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Tolls and Toll-by-Plate in Vermont

This report presents tolling practices across the United States, focusing on the costs and privacy issues associated with toll-by-plate, a type of electronic tolling, in addition to the feasibility of its implementation in Vermont. With more fuel-efficient and electric cars on the road, states are looking for alternative ways to replace lost gas tax revenues, such as tolling.

A Comprehensive Look at Tolls in the United States

Tolls have a few advantages compared to the gas tax—they can manage congestion on roadways and charge drivers for their road consumption to finance infrastructure.¹ There is the potential, however, that the imposition of tolls may cause drivers to use substitute routes, resulting in congestion on those other roadways.²

Across the United States, tolls are charged on various lanes, roadways, and bridges.³ Tolls can be fixed or variable, dependent on the type of vehicle or time of day. Currently, Vermont is one of fourteen states (one of two in the Northeast) that does not collect tolls. States with tolls use a variety of collection methods, including cash, card, E-ZPass, all electronic tolling (AET), or electronic toll collection (ETC), transponders, and toll-by-plate (TBP), or a combination of these methods.⁴

¹ David Levinson, "Why States Toll: An Empirical Model of Finance Choice," *Journal of Economics and Policy* 35, no. 2 (May 2001): 223-237, <https://www.jstor.org/stable/20053868>.

² Morten Welde, Svein Brathen, Jens Rekdal, and Wei Zhang, "Road Investment and the Trade-Off Between Private and Public Funding," *Research in Transportation Economics* 82, (October 2020), <https://doi.org/10.1016/j.retrec.2020.100875>.

³ Lane tolls are called "managed lanes." Drivers can pay to use certain lanes at certain times of day to decrease their own travel time by using a less congested lane, thus aiding the flow of traffic for other drivers. Sometimes, managed lanes are also High Occupancy Vehicle (HOV) Lanes, in which vehicles with more than one person can use them at no cost.

⁴ HNTB, *AET Feasibility Analysis and Comparative Assessment of ORT: Follow-up Analysis at the Dover and Rochester Toll Plazas – Comparing the Financial Feasibility of Open Road Tolling vs. All Electronic Tolling*, a report presented to the New Hampshire Department of Transportation, Bureau of Turnpikes, accessed May 5, 2021, https://www.nh.gov/dot/org/operations/turnpikes/documents/aet-vs-ort_v1.9.pdf.

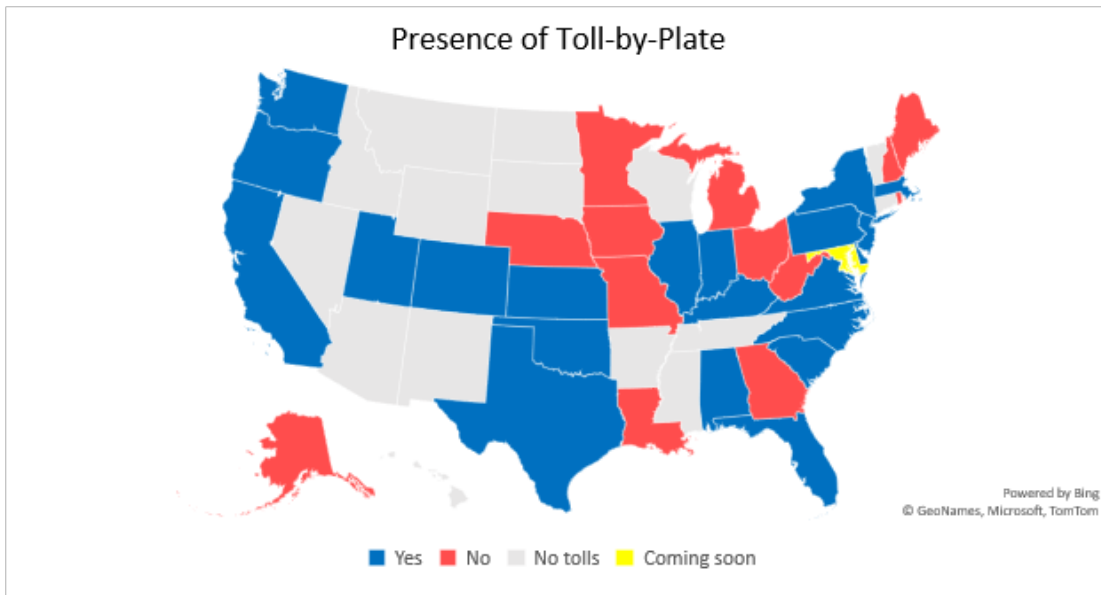


Figure 1: Toll-by-Plate

Source: compiled and created by authors based on data gathered from state transportation agencies.

All Electronic Tolling (AET)

AET uses automatic vehicle identification (AVI) which typically “involves the transmission of an identification code between a transponder in the vehicle and a roadside reader.”⁵ The transponder and roadside readers communicate through radio waves.⁶ The former contains information about the vehicle, and the identification number is “linked to the customer’s account from which the appropriate toll is automatically deducted or the customer is billed.”⁷

Toll by plate (TBP) is an alternative to traditional AVI. With license plate readers and automatic number plate recognition, a picture of the license plate is “used to determine the owner’s name and address so that an invoice for the toll and service fee can be sent.”⁸ This method can be used with transponders or without. TBP uses the same infrastructure as AET, as Figure 2 illustrates.⁹

⁵ Buxbaum, Jeffrey, “Washington State Comprehensive Tolling Study: Final Report – Volume 2: Background Paper #8: Toll Technology Considerations, Opportunities, and Risks,” Intelligent Transportation Systems Joint Program Office, Cambridge Systematics, June 28, 2007, <https://www.itskrs.its.dot.gov/its/benecost.nsf/ID/72b40da5c0eb49b5852573000058309f>.

⁶ Buxbaum, “Washington State Comprehensive Tolling Study.”

⁷ Buxbaum, “Washington State Comprehensive Tolling Study.”

⁸ Buxbaum, “Washington State Comprehensive Tolling Study.”

⁹ Robert S. Kirk, Congressional Research Service (CRS), “Tolling U.S. Highways,” August 2016, accessed May 5, 2021, <https://fas.org/sgp/crs/misc/R43575.pdf>.

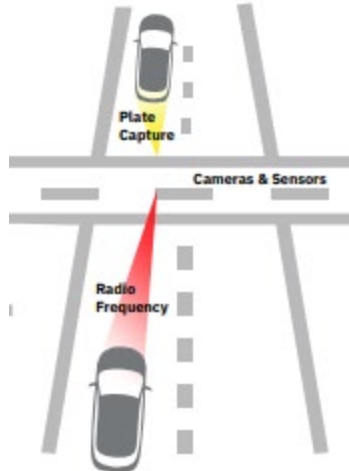


Figure 2: Dual Readers

Source: Heather Nolan, "Toll by Plate: Impact on Fleets & Best Practices for Management," *Bestpass Thought Leadership Series: 01/22/2020*, accessed May 5, 2021, https://bestpass.com/images/whitepapers/BPW_TollByPlate.pdf; 3-4.

Vendors

There are three managing options for the construction and maintenance of tolling roadways: through public operators, private operators, or public-private partnerships (P3). P3s allows the public sector to share some of the production risk with the private sector.¹⁰

Publicly operated toll roads are usually run by a state's Agency or Department of Transportation. In California, toll roads are operated by the Transportation Corridor Agencies, which were established by the legislature in 1986.¹¹ Since 1995, California's State Route 91 has been fully public after buying-out a private contractor.¹²

Privately operated toll roads can either be leased to a private entity by the state or constructed as a new road by the private entity.¹³ Full private ownership and operation is limited, as the private vendors get to keep all toll revenue as a profit-driven entity, preventing the use of

¹⁰ John Forrer, James Edwin Kee, Kathryn E. Newcomer, and Eric Boyer, "Public-Private Partnership and the Public Accountability Question," *Public Administration Review* 70, no. 3 (May | June 2010): 475-484, <https://www.jstor.org/stable/40606405>, 476.

¹¹ The Toll Roads of Orange County, "Who Owns and Operates the Toll Roads," accessed April 17, 2021, <https://thetollroads.com/help/faq/389>.

¹² Transportation Research Boards, "5 Finance Reform Proposals: Toll Road Expansion and Road Use Metering," in *The Fuel Tax and Alternatives For Transportation Funding: Special Report 285*, (Washington, DC: The National Academies Press, 2006), 121-157.

¹³ Transportation Research Boards, "5 Finance Reform Proposals."

revenues as an alternative to the gas tax.¹⁴ This creates some resistance to private operation.¹⁵ Advocacy groups claim other reasons, such as the shift in accountability from the public to shareholder, lack of transparency, and the loss of control of roadway policy and construction, all of which may create higher monitoring costs, create resistance as well.¹⁶ Private operation, however, allows for faster construction of new roads due to a larger availability of funds without taking public funds from other projects or having to rely on yet-to-be-paid toll revenues.¹⁷ One of the more well-known fully private toll roads is Illinois' Skyway, connecting Interstate 290 around Chicago's South Side to the Indiana Toll Road and Interstates 80 and 90.¹⁸

Declining gas tax revenues and increasing costs related to transportation infrastructure make it "increasingly difficult to depend solely on public funding of transport infrastructures."¹⁹ Thus, states have turned to P3s and private investors to build these roads to bridge the funding gap.²⁰ In some of these partnerships, a contract holds a private firm responsible for the design, construction, and/or operation of the roadway, while also bearing some risk.²¹ In other partnerships, state's transportation agencies partner with E-ZPass (or a similar company) for toll collection. P3s have many of the same advantages of private ownership while allowing for states to see some of the profits and maintain control of its roadways.²²

Privacy Concerns

Different transportation departments take different approaches to electronic tolling privacy.²³ Some divide identifiable information between different components, diffusing the data linkage, while others utilize strong encryption to protect personal information.²⁴ Multiple agencies,

¹⁴ United States Government Accountability Office (GAO), *Highways and Transit: Private Sector of Sponsorship of and Investment in Major Projects Has Been Limited*, GAO-04-419, 2004, <https://www.gao.gov/assets/gao-04-419.pdf>; Transportation Research Boards, "5 Finance Reform Proposals."

¹⁵ Transportation Research Boards, "5 Finance Reform Proposals."

¹⁶ Phineas Baxandall, Kari Wohlschlegel, and Tony Dutzik, *Private Roads, Public Costs: The Fact About Toll Road Privatization and How to Protect the Public* (Washington, DC: US Public Interest Research Group, 2009), https://uspig.org/sites/pig/files/reports/Private-Roads-Public-Costs-Updated_1.pdf.

¹⁷ GAO, *Highways and Transit*; Welde, Brathen, Rekdal, and Zhang, "Road Investment and the Trade-Off Between Private and Public Funding."

¹⁸ Transportation Research Boards, "5 Finance Reform Proposals;" Chicago Skyway, "The Skyway," accessed April 25, 2021, <https://www.chicagoskyway.org/the-skyway/>.

¹⁹ Tomaz Kramberger, Uros Kramar, Andreja Curin, Marko Cedilnik, Martin Lipicnik, and Viktor Tajsek, "Fiscal Impact of Electronic Fee Collection System on Long-Run Efficiency," *Transport Problems: An International Scientific Journal* 7, no. 2 (June 2012): 5-13, 6.

²⁰ GAO, *Highways and Transit*.

²¹ Transportation Research Boards, "5 Finance Reform Proposals."

²² GAO, *Highways and Transit*.

²³ Fries, Ryan N, Gahrooei, Mostafa Reisi, Chowdhury, Mashrur, and Conway, Alison J. "Meeting Privacy Challenges While Advancing Intelligent Transportation Systems," *Transportation Research, Part C, Emerging Technologies* 25 (2012): 34-45.

²⁴ Fries, Gahrooei, Chowdhury, and Conway, "Meeting Privacy Challenges While Advancing Intelligent Transportation Systems," 36.

including the Massachusetts Department of Transportation (MassDOT) and Transport for London, have clear-set lengths of time for which information is stored, after which the data is purged from the system.²⁵ E-ZPASS, commonly used in the United States, has a strong privacy policy surrounding the information that is collected from electronic tolls. The Virginia Department of Transportation states that information collected from E-ZPASS is only accessible outside of VDOT by “law enforcement conducting criminal investigations in accordance with subpoenas, court orders or amber alerts” and “in summary form (i.e. combined and summarized data that does not include any information specific to an individual customer)” for research purposes.²⁶

Privacy issues surrounding electronic tolling have not been a major source of concern for authorities, academics, or interest groups for a few decades.²⁷ News coverage of privacy issues does still occur, especially when data related to criminal investigations is obtained via electronic tolling. Reactions from news outlets and advocacy groups over the utilization of a hot list in Massachusetts is indicative of this.²⁸ The hot list is "a list of specific license plates and/or transponder numbers provided or identified by law enforcement to MassDOT."²⁹ Law enforcement can request to be notified when certain plate numbers are picked up by electronic tolls. Massachusetts has comprehensive regulations about acceptable usage of this information, with the hot list only to be used in "limited emergency situations."³⁰ If Vermont chooses to implement electronic tolling and/or a hot list, it will behoove the state to have comprehensive statutes around the usage and holding of information, in order to ease privacy concerns and avoid potential lawsuits from advocacy groups. Vermont has a statute regarding information obtained from electronic tolling, under 23 V.S.A § 1607, but the section is repealed effective June 01, 2022.³¹

²⁵ Fries, Gahrooei, Chowdhury, and Conway, "Meeting Privacy Challenges While Advancing Intelligent Transportation Systems," 36.

²⁶ Virginia Department of Transportation, "E-ZPASS Virginia Privacy Policy," accessed May 4, 2021, <https://ezpassva.com/pdfs/privacy.pdf>.

²⁷ Fries, Gahrooei, Chowdhury, and Conway, "Meeting Privacy Challenges While Advancing Intelligent Transportation Systems," 36.

²⁸ Barb Darrow, "Massachusetts Automated Toll System Raises Privacy Concerns," *Fortune*, August 22nd, 2016, accessed April 29th, 2021, <https://fortune.com/2016/08/22/automated-tolls-raise-privacy-concerns/>; Dan Glaun, "Police have used the Mass. Pike's electronic tolling system to track people 7 times since system launch," *MassLive*, August 10th, 2017, updated January 7th, 2019, accessed April 29th, 2021, https://www.masslive.com/news/2017/08/how_police_are_using_location.html.

²⁹ Code of Massachusetts Regulations Title 700 11: Maurice J. Tobin Memorial Bridge, Section 11.06(8), Massachusetts Department of Transportation.

³⁰ Code of Massachusetts Regulations Title 700 11: Maurice J. Tobin Memorial Bridge, Section 11.06(8), Massachusetts Department of Transportation.

³¹ Vermont State Statute, 23 V.S.A § 1607, accessed April 29th, 2021, <https://legislature.vermont.gov/statutes/section/23/015/01607>.

Massachusetts Case Study

Massachusetts began toll-by-plate implementation in 2014.³² It is referred to as all electronic tolling (AET) by the state and is a different system than the transponder-style E-ZPass. This was the result of a wider push for transportation reform by Deval Patrick, Governor of Massachusetts at the time, as well as the state legislature.³³ Transportation reforms are outlined in a report titled “The Way Forward: A 21st Century Transportation Plan.”³⁴ The report was put together by MassDOT and outlines the economic benefits of transportation reform.

AET was proposed primarily to eliminate congestion. The elimination of traditional toll booths would allow for improved traffic flow, resulting in a decrease in emissions from idling as well as safer roadways. It would also result in a decrease in operating costs.³⁵ Massachusetts already had an expansive tolling system, as well as electronic tolling through E-ZPass, so their motivations for AET implementation are not as applicable to Vermont.

Governor Patrick's administration estimated that would reduce operating costs by roughly 50 million dollars annually.³⁶ A 2016 report by MassDOT found that this estimate did not fully account for operating costs of the system. The reduction amounted to about 5 million dollars per year in operating costs.³⁷ The total cost of the system was roughly 130 million dollars.³⁸

Using AET results in more “leakage” than E-ZPass. Leakage is the difference between potential revenue and what is collected. AET leakage comes from a multitude of sources, including non-payment, unreadable images, or incorrect addresses.³⁹ MassDOT estimates for 2019 stated that 20-40% of AET tolls would remain uncollected.⁴⁰ This is consistent with other estimates, as well as the data collected from the Tobin Bridge Pilot of AET. Since E-ZPass makes up 86% of tolls in Massachusetts as of 2019, this results in lost AET tolls hovering around 3-6% of total tolls.⁴¹

³² Executive Office of Administration and Finance, "Transportation Reform," accessed April 22, 2021, https://budget.digital.mass.gov/bb/h1/fy14h1/exec_14/hbudbrief6.htm.

³³ An Act Relative to Financing and Reforming Public Transportation in the Commonwealth, Acts of 2012, Chapter 132, approved June 29, 2012.

³⁴ Massachusetts Department of Transportation (MassDOT), *The Way Forward: A 21st-Century Transportation Plan*, (MassDOT Board of Directors, 2014), 1-64.

³⁵ *The Way Forward: A 21st-Century Transportation Plan*, 23.

³⁶ MassDOT, *The Way Forward: A 21st-Century Transportation Plan*, 23; Executive Office of Administration and Finance, "Transportation Reform," accessed April 22, 2021, https://budget.digital.mass.gov/bb/h1/fy14h1/exec_14/hbudbrief6.htm.

³⁷ MassDOT, *All Electronic Tolling (AET): Frequently Asked Questions*, 7.

³⁸ MassDOT, *All Electronic Tolling (AET): Frequently Asked Questions*, 7.

³⁹ MassDOT, *All Electronic Tolling Update*, (MassDOT, March 2019), 3.

⁴⁰ MassDOT, *All Electronic Tolling Update*, 5.

⁴¹ MassDOT, *All Electronic Tolling Update*, 5.

It's easier to ensure payment by Massachusetts drivers, as unpaid tolls prevent vehicle registration.⁴² The issue of unpaid tolls by out-of-state drivers is a source of concern, as it's more difficult to ensure payment. During the pilot implementation of AET at Tobin Bridge, 64% of unpaid tolls were Massachusetts residents. MassDOT estimated a higher percentage of unpaid tolls coming from out-of-staters on the turnpike.⁴³ Massachusetts has developed reciprocity agreements with DMVs in some neighboring states in order to prevent out-of-state leakage.⁴⁴

Tolling in Vermont

History

Vermont has a brief history with toll collection, and none of the roadways previously established are operating today.

In the early 1800s, Vermont experienced a "turnpike craze," and midway through the century, about fifty turnpikes had been constructed.⁴⁵ Road maintenance for these turnpikes was paid for using toll revenue; however, "ministers, post riders, and farmers engaged in local transport were usually allowed to pass free."⁴⁶ Many drivers circumvented the charge by using other routes, called "shunpikes."⁴⁷ None of these tolls are still in operation.⁴⁸

The McCullough Turnpike was authorized to become a private toll turnpike by the Vermont legislature in 1933, but the rights to it were sold to the state two years later, and it never became a toll road.⁴⁹ In 1952, the Vermont Department of Highways published a report recommending "the establishment of two toll roads, Montpelier to Burlington and Montpelier-Barre," but the tolls were never constructed, becoming part of an interstate, instead.⁵⁰

2016 VTrans Study

In 2016, the Vermont Agency of Transportation composed a report on Vermont's transportation funding options to replace the gas tax. This report asserts that "[t]he minimum amount of daily traffic for tolls to be feasible is generally regarded as 30,000 vehicles per

⁴² Massachusetts Department of Transportation, *All Electronic Tolling: Rate Setting*, (MassDOT, August 22nd, 2016), page 18.

⁴³ MassDOT, *All Electronic Tolling: Rate Setting*, 31.

⁴⁴ MassDOT, *All Electronic Tolling Update*, 5.

⁴⁵ Berger, Louis, *Vermont Transportation Theme: Statewide, Vermont*, Albany: Louis Berger, 2018, accessed April 29, 2021, <https://accd.vermont.gov/sites/accdnew/files/documents/HP/Final%20Draft%20-%20Transportation%20Theme.pdf>, 11.

⁴⁶ Berger, *Vermont Transportation Theme*, 11.

⁴⁷ Berger, *Vermont Transportation Theme*, 11.

⁴⁸ Berger, *Vermont Transportation Theme*, 11.

⁴⁹ Berger, *Vermont Transportation Theme*, 25.

⁵⁰ Berger, *Vermont Transportation Theme*, 25.

day.”⁵¹ The authors posit, using 2013 data, that “only a small portion of I-89 in Chittenden County would qualify.” As of 2019, the eligible roads by these standards are Route 7, Route 2, and I-89, with all the highway segments residing in Chittenden County.⁵² These roadways are federal aid highways subject to the regulations in Title 23, U.S.C., presented below.⁵³

Feasibility

Federal Statutes

Current federal law Title 23, United States Code (U.S.C.) requires “all highways constructed under the provisions of this title be free from tolls of all kinds,” with the exceptions noted in Section 129 (these exceptions can be found in Appendix A).⁵⁴

Robert S. Kirk, Specialist in Transportation Policy for the Congressional Research Service, sums up the federal tolling legislation by stating “that all conversions of existing federal-aid highways, bridges, or tunnels to toll facilities require that the facility be reconstructed, restored, rehabilitated, or replaced (unless the conversion occurs under the Value Pricing Pilot Program),” and the decision to introduce tolls must be made before the construction is complete.⁵⁵ The federal government’s Value Pricing Pilot Program allows variable tolling to manage congestion.⁵⁶

Costs

There are two main costs of tolls to suppliers: collection and capital. At 8-10%, toll collection costs are much higher than gas tax collection costs, which are around 1%.⁵⁷ This collection cost figure varies based on the traffic volume and method of toll collection; all electronic tolling is the cheapest method, and logistics studies have shown it is also the most efficient method.⁵⁸

⁵¹ Pappis, Costa, *Vermont Transportation Funding Options: Section 10 (a): Act 40 (2015)*, Vermont Agency of Transportation, 2016, accessed April 29, 2021, <https://vtrans.vermont.gov/sites/aot/files/planning/documents/planning/Vermont%20Transportation%20Funding%20Options%20%282016%29.pdf>, 45.

⁵² “VT Annual Average Daily Traffic (AADT) – 2016,” Vermont Open Geodata Portal, State of Vermont, November 23, 2020, <https://geodata.vermont.gov/datasets/VTrans::vt-annual-average-daily-traffic-aadt-2016?geometry=-80.796%2C42.478%2C-64.108%2C45.249>.

⁵³ Vermont Agency of Transportation, *Map Showing Federal Aid Highways of Vermont Highways*, accessed April 26, 2021, https://vtransmaps.vermont.gov/Maps/Publications/Maps/FederalAidStateMaps/FederalAidHighwaysMap_2015.pdf.

⁵⁴ 23 U.S.C. § 301 (2012).

⁵⁵ Kirk, “Tolling U.S. Highways,” 4.

⁵⁶ Kirk, “Tolling U.S. Highways,” 4.

⁵⁷ Kirk, “Tolling U.S. Highways.”

⁵⁸ Kirk, “Tolling U.S. Highways,” Kramberger, Kramar, Curin, Cedilnik, Lipicnik, and Tajsek, “Fiscal Impact of Electronic Fee Collection System on Long-Run Efficiency.”

Cash-only tollbooths are the most expensive, mostly due to the labor and toll plaza infrastructure costs.⁵⁹

AET collection, however, requires niche radio-frequency identification infrastructure that is typically not already in place.⁶⁰ HNTB, an infrastructure design firm working for the New Hampshire Department of Transportation, estimated the cost of the AET equipment to be around \$2 million, though the costs of transitioning to tolling a road can bring project costs to over \$300 million.⁶¹ Thus, before tolls can turn profits, there is a need for high traffic volumes.⁶² Such volumes may not be met in areas of low traffic or in areas with competing free roadways.⁶³ In 2016, Kirk claimed that “in rural areas, highways often do not have enough traffic to cover the cost of building toll-collection infrastructure and collecting tolls.”⁶⁴

In terms of costs to drivers, toll-by-plate costs are typically higher than cash tolls as the fees also cover the mailing and administrative costs.⁶⁵ When used in conjunction with AET, however, drivers have a choice as to which price they wish to pay, if they pay for the transponder and set up an account.

Benefits

There are many benefits to implementing an electronic toll system over a traditional tollgate system. Electronic toll collection (ETC) was shown to reduce pollution and cancer risk in Taiwan.⁶⁶ Specifically, the country saw a reduction in ultrafine particles and PM2.5 mass concentration after the introduction of ETC, and a 49.3 percent reduction in excessive lifetime cancer risks was calculated.⁶⁷ ETCs and hybrid toll plazas have also resulted in fewer car crashes, according to a study of Florida’s tolling systems: All electronic toll collection was associated with 72.9 percent fewer crashes than traditional toll plazas, and hybrid toll plazas were associated with 44.7 percent fewer crashes than traditional toll plazas.⁶⁸

⁵⁹ Kirk, “Tolling U.S. Highways.”

⁶⁰ GAO, *Highways and Transit*.

⁶¹ HNTB, *AET Feasibility Analysis and Comparative Assessment of ORT*; CDM-Smith, *Connecticut Tolling Options and Evaluation Study* (Boston, MA: CDM Smith, 2018), [CTDOTTollingReport11142018pdf.pdf](https://www.ctdot.gov/Portals/0/CTDOTTollingReport11142018pdf.pdf).

⁶² Kirk, “Tolling U.S. Highways.”

⁶³ Kirk, “Tolling U.S. Highways,” 4; Welde, Brathen, Rekdal, and Zhang, “Road Investment and the Trade-Off Between Private and Public Funding.”

⁶⁴ Kirk, “Tolling U.S. Highways,” 4.

⁶⁵ PA Turnpike, *Toll By Plate*; Kirk, “Tolling U.S. Highways.”

⁶⁶ Lin, Ming-Yeng, Yu-Cheng Chen, Dung-Ying Lin, Bing-Fang Hwang, Hui-Tsung Hsu, Yu-Hsiang Cheng, Yu-Ting Liu, and Perng-Jy Tsai, “Effect of Implementing Electronic Toll Collection in Reducing Highway Particulate Matter Pollution,” *Environmental Science & Technology* 54, no. 15 (June 26, 2020): 9210–16, <https://doi.org/10.1021/acs.est.0c00900>.

⁶⁷ Lin, et al., “Effect of Implementing Electronic Toll Collection in Reducing Highway Particulate Matter Pollution.”

⁶⁸ Abuzwidah, Muamer, and Mohamed Abdel-Aty. “Safety Assessment of the Conversion of Toll Plazas to All-Electronic Toll Collection System.” *Accident Analysis & Prevention* 80 (April 21, 2015): 153–61. <https://doi.org/10.1016/j.aap.2015.03.039>.

Conclusion

Well-maintained roads benefit society by providing ease of access to places like hospitals, schools, and markets, which contribute to economic development and growth.⁶⁹ When roads fall into disrepair, those economic benefits are minimized, and drivers experience increased operating costs, such as more frequent vehicle repairs.⁷⁰ Generally, roads are thought of as public goods because they are seen as nonrival and nonexcludable in most situations, though changing the institutional environment in which they are provided can make them private goods, club goods, or common pools.⁷¹ Tolled roadways become club goods because those who do not pay can be excluded.

Before implementing tolls, a state must decide if tolls are feasible in the area. Toll feasibility is dependent on: the costs of capital, implementation, and maintenance; the federal statutes in place, namely U.S.C. Title 23; and the traffic volumes, which are limited outside of Chittenden County. Feasibility may also rely on the benefits to consumers and the state outweighing the costs. Such benefits are mostly increased revenue for infrastructure maintenance to replace declining gas tax revenues due to more fuel-efficient and electric vehicles.

This report was completed on May 10, 2021, by Fallon Clark, Cynthia Miller, and Owen Sette-Ducati under the supervision of VLRS Director, Professor Anthony “Jack” Gierzynski in response to a request from Senator Thomas Chittenden.

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⁶⁹ Burningham, Sally, and Stankevich, Natalya, *Why Road Maintenance is Important and How To Get It Done* (The World Bank: Washington, D.C., 2005), <https://openknowledge.worldbank.org/bitstream/handle/10986/11779/339250rev.pdf?sequence=1&isAllowed=y>, 1.

⁷⁰ Burningham and Stankevich, *Why Road Maintenance is Important and How To Get It Done*, 1.

⁷¹ Jonathan Gruber, *Public Finance and Public Policy* (New York, NY: Worth Publishers, 2019); Benson, Bruce L., “Are Roads Public Goods, Club Goods, Private Goods, or Common Pools?” *Explorations in Public Sector Economics*, 2017: 171-213. https://doi.org/10.1007/978-3-319-47828-9_11, 3.

Appendix A

The Section 129 exceptions of United States Code Title 23 are as follows.

- (A) initial construction of a toll highway, bridge, or tunnel or approach to the highway, bridge, or tunnel;
- (B) initial construction of 1 or more lanes or other improvements that increase capacity of a highway, bridge, or tunnel (other than a highway on the Interstate System) and conversion of that highway, bridge, or tunnel to a tolled facility, if the number of toll-free lanes, excluding auxiliary lanes, after the construction is not less than the number of toll-free lanes, excluding auxiliary lanes, before the construction;
- (C) initial construction of 1 or more lanes or other improvements that increase the capacity of a highway, bridge, or tunnel on the Interstate System and conversion of that highway, bridge, or tunnel to a tolled facility, if the number of toll-free non-HOV lanes, excluding auxiliary lanes, after such construction is not less than the number of toll-free non-HOV lanes, excluding auxiliary lanes, before construction;
- (D) reconstruction, resurfacing, restoration, rehabilitation, or replacement of a toll highway, bridge, or tunnel or approach to the highway, bridge, or tunnel;
- (E) reconstruction or replacement of a toll-free bridge or tunnel and conversion of the bridge or tunnel to a toll facility;
- (F) reconstruction of a toll-free Federal-aid highway (other than a highway on the Interstate System) and conversion of the highway to a toll facility;
- (G) reconstruction, restoration, or rehabilitation of a highway on the Interstate System if the number of toll-free non-HOV lanes, excluding auxiliary lanes, before reconstruction, restoration, or rehabilitation;
- (H) conversion of a high occupancy vehicle lane on a highway, bridge, or tunnel to a toll facility; and
- (I) preliminary studies to determine the feasibility of a toll facility for which Federal participation is authorized under this paragraph.⁷²

⁷² 23 U.S.C. § 129 (2012).