Traffic Modeling and M-83 Extended

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Presented to Montgomery County Council, July 8, 2025

The only possible justification for building M-83 is that it would relieve traffic congestion. But there is no credible evidence that it will do so.

Project proponents point to a 2017 traffic model of this project, done as part of the Midcounty Corridor Study. They claim that the traffic model shows that the project will reduce traffic congestion in the upcounty.

This is not correct. The modeling was done with the MWCOG travel demand model. Traffic models of this type cannot tell you whether new highways will reduce traffic congestion. They assume the answer to that question, and the MWCOG model assumes the wrong answer.

How much congestion relief will come from a new highway depends on how much added car traffic will emerge as a consequence of building the highway. The assumption buried in the MWCOG model is that such traffic will be negligible. In congested cities and suburbs, experience shows the opposite: new and widened highways fill up with added traffic. A USDOT report released last December documents this, based on many years of research. Since Trump took office it has been deleted from the federal website, so I am attaching it to my written testimony.

The USDOT report says that the best practice for modelers is to assume that the number of vehicle-miles driven in the area of a highway project will increase by the same percentage as the number of lane-miles of highway increases. It's good advice.

If you accept that assumption, however, you don't need a computer model to estimate how much congestion relief M-83, or any new highway, will deliver. The answer is none. Traffic will get better in some places and worse in others, but the overall level of congestion will not change. This answer is supported by many years of empirical research.

You can say a little more. Traffic will probably get better on roads parallel to the new highway and worse on roads that feed into it. If, however, you want to know how much better and worse, you do need a computer model.

The bottom line is very simple. New highways don't reduce congestion. You don't need a computer model to tell you that, and the computer model cannot tell you otherwise.

U.S. Department of Transportation, Climate Change Center
Climate Strategies that Work

IMPROVED TRAVEL DEMAND MODELING

Improved travel demand modeling enables more accurate accounting of changes in travel behavior and associated greenhouse gas emissions, which leads to transportation infrastructure investment decisions that are more fiscally responsible, alleviate long-term traffic congestion, and align with climate goals.

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OVERVIEW

Best Suited for:
Long Term
Urban & Suburban

While increasing roadway capacity by adding lanes may reduce congestion in the short term, highway infrastructure capacity expansions typically increase demand in the long term. Accurate travel demand modelling is better able to capture demand for vehicle miles that is induced by expanded roadway capacity and limited alternative transportation options like pedestrian routes and public transit service. **Induced vehicle miles traveled (VMT) can increase greenhouse gas (GHG) emissions, worsen air quality, reduce safety, increase noise pollution, and create less livable communities for families and businesses near expansion projects.** Furthermore, these projects may not alleviate the highway congestion that they are intended to reduce. In other words, a road is likely to fill up long before its due for reconstruction.

Did you know?

In Walkable City, author and planner Jeff Speck reports on a meta-analysis of studies that found "on average, a 10% increase in lanes miles induces an immediate 4% increase in vehicle miles traveled, which climbs to 10%—the entire new capacity—in a few years."

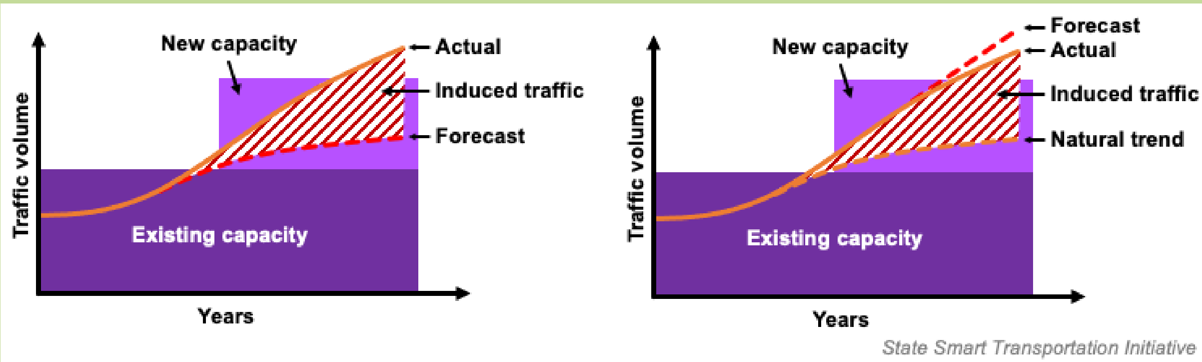
Many commonly used travel demand models, such as traditional "four-step" models, face challenges in accounting for the full range of changes in travel behavior and land use that may result from additional roadway capacity. Changes include the decentralization of land use patterns, greater generation of auto trips, increases in trip distances, and decreased use of transit and nonmotorized modes. These models also may have limited sensitivity to projects and strategies that promote alternatives to driving, such as bike and pedestrian facilities.

Defining Induced Demand

Induced demand refers to the rise in demand for travel demonstrated by additional vehicle miles travelled that occur in response to an increase in roadway supply. Induced travel demand follows basic economic principles – as the cost of driving does down, the quantity of driving goes up. Any initial increases in travel speeds are temporary, and traffic-related air pollution and greenhouse gas emissions ultimately increase as a result of adding new lanes. **Building additional roadway capacity induces more vehicle travel** (Volker & Handy, 2023). Learn more about induced demand at the UC Davis National Center for Sustainable Transportation.

Activity-based models, which use dynamic traffic assignment, and integrated transportation land use models can better capture traveler behavior as it changes in response to existing and changing conditions. These tools better account for many changes in travel behavior and can provide better information to decisionmakers, helping prioritize projects that have a higher potential for meeting local and regional goals such as reducing GHG emissions by encouraging use of transit and alternative transportation modes. See the Best Practices section for five key approaches to improve the accuracy of travel demand forecasts.

> *Meta-analyses of numerous studies show that a 10% increase in metropolitan lane miles induces an almost immediate 3-6% increase in VMT, which climbs to 6-10%–the entire new capacity–in the following five to ten years (Speck, 2012; Handy and Boarnet, 2014).*



Common depiction of induced demand (left) versus case with aggressive traffic forecast (right) (Source: State Smart Transportation Initiative)

Travel demand modelling can be used in a variety of project types, including:

- Changes in capacity
- Changes in pricing schemes (including, tolls, congestion pricing, fare structure, parking pricing)
- Changes in land-use
- Improvements to existing infrastructure

Travel demand modelling can inform many decisions, including:

- Scale and scope of projects
- Route planning
- Station locations
- Service frequencies
- Pricing strategies

GREENHOUSE GAS REDUCTION POTENTIAL

This section provides an overview of greenhouse gas (GHG) emission reductions associated with the strategy. It highlights key findings and relevant metrics from GHG modeling resources, peer-reviewed studies, and real-world applications.

IGNORING INDUCED TRAFFIC EXAGGERATES THE BENEFITS OF CAPACITY EXPANSIONS

Research shows that highway expansion projects are often pursued for short-term congestion relief and that environmental analyses required by federal and state law do not always account for induced travel effects (Lee, 2023; Volker and Sinetos, 2021).

UC Davis researchers reviewed five highway expansion projects approved in California and found that only three projects' environmental reviews estimated induced travel effects. Analyses conducted for these three projects failed to accurately analyze induced vehicle travel and greatly over-estimated the congestion and GHG benefits of highway expansion (Volker, Lee, and Handy, 2021).

Litman (2024) provides examples and case studies showing what happens when induced demand is not factored into analysis for capacity expansion projects. In one example where two lanes are added to a four-lane highway, if generated traffic is ignored in travel demand modeling, traffic will grow at a steady 2% per year. When generated traffic is considered, modeling predicts much faster growth until maximum lane capacity is reached after about 9 years. There is a difference of over 1,000 trips per peak hour on the expanded roadway when induced travel is included in modeling (Litman 2024).

CAPACITY EXPANSION PROJECTS DRIVE INCREASES IN VMT AND EMISSIONS

Roadway capacity projects that add lane miles can significantly drive up VMT. For example, the Rocky Mountain Institute estimates that traffic generally increases by a range of 2 to 8 million VMT per year for every new highway lane mile added in Colorado's urbanized areas. More densely populated areas with busier roads tend to fall on the upper end of the range (Rowland, 2021). Improved travel demand modeling could help prioritize projects that address roadway congestion issues without dramatic increases in VMT and associated emissions.

There is about a 1:1 ratio in percent change in GHG emissions to percent change in VMT. Increasing the number of lane miles, and therefore increasing VMT for a given roadway by – say 25% - would therefore increase GHG emissions by about 25% as well (CS, 2009).

Volker and Handy (2023) reviewed 12 studies related to induced travel and found clear linkages between highway capacity expansion and VMT. Roadway capacity expansions of 10% are likely to increase VMT by 3 to 8% in the short term and 8 to 10% or more in the longer term.

The full impacts of new or extended lanes on VMT across a road network are typically seen within 3 to 10 years. Reasons for VMT increase include (Volker & Handy, 2023):

- People may shift from other modes to driving.
- Drivers may make longer or more frequent trips.
- In the longer term, people may move farther away from where they work, or take jobs farther away from home.

CLIMATE-SMART SOLUTIONS TO ROADWAY EXPANSIONS

Roadway expansions may reduce congestion and per-mile emission rates in the short-term but are likely to increase total emissions in the longer term. The lowest vehicle emission rates are typically seen at 20 to 50 miles per hour (mph). Adding lanes may initially reduce extreme congestion (Levels of Service [LOS] E or F) and associated emissions, but these benefits are typically small and offset by speeds above 50 mph and induced VMT (Litman, 2024).

Investing in high-quality public transportation, road pricing programs, and commuter benefits can provide greater emissions reductions compared with capacity expansions (Litman, 2024).

Influence on highway policy largely rests at the local level. Comprehensive research into the effects of capacity expansions found that new auto capacity made up a significant share of planned and programmed funding in all California regions (as of 2023). Highway expansions were primarily designed to support new auto-oriented land development. Local policies that support active transportation and multimodal investments can help reverse these spending patterns (Lee, 2023).

The Convenient Transportation Action Plan, developed by the U.S. Department of Transportation, Department of Energy, Environmental Protection Agency, and Department of Housing and Urban Development, was released in December 2024. The plan emphasizes prioritizing fixing and modernizing existing assets, rather than expanding road infrastructure (e.g., widening highways), to enable a more convenient and fiscally responsible transportation system. Examples of fiscally responsible transportation investments include:

- Active Transportation projects, including new bicycle and pedestrian infrastructure. *See the Active Transportation Strategy Guide.*
- Transit-oriented development to support more walkable and dense communities with better access to transit services. *See the Transit-Oriented Devolvement Strategy Guide*.
- Retrofitting highways to reconnect communities, creating space for transit or active transportation.
- Adding grade separations at train crossings to prevent lengthy detours and vehicle idling while trains are passing.
- Fixing existing assets, like bridges, to prevent drivers from making detours and adding unnecessary miles to vehicle trips.
- Congestion pricing and parking pricing to reduce congestion and encourage lower carbon-intensity travel modes. *See the Road Pricing Strategy Guide.*

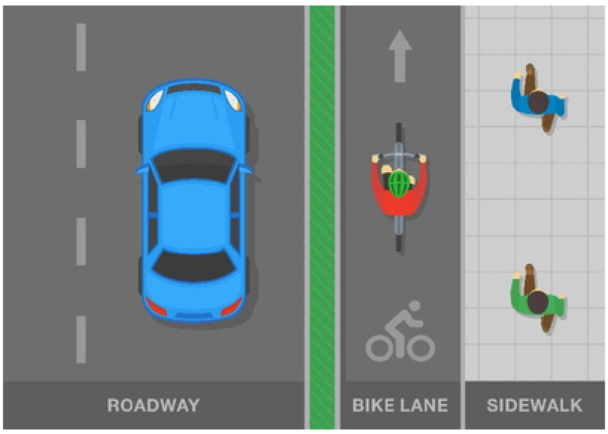
CO-BENEFITS

This section outlines the multiple co-benefits associated with the strategy, including safety benefits, local air quality improvements, and improved accessibility. Each co-benefit presents examples that demonstrate how the strategy enhances regional or community well-being while addressing emissions.

SAFETY

Travel demand modeling can inform better decisions for reducing VMT and support the development of complete streets, providing a safer environment for pedestrians and bicyclists and decreasing opportunities for vehicle-pedestrian and vehicle-bicycle crashes. Safety improvements, in turn, positively reinforce uptake of low-emission modes (Boutros et al., 2023).

Focusing on highway maintenance and retrofitting over continual expansion can make roads safer for all road users. For example, a post-project evaluation of a highway removal project in Rochester, New York found that the project increased walking by 50 percent and biking by 60% (McCormick, 2020).



AIR QUALITY AND HEALTH

Capacity expansions increase traffic-related air pollution in the medium- to long-term. Pollution from tailpipe and non-tailpipe emissions contribute to health inequities for communities, especially communities of color, which are disproportionately located near major roadways (USEPA, 2014; Jbaily et al., 2022).

Improved travel demand modeling supports transportation agencies and planners in prioritizing fiscally responsible transportation infrastructure projects that reduce congestion, reduce greenhouse gas emissions from individual trips, and decrease air pollutants that are harmful to human health (Litman, 2024).

Modeling the effects of generated traffic can show how adding lanes increases air pollution. Post-project data from a capacity expansion on I-405 in Los Angeles show increased air pollution and limited congestion relief (Planetizen, n.d.).

COST SAVINGS

Longer and induced vehicle trips can lead to more automobile dependent transportation and land use over the long term. These costs are difficult to quantify but are likely significant. Improved travel demand modeling helps account for additional vehicle trips and vehicle miles travelled that would be generated (or induced) by expanded highway capacity and any associated limited access to other options, like pedestrian street-level routes or public transit service. Limiting transportation options to trips available by car, or incentivizing longer car trips, may increase household transportation costs to include car ownership, car maintenance, gas costs, and parking fees (Litman, 2024).

Instead of adding capacity, transportation can be repriced in an equitable manner by converting fixed costs (like insurance premiums and vehicle registration fees) to variable costs that are charged on a per-mile basis. A FHWA study found that bundling six different repricing strategies could reduce vehicle miles traveled by 32 percent and save low-income drivers $460 per year (Viggiano, et al., 2024).

ECONOMIC GROWTH

Accurately accounting for induced demand from new highway capacity expansion and other transportation infrastructure projects enables transportation agencies to prioritize funding for projects that meet demand and enable economic growth and community vitality (Litman, 2024).

Research has shown that public transit and active transportation projects produce more jobs per dollar than road infrastructure projects (Smart Growth America, 2010; Peltier, 2011). Active transportation projects can also spur economic development and generate revenue to cover the relatively minimal maintenance costs of the active transportation network (WeConservePA).

RURAL

Induced demand occurs in rural areas too. Any time a project increases average travel speeds, makes travel times more reliable, makes driving perceptibly safer or less stressful, or opens up access to new areas, VMT increases (Volker & Handy, 2023).

According to the National Bridge Inventory, average detour miles for rural travelers is nearly twice as much as detours by urban travelers. Fixing bridges in rural areas to prevent unnecessary detours can lead to a significant reduction in miles traveled for both passengers and goods and reduce air pollution in near-highway communities (BTS Rural).

RESILIENCE AND ADAPTATION

Highway capacity expansions can trigger land use and land growth effects that reduce the resilience of regions and communities to climate change. In one study that used remote sensing technology to analyze the impacts of highway capacity expansion in California on land use and land cover (LULC), researchers found that expansion projects, particularly those located near less-developed areas with more extensive natural vegetation, can cause significant habitat and vegetation loss (Alexander et al., 2023). This vegetation loss, along with the increase in impervious surfaces that naturally comes with highway development, can increase flood risk during storms and have wide-reaching effects on ecosystems and biodiversity (Massachusetts Climate Action Tool).

COST CONSIDERATIONS

COST EFFECTIVENESS

Travel demand modeling can be cost-effective in the long run by helping policymakers anticipate and plan for infrastructure needs and potentially reducing unnecessary spending on projects that may exacerbate congestion. Better modelling enables more efficient allocation of resources and helps avoid costly overruns by accounting for future demand shifts (Litman, 2024).

COST OF IMPLEMENTATION

The cost of updating a travel demand model and incorporating new planning and travel demand forecasting processes can vary widely depending on factors such as the scope and complexity of the model, the availability and quality of data, and the need for external technical input. The benefits of accurate modeling outweigh these initial costs through more efficient infrastructure planning and investment decisions.

See the Convenient Transportation Action Plan for information about fiscally responsible transportation investments.

FUNDING OPPORTUNITIES

FHWA's **Prioritization Process Pilot Program** (PPPP) funds the development and implementation of pilot prioritization processes that address and integrate the components of existing transportation programs and support projects that improve safety, climate change and sustainability, equity, and economic strength and global competitiveness consistent with DOT's strategic goals. The PPPP supports data-driven approaches to planning, which may include modeling the impacts of highway expansion projects.

OST-R Research Opportunities: OST-R coordinates the Department's research investment, oversees the development of Annual Modal Research Plans, and provides opportunities for research collaboration with public and private sector partners. For example, DOT invests in the future of transportation through its University Transportation Centers (UTC) Program, which awards and administers grants to consortia of colleges and universities across the United States. The UTC Program advances the state-of-the-art in transportation research and technology, and develops the next generation of transportation professionals. The Congressionally-mandated program has been in place since 1987 to help address our Nation's ever-growing need for the safe, efficient, and environmentally sound movement of people and goods.

COMPLEMENTARY STRATEGIES

Travel demand modelling can be used to support policymakers in transportation infrastructure project prioritization and may lead to deprioritizing certain highway capacity expansion projects that cause, rather than alleviate, highway traffic congestion. Providing safe and accessible active transportation infrastructure can serve as an alternative transportation funding priority and can support community access to low-carbon alternatives to driving reducing reliance on personal vehicles, particularly for short-distance trips. This information can help guide the allocation of resources to maximize the benefits of these projects.

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Travel demand modeling can be used to support policymakers in transportation infrastructure project prioritization and may lead to deprioritizing certain highway capacity expansion projects that fail to alleviate highway traffic congestion in the long term. Providing safe and accessible public transit infrastructure can serve as an alternative transportation funding priority and can support community access to low-carbon alternatives to driving reducing reliance on personal vehicles, particularly for short-distance trips. This information can help guide the allocation of resources to maximize the benefits of these projects.

Travel demand modeling plays a critical role in assessing the effects of road pricing on transportation systems. By analyzing how pricing schemes influence travel behavior, transportation planners can anticipate changes in travel demand elasticity and sensitivity to changes in price. This analysis helps design effective congestion mitigation strategies.

View All Strategies

CASE STUDIES

EMPIRICAL ESTIMATES OF INDUCED TRAVEL ELASTICITIES FROM AREA-WIDE STUDIES

Volker and Handy (2022) reviewed 12 studies that estimated an elasticity of (vehicle miles traveled) VMT (or vehicle kilometers traveled, VKT) with respect to lane miles. In the U.S., short-run elasticity estimates range from 0.07-0.76, while longer-run elasticity estimates range from 0.26-1.06. Excluding studies that included local roads, which tend to have the lowest VMT density of all road types and provide the least per-mile improvement in travel speed or access, the range of elasticities shrinks to 0.23-0.76 (short-run) and 0.77-1.06 (long-run). This research was used to support an update to the elasticities used in the Induced Demand Calculator, which allows users to estimate VMT induced as a result of lane additions in California.

What is elasticity?

- Elasticity is the percentage increased in VMT that results from a 1% increase in lane miles. An elasticity of 1.0 means that VVMT will increase proportionally with lane miles.
- Short-run elasticities captured induced VMT effects that occur immediately and within the first 1-3 years after a capacity expansion, such as substituting driving for other modes.
- Long-run elasticities capture a broader range of induced travel effects that occur after 3 to 10 years, including persistent short-run effects and changes in land use.

INDUCED VMT FROM CALIFORNIA HIGHWAY EXPANSION PROJECTS

Researchers applied the California Induced Demand Calculator to five highway expansion projects approved in California between 2009 and 2021 and found that for the three projects that estimated induced travel effects, all three estimates were lower (two were more than 10 times lower) than Calculator estimates. The use of improved travel demand modeling can provide decisionmakers and the public with more accurate estimates of induced travel effects and added traffic, air pollution and GHG emissions.

IMPLEMENTING IMPROVED TRAVEL DEMAND MODELING: **WHAT TO READ NEXT**

There are several ongoing efforts that can help State DOTs, MPOs and local governments implement travel demand modeling. USDOT is required by the Bipartisan Infrastructure Law (PL 117-58 Sec. 11205. Travel Demand and Data Modeling) consider the historical accuracy of travel demand modelling and support States and MPOs in increased travel demand modelling accuracy efforts. The Transportation Research Board is also actively pursuing research to develop an Induced Demand Assessment Framework and a guide for DOTs to apply the assessment framework to policy and planning analysis.

Check out these resources to learn more about highway expansion policy and the importance of accounting for induced travel in environmental analyses:

- Increasing Highway Capacity Induces More Auto Travel (Volker and Handy, 2023).
- The Policy and Politics of Highway Expansions (Lee, 2023).
- Generated Traffic and Induced Travel (Litman, 2024).

BEST PRACTICES FOR TRAVEL DEMAND MODELING ACCURACY

This section provides best practices for travel demand forecasting based on review of the literature and consultation with academic experts in the field (Volker and Handy, 2022; Volker et al. 2021; Mladenovic and Trifunovic, 2014; Marshall, 2018). Improved and updated models provide more accurate assessment of future travel demand when prioritizing investments in transportation infrastructure projects.

- **Account for Historical Accuracy:** Travel demand modelling should account for historical accuracy of projections. In cases where systematic biases or inaccuracies are identified via comparisons to historical projections, models should be adjusted to compensate for these shortcomings.
- **Account for National Studies:** Many studies assert that long-term travel demand elasticity associated with new lane miles is consistently around 1.0. This means that highway travel demand tends to rise to fill new capacity over time, reducing the congestion relief of highway capacity expansion projects, while negatively impacting regional air quality through induced vehicle miles traveled. Project environmental and other analyses should incorporate best-in-class research and analysis on travel demand.
    - This analysis applies to urban and suburban areas, but the research is developing for the impact of highway capacity expansion projects in rural areas outside of metropolitan statistical areas and Metropolitan Planning Organization areas.
- **Disclose Model Considerations:** In order to foster robust engagement and promote government transparency, travel demand modelling and project prioritization processes (including State Transportation Improvement Plans) should clearly and simply disclose the limitations of the travel demand model with respect to measurement of induced travel and land use growth effects.
- **Intervene Early in Planning Phase:** Accounting for induced demand and the possibility of little or no roadway congestion relief in the planning and environmental review processes is critical to understanding the costs and benefits of highway expansion projects and other transportation investments. USDOT recommends that state and local decisionmakers account for induced travel during the Planning Phase using the best available research on elasticities of vehicle miles travel relative to lane mile.

- **Consider Congestion Mitigation Strategies:** Strategies that mitigate congestion need to be taken into consideration including innovative technology solutions, traffic efficiency improvements, cordon and congestion pricing, as well as conversion of general-purpose lanes to high occupancy vehicle lanes or high occupancy toll lanes can mitigate congestion (see the Transit Cooperative Research Program Report 95). These strategies, alongside fast, reliable, and affordable transit, improvements to cycling and pedestrian networks, and compact development have the potential to reduce vehicle miles traveled and support equitable transportation access.

RESOURCES

GENERAL RESOURCES

Transportation Research Board Critical Issues in Transportation for 2024 and Beyond: Research in Progress – Induced Demand Assessment Framework: A Guide: This guide presents local agencies and departments of transportation with an assessment framework on induced demand, including defining induced demand, presenting data needed to develop assessments, piloting and testing the framework, and communicating findings to build consensus.

Transportation Research Board National Cooperative Highway Research Program Traffic Forecasting Accuracy Assessment Research: This report develops a process and methods to analyze and improve the accuracy, reliability, and utility of project-level traffic forecasts.

Closing the Induced Vehicle Travel Gap between Research and Practice and The Policy and Politics of Highway Expansions: These two academic papers consider the gap between academic documentation of induced travel effects and the practices of transportation agencies in accounting for travel demand.

The Massachusetts Climate Action Tool allows users to access information on climate change impacts and vulnerability of species and habitats, as well as explore adaptation strategies and actions to help maintain healthy, resilient natural communities based on location and interests.

Check out these resources to learn more about highway expansion policy and the importance of accounting for induced travel in environmental analyses:

- Increasing Highway Capacity Induces More Auto Travel (Volker and Handy, 2023).
- The Policy and Politics of Highway Expansions (Lee, 2023).
- Generated Traffic and Induced Travel (Litman, 2024).

TOOLKITS AND MODELLING APPROACHES

The National Center for Sustainable Transportation (NCST) developed the California Induced Travel Calculator, which allows users to estimate induced vehicle miles traveled (VMT) from highway capacity expansion projects. As induced VMT is often not accurately accounted for when evaluating transportation projects, this calculator offers a simple way to estimate induced VMT for a more complete understanding of the impacts on travel demand. This helps to accurately analyze whether the congestion benefits of a project might be outweighed by the potential induced VMT to select projects that will have high decarbonization potential. However, a study evaluating the application of the Induced Demand Calculator for rural projects found that the tool consistently overestimated VMT growth. This further demonstrates the need to better understand demand elasticity.

Rocky Mountain Institute (RMI) in coordination with Transportation for America, the National Resources Defense Council, and a consortium of other partners to create the State Highway Induced Frequency of Travel (SHIFT) Calculator, which draws on formulas sourced from decades of proven scientific literature to deliver detailed, community-specific induced demand forecasts with the click of a button. RMI's tool makes it easy to estimate induced demand, relative to how many new lanes miles are built in a given city.

Colorado DOT (CDOT) uses an advanced state-wide activity-based model (ABM) to estimate travel demand. As an ABM, CDOT’s model derives travel from each person’s choice of daily activities, providing a realistic depiction of changes in people travel behavior as travel conditions change. This and other features permit CDOT’s statewide model to support sensitivity to “induced demand,” much better than older model forms.

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