Target Setting with VisionEval

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DEPARTMENT OF TRANSPORTATION

Outline

- **What are we being asked to do?**
  - Legislation and MnDOT direction for strategic GHG modeling
- **Why VisionEval?**
- **How is VE-State Minnesota set up?**
  - Essential inputs and statistical methods
  - Model rebuilds
- **Lessons Learned**
- **Contacts**

Minnesota Transportation Emissions Reduction Laws 2023 and 2024

1. **Regional emissions reduction performance targets for the transportation sector (think tailpipe emissions)**
2. Capacity expansion impact assessment and offset plan
3. Program conformance with regional emissions target (under development)

How can you reduce emissions in the transportation sector?

Fuels

Miles

Fuel Type + MPG **Fuel Efficiency** = **Vehicle Fuels**

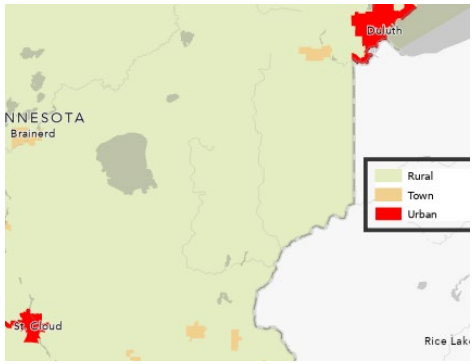
Transportation Options
(modes of travel)
+ **Land Use Choices** = **Vehicle Miles Traveled**
(Measured per capita)

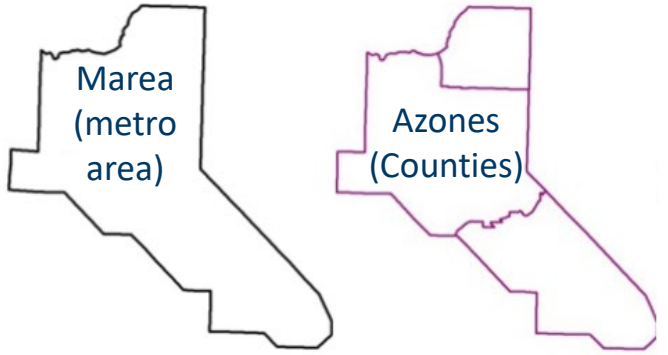
Why VisionEval For Target Setting

- VisionEval is:
  - **Open source**
  - **Strategic in nature,** allowing for quick changes to inputs and scenarios
  - **A Higher, sketch level framework** that can run quite quickly
  - **Accommodating of a mix of geographies,** making suballocation easier (counties, MPOs, cities)
  - **Looks at the relationship of transportation, land use, and VMT/GHG**
  - **Customizable in post-processing,** meaning different outcomes can be measured based on measure, geography, or unit

MnDOT's VisionEval Model

- **MnDOT's model:**
  - Primary purpose: to **evaluate** Minnesota **baseline future GHG emissions** in five-year increments with **respect to regional feasibility** as well **as evaluate mitigation policies**
  - Broke down Minnesota's geography into three development types: Urban, Town & Rural
  - Used 2 geographical classifications: **counties** (called **Azones** in MN VE) and the 8 **metropolitan areas** (**Mareas** in MN VE)
  - Primarily examined the metric tons of CO_2e and Vehicle Miles Traveled (VMT) outputs





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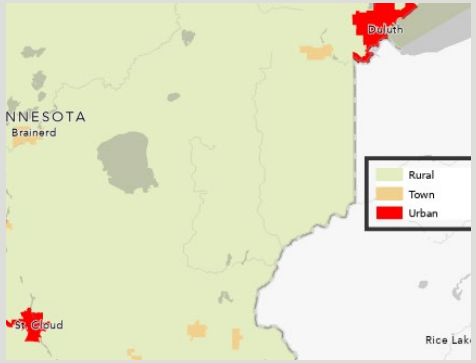
Recipe for GHG Modeling in VE-State Minnesota

1. Break up Minnesota into geographies and development patterns



2. Compile input datasets and modify for use in VE

eia Independent Statistics and Analysis ™ U.S. Energy Information Administration

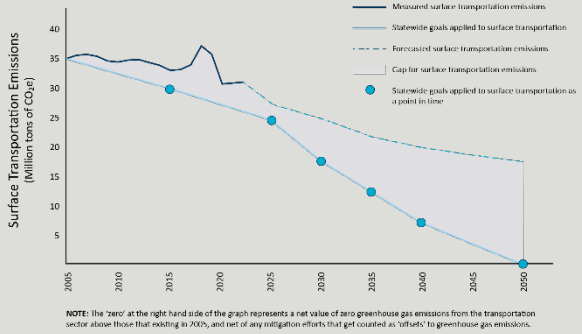
MINNESOTA STATE DEMOGRAPHIC CENTER DEPARTMENT OF ADMINISTRATION

United States Census Bureau

U.S. Department of Transportation Federal Transit Administration

3. Set up RStudio and run model; repeat as needed and rebuild modules

4. Run results query for GHG and VMT metrics for necessary geography



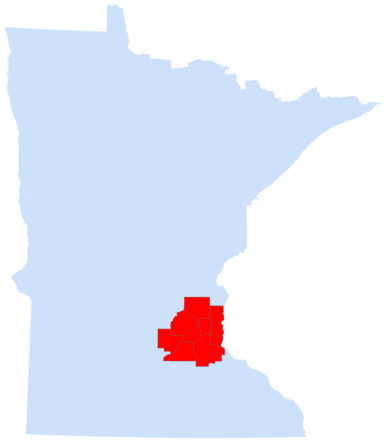
1. Breaking Up Geographies

- How we do this is important legislatively:
  - Reminder: We need to calculate baseline and scenario results for **regional feasibility** and for the **7 County Twin Cities Metro Area specifically**

Approaches:

Metropolitan Council's 7-county metro area *(statute defined)*

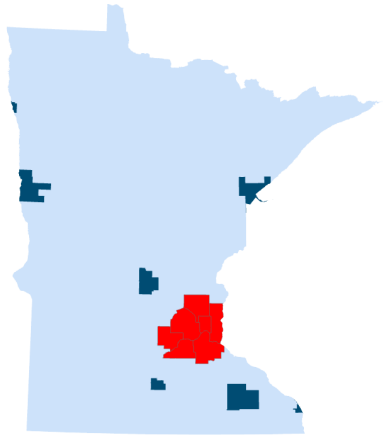
Greater Minnesota *(everywhere outside the metro area)*



Metropolitan Council's 7-county metro area *(statute defined)*

7 Other Metropolitan Planning Organizations

Greater Minnesota *(everywhere outside the metro area and MPOs)*



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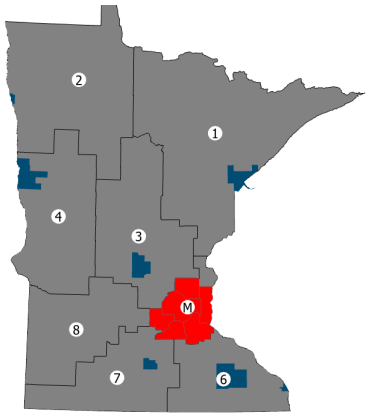
7 Other Metropolitan Planning Organizations

MnDOT Area Transportation Partnership Districts (8)



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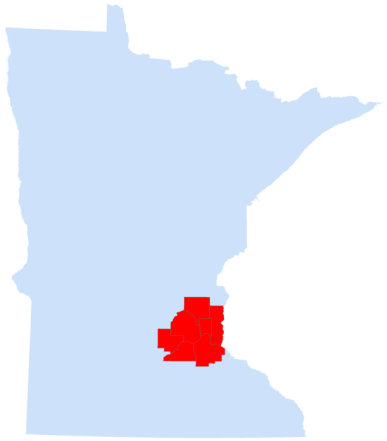

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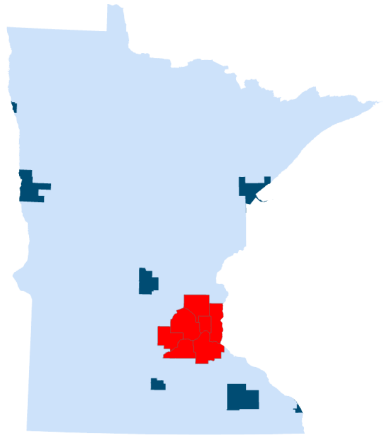

We can see ourselves in the work because it's more context-sensitive.

Provides more opportunities for accountability.

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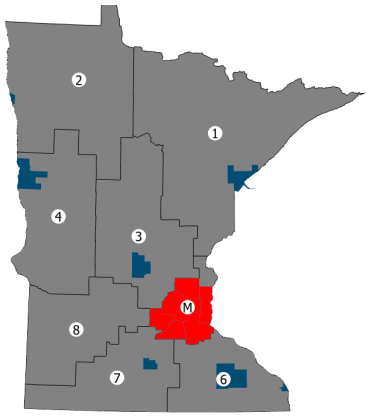
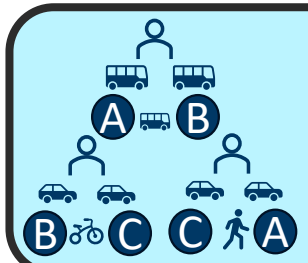


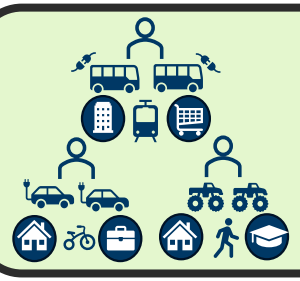
2. Model Inputs

Demographic data
Aggregated using GIS to different development types for counties
Income, employment, age, family size data



Travel Data
Aggregated to development types for either counties or MPOs
Income, employment, age, family size data

Land Use Data
Aggregated to development types for either counties or MPOs
Income, employment, age, family size data, parking

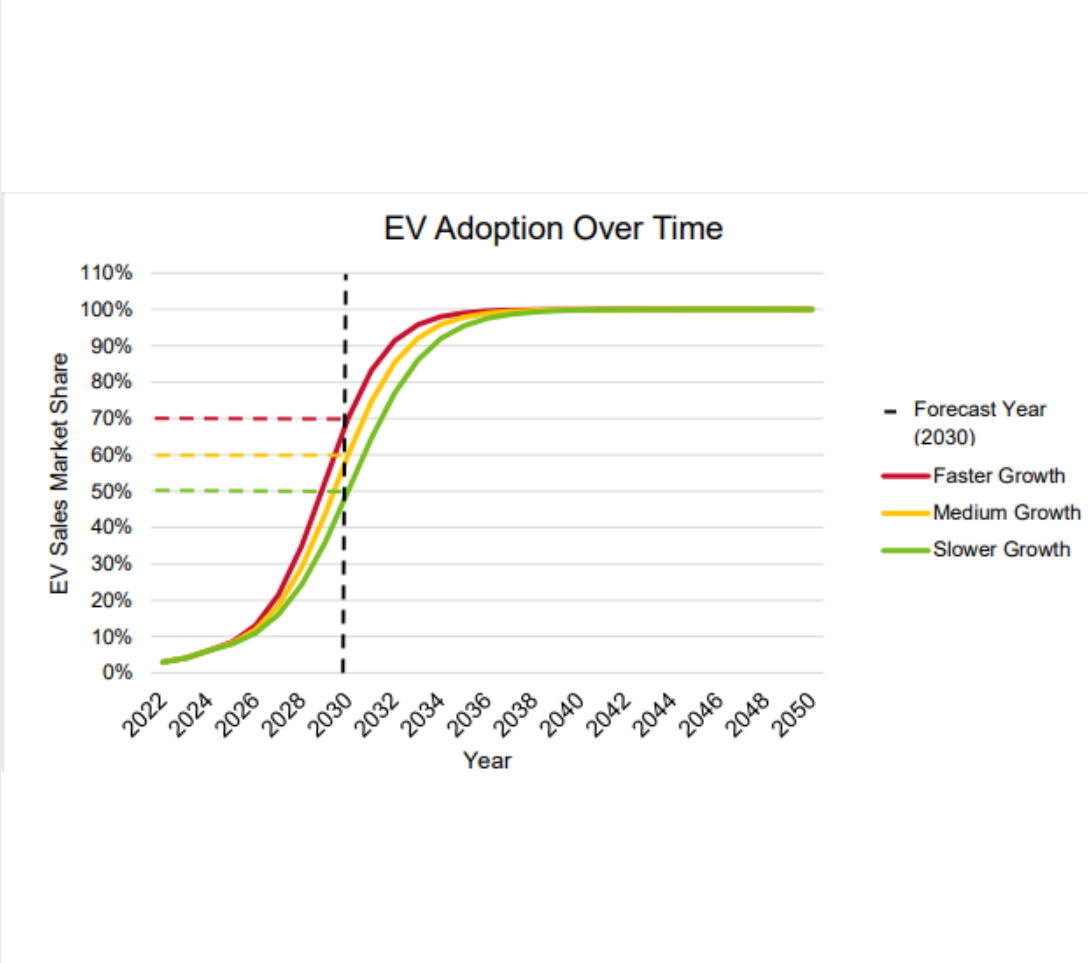


Power/Fuel and Vehicle Data
Aggregated to either counties, MPOs, or statewide measure
Powertrain, vehicle type, fuel cost, fleet fuel use, vehicle ownership

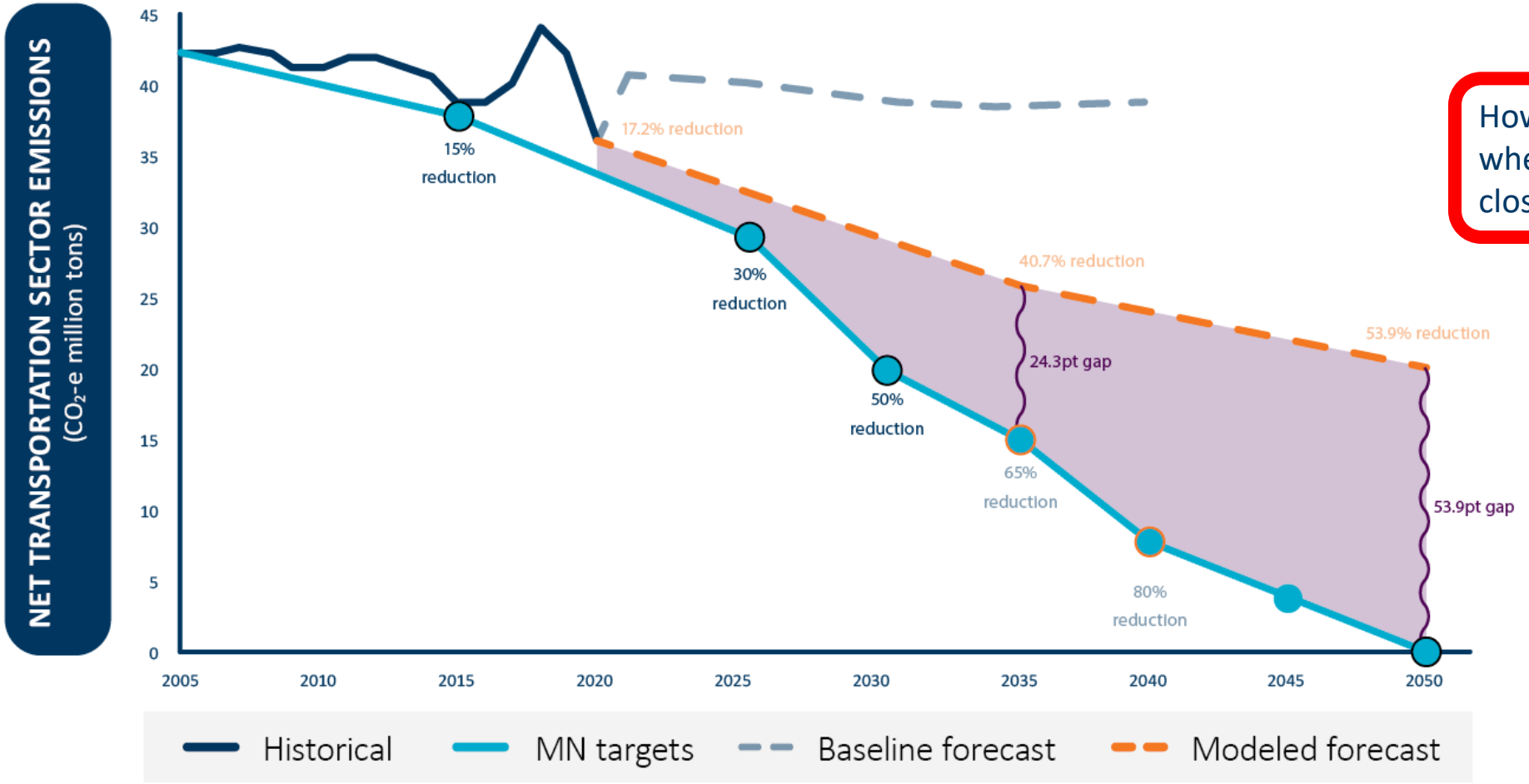
Note: Diagram shows only inputs most relevant to GHG (there are many others!)

3. Running the Model

- After running the model a few times, it was clear that our electric vehicle projections did not line up with how VisionEval looks at EVs
- To fix this, we rebuilt the VEpowertrainsandfuels module using R's build features
- Forecasts courtesy of MnDOT's Electric Vehicle Infrastructure Needs Assessment



4. Results and Scenario Planning



How, where and when do we close the gap?

NOTE: The 'zero' at the right hand side represents a net value of zero GHG emissions from the transportation sector above those that existed in 2005 (43,557,058 tons), and net of any mitigation efforts that get counted as 'offsets' to GHG emissions.

How can you reduce emissions in the transportation sector?

Fuels

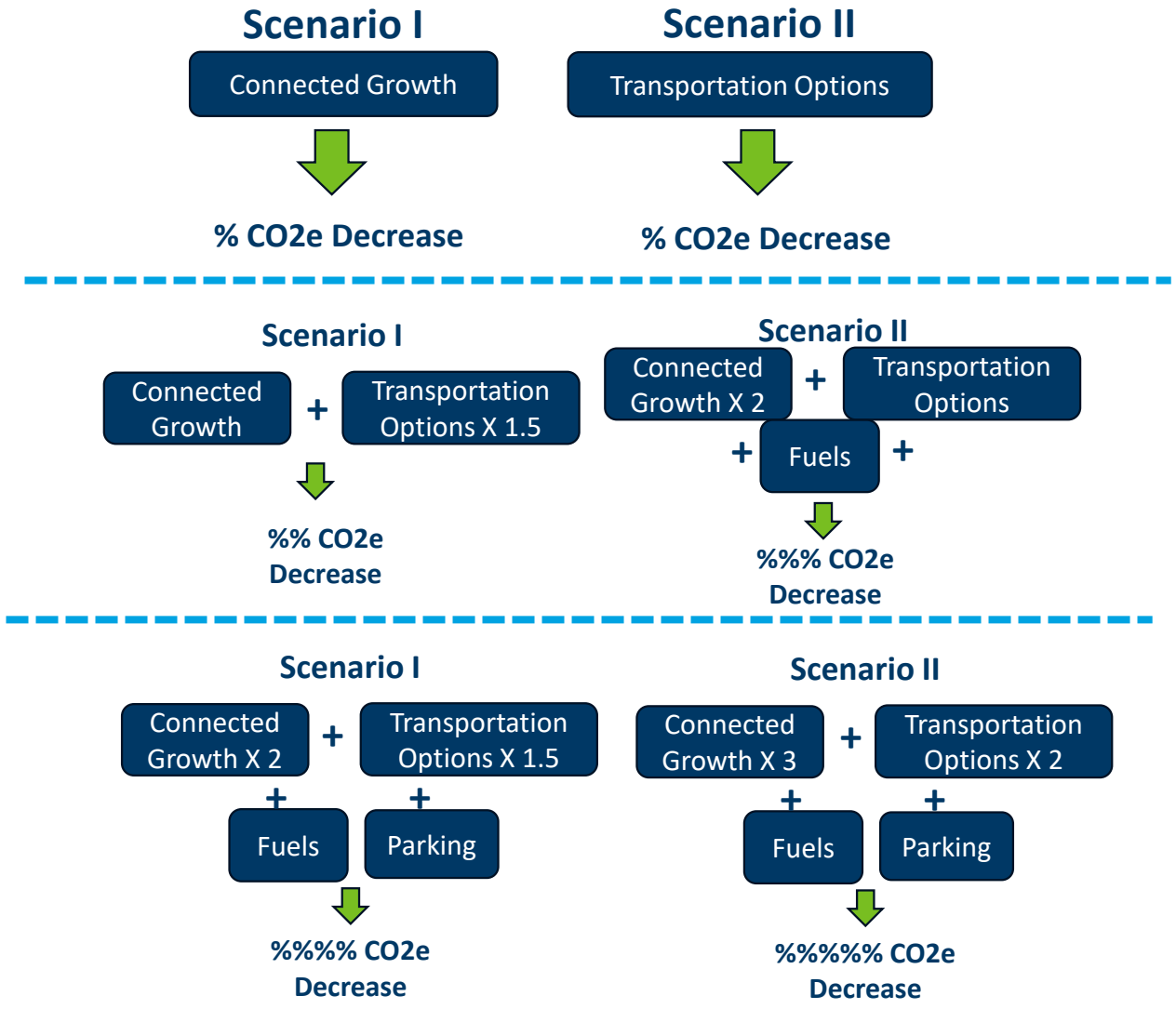
Miles

Fuel Type + MPG **Fuel Efficiency** = **Vehicle Fuels**

Transportation Options
(modes of travel)
+ **Land Use Choices** = **Vehicle Miles Traveled**
(Measured per capita)

4. Results and Scenario Planning

- Scenario Planning involved several forms of input:
  1. Stakeholder engagement with subject matter experts
  2. Engagement with regional partners to understand regional priorities for GHG, active transportation/transit, and land use
  3. Best practices from Oregon DOT and Washington DOT models



Using VE Outputs for Benchmark Setting

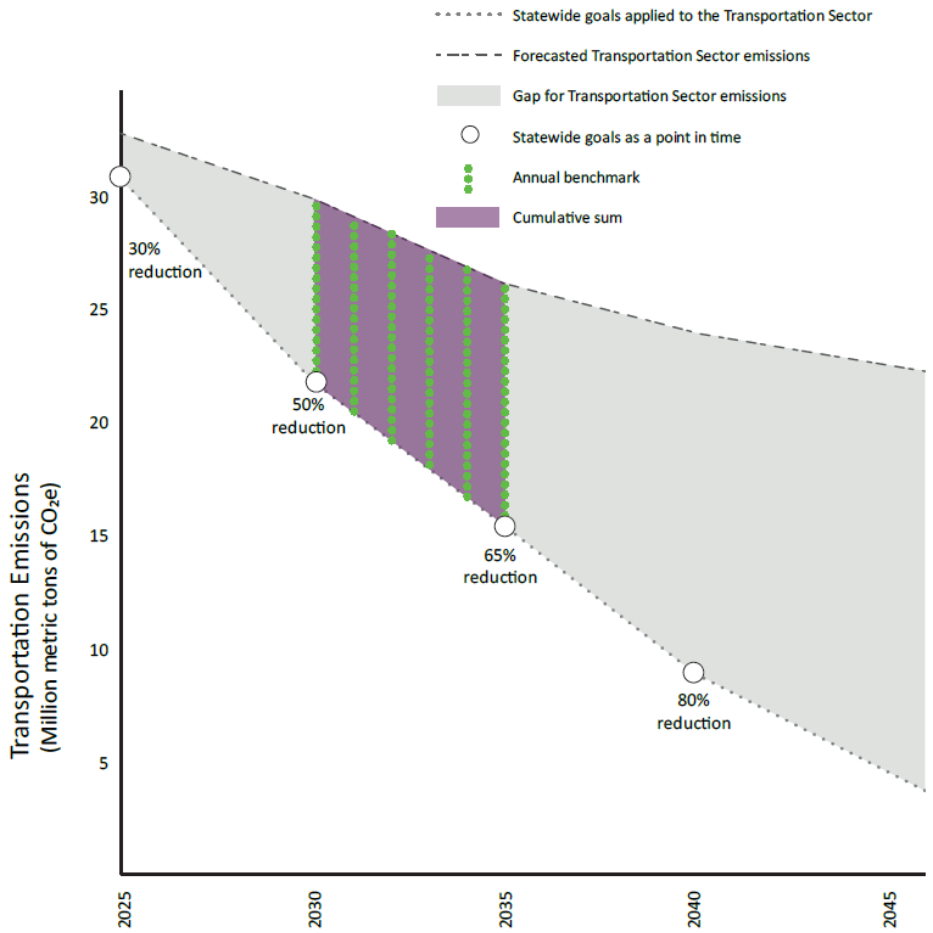
$$aB_x = \boldsymbol{G} \times \frac{sP}{rP}$$

$aB_x =$ Annual GHG emissions reduction benchmark

$G =$ Forecasted surface transportation emissions gap in CO_2e (via VisionEval)

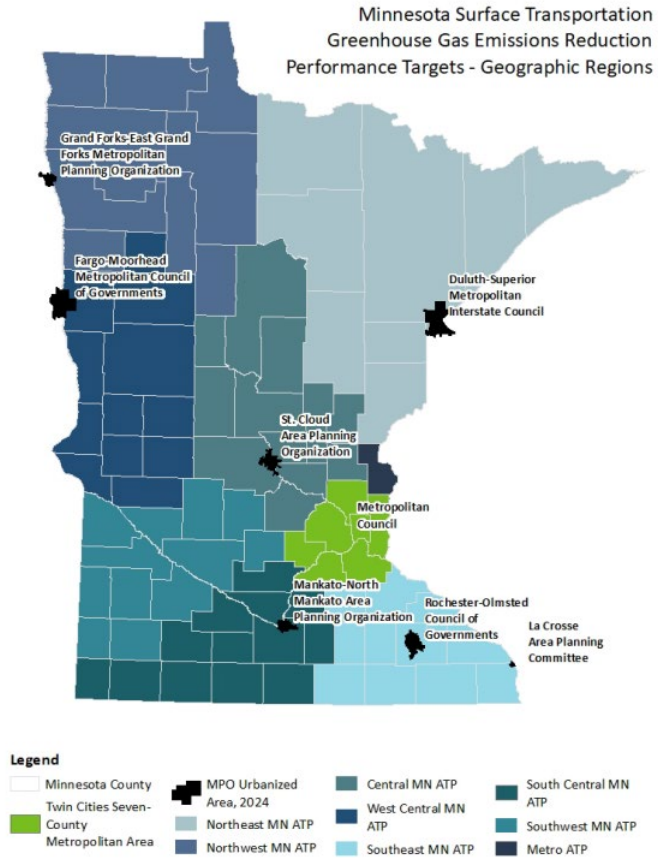
$sP =$ Forecasted state population (source: Minnesota State Demographic Office projections)

$rP =$ Forecasted regional population (source: Minnesota State Demographic Office projections)



Resulting Regional Targets

Region	Annual Benchmark (Metric Tons of CO_2e to reduce)				
	2030	2035	2040	2045	2050
7-County Metropolitan Area	12,644,000	22,456,000	29,710,000	37,879,000	44,269,000
St. Cloud	936,000	1,688,000	2,276,000	2,955,000	3,515,000
Duluth	958,000	1,666,000	2,150,000	2,675,000	3,044,000
Mankato	434,000	781,000	1,052,000	1,365,000	1,621,000
La Crosse/La Crescent	73,000	125,000	158,000	197,000	225,000
Rochester	936,000	1,688,000	2,276,000	2,955,000	3,515,000
Grand Forks/East Grand Forks	112,000	189,000	232,000	275,000	298,000
Fargo-Moorhead	266,000	475,000	632,000	813,000	958,000
ATP-1 rural area	413,000	714,000	912,000	1,123,000	1,264,000
ATP-2 rural area	550,000	951,000	1,214,000	1,491,000	1,673,000
ATP-3 rural area	1,976,000	3,578,000	4,850,000	6,324,000	7,560,000
ATP-4 rural area	794,000	1,417,000	1,889,000	2,427,000	2,861,000
Metro ATP rural area	236,000	426,000	571,000	741,000	881,000
ATP-6 rural area	1,073,000	1,884,000	2,454,000	3,083,000	3,549,000
ATP-7 rural area	791,000	1,386,000	1,804,000	2,261,000	2,597,000
ATP-8 rural area	698,000	1,214,000	1,569,000	1,957,000	2,235,000



Lessons Learned

- VE is a strategic tool, so it does not consider smaller geographic variation (for example, parcel level zoning)
- VE's ability to change individual modules allows for more customization and model fitting
- Scenario "levers" show exponentially higher results for GHG mitigation when they are **combined** (i.e. mode shift, parking, and land use) **than they do by themselves** (separate scenarios for mode shift and land use)
- Building an understanding with stakeholders over what is and is not possible is essential
- The model can take a significantly longer time to run depending on how many scenarios and geographies you have

Thank You!

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