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Authors
Volker, Jamey M.B., PhD
Handy, Susan L, PhD

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The Induced Travel Calculator and Its Applications

Jamey M. B. Volker, Ph.D., Postdoctoral Scholar, Institute of Transportation Studies, University of California, Davis
Susan L. Handy, Ph.D., Professor, Department of Environmental Science and Policy, University of California, Davis

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16. Abstract

The National Center for Sustainable Transportation's Induced Travel Calculator (Calculator) has generated substantial interest in the professional community as a method for estimating the additional vehicle miles traveled (VMT) induced by expanding the capacity of major roadways. The Institute of Transportation Studies at the University of California, Davis (ITS-Davis) initiated a technical assistance project to support Caltrans and others in applying the Calculator. This report: (1) provides an overview of the Calculator and the induced vehicle travel effect, (2) summarizes the results from an earlier study comparing the Calculator's estimates with other induced travel analyses, (3) describes the technical assistance efforts and outcomes, and (4) discusses plans for future improvements to the Calculator. During the project, ITS-Davis advised Caltrans as it developed its Transportation Analysis Framework to guide transportation impact analysis for projects on the State Highway System. Caltrans published the final document in September 2020, in which it recommends that the Calculator be used where possible to estimate induced VMT. ITS-Davis also advised on efforts to apply the Calculator's elasticity-based method to estimate induced VMT from out-of-state highway capacity expansion projects, including projects in Portland, Oregon, Washington, D.C., Kenya, and China. In a follow-up project, ITS-Davis will work with Caltrans to improve the Calculator documentation to answer questions raised by Caltrans and others, explore possible technical improvements to the Calculator, and explore opportunities for assessing the validity of the Calculator's induced VMT estimates.

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About the UC Institute of Transportation Studies

The University of California Institute of Transportation Studies (UC ITS) is a network of faculty, research and administrative staff, and students dedicated to advancing the state of the art in transportation engineering, planning, and policy for the people of California. Established by the Legislature in 1947, ITS has branches at UC Berkeley, UC Davis, UC Irvine, and UCLA.

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Disclaimer

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Jamey M. B. Volker, Ph.D., Postdoctoral Scholar, Institute of Transportation Studies, University of California, Davis
Susan L. Handy, Ph.D., Professor, Department of Environmental Science and Policy, University of California, Davis

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Glossary

Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
FWHA	Federal Highway Administration
HOV	high-occupancy vehicle
HPMS	Highway Performance Monitoring System
MSA	metropolitan statistical area
NCST	National Center for Sustainable Transportation
TSN	Transportation System Network
VMT	vehicle miles traveled

Executive Summary

Executive Summary

In early 2019, the National Center for Sustainable Transportation developed and launched an online tool that allows users to estimate the additional vehicle travel induced by expanding the capacity of major roadways in California's urbanized counties (i.e., counties within Census-defined metropolitan statistical areas). The Induced Travel Calculator (Calculator) has generated substantial interest among policymakers and practitioners as a method for estimating induced vehicle miles traveled (VMT). Approximately 1,800 people used the Calculator at least once in 2020. At the Institute of Transportation Studies at University of California, Davis (ITS-Davis), we initiated a technical assistance project to support Caltrans and others in applying the Calculator.

This report describes our technical assistance efforts and outcomes, as well as our plans for future improvements to the Calculator. We also discuss the induced vehicle travel effect, our impetus for developing a tool to estimate induced VMT, and how the Calculator works. In addition, we summarize the results from an earlier study we conducted to better understand how the Calculator's induced VMT estimates compare to other induced travel analyses. In that study we applied the Calculator to estimate the VMT induced by five highway expansion projects in California and compared our estimates with the induced travel analysis completed for the projects' actual environmental impact assessments.

During the project we advised Caltrans as it developed its Transportation Analysis Framework to guide transportation impact analysis for projects on the State Highway System. Caltrans published the final document in September 2020, in which it recommends that the Calculator be used where possible to estimate—or at least benchmark—induced VMT. We also advised on efforts to apply the Calculator's elasticity-based method to estimate induced VMT from out-of-state highway capacity expansion projects, including projects in Portland, Oregon, Washington, D.C., Kenya, and China.

With growing usage, it is essential that the Calculator be maintained and, where feasible, improved to better meet transportation impact analysis needs in California and elsewhere. To that end, we will work with Caltrans on a follow-up project to: (1) improve the Calculator documentation to answer questions raised by Caltrans and others; (2) explore possible technical improvements to the Calculator; and (3) explore opportunities for assessing the validity of the Calculator's induced VMT estimates.

Contents

Introduction

Roadway capacity expansion is often proposed as a solution to traffic congestion and even as a way to reduce greenhouse gas (GHG) emissions. The cited logic is often that increasing roadway capacity increases average vehicle speeds, which improves vehicle fuel efficiency and reduces per-mile emissions of GHGs and local air pollutants. But that logic is flawed because it fails to account for the induced vehicle travel effect. Constructing new highway lanes generally increases the average speed of highway traffic and thereby reduces the effective cost of driving on the highway. That, in turn, induces more travel on the highway and more vehicle miles traveled (VMT), which often increase traffic congestion back to pre-expansion levels.

Despite its importance, the induced travel effect is often not fully accounted for in travel demand models or in the environmental review process for capacity expansion projects. This often results in agencies overestimating the benefits of highway capacity expansions (like reduced traffic congestion) and underestimating the environmental costs (like emissions of GHGs and local air pollutants) (Naess, Nicolaisen and Strand, 2012; Milam et al., 2017).

With these problems in mind, we developed an online tool to help agencies estimate the VMT induced annually by adding lanes to major roadways in California's urbanized counties. The website[1] for the Induced Travel Calculator (Calculator) went live in early 2019, and we followed its release with several education and outreach activities, including a recorded webinar[2] in May 2019. Our outreach efforts spurred continuing discussions with the California Department of Transportation (Caltrans) and others about incorporating the Calculator into environmental impact analyses for highway capacity expansion projects. Those discussions highlighted three things in particular:

1. a need to better understand how the Calculator's estimates of induced VMT compare to other induced travel analyses;
2. a need for the National Center for Sustainable Transportation (NCST) to provided continued technical assistance to agencies and other practitioners in applying the Calculator; and
3. an ongoing need to maintain the Calculator and update and improve its functionality where feasible.

We started to address the first need as part of an earlier project, where we applied the Calculator to estimate the VMT induced by five highway expansion projects in the state that had undergone environmental review within the last 15 years. This short-term follow-up project focused on the second and third needs. We provided continued advice and technical assistance to Caltrans as it formulated its Transportation Analysis Framework – its guidance for the evaluation of environmental impacts for highway projects under the California

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[1] The Calculator is currently available here: https://blinktag.com/induced-travel-calculator. Note that we might move the Calculator to a new website in the coming year. Regardless of where the Calculator is hosted, this page will always contain a link to the correct page: https://ncst.ucdavis.edu/research-product/induced-travel-calculator.
[2] Available at https://its.ucdavis.edu/webinar/a-new-web-tool-to-calculate-induced-travel.

Environmental Quality Act (CEQA). We also consulted with other agencies and practitioners about applying the Calculator, including adapting it for use outside of California. In addition, we developed a plan and obtained funding for improving the Calculator in 2021.

This report proceeds as follows. The next (second) chapter provides background on induced travel. The third chapter describes the Calculator. The fourth chapter summarizes the results from our comparative analysis of the induced VMT estimation for five capacity expansion projects in California. The fifth chapter summarizes our technical assistance efforts and outcomes. The sixth chapter discusses our plan for improving the Calculator. And the seventh chapter concludes.

Background on Induced Vehicle Travel

Induced travel is a well-documented effect in which expanding capacity on a highway (or other major roadway) increases the average travel speed on the highway or provides access to previously inaccessible areas, both of which reduce the perceived "cost" of driving and thereby induce more driving (Handy, 2015). In the shorter term, the reduced time cost of vehicle travel can cause people to substitute driving for other travel modes, elongate their driving routes, or take additional trips. These behavioral responses can affect both personal and commercial driving (Duranton and Turner, 2011; Milam *et al.*, 2017). In the longer term, it can lead people to live farther away from where they work (or vice versa) and even spur commercial or residential growth in the region (Duranton and Turner, 2011; Milam *et al.*, 2017). Figure 1 illustrates the induced travel effect.

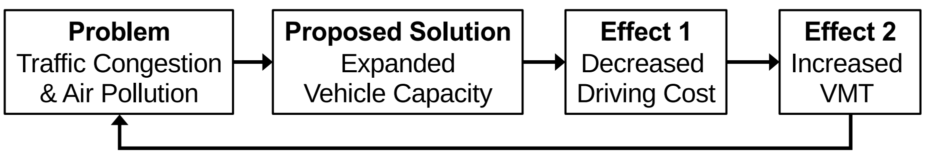

Figure 1. Induced Vehicle Travel Effect of Highway Capacity Expansions

The magnitude of the induced travel effect is typically measured as the elasticity of VMT with respect to lane miles, as shown in Equation 1. The elasticity is the percentage in VMT that results from a 1% increase in lane miles. An elasticity of 1.0 means that VMT will increase by the same percentage as the increase in lane miles.

$$\text{Elasticity} = \frac{\text{\% Change in VMT}}{\text{\% Change in Lane Miles}} \qquad \text{(Eq. 1)}$$

There is ample support in the literature for the induced travel effect. Handy and Boarnet (2014, p. 4) reviewed the induced travel studies published between 1997 and 2011 and concluded that the "best estimate of the long-run effect of highway capacity on VMT is an elasticity close to 1.0." That means that within 5 to 10 years after construction of the capacity expansion, VMT will have increased by a commensurate percentage, likely negating any initial reduction in traffic congestion.

Most recent studies have estimated elasticities in the same ballpark for capacity expansions on major roadways—like interstates, freeways, highways, expressways, and principal arterials—in urbanized areas (Duranton and Turner, 2011; Melo, Graham and Canavan, 2012; Graham *et al.*, 2014; Hsu and Zhang, 2014; Hymel, 2019). The consistency is particularly robust because the studies have used a wide range of methods to control for other VMT-inducing factors and the bi-directional relationship (simultaneity) between VMT and capacity expansion. Table 1 summarizes the five econometric studies of induced travel in urbanized areas that we identified from our review of the peer-reviewed journal literature over the last 10 years (2011-2020).

Table 1. Recent Studies Estimating Induced Travel Elasticities

Authors	Study Location	Study Years	Roadway Types	Methodology (Estimator)	Elasticity
Duranton & Turner (2011)	United States (metropolitan statistical areas)	1983–2003	Interstate highways	2-stage least squares regression with instrumental variables	1.03 (10 year)
			Other highways, principal arterials, collectors, and minor arterials	Pooled ordinary least squares	0.67–0.89 (10 year)
Melo et al. (2012)	United States (urbanized areas)	1982–2010	Arterials	Generalized method of moments	0.98 (~10 year)
Graham et al. (2014)	United States (urbanized areas)	1985–2010	Freeways and arterials	Propensity score	0.77 (~10 year)
Hsu & Zhang (2014)	Japan (urban employment areas)	1990–2005	National expressways	2-stage least squares regression with instrumental variables	1.24–1.34 (3-5 year)
Hymel (2019)	United States (urban areas)	1981–2015	Freeways and other limited-access roads	2-stage least squares regression with instrumental variables	0.89–1.06 (5 year)

Notes: Most of the studies compared multiple estimators and model specifications. The table attempts to summarize the preferred estimators and elasticities reported by the studies' authors.

The Induced Travel Calculator

A growing body of empirical evidence demonstrates the induced travel effect, and mitigating induced VMT is vital to reducing GHG emissions. Nonetheless, induced travel is often not fully accounted for in travel demand models or in the environmental review process for capacity expansion projects (Naess, Nicolaisen and Strand, 2012; Milam *et al.*, 2017). The primary issue is that most models do not include all of the feedback loops necessary to capture the behavioral changes caused by capacity expansion (Milam *et al.*, 2017; Litman, 2019). For example, not many models feed changes in estimated travel times back into the trip distribution or trip generation stages of the model, which ignores the possibility that improved travel times from a capacity expansion will: (a) increase the number of trips that households and freight operators choose to make, or (b) cause them to choose more distant trip destinations. Neither do most models feed changes in estimated travel times back into assumptions about the growth and distribution of population and employment.

With these limitations in mind, we developed an online tool to help agencies estimate the VMT induced annually by adding lanes to major roadways in California's urbanized counties. We followed Milam et al.'s (2017, p. 6) recommendation to produce "elasticity-based estimates of VMT levels derived from the project's lane mile changes" and the elasticity values reported in the literature. The Induced Travel Calculator estimates project-induced VMT using the project length entered by the user, lane-mile and VMT data from Caltrans, and estimates of elasticities from peer-reviewed studies. To estimate the induced VMT for capacity expansion projects, the Calculator solves the following equation (Equation 2) based on the user-specified project geography and lane mile length:

$$\% \Delta \text{ Lane Miles} * \text{Existing VMT} * \text{Elasticity} = \text{Project-Induced VMT} \quad \text{(Eq. 2)}$$

The Calculator produces long-run estimates of induced VMT—the additional annual VMT that could be expected 5 to 10 years after facility installation. All estimates account for the possibility that some of the increased VMT on the expanded facility is traffic diverted from other types of roads in the network, though the studies generally show that "capacity expansion leads to a net increase in VMT, not simply a shifting of VMT from one road to another" (Handy & Boarnet, 2014, p. 5).

The Calculator currently applies only to public (not private) facilities with Federal Highway Administration (FHWA) functional classifications of 1, 2, or 3 in one of California's urbanized counties (the 37 counties within a metropolitan statistical area [MSA]). That corresponds to interstate highways (class 1), other freeways and expressways (class 2), and other principal arterials (class 3). The Calculator is also limited to use for capacity expansions (lane additions, roadway lengthening, and new facility construction). It cannot be used to estimate the VMT effects of capacity reductions, and it should not be used to estimate the induced VMT from lane type conversions without supplemental analysis. In addition, the Calculator is conservatively limited to use for additions of general-purpose and high-occupancy vehicle (HOV) lanes. It should not be used to estimate induced VMT from additions of toll lanes without supplemental analysis. Other caveats also apply to using the Calculator, which are enumerated on the Calculator website.[3] We describe below the data sources and specifications for the inputs to the Calculator equation.

Lane Mile Data

The Calculator uses 2016 lane mileage data from Caltrans' Transportation System Network (TSN) database (similarly reported in the Highway Performance Monitoring System [HPMS]). The percent change in lane miles is calculated by dividing the number of project-added lane miles (input by the user) by the total lane miles of the same facility type in the same geography. For interstate highways (FHWA functional class 1), lane mileage is calculated at the MSA level. For other Caltrans-managed freeways, expressways and major arterials (classes 2 and 3), lane mileage is calculated at the county level. The choice of geographies is discussed further below, in conjunction with elasticities. The data are available on the Calculator website.

VMT Data

The Calculator uses 2016 VMT data retrieved using Caltrans' TSN and HPMS database. The VMT is tallied for each county and each FHWA functional classification. Existing VMT on interstate highways (FHWA functional class 1) is calculated at the MSA level, and existing VMT on other Caltrans-managed freeways, expressways, and major arterials (classes 2 and 3) is calculated at the county level. The data are available on the Calculator website.

Elasticities

The Calculator uses an elasticity of 1.0 for lane additions to interstate highways, and an elasticity of 0.75 for lane additions to class 2 or 3 facilities.

For interstate highways (class 1 facilities), the 1.0 elasticity derives from Duranton and Turner (2011) and is consistent with the more recent studies that likewise use robust statistical methods to estimate induced travel elasticities while addressing the simultaneity bias (the fact that increasing VMT can spur roadway expansion in addition to being caused by it) (see Table 1). At the time we developed the Calculator, Duranton and Turner (2011) was the most recent study we could find that used data across broad areas of the United States to estimate induced travel elasticities for class 1 facilities. And it remains perhaps the most thorough and stringently vetted induced travel study to date. Duranton and Turner's study used data from 1983, 1993, and 2003 for all MSAs in the US that had nonzero interstate lane mileage in all three years. Among other modeling, the study used a two-stage least squares regression with three instrumental variables to estimate the elasticity

[3] The Calculator is currently available here: https://blinktag.com/induced-travel-calculator. Note that we might move the Calculator to a new website in the coming year. Regardless of where the Calculator is hosted, this page will always contain a link to the correct page: https://ncst.ucdavis.edu/research-product/induced-travel-calculator.

of vehicle kilometers traveled on interstate highways in the 228 studied MSAs with respect to interstate lane kilometers in those MSAs. The authors concluded that their estimation method better controls for the possible bi-directional relationship between VMT and lane miles than do the methods used in previous studies. Using that "preferred estimation method," their "preferred estimate" was a long-run (10-year) elasticity of 1.03. However, while the authors concluded that "diversion of traffic from other road networks does not appear to play a large role," they cautioned that they could not "rule out the absence of a substitution effect" (p. 2646). They estimated that the "diversion of traffic from other classes of roads accounts for between 0 and 10 percent of the total [induced] interstate VKT [vehicle kilometers traveled]" (p. 2644).

Like Duranton and Turner (2011), the Calculator uses MSAs as the unit of analysis for interstate highway capacity expansions. The Calculator also uses a similar VMT elasticity (1.0), albeit rounded down (in part to account for the small potential substitution effect). That accords with Handy and Boarnet's (2014) conclusion that the best estimate for the long-run VMT elasticity for highway lane additions is close to 1.0. It is also consistent with the more recent econometric studies that have estimated long-run induced VMT elasticities (Table 1).

For other publicly managed highways, expressways and major arterials (class 2 and 3 facilities), the 0.75 elasticity derives from Duranton and Turner (2011) and Cervero and Hansen (2002), as well as the subsequent studies summarized in Table 1. While Duranton and Turner (2011) could not use their preferred method to estimate elasticities for state highways and other "major roads"[4] besides interstates, their elasticity estimates using ordinary least squares regression all fall between 0.67 and 0.89. Cervero and Hansen (2002) similarly estimated an intermediate-run (5-year) VMT elasticity of 0.79 for lane mile additions to state-owned roadways in California's urbanized counties (then numbering 34, and now 37), using three-stage least squares regression. Those elasticities are similar to other longer-term elasticities calculated for combined major road types (not just interstate highways) in California and across the US (see Table 1 for recent studies; see Handy and Boarnet (2014) for earlier studies).

Like Cervero and Hansen (2002), the Calculator uses urbanized counties (those within MSAs) as the unit of analysis for capacity expansions on non-interstate highways, expressways, and major arterials managed by a governmental agency (mostly Caltrans). The Calculator also uses a similar VMT elasticity (0.75) for those facilities as Cervero and Hansen (2002) estimated for state-owned and maintained roadways (0.79), and within the range Duranton and Turner (2011) found for non-interstate "major roads" in the urbanized areas of MSAs (0.67 to 0.89). The Calculator's 0.75 elasticity is rounded down from the estimates of Cervero and Hansen (2002) and Duranton and Turner (2011), in part to account for the small potential substitution effect discussed in Duranton and Turner (2011). The 0.75 elasticity is also consistent with the longer-term elasticities calculated in other recent studies for combined major road types in the US (Melo, Graham and Canavan, 2012; Graham *et al.*, 2014; Hymel, 2019).

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[4] Besides non-interstate highways, these "major roads" included principal arterials, minor arterials, and collectors.

Comparing the Calculator Estimates to the Induced Travel Analyses for Five Highway Projects in California

Our conversations with Caltrans and others highlighted a need to better understand how the Calculator's induced VMT estimates compare to other induced travel analyses. We started to address that need as part of an earlier project, where we applied the Calculator to estimate the VMT induced by five highway expansion projects in the state that had undergone environmental review within the last 15 years. The five projects are: (1) the U.S. Highway 101 HOV Widening (Marin-Sonoma Narrows), (2) State Route 1 Corridor Analysis of HOV Lanes (Santa Cruz), (3) the State Route 210 Mixed-Flow Lane Addition (San Bernardino), (4) the State Route 99 South Stockton Six-Lane Project, and (5) the Interstate 405 HOV Widening. After estimating each project's induced VMT using the Calculator, we compared each estimate with the corresponding induced travel analysis completed for the project's actual environmental impact assessments (Volker, Lee and Handy, 2020).

We found that the environmental analysis documents for the five projects varied wildly in their discussion of induced vehicle travel impacts. Two documents did not discuss the induced travel phenomenon at all. And the only two documents to analyze it in detail did so in responses to comments, not in the original analysis. Even when the documents did analyze induced travel in detail, the discussion of the effect was internally inconsistent and inconsistent with the induced travel literature.

In terms of quantitative analysis, three of the five documents reported estimates of induced VMT. And all three estimates were lower than what we estimated using the Calculator. In two of the three cases, the estimates were an order of magnitude lower. Figure 2 compares the estimates.

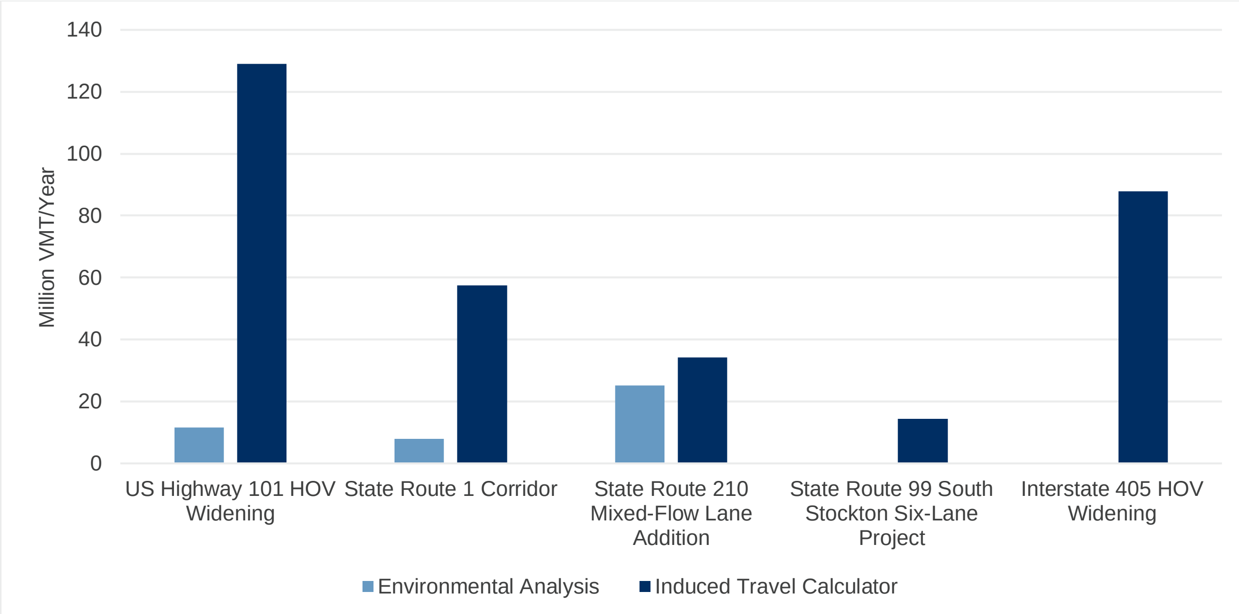

Figure 2. Induced VMT Estimates for the Five Highway Expansion Projects

Overall, our results provide additional evidence that environmental analyses often fail to consistently and accurately discuss—let alone estimate—the induced travel effects of highway capacity expansion projects. Our full analysis is published in the Transportation Research Record: Journal of the Transportation Research Board (Volker, Lee and Handy, 2020).

Technical Assistance Efforts and Planned Improvements to the Calculator

Our conversations with Caltrans and others highlighted several needs in addition to better understanding how the Calculator compares to other induced travel analyses. These additional needs were: (1) for NCST to provided continued technical assistance to agencies and other practitioners in applying the Calculator; and (2) ongoing maintenance of the Calculator, and updates and improvements to its functionality where feasible. This short-term project focused on those two goals. We summarize our efforts and upcoming plans below.

Technical Assistance

Throughout 2020, we were in frequent communication with staff at Caltrans and other practitioners about how to use the Calculator more formally in environmental analyses of highway expansion projects, both in California and elsewhere. Most prominently, we provided technical assistance to Caltrans as it developed its Transportation Analysis Framework, which helps guide CEQA transportation impact analysis for projects on the State Highway System. That technical assistance entailed numerous emails and calls regarding how the Calculator works, the research and data that underpins it, and potential ways to improve the Calculator and the information on the Calculator website. We also conducted further literature reviews as part of this process and iteratively updated the Calculator website along the way. In addition, Dr. Handy was a panelist on the expert panel convened by Caltrans to guide its choice of induced travel estimation methods for the Transportation Analysis Framework. Dr. Volker also consulted with the panel in an informal capacity. Caltrans published the Transportation Analysis Framework in September, in which it recommended that the Calculator be used where possible to estimate—or at least benchmark—induced VMT: "In cases where the NCST Calculator can be directly used, it should either be used exclusively or used to benchmark results from a [travel demand model]" (California Department of Transportation, 2020, p. 14).

In addition to working with Caltrans, we also communicated about the Calculator with other agencies, NGOs, consultants, academics, and other interested people, primarily in response to queries about how to apply the Calculator (or induced travel concepts generally) to analyze highway capacity expansion projects, including projects elsewhere in the United States (outside of California) and even internationally. For example, we consulted with the Institute for Transportation and Development Policy about estimating the induced VMT from two proposed highway project in other countries. We advised consultants regarding estimating induced travel from highway projects in the Washington, D.C. and Portland, Oregon regions. We met with the Regional Modeling Working Group in the San Francisco Bay Area to discuss the Calculator. And we frequently receive and respond to informational queries about the Calculator from members of the public.

Overall, our technical assistance efforts have both responded and contributed to the substantial interest in the Calculator. Across the last calendar year (2020), approximately 1,800 people used the Calculator at least once, according to Google Analytics.

Updating and Improving the Calculator

Particularly now that Caltrans has recommended using the Calculator in transportation impact analyses for projects on the State Highway System, it is essential that the Calculator be maintained and, where feasible, improved to better meet transportation impact analysis needs in California and elsewhere. To that end, we executed a contract agreement with Caltrans (State Agreement 65A0686) to explore, implement, and recommend possible improvements to the Calculator. More specifically, we plan to do three things.

First, we will improve the Calculator documentation to answer questions raised by Caltrans and others. That will include adding an FAQ page to the website, with answers to frequently asked questions like these:

- Are auxiliary lane miles included in the data used to estimate the elasticities?
- Is truck VMT included in the estimates of the elasticities?
- How do the econometric methods used in the empirical studies from which the elasticities are taken control for factors such as population growth, economic downturn, and gas price change?
- Is it appropriate to apply lower elasticities in areas with less traffic congestion?

Second, we will explore possible technical improvements to the Calculator. These include both near-term improvements based on available research and data, as well as long-term improvements that would require additional research and/or data collection. Potential improvements we will explore include the following:

- Updating the lane mile and VMT data from 2016 to more recent data;
- Applying the Calculator to toll lanes;
- Providing induced VMT estimates specific to general purpose lanes, HOV lanes, and high-occupancy toll lanes;
- Allowing users to adjust the induced VMT calculations based on project context; and
- Providing guidance using an elasticity-based method to estimate induced VMT from projects outside of California.

Third, we will explore opportunities for assessing the validity of the Calculator's induced VMT estimates. This might involve, for example, applying the Calculator to actual projects in a variety of contexts and comparing its estimates to those from travel demand models. However, a true validation of the Calculator might not be possible, given the long periods of time over which projects are constructed and induced travel effects occur, as well as the challenge of isolating the effect of capacity expansion from the effects of other factors in real-world settings.

Conclusion

The induced travel effect is often not fully accounted for in travel demand models or in the environmental review process for capacity expansion projects. We developed an online tool—the NCST Induced Travel Calculator—to help agencies estimate the VMT induced annually by adding lanes to major roadways in California's urbanized counties. We also provided technical assistance on the Calculator and induced VMT estimation to Caltrans, other agencies, NGOs, consultants, academics, and other interested people. Caltrans now officially recommends using the Calculator in transportation impact analyses for projects on the State Highway System. Efforts have also been made to apply the Calculator's elasticity-based method to estimate induced VMT from out-of-state highway capacity expansion projects. With growing usage, it is essential that the Calculator be maintained and, where feasible, improved to better meet transportation impact analysis needs in California and elsewhere. To that end, we have a new contract with Caltrans to (1) improve the Calculator documentation to answer questions raised by Caltrans and others; (2) explore possible technical improvements to the Calculator; and (3) explore opportunities for assessing the validity of the Calculator's induced VMT estimates.

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