs.”⁶

Shortcomings of the Federal Gas Tax

For nearly a century, the federal gas tax has been the primary source of federal funding for highway projects. The Highway Trust Fund (HTF) collects about 85 to 90 percent of its revenue from taxes on motor fuel, commonly known as the *gas tax*.⁷ Taxes on tires and heavy trucks account for the rest of the fund’s revenue. The fuel tax of 18.4 cents per gallon for gasoline and 24.4 cents per gallon of diesel has not been raised since 1993, and inflation has since eroded its purchasing power by 40 percent.

Meanwhile, construction costs, system deterioration, and travel volumes are accelerating, placing unprecedented strain on the HTF. For the last decade, the HTF has moved from one financial crisis to the next, repeatedly propped up by last-minute congressional bailouts.

³ “2017 Infrastructure Report Card,” American Society of Civil Engineers, 2017,

<https://www.infrastructurereportcard.org/wp-content/uploads/2017/01/Roads-Final.pdf>.

⁴ “U.S. Road and Bridge Data by State,” U.S. Department of Transportation, updated October 13, 2013, <https://www.transportation.gov/briefing-room/dot-fact-sheets-highlight-grim-state-us-roads-and-bridges>.

⁵ Ibid.

⁶ “2017 Infrastructure Report Card,” American Society of Civil Engineers, 2017,

<https://www.infrastructurereportcard.org/wp-content/uploads/2017/01/Roads-Final.pdf>.

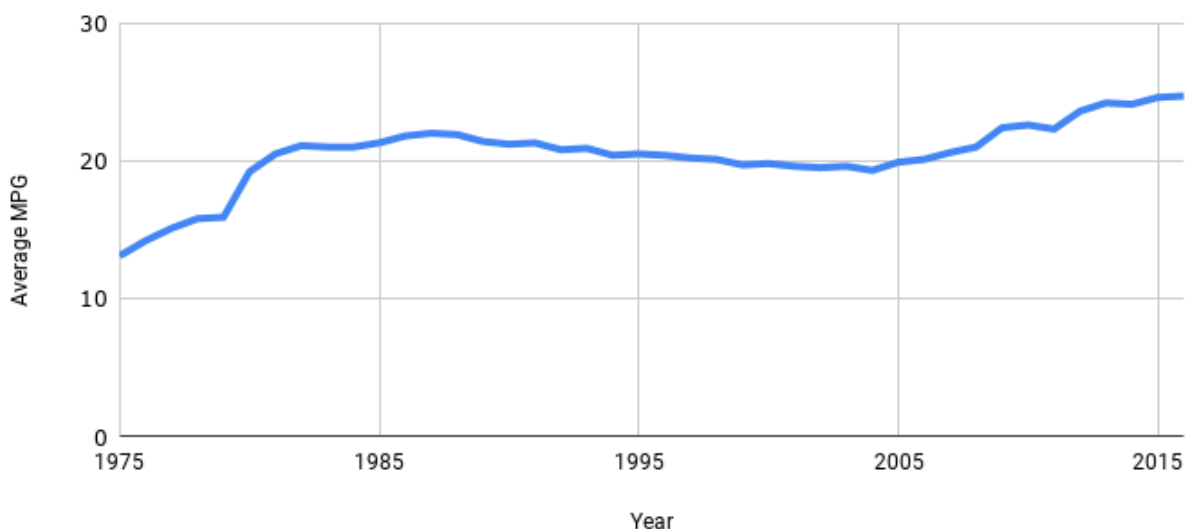
⁷ “The Highway Trust Fund Explained,” Peter G. Peterson Foundation, July 27, 2018, <https://www.pgpf.org/budget-basics/budget-explainer-highway-trust-fund>.

Since 2008, the Congressional Budget Office says that lawmakers have moved \$143 billion in general taxpayer dollars to the HTF.⁸ By 2021, the HTF is expected to be insolvent.⁹

An obvious solution to America’s need for additional highway funding is to raise the gas tax. But increasing the gas tax is a short-term fix, not a long-term solution, and is politically unfeasible. Looking forward, there is broad agreement that the gas tax, due to the convergence of several factors, is an unsustainable source of highway funding.

Figure 1: Light-Duty Vehicle Average Miles Per Gallon, by Model Year

Source: U.S. Environmental Protection Agency



The primary challenge facing the gas tax is that the fuel efficiency of cars and trucks in the U.S. has improved markedly over the past four decades (see Figure 1). In 2017, preliminary data showed that the average light-duty vehicle traveled 25.2 miles per gallon of gas, nearly double the average in 1975.

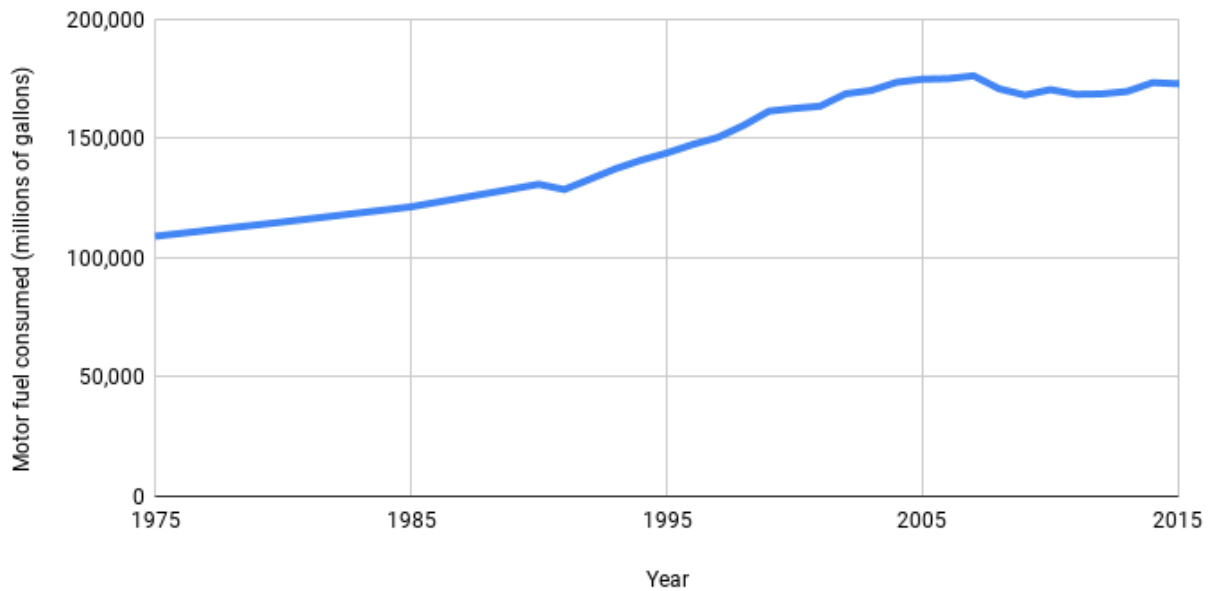
As a result, total motor fuel consumption has remained fairly stable since 2005, despite tens of millions of vehicles being added to America’s roads (see Figure 2). The development of alternative fuel vehicles – especially electric cars – will also continue to erode aggregate gas consumption. While that’s good news from a pollution and energy independence perspective, it means that HTF revenues will further dwindle in the decades ahead.

⁸ “Approaches to Making Federal Highway Spending More Productive,” Congressional Budget Office, February 11, 2016, <https://www.cbo.gov/publication/50150>.

⁹ Brianna Fernandez, “Raising the Gas Tax is Not a Long-Term Fix for the Highway Trust Fund,” American Action Forum, April 24, 2018, <https://www.americanactionforum.org/insight/raising-gas-tax-not-long-term-fix-highway-trust-fund/>.

Figure 2: Motor Vehicle Fuel Consumption in the U.S., by Year

Source: U.S. Department of Transportation, Bureau of Transportation Statistics



The gas tax has other flaws as well. Although drivers generally pay more fuel taxes the more they drive, those tax-related costs are not linked to when they choose to travel or what roads they drive on, so the fuel taxes they pay often do not reflect the full costs of their travel decisions. For example, whether you travel on a quiet, back-country road or a congested city street during rush hour, the gas tax doesn't distinguish between these behaviors, despite the different costs you are imposing on the transportation system.

Heavy trucking provides a stark example of how driver costs are not aligned with total system costs. Consider this data from *Governing Magazine*:

*"Engineers estimate that a fully loaded truck--a five-axle rig weighing 80,000 pounds, the interstate maximum--causes more damage to a highway than 5,000 cars. Some road planners say that the toll is even higher, that it would take close to 10,000 cars to equal the damage caused by one heavy truck. When the trucks are overloaded, as quite a few of them are, the damage is exponentially worse. Increasing a truck's weight to 90,000 pounds results in a 42 percent increase in road wear. Pavement designed to last 20 years wears out in seven."*¹⁰

The fuel taxes and other fees that heavy trucks pay, though higher than other motorists, are not adequate to cover the full costs of repairing the damage they cause to our roads.¹¹ The

¹⁰ Zach Patton, "Too Big for The Road," *Governing Magazine*, July 2007, <http://www.governing.com/topics/transportation-infrastructure/Too-Big-The-Road.html>.

¹¹ "Estimated Highway Pavement Damage Costs Attributed to Truck Traffic," Kansas University Transportation Research Institute, December 2009, <http://www2.ku.edu/~iri/publications/HighwayDamageCosts.pdf>.

same logic applies to smaller vehicles. Given the exponential relationship between vehicle weight and road deterioration, a large 6,000-pound SUV causes 80 times more pavement damage than a small 2,000-pound car.¹²

In addition, as electric and other alternative fuel vehicles become more common, a growing number of (disproportionately wealthy) drivers are escaping the gas tax entirely and not contributing to maintaining the roads they enjoy. Last year, an estimated 750,000 electric cars are already circulating on America's roads, a number expected to climb sharply over the next decade.¹³

Finally, experts have long noted that fuel taxes are highly regressive. Lower-income individuals typically spend a much larger portion of their income on fuel taxes than wealthier individuals do. An analysis by the Tax Foundation found that the gas tax burden on families earning less than \$10,000 per year, as a share of income, is more than 10 times greater than the burden on families earning more than \$150,000 per year.¹⁴

In light of these flaws in the gas tax, there is a growing interest in exploring other revenue sources for funding road investment. One widely discussed approach is to implement a system of mileage-based user fees, or a road user charge, commonly known as a *vehicle miles traveled* (VMT) fee.

The Advantages of a VMT Fee

A VMT fee, as the name suggests, charges motorists based on the distance they travel instead of the amount of fuel they consume. Properly designed, a VMT fee could overcome many of the shortcomings of the gas tax discussed above.

Most importantly, transitioning to a VMT would insulate HTF revenues from improvements in fuel economy standards, creating a sustainable highway funding stream far into the future.

Another advantage of a VMT is that rates can be adjusted based on vehicle weight, road type, time-of-day, and other parameters to better reflect the actual costs imposed on the transportation system. For example, given the higher societal costs of driving in congested

¹² "Excessive Truck Weight: An Expensive Burden We Can No Longer Support," Government Accountability Office, Report CED-79-94, 1979, <https://www.gao.gov/assets/130/127292.pdf>.

¹³ "Number of Electric Cars Rises from 2 Million to More Than 3 Million," *T&D World*, February 27, 2018, <https://www.tdworld.com/distribution/number-electric-cars-rises-2-million-more-3-million>.

¹⁴ Jonathan Williams, "Paying at the Pump: Gasoline Taxes in America," Tax Foundation, Background Paper #56, October 2007, <https://files.taxfoundation.org/legacy/docs/bp56.pdf>.

urban areas, a VMT could incorporate congestion pricing, as London successfully did in 2003.¹⁵ Similarly, vehicles that do more damage to roadways – heavy trucks, for instance – would pay more. This would encourage heavy vehicles to drive on roads that are properly built for large loads and to make fewer, more efficient trips.

Because VMT rates could be calculated based on the true costs individual drivers are imposing on our highways, a VMT would strengthen what economists call *the benefit principle of taxation* – the idea that consumers of government services should be taxed in proportion to the benefit they derive from those services. In other words, users of highways would fully and directly fund that use, ending the problematic trend of general taxpayer subsidization.

In theory, such a transition could be a significant tax savings, as Americans would no longer be contributing taxpayer dollars to fund roads that they hardly use or do not at all, while heavy users – including commercial vehicles and individuals who drive the most – would pay their fair share. Such a system, if implemented correctly, would be more equitable and fiscally responsible than the current system.

How Would a VMT Tax Be Collected?

In general, here's how a VMT works:

- Vehicles are outfitted with an inexpensive onboard odometer. Heavy trucks can also be equipped with wireless axle-weight sensors to calculate additional surcharges based on pavement damage.
- An onboard computer, loaded with price-per-mile data for every road in the country, keeps track of accrued fees and periodically (usually monthly) uploads this information to program administrators (either private firms or government agencies) to remit payment. To safeguard motorists' privacy, old data is deleted after a VMT bill is paid.

Economic Effects of a VMT

In 2017, a study published in the *Journal of Public Economics* found that implementing a VMT at a level that would boost highway funding by \$55 billion per year would increase social welfare by 20 percent when compared to an increase in the gas tax, assuming the fuel efficiency of vehicles continues to improve as expected in the future.¹⁶ The study showed that by charging motorists different tax rates to manage traffic volumes and congestion, limit pollution, reduce accidents, and account for the riskiness of different drivers, policymakers could accurately capture the true social costs of automobile travel.

¹⁵ Brianna Fernandez, "Raising the Gas Tax Is Not a Long-Term Fix for the Highway Trust Fund," American Action Forum, April 24, 2018, <https://www.americanactionforum.org/insight/raising-gas-tax-not-long-term-fix-highway-trust-fund/>.

¹⁶ Ashley Langer, Vikram Maheshri and Clifford Winston, "From Gallons to Miles: A Disaggregate Analysis of Automobile Travel and Externality Taxes," *Journal of Public Economics*, 2017, posted online on May 26, 2017 at <https://www.brookings.edu/wp-content/uploads/2017/06/jpube-vmt-paper.pdf>.

Annual Net Benefits from a Gasoline Tax and Differentiated Urban-Rural VMT Tax to Raise at Least \$55 Billion Per Year for Highway Spending

Change In:	54.9 Cents/Gallon gas Tax	Differentiated VMT Tax
Vehicle Miles Traveled (Billions)	-53.5	-52.2
Consumer Surplus (\$Billions)	-55.5	-57.6
Government Revenues (\$Billions)	55.0	57.0
Congestion (\$Billions)	-5.13	-6.12
Carbon Dioxide (\$Billions)	-0.73	-0.69
Accidents (\$Billions)	-2.90	-3.46
Local Air Pollution	-0.62	-0.75
Total External Costs (\$Billions)	-9.4	-11.0
Net Benefits (\$Billions)	8.9	10.5

Note: Assumes 40% increase in average fuel economy, and a differentiated tax of 0.575 cents per rural mile and 2.497 cents per urban mile.

Source: <https://www.brookings.edu/wp-content/uploads/2017/06/jpube-vmt-paper.pdf>

Promising Experiments

Several states – including California, Oregon, Colorado, Nevada, and Minnesota – have completed pilot programs as a proof-of-concept for VMT fees.¹⁷

Oregon, in particular, conducted two pilot programs of a VMT in 2006 and 2012.¹⁸ A study of these programs concluded that the VMT is “workable and practical, a genuine alternative to the gasoline tax.”

Building on those successes, Oregon launched a small, permanent program in 2015, capping participation at 5,000 vehicles. Under the program, motorists who volunteer for the program pay 1.7 cents for every mile they travel.¹⁹ Participants get refunded the state gas taxes they pay at the pump, and driving data is destroyed on a set schedule to protect privacy. The mileage fee is set so that a driver who gets 20 miles per gallon would pay the same amount in mileage fees as they would at the gas pump. Public reaction to the program has been positive,

¹⁷ “Road Use Charges (RUC),” National Conferences of State Legislatures, April 24, 2018, <http://www.ncsl.org/research/transportation/road-use-charges.aspx>.

¹⁸ “Oregon’s Road Usage Charge,” Oregon Department of Transportation, April 2017, https://www.oregon.gov/ODOT/Programs/RUF/IP-Road%20Usage%20Evaluation%20Book%20WEB_4-26.pdf.

¹⁹ “OReGO per-mile and Oregon fuels tax rates change in 2018,” Oregon Department of Transportation, January 25, 2018, <http://www.myorego.org/blog/orego-per-mile-oregon-fuels-tax-rates-change-2018/>.

with more than 80 percent of motorists who volunteered for the program giving it a rating of “good” or “excellent.”²⁰

Policy Solutions

With the HTF teetering on the brink of insolvency, Congress must design an alternative mechanism to fund federal highway projects. Lawmakers should implement a national, voluntary VMT pilot program, like the proposal offered by Rep. (D-OR) Peter DeFazio, which would allow experts to collect and analyze critical data on the behavioral responses of drivers, evaluate different administration methods, and gauge public support for the idea.²¹

No one wants to pay more to drive, but if severe deficits in infrastructure funding are not reversed, America’s first-class surface transportation system will only fall further into disrepair.

²⁰ “Oregon’s Road Usage Charge,” Oregon Department of Transportation, April 2017, https://www.oregon.gov/ODOT/Programs/RUF/IP-Road%20Usage%20Evaluation%20Book%20WEB_4-26.pdf.

²¹ Sam Mintz, “Graves on board with VMT pilot push,” *Politico*, December 13, 2018, <https://www.politico.com/newsletters/morning-transportation/2018/12/13/graves-on-board-with-vmt-pilot-push-454663>.