Michigan Transportation Infrastructure Needs and Funding Solutions

March 2023

PSC

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Introduction

In 2016, the State of Michigan's 21st Century Infrastructure Commission estimated that Michigan needs to invest an additional $2.2 billion in roads and bridges each year to meet established goals for state road and bridge quality. If multimodal transportation (e.g., bus transit, passenger rail, and freight) needs are considered, the annual total rises to $2.6 billion.

To address the estimated gap in transportation infrastructure funding, the State of Michigan and the Michigan legislature worked to increase revenue. In 2017, Michigan's gas tax increased slightly to $.263 per gallon for both gas and diesel, increasing the total motor fuel tax revenue by 34.3 percent, or $347.2 million. Additionally, Michigan will receive a one-time funding allocation of $7.3 billion from the federal Infrastructure Investment and Jobs Act (IIJA), and the 2019 Rebuilding Michigan Program (RBMP) provided $3.5 billion in one-time bond funding for state and federal roads.

In 2022, to better understand the impact of additional funding on Michigan's infrastructure needs, the Michigan Infrastructure and Transportation Association (MITA) approached Public Sector Consultants (PSC) to update the transportation infrastructure estimates in the 21st Century Infrastructure Commission report and review potential solutions to fill the long-term funding gap.

Overview

This report addresses three topics:

- The overall cost of Michigan's road system through PSC-developed estimates on the cost of maintaining Michigan's vast road network to examine future funding needs.
- The current road funding estimates, the revenue sources for funding roads, and long-term trends in transportation spending.
- The potential options for raising additional revenue to close the funding gap.

Key Findings

- **Michigan's transportation system needs are likely higher than previous estimates.** Transportation organizations' previous estimates focused on the part of the system under their authority, federal-aid roads for the Michigan Department of Transportation (MDOT) and non-federal-aid roads for the County Road Association (CRA), which presents an incomplete picture. PSC modeled the total cost of the Michigan road system using MDOT information on the life cycle of a lane mile of road (referred to throughout the report as a lane mile) according to different maintenance approaches. PSC estimates that Michigan's transportation network cost $9.0 billion per year to operate and maintain, and upwards of up to $16.7 billion per year, depending on how much maintenance is deferred.

- **Investment in recommended maintenance can save Michigan residents money.** Spending to maintain and rehabilitate roads is more cost effective than waiting until a lane mile has reached the end of its design life, when reconstruction becomes the only option. PSC estimates that proper maintenance (sometimes referred to the right fix at the right time) savings could be between $3.0 and $7.6 billion per year.
- **Michigan road system has not been properly maintained to MDOT-recommended standards, and it will cost more to bring the system up to standard.** MDOT assessments of Michigan road conditions show that 33 percent of all federal-aid roads and 45 percent of non-federal-aid roads are in poor condition and should be reconstructed in the next two years. Reconstruction is five to eight times more expensive per lane mile than preventative maintenance.
- **After accounting for new federal and state funding, there is an estimated annual funding gap of between $2.1 and $3.9 billion per year and could be significantly more depending on the maintenance approach.** This funding shortfall includes estimates for the formula funding portion of the bipartisan IIJA as well as the RBMP, the state's bonding plan.
- **The report outlines five common funding options for closing the revenue gap, which on a per capita basis (using only Michigan's adult population) would cost between $283 and $535 annually.**
    - **Option one would require a motor fuel tax increase between $0.39 to $0.74 per gallon to meet the funding gap.** The tax rate increase ranges from $0.39 per gallon, which meets MDOT and CRA estimates, to $0.74 to meet PSC's modeled estimates for different pavement life cycle maintenance levels.
    - **Option two would also increase the motor fuel tax and assess the motor fuel tax on a per dollar (instead of per gallon) basis.** This increases revenue during times of higher gas prices, but similarly decreases revenue during price downturns. Other states have moved away from this approach due to its volatility.
    - **Option three would increase the sales tax and dedicate the increase to transportation funding. It would require a sales tax increase of 2 to 3 percentage points dedicated to transportation to meet the funding gap.** This option would require an amendment to the State of Michigan constitution.
    - **Option four would allow local communities to pursue sales tax increases.** While local communities are currently prohibited from charging their own sales tax, this could be changed through a constitutional amendment and could provide local government units of government a revenue source for local roads. This option is similar to option three.
    - **Option five would generate revenue based on the miles traveled on Michigan roads; a tax between $0.03 and $0.05 per mile traveled would be necessary to meet the funding gap.** Different states and countries have explored this approach in different ways, and the federal government is currently providing funding to pilot this model.

Overall Cost of Michigan's Road System

State of Michigan Published Estimates

The State of Michigan has provided a cost estimate for model to preserve the Michigan transportation system in MDOT's *Michigan Mobility 2045* (MM2045) plan. MDOT estimates the total cost of preserving Michigan's federal-aid road network until 2045 is $123.5 billion, which averages to about $4.9 billion annually. However, federal-aid roads only account for 33 percent of all roads in Michigan, a figure based on published estimates from the Federal Highway Administration (FHWA), MDOT, and the Transportation Asset Management Council (MDOT November 2021b) (Exhibit 1).

EXHIBIT 1. Cost of Preserving Michigan's Federal-Aid Road Network to 2045, MM2045

	Annual Average	To 2045 (25-year Total)	Lane Miles	Percent of Road System
MDOT-owned federal-aid roads	$2,476,000,000	$61,900,000,000	27,366	10.7%
Locally owned federal-aid roads	$2,464,000,000	$61,600,000,000	58,224	22.7%
Total	**$4,940,000,000**	**$123,500,000,000**	**85,590**	**33.4%**

Sources: MDOT November 2021b, USDOT FHA 2022

In the *2021 Michigan County Road Investment Plan*, the County Road Association (CRA) of Michigan, which advocates on behalf of Michigan's 83 county road agencies, conducted a needs study to estimate the level of investment needed to reach performance goals. In its report, CRA provided an estimate for roads not eligible for federal aid ($1.5 billion), as well as costs for maintenance, equipment, and facilities ($729 million). PSC included this estimate and as a proportional share of the non-federal-aid road budget. PSC added the two components of the non-federal-aid road budget to the budget for federal-aid roads and bridges, which brought the estimate to $2.2 billion per year.

This estimate assumed that 15 percent of roads would receive investment every year, which means non-federal-aid roads would be on a seven-year cycle. The CRA report is unclear about the type of investment (prevention, rehabilitation, and reconstruction) that would be used (CRA June 2021).

Together, MDOT's and CRA's combined estimates equal approximately $7.2 billion per year (Exhibit 2).

For a glossary of different road types, federal-aid eligibility, and management organization, see Exhibit A1 in the appendix.

EXHIBIT 2. Combined Annual Estimated Cost of Preserving Michigan's Road System, MDOT and CRA

	Annual Average	Lane Miles	Percent of Road System
MDOT-owned federal-aid roads	$2,476,000,000	27,366	10.7%
Locally owned federal-aid roads	$2,464,000,000	58,224	22.7%
Federal-aid roads Total	*$4,940,000,000*	*85,590*	*33.4%*
Non-federal-aid roads, CRA (15 percent per year)	$2,245,676,838	170,704	66.6%
MDOT and CRA Combined Estimated Total	**$7,185,676,838**	**256,294**	**100%**

Sources: MDOT November 2021b, CRA 2021, US DOT FHA 2022

Public Sector Consultants–modeled Estimates

PSC also modeled the total cost of Michigan's road system according to different maintenance cycles. Our goal was to establish an overall estimate of the cost to operate and maintain the current road system. To do this, PSC first established an estimate for a road's design life, which is how long a given lane mile of road will last without any investment in additional maintenance. According to MDOT and the Senate Fiscal Agency, the average lane mile of Michigan road will last 20 years on average before it must be reconstructed. This life cycle can be extended through maintenance, but roads cannot be maintained in perpetuity—at some point they must be reconstructed.

PSC then looked at three different types of road maintenance investments uses to extend the life of a road: prevention, rehabilitation, and reconstruction. PSC used MDOT estimates for the cost per mile of each investment as well as the average life that each investment adds to one lane mile (MDOT March 2021) (Exhibit 3).

EXHIBIT 3. Average Cost and Life of Different Maintenance Approaches per Lane Mile

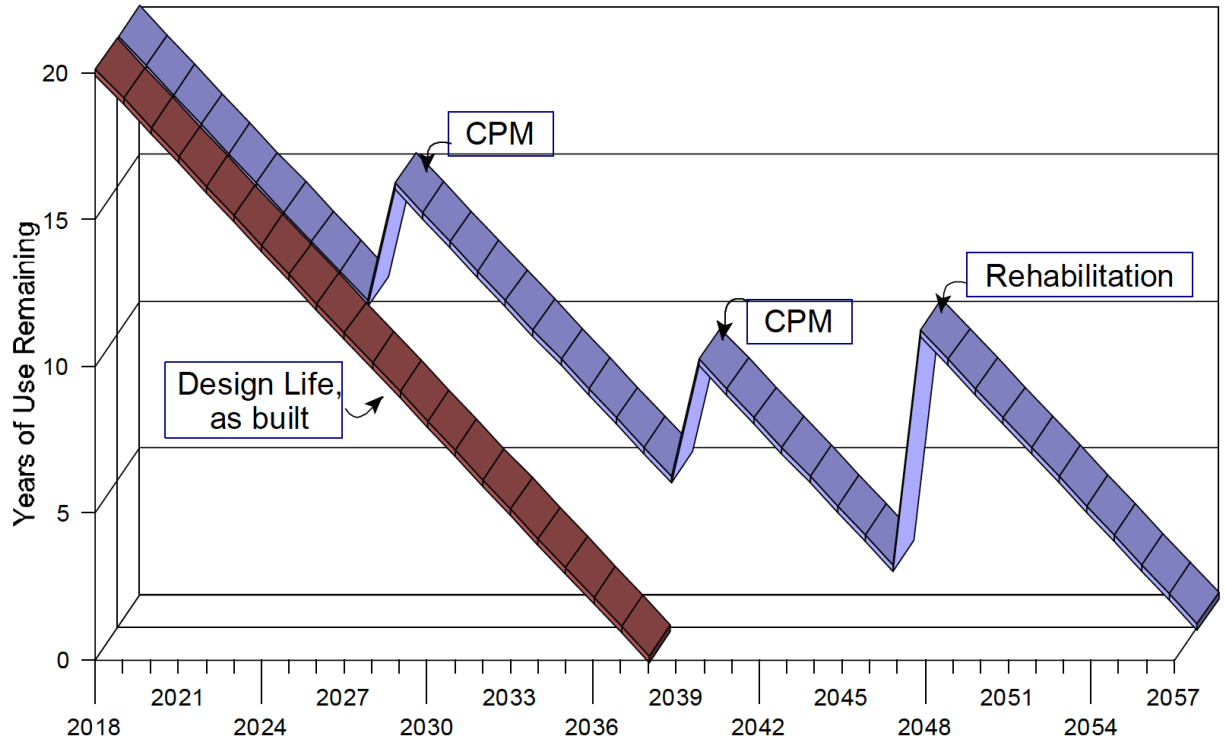
	Prevention	Rehabilitation	Reconstruction
Federal-aid roads average cost per lane mile	$109,000	$792,000	$3,216,000
Average life of investment	6.5	16	22
Average annual cost per lane mile	$16,769	$50,000	$136,364
Non-federal-aid (local) roads average cost per lane mile	$21,372	$112,203	$402,648
Average life of investment	6.5	16	22
Average annual cost per lane mile	$3,288	$7,013	$18,302

Sources: MDOT March 2021, Siracuse 2019

PSC used MDOT estimates to establish pavement life cycles I, II, and III, which demonstrate how different levels of maintenance and investments can extend the life of a road based on the amount of preventative and rehabilitation investment. In applying these different maintenance approaches, the life cycles for one lane mile range from 26.5 to 49 years. As expected, the cost for the pavement life cycles I–III vary by the number and type of maintenance used. Exhibit 4 shows how preventative maintenance (referred to as CPM in the exhibit) and rehabilitation can substantially extend a road's design life.

- **Pavement life cycle I,** full maintenance, invests in two preventative maintenance (before and after rehabilitation) which each extend the life of a lane mile 6.5 years, and one rehabilitation of the road, which extends the life cycle of each lane mile by 16 years, for a total of 29 additional years before restarting the cycle again with reconstruction.
- **Pavement life cycle II,** moderate investment, invests in one preventative maintenance as well as one rehabilitation, which extends the life cycle of each lane mile by 6.5 and 16 years, respectively, for a total of 22.5 additional years before restarting the cycle again with reconstruction.
- **Pavement life cycle III,** limited maintenance, invests in one preventative maintenance, which extends the life of the lane mile by an average of 6.5 years before it must be reconstructed. This model requires the least number of investments in a road lane mile but costs the overall road system the most amount of money to maintain.

EXHIBIT 4. Illustration of Pavement Life Cycle Comparisons, Michigan Senate Fiscal Agency and MDOT



Sources: Bleech 2018, Siracuse 2019

After establishing the cost of different maintenance investments per lane mile, PSC was able to estimate the cost to maintain Michigan's overall road system. PSC estimates that Michigan's 83,030 lane miles of federal-aid roads and 165,000 lane miles of local county roads should cost between $9.0 to $13.6 billion to operate and maintain annually. If there is no investment in maintenance, roads will have to be fully replaced at the end of their design life, which increases the annual cost of Michigan's road system to $16.7 billion. The analysis demonstrates that investing in the right maintenance fix at the right time saves Michigan residents money.

With proper maintenance and investments in the road network, PSC has estimated the annual cost to preserve Michigan's road network at $9 billion (Exhibit 5).

EXHIBIT 5. Estimated Overall Annual Cost of Michigan's Road System

Federal-aid Roads	
Total cost per lane mile	$4,226,000
Average annual cost per lane mile	$86,245
Total lane miles	83,030
Total average annual cost	$7,160,940,012
Non-federal-aid Roads	
Total cost per lane mile	$557,595
Average annual cost per lane mile	$11,379
Total lane miles	165,000
Total average annual cost	$1,877,615,816
Average annual cost of the State of Michigan road system, all roads	**$9,038,555,828**

Source: PSC calculations

Spending to maintain and rehabilitate roads is more cost effective than waiting until a lane mile has reached the end of its functional design life and reconstruction becomes the only option, which costs five to eight times more per lane mile than preventative maintenance. PSC modeled estimates are by nature approximate and are meant to provide general guidelines for assessing the cost to operate Michigan's road system.

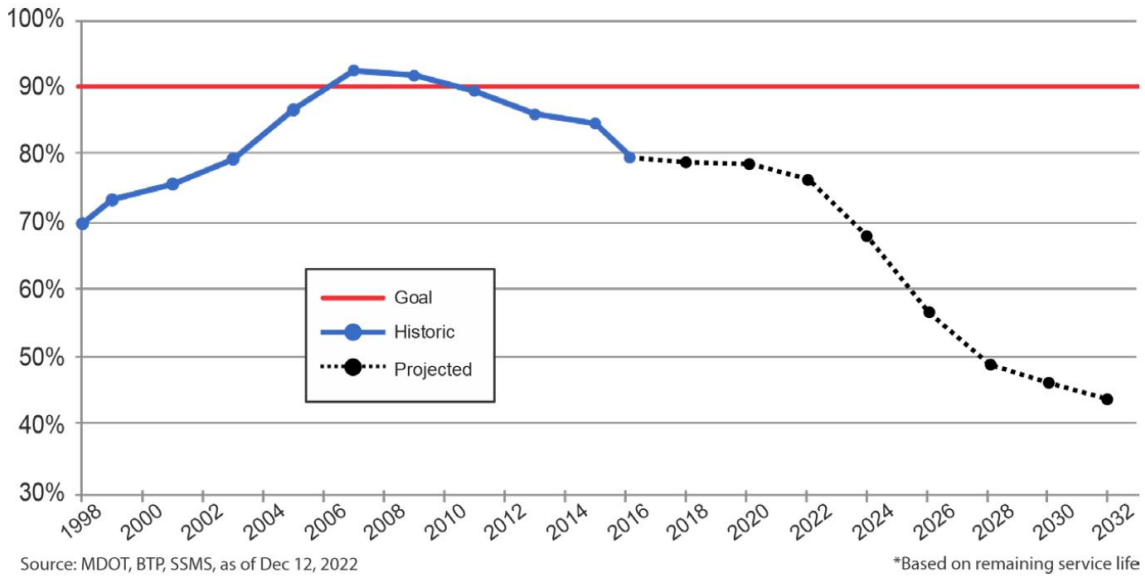
Road Assessments

In discussing Michigan's road system's overall needs, it is important to also address how road conditions are assessed. MDOT; the Transportation Asset Management Council (TAMC); and county, regional, and metropolitan planning agencies all jointly use the Pavement Surface Evaluation and Rating (PASER) system to measure the condition of pavement of any given lane mile as good, fair, or poor. MDOT used the data from the PASER studies to determine the remaining surface life (RSL) and the right preventative maintenance

approach to take to extend the life of the pavement. When the pavement reaches an RSL category of I, it should be reconstructed.

According to MDOT, the pavement deterioration rate has been about 1 percent per year and is forecasted to accelerate considerably in the coming years. MDOT's highway condition goal is to maintain 90 percent of pavement in good or fair condition. Exhibit 6 represents historic and projected state trunkline system condition based on RSL.

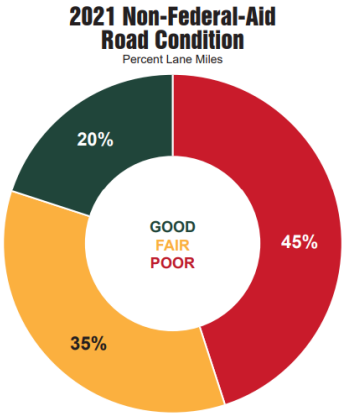
EXHIBIT 6. MDOT Historic and Projected Trunkline Pavement in Good or Fair Condition, 1998–2032

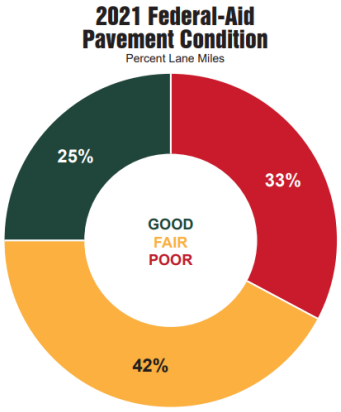


Source: MDOT July 2022

In *Michigan's 2021 Roads & Bridges Annual Report,* the TAMC provided new estimates on the condition of Michigan's federal-aid and non-federal roads through PASER data collection. In 2021, 33 percent of all paved federal-aid roads were rated in poor condition, a significant decrease from previous years. Local roads (or non-federal aid roads) had 45 percent of the road rated in poor condition. From a road system perspective this means over 100,000 lane miles of roads are in poor condition and should be replaced within the next two years (Exhibit 7).

EXHIBIT 7. Pavement Conditions





Source: TAMC 2021

Impact of Inflation

PSC also sought to estimate the impact of inflation on the potential cost of operating and maintaining Michigan's road system. Using U.S. Bureau of Labor Statistics (BLS) data, PSC calculated an eight-year average for the Producer Price Index (PPI) for road construction materials of 121, or 21 percent higher than the baseline cost of materials. Multiplying this figure by the modeled cost provides an inflation-adjusted estimate for the cost to maintain Michigan's roads.

In dollars, we estimate that inflation could add $1.1 billion to the annual cost of operating and maintaining Michigan's road system.

While PSC calculated the impact of inflation, pre-inflation numbers were not used in this report to allow for a point-by-point comparison with MDOT estimates.

Current Revenue Estimates for Michigan's Road System

After estimating the cost to operate and maintain Michigan's road system, PSC sought to clarify the funding amount Michigan currently allocates to meet those needs. In the MM2045 plan, MDOT provides an overall estimate of state and federal funding sources to 2045. The revenue forecast in MM2045 does not account for any changes to federal formula funds, discretionary grant programs, or one-time spending associated with the IIJA or the Infrastructure Expansion Act of 2021. The MDOT estimate does appear to include state funding allocations to local road agencies, but it is unclear whether it accounts for funding from local municipalities themselves through millages or other sources. A more detailed breakdown of MDOT's funding estimates is located in the Appendix, Exhibit A2. The MDOT estimate also does not account for any estimated changes to revenue streams associated with the transition to electric vehicles and the impact that could have on revenues from fuel-based taxes.

MDOT's funding estimate does not include funding through the IIJA, which was enacted in November 2021. The IIJA extended authorization for federal-aid transportation programs through Fiscal Year (FY) 2026 and included increases in funding targets for those programs. According to the Michigan House Fiscal Agency, Michigan's estimated share of federal-aid highway program would increase $377.8 million in FY 2023 over FY 2022, and if we assume that this level increase holds throughout the duration of the IIJA, this would result in $1.5 billion over the next four years (Hamilton 2022) (Exhibit 8). Please note the IIJA estimates represent the increase in the formula-funded portion of IIJA for roads. IIJA formula funding accounts for an estimated 64 percent of the road funding available through the IIJA. There will also be a part of the IIJA available for allocation through competitive grants.

The funding estimate MDOT presented in MM2045 also does not include bonds administered through the Rebuilding Michigan Program. Introduced in FY 2022, the RBMP will make an additional $2.3 billion available through FY 2026, or approximately $462 million annually. Together, IIJA and RBMP will add $764 million annually through FY 2026 (MDOT November 2021a).

EXHIBIT 8. Five-year Revenue Estimates Including IIJA and RBMP

	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	Annual Average
State funds,* MM2045 annual estimate	$3,183,400,000	$3,183,400,000	$3,183,400,000	$3,183,400,000	$3,183,400,000	$3,183,400,000
Federal funds, MM2045 annual estimate	$1,158,760,000	$1,158,760,000	$1,158,760,000	$1,158,760,000	$1,158,760,000	$1,158,760,000
IIJA increase, House Fiscal Agency estimate	$0	$377,800,000	$377,800,000	$377,800,000	$377,800,000	$302,240,000
RBMP, MDOT Five-year plan	$1,441,000,000	$774,000,000	$0	$97,000,000	$0	$462,400,000
Total	**$5,783,160,000**	**$5,493,960,000**	**$4,719,960,000**	**$4,816,960,000**	**$4,719,960,000**	**$5,106,800,000**

*Municipalities and villages can also provide their own funding through millages. It is unclear whether this funding is included in the MDOT estimates.
Sources: MDOT November 2022a, Hamilton 2022

The five-year estimates included in Exhibit 8 differ from MDOT's 2022–2026 Five-year Transportation Program (5YTP) when it comes to state and federal funding estimates. The 2022–2026 5YTP estimates approximately $2.1 billion annually in state and federal revenue, including RBMP bonds, over the next five years for the highway program, and it is unclear whether this includes funding for locally owned roads (MDOT November 2021b). The 2023–2027 5YTP also includes the IIJA funding, but MDOT estimates a decline to $2.0 billion in annual revenue (MDOT July 2022).

Funding Gap

Based on the sources and approaches discussed, PSC estimates Michigan is underfunding its road system by $3.9 billion (Exhibit 9). This gap is based on estimates for maintaining Michigan's existing road system and does not account for inflation.

Given PSC's understanding of the preferred method of road maintenance, that of extending the life of the road for as long as possible, PSC estimated the funding gap using our model of Pavement Life Cycle I: Full Maintenance. As discussed in greater detail throughout the report, failure to use the right fix and maintenance approach at the right time will significantly increase the funding necessary and only exacerbate the gap funding (to potentially more than $11 billion per year).

EXHIBIT 9. Annual Estimated Road Funding Gap, MDOT and CRA and PSC-modeled* estimates

	Combined MDOT and CRA Estimate	PSC Estimate
Average annual cost of the State of Michigan road system, federal- and non-federal-aid roads	$7,185,676,838	$9,038,555,829
MDOT state and federal annual estimate through 2045	$4,342,160,000	$4,342,160,000
IIJA increase and RBMP through FY 2026	$764,640,000	$764,640,000
Average annual deficit through FY 2026	**$2,078,876,838**	**$3,931,755,829**

*PSC-modeled estimates in this exhibit do not include estimated inflation.
Sources: MDOT November 2021a, MDOT November 2021b, Hamilton 2022

After looking at Michigan's transportation funding needs, and adjustments needed to the current primary transportation funding mechanism, it is clear that if transportation funding is not increased, Michigan's transportation system will continue to decline while the cost to repair the system will increase over time.

The remainder of this report focuses on options for increasing funding to meet Michigan's transportation funding needs.

Funding Solution Analysis

To look at policy options for closing the funding gap, including adjusting the existing model, it is helpful to examine how the State of Michigan raises revenue to contribute state funds to road infrastructure investments, as well as the trends affecting those revenue sources.

Current Revenue Sources

The state's primary transportation funding mechanism for infrastructure is the Michigan Transportation Fund (MTF), which accounts for over 90 percent of state transportation funding. The MTF is funded through different taxes, including vehicle registration taxes and motor fuel taxes on gasoline, diesel, liquified petroleum, and alternative fuels (Exhibit 10).

EXHIBIT 10. State of Michigan Department of Treasury Michigan Transportation Fund (MTF) Revenue by Source

Revenue Source	FY 2020	FY 2021	FY 2022*	FY 2023*	FY 2024*	Annual Average
Vehicle registration taxes	$1,345,112,000	$1,400,015,000	$1,445,800,000	$1,487,300,000	$1,524,500,000	$1,440,545,400
Gasoline tax	$1,086,857,000	$1,111,621,000	$1,165,200,000	$1,224,700,000	$1,270,800,000	$1,171,835,600
Diesel and MCFT	$229,917,000	$240,224,000	$247,000,000	$258,000,000	$268,500,000	$248,728,200
Liquefied Petroleum and alternative fuels	$1,579,000	$2,289,000	$2,400,000	$2,500,000	$2,600,000	$2,273,600
Other licenses and permits and misc.	$35,426,000	$41,415,000	$42,555,000	$43,540,000	$43,540,000	$41,295,200
Income tax redirection to MTF	$468,000,000	$600,000,000	$600,000,000	$600,000,000	$600,000,000	$573,600,000
Excise tax on recreational marijuana	$0	$0	$52,200,000	$61,300,000	$68,000,000	$36,300,000
Interest, common cash	$2,640,000	$254,000	$1,735,000	$1,735,000	$1,735,000	$1,619,800
MTF Revenue	$3,169,531,000	$3,395,818,000	$3,556,890,000	$3,679,075,000	$3,779,675,000	$3,516,197,800
Total State Transportation Revenue without federal aid	$3,342,475,000	$3,595,390,000	$3,866,425,000	$4,003,276,000	$4,107,392,000	$3,782,991,600

Revenue Source	FY 2020	FY 2021	FY 2022*	FY 2023*	FY 2024*	Annual Average
MTF share of total state transportation revenue	95%	94%	92%	92%	92%	93%

* Projections are from the May 2022 Michigan Department of Treasury Office of Revenue and Tax Analysis (ORTA) forecast.
Source: ORTA May 2022

On average, state motor fuel taxes account for approximately 40 percent of MTF revenue and are the largest single source of revenue for transportation. The state motor fuel tax from 2017 to 2021 was $0.263 per gallon. On January 1, 2022, the motor fuel tax increased to $0.272 per gallon (Michigan Department of Treasury January 2022).

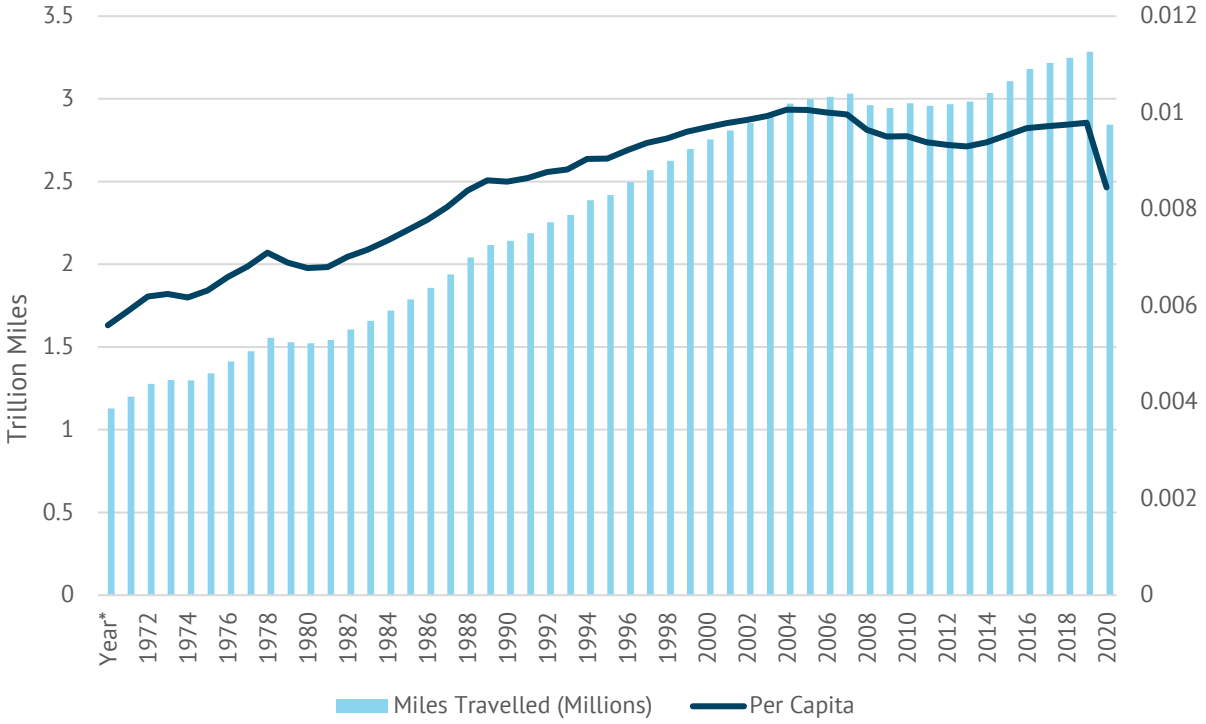
Long-term Trends

In comparing options for increasing investment in road infrastructure, it is important to consider long-term trends affecting road and vehicle usage.

Changes to Vehicle Miles Traveled

According to the Federal Highway Administration, vehicle miles traveled (VMT) will grow at an average of approximately 1.1 percent per year over the next 20 years (Congressional Research Service May 2020.) VMT flattened or declined in growth after oil price increases in 1974, 1979, and 2008, and the COVID-19 pandemic led to the lowest VMT since 2002 (DOE June 2022). Per capita miles traveled largely matched nationwide miles traveled until 2004, when per capita VMT began to decline and level off relative to nationwide miles traveled (Exhibit 11). The U.S. is currently experiencing record-high gas prices for several reasons, including the ongoing war in Ukraine, and this could affect prices moving forward (Koeze and Krauss June 2022).

EXHIBIT 11. Annual VMT in the United States

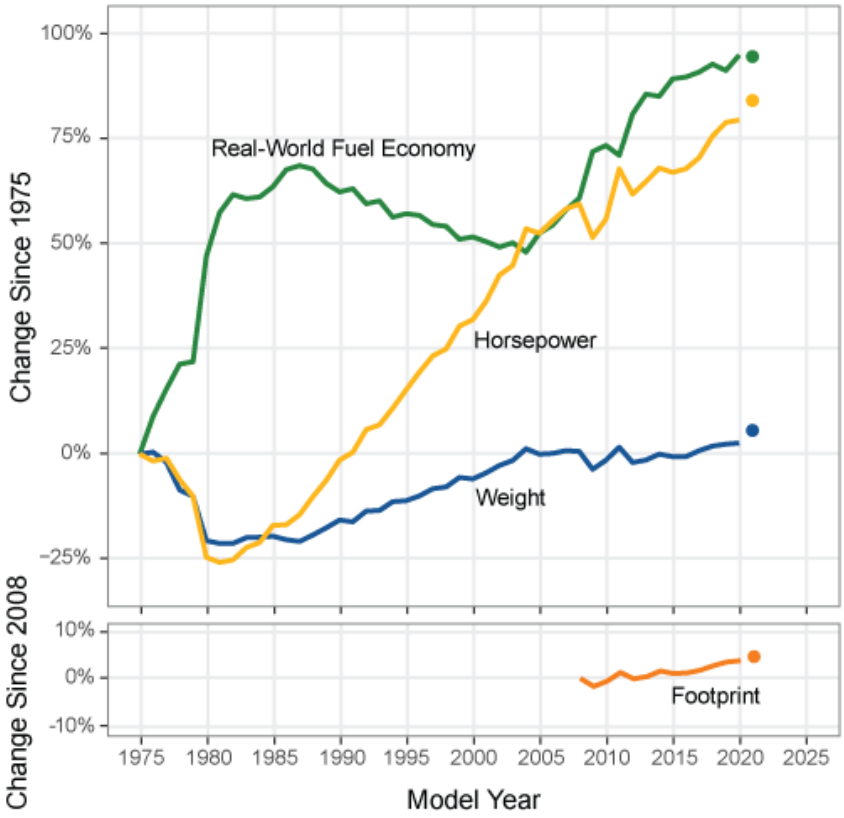


Source: U.S. Department of Energy Alternative Fuels Data Center

Increase in Vehicle Fuel Efficiency

Policy changes, technological innovation, and changes to consumer preference are weakening the connection between VMT and motor fuel consumption. According to the U.S. Environmental Protection Agency (EPA), since model year 2004, fuel economy in all new vehicles has increased 32.1 percent, or 6.1 miles per gallon, and fuel economy has improved in 13 of 16 years (November 2021). At the same time, market trends favoring larger sport utility vehicles have led to increases in vehicle horsepower by 17 percent, vehicle weight by 1 percent, and, since 2008, vehicle footprint—the EPA term for vehicle size—by 4 percent, and these trends have mitigated some of the gains improvements in fuel economy (EPA November 2021) (Exhibit 12).

EXHIBIT 12. Percent Change in Real-world Fuel Economy, Horsepower, Weight, and Footprint



Source: EPA November 2021

Recent Increase in Electric Vehicles Purchases

Electric vehicles (EVs), Plug-in hybrid vehicles (PHEVs), and fuel cell vehicles (FCVs) are a small but growing percentage of all vehicles. In 2020, EVs and PHEVs accounted for 2.2 percent of all new vehicle sales, up from less than 1 percent in 2015. According to three scenarios developed by Electric Power Research Institute (EPRI), a member of the U.S. DRIVE research partnership between the U.S. Department of Energy, auto industry, electric utilities, and the energy fuels industry (DOE n.d.), U.S. new electric vehicle sales (defined as light-duty EVs and PHEVs) could account for between 2 percent and 40 percent of new vehicle sales by 2030 and could represent between 1 and 15 percent of the total U.S. vehicle fleet by 2030 (U.S. DRIVE November 2019).

Since the time of EPRI's projections, there have been additional announcements that could increase the uptake of electric vehicles. In August 2021, the White House set a target that by 2030, 50 percent of all vehicles sold in the U.S. would be zero-emission vehicles, including battery electric, plug-in hybrid electric, or fuel cell electric vehicles (White House August 2021) (Exhibit 13).

EXHIBIT 13. EV and PHEV Share of New Vehicle Sales and Total U.S. Fleet by Source

	Actual		EPRI Scenarios			White House
	2015	2020	2030 Low	2030 Medium	2030 High	2035
Percent of new vehicle sales	<1%	2%	2%	12%	40%	50%
Percent of total U.S. fleet	-	-	1%	5%	15%	-

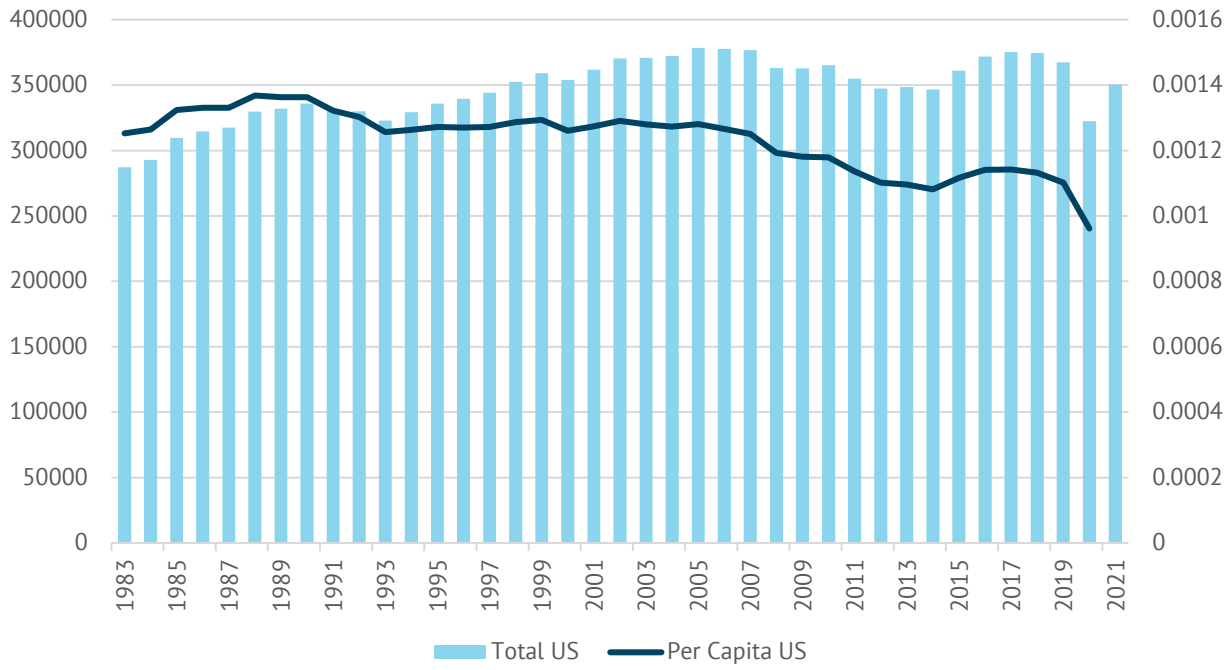
Sources: U.S. DRIVE November 2019 and White House August 2021
Note: White House target includes fuel cell vehicles.

In August 2022, the California Air Resources Board announced that by 2035, it would require all new vehicles sold in the state to be powered by electricity or hydrogen (Associated Press August 2022). Seventeen other states follow some or all of California's energy policies, and three states—Washington, Virginia, and Massachusetts—have trigger laws in place that automatically follow California policy. Manufacturers have also followed suit. In October 2021, General Motors announced that by 2035, it will only sell zero-emission vehicles (Boudette and Davenport October 2021), while Ford announced that 40 percent of its global vehicle sales will be electric by 2030 (Isidore May 2021). Canada and the European Union have issued similar targets, with the European Parliament voting to ban the sale of combustion engine cars by 2035, while Canada set a mandatory target for all new light-duty cars and passenger trucks to be zero-emission by 2035 (Government of Canada August 2022.)

Trends' Potential Impacts on Gasoline Sales

While increases in vehicle fuel efficiency and relative decreases in VMT have correlated with decreases in per capita fuel sales, total gasoline sales have remained relatively consistent over the last 30 years (Exhibit 14). Increased adoption of EVs in the future could change this significantly since they currently represent only 1 percent of the U.S. vehicle fleet.

EXHIBIT 14. U.S. Total and Per Capita Gasoline All Sales/Deliveries by Prime Supplier (Thousand Gallons per Day)



Sources: EIA June 2022 and United Nations July 2022

Options for Raising Additional Revenue

According to the Urban Institute, states interested in meeting the increasing costs of maintaining and expanding highway and transit infrastructure must choose among three difficult alternatives (Auxier 2014):

1. Raise more revenue from taxes dedicated to transportation (e.g., motor fuel tax)
2. Allocate more funds to transportation from other parts of the budget
3. Scale back transportation projects

PSC's analysis looks at the first alternative—raising more revenue—and examines five different policy options to accomplish this:

- Increase the motor fuel tax
- Increase the motor fuel tax and assessing the motor fuel tax on a per dollar basis
- Increase or change the sales tax apportionment for transportation
- Allow local governments to charge their own sales taxes to meet specific needs like transportation
- Move toward mileage-based user charges

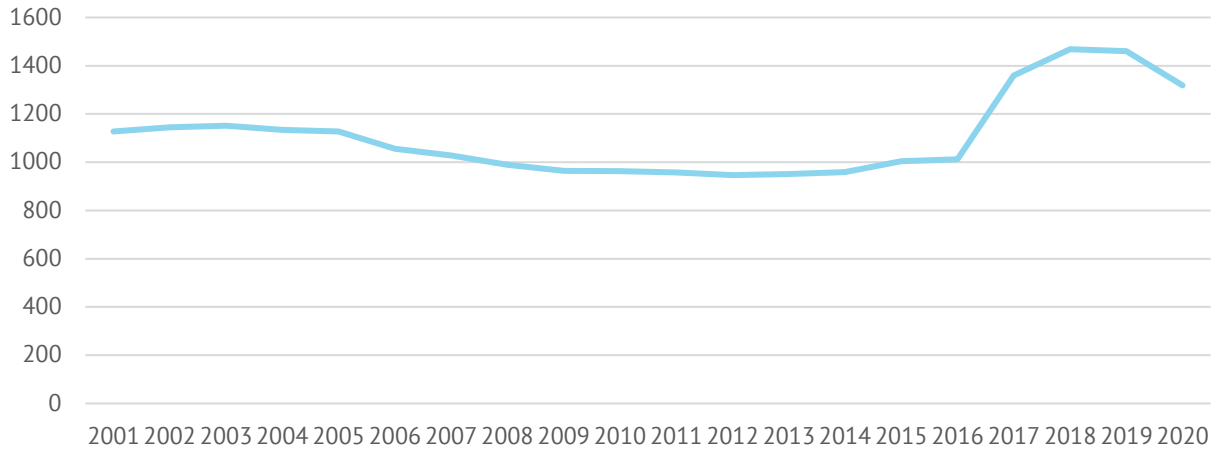
Option One: Increase the Motor Fuel Tax

All U.S. states, the District of Columbia, and the federal government tax motor fuels. The federal government taxes motor fuels at the rate of $0.184 per gallon, while state tax rates range from $0.0895 in Alaska to $0.57 per gallon in Pennsylvania.

As discussed above, Michigan levies two different taxes on gasoline: a motor fuel tax and a sales tax. Only the motor fuel tax is currently dedicated to funding Michigan's transportation needs. The state's motor fuel tax is calculated on a per gallon basis, meaning that for every gallon sold, suppliers are required to pay an additional fee of $0.272 per gallon.

The Michigan Legislature has passed a motor fuel tax increase before. In 2015, it passed Public Act 176, which increased the motor fuel tax to $.263 per gallon for both gasoline and diesel (increasing the gasoline tax 7.3 cents and the diesel tax 11.0 cents). Public Act 176 also indexed Michigan motor fuel taxes to inflation beginning in 2022. More specifically, Public Act 176 stated that every year on January 1, MDOT "shall determine a cents-per-gallon rate on motor fuel that shall be derived by multiplying the cents-per-gallon rate in effect during the immediately preceding calendar year by 1 plus the lesser of 0.05 or the inflation rate and rounding up the product to the nearest 1/10 of a cent" (MCL 207.1008). Exhibit 15 shows the revenue generated from motor fuel tax over time, including the bump in revenue from the motor fuel tax increase in 2017.

EXHIBIT 15. Michigan Revenue from Motor Fuel Taxes (Gasoline, Diesel, and Alternative Fuels), FY 2001 to FY 2020, in Millions of Dollars



Sources: Michigan Senate Fiscal Agency October 2021, Siracuse 2019

Proposals to raise the motor fuel tax have created political pushback as well. In 2019, a bipartisan group of former state legislators, working through an initiative from the Center for Michigan, proposed an almost $0.50 increase to the motor fuel tax (VanHulle January 2019). In 2019, a similar proposal by Governor

Gretchen Whitmer to increase the gas tax to 45 cents was unpopular, and it was not introduced for a vote in the legislature (Beggin August 2019.) Between 2013 and 2021, 33 states and the District of Columbia raised their motor fuel tax rates (Urban Institute 2022).

To estimate the tax rate needed to meet the funding gap for road infrastructure, PSC calculated the number of fuel gallons consumed in the state. Using these tax rates and the State of Michigan revenue estimates, it is possible to estimate the average number of gallons purchased in Michigan annually (Exhibit 16).

EXHIBIT 16. Estimated Annual Average Gallons of Fuel Consumed in Michigan

	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Annual Average	Average in Percent
Gasoline	4,132,536,122	4,226,695,817	4,430,418,251	4,541,093,645	4,672,058,824	4,400,560,532	82.4%
Diesel fuel	874,209,125	913,399,240	939,163,498	956,644,207	987,132,353	934,109,685	17.5%
Alternative fuel (incl. LPG)	6,003,802	8,703,422	9,125,475	9,269,808	9,558,824	8,532,266	0.2%
Total gallons	**5,012,749,049**	**5,148,798,479**	**5,378,707,224**	**5,507,007,660**	**5,668,750,000**	**5,343,202,483**	**100.0%**

Sources: ORTA May 2022 and PSC calculations

With the assumption that the number of gallons consumed annually will hold constant if the motor fuel tax is increased, one can estimate the revenue needed to close the funding gap against the different scenarios PSC developed (Exhibit 17).

EXHIBIT 17. Additional Motor Fuel Revenue Needed to Meet Deficit, Annual Average through FY 2026

	MDOT and CRA Estimate	PSC Estimate
Average annual deficit through FY 2026	$2,078,876,838	$3,931,755,829
Motor fuel tax revenue needed— gasoline	$1,712,123,655	$3,238,119,756
Motor fuel tax revenue needed— diesel	$363,433,539	$687,357,668
Motor fuel tax revenue needed— alternative fuels	$3,319,644	$6,278,405

Source: PSC calculations

When one divides the revenue needed by the average annual gallons consumed, one can estimate the tax rate increase required to meet the funding gap. The tax rate increase ranges from $0.39 per gallon to meet the MDOT and CRA estimate to $0.74 to meet PSC's modeled estimates for extending the road life through full maintenance (Exhibit 18). PSC's estimates are based on average fuel consumption estimates used by the Michigan Department of Treasury in estimating transportation revenue, and it does not consider potential changes to fuel consumption that could result from a motor fuel tax increase.

EXHIBIT 18. Estimated Motor Fuel Tax Increase to Meet Deficit, Annual Average through FY 2026

	MDOT and CRA Estimate	PSC Estimate
Additional tax per gallon— gasoline	$0.39	$0.74
Motor fuel tax revenue needed—diesel	$0.39	$0.74
Motor fuel tax revenue needed—alternative fuels	$0.39	$0.74

Source: PSC calculations

When added to Michigan's existing motor fuel tax, one can estimate a revised motor fuel tax between $0.66 and $1.01 per gallon.

Michigan also charges a sales tax on gasoline of 6 percent per dollar spent. When translated into a per gallon fee, the charge fluctuates based on the price of gasoline. Using U.S. Energy Information Administration (EIA) estimates from August 2022, the per gallon rate is equivalent to $0.273 per gallon (Exhibit 19). While this sales tax is a revenue source for the state, it has not historically been a major source of revenue for transportation in Michigan. The sales tax will be discussed in a further section of this report. The federal government also charges a motor fuel tax of $0.184 per gallon gasoline and $0.244 per gallon on diesel (EIA July 2022).

EXHIBIT 19. Top Ten U.S. States Motor Fuel Tax Rates—Gasoline, Including Other Taxes and Fees[1]

		State Motor Fuel Tax	Other Taxes and Fees[2]	Total State Taxes[3]
1	California*	$0.54	$0.1120	$0.6510
2	Illinois*	$0.39	$0.2410	$0.6330
3	Indiana	$0.33	$0.3010	$0.6310
4	Pennsylvania	$0.58	$0.0110	$0.5870
5	Puerto Rico	$0.16	$0.3690	$0.5290
6	Washington*	$0.49	$0.0298	$0.5238
7	**Michigan**	**$0.27**	**$0.2450**	**$0.5170**
8	Maryland	$0.29	$0.1399	$0.4289
9	New Jersey	$0.11	$0.3195	$0.4245
10	North Carolina	$0.39	$0.0025	$0.3875

Sources: EIA July 2022, federal and state motor fuel taxes

Option Two: Increase the Motor Fuel Tax and Assess the Motor Fuel Tax on a Per Dollar Basis

Another option for increasing revenue from the motor fuel tax is to change what is taxed, shifting from a per gallon to a per dollar tax, otherwise known as an ad valorem tax. When assessed on a per dollar basis, taxes and tax revenue increase (or decrease) when the price increases (or decreases). Twelve states and the District of Columbia tie a portion of their motor fuel tax to the price of gasoline (Urban Institute 2022).

While sales of gasoline have remained relatively consistent over the last thirty years, as shown in Exhibit 20, gas prices have fluctuated significantly. This has implications for state revenues. According to the EIA, the nominal price of gasoline, which is the price actually paid at the pump, has increased overall since 1976, with drops in 2009, 2016, and 2020. The real price of gasoline, which is the price adjusted for inflation, has fluctuated more significantly, with high points in 1980 and 2012 and drops in 2009, 2016, and 2020 as it began to more closely mirror the nominal price (Exhibit 20).

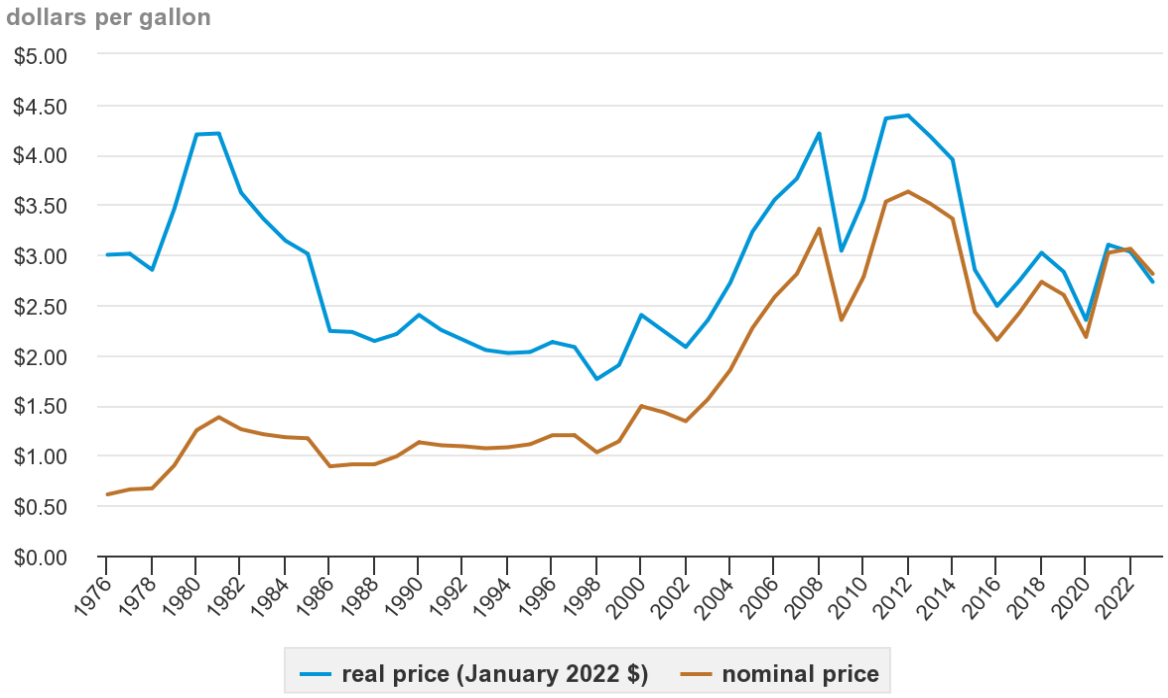
[1] This list includes rates of general application (including, but not limited to, excise taxes, environmental taxes, special taxes, and inspection fees), exclusive of county and local taxes. Rates are also exclusive of any state taxes based on gross or net receipts. The information included in this document is for general informational purposes only and should not be construed as legal, tax, or other advice. Contact the appropriate state agencies for official information or guidance about motor fuel taxes and fees. State rates in effect as of July 1, 2022. Source: State and Territorial statutes and government agencies

[2] May include sales and/or use taxes, inspection fees, environmental fees, or other charges.

[3] Average of total state taxes may not equal the sum due to rounding.

* Local option taxes (LOTS) are allowed.

EXHIBIT 20. U.S. Average Annual Regular-grade Gasoline Prices, 1976–2023



Source: EIA January 2022
Note: Prices are retail prices including taxes.

In times of price increases, states with motor fuel taxes tied to the price of gasoline benefit from increased revenue compared to those with a per gallon tax. For example, between 1993 and 2004, Kentucky's motor fuel tax revenue mirrored that of Massachusetts and the U.S. overall. However, when gasoline prices increased between 2004 and 2011, Kentucky, which ties its gas tax to the wholesale price of gasoline, showed a per capita revenue increase $31 (or $135.5 million), while Massachusetts, which uses a per gallon gas tax, saw its per capita revenue decrease $27 (or $178.5 million), while U.S. per capita revenue decreased $10 per capita (Auxier 2014).

In times of gasoline price decreases, states that have tied their motor fuel tax to the price of gasoline would similarly experience a revenue decrease. For example, when gasoline prices decreased in the early 2010s, Kentucky instituted a price "floor" to mitigate revenue losses, while North Carolina decided to tie their tax to population and inflation (Urban Institute 2022).

For Michigan, with an estimated funding gap between $2.1 and $3.9 billion, this policy option alone would not be able to address the funding gap. Michigan could increase the motor fuel tax as discussed in option one and move to a per dollar assessment of the tax, and this approach would lead to increased revenues during times of higher gas prices, but lower revenues when prices decline. California moved away from this approach due to what they perceived as the increased volatility associated with the per dollar approach (Madowitz 2013).

Option Three: Increase and Change the Apportionment of the Sales Tax for Transportation

Sales taxes on motor fuel are another form of motor fuel tax assessed on a per dollar basis. As of May 2019, six states, including Michigan, have a sales tax on gasoline. At 6 percent, Michigan's general sales tax is 17th in the country (Fritts January 2021). When applied to the price of gasoline in August 2022, the per gallon rate is equivalent to $0.273 per gallon (EIA July 2022). Revenue from the sales tax is not currently allocated to road transportation infrastructure.

Sales tax collection and allocation is delineated in Article IX of the 1963 Michigan Constitution, and any increase or change to the allocations requires a constitution amendment. Such a change requires two-thirds majority support in both the House and Senate along with voter approval in the next statewide election (Oosting February 2013). Since the sales tax is not currently allocated to road infrastructure, it would be necessary to change the constitution to raise the sales tax and specify that the additional revenue is for a specific use, in this case, transportation.

According to the constitution, the sales tax is actually administered as a 4 percent sales tax and a 2 percent sales tax, with most goods being taxed at 6 percent, while some goods (e.g., sales of electricity, natural gas, and home heating fuels) are taxed at 4 percent (Michigan Department of Treasury 2022). 60 percent of the 4 percent sales tax, as well as 100 percent of the 2 percent sales tax is earmarked for the Michigan School Aid Fund, which provides funding to Michigan schools, higher education, and teacher pensions. Of the 4 percent tax, 15 percent is earmarked for revenue sharing with local government—Michigan cities and villages—on a per capita basis by formula (Michigan Legislature September 2022). A small percentage is allocated to the Comprehensive Transportation Fund, which provides funding for transit infrastructure improvements (e.g., bus terminals) (Exhibit 21). The State of Michigan does not allow city or local units to impose a sales tax (Michigan Department of Treasury 2022).

EXHIBIT 21. Sales Tax Revenue Collection and Distribution, FY 2019–FY 2021

	FY 2019	FY 2020	FY 2021	FY 2019–FY 2021 Average
Estimated Total Sales*	$137,550,000,000	$137,130,000,000	$135,983,333,333	$136,887,777,778
Sales Tax Collections				
4 percent sales tax	$5,767,200,000	$5,598,000,000	$5,554,400,000	$5,639,866,667
2 percent sales tax	$2,485,800,000	$2,629,800,000	$2,604,600,000	$2,573,400,000
Total	$8,253,000,000	$8,227,800,000	$8,159,000,000	$8,213,266,667
Sales Tax Distributions				
School Aid Fund	$6,008,100,000	$5,988,500,000	$5,949,300,000	$5,981,966,667
General fund/general purpose	$1,277,000,000	$1,280,000,000	$1,250,200,000	$1,269,066,667

	FY 2019	FY 2020	FY 2021	FY 2019–FY 2021 Average
Constitutional revenue sharing	$851,300,000	$850,500,000	$851,900,000	$851,233,333
Comprehensive Transportation Fund	$96,900,000	$89,600,000	$92,000,000	$92,833,333
Health initiative	$9,000,000	$9,000,000	$9,000,000	$9,000,000
Aeronautics and airport funds	$10,800,000	$10,200,000	$6,600,000	$9,200,000
Total	$8,253,100,000	$8,227,800,000	$8,159,000,000	$8,213,300,000

Source: House Fiscal Agency September 2020
*PSC calculations

If the State of Michigan were to consider a sales tax increase for transportation, it is possible to estimate the size of the increase required to address the state's estimated annual transportation funding deficits. Using House Fiscal Agency estimates for sales tax revenue from FY 2019 to FY 2021, PSC calculated the total average total sales on which the sales tax revenues were based. PSC then divided this total by the transportation funding deficit against our estimates to develop an estimate of the additional sales tax that would be needed to meet this deficit if the additional sales tax was dedicated to transportation infrastructure specifically (Exhibit 22).

EXHIBIT 22. Sales Tax Increase Needed to Meet Transportation Funding Deficits

	MDOT and CRA Estimate	PSC Estimate
Average annual deficit through FY 2026	$2,078,876,838	$3,931,755,829
Additional sales tax needed to meet deficit (1% = 1 cent)	2%	3%
Percent increase to sales tax	33%	50%

Source: PSC calculations

Michigan has contemplated an increase to sales tax related to transportation before. In 2015, Proposal 1, also known as Michigan Sales Tax Increase for Transportation Amendment, was a referendum through special election that would have raised an additional $1.3 billion for roads by:

- Increasing the motor fuel tax to $0.417 or 14.9 percent of the base cost of gasoline
- Eliminating the sales tax on gasoline
- Increasing the sales tax 1 percent to 7 percent to compensate for the lost revenue associated with eliminating the sales tax on gasoline

Contrary to what the title suggested, the sales tax increase was not for transportation, but to compensate for the elimination of the sales tax on gasoline, while the motor fuel tax increased to fund transportation. This ballot proposal was supported by Governor Rick Snyder, and a bipartisan majority in the Michigan House and Senate voted to put the measure on the ballot) (Ballotpedia n.d.) It was defeated by the voters 80 percent to 20 percent, the largest margin in Michigan since 1963 (Egan May 2015).

Other states have moved away from the use of the sales tax as a way of funding transportation infrastructure. For example, in 2010, California instituted Assembly Bill x8-6, better known as the Gas Tax Swap, which increased the state's motor fuel tax and decreased the sales tax. A study in the journal *Energy Policy* noted that one of the benefits of this approach is reducing the volatility associated with changing gas prices (Madowitz 2013). This approach is not dissimilar from what Proposal 1 attempted to do in 2015.

Option Four: Allow Local Governments to Charge Their Own Sales Taxes to Meet Specific Needs Like Transportation

While Michigan prohibits the collection of local sales taxes, 38 other states allow local governments to charge their own local sales tax. When local sales taxes are included, Michigan is 38th in the country for sales tax rates (Fritts January 2021) (Exhibit 23).

EXHIBIT 24. Top 15 States Plus Michigan Combined Sales Tax Rates, 2021

State	State Sales Tax Rate	Rank	Avg. Local Sales Tax Rate[1]	Combined Sales Tax Rate	Rank	Max Local Sales Tax Rate
Tennessee	7.00%	2	2.55%	9.55%	1	2.75%
Louisiana	4.45%	38	5.07%	9.52%	2	7.00%
Arkansas	6.50%	9	3.01%	9.51%	3	5.13%
Washington	6.50%	9	2.73%	9.23%	4	4.00%
Alabama	4.00%	40	5.22%	9.22%	5	7.50%
Oklahoma	4.50%	36	4.45%	8.95%	6	7.00%
Illinois	6.25%	13	2.57%	8.82%	7	9.75%
Kansas	6.50%	9	2.19%	8.69%	8	4.00%
California[2]	7.25%	1	1.43%	8.68%	9	2.50%
New York	4.00%	40	4.52%	8.52%	10	4.88%
Arizona	5.60%	28	2.80%	8.40%	11	5.60%
Missouri	4.23%	39	4.03%	8.25%	12	5.76%
Nevada	6.85%	7	1.38%	8.23%	13	1.53%

[1] City, county, and municipal rates may vary; these rates are weighted by population to compute an average local tax rate for the state.

[2] Three states levy mandatory, statewide, local add-on sales taxes at the state level: California (1%), Utah (1.25%), and Virginia (1%). These rates are included in the state sales tax.

State	State Sales Tax Rate	Rank	Avg. Local Sales Tax Rate[1]	Combined Sales Tax Rate	Rank	Max Local Sales Tax Rate
Texas	6.25%	13	1.94%	8.19%	14	2.00%
Michigan	6.00%	17	0.00%	6.00%	38	0.00%

Source: Fritts January 2021

During stakeholder interviews for this project, one expert expressed support for the use of local taxes to fund improvements in transportation. A referendum to grant local governments the ability to charge local sales taxes to meet local priorities may face a different political climate than a statewide increase, with later decisions about tax increases undertaken at the local level.

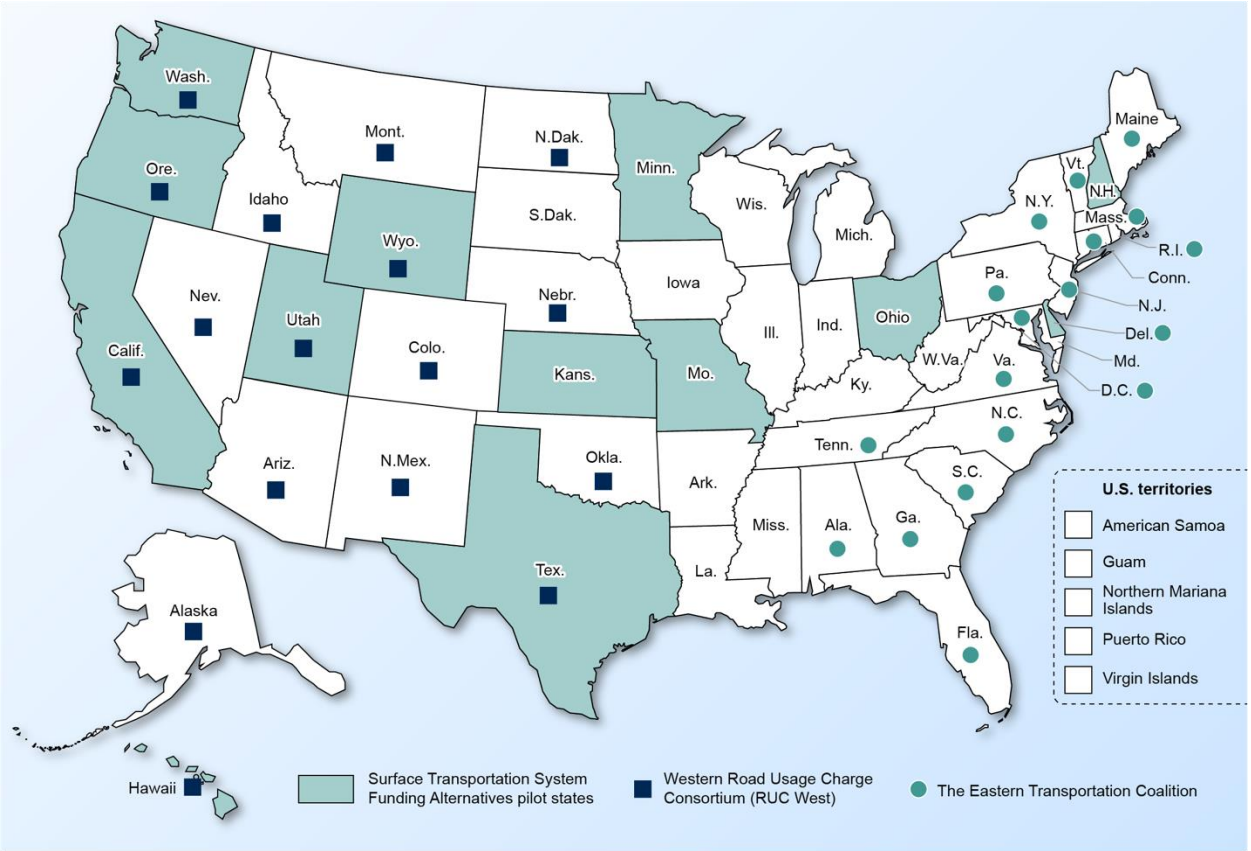
As an alternative to local sales taxes, some Michigan cities and villages have raised millages dedicated to addressing their own road funding gaps. A millage rate is the rate at which property taxes are levied on the taxable value of a property, with 1 mill being equivalent to 1/1000 of a dollar (Michigan Department of the Treasury 2022). For example, in 2015, Royal Oak voters approved a ten-year, 2.5 mill tax increase to upgrade local streets that is projected to raise an additional $5 million annually (Royal Oak n.d.) In 2016 and 2020, Washtenaw County voted for a 0.5 mill tax that provides an additional $4 million per year for road improvements (Washtenaw County Road Commission 2022).

Option Five: Pilot Mileage-based User Charges

Vehicle miles traveled (VMT) taxes charge drivers on a per mile basis for the distance the vehicle is driven to cover costs such as wear and tear on the roads, air pollution, and traffic congestion. Unlike motor fuel taxes, which are assessed and collected where the fuel is purchased, a VMT approach requires estimating or tracking the number of miles traveled, which could be accomplished using solutions such as global positioning system (GPS) tracking on vehicles or annual odometer readings completed during vehicle registration. Since VMT approaches could be similarly applied to owners of electric vehicles and owners of gasoline vehicles, option five does not face the same long-term challenges that may affect motor fuel taxes and is viewed by many as a preferred model for the future of transportation funding.

To encourage states to explore and pilot different approaches to VMT, the U.S. government provided grant funding. In 2016, U.S. Congress authorized $95 million in grant funding through Section 6020 of the Fixing America's Surface Transportation (FAST) Act (U.S. Congress 2015) to demonstrate "user-based alternative revenue mechanisms" (Congressional Research Service June 2016). As shown in Exhibit 24, since FY 2016, 16 states and two multistate coalitions have developed pilots using this funding, known as the Surface Transportation System Funding Alternatives (STSFA) (Kirk 2016).

EXHIBIT 24. Surface Transportation System Funding Alternatives Participants, 2016 to Present



Source: GAO analysis of Federal Highway Administration Data and Map Resources. | GAO-22-104299

Through the STSFA pilot program, states explored different approaches to the collection of vehicle-miles traveled. State VMT pilot approaches, as well as those of other countries, include the following, listed below.

GPS-based Mileage Fee System

Under this approach, an on-board unit (OBU) or cell phone determines vehicle location using global positioning data (GPS) and then transmits these data to a central office for billing. California tested this approach with both cell phones and vehicle telematics systems, which are systems already built into some cars that transmit data about the car to the manufacturer. According to the U.S. Government Accountability Office (GAO), only a limited number of manufacturers were willing to share these data with California during the pilot project (GAO January 2022). GPS-based mileage fees are one of the options available under Oregon's OReGO program, as well as a non-location tracking OBU and a manual option for tracking miles through the odometer (GAO January 2022).

Pay-at-the-Pump System

Under this approach, no GPS receiver would be required. Devices on vehicles and fuel pumps exchange information about the miles traveled, and the fuel pump transmits these data to a central office to determine billing. Two states piloted this approach. In Nevada, a transponder on the vehicle estimated the vehicle's fuel efficiency, transmitted this information to the fuel pump, which in turn relayed the information to a central office, and finally, the central office estimated the tax based on the amount of gallons of fuel purchased. After participants in Oregon expressed privacy concerns about the GPS approach, Oregon also tested a pay-at-the-pump system (CRS June 2016).

Plug-in Device without GPS

Oregon's OReGO program includes an option for using an on-board unit (OBU) to track miles and communicate miles without tracking location. Switzerland currently operates a system not dissimilar from this, which is discussed in more detail below (Kirk 2016).

Odometer Readings

A mileage-based user charge could be assessed based on a vehicle's odometer reading. This could be collected during an annual inspection. Hawaii piloted this approach, as well as a GPS alternative where drivers could take a picture of their odometer and send it to the collection agency. Oregon's OReGO program provides a similar option (OReGO 2022).

Prepaid Mileage System

Under this approach, the driver would purchase a license or card that permits a certain number of miles of driving based on an odometer reading at the time of purchase. This approach avoids collecting location information. It is currently implemented in New Zealand, which is discussed further below.

Concerns about VMT Programs

In its assessment of the STSFA programs, GAO relayed concerns shared by the states about the vehicle-miles traveled programs. Specifically, state officials cited public acceptance as a major challenge to the adoption of VMT programs, and they cited two specific public acceptance concerns: privacy and equity.

Privacy

According to the GAO, several states reported that privacy concerns limited public support for a mileage-based fee in their state. Officials cited concerns over government tracking of their travel and doubts about their ability to protect this information as barriers to GPS-based systems States such as Washington, Oregon, and Hawaii responded by creating non-GPS alternatives (GAO January 2022). Oregon also established privacy protections on GPS data (OReGO 2022), while the Eastern Transportation Coalition and Oregon both required third-party partners to delete all data after 30 days (GAO January 2022).

Equity

Some state officials expressed concerns around equity. In some states, officials relayed concerns from rural drivers who felt that they would pay more than their fair share under a VMT program. Drivers of more fuel-efficient vehicles and electric vehicles also shared equity concerns, arguing that a VMT tax system disincentivized the purchase of more fuel-efficient vehicles. Some officials also expressed concerns about how implementation could affect those traditionally challenged by technology, such as the elderly, as well as those without access to electronic banking (GAO January 2022).

Additional Concerns

In addition to public acceptance, state officials shared concerns over the cost of start-up, operation, and enforcement of VMT programs (GAO January 2022). These costs came from the need for new technologies and data management systems, as well as what some officials cited as costs associated with managing the increased potential for fraud (GAO January 2022).

Overview of VMT Implementations in the U.S. and Globally

While different states piloted VMT, Oregon was the first state to pilot and implement a mileage-based revenue program statewide. Known as OReGO, Oregon's program allows drivers to choose one of three account managers that provide different implementation models, including plug-in device with GPS tracking, plug-in device without GPS tracking, and manual entry reporting. Drivers pay $.019 per mile traveled on Oregon roads, and they are compensated for miles traveled outside the state (OReGO 2022).

The Infrastructure Investment and Jobs Act (IIJA), passed in 2021, provides additional funding ($75 million) for state level pilots but also provides funding ($50 million) for the Secretary of Transportation, in coordination with the Secretary of the Treasury, to develop a pilot program to demonstrate a national motor vehicle per-mile user fee (U.S. Congress 2021). More specifically, Section 13002 of the IIJA asks for volunteers from among the 50 states, the District of Columbia and Puerto Rico to test the design, acceptance, implementation, and financial sustainability of a national motor vehicle per-mile user fee, and it stipulates potential collection tools states can use, including smartphone applications; third-party on-board diagnostic devices (OBDs); and data collected by fueling stations, automakers, and insurance companies (U.S. Congress 2021). The pilot program will be governed by an advisory board of parties from across government, nonprofits, fleet vehicle owners, academia, data security firms, and others.

Outside the United States, other countries have implemented VMT programs (Exhibit 25). Switzerland requires that trucks over a certain weight must have an on-board unit (OBU) installed to collect information about distance traveled and driving time; the driver must periodically download and forward this information to the Swiss Federal Office for Customs and Border Security for billing (CRS 2022). Austria operates a similar system, which uses an OBU to track miles traveled without GPS. Germany implements a more complicated system based on OBUs using GPS, but since it is prohibited from requiring non-German drivers to install these devices, the country also uses cameras and roadside checks in what CRS describes as an "extensive surveillance effort" (CRS 2016). As discussed above, New Zealand requires drivers to purchase mileage cards

that allow for a certain number of miles traveled, and drivers install an odometer on a left-side axel that allows inspectors to determine if a license is valid (Kirk 2016).

EXHIBIT 25. VMT Program Approaches Piloted in the U.S. and Other Countries

VMT Approach	Description	Pilot Location by U.S. State or Country	Vehicle Location Data
GPS-mileage fee	An OBO or cell phone uses GPS to track a vehicle and transmits VMT to a central office for billing.	California, Oregon, Minnesota	Yes
Pay-at-the-pump	Devices on vehicles share VMT or estimated fuel efficiency with fuel pumps, which then share this information with a central office for billing.	Nevada, Oregon	No
Plug-in device without GPS	Devices on vehicles share VMT with a central office. In Switzerland, drivers share directly with the central office.	Oregon, Switzerland, Austria	No
Odometer with manual reporting	Taxes are assessed based on odometer readings, either with inspections or with driver-submitted photos.	Hawaii, Oregon, and Washington	No
Prepaid manual mileage	Drivers purchase a license or card that permits a certain number of miles.	New Zealand	No

Sources: Kirk 2016, GAO January 2022, OReGO 2022

In addition to the different policy and technological approaches discussed, Michigan would also want to consider what the potential costs to the taxpayer could look like in a VMT system. If Michigan were to consider a VMT approach as a means of covering annual road funding needs, it is possible to estimate the necessary per mile rate. Removing revenue from motor fuel taxes, it is possible to compare the average annual transportation funding deficit with the average annual vehicle miles traveled in Michigan from 2010-2020 to determine the estimated per mile tax needed to meet the total funding needs. According to PSC estimates, this would be between $0.03 and $0.05 per mile traveled (Exhibit 26).

EXHIBIT 26. Estimated per Mile Fee Needed to Meet Total Estimated Road Funding in Michigan

	MDOT and CRA Estimate	PSC Estimate
Average VMT in Michigan, 2010–2020	96.8	96.8
Average annual deficit through FY 2026 (in billions of dollars)	$2.1	$3.9
Estimated annual motor fuel revenue (in billions of dollars)	$1.3	$1.3
Average annual deficit through FY 2026, excluding motor fuel revenue (in billions of dollars)	$3.4	$5.2
Estimated per mile fee to cover	$0.03	$0.05

Sources: PSC Calculations, Michigan Office of Highway Safety Planning 2022

Conclusion

MITA asked PSC to update prior estimates of the cost to operate Michigan's transportation system and to look at different funding options. PSC estimated that the cost to operate Michigan's transportation system is between $7.2 and $9.0 billion per year, based on estimates from MDOT, MDOT partners, interviews with subject matter experts including MDOT officials, and PSC calculations. Compared to public estimates of funding available to MDOT from federal, state, and local sources, there is a funding gap of between $2.1 and $3.9 billion per year. To meet this gap, PSC examined five potential options that have been considered and implemented by other states and countries:

- Option one: increase the motor fuel tax
- Option two: increase the motor fuel tax and assess the motor fuel tax on a per dollar basis
- Option three: increase or change the apportionment of the sales tax for transportation
- Option four: allow local governments to charge their own sales taxes to meet specific needs like transportation
- Option five: Pilot mileage-based user charges

To be as cognizant as possible of various social and economic factors, PSC included evidence from several states and countries regarding each option's effectiveness. PSC also estimated what the costs could look like for taxpayers when it comes to meeting the transportation infrastructure funding needs of the State of Michigan.

Appendix

EXHIBIT A1. Glossary of Roads in Michigan

Road Category	Definition	Owner/Manager	Federal-aid Roads	Non-federal-aid Roads	MDOT-owned Roads	Locally Owned Roads	Trunkline Roads	Non-trunkline Roads	County Roads	Primary Roads	Secondary Roads	City/Village Roads	City/Village Major Streets
Federal-aid roads	MDOT defines federal-aid roads as roads eligible for federal Surface Transportation Program (STP) road funds. Roads that are federal-aid eligible are federal-aid highways. MDOT also recognizes partially eligible rural roads, known as rural minor collectors.	MDOT, cities, villages	✸		✸	✸	✸						✸
Non-federal aid roads	Roads funded by state and local sources	County road agencies, cities, villages		✸		✸		✸	✸	✸	✸	✸	
MDOT-owned roads	MDOT is responsible for all state trunkline roads that carry "I", "US, or "M" designations	MDOT	✸		✸		✸						
Locally-owned roads	All other roads in Michigan	County road agencies, cities, villages	✸	✸		✸		✸	✸	✸	✸	✸	✸
Trunkline roads	Roads that carry the I-, US-, or M-designation	MDOT	✸		✸		✸						

Road Category	Definition	Owner/Manager	Federal-aid Roads	Non-federal-aid Roads	MDOT-owned Roads	Locally Owned Roads	Trunkline Roads	Non-trunkline Roads	County Roads	Primary Roads	Secondary Roads	City/Village Roads	City/Village Major Streets
Non-trunkline roads	All other roads in Michigan	County road agencies				✸		✸	✸	✸	✸	✸	✸
County roads	Non-trunkline roads managed by county road agencies	County road agencies	✸	✸		✸		✸	✸	✸	✸		
Primary roads	County roads that are eligible for federal aid	County road agencies	✸			✸			✸	✸			
Secondary roads	County roads that are not eligible for federal aid	County road agencies		✸		✸			✸		✸		
City/village roads	City/village roads are managed by the community in which they reside; some but not all these roads are eligible for federal aid	Cities, villages	✸	✸		✸		✸				✸	✸
City/village major streets	City/village major streets are city/village roads that are eligible for federal aid	Cities, villages	✸			✸		✸				✸	✸

Source: MDOT 2022c and Douglas 2018

EXHIBIT A2. *Michigan Mobility 2045 Plan* Funding Estimates by State and Federal Source, FY 2021–FY 2045

MM2045 Funding Estimates, FY 2021–FY 2045	25-year Total	Estimated Annual Average
State Funds	**$90,003,000,000**	**$3,600,120,000**
Locally owned roads	$45,900,000,000	$1,836,000,000
MDOT owned roads	$33,685,000,000	$1,347,400,000
Other (e.g., public transportation, aviation)	$10,418,000,000	$416,720,000
Federal Funds	**$35,455,000,000**	**$1,418,200,000**
Locally owned roads	$7,242,000,000	$289,680,000
MDOT owned roads	$21,727,000,000	$869,080,000
Other (e.g., public transportation, aviation)	$6,486,000,000	$259,440,000
Total	$125,458,000,000	$5,018,320,000
Total for roads (not including "other" as listed above)	**$108,554,000,000**	**$4,342,160,000**

Source: MDOT November 2021b

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