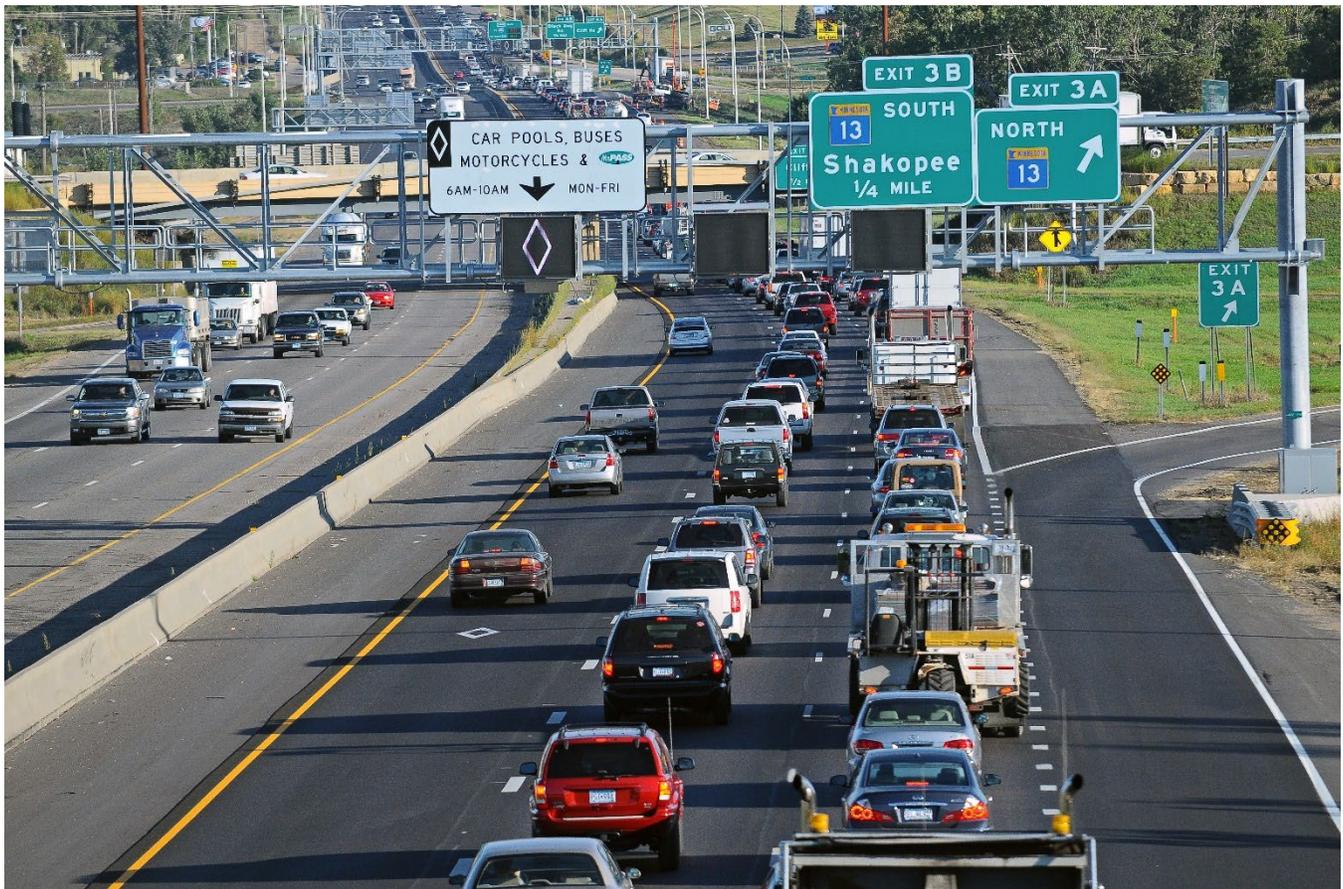


2023-2024 Report on

Transportation Greenhouse Gas Emissions Impact Mitigation Working Group

February 2024



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Legislative Request

This report is issued to comply with 2023 Laws of Minn., Ch. 68, Art. 4, Sec. 125, Subd. 4. , Sec 125, subdivision 4.

Sec. 125. **GREENHOUSE GAS EMISSIONS IMPACT MITIGATION WORKING GROUP.**

Subdivision 1. Establishment; purpose.

By August 1, 2023, the commissioner of transportation must convene a Greenhouse Gas Emissions Impact Mitigation Working Group to assist the commissioner with:

- (1) development of a process for impact assessment under Minnesota Statutes, section 161.178;
- (2) development of an impact mitigation plan;
- (3) consideration of options related to funding greenhouse gas emissions mitigation activities in conjunction with transportation capacity expansion projects; and
- (4) consideration of options for alternative mitigation options.

Subd. 2. Membership; chair.

(a) At a minimum, the working group must include:

- (1) the commissioner of transportation, or a designee;
 - (2) the chair of the Metropolitan Council, or a designee;
 - (3) two representatives from the Department of Transportation Sustainable Transportation Advisory Council;
 - (4) two representatives from the Minnesota County Engineers Association;
 - (5) two representatives from the City Engineers Association of Minnesota;
 - (6) one representative from a metropolitan planning organization or regional development organization in greater Minnesota; and
 - (7) one representative from Move Minnesota.
- (b) Appointments and designations to the working group must be completed by July 1, 2023.
- (c) The members of the working group must select a chair from its membership.

Subd. 3. Administration.

- (a) The working group must meet a minimum of six times.
- (b) Members serve without compensation or payment of expenses. The commissioner must provide administrative support to the working group.
- (c) Appointments and designations to the working group must not include a member of the legislature.

Subd. 4. Legislative report.

By February 1, 2024, the working group must submit its findings and recommendations, including any recommendations for legislation, to the chairs and ranking minority members of the legislative committees with jurisdiction over transportation finance and policy.

Subd. 5. Expiration.

The working group expires on the earlier of February 15, 2025, or upon submission of the report required under subdivision 4.

EFFECTIVE DATE. This section is effective the day following final enactment.

As requested by Minn. Stat. 3.197: The cost for developing this report was approximately \$250,000, which includes staff and consultant time for work group facilitation, report writing and coordination.

Executive Summary

This report details the findings and recommendations of the Greenhouse Gas Emissions Mitigation Working Group, which was established by the 2023 Minnesota Legislature. Its purpose is to assist the Commissioner of the Minnesota Department of Transportation with implementing a process for assessing and mitigating the greenhouse gas (GHG) emissions and vehicle miles traveled (VMT) impacts of increasing capacity on the state's trunk highway system. Working group membership was set forth in state statute and included ten members from various areas of the state, transportation related organizations and agencies.

Working group members affirmed the importance of Minnesota's net zero emissions reduction goal for transportation by 2050¹ and the related goal of reducing per capita VMT. These targets advance Minnesota's goals of leading the transition to a low-carbon economy and addressing climate change. In addition to the environmental benefits of these goals, they advance transportation equity and livability by seeking to increase access to transportation options for all Minnesotans, reduce air pollution, and increase transportation safety. MnDOT has incorporated both GHG and VMT reduction targets in the Statewide Multimodal Transportation Plan (SMTP).

The working group met over seven months from July 2023 to January 2024. They discussed several aspects of the legislation and developed findings and recommendations that would advance its implementation.

The working group found that with existing tools and capabilities basic aspects of the legislation can be implemented. The working group also determined that to fully realize the legislation's effectiveness, a comprehensive and integrated multimodal planning framework should be developed. Transportation investments that reduce emissions and VMT need to be coordinated between cities, counties, metropolitan planning organizations (MPOs) and MnDOT. Consistent regional and statewide modeling and analysis tools need to be developed. The working group has described a maturity approach for implementing this legislation that would allow emissions and VMT analysis to be integrated into a regional multimodal planning strategy. This integrated approach is described as Level 3 in the maturity model ([Figure 1](#)) and is the preferred approach by working group members. The working group outlines this pathway through recommendations set forth in the report.

The working group found that establishing and advancing the implementation process will require capacity to be developed at all levels of transportation decision-making and additional funding support is needed from the state legislature. Overall implementation of GHG and VMT reduction can be incentivized by creating an implementation funding program. Access to additional multimodal funding resources will incentivize MPOs and/or other geographic regions to develop land use and transportation plans that meet statewide GHG and VMT reduction targets. Smaller MPOs, area transportation partnerships (ATPs) and MnDOT need additional resources to more effectively model multimodal investments and integrate GHG/VMT reduction into regional plans. Enhancing state and MPO modeling will allow MnDOT and regions to create a statewide travel demand model and for MPOs to model GHG/VMT reduction more effectively and consistently.

¹ [Minn. Stat. 216H.02](#), which was modified by [2023 Laws of Minn., Ch. 60, Art. 12, Sec. 61](#)

The recommendations to the legislature seek action in two forms. In some cases, modification of the legislation is sought to provide clarity of some elements and ensure MnDOT is able to implement the requirements effectively. The second case is the request for funding, which is to be used to build implementation capacity, specifically in the areas of planning and modeling, and perhaps more importantly to provide funding for GHG- and VMT-reducing projects that can be used as mitigation and to set the state on a path to achieving its transportation goals.

Working Group Recommendations

Assessment Implementation Maturity: The working group has described a maturity approach for implementing this legislation that would allow emissions and VMT analysis to be integrated into a regional multimodal planning strategy. To implement this legislation with existing tools and processes, project proposers should be able to choose to evaluate their expansion project by itself or in the context of a multimodal MPO plan or regional program of projects ([Figure 1](#)) over an equal comparison period. Connecting GHG and VMT reduction to MPO and regional plans should be supported over an equal comparison period. Connecting GHG and VMT reduction to MPO and regional plans should be supported.

Technical Oversight Committee: The legislation should include language that directs MnDOT to establish an oversight committee. The committee should be made up of technical experts selected by the Commissioner to evaluate assessments. Members should be appointed based on demonstrated expertise in travel demand modeling, traffic forecasting or transportation-related greenhouse gas emissions assessment and analysis, and other expertise as determined necessary by the Commissioner. Elected officials should not be eligible for appointment to the committee. The committee should be charged with approving assessment requirements, evaluating mitigation sufficiency and determining expanded mitigation actions.

Building Implementation Capacity:

1. Provide funding to MnDOT to develop a statewide travel demand model for purposes of evaluating project- and program-level GHG and VMT impacts of land use and transportation planning (estimated funding need of \$1.5M to \$2.0M annually). Additionally, several new staff positions at MnDOT would be required to develop, maintain and administer a statewide travel demand model.
2. Provide transitional funding to support expansion project mitigation compliance for 1–3 years.
3. Provide funding to MPOs, ATPs and local agencies to invest in the staffing and tools to develop and adopt GHG/VMT reduction conforming plans and build overall assessment capacity (estimate needed).
4. Incentivize development of MPO and regional plans that conform with emissions and VMT reduction by creating a GHG/VMT reduction implementation funding program (funding level of \$25M to \$50M annually is recommended).

Mitigation Management:

1. Amend the legislation to allow transportation mitigation categories to be added by approval of the oversight committee beyond the nine areas listed currently. Any added categories should be based on empirical testing and review and should be transportation-related.
2. Establish a GHG and VMT Mitigation Management Program to manage mitigation and interlinking delivery and compliance ([Minn. Stat. 161.178, subdivision 4, 5, and 6](#)).
3. Develop an annual Mitigation Action Plan.

Funding Flexibility: Address the potential eligibility of trunk highway funding to be used for mitigation/interlinking eligible projects that are not on the trunk highway system.

Land Use: Establish consistent land use planning processes and procedures across the state that are coordinated with transportation planning that align with the State's GHG and VMT reduction goals.

Definition of Capacity Expansion: MnDOT Commissioner to clarify project types qualifying as trunk highway capacity expansion under [Minn. Stat. 161.178, subdivision 1](#).

Safety and Well-Being: Clarify safety and well-being language under [Minn. Stat. 161.178, subdivision 7](#).

Introduction and Background

The 2023 Minnesota Legislature established a requirement that capacity expansion projects on Minnesota's trunk highway (TH) system must be assessed to determine conformance with GHG emissions reduction and VMT reduction targets established in the [Statewide Multimodal Transportation Plan \(SMTP\)](#)² under [Minn. Stat. 174.03, subdivision 1a](#).³ Under [Minn. Stat. 216H.02](#), the legislature also amended the Greenhouse Gas Emissions Reduction goal for the GHG emissions across all sectors producing emissions to reach net zero emissions by 2050.⁴

The legislation states that trunk highway capacity expansion projects not meeting the targets established in the SMTP are required to either alter the scope of the project until it conforms to established targets or interlink the projects with impact mitigation to achieve conformance. Projects that do not conform to these requirements must be halted and cannot be included in the relevant transportation improvement program.

To prepare recommendations on implementing these requirements, the legislature established the Greenhouse Gas Emissions Impact Mitigation Working Group. The working group was convened by a representative designated by the Minnesota Department of Transportation's Commissioner.

Appointments to the working group outlined in legislation include the following representatives:

- The commissioner of transportation or a designee
- The chair of the Metropolitan Council or a designee
- Two representatives from the Department of Transportation Sustainable Transportation Advisory Council (STAC)
- Two representatives from the Minnesota County Engineers Association (MCEA)
- Two representatives from the City Engineers Association of Minnesota (CEAM)
- One representative from a metropolitan planning organization or regional development organization in greater Minnesota
- One representative from Move Minnesota

The working group members are listed on the following page.

² [Minnesota GO: 2022 Final SMTP Plan](#). (n.d.). Minnesota. <https://minnesotago.org/final-plans/smtf-final-plan-2022>

³ [2023 Laws of Minn., Ch. 68](#) (n.d.). <https://www.revisor.mn.gov/laws/2023/0/68/laws.4.64.0#laws.4.64.0>

⁴ [2023 Minn. Stat. 216H.02](#). (n.d.). <https://www.revisor.mn.gov/statutes/cite/216H.02>

The Greenhouse Gas Emissions Impact Mitigation Working Group's membership included:

Role in legislation	Name	Organization
Commissioner of Transportation (or designee)	Erik Rudeen (Chair)	MnDOT
Met Council Chair (or designee)	Charles Carlson	Metropolitan Council
STAC (1)	Diana Chaman Salas	Hennepin County
STAC (2)	Russ Stark	City of Saint Paul
MCEA (1)	Lyndon Robjent	Carver County Engineer
MCEA (2)	Joe MacPherson	Anoka County Engineer
CEAM (1)	Dillon Dombrovski	City of Rochester Engineer
CEAM (2)	Marc Culver	CEAM Director of Smart Cities Initiatives
Greater Minnesota RDO (1)	Mike Nicholas	Mid-Minnesota Rural Development Commission (MMRDC)
Greater Minnesota MPO (1)	Stephanie Halford	Grand Forks/East Grand Forks MPO
Move Minnesota (1)	Sam Rockwell	Move Minnesota

This report to the legislature details the findings and recommendations of the Greenhouse Gas Emissions Impact Mitigation Working Group.

The working group met twelve times since its formation in July 2023. Working group meetings were held every two weeks and were facilitated by MnDOT. Meetings were held in-person, with an option to join online. Working group meetings included background information provided by MnDOT staff and partner agencies, in addition to presentations from subject matter experts. Meetings were open to the public and included time for public comment. A summary of each working group meeting can be found in [Appendix A: Working Group Proceedings](#).

Working Group Findings

This section of the report provides an overview of the working group’s significant observations and findings throughout its proceedings. These findings form the basis for recommendations that the working group has set forth in this report for consideration by the legislature. The findings are outlined in the areas identified below.

General Findings

The working group found that this legislation provided significant opportunities to advance the state’s goals and targets focused on reducing carbon emissions, advancing transportation equity, increasing access to public transportation and active transit, and improving public health. The legislation also affords MnDOT the ability to identify new approaches to transportation investments and programming.

Working group proceedings revealed that there were few nationwide precedents for implementing this legislation in its entirety. However, there are numerous state and international efforts being implemented that could be drawn from. Some examples include the progress made by the Colorado Department of Transportation (CDOT)⁵ and partner agencies on creating programs for transportation investments across the state that are assessed for conformance with a statewide GHG reduction target. CDOT also estimates the VMT reduction alongside the emissions analysis. California has several connected efforts both at the state and local levels to reduce VMT and increase the use of low- or zero-carbon transportation modes.⁶ The State of Oregon has coordinated efforts with the Departments of Transportation, Energy Environmental Quality, and Land Conservation and Development to reduce emissions and VMT.⁷ Internationally, several countries have set national GHG and VMT reduction targets, including Scotland, the United Kingdom and New Zealand. Group members noted that several of these examples provide a strong basis of understanding for Minnesota as the state develops its own approach.

Working group members identified that the use of the term “mitigation” in the legislation and in this report is in conflict with the definitions set forth in the National Environmental Policy Act (NEPA). Members therefore suggested that the term “offset” be used instead.

A key point of discussion among the working group was how an expansion project would be assessed for its GHG and VMT impacts. Some members have concerns around the ability to confidently model and measure VMT reduction at the project scale. The working group identified that the choice between project- and program-level analyses results in various implications and tradeoffs. The understanding is that program-level assessment allows greater potential integration of multimodal decision-making. In contrast, project-level analysis provides accountability but limits the ability to assess multimodal system needs.

Working group members have found that the preferred approach for evaluating the GHG and VMT conformance of transportation investments is through integrated multimodal regional planning. This plan would establish the overall process for achieving the state’s GHG and VMT reduction targets and provide the ability to incorporate

⁵ [Greenhouse Gas \(GHG\) Program](https://www.codot.gov/programs/environmental/greenhousegas). (2021, September 1). Colorado Department of Transportation. <https://www.codot.gov/programs/environmental/greenhousegas>

⁶ [SB 743 \(LOS to VMT Transition\)](https://mtc.ca.gov/planning/transportation/driving-congestion-environment/sb-743-los-vmt-transition). (2021, March 17). Metropolitan Transportation Commission. <https://mtc.ca.gov/planning/transportation/driving-congestion-environment/sb-743-los-vmt-transition>

⁷ [Oregon Transportation Emissions](#)

land use, highway and other multimodal transportation planning into an overarching vision for the state. It would also provide consistency in the evaluation of proposed trunk highway expansion projects by adopting a consistent set of analysis tools and planning procedures in all areas of Minnesota. This approach is discussed further in the Implementation Maturity Model ([Figure 1](#)), where it is presented as Level 3. The working group recognizes that achieving this planning paradigm will take time as well as additional resources and potentially legislative action.

Integration of Multimodal Decision-Making

Minnesota does not currently have an integrated structure that allows for multimodal transportation decision-making across jurisdictions. The lack of integration limits the ability to deliver complementary investments for GHG and VMT reduction. For example, a city or county may originate a trunk highway capacity expansion project, while a regional transit agency may originate a new bus rapid transit (BRT) system. These projects may be planned and implemented independently of each other, complicating the opportunity to connect them to the statewide emissions reduction target and per-capita VMT reduction target.

In addition, Minnesota's state transportation funding system currently does not have flexibility to easily shift resources. Funding that is used for projects on the trunk highway system cannot readily be shifted to local or other agency-led projects that may reduce carbon emissions, such as building out bike and pedestrian infrastructure or expanding transit.⁸ This legislation creates an opportunity to advance a more integrated approach to multimodal transportation planning and investments. Measuring project impact and mitigation management is a critical step in being able to link projects to each other and to the state's GHG and VMT reduction targets. It will be necessary to build the capacity of agencies across the state to consistently measure project impact and mitigation management activities.

Land Use

In several meetings, the group reiterated the close connection between land use decisions and travel behavior, and VMT and GHG. Land use is the factor with greatest influence on travel behavior and demand. The legislation in [Minn. Stat. 473.145](#) directs the Metropolitan Council to guide development—including land use and transportation—in the metropolitan area and ties them to GHG and VMT reduction goals. In greater Minnesota, land use planning is less consistent. Some larger cities and MPOs prepare land use plans while many smaller communities and rural areas do not. As a result, aligning transportation investments with density of land use is not consistently applied statewide.

It was noted that while land use decisions are outside MnDOT's immediate regulatory authority, transportation investments made by the agency and others can impact development in the state, particularly in areas where future land use is not regulated.⁹ New development decisions made by local agencies or private companies consider existing and proposed transportation infrastructure. Similarly, the need for new or expanded multimodal transportation systems can be playing "catch up" to land use in developing areas. The working group noted that opportunities exist for MnDOT to coordinate more closely with local governments and transit

⁸ [Funding Transportation in Minnesota](#). (n.d.). Funding Transportation in Minnesota. <https://www.minnesotago.org/funding/>

⁹ Maroua Aïkous, et.al, Highway expansion and impacts on land use changes: An event study approach, *Transportation Research Part D: Transport and Environment*, Volume 119, 2023

agencies to make transportation and land use decisions in a manner that could advance the state's VMT reduction target and improve transportation options for Minnesotans.

The group noted Colorado's efforts to better integrate land use changes into its conformance program. The working group suggested that in Minnesota, cities, counties, and other local units of government may be incentivized to create comprehensive plans and associated transportation plans that shorten and reduce the number of trips made in single occupancy vehicles. For example, a city's comprehensive plan may increase allowable densities of residences and encourage more compact and mixed-use development. This could spur increased housing density and employment destinations. With more destinations near each other, trips made on public transit, biking or walking might become more feasible and appealing.

Vehicle Miles Traveled

Vehicle miles traveled is a metric of how many miles are driven by motor vehicles in a year in a given geographic area. VMT can be an indicator of the health of a multimodal transportation system, where lower VMT can indicate that there are alternative transportation options besides single occupancy vehicles and thus less reliance on personal vehicles, less time in cars, and benefits for health, equity and the environment. When measured through GHG emissions, VMT reduction is a tool for improved climate outcomes. When measured by multimodal transportation use, it can also be a tool for accessibility, equity and safety.

In MnDOT's state policy plan, VMT is identified as one measure to help understand how the transportation system is serving communities across the state. VMT is a key driver of carbon emissions from transportation. Increasing VMT in traditional combustion engine vehicles leads to increased carbon emissions as more fossil fuels are burned to drive longer distances. Reducing VMT has therefore been identified as a key objective to achieve Minnesota's target of eliminating carbon emissions economy wide by 2050.

Measuring VMT has other benefits. Lower community-wide VMT is associated with improved safety and accessibility and reduced particulate matter emissions and cost to maintain roads and bridges. Lower VMT can lower households' costs by reducing the need to own many vehicles and provide health benefits in the form of better air quality. VMT reduction can also advance equitable outcomes and benefit the environment.

Over the last few decades, growth in VMT has far outpaced population growth. Between 1994 and 2018, Minnesota's population increased by 23 percent while VMT grew by 40 percent.¹⁰ VMT is correlated with geography—urban households in the state drive 14,360 miles on average while rural/exurban households drive 25,350 miles annually.

Existing Analysis Methods

The working group found that existing approaches could be implemented for assessing the VMT and GHG impacts of new projects as the legislation goes into effect, including:

Travel Demand Models: These are tools that can be used to forecast future travel patterns and demands resulting from changes to the transportation system, including new roadways, wider roads with more capacity, land use changes, new pedestrian and bike networks, transit networks, and changes in demographics such as

¹⁰ [MnDOT Roadway Data](https://www.dot.state.mn.us/roadway/data/index.html). <https://www.dot.state.mn.us/roadway/data/index.html>

increase or decrease in population in a given area. Travel demand models currently exist for the Twin Cities metropolitan region and most metropolitan planning organizations in greater Minnesota in varying levels of complexity.

Travel demand models vary in sophistication—in Minnesota, the Metropolitan Council’s travel demand model is able to reflect changes in regional transportation networks, observed demographics, observed travel patterns and behaviors, and policy issues. They can often be expensive to develop and may require significant amounts of computing power to provide outputs. The Metropolitan Council currently uses an activity-based model (Tourcast) in conjunction with a land use model (UrbanSim). The Council is currently transitioning from Tourcast to the newer ActivitySim model. One of the reasons for this transition is to reduce the computer processing time required to run the model from nearly a week down to a couple of days. Travel models used by other MPOs in the state are simpler three-step or four-step models that can complete runs in a few minutes.

These models have been used effectively for several decades to prepare forecasts for specific transportation investments, such as ridership for transitways and traffic volumes for highways. They are also used in the transportation planning process to identify system needs and to develop regional and subarea performance measures (e.g., VMT). Models have proven effective in comparing the performance of alternatives, particularly in a relative sense. While models can be run with any given land use inputs, traditional practice has been to use a single, static land use forecast for the horizon year. As a result, there has traditionally not been a mechanism for models to account for development patterns to change in response to transportation actions. The Metropolitan Council also maintains a separate land use model for its planning activities, and while there is interest in linking this more closely to the transportation model, this remains in the experimental phase and has not been meaningfully applied to transportation project development.

VMT Analysis: At the state level, MnDOT’s Transportation Data and Analysis program calculates VMT. MnDOT’s Traffic Forecasting and Analysis office generates annual average daily traffic (AADT) by coordinating MnDOT’s traffic monitoring, counting, and vehicle classification programs. This is combined with MnDOT’s roadway data—an integrated database with roadway and selected bridge, crash, traffic and pavement data. VMT is determined by multiplying AADT with the length of the total centerline of roadway lengths in the state. This data collection and calculation process typically includes roads classified as arterials and collectors, but generally not local roads.

Environmental Protection Agency’s Motor Vehicle Emissions Simulator (MOVES): MOVES is a system that estimates mobile source emissions at the national, county and project level for criteria air pollutants, GHG emissions and air toxics. MOVES uses inputs like vehicle type, VMT, road types and geographical areas to provide estimates of GHG emissions and air toxic emissions. For GHG emissions estimates MOVES calculates the energy it takes to operate an on-road vehicle based on defined energy consumption rates and provides a CO₂ equivalent value. Assumptions within MOVES models often are based on national averages (such as average speed and VMT distribution). Pairing MOVES outputs with local data may help build a more complete picture of carbon emissions from individual projects.

Infrastructure Carbon Estimator (ICE) and Minnesota Infrastructure Carbon Estimator (MICE): ICE is a spreadsheet tool that estimates the lifecycle energy and GHG emissions from the construction and maintenance of transportation facilities. ICE helps answer the question at a planning level of how much carbon will be embodied in the building, modification, and/or maintenance of a transportation project or group of transportation projects. MICE is the Minnesota-specific version of ICE. It incorporates Minnesota-specific motor

vehicle emissions factors to measure project construction and operational emissions including offsite construction materials and transportation emissions, onsite construction operation emissions, project lifetime maintenance emissions, project lifetime vehicle operations emissions, and project construction detour emissions. The MICE tool relies on existing and projected VMT information to determine vehicle operations emissions for build/no-build analysis.

Multimodal Accessibility Tools: Multimodal accessibility tools allow the measurement of access to priority destinations by walking, biking, transit or vehicles. These tools measure either from a point or a defined area. Tools that are available today allow for quick and iterative editing of transportation networks within the area being analyzed, can facilitate comparison of project alternatives, and provide flexibility to analyze different trip origins and destinations. Multimodal accessibility is an emerging area of research and practice with over 13 US states currently engaged in advancing the use of these tools. An example of a multimodal accessibility tool is the University of Minnesota’s Accessibility Observatory, and there are also proprietary and open-source accessibility tools available to transportation practitioners.

Induced Demand Calculators: These are spreadsheet-based tools that can be used to estimate VMT impacts from a roadway segment expansion using measures of elasticity that are based on empirical evidence of increased travel from projects with added lane miles.^{11,12} However, the current calculators available have limited functionality. They cannot be used to measure changes in facility types, for example, going from a traditional intersection to an interchange. The group noted that tools to measure and evaluate VMT are being developed and will evolve over time. As complexity and sophistication develop, Minnesota’s implementation approach should integrate current, emerging, and improving tools over time.

Summary of Existing Analysis Methods: The working group identified a number of tools that are currently available and can be used to assess GHG and VMT impacts. Nonetheless, all of the tools have limitations with respect to these assessments and/or are inconsistently available across the state. For example, the travel demand model for the metropolitan area is the most sophisticated tool available, but it has limited capability to capture land use impacts of transportation actions. Further, it does not cover the entire state, leaving much of Greater Minnesota to rely on simpler approaches.

Balancing Transportation System Objectives

While this legislation focuses on the GHG and VMT impacts of trunk highway capacity expansion, it also includes a provision in [Minn. Stat. 161.178, subdivision 7](#) that these may not supplant broader safety and well-being goals established under [Minn. Stat. 174.01, subd. 2, \(1\) and \(2\)](#). The working group deliberated how these goals may be balanced against each other. For example, how a project focused on improving safety, such as one that converts a traditional intersection to an interchange on a low volume rural road, might be assessed if the relevant model suggests that another effect of the project will be increased GHG and/or VMT. Some members of the group suggested linking critical crash rate measures to assessment requirements.

¹¹ Hymel, Kent If you build it, they will drive: Measuring induced demand for vehicle travel. Transport Policy 76 (2019) 57-66

¹² Handy, Susan, Impact of Highway Capacity and Induced Travel on Passenger Vehicle Use and Greenhouse Gas Emissions. California Environmental Protection Agency Air Resources Board September 30, 2014

Implementation Maturity Model

The working group found that it is also important to identify a clear pathway towards implementing an agreed-upon approach that sets out consistent guidelines for agencies statewide. Based on these discussions the group identified the need to create an approach that would allow for implementation with existing tools and methods and to describe how implementation can mature over time. The working group outlined a GHG Assessment Implementation Maturity Model ([Figure 1](#)) with the goal of increasing the sophistication of assessment and mitigation methods statewide over time. The group also identified the need to support these efforts through the provision of additional state funding to develop and continuously improve a statewide travel model.

Flexibility and Direction: Not all parts of the state have the same multimodal transportation modeling ability, which is why it is important to develop an implementation approach that is sensitive to those differences. For example, non-MPO areas that do not have regional travel demand models can assess their expansion projects using existing project travel demand forecast methods (Figure 1, Level 1). Communities can mature over time as they have a better understanding of their multimodal investments and the regional emissions and VMT they are likely to reduce (Figure 1, Levels 2 and 3). Providing flexibility and a maturity strategy allows communities as well as MnDOT to begin evaluating with existing tools and methods. It also charts a strategy for how Minnesota can connect multimodal decision-making plans to reduce emissions and per capita VMT.

Suggested Timeline:

- The working group determined that the approach would move forward on a three-to-five-year timeline towards reaching Level 3 as defined in the implementation maturity model in Fig. 1.
- Funding allocations for developing the implementation approach from the legislature will accelerate the transition to Fig. 1, Level 3.
- MnDOT's Commissioner will assess the development of assessment tools and methods and make a determination on readiness to transition to Levels 2 and 3 in Fig. 1.

Figure 1: GHG Assessment Implementation Maturity Model

Assessment Maturity	Level 1: Project 	Level 2: MPO Plan (Metro & greater MN MPOs) 	Level 3: Regional and Statewide Plan (Not currently available) 
Summary	A trunk highway capacity expansion project is analyzed. The network directly within the project is analyzed for emissions and VMT impacts. If interlinking /mitigation is needed, the project proposers develop a mitigation plan.	A trunk highway capacity expansion project is analyzed in the context of an MPO plan of projects. All projects are evaluated for their emissions and VMT reduction benefits and impacts. If interlinking /mitigation is needed, the MPO develops a mitigation plan.	A trunk highway capacity expansion project is analyzed in the context of a region and state. All multimodal investments are evaluated for their emissions and VMT reduction benefits and impacts. If interlinking /mitigation is needed, the region develops a mitigation plan.
Assessment Area + Method(s) (Area of analysis and determination of current and future speeds, traffic volume, etc.)	Affected network of project is analyzed using currently available travel demand forecasts for a project area to determine build/no build operational impacts	MPO region and plan of projects evaluated with the Regional Model in the metro area and using greater Minnesota MPO transportation demand models in MPO's outside the metro	Regional plan of multimodal investments evaluated regionally such as an ATP or Statewide (not available)
Analysis Validation (Determining net change in VMT and carbon emissions)	<ul style="list-style-type: none"> • Minnesota Infrastructure Carbon Estimator (MICE) • Motor Vehicle Emission Simulator (MOVES) project level tool 	<ul style="list-style-type: none"> • Minnesota Infrastructure Carbon Estimator (MICE) • Motor Vehicle Emission Simulator (MOVES) program level tool • Off-the-shelf program of projects evaluation tool (e.g. Georgetown Climate Center TEA-CART) 	<ul style="list-style-type: none"> • Motor Vehicle Emission Simulator (MOVES) program level tool • Emissions evaluation integrated into TDM analysis • Off-the-shelf program of projects evaluation tool (e.g. Georgetown Climate Center TEA-CART)
Conformance	Project build results in a reduction of emissions and VMT per capita over the 20 years of the project	Multimodal MPO program of projects conforms with net emissions and VMT per capita reduction targets for 2025, 2030, 2040, and 2050	Multimodal regional program of projects conforms with net emissions and VMT per capita reduction targets for 2025, 2030, 2040, and 2050
Mitigation/Interlinking Management Plan	Project proposer develops offsetting mitigation management plan	MPO develops offsetting mitigation management plan	Region develops offsetting mitigation management plan

The working group noted that there were outstanding questions around how impact assessments and mitigation approaches would be implemented. These included:

- What are the geographic extents or “area of influence” that would need to be taken into account while examining an individual trunk highway capacity expansion project? Would these simply be the extent of the project corridor, or would it include the surrounding roadway network? If the latter, how is that area determined?
- If the area of influence includes the surrounding roadway network, how does the project proposal ensure that, if the project relieves congestion on surrounding roads, the project does not induce demand on those surrounding roads in the future?
- What timelines must be taken into account to assess project conformance beyond those defined in the statute? How will mitigation projects that may be programmed on a different timeline be assessed during interlinking?
- What reporting metrics and data collection must be put into place to ensure that impact mitigation benefits are not “double counted” (i.e., the benefits of the same project being credited more than once)?

Technical Oversight

During working group proceedings that involved an overview of impact assessment and mitigation management methods, the group noted that Minnesota currently does not have a recognized body that could validate the results of impact assessments and mitigation approaches. The group expressed a desire for the creation of such a body reporting to the Commissioner, with membership based on expertise and carrying out its functions in a neutral manner. This is envisioned as a technical body that supports the identification of geographic areas of influence, timelines and standardization of reporting metrics as well as validation of impact assessments and offers technical expertise in mitigation strategies.

Mitigation Actions

The legislation currently sets out nine categories of mitigation actions that can satisfy requirements for GHG reduction. MnDOT has also adopted emissions quantification methods for measuring several project types within many of the categories of mitigations outlined above.¹³ MnDOT has invested in tools to quantify GHG emissions of transportation projects, such as the MICE tool. Updates and personalization to the methodology of these tools could support assessment.

The working group found that to implement this legislation a comprehensive mitigation management strategy must be developed. Legislation may be updated to include new mitigation strategies if they are found to effectively reduce transportation emissions. Mitigation projects must be assessed consistently across the state as soon as it is practical. Emissions reductions from mitigation projects must be duly accounted for to prevent “double counting” of credits. To enable mitigation projects from outside the impacting project area to be interlinked, it will likely be necessary to establish an administrative program that allows for VMT or carbon emissions reductions to be “exchanged.”

¹³ [MnDOT Carbon Reduction Strategy](https://www.dot.state.mn.us/carbon-reduction-program/). <https://www.dot.state.mn.us/carbon-reduction-program/>

Working group members found the need for a method/means to expand the number of categories of mitigation categories without legislative action to allow for increased program flexibility and to incorporate new actions or technologies as they become available. Any new categories included will maintain a focus on mitigation strategies within the transportation sector.

Working Group Recommendations

Assessment Implementation Maturity

Recommendation: To implement the legislation with existing tools and processes, project proposers should be able to choose to evaluate their expansion project by itself or in the context of a multimodal MPO plan or regional program of projects (Figure 1) over an equal comparison period. Connecting GHG and VMT reduction to MPO and regional plans should be supported.

Reasoning: Evaluating GHG emissions and excess VMT impacts can be most effectively done in the context of a region's multimodal system investments. However, fully integrated decision-making across jurisdictions does not currently exist. The working group outlined the need to identify implementation with existing tools and how to mature that process as improved methods become available over time. Level 2 and above assessment maturity (Figure 1) allows regional multimodal investments and transportation-aligned land use changes to be evaluated in their totality that will reduce emissions and VMT for their plan area. Level 2 and 3 of maturity also offer the potential to set clear, geographically bound GHG and VMT reduction targets. These levels will facilitate integration and standardization of tools and metrics. Higher levels of maturity also allow regions to contextualize other reasons for individual project investments such as safety.

While the working group sees this flexibility as necessary for near-term implementation, there is a unanimous desire to achieve the Level 3 Statewide Plan stage of maturity as soon as can practically be achieved. This would establish an overall process for achieving the state's GHG and VMT reduction targets and provide the ability to incorporate land use, highway, and other multimodal transportation planning into an overarching vision for the state. It would also provide consistency in the evaluation of proposed trunk highway expansion projects by adopting a consistent set of analysis tools and planning procedures throughout all areas of Minnesota.

Technical Oversight Committee

Recommendation: The legislation should include language that directs MnDOT to establish an oversight committee. The committee should be made up of technical experts selected by the Commissioner to evaluate assessments. Members should be appointed based on demonstrated expertise in travel demand modeling, traffic forecasting or transportation-related greenhouse gas emissions assessment and analysis, and other expertise as determined necessary by the Commissioner. Elected officials should not be eligible for appointment to the committee. The committee should be charged with approving assessment requirements, evaluating mitigation sufficiency and determining expanded mitigation actions.

Reasoning: To ensure a consistent impact assessment and mitigation analysis process, it will be necessary to form a body that provides oversight over the methodology, tools and results produced. The creation of such a body will allow projects across the state to be assessed in a consistent manner. The body will determine tools that will be used for measuring GHG and VMT impacts from trunk highway capacity expansion projects

and will validate results produced by an applicable entity. To build confidence in the results, it will be necessary for the body to remain non-partisan. Members of this body will need to possess the technical expertise necessary to make assessment, mitigation and conformance recommendations. This committee should also provide technical support regarding mitigation options and best practices throughout the life of the project/program.

Building Implementation Capacity

Figure 2: Implementation Capacity Support Options

	Compliance and Transition Support	Proactive Multimodal Transportation Investment and Strategic Support (Establish and Incentive Level 3 Maturity Process)
Modeling + Planning	Recommendation 1 (Staff + Modeling) Develop Statewide Travel Demand Model (\$1.5M–\$2.0M annual) and support greater Minnesota MPO TDM modeling (\$0.5M annual)	Recommendation 3 (Regional GHG Planning) Fund integrated regional planning that reduces net emissions and VMT (\$3M–4M)
Infrastructure Funding (That reduces emissions and per capita VMT)	Recommendation 2 (Transition) Transitional mitigation funding to ease compliance for initial 1–3 years (\$5M–\$20M)	Recommendation 4 (Incentive Program) State and local government access to infrastructure funding for emissions and VMT reducing infrastructure (\$25M–\$50M annually)

Recommendation:

1. Provide funding to MnDOT to develop a statewide travel demand model for purposes of evaluating project and program-level GHG and VMT impacts of land use and transportation planning (estimated funding need of \$1.5M to \$2.5M annually). Additionally, several new staff positions at MnDOT would be required to develop, maintain and administer a statewide travel demand model.
2. Provide transitional funding to support expansion project mitigation compliance for 1–3 years, prioritizing expansion project mitigation needs that have a significant safety component (\$5M to \$20M annually).
3. Provide funding to MPOs, ATPs and local agencies to invest in the staffing and tools needed to develop and adopt GHG/VMT reduction conforming plans and build overall assessment capacity (\$3–4M).
4. Incentivize development of MPO and regional plans that conform with emissions and VMT reduction by creating a GHG/VMT reduction implementation funding program (funding level of \$25M to \$50M annually is recommended).

Reasoning: Overall implementation of GHG and VMT reduction can be incentivized by creating an implementation funding program. Access to additional multimodal funding resources will incentivize MPOs and/or other geographic regions to develop land use and transportation plans that meet statewide GHG and VMT reduction targets. New resources made available should be conditioned on recipient agencies making demonstrable progress towards development, adoption and implementation of conforming plans.

Smaller MPOs, ATPs and MnDOT need additional resources to more effectively model multimodal investments and integrate GHG/VMT reduction into regional plans. Enhancing state and MPO modeling will allow MnDOT and regions to create a statewide travel demand model and for MPOs to model GHG/VMT reduction more effectively and consistently. Statewide travel demand models have been created in some states, including Colorado and California. New and improved travel demand models would provide consistency among project evaluations by providing a unified platform for evaluating GHG and VMT outcomes of specific transportation investments. Funding will also allow MnDOT's partner agencies to carry out the legislation's assessment requirements during project planning and scoping.

Mitigation Management

Recommendation:

- 1. Amend the legislation to allow transportation mitigation categories to be added by approval of the oversight committee beyond the nine areas listed currently. Any added categories should be based on empirical testing and review and should be transportation related.**
- 2. Establish a GHG and VMT Mitigation Management Program to manage mitigation and interlinking delivery and compliance ([Minn. Stat. 161.178, subd. 4-6](#)). (Estimate of FTEs needed.)**
- 3. Develop an annual Mitigation Action Plan.**

Reasoning: Expanding the number of eligible mitigation categories will allow for the incorporation of other mitigation actions that have measurable impacts on GHG and VMT, as well as new types of projects or technologies as they evolve over time. This allows for greater flexibility in implementation. Examples of additional mitigation efforts may include zoning changes and infill incentives, growth management programs, high-occupancy vehicle (HOV) and transit lane buildout, bike and pedestrian network buildout, complete street guidance, transit commuter benefit programs and road pricing.

To allow for projects that are in different geographic areas to be interlinked with each other, it will be necessary to establish a unified program that manages and administers all aspects of project assessment and mitigation. The implementation of the mitigation program could potentially be administered through a bank or exchange model. Similar to the wetland bank model administered by Minnesota's Board of Water and Soil Resources (BWSR), the program will create a GHG/VMT assessment methodology/protocol and associate potential GHG reduction based on the list of strategies identified in the mitigation suite for GHG and VMT impacts created by trunk highway capacity expansion and mitigation projects. This will allow the state to assess individual projects or a program of projects for conformance using a consistent approach and accounting methods. The program will establish baselines for travel demand models and approved transportation plans to assess conformance to interim milestone goals for GHG and VMT reduction targets. This will also prevent the "double counting" of VMT/GHG credits from mitigation projects.

Funding Flexibility

Recommendation: Address the potential eligibility of trunk highway funding to be used for mitigation/interlinking eligible projects that are not on the trunk highway system.

Reasoning: Projects subject to the current legislation will most often be developed using trunk highway funds. To offset the emissions these projects will generate, proposers need to be able to develop projects outside the trunk highway system. Currently, a project must meet a trunk highway purpose ([Minn. Stat](#)

[161.20, subd. 3](#)) to use trunk highway funding. It will be necessary to explore whether offsetting mitigation should be eligible to use trunk highway funding that serves multimodal needs that reduce emissions and per capita VMT or should be eligible to use other existing multimodal funding sources. A sustainable funding program should be developed using existing and new sources of funding as necessary.

Land Use

Recommendation: Establish consistent land use planning processes and procedures across the state that are coordinated with transportation planning that align with the state’s GHG and VMT reduction goals.

Reasoning: The working group recognized that land use may be the most critical driver of transportation demand. Despite this, land use planning practices and requirements are not consistent across the state. Defining consistent processes and procedures will result in closer coordination among local governments and MnDOT and establish connection between land use decisions and travel demand. In addition, maintaining consistent land use data and future land use information statewide is an important input to a statewide travel demand model, as described in the *Building Implementation Capacity* recommendation.

Definition of Capacity Expansion

Recommendation: MnDOT Commissioner to clarify project types qualifying as trunk highway capacity expansion under [Minn. Stat. 161.178, subdivision 1](#)

Reasoning: The working group anticipates that projects are likely to arise that are not clearly defined with respect to the definition of trunk highway capacity expansion provided in the legislation. This adjustment would more clearly state that the Commissioner is to make a determination for specific project types or at the individual project level as necessary, without requiring further legislative action. In practice, it is likely that the technical oversight body would weigh consideration of eligibility for specific project types or individual projects and submit a recommendation to the Commissioner for final determination. It is also important to emphasize that this recommendation does not entail deletion of the current capacity expansion definition in the legislation.

Safety and Well-Being

Recommendation: Clarify safety and well-being language under [Minn. Stat. 161.178, subdivision 7](#) related to impact mitigation.

Reasoning: There are circumstances in which a significant safety problem requires a solution that qualifies as a trunk highway capacity expansion project under [Minn. Stat. 161.178, subdivision 1](#), paragraph (d). The working group recommends that a safety benefit cost analysis be used when determining the level of impact mitigation transitional funding (*Building Implementation Capacity: Recommendation 2*) for trunk highway capacity projects. Recognizing that the statute also states, “The requirements of this section are in addition to and must not supplant the safety and well-being goals established under section 174.01, subdivision 2, clauses (1) and (2),” the working group would ask the legislature to provide more direction on subdivision 7.

Further Study Needed

Eligible Project Types

Most capacity expansion projects are clearly understood in the legislation. Some additional investigation is warranted to more clearly define a few trunk highway project types that would or would not qualify as capacity expansion projects subject to GHG impact assessment requirements. While many projects would be clearly within or outside of the capacity expansion definition provided in statute, it is also understood that there are several examples of projects recently completed or under development that would be ambiguous with respect to these requirements. These examples should be summarized and discussed by either the working group or future technical oversight body to establish better definitions for projects meeting requirements for assessment. For example, more clarity on projects with safety needs should be provided.

Example Project Evaluations

Quantitative demonstration of several qualifying trunk highway capacity expansion projects is an essential step to understanding the practical implications of applying the legislation. These demonstrations should attempt to implement practices and procedures that satisfy the intent of the statute while using the best tools that are currently available to perform the assessment. A variety of project types (e.g., lane addition, grade separation) and contexts (e.g., urban, suburban, rural) should be explored to provide a broad cross section of results.

Key findings of this work would include:

1. Establishing the efficacy and sufficiency of current tools,
2. Understanding the range of GHG and VMT impacts of different project types in different contexts, and
3. Estimating the level of mitigation required to achieve project conformance.

This evaluation should be conducted by practitioners with expertise in the relevant evaluation tools. The evaluation should be overseen by either the working group or future technical oversight body to guide the process and interpret outcomes.

Induced Demand Long-Term Effects

Induced demand from expansion of roadway capacity is well established and understood in the research.¹⁴ This is especially true for areas that are more populated and areas experiencing population growth. Some components of induced demand are effectively captured in travel demand modeling, but not all. Key challenges exist for evaluating the important role of land use changes in complex-built environments. Representatives from CDOT and the Metropolitan Council shared aspects of induced demand that are captured and limitations.

¹⁴ Handy, S. (2014). Impact of highway capacity and induced travel on passenger vehicle use, California Air Resources Board

Further study is justified to improve the understanding, communication and analytical capabilities surrounding induced demand.

Appendices

Appendix A: Working Group Proceedings

Working group members established a schedule of meeting every two weeks to conduct proceedings. Erik Rudeen of MnDOT was selected as Chair by working group membership.

The following is a summary of working group meetings.

July 23, 2023, Kickoff Meeting:

Representative Larry Kraft, author of the legislation, was present at the inaugural meeting of the working group and provided members with an overview of the intent of the legislation.

Rep. Kraft stressed the importance of reducing carbon emissions from transportation as a critical pathway towards achieving the state's climate goals. Members reviewed key aspects of the legislation and discussed the working group's charge. Priority items identified included:

- Providing recommendations to assist MnDOT with creating a framework for impact assessment.
- Developing recommendations to facilitate the creation of an impact mitigation plan for capacity expansion projects on the state trunk highway network.
- Considering options for a range of mitigation activities.
- Discussing funding options to facilitate mitigation activities.

Group members discussed questions including approaches to addressing projects in the greater Minnesota region, the role of land use in impacting travel behavior, learning from other states and regions that are advancing similar efforts, and the importance of outreach and education to move the state's climate goals forward.

August 10, 2023:

Working group members agreed to a working group charter and decided to take a consensus-based approach to creating recommendations. Key items that were discussed included:

- Key aspects of the methodology that will be used to determine if a capacity expansion project is in conformance with the legislation's requirements.
- Members discussed if conformance determination should be carried out at the level of an individual project, or whether entire "programs" of projects would be assessed together in a plan.
- MnDOT staff shared details of the ICE tool developed by Federal Highway Administration (FHWA) and adapted by Minnesota. MICE measures offsite construction and transportation emissions, onsite construction operation emissions, project lifetime maintenance, vehicle operations emissions for the lifetime of a project (VMT included in this piece), vehicle operations for project detours for the construction phase of project, and mitigation practices. It does not meaningfully account for changes in land use.

August 24, 2023:

The group discussed options for how mitigation/interlinking could be administered with members identifying key questions posed by each option. MnDOT staff shared existing program and project development processes for both MnDOT as well as cities and counties. Group members began identifying how the new legislative requirements could be an integrated program and project process.

Members identified key questions that would impact findings and recommendations:

- Currently, there may not be tools that are sophisticated enough to be able to measure changes in VMT and associated GHG with a high level of confidence for individual projects, and this might impact whether assessments are being done at the project or the program level.
- Projects that were primarily focused on safety were discussed, with members discussing how these might be considered in assessment.
- Other similar approaches to mitigating environmental impacts of transportation projects were discussed, including the state's wetland banking program.

September 7, 2023:

Working group members discussed and identified a framework for:

- Areas where there are clear recommendations from the working group.
- Areas where the legislature should provide more clarity—for example, where safety goals may conflict with VMT reduction goals.
- A slate of options that the working group discussed if the working group was not able to reach agreement.

Guest speakers from CDOT were invited to share their approach to implementing similar legislation. Takeaways included:

- The Colorado rule focuses on light duty vehicles (cars and small trucks) that make up the majority of surface transportation emissions.
- It requires CDOT and the state's five MPOs to create transportation plans that create more travel options to reduce GHG emissions.
- The rule currently takes a systems-planning approach, as opposed to a project-level approach.
- MPO plans need to show compliance with state GHG targets. In addition, they are required to submit a GHG report each year. Yearly plans are required to show reductions in GHG emissions from current comprehensive plans already in place.
- GHG reduction targets are roughly equivalent to existing VMT. For example, the Denver Regional Council of Governments (DRCOG) MPO is responsible for approximately 60 percent of VMT in the state. DRCOG is therefore responsible for approximately 60 percent of the GHG reduction target.
- Members discussed several aspects of the Colorado rule's structure and implementation. It was noted that Minnesota's legislation focuses on a project-level approach. Guest speakers shared that this was discussion that they have had several times—and have concluded that a systems level approach works best in their case.
- Colorado mitigation strategies have been framed as "aggressive, but feasible," giving agencies ambitious but not unattainable targets.

Members noted that mitigation plans did not include electrification—as a key goal of the rule is to provide multimodal transportation access.

September 21, 2023:

Working group members were provided with context on best practices on VMT and GHG reduction from across the country. Members also discussed the background of Minnesota’s newly developed per capita VMT reduction target as set forth in the SMTP. Members were provided with information on factors that influence VMT and practices that have been found to reduce VMT. MnDOT staff also emphasized that a key goal of VMT reduction is to increase multimodal access, improve safety, improve connections between where people live and important destinations, and reduce carbon emissions.

October 5, 2023:

Working group members were provided with information about approaches to creating a system of “credits” that would allow a bank of GHG or VMT offsets to be created. For example, a bike or pedestrian project that reduces VMT would be able to generate these credits that could then be used to offset increased VMT from trunk highway capacity expansion projects. Trunk highway capacity expansion project originators would be able to use these credits by paying into a fund or “bank” created to facilitate this process. Working group members discussed the need to have clear accounting practices to ensure that credits reflect real-life reductions in VMT and GHG. The costs of mitigating through such a system were discussed, with working group members noting that these mitigation actions could substantially increase the cost of a trunk highway capacity expansion project.

Members were also provided with an example of Minnesota’s wetland banking system as it exists today. Key takeaways from the presentation included the administrative effort needed to manage the program. Mitigation from the wetland banking program is funded through a state appropriation, reducing the cost burden on applicants. Another point of note was the quality of mitigation—wetlands are classified by quality, and mitigation costs vary depending on the type of mitigation to be carried out. Working group members discussed whether this would be analogous to the type of mitigation trunk highway capacity expansion projects would need to carry out.

Metropolitan Council staff members then gave working group members an overview of current travel demand models and their capabilities. The Met Council’s travel demand models take factors into account such as job locations, economic performance, effects of the pandemic, and induced demand of roadways. These models allow them to ask and answer questions around mode-change feasibility. They have found that around 25 percent of the trips taken by a single occupancy vehicle can realistically be switched to a different mode of travel.

The significant computing processing power it takes to run these models was discussed, with a model run taking up to three days in some cases. Working group members pointed out that this could hamper the assessment process due to the volume of trunk highway capacity expansion projects that need to be assessed. Council modeling staff also noted that there is an initiative to migrate the current activity-based model away from the current proprietary, “black box” tour generator to an open-source platform that has been implemented in a few other regions around the country. The hope is that this will result in reduced run times and greater ability to conduct diagnostics on travel behavior and choices predicted by the model.

The group discussed land use and the political implications and possibility of regulating land use to reduce VMT, and whether the working group should hear from land use planners to get their perspectives on the relationship between land use, transportation and VMT reduction.

October 19, 2023:

Working group members were given an overview of a framework to analyze VMT and carbon emissions from transportation projects. The group noted that reducing congestion and travel time on roadways might reduce GHG emissions in the very short term but increase GHG emissions in the long term due to the phenomenon of induced demand.

Working group members were also given examples of two ways in which an assessment and impact mitigation approach may be carried out in practice. One was based on a regional plan/program and the other was based on assessing individual projects.

MnDOT gave an update on the state's Carbon Reduction Strategy. Along with establishing emissions reduction priorities, it develops a methodology for evaluating the emissions reduction benefits from various multimodal investments. The tool and others like it can be used to evaluate the potential for mitigation/interlinking reducing carbon emissions.

November 1, 2023:

Working group members were shown an example project that showcased how trunk highway capacity expansion results in VMT increases. The group also discussed different geographic contexts for implementation approaches. Implementation strategies differ based on whether a project is located in an urban, suburban, exurban, or rural area. Group members discussed questions including:

- Would conformance be evaluated on a project or program level?
- What timeline might be taken into account to develop a conformance determination?
- Some mitigation projects may take longer or shorter to be implemented, and mitigation/conformance plans should reflect that.

Group members then carried out an activity to take first steps towards determining priority topics that would be put forth as recommendations to the legislature. Notable discussions included:

- There was general agreement for recommending state support to build capacity for travel demand models in areas that either currently do not have models or where models do not have sufficient granularity.
- There was general agreement that there must be consistency around how projects will be evaluated. In addition, there was agreement that projects may not be retroactively found not in conformance as a result of measurements becoming more advanced or tools being upgraded.
- There was robust discussion around how safety projects may be evaluated. Group members brought up that some safety projects have goals that do not include reducing VMT or GHG, but nevertheless support other goals.
- There was a discussion centered around how safety projects often result in capacity expansion—and that often other alternatives may be available.

- The group agreed that a “maturity model” needs to be laid out for how an approach might evolve as more work is carried out.

November 16, 2023:

Working group members were shown an example of a “maturity model” as discussed in previous meetings. This is a chart that shows how different portions of the legislation will be implemented across geographies, and over time, as the statute goes into effect. The model focuses on a series of priority areas that include assessment methods, analysis validation, conformance guidelines and mitigation/interlinking. Working group members discussed the model and provided comments, including a general comment that approaches at the MPO plan level and the regional/metro level were not necessarily sufficiently indistinguishable from each other. A suggestion was made to consider MnDOT districts as an area of interest for the development of a conforming regional plan. In addition, members agreed to add another level of geography where all projects and mitigation strategies statewide would be assessed together. Members suggested that even within this model, different regions would be assigned VMT and GHG reduction targets.

Members then discussed selected priority topics that were put forward as potential recommendations based on working group proceedings up to this point.

November 30, 2023:

Working group members continued discussions on proposed recommendations. Members then participated in an exercise to gauge their support for recommendations developed based on past working group proceedings. Members agreed to include the following recommendations:

- Adoption of the proposed maturity model.
- Including funding to support MnDOT and partner agencies with building support for assessment and mitigation management.
- Increase the number of transportation mitigation categories beyond the nine areas listed currently based on empirical testing and review.

Appendix B: Glossary

The terms defined below are used in the Greenhouse Gas Impact Mitigation Working Group’s report to the legislature. This glossary is intended to provide consistent and mutually understood definitions to aid in understanding, development and implementation of policies and practices as the legislation goes into effect.

Many of the definitions are taken from authoritative sources to the extent possible, whereas others are considered working definitions. Working group members were invited to share proposed revisions to working definitions if they identify opportunities for improvement.

In statute	Definitions are provided as part of the 2023 transportation legislation. Section numbers are provided for reference.
Federal definition	Definitions are established in Federal laws and/or policies. In many cases State Statute references these Federal definitions as the for-implementation purposes.
Working definition	Definitions are established by the working group based on technical expertise and interpretation of the intent of the legislation. This report will help to define these terms for subsequent implementation actions.

Achieving targets

Working definition	A determination at the planning or project level that anticipated transportation investments are consistent with state GHG and VMT reduction targets.
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Affected network

Working definition	The roadway system surrounding a trunk highway capacity expansion project that is influenced by that project. This is the area expected to be evaluated in a GHG and VMT impact mitigation assessment. See also Area of influence.
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Area of influence

Working definition	The geographic boundaries established around a proposed trunk highway capacity expansion project from within which generated GHG and VMT will be measured.
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Areas of persistent poverty

Federal definition	An “Area of Persistent Poverty” is defined by the Bipartisan Infrastructure Law. A project is located in an Area of Persistent Poverty if: <ol style="list-style-type: none">1. the County in which the project is located consistently had greater than or equal to 20 percent of the population living in poverty in all three of the following
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datasets: (a) the 1990 decennial census; (b) the 2000 decennial census; and (c) the most recent (2021) Small Area Income Poverty Estimates; OR

2. the Census Tract in which the project is located has a poverty rate of at least 20 percent as measured by the 2014-2018 5-year data series available from the American Community Survey of the Bureau of the Census; OR
3. the project is located in any territory or possession of the United States.

Capacity expansion project

In statute (Section 28) Project for trunk highway construction or reconstruction that:

1. is a major highway project, as defined in section 174.56, subdivision 1, paragraph (b); and
2. adds highway traffic capacity or provides for grade separation at an intersection, excluding auxiliary lanes with a length of less than 2,500 feet.

Conformance

Working definition The determination that mitigation or interlinking measures applied to a trunk highway capacity expansion project meet VMT and GHG reduction targets as determined (or) the determination that a proposed trunk highway capacity expansion project does not increase VMT and GHG beyond established thresholds.

Context – program versus project

Working definition Transportation planning activities are performed at different levels of context and result in different outcomes. Program describes an entire category of transportation investments over a longer period of time (e.g., 5 to 20 years). Projects describe individual investments made at a point in time.

The planning context (program or project) is an important distinction with regard to GHG and VMT reduction targets. Specifically, the program must result in outcomes that meet state reduction targets in order to conform. Whereas an individual project may move GHG and VMT trends closer or farther from targets, it cannot be determined to conform outside of the program context.

Determination/verification of outcomes

Working definition The determination or verification of outcomes is a statement from an authoritative body that a given project or program is or is not in conformance with GHG and VMT reduction targets. The process of determining/verifying outcomes will dictate whether a proposed trunk highway capacity expansion project requires mitigation,

and whether a proposed mitigation is satisfactory with respect to interlinking and mitigation requirements.

GHG (greenhouse gases)

General definition Greenhouse gases (GHG) are gases in the earth's atmosphere that trap heat. During the day, the sun shines through the atmosphere, warming the earth's surface. At night the earth's surface cools, releasing heat back into the air, but some of the heat is trapped by the greenhouse gases in the atmosphere.

There are several gases known as GHG. The main greenhouse gas produced by vehicles is carbon dioxide (CO₂), but they also produce nitrous oxide and methane.

GHG reduction targets

MnDOT Targets Minnesota's Climate Action Framework has adopted a GHG reduction target of 80% decrease from 2005 baseline levels by year 2040. The following targets are established for GHG from transportation through 2040.

Year	Annual GHG Emissions (million metric tons CO ₂ e)	Change from 2005
2025	≤26.5	-30%
2030	≤20.1	-50%
2035	≤14.1	-65%
2040	≤8.0	-80%

Historically disadvantaged community

Federal definition A "Historically Disadvantaged Community" is defined by USDOT, consistent with OMB's Interim Guidance for the Justice40 Initiative. A project is located in a Historically Disadvantaged Community if:

1. the project is located in certain qualifying census tracts; OR
2. the project is located on Tribal land; OR
3. the project is located in any territory or possession of the United States.

Indicators

Working definition Measures developed through a trunk highway capacity expansion project assessment that describe the greenhouse gas and vehicle miles traveled impacts. These indicators can be estimated for the trunk highway capacity expansion project itself or of potential interlinked mitigation actions. The indicators should reflect the impacts

within the affected network and/or area of influence established for the project assessment.

Induced demand

Working definition In economics, induced demand is the phenomenon whereby an increase in supply results in a decline in price and an increase in consumption. For transportation, the theory of induced demand asserts that as roadways become wider and able to accommodate higher volumes of traffic, additional vehicles will materialize as drivers feel incentivized to use the expanded road due to the belief that added lanes have reduced congestion.

Current practices frequently identify six elements of induced demand:

1. Change of route – after completion of a trunk highway capacity expansion project, drivers shift from routes they had previously been using to travel on the expanded highway which now has reduced congestion. This may result in additional VMT if the expanded route results in longer trip distances, but may also be a neutral shift in VMT between routes.
2. Change of destination – completion of a trunk highway capacity expansion project may allow travelers to reach destinations that are farther away compared to destinations they previously traveled to. This would result in additional VMT on the system.
3. Change of daily activity pattern – completion of a trunk highway capacity expansion project may allow travelers to make additional trips and/or reach additional destinations. This would most likely result in additional VMT on the system.
4. Change of mode – completion of a trunk highway capacity expansion project may reduce the travel time burden of driving as a mode, causing travelers to switch to driving from a different mode such as transit, walking, or biking. This would result in additional VMT on the system.
5. Change of time of day – completion of a trunk highway capacity expansion project may result in additional corridor throughput during peak periods, allowing more drivers to make their trips during the peaks. This may result in additional VMT, however, if only the time of travel changes, the same VMT would occur but during different times of day.
6. Change of development pattern – completion of a trunk highway capacity expansion project increases the accessibility of undeveloped land. Over a longer time horizon, this land develops with uses that result in additional vehicle trips and longer distance travel, which would result in additional VMT on the system.

Interlinking

Working definition The process by which projects that provide GHG and VMT mitigation, such as public transit, bike, or pedestrian infrastructure, are grouped with the trunk highway capacity expansion project to achieve conformance.

In statute (Section 28) A mitigation action may be identified as interlinked to the capacity expansion project if:

1. there is a specified project, program, or modification;
2. the necessary funding sources are identified and sufficient amounts are committed;
3. the mitigation is localized as provided in subdivision 5; and
4. procedures are established to ensure that the mitigation action remains in substantially the same form for or a revised form that continues to meet the calculation under paragraph (b).

Land use

Working definition Land use is the term used to describe the human use of land. It represents the economic and cultural activities that are practiced at a given place. Common land use types include agricultural, residential, commercial, and industrial. Each of these land use types can have a wide variety of forms that reflects their density and influences their relationship to transportation.

Local sponsor/locally-led project

Working definition While MnDOT has primary responsibility for the operation and maintenance of Interstate, US, and MN trunk highways in Minnesota, a trend of locally-led projects on the trunk highway system has emerged. In these instances, a local government (city or county) takes a lead role in the planning, development, and funding of an improvement project on a state-owned roadway. The level of involvement can vary from simply advocating for project support, to conducting planning and engineering studies, to full delivery of the project.

Localization

In statute (Section 28) A mitigation must be localized in the following priority order:

1. within or associated with at least one of the communities impacted by the capacity expansion project;

2. if there is not a reasonably feasible location under clause (1), in areas of persistent poverty or historically disadvantaged communities, as measured and defined in federal law, guidance, and notices of funding opportunity;
3. if there is not a reasonably feasible location under clauses (1) and (2), in the region of the capacity expansion project; or
4. if there is not a reasonably feasible location under clauses (1) to (3), on a statewide basis.

Measurable progress

Working definition An applicable trunk highway capacity expansion project together with interlinked mitigation demonstrates effectiveness towards achieving greenhouse gas emission and vehicle miles traveled reduction targets but does not immediately fully achieve targets.

Mitigation

Working definition Measures that will allow highway capacity project to meet VMT and GHG reduction targets as determined. Examples of measures include active transportation projects, public transportation, a carbon “banking system” and travel demand management measures.

In statute (Section 28) "Consists of a project, program, or operations modification in one or more of the following areas:

1. transit expansion, including but not limited to regular bus route, arterial bus rapid transit, highway bus rapid transit, rail transit, and intercity passenger rail;
2. transit service improvements, including but not limited to increase service level, transit fare reduction, and transit priority treatments;
3. active transportation infrastructure;
4. micromobility infrastructure and service, including but not limited to shared vehicle services;
5. transportation demand management, including but not limited to vanpool and shared vehicle programs, remote work, and broadband access expansion;
6. parking management, including but not limited to parking requirements reduction or elimination and parking cost adjustments;
7. land use, including but not limited to residential and other density increases, mixed-use development, and transit oriented development;

8. infrastructure improvements related to traffic operations, including but not limited to roundabouts and reduced conflict intersections; and
9. natural systems, including but not limited to prairie restoration, reforestations, and urban green space."

MPO (metropolitan planning organization)

General definition A metropolitan planning organization (MPO) is the policy board of an organization created and designated to carry out the metropolitan transportation planning process. MPOs are required to represent localities in all urbanized areas (UZAs) with populations over 50,000, as determined by the U.S. Census.

Minnesota has land area within the planning boundaries of eight MPOs.

- Grand Forks-East Grand Forks Metropolitan Planning Organization
- Fargo-Moorhead Metropolitan Council of Governments
- Duluth-Superior Metropolitan Interstate Council
- Saint Cloud Area Planning Organization
- Metropolitan Council (seven-county Twin Cities region)
- Mankato/North Mankato Area Planning Organization
- Rochester-Olmsted Council of Governments
- La Crosse Area Planning Committee

Net neutral

Working definition An applicable trunk highway capacity expansion project assessment concludes that the project action would not result in any changes in greenhouse gas emissions or vehicle miles traveled compared to a no action condition.

Programming

General definition The process a transportation undertakes to move candidate project investments from a planning stage to a commitment of implementation that is feasible within projected funding availability. All of the projects that are programmed make up the agency’s capital investment program, which commonly has a time horizon of four or more years.

Reduction feasibility

In Statute (Section 64) Greenhouse gas emission targets must account for differences in the feasibility and extent of emissions reductions across forms of land use and across regions of the state.

Region/regional

Working definition A geographic portion of the state that may be utilized as the applicable area for evaluating or implementing GHG and/or VMT impact mitigation. Typically, a region would be characterized by a consistent transportation planning and funding structure, such as a metropolitan planning organization or MnDOT district.

Social determinants of health

Federal definition The conditions in the environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks. These are often grouped into five domains of economic stability, education access and quality, health care access and quality, neighborhood and built environment, and social and community context.

Source: <https://health.gov/healthypeople/priority-areas/social-determinants-health>

STIP (State Transportation Improvement Program)

MnDOT definition The STIP is a federally required public document which lists Minnesota’s four-year transportation improvement program. The STIP includes all state and local transportation projects which are using federal highway and/or federal transit funding as required per Title 23 United States Code (USC). The STIP must also contain all regionally significant transportation projects that require an action by FHWA or the Federal Transit Authority (FTA) whether funding from either agency is anticipated. Information contained within the STIP includes the cost, schedule, and funding sources for the identified projects. The STIP is developed on an annual basis and must be financially constrained by year.

TIP (Transportation Improvement Program)

General definition Transportation Improvement Program (TIP) is a list of upcoming transportation projects covering a period of at least four years developed and adopted by an MPO. The TIP includes all state and local transportation projects which are using federal highway and/or federal transit funding as required per Title 23 United States Code (USC). The TIP must also contain all regionally significant transportation projects that require an action by FHWA or the Federal Transit Authority (FTA) whether funding from either agency is anticipated. . For MnDOT’s TIP, see STIP.

Transportation demand management (TDM)

Working definition The application of strategies and policies to increase the efficiency of transportation systems, that reduce travel demand, or to redistribute this demand in space or in time. TDM is often implemented using suite of services that encourage people to use transit, ridesharing, walking, biking, and telework.

Travel demand model

Working definition A tool used to predict the quantity and type of travel that would occur as a result of a variety future actions and conditions. Models typically rely on input data that includes traveler behaviors along with spatial representations of land uses and transportation networks. Travel demand models may consider a single mode of transportation or multiple modes and the interactions between them. Models may also have different temporal scales, such as daily, peak periods, or hourly. Output measures typically include route and segment level flows (e.g., traffic volume or transit ridership), travel patterns, and origin-destination flows. Models also produce system-level measures such as vehicle-miles traveled and vehicle-hours traveled.

VMT (vehicle miles traveled)

General definition Overall measure of the number of miles driven by vehicles on the roadway system, typically aggregated at the annual level. MnDOT estimates VMT for the state by multiplying daily traffic volumes by the length of a roadway segment, and then adding up all segments in the state.

VMT reduction targets

SMTTP Targets MnDOT's Statewide Multimodal Transportation Plan (SMTTP) has adopted a VMT per capita reduction target of 14% decrease from 2019 baseline levels by year 2040. The following targets are established for VMT per capita through 2040.

Year	VMT per capita	Change from 2019
2025	≤10,263	-4%
2030	≤9,835	-8%
2035	≤9,515	-11%
2040	≤9,195	-14%