The Minnesota Experience

Implementing Induced Travel Guidance

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Office of Transportation System Management

DEPARTMENT OF TRANSPORTATION

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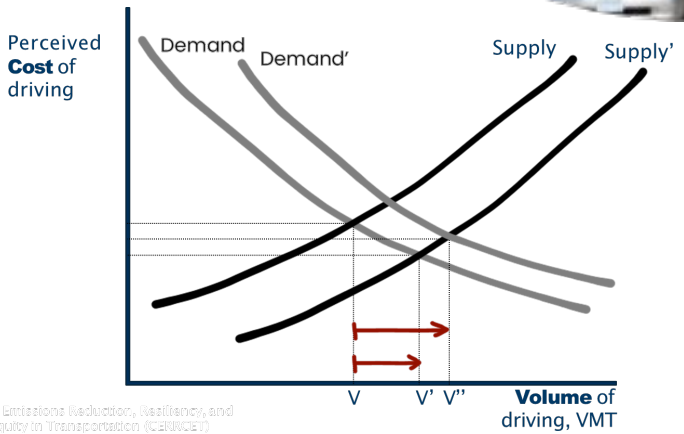
SRF – Paul Morris

Measuring impacts from highway expansion

What goes up, what goes down



1. **Transit Expansion**
2. **Transit Service Improvements**
3. **Active Transportation Infrastructure** (Biking and Walking)
4. **Micromobility**
5. **Transportation Demand Management**
6. **Parking Management**
7. **Land Use Changes** (Residential, Mixed-Use, Transit-Oriented)
8. **Infrastructure Improvements Related to Traffic Operations**
9. **Natural Systems**

Expanding highways

Transportation options + connected land use

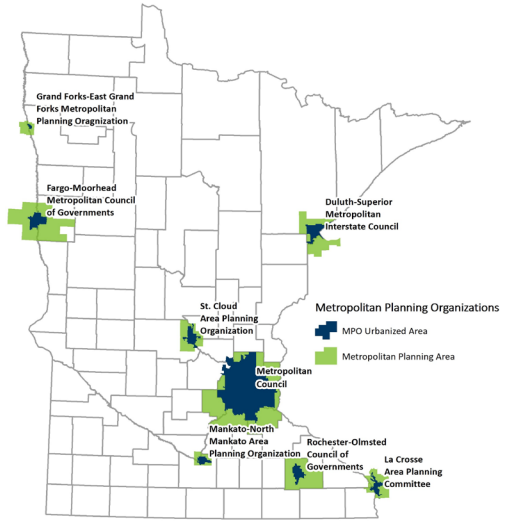
Key Dates and Legislative Direction

2023 Session: Legislature requires emissions impact assessment of highway capacity expansion and creates work group to address

2024 Session: Work group submits report with recommendations to effectively implement legislation. Legislature adopts recommendations and establishes Technical Advisory Committee

2025: New highway expansion projects need to assess impacts and offset before entering a STIP or TIP

Future: Mature multimodal emissions analysis and assess regional program outcomes



Technical Advisory Committee

(established by the legislature)

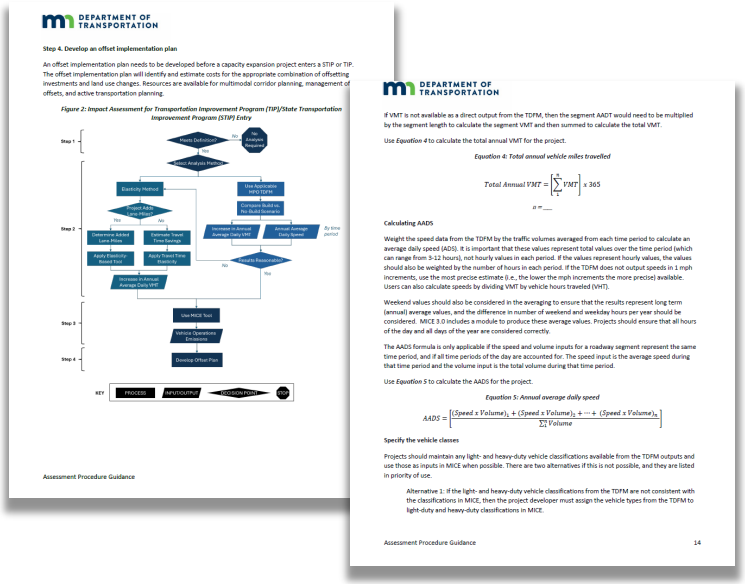
Department of Transportation - **Jon Solberg**
Metropolitan Council - **Jonathan Ehrlich**
County - **Lyndon Robjent**, Carver County
City - **Marcus Culver**, City of Brooklyn Park
Pollution Control Agency - **Kate Knuth**
U of M: Center for Transportation Studies – **Eric Lind**
MPO from Greater Minnesota - **Stephanie Halford**
Active transportation - **Mitzi Alex**, Toole Design
National expert - **Robert Noland**, University of Rutgers

How capacity expansion projects are assessed
Summary

Step 1: Determine if a project adds lanes for more than a half mile or creates a new interchange on the highway system, would be a capacity expansion project (typically 3-6 projects a year)

Step 2: That project will then be assessed for new impacts (increased emissions and VMT) from building the project over a 20-year analysis period

Step 3: Projects will need to offset any increases in emissions and VMT that will result from the project using any of the nine categories identified by the legislature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Step 4. Develop an offset implementation plan

An offset implementation plan needs to be developed before a capacity expansion project enters a STIP or TIP. The offset implementation plan will identify and estimate costs for the appropriate combination of offsetting investments and land use changes. Resources are available for multimodal corridor planning, management of offsets, and active transportation planning.

Figure 2: Impact Assessment for Transportation Improvement Program (TIP)/State Transportation Improvement Program (STIP) Entry

Assessment Procedure Guidance

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If VMT is not available as a direct output from the TDFM, then the segment AADT would need to be multiplied by the segment length to calculate the segment VMT and then summed to calculate the total VMT.

Use *Equation 4* to calculate the total annual VMT for the project.

Equation 4: Total annual vehicle miles travelled

$$Total\ Annual\ VMT = \left[\sum_{i}^{n} VMT\right] x\ 365$$

$n =$ ___

Calculating AADS

Weight the speed data from the TDFM by the traffic volumes averaged from each time period to calculate an average daily speed (ADS). It is important that these values represent total values over the time period (which can range from 3-12 hours), not hourly values in each period. If the values represent hourly values, the values should also be weighted by the number of hours in each period. If the TDFM does not output speeds in 1 mph increments, use the most precise estimate (i.e., the lower the mph increments the more precise) available. Users can also calculate speeds by dividing VMT by vehicle hours traveled (VHT).

Weekend values should also be considered in the averaging to ensure that the results represent long term (annual) average values, and the difference in number of weekend and weekday hours per year should be considered. MICE 3.0 includes a module to produce these average values. Projects should ensure that all hours of the day and all days of the year are considered correctly.

The AADS formula is only applicable if the speed and volume inputs for a roadway segment represent the same time period, and if all time periods of the day are accounted for. The speed input is the average speed during that time period and the volume input is the total volume during that time period.

Use *Equation 5* to calculate the AADS for the project.

Equation 5: Annual average daily speed

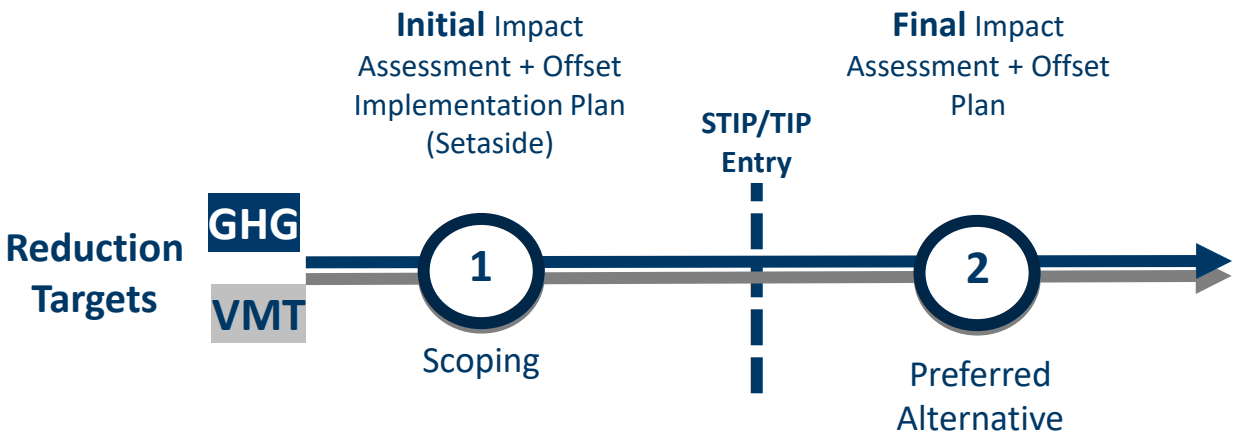
$$AADS = \left[\frac{(Speed\ x\ Volume)_1 + (Speed\ x\ Volume)_2 + \cdots + (Speed\ x\ Volume)_n}{\sum Volume}\right]$$

Specify the vehicle classes

Projects should maintain any light- and heavy-duty vehicle classifications available from the TDFM outputs and use those as inputs in MICE when possible. There are two alternatives if this is not possible, and they are listed in priority of use.

Alternative 1: If the light- and heavy-duty vehicle classifications from the TDFM are not consistent with the classifications in MICE, then the project developer must assign the vehicle types from the TDFM to light-duty and heavy-duty classifications in MICE.

Assessment Procedure Guidance 14



Sensitivity Testing on Induced Travel

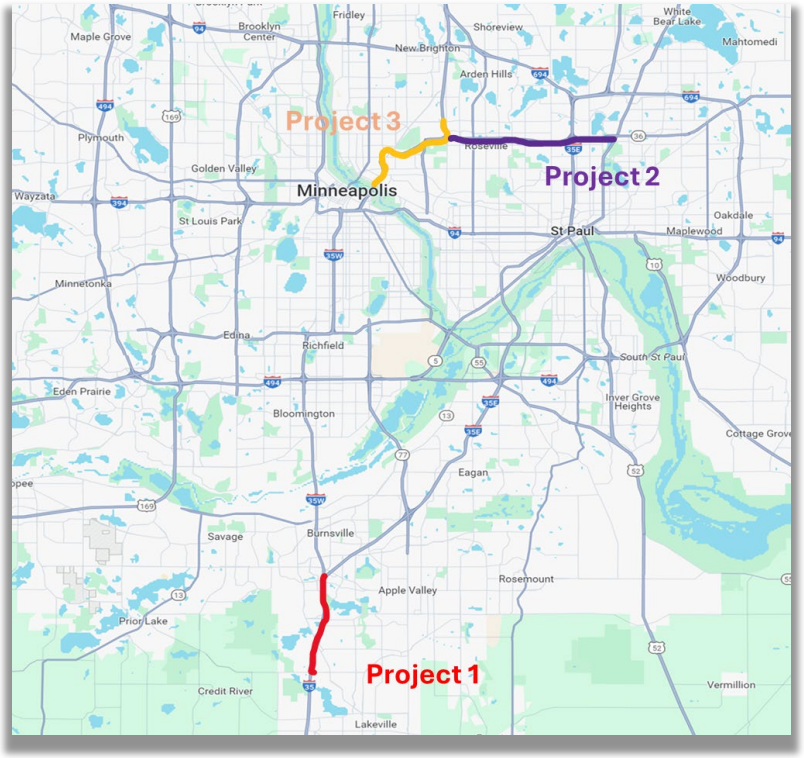
TDM Capabilities + Gaps from project testing

Travel demand model

Most capable

- Route changes (diversion from other roads)
- Destination changes (longer trips)
- Mode changes (shift to auto)
- Newly generated trips (more frequent trips)
- More dispersed, auto-dependent land development
- Faster regional growth / population in-migration
- More freight movement (logistics changes)

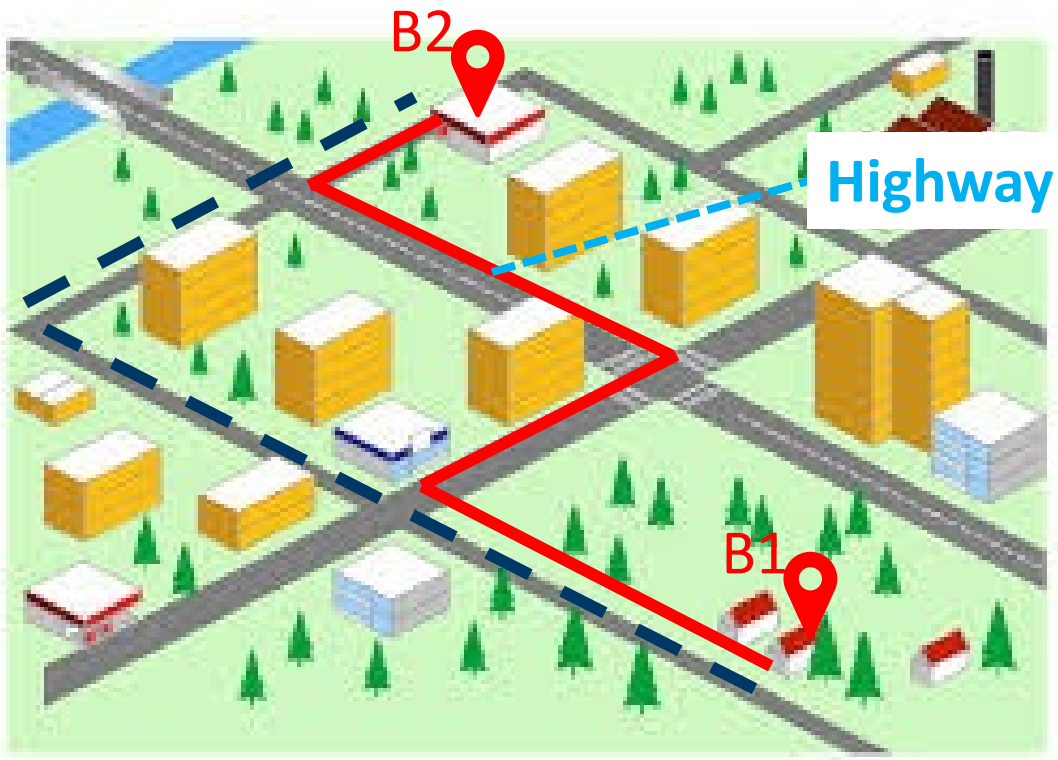
Not capable OR not a function of the TDM



Credit: HFTE Inc.

What about trip diversion from low volume roads?

What about traffic diversion from lower volume roads?



Source	Share of Induced VMT
Increased Household Driving	9-39%
Increased Commercial Truck VMT	19-29%
Traffic Diverted from Other Routes	0 to 10%
Population Increase from Migration	5-21%

Source: Duranton and Turner (2011); Volker et al (2022)

- The lack of a substitution effect (diversion) for lower-classification roadways is not all that surprising since they also serve as complements to higher-classification roadways, with most trips on state highways beginning and ending on non-state facilities. (Hansen and Huang 1997) conclude that "**this complementary relationship compensates for, or even outweighs, the substitution effect stemming from traffic diversion"** (Volker 2022)

- **Only a small amount (up to ten percent of the total) appears to be substitution from other roads.** New road supply tends to pull vehicles onto the road. Or, as they put it, induced VMT "mostly reflects traffic creation rather than diversion." (Manville 2024, summarizing Duranton 2011)

Methods available for assessing impacts

Two Options, Compare when possible

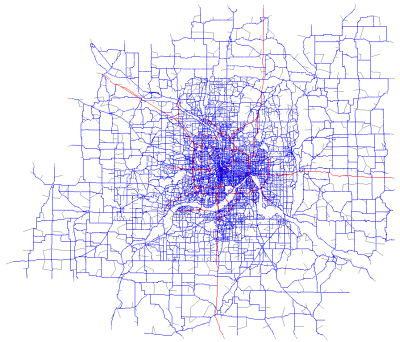
Elasticity Calculation

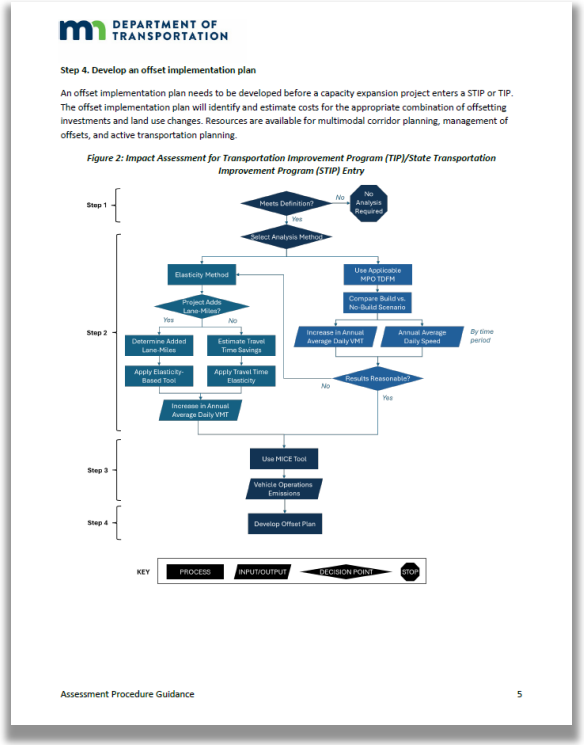
(Looking back)

$$\text{Build}_{\text{AddedVMT}} = \varepsilon \cdot \frac{\text{NewLM}}{\text{LM}} \cdot \text{VMT}$$

Travel Demand Forecast Model

(Looking forward)





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Assessment Procedure Guidance 5

Assessment guidance:

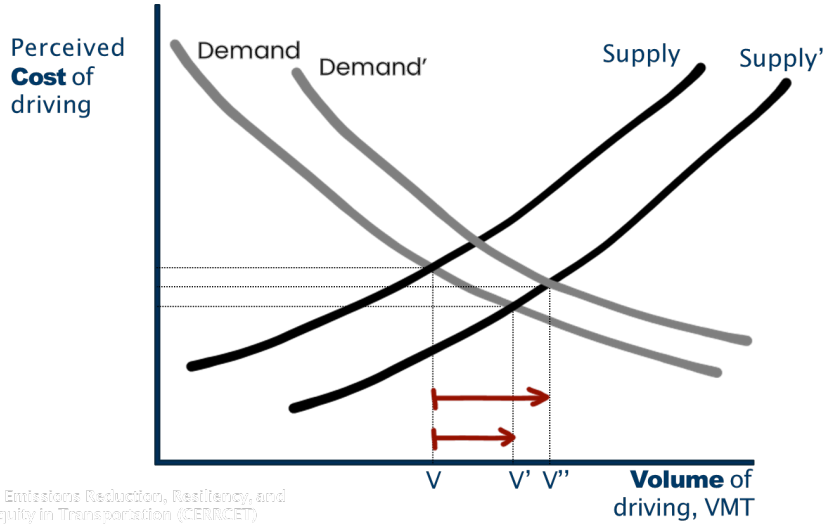
Transportation Greenhouse Gas Emissions Impact Assessment - Sustainability and Public Health – MnDOT (https://www.dot.state.mn.us/sustainability/ghg-assessment.html)

What we have learned

1. Research has shown that capacity expansion induces additional vehicle travel over a 20-year project design period [1, 2, 3, 4] . When the highway system is expanded, the perceived "cost" of driving goes down and the volume of vehicles miles traveled goes up. The net change in vehicle travel is well documented in the US and internationally.

2. Minnesota's own travel demand models - that are already used for decision making - show a net increase in driving on the overall system from capacity expansion

3. Less research on individual interchange conversions has been done, research that is available, shows induced travel effects



Source: UC Davis

[1] Duranton, G., and M. A. Turner. The Fundamental Law of Road Congestion: Evidence from US Cities. American Economic Review, Vol. 101, No. 6, 2011
[2] Hymel, Kent. If you build it, they will drive: Measuring induced demand for vehicle travel in urban areas. Science Direct, Vol. 76, April 2019
[3] Manville, Michael. Induced Travel Estimation Revisited. UCLA July 1, 2024
[4] USDOT Improving Travel Demand Modeling (Dec. 2024)

Questions