Key Updates

- Office of Sustainability and Public Health Overview
- Pathways
- Sustainable Transportation Advisory Council
- Agency Sustainability Report
- Resilience Report and Research
MnDOT Sustainability and Public Health

1. Reduce Transportation Sector GHG
   Work with partners to reduce GHG emissions from all modes of transportation

2. Promote Agency Sustainability
   Internal focus, engage staff, and lead by example

3. Improve Resilience of Transportation System
   Help the agency prepare for climate change

4. Promote Public Health
   Support public health and healthy communities
174.01 CREATION; POLICY.
In order to provide an integrated transportation system of aeronautics, highways, motor carriers, ports, public transit, railroads, and pipelines, and including facilities for walking and bicycling, a Department of Transportation is created...

Subd. 2. Transportation goals.

10) ensure the planning and implementation of all modes of transportation are consistent with the environmental and energy goals of the state

11) promote and increase the use of high-occupancy vehicles and low-emission vehicles

13) increase use of transit as a percentage of all trips statewide by giving highest priority to the transportation modes with the greatest people-moving capacity and lowest long-term economic and environmental cost

15) reduce greenhouse gas emissions from the state's transportation sector

16) accomplish these goals with minimal impact on the environment
NGEA requires the state to reduce GHG emissions from 2005 levels, 15% by 2015, 30% by 2025, and 80% by 2050.

*We missed the 2015 target and are not on track for 2025.*
Minnesota Emissions by Sector 2005-2016

<table>
<thead>
<tr>
<th>Sector</th>
<th>Emissions (CO2-e tons)</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation</td>
<td>-3.31M</td>
<td>-8%</td>
</tr>
<tr>
<td>Electricity generation</td>
<td>-16.41M</td>
<td>-29%</td>
</tr>
<tr>
<td>Agriculture, Forestry and Land use</td>
<td>-4.52M</td>
<td>-12%</td>
</tr>
<tr>
<td>Industrial</td>
<td>+2.99M</td>
<td>+17%</td>
</tr>
<tr>
<td>Residential</td>
<td>+0.94M</td>
<td>+11%</td>
</tr>
<tr>
<td>Commercial</td>
<td>+0.1M</td>
<td>+1%</td>
</tr>
<tr>
<td>Waste</td>
<td>-0.13M</td>
<td>-6%</td>
</tr>
</tbody>
</table>
Pathways Overview

Technical Stakeholder Engagement

Work with technical experts from the public, private, and nonprofits sectors to inform modeling assumptions and strategies that should be considered.

April – June 2019

Modeling

Model different pathways for decarbonizing transportation.

April – May 2019

Public Engagement

Meet with the public at locations around the state to hear their feedback and thoughts on strategies.

May – June 2019
Surface Transportation

Minnesota Emissions Profile

- Surface Transportation: 20%
- Light-duty trucks: 32%
- Medium-duty trucks: 17%
- Heavy-duty trucks: 4%
- Mobile air conditioning: 1%
- Buses: 1%
- Other Transportation: 1%
- Electricity Generation: 25%
- Agriculture: 17%
Technical Stakeholder Meetings

<table>
<thead>
<tr>
<th>Organization</th>
<th>Meeting 1</th>
<th>Meeting 2</th>
<th>Meeting 3</th>
<th>Total Unique Attendees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance</td>
<td>45</td>
<td>41</td>
<td>34</td>
<td>106</td>
</tr>
</tbody>
</table>

- Input on GHG reduction strategies, data, and assumptions for modeling
- 74 organizations invited, >50 attended one or more meeting
- State and local agencies, industry associations, tech companies, auto manufacturers, environmental advocacy groups, nonprofits, others…
## Actions to reduce emissions in transportation

<table>
<thead>
<tr>
<th>Model strategy</th>
<th>Example tactics to reduce transportation carbon pollution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve fuel economy</td>
<td>• Federal or state vehicle efficiency standards</td>
</tr>
<tr>
<td>Reduce driving and VMT</td>
<td>• Smart, dense city design</td>
</tr>
<tr>
<td></td>
<td>• Neighborhoods built for biking, walking, and rolling</td>
</tr>
<tr>
<td></td>
<td>• Carpooling incentives</td>
</tr>
<tr>
<td></td>
<td>• Improved public transit</td>
</tr>
<tr>
<td>Increase electric vehicle sales</td>
<td>• Consumer rebates</td>
</tr>
<tr>
<td></td>
<td>• State vehicle targets</td>
</tr>
<tr>
<td></td>
<td>• Public and workplace charging stations</td>
</tr>
<tr>
<td>Reduce the carbon intensity of biofuels</td>
<td>• Regenerative agricultural and soil practices</td>
</tr>
<tr>
<td></td>
<td>• Process efficiency</td>
</tr>
<tr>
<td></td>
<td>• Low-carbon fuel standard</td>
</tr>
<tr>
<td>Increase lower-carbon electricity</td>
<td>• Clean electricity standards</td>
</tr>
<tr>
<td>generation</td>
<td>• Utility greenhouse gas reduction goals</td>
</tr>
<tr>
<td></td>
<td>• Retire coal plants</td>
</tr>
</tbody>
</table>
Minnesota GHG Emissions Reduction Measures in Transportation, 80x50 Scenario

- Start ramping up sales of electric vehicles in light, medium, and heavy duty vehicles
- Reduce urban miles traveled by 6% (relative to reference)
- 30% sales of hybrid vehicles in medium and heavy duty
- 40% electric vehicle sales in light duty
- 750,000 electric passenger vehicles on the road
- 50% electric bus sales
- 20% blend of low-carbon biofuels in gasoline and diesel
- 100% of new vehicles sold use low global warming potential refrigerants
- 55% blend of low-carbon biofuels in gasoline and diesel
- 90% zero-carbon electricity
- Reduce urban miles traveled by 10%
- 80% electric vehicle sales in light duty
- 50% electric bus sales
- Reduce urban miles traveled by 10%
- 80% electric vehicle sales in light duty
- 50% electric bus sales
- Reduce urban miles traveled by 10%
- 80% electric vehicle sales in light duty
- 50% electric bus sales
Emissions Reduction Scenarios

Total Surface Transportation Emissions by Scenario

- Reference
- 80x50
- 100x50

GHG emissions (MST CO2e)

- 15% below 2005 levels
- 30% below 2005 levels
- 80% below 2005 levels
- 100% below 2005 levels

Years:
- 1990
- 2000
- 2010
- 2020
- 2030
- 2040
- 2050
Emissions Reductions

80 x 50

Greenhouse Gas Emissions ( Million Short Tons CO2e)

- Fuel Economy Standards
- Reduction in Urban Miles Traveled
- Light Duty Electric Vehicles
- Medium Duty Electric and Hybrid Vehicles
- Heavy Duty Electric and Hybrid Vehicles
- Biofuels
- Mobile Refrigerants
- GHG Goals
### Public Engagement

<table>
<thead>
<tr>
<th></th>
<th>Online survey responses</th>
<th>Online comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,115</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Webinar attendees</th>
<th>In-person meeting attendees</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>53</td>
<td>280</td>
</tr>
</tbody>
</table>

*Legend*
- Berdiji
- Duluth
- Marshall
- Minneapolis
- Multiple
- Online
- Rochester
Actions and Recommendations

**Actions**

- What MnDOT can do now in response to public input

**Recommendations**

- Outside of MnDOT’s control and suggested for consideration by other state agencies and the Governor
Find Integrated Solutions

• Sustainable Transportation Advisory Council (STAC)

• Regional Collaboration on EV Corridors

Fund EV Infrastructure

• Clean Transportation Funding Pilot Program

I-94 near Albertville
Co-chairs
- Commissioner Margaret Anderson Kelliher, MnDOT
- Chris Clark, Xcel Energy

Members
- Katie Bell, Cummins
- Katie Frye, Minnesota Power
- Dorian Grilley, Bicycle Alliance of Minnesota
- Greg Ikka, Steele County
- Katie Jones, Center for Energy and Environment
- Ashwat Narayanan, Our Streets Minneapolis
- Michael Noble, Fresh Energy
- Rolf Nordstrom, Great Plains Institute
- Daniel Schellhammer, Midstate Reclamation Inc.
- Patrick Seen, Destination Medical Center
- Russ Stark, City of St. Paul
- Emma Struss, City of Bloomington
- Vishnu Laalitha Surapaneni, University of Minnesota
- Lisa Thurstin, American Lung Assoc., Twin Cities Clean Cities Coalition
- Peter Wagenius, Sierra Club North Star Chapter
- Tara Wetzel, Mathy Construction Company

Ex officio
- Representative Frank Hornstein (DFL)
- Senator Scott Dibble (DFL)
- Senator Scott Newman (R)
- La Shella Sims, MPCA EJ Advisory Council
- Nick Thompson, Metro Transit
Actions

Provide More Transportation Options on Projects

• Analyze GHG emissions on transportation projects

Provide EV Incentives

• MnPass Incentive

Example: electric transit bus
Recommendations

Build an EV Market and Provide More EV Options

• Adopt the Clean Car Standards
  
  • [https://www.pca.state.mn.us/air/clean-cars-mn-about](https://www.pca.state.mn.us/air/clean-cars-mn-about)

Promote Biofuels to Reduce GHG Emissions and Support Rural Minnesota

• Strengthen petroleum replacement goals
  
  • Expand biofuel infrastructure
  
  • Higher biodiesel blends and renewable diesel
  
  • Reduce the carbon impact of biofuels

*Star Tribune, Sept 16, 2019*
<table>
<thead>
<tr>
<th>Metric</th>
<th>Target</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sector Level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total annual GHG emissions</td>
<td>29,500,000</td>
<td>41,842,898</td>
</tr>
<tr>
<td>generated by Minnesota’s</td>
<td>tons CO₂e</td>
<td>2018</td>
</tr>
<tr>
<td>transportation system</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>State Highway Construction</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total annual GHG emissions</td>
<td>252,500</td>
<td>228,245</td>
</tr>
<tr>
<td>from the fuel and materials</td>
<td>metric tons CO₂e</td>
<td>metric tons CO₂e</td>
</tr>
<tr>
<td>used to construct MnDOT</td>
<td>2017</td>
<td>2017</td>
</tr>
<tr>
<td>projects</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MnDOT GHG Emissions -</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilities</td>
<td>21,800</td>
<td>27,012</td>
</tr>
<tr>
<td>Total annual GHG emissions</td>
<td>metric tons CO₂e</td>
<td>metric tons CO₂e</td>
</tr>
<tr>
<td>generated from energy used</td>
<td>2018</td>
<td>2018</td>
</tr>
<tr>
<td>by MnDOT-owned facilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fleet</strong></td>
<td>26,500</td>
<td>43,028</td>
</tr>
<tr>
<td>Total annual GHG emissions</td>
<td>metric tons CO₂e</td>
<td>metric tons CO₂e</td>
</tr>
<tr>
<td>generated from fuel used</td>
<td>2018</td>
<td>2018</td>
</tr>
<tr>
<td>by the MnDOT-owned fleet</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Our Sustainability Journey

2016
Fall - Internal team researched and developed metrics
Next Generation Energy Act applied uniformly across enterprise to create emissions reductions targets
These targets positioned MnDOT as a leader among DOTs in the country on sustainability

2017
Jan - STSC Approved Sustainability Metrics
Mar – 2016 Sustainability Report published (“Establishing a Baseline”)
Spring/Summer – Subject matter experts developed strategies to meet targets
Dec - STSC reviewed all strategies

2018
Jan - Strategies and data integrated into 2017 Sustainability Report update
Mar – 2017 Sustainability Report published (“Identifying Sustainability Strategies”)
Apr – Launched temperature set point standards for facilities

2019
Mar - Fleet Managers developed Fleet Action Plan
May – 2018 Sustainability Report published (“Planning for Progress”)
Jul – Launched fleet selector tool and idle reduction standards
Fall – Purchased 5 BEVs and 16 PHEVS and 30 charging stations statewide
• Introduction will include *new* content on sector greenhouse gas emissions

• Dashboards
  • Facilities
  • Fleet
  • Highway Operations
  • Roadside Management
  • Transportation Options
  • Resilience (*NEW*)
2019 Report Timeline

• Jan - March – Data collection and analysis
• Late March – Early April – Report development/formatting
• Early April – Share draft with STSC and SMEs for review via email
• Mid-April – Complete requested edits
• April 22 (Earth Day) - Release
## Climate Change Impacts on Transportation

<table>
<thead>
<tr>
<th>Climate Impacts</th>
<th>Likelihood</th>
<th>Potential Negative Implications for Transportation System</th>
</tr>
</thead>
</table>
| Floods               | Very High  | • Slope failures and erosion  
                      |                                                                    | • Increased large-scale river flooding and localized flooding       |
|                      |            | • More frequent and extensive inundation of low-lying areas                                                               |
| Warmer Winters       | Very High  | • Increase in overnight icing and in freeze/thaw cycles, leading to reduced pavement conditions and life cycles length   |
|                      |            | • Increase in average winter precipitation and more extreme precipitation                                                    |
| Invasive Species     | High       | • Soil erosion from vegetation loss                                                                                       |
|                      |            | • Increase in invasive species populations                                                                                 |
|                      |            | • Wetland site failure                                                                                                     |
| Droughts             | Medium     | • Roadside vegetation stress and increases soil erosion                                                                     |
|                      |            | • Low stream and ground water flow                                                                                         |
| Extreme Heat         | Medium Low | • Pavement and rail buckling                                                                                            |
|                      |            | • Increase in vehicles overheating and electrical system malfunctions                                                     |
|                      |            | • Limitations on construction hours                                                                                        |
| Wildfires            | Low        | • Immediate and significant threat to human safety                                                                      |
|                      |            | • Increased risk of future flooding and slope failure                                                                      |
| Severe Wind          | Low        | • Severe wind-related road closures, blown-down trees, signs                                                            |
## MnDOT Current Resilience Practices

<table>
<thead>
<tr>
<th>Planning</th>
<th>Design and Environmental Review</th>
<th>Construction</th>
<th>Maintenance and Operations</th>
<th>Emergency Response</th>
<th>Overarching Initiatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Flash Flood VA and Extreme Flood VA</td>
<td>• Bridge Manual (draft language)</td>
<td>• Stormwater Erosion Control</td>
<td>• Living Snow Fences</td>
<td>• State Aid Betterment</td>
<td>• Advancing Transportation Equity</td>
</tr>
<tr>
<td>• Slope Stabilization Guide and Slope VA (multi-phased)</td>
<td>• MN AOP Guide</td>
<td>• State Flood Mitigation Program</td>
<td>• Salt Management</td>
<td>• Emergency Management &amp; Response</td>
<td>• Active Transportation and Complete Streets</td>
</tr>
<tr>
<td></td>
<td>• Geomorphic Design</td>
<td>• Sustainable Pavements</td>
<td>• Native and Resilient Plants</td>
<td></td>
<td>• EV and EV Infrastructure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• On-site Solar Energy</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Asset Management</td>
<td></td>
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**Overarching Initiatives**

- Advancing Transportation Equity
- Active Transportation and Complete Streets
- EV and EV Infrastructure
Ongoing Efforts

- Complete System-wide Climate Vulnerability Assessment – In Progress
- Protect Environmental Justice and Vulnerable Populations – In Progress
- Actions with Adaptation Co-benefits – In Progress
- Resilience Research – In Progress
- Incorporate findings into Asset Management
- Update Design Guidelines
- Downscaled Climate Data
Active Research

Extreme Flood Vulnerability Analysis

BR 5553, Highway 23 over South Fork Nemadji River

District 2 Resilience Pilot Project