



# REPORT

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## IMPROVING MISSOURI'S TRANSPORTATION SYSTEM THROUGH TOLLING

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### KEY TAKEAWAYS

- User fees are a fair and efficient way to fund transportation infrastructure.
- Direct user fees (such as tolls) are more effective than indirect user fees (such as fuel taxes) at raising revenue from users in proportion to the damage they do to roads.
- Several major Missouri roads will require an expensive rebuild soon; tolling could help defray the costs for this work.
- Technological advances make tolling a viable option to raise money, improve road quality, and quicken travel times.

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FOR MISSOURI PUBLIC POLICY

Missouri's roads and bridges are in structural trouble; many of them are overdue for repair or replacement because state road maintenance has been underfunded for nearly a decade.<sup>1</sup> Current funding levels are inadequate to maintain the state's transportation infrastructure. There are four feasible options to increase funding: bonds, general revenue, and direct and indirect user fees. User fees—charged to drivers for their road use—present the most fair and sustainable funding method, as they tie the cost of driving directly to the cost of upkeep.

## MISSOURI ROAD CONDITIONS

The condition of Missouri's transportation infrastructure has received significant attention in recent years. Numerous studies evaluating road and bridge conditions paint a troubling picture for the state. The Missouri Department of Transportation (MoDOT) has faced budget shortfalls since 2011.<sup>2</sup> Since 2018, MoDOT estimates that an average of \$745 million in high-priority road and bridge transportation needs are going unmet each year.<sup>3</sup> Missouri ranks 48th nationally in road and bridge funding revenue per mile of road maintained. Missouri's low ranking is due in part to heavy reliance on gasoline tax revenues. Missouri's fuel tax is the second-lowest in the nation at 17 cents per gallon and has not been raised in decades.<sup>4</sup> Making matters worse, inflation has been unkind to MoDOT. Construction costs have risen faster than the overall inflation rate since 1996. Moreover, even though the number of vehicle miles driven has risen over the years, increases in vehicle fuel efficiency have meant that fuel tax revenue today has less than half the purchasing power that it had in 1996.<sup>5</sup> Finally, Missouri operates the seventh-largest state highway network in the country, at 33,838 miles.<sup>6</sup>

As is evident in Table 1, the percentage range of roads in

**Table 1:  
Ranking of Missouri's Roads and Bridges,  
Various Studies.**

Study	Percentage of Missouri's roads in poor condition	Percentage of Missouri's bridges in poor condition	National ranking	Roads studied
QuoteWizard (2018) <sup>7</sup>	23	12	8th worst	State highway network
TRIP (2018) <sup>8</sup>	24	13	13th worst	Major roads and highways in state's four largest urban areas
American Society of Civil Engineers (2017) <sup>9</sup>	23	12.5	—	State highway network
Bureau of Transportation Statistics (2019) <sup>10</sup>	23.4	8.6	—	Public roads
Reason Foundation (2019) <sup>11</sup>	0.36–7.01*	12.6	3rd best	Rural and urban interstate and arterial (hence range)
Missouri House Transportation Committee Task Force (2018) <sup>12</sup>	14*	8.5	—	Interstates, major and minor routes
Missouri Department of Transportation (2019) <sup>13</sup>	8.5	8.7	—	Major roads

\*The Reason study gives road quality ratings to multiple road categories, rather than one comprehensive number.

poor condition varies significantly from study to study. The first three studies are from an insurance company, a transportation-focused nonprofit, and an industry group, respectively. The Bureau of Transportation Statistics is part of the Federal Highway Administration, and the Reason Foundation is a free-market think tank.

The Missouri House Transportation Committee Task Force report does not provide a single percentage rating of the overall quality of Missouri's roads. Rather, it rates them by type of road, and it excludes many lesser-used roads. However, the task force's assessment includes quality ratings of the roads that carry 98 percent of travel in Missouri. Thus, the number for the percentage of roads

in poor condition in Table 1 was calculated by the author based on the information provided by the task force report.<sup>14</sup>

Two of the studies—those conducted by the Reason Foundation and by MoDOT—listed much lower percentages of roads in poor condition than the others. One major reason for this difference is that unlike the others, these two studies did not include county and local roads, which all sources agree are in worse condition than major roads. The Reason study’s high ranking for Missouri is due to factors included in that report not considered in others, such as per-mile disbursements for capital, maintenance, and administrative costs. It is not a “road quality” study in the sense that the others are, and Missouri’s high ranking is driven more by low expenditures per state-controlled mile than by the quality of those roads. Many of Missouri’s county and local roads are less-used routes that would be maintained by counties, cities, or other municipal governments in other states but are the state’s responsibility in Missouri.<sup>15</sup> MoDOT expects that by 2025, 73 percent of such county and local roads will be in poor or fair condition.<sup>16</sup> Further, the MoDOT number in the chart is only for major roads, which have been significantly improved over the last 15 years, from 52.6 percent in poor condition to 8.5 percent currently according to MoDOT’s own assessment.<sup>17</sup> The recent improvement in the condition of Missouri’s major roads is welcome news, but it should not distract policymakers from the estimate (also from MoDOT) of a \$745 million shortfall each year in funding for high-priority transportation projects that are needed either to maintain the current system or prepare for future growth. Prioritizing the major roads may be prudent during a funding shortfall, but neglect of minor roads will be increasingly costly over the long term.

Perhaps the biggest challenge facing MoDOT is the need to rebuild (rather than simply repair) Missouri’s interstate highways. States own and operate interstate highways, although funding for such duties is shared by both state and federal governments through a typical 4:1 federal-to-state funding match for approved highway capital improvement projects.<sup>18</sup> The federal interstates are critical for the state’s economy, so keeping them in good condition is one of MoDOT’s priorities. However, most of I-70 was built in the 1950s and 1960s with an expected lifespan of

roughly 50 years. In addition, I-44 and I-55 are nearing the end of their lifespans.<sup>19</sup> Reconstructing the existing lanes on I-70 alone is projected to cost a minimum of \$2 billion,<sup>20</sup> which is nearly twice the \$1.07 billion MoDOT expects to spend on construction in 2020.

To be clear, a rebuild of I-70 would likely take place over several years, and if federal matching funds are available they would reduce the cost to Missouri. However, MoDOT’s most recent analysis indicates no federal programs were distributing additional funds to states for interstate improvements.<sup>21</sup> Further, MoDOT’s construction budget fluctuates annually, with 2020 being one of the highest in several years.

Considering the divergence of road-quality rankings in the studies summarized in Table 1, as well as the stated limitations of the more generous rankings, this paper is written using the assumption that roughly 15 percent of Missouri’s roads and 10 percent of its bridges are in poor condition. While there is room for variation in those numbers, they are in the middle range of the above reports. Further, they mirror closely the findings from the House Task Force, which is the most comprehensive official report on the matter.

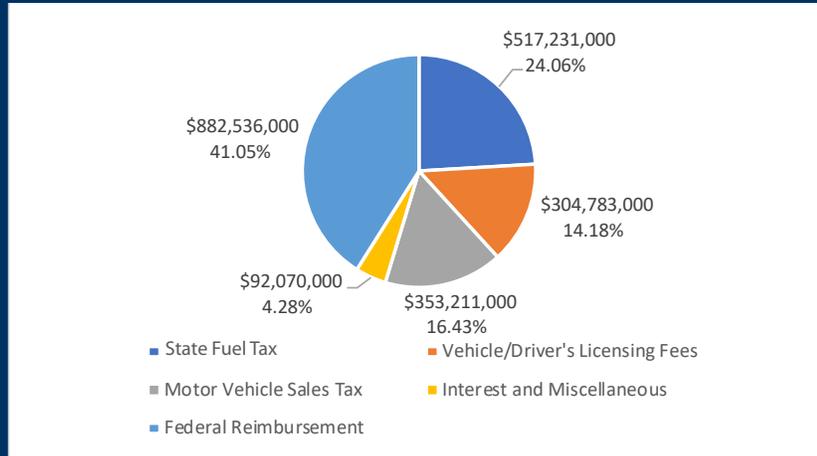
## MoDOT BUDGET BREAKDOWN

MoDOT road and bridge work is funded primarily by gasoline taxes, both state and federal. MoDOT’s 2019 revenue sources that are dedicated to construction and maintenance of roads and bridges are broken down in Figure 1. In addition to this money, MoDOT has a much smaller amount of other revenue that is not restricted, largely from the state General Revenue Fund. Road and bridge revenue totaled \$2,149,831,000 in 2019 and expenditures in 2019 totaled \$2,200,751,000, with the additional expenditures of just under \$51 million coming from other sources such as the Department of Revenue and State Highway Patrol.

The bulk of the federal reimbursement for MoDOT comes from the Federal Highway Trust Fund, for which 87 percent of the funding comes from the federal gasoline and diesel taxes, which have been stagnant at 18.4 cents and 24.4 cents per gallon, respectively, since 1993. As stated earlier, per-gallon fuel taxes come with their own

## Figure 1: MoDOT Revenue Sources, 2019

MoDOT is heavily reliant on state and federal fuel taxes.



Source: MoDOT 2019 Financial Snapshot, p.4.

set of problems. Improvements in fuel efficiency mean that each car can stay on the road longer (and therefore do more damage to the roads) for every gallon of fuel it uses. Meanwhile, inflation of highway construction costs has meant that the money raised by fuel taxes doesn't go as far as it once did. Together, these two factors have reduced the purchasing power of each fuel-tax dollar raised for road repair purposes by two thirds since 1993.<sup>22</sup> As a result, the Federal Highway Trust Fund depends on transfers of general revenue in order to remain solvent.<sup>23</sup>

Missouri is a net beneficiary of the trust fund; the state receives \$1.21 in federal money for every \$1 contributed by fuel taxes in Missouri.<sup>24</sup> Missouri's state fuel tax has remained stagnant since 1996 at 17 cents per gallon. As Missouri's voting public and its legislature have both been opposed to raising fuel taxes, the purchasing power of Missouri's primary source of revenue for roads has steadily dwindled. Occasional injections of federal money, such as money received as part of the American Recovery and Reinvestment Act (also known as President Obama's stimulus package), have boosted MoDOT's revenue. While federal money has come to Missouri in large amounts in the past, the infusions have been sporadic and certainly are not guaranteed to arrive in the future, so

federal cash should not be considered a reliable funding source.

While the fuel tax receives the most attention among in-state sources of revenue, it is one of three user fees that help fund MoDOT's construction and maintenance of roads and bridges. These in-state sources of revenue—the fuel tax, vehicle and driver's licensing fees, and motor vehicle sales taxes—are shown in Figure 2.

Fuel tax revenue has risen only slightly since 2003, as any increase in mileage driven has been nearly offset by greater fuel efficiency. Also, considering the reduced demand for gasoline during the coronavirus pandemic, fuel tax revenue will likely decline in the near term. Regardless of the condition of the economy, however, the interstates will need to be rebuilt from the ground up as they are near the end of their intended lifespans, as noted earlier. Revenue from vehicle licensing fees has also increased slightly over the past decade and a half, likely due to more drivers. The only user fee that has substantially increased in terms of revenue generated is the motor vehicle sales tax. Because sales tax revenue depends on the price of the vehicle sold, the vehicle sales tax essentially rises with inflation, providing a revenue source that grows along with the economy.

In contrast to the revenue generated by user fees, federal contributions and general bond revenue are more volatile and are responsible for most of the annual variation in MoDOT's road and bridge budget.

In order to issue bonds, MoDOT must receive authorization, either from the state legislature or a constitutional amendment, and it must also set a designated repayment schedule, making bond issuing infrequent. For instance, the bond proceeds that ended in 2010 were backed in part by motor vehicle sales taxes. As a result, although vehicle sales tax revenue continued to increase each year, the additional revenue was directed toward bond repayment rather than funding road repair or

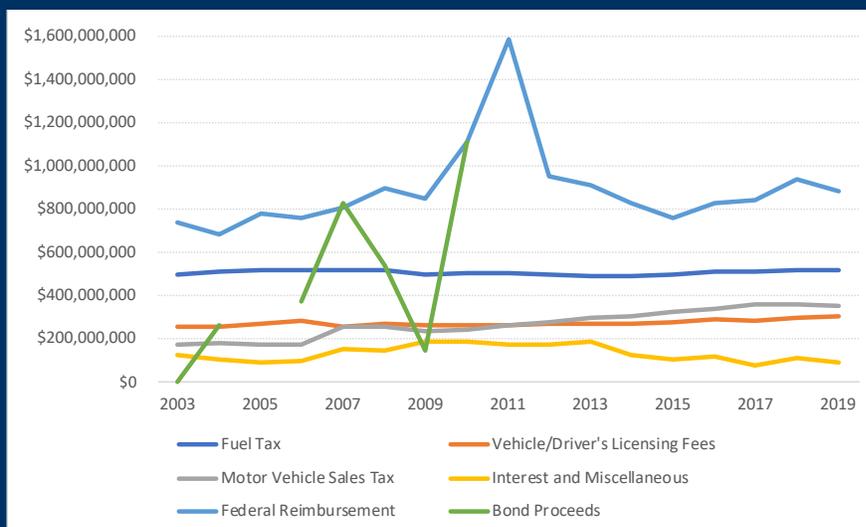
maintenance.<sup>25</sup>

Perhaps the two biggest areas of concern for MoDOT's funding health are its reliance on the Federal Highway Trust Fund for over 40 percent of its revenue and the diminishing efficiency of fuel taxes. As stated earlier, the Federal Highway Trust Fund has relied on infusions of general revenue in order to stay solvent, and Missouri is at the mercy of federal policymakers who could decide to reduce appropriations to the fund in favor of other priorities. As for fuel tax revenues, both vehicle fuel economies and total vehicle miles traveled in Missouri are projected to increase.<sup>26</sup> Vehicle miles traveled in Missouri increased by 12 percent between 2008 and 2018 while MoDOT fuel tax revenue decreased by 0.5 percent.<sup>27</sup> Despite the decline in fuel tax revenue, in 2018 Missouri voters rejected a measure to increase the fuel tax.<sup>28</sup>

To address the mismatch between the state's transportation infrastructure needs and its revenue, several options are available, including bonds, using funds from general revenue, and user fees. Raising money through bonds is not a way to generate new revenue as much as a way to borrow it on behalf of future taxpayers, as future tax revenue would have to be used in order to pay off any bonds issued. Using general revenue to fund transportation infrastructure might be politically feasible, but it would violate the user-pays principle. Paying for roads and bridges with taxes on unrelated activities shields drivers from the true cost of driving, leading to even more inefficient use of transportation infrastructure, which in turn results in higher direct costs (maintenance) and indirect costs (wasted fuel, wasted time, air pollution, and congestion).<sup>29</sup> Currently this is not a large problem in Missouri, as MoDOT received only \$11 million from the state's general revenue fund in 2018. This money was not restricted to a certain modal use and had little impact

## Figure 2: MoDOT Revenue Breakdown, 2003–2019

Most of MoDOT's revenue streams are either erratic or do not grow with inflation.



Source: MoDOT Financial Snapshot, 2007, p.5; 2011, p.5; 2015, p.5; 2019, p.4.

on MoDOT's road and bridge restricted budget of \$2.2 billion.<sup>30</sup>

Alternatively, user fees could be increased. While paying more for transportation may be unpleasant, it brings the costs of using roads and bridges in line with reality. Increased use of user fees, particularly direct user fees, would be a fair and stable way to meet Missouri's transportation needs.<sup>31</sup> It should be noted, though, that the revenue and budget numbers presented here are MoDOT's own. MoDOT has not undergone an external audit to cross-examine its reporting.

### USER FEES AS A FUNDING MECHANISM

User fees are charges levied on drivers based on their use of roads and other infrastructure. User fees come in several forms. Some user fees are direct, like mileage-based user fees. Mileage-based user fees are charges drivers pay for road usage by the mile (rather than by the gallon of fuel). Drivers can pay electronically through an account with a third party that provides a transponder or mileage recording device, or they can pay based on monthly or

yearly odometer readings. Details of mileage-based user fee programs are discussed at the end of the paper.<sup>32</sup> Tolling is another form of direct user fee, as it is essentially a mileage-based user fee for a specific route. Other user fees, like vehicle sales taxes and gasoline taxes, are indirect, in that they are connected to a purchase that facilitates driving rather than the driving itself.

Funding transportation infrastructure through user fees has been a subject of much academic and political debate.<sup>33</sup> The factor most closely related to road maintenance costs is not how many gallons of gasoline are used or even how many miles are driven, but rather how much damage is done to the roads. Heavier vehicles inflict more damage, and a direct user fee can be adjusted based on the weight of the vehicle. Direct user fees also tie revenue directly to how much of the road each driver uses. Vehicle fuel economy has improved, and fuel tax revenues have failed to keep pace with the increased costs of road maintenance. A new funding method that generates revenue based on the increased travel rather than the decreasing amounts of fuel needed would enhance revenue stability.<sup>34</sup>

Perhaps the biggest obstacle to the implementation of user fees is institutional inertia. Fuel taxes and motor vehicle sales taxes are already in place, and all that is needed to raise them is to pass a bill or obtain voter approval. Direct user fees would require some up-front investment before they could be put in place. Infrastructure would need to be built, and workers would need to be hired to administer the fees. Whatever the long-run advantages, there would certainly be short-term implementation challenges. There are also legal and constitutional matters to consider, which will be addressed later.

Critics have also challenged direct user fees on fairness grounds. One concern is that either tolling or mileage-based user fees would place an unfair burden on rural drivers.<sup>35</sup> Rural drivers usually cover longer distances on routine trips, and Missouri's geography makes the tolling of major highways a concern for those who depend on them for routine long-distance trips. However, rural drivers are also more likely to own older and less fuel-efficient vehicles,<sup>36</sup> so fuel taxes affect them disproportionately as well. Several studies of a mileage-based user fee pilot program in Oregon found that paying

a flat rate fee of \$0.012 per mile—as opposed to a gas tax—resulted in greater savings for rural households than urban households.<sup>37</sup> Studies of proposed changes from fuel taxes to mileage-based user fees at the national level have consistently projected that these fees would cost rural drivers less than fuel taxes do.<sup>38</sup>

Another concern is that switching to direct user fees would disproportionately harm low-income individuals. However, we must bear in mind that the current fuel tax system is already regressive, exerting a larger financial toll as a percentage of income on lower-income individuals and households than on those with higher incomes.<sup>39</sup> So the question is whether a direct user-fee system would be more or less regressive than the current fuel tax regime. Research is divided on this question. Studies range from finding that direct user fees are slightly more regressive,<sup>40</sup> to no change in regressivity,<sup>41</sup> to direct user fees being a slightly less regressive system.<sup>42</sup> Part of the variation in findings is due to the fact that demand for gasoline is more price-sensitive among low-income households than for middle- or upper-income households.<sup>43</sup> A consumer who changes her behavior (i.e., drives less) in response to an increase in the cost of driving is certainly affected by that increase even if she doesn't end up paying the new, higher cost. Another factor to consider is that some benefits of tolling—namely reduced traffic congestion, improved air quality, and reduced public transit times<sup>44</sup>—also accrue to low-income individuals living in urban areas, as such individuals are more likely to take public transit and be affected by air pollution.<sup>45</sup> Such complicating factors show that the effects of user fees or other forms of revenue generation will have indirect effects that can be difficult to quantify.

Certain types of user fees, namely electronic tolling, have raised privacy concerns. Protecting driver privacy is an important part of public acceptance of electronic tolling programs, and some have questioned whether systems that use transponders adequately protect driver privacy.<sup>46</sup> States that have enacted electronic tolling and mileage-based user fees have taken steps to protect driver privacy. These include stripping transponder data of personal information before it is reported to tolling authorities and using third parties to collect mileage information. This topic will be discussed in more detail later.

While mileage-based user fees are the most widely discussed direct user fee in the literature, tolling has existed for longer and is more familiar to the public. Further, if mileage-based user fees are a method of tolling a state's entire road network, then tolling a specific route can be considered a small-scale version of a mileage-based user fee.

## TOLLING IN MISSOURI

The questions of which direct user fee to use and how to implement it are important. Of the two under consideration (mileage-based user fees and tolling), tolling is more established. Other states have experimented with mileage-based user fees, but only on a small scale. Therefore, despite their promise, mileage-based user fees might be regarded with skepticism by many if they were proposed as a significant new revenue source. Despite recent evidence of tolling's unpopularity with the public, it still might be easier to shift public opinion on tolling than to build support for a completely new user-fee model. Accordingly, this report examines tolling as a possibility for Missouri.

### Not Your Grandfather's Turnpike

The traditional image of a highway tolling facility, with booths where cars must stop and drivers either hand money to an attendant or toss it into a chute, is no longer accurate. With electronic tolling, there is essentially an open road at the point of toll collection. A structure is built over the road and outfitted with sensors and cameras. Rather than stopping, drivers continue driving as usual, their cars outfitted with transponders that are detected by the sensors overhead. The toll is then automatically deducted from an account the driver opened and funded when purchasing the transponder from the department of motor vehicles, with no stopping required. If there is no transponder in the vehicle, the cameras photograph the license plate and a bill is sent to the address at which the plates are registered. In cases where the driver simply forgot his transponder, the license plate can be matched with his account and the toll can be automatically deducted from the account.

Two types of electronic tolling exist. All-electronic tolling lacks many of the defining characteristics of traditional tolling plazas. There are no booths, no concrete barriers

separating lanes, and no need to change lanes and speeds to get into the correct booth. There are open roads with tolling sensors and cameras. Relatedly, there is no need to build the attendant facilities necessary for having, say, ten toll collectors on site. Parking lots, break rooms, restrooms, and other amenities are not necessary for all-electronic tolling, reducing maintenance costs.

Open-road tolling is a hybrid of traditional mainline plaza tolling and all-electronic tolling, consisting of some open-road lanes that employ only electric tolling methods and some traditional toll plaza lanes. Accordingly, some physical facilities characteristic of traditional tolling plazas (such as parking lots, break rooms, and restrooms) may still be needed, albeit likely on a smaller scale.

### Revenue-generating Potential of Tolling

How much money could be raised from electronic tolling? Let's consider I-70, the most frequently discussed candidate for tolling in Missouri, as an example. As indicated previously, I-70 will soon need to be rebuilt from the ground up. When this happens, MoDOT hopes to expand I-70 with at least one additional lane in each direction from Wentzville to Independence. According to MoDOT's 2014 I-70 tolling white paper, projected costs for this project range from \$2 billion (a simple rebuild with one new lane in each direction) to \$3 billion (a simple rebuild that adds one lane in each direction and right-of-way acquisitions for a wide median to be reserved for future transportation options) to \$4 billion (two new lanes on each side with dedicated truck and general-purpose lanes also requiring new right of way acquisitions).<sup>47</sup>

If I-70 were rebuilt as an electronically tolled highway, toll revenue could cover the costs over a period of 30 years. MoDOT reports that I-70 carried roughly 5 billion vehicle miles in 2019. Roughly 12 percent of this traffic was from commercial vehicles. I-70 from Wentzville to Independence carried roughly 2.8 billion vehicle miles, about 16 percent of which came from commercial vehicles. Excluding Columbia, the only major urban section on I-70 along that route, I-70 carried 2.6 billion vehicle miles with 16 percent from commercial vehicles.<sup>48</sup>

Based on 2019 traffic numbers, assuming both passenger and commercial vehicle traffic grow by 1 percent each year,

and assuming a 2 percent discount rate—reflecting the current 30-year Treasury yield—to account for inflation and the present value of future money, there are several toll options for an I-70 rebuild that do not exceed 4 cents per mile for passenger vehicles and 17.5 cents per mile for commercial vehicles. (These toll road traffic growth assumptions are reasonable, as ridership on both the Kansas Turnpike and Oklahoma Turnpike has grown at well over 1 percent per year over the past 30 years.)

These estimates that follow were calculated to generate \$2 to \$4 billion over 30 years, and they assume a 10-percent passenger vehicle traffic diversion and a 20-percent commercial vehicle traffic diversion.<sup>49</sup> Such diversion could come from drivers adjusting their routes to avoid tolled roads; however, the estimates also account for the possibility that toll checkpoints could be intentionally installed in locations that allowed residents of some communities to use the route in question for daily travel without crossing through checkpoints. Such cases would reduce the amount of revenue generated, but they would also avoid a situation in which commuters in towns located near a checkpoint paid daily tolls that were out of proportion to the relatively small distances they traveled on the tolled roads. Diversion was calculated by using I-70 traffic data from MoDOT. The costs of tolling infrastructure (in addition to the costs of building and maintaining the roads) are also accounted for, using 2019 maintenance costs from the Kansas Turnpike, which happen to be the highest in recent years.<sup>50</sup> Toll estimates reflect the nationwide average of passenger vehicle tolls being around 30 percent of a truck toll per mile and are within range for the average costs per mile.<sup>51</sup> Trucks would be charged more per mile based on axles, given that they do a disproportionate amount of damage to highways (see Table 2). The estimates are applied to three tolling scenarios described in the MoDOT white paper:

- *Scenario 1:* Tolling 250 miles statewide from Saint Louis to Kansas City at 3 cents per mile for passenger vehicles and 13 cents per mile for trucks could pay for the \$4 billion project over 30 years. Passenger-vehicle drivers would pay \$7.50 to travel the length of the toll road, and trucks would pay \$32.50.
- *Scenario 2:* Tolling 174 miles from Wentzville to Independence at 4 cents per mile for passenger vehicles and 17.5 cents per mile for trucks could pay for the \$3

billion project over 30 years. Passenger-vehicle drivers would pay \$6.96 to travel the length of the toll road and trucks would pay \$30.45.

- *Scenario 3:* Tolling 163 miles on only the rural parts of I-70, from Wentzville to Independence excluding Columbia, at 3.25 cents per mile for passenger vehicles and 13.5 cents per mile for trucks could pay for the \$2 billion project over 30 years. Passenger-vehicle drivers would pay \$5.29 to travel the length of the turnpike and trucks would pay \$22. According to MoDOT’s white paper on tolling I-70, this route design would be the most likely option.<sup>52</sup>

It is important to note that it is unknown how quickly future travel on I-70 will rebound in the aftermath of COVID-19. However, given the length of time required for permitting, legal deliberations, and other pre-construction matters, it appears reasonable to assume traffic patterns will resume pre-COVID levels in the meantime.

Another route that could be tolled in Missouri is I-44. The need to rebuild I-44, while growing with time, is not as urgent as it is for I-70. MoDOT also has not proposed a toll-and-rebuild plan for I-44 as it has for I-70, although this is likely due to prior federal approval to toll I-70 but not I-44 (see “Future Obstacles and Opportunities” below). If Missouri receives federal authority to toll its interstates, I-44 and I-70 would be likely candidates. Indeed, I-44 and I-70 are already tolled in Oklahoma and Kansas, respectively.

### **Example: Missouri’s Only Toll Facility**

An example of the process of raising money and repaying loans can be seen in Missouri’s only existing toll facility. The Lake of the Ozarks Community Bridge opened in 1998 and connects the east and west sides of the Lake of the Ozarks. In 1990, the Missouri Transportation Corporation Act became law, allowing transportation corporations to be created by private parties in cooperation with the Missouri Highways and Transportation Committee. The Lake of the Ozarks Community Bridge Corporation was formed in 1992 and was able to raise \$43 million in bonds to build the bridge with the expectation that the bonds would be repaid by 2026.<sup>53</sup> Revenue for bridge operation and loan repayment is collected through

toll rates that vary for in-season and out-of-season travel, as well as by the number of axles on a vehicle, which is a proxy for vehicle weight.

The toll bridge has been successful. Connecting both sides of the Lake of the Ozarks increased economic development on both sides, bringing new businesses and raising property values. Despite inevitable financial and traffic throughput hurdles during recessions, the bridge is on track to be paid off in 2026, after which it will be a toll-free bridge and turned over to the state.<sup>54</sup> The Lake of the Ozarks Community Bridge is an example of how tolling can generate targeted funding for needed projects that otherwise may not be built.

## External Effects

Some states have converted their non-tolled roads or traditional tolling plazas into open-road tolling and all-electronic tolling plazas. What have their results been? Categories to compare include safety, traffic flow, pollution, and cost of collection.

### *Safety*

Traditional tolling can be disruptive and potentially dangerous, but the rise of electronic tolling mitigates these problems. With electronic tolling, drivers don't need to merge into a specific proper payment lane at a toll plaza while other drivers also attempt to do so at varying speeds. Because the technology used for electronic tolling is fairly recent, few studies have been completed to assess the safety benefits of open-road tolling and all-electronic tolling on specific routes. However, the few studies we have point in the same direction. It should not come as a surprise that highways that transition from traditional tolling to nontraditional tolling experience significantly fewer non-fatal and fatal vehicle crashes, as well as a reduction in property damage.<sup>55</sup>

Further, some research suggests that electronically tolled roads are safer than comparable non-tolled roads, although a direct relationship is hard to establish. Revenues from Toronto's highway 407 Express Toll Route (ETR) have been reinvested in maintenance and expansion; research suggests that as a result, the 407 ETR is safer than the rest of greater Toronto's major roads due to more consistent speeds and better road quality.<sup>56</sup> Similar reinvestment

of toll revenue has occurred on the Ohio Turnpike, resulting in its pavement quality being rated significantly higher than the national average according to a standard pavement condition rating. National highway system conditions are split 51 to 48 percent between good and fair, respectively; the Ohio Turnpike reports 70 good and 30 percent fair.<sup>57</sup>

Research from as far back as 2005 has considered numerous aspects of how toll roads compare to non-tolled roads and has shown that tolled interstate highways have lower fatality rates than non-tolled interstate highways. Further, hybrid toll plazas with electronic toll collection lanes had fatality rates at the collection plaza that were one-quarter of those at traditional toll plazas, suggesting that electronic tolling could provide greater safety benefits relative to non-tolled roads. This benefit may result from more consistent traveler speed, appropriate barriers at interchanges, and budget space for capital improvement, all of which are more common on tolled highways.<sup>58</sup>

### *Traffic flow*

There is evidence that electronically tolled roads have less traffic congestion and shorter travel times compared to non-tolled roads, although like the findings regarding safety improvements, this could be due to wise management of the money tolling generates. Drivers on Toronto's 407 ETR experience shorter and more reliable travel times relative to comparable non-tolled routes even though traffic on the 407 ETR has consistently increased for both business and personal trips.<sup>59</sup> Similarly, the Ohio Turnpike has consistently seen reduced travel times despite traffic growth.<sup>60</sup>

Tolling also offers the option of congestion pricing, which some cities have used to reduce traffic congestion. Road space is limited, and rush hour drivers crowd it to a standstill. Demand is outstripping supply, meaning the value of space on the road increases during peak driving times. Tolling the most heavily used parts of highways reduces congestion because some drivers will avoid taking that route to avoid paying the toll or alter when they travel.

London, Stockholm, and Singapore have all implemented congestion pricing to successfully smooth traffic flows.<sup>61</sup> Stockholm and Singapore vary their toll rates based on

the time of day to achieve a consistent flow of traffic throughout the day, with Singapore also varying the fee based on vehicle size. By better understanding the cost of using the roadway system—the costs imposed on other drivers and the damage done to roads—drivers can make more informed decisions about when and where to drive.

More common in the United States are high-occupancy toll (HOT) lanes. HOT lanes are highway lanes designated for vehicles carrying a certain number of people, usually around high-traffic cities. For a fee, vehicles carrying passengers below the HOT lane limit can also use the lane. Essentially, HOT lanes are one-lane congestion pricing. Cities with HOT lanes have increased traffic flow. In Minneapolis, I-394 has experienced a 48 percent increase in vehicle throughput, and Denver's I-70 HOT lanes have reduced travel times between 26 to 52 percent. Denver's I-25 makes extensive use of electronic tolling via HOT lanes, with traffic on tolled lanes traveling 11 mph faster than on general-purpose lanes.<sup>62</sup>

Missouri drivers could benefit from congestion pricing. Total traffic congestion costs add up to nearly \$200 per month for Missouri's drivers; cumulatively Missourians suffer \$575 million in wasted fuel, vehicle damage, and lost time per year.<sup>63</sup> In St. Louis and Kansas City, the average driver spends roughly 40 hours per year sitting in traffic.<sup>64</sup>

### *Pollution*

Electronic tolling can also bring air quality benefits, either through congestion pricing or by setting tolls such that drivers reduce their travel. When traffic congestion is reduced, engine idling and associated air pollution decrease. Congestion pricing in Stockholm, London, and several cities in China has reduced air pollution by up to 20 percent, improving health outcomes for local residents. Moreover, these health benefits can be quite stark. For instance, the introduction of E-ZPass in the United States lowered vehicle emissions by reducing traffic congestion and idling near previously congested toll-collection plazas, which contributed to an 11 percent drop in premature births near those prior collection points.<sup>65</sup> If all-electronic tolling is used, it can bring these benefits without the drawbacks of traditional tolling.

### *Cost of collection*

Collection costs, such as customer support, back-office processing, and enforcement costs, are among the most common concerns about electronic tolling. The high end of electronic tolling collection cost estimates are 10 percent, whereas several studies have yielded estimates of between 5 and 8 percent.<sup>66</sup> If these lower electronic toll collection cost estimates are accurate, then raising transportation money through electronic tolling is already about as economical as doing so through fuel taxes. Even if the higher electronic toll collection cost estimates are correct, collection cost disparities are likely to diminish over time, as technology improvements can be expected to improve collection efficiency.

Several cities have implemented small-scale electronic tolling programs. A 2012 study by the Reason Foundation examined several cities with such programs in order to determine the cost of collection. The Colorado I-25 Managed Lanes near Denver, the Fort Bend County Toll Road Authority near Houston, and the Tampa-Hillsborough Expressway Authority in Florida have all used electronic toll collection. Reducing violation rates and increasing the use of transponders as the payment method are keys to cutting collection costs. All three programs studied had at least 80 percent of trips via transponders, and the two with active enforcement programs had effective collection rates of 98 percent. Given the small-scale nature of these projects, the study normalized the toll to \$5 to reflect a more standard-sized operation. Under this normalized rate, Fort Bend and Tampa-Hillsborough had costs as a percentage of revenue between 4 to 5 percent. Colorado I-25's collection costs were higher, at least in part because the project was on such a small scale that it was overwhelmed by administrative costs.<sup>67</sup> As this was essentially a micro-toll operation, its fixed costs were higher in proportion to overall revenue than the toll operations in Fort Bend and Tampa-Hillsborough.

### **Legal Aspects**

#### *History of Tolling Attempts in Missouri*

Various toll road proposals have been considered in Missouri going back over 50 years, but for various reasons all have failed. In 1968, the Missouri State Highway

Commission, through the recently passed Toll Road Authority Act, attempted to incorporate turnpikes into the state highway system. The new Missouri Turnpike Authority would have issued bonds to provide the initial funding to construct toll roads. The bonds would have been backed by state road fund revenue. Before any toll roads and plazas could be built, however, the Missouri Supreme Court found this potential diversion of money unconstitutional, and the project was scrapped. At issue was the promissory use of the state road fund. The toll road would have remained under the jurisdiction of the Missouri Turnpike Authority until the bonds were paid off, after which the toll road would have been incorporated as part of the state highway system. If toll revenues were insufficient to pay off the bonds, the State Highway Commission would have paid the remaining balance from the state road fund. Use of state road fund revenue is limited by the constitution to construction and maintenance activities on free roads, and toll roads are not free roads. Accordingly, using state road fund revenues for toll roads is unconstitutional. The court found that such a promissory pledge of the state road fund was integral to the legislation and struck the entire act down.<sup>68</sup>

In addition to judicial roadblocks, toll roads in Missouri have faced hostility from voters. In 1970, an initiative to allow toll roads was opposed by 70 percent of voters. An initiative to allow toll roads was put to voters again in 1992, with 58 percent opposing it.<sup>69</sup> Statewide voting measures to ban toll roads have also come up short. In 2014, a ten-year ban on toll roads was proposed along with a 0.75 percent sales tax increase to boost transportation funding, but the initiative was defeated by 58 percent of voters.<sup>70</sup> Several ballot initiatives were filed in 2018 that would have banned toll roads in Missouri, but none received the required number of signatures.<sup>71</sup>

### *Future Obstacles and Opportunities*

The funding for a Missouri toll road authority must satisfy the Missouri Constitution and statutory requirements. The establishment of either a toll road authority or tolling infrastructure cannot rely on funding sources dedicated to other purposes, as this is what triggered the 1968 court decision. Bonds could be issued, but only if they are backed by funding sources that are available to be used on tolling infrastructure.

Any attempt to establish toll roads in Missouri would have to clear federal hurdles as well. Tolling a federal highway requires federal approval in the form of legislation, as it is currently prohibited by the U.S. Code. Missouri was given conditional approval in 1998 to toll I-70 to finance its reconstruction, but this approval expired in 2017 due to inactivity.<sup>72</sup> As Missouri had federal approval for twenty years and did not act, it may be difficult to obtain such an allowance again. However, a unified approach from Missouri's federal delegation may be able to achieve this allowance. Considering that Missouri's interstates will need to be rebuilt soon, approval for this option is needed sooner rather than later to avoid any unnecessary delays.

The challenges policymakers would face at the state level in enacting tolling or other use fee legislation would depend on the project being proposed. Legislators must keep in mind constitutional limits. These include the funding problems that derailed Missouri's previous attempt at tolling and also the Hancock Amendment's requirement that a tax increase of over roughly \$100 million annually would require a statewide vote. Legislators must also remember statutory limits that would vary based on the method of tolling chosen. How each of these apply depend on the approach taken, as follows.\*

One method would be to toll roads through public-private partnerships. Through a public-private partnership, a private company leases the road from the state, and the company then makes back the cost of the lease and road maintenance by tolling drivers. Since funding comes from a private company, it would not violate the constitutional funding provision that nullified Missouri's previous tolling attempt. In addition, it would not trigger the Hancock Amendment and thus would not require voter approval. However, current public-private partnership law forbids their use for toll roads, so new legislation would be required in order to implement tolling in this manner.<sup>73</sup> Several prior legislative measures within the past decade have proposed tolling through public-private partnerships.<sup>74</sup> Numerous other states have used

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\* One possibility that is not covered in detail here is the use of HOT lanes to toll short sections of interstates. In theory, this could be the cheapest and most limited way to enact direct user fees; however, traffic studies would need to be done to evaluate whether there is enough traffic volume and congestion to make HOT lanes a practical way to raise money. There are also sufficient legal questions that any action taken toward building HOT lanes would likely be litigated.

Table 2:  
**Percentage of Traffic and Wear (“Loading”) on Interstates by Vehicle Type**

Large trucks cause over 90 percent of the damage nationwide to rural and urban interstates, despite making up roughly one-fifth of the traffic on rural interstates and one-tenth of the traffic on urban interstates.

National	Rural Interstates		Urban Interstates	
	Traffic %	Loading %	Traffic %	Loading %
Passenger vehicles	79%	2%	91%	6%
Large trucks	21%	98%	9%	94%

*Source: Federal Highway Administration, 2014 data.*<sup>72</sup>

this method to implement toll roads, and their experiences could inform policymakers here. Privately operated toll roads are discussed further below.

A more ambitious tolling method would be to have state owned and operated toll roads. In this scenario the state would handle the entire process of building tolling infrastructure, collecting tolls, and maintaining the tolled highway. However, such an effort must avoid the conflict with the Missouri Constitution that nullified Missouri’s previous attempt at tolling (when the bonds that the state issued to establish a turnpike authority were backed—unconstitutionally—with revenue from the state road fund). To avoid a repeat of this error, the state could issue bonds (to be repaid with toll revenue) backed by a funding source that does not have the expenditure restrictions that the state road fund does. However, this runs the risk that taxpayers would be on the hook for repayment if toll revenues were insufficient to pay off the bonds. Alternatively, the state constitution could be amended to allow the state road fund to back bonds to establish a turnpike authority. This action would require voter approval.<sup>75</sup> Even if these steps were taken, a state-operated toll road could generate revenue sufficient to trigger Hancock Amendment provisions, which would also place the question of establishing that toll road before Missouri voters. New legislation would also be needed to create a turnpike authority and govern all aspects of the implementation of a tolling system, such as its creation and funding, jurisdiction, and requirements regarding how

revenue be spent.<sup>76</sup>

## Objections

*“I already pay for the roads; tolling is double taxation.”*

Missourians have not fully paid for the construction and maintenance of the state’s roads. What is paid through the gas tax and other fees covers only a portion of the costs of road maintenance. According to MoDOT’s 2019 funding report, MoDOT faces \$745 million in annual unfunded road and bridge maintenance costs. Considering that MoDOT spends \$1.506 billion on road and bridge maintenance costs, this means current funding is only two thirds of MoDOT’s estimate of necessary spending.<sup>77</sup>

As noted in the section above on MoDOT’s budget, revenues from federal and state fuel taxes have been declining in value for decades, leading to MoDOT’s current budget crunch. User fees would help close the funding gap.

*“Tolling would be unfair to the freight industry and to communities near the toll road.”*

Tolling would not be unfair to the trucking industry, and the impact on highway travel-dependent communities can be mitigated through carefully designed toll rates. Under a fuel-tax-only regime, trucking companies are being subsidized while they inflict heavy damage on roads. Nationwide, heavy trucks inflict over 90 percent of road damage, known as “loading” (Table 2). The Federal Highway Administration does not publish these data at the state level. However, large trucks make up a higher percentage of traffic in Missouri than they do nationwide on all types of roads (Table 3). Thus, it is reasonable to assume similar if not higher damage numbers for Missouri’s roads.

Further, over 60 percent of the freight (as estimated by value) carried by large trucks on Missouri roads simply passes through Missouri.<sup>81</sup> When trucks pay an artificially low price to transport their goods through the state, those goods are effectively subsidized by Missouri taxpayers. It should also be noted that freight trucks traveling west

through Missouri on I-70 and I-44 pay tolls as soon as they cross into Kansas and Oklahoma, respectively.

Businesses near interstates could be hurt if tolling reduced traffic on nearby interstates. To some extent this would simply be the end of a subsidy that currently benefits these businesses. Not paying the true cost of driving means that some businesses benefit from more drivers due to an artificially low cost of driving in the form of more customers and higher property values. Still, business owners who made decisions about the nature and location of their establishments based on interstate highway traffic deserve consideration if tolling is implemented. The negative impact on these businesses can be reduced by a tolling schedule that charges less to passenger cars than to large trucks. Such a schedule would be fair, in that large trucks are doing most of the damage to the highway, and it would do less to dissuade passenger vehicle drivers to avoid the tolled highway.

***“What happens to people in smaller communities who have jobs in other towns, forcing them to drive on tolled interstates or highways to get to work?”***

Toll collection points can be spaced to mitigate the impact on local drivers. Some drivers, particularly in rural areas, have little or no choice but to drive on an interstate or highway in order to get to work or do their shopping. Charging these drivers more to drive on necessary roads could harm rural communities. To address such concerns, tolling checkpoints can be spaced in such a way as to enable some trips to be taken without driving through a checkpoint. The effect of such placement of tolling checkpoints on revenue generation is accounted for in the projections discussed above.

***“Don’t toll roads end up being privatized? And isn’t that too risky if the company goes bankrupt?”***

It is neither inevitable that toll road operations become

**Table 3:  
Traffic on Highways by Vehicle Type: Missouri and United States**

There are more large trucks on the roads in Missouri than the nationwide average, meaning it is likely that a higher percentage of road damage in Missouri is attributable to large trucks (as compared to passenger vehicles) than the nationwide average.

Vehicle Type	Rural Interstates	Urban Interstates	Rural Arterial Roads	Urban Arterial Roads
<b>Missouri</b>				
Passenger vehicles	66.24%	81.80%	83.01%	91.11%
Large trucks	31.56%	16.32%	15.21%	7.70%
Other	2.20%	1.88%	1.78%	1.19%
<b>United States</b>				
Passenger vehicles	77.00%	86.63%	86.5%	92.82%
Large trucks	21.70%	12.34%	12.10%	5.98%
Other	1.30%	1.03%	1.40%	1.20%

*Source: Federal Highway Administration, 2018 data.<sup>79, 80</sup>*

privatized nor disastrous for drivers if they do. While circumstances vary, private toll roads have remained operational even when the companies that own them go bankrupt, as the debt is either refinanced or ownership of the lease changes.<sup>82</sup> There are two ways debt refinancing is done: entirely with private money, or through the Transportation Infrastructure Finance and Innovation Acts loan program, where the federal government offers either a line of credit up to 33 percent of the project budget or a one-time loan of 50 percent. While the federal government may still be risking money through these loans, financing up to 50 percent with a mechanism for repayment is better than the current formula of funding 80 percent to 90 percent of interstate highway projects with no prospect of getting a return.<sup>83</sup>

For instance, the controversial Indiana Toll Road Concession Company (ITRCC) bankruptcy resulted in another company buying the toll road lease from the

ITRCC for \$5.7 billion and agreeing to invest over \$260 million of private money into maintenance. The highway did not shut down; the ownership of the lease simply changed hands. In this instance, the new lessee—Private Funds Management—purchased the lease but did not refinance it. Indiana and its residents actually benefitted from this arrangement, as ITRCC originally paid the state \$3.8 billion for the lease, which the state reinvested in highway maintenance over ten years. ITRCC also agreed to invest \$458 million in highway improvements. The risks involved were shouldered by private industry, and the state of Indiana and its taxpayers were not on the hook for the costs.<sup>84</sup>

However, it is far from a foregone conclusion that a private company leasing toll roads will go bankrupt. Toronto's 407 ETR provides beneficial results while being managed by a private company, and the Chicago Skyway has been privately operated for 15 years to date. When governments lease toll road operations to private companies, those companies shoulder the financial risks associated with toll roads, with the lease payment to the government coming either in the form of an up-front lump sum payment or annual payments. This payment can be used as the government chooses, but many choose to reinvest it in transportation-related projects. Concerns that private companies will unfairly raise tolls can be addressed during contract negotiations between the government and the company before a lease is granted.<sup>85</sup>

***“If excess toll revenue from one route is spent on maintenance of another route, doesn't this violate the user-pays principle?”***

In order to stay as close to the user-pays principle as possible, toll road funding should be spent on the road that generated it, leaving other funding sources to pay for maintenance on other roads. Adhering to the user-pays principle is a challenging aspect of increasing MoDOT's funding through tolling. As noted, Missouri's major roads are in much better condition than its secondary roads. However, diverting funds raised from tolling to address poor-quality secondary roads would be distortionary in the same way that using general revenue to fund transportation would be, shielding drivers from the actual cost of using the roads.<sup>86</sup> Rather, the increased revenue should be spent on the route from which it was generated,

freeing up other fuel tax revenue to be used for road maintenance throughout the state. While this falls short of adhering to a strict user-pays principle, it allows fuel tax revenue to continue to be distributed at MoDOT's discretion, as is currently the case. Depending on factors like traffic and maintenance costs, toll roads can generate revenue beyond what is needed for operations. It should be acknowledged that in the event of a private company operating the toll road and collecting tolls, that company would keep some of the excess revenues, as negotiated in its contract.

***“Electronic tolling is an invasion of privacy.”***

With proper safeguards, driver privacy can be protected under electronic tolling regimes. According to the Federal Highway Administration, the data collected during electronic tolling are stripped of personal information before being reported to the relevant tolling agency.<sup>87</sup> However, information can be collected at locations other than toll plazas. In cases where this happens, the state department of transportation is usually using the data for traffic flow information. This was the case in New York City, which enacted a program to monitor traffic flow.<sup>88</sup> If states or cities want more stringent privacy protections, these can be codified in state law—though it should be borne in mind that collection of anonymous transponder data does appear to provide valuable information to transportation agencies.<sup>89</sup>

Still a more concrete example can be provided. Several states have experimented with mileage-based user fees (or road usage charges) where drivers pay for road usage per mile driven instead of paying fuel taxes. While this is not the same as electronic tolling, the principle is the same and its implementation is similar. States experimenting with mileage-based user fees have several options for how drivers can report their mileage. One option is a transponder that can be placed in the car that measures mileage and reports it, typically to a third-party system. Driver privacy concerns are present with these programs, but states have taken measures to implement protections.

The state with the most developed road usage charge program is Oregon, which created a voluntary program where drivers could pay a per-mile charge rather than the state fuel tax. Participants had several options for tracking

their miles, but the program works most effectively when drivers install an on-board transponder inside their vehicles to measure miles traveled and track where they drive. Concerns of compromised driver privacy are mitigated by using a third-party system that sends a one-way GPS signal to monitor in-state road usage only within a certain transportation zone. Data are stripped of personal information in accordance with state law, and only cumulative miles traveled are reported to the state department of transportation for billing. Personal data are confidential and available only to the driver.<sup>90</sup>

It should also be noted what GPS technology does and does not do. GPS satellites do not necessarily track drivers who have receivers or phones. Rather, it is the GPS unit itself, whether in a transponder or a cell phone, that tracks its own location in relation to a satellite. Unless that receiver is equipped with reporting capability, the device's location is not shared with the satellite.<sup>91</sup>

## CONCLUSION

The challenge of providing adequate funding to maintain Missouri's roads and bridges has many potential solutions. The fairest and most stable, however, is tolling. The advent of electronic tolling has opened new possibilities for raising money and improving road quality and safety. If Missouri is serious about raising the needed money to improve its road and bridge quality, it's time to take a serious look at tolling.

## NOTES

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