# MPO Innovation

Wednesday, October 28, 3:15 PM - 4:30 PM ET

**Using Location Based Services Data for Calculating the Greenhouse Emissions of Communities in Minnesota's Metropolitan Region**

Catherine Manzo, StreetLight Data

Mauricio Leon, Metropolitan Council

Liz Roten , Metropolitan Council

**Freeway System Interchange Study**

Tony Fischer, Metropolitan Council

Michael Corbett, Minnesota Department of Transportation

Catherine Manzo, Mauricio Leon, Liz Roten

**Metropolitan Council**

# Using Location-Based Services Data for Calculating the Transportation GHG Emissions of Communities in Minnesota's Metropolitan Region

AMPO 2020

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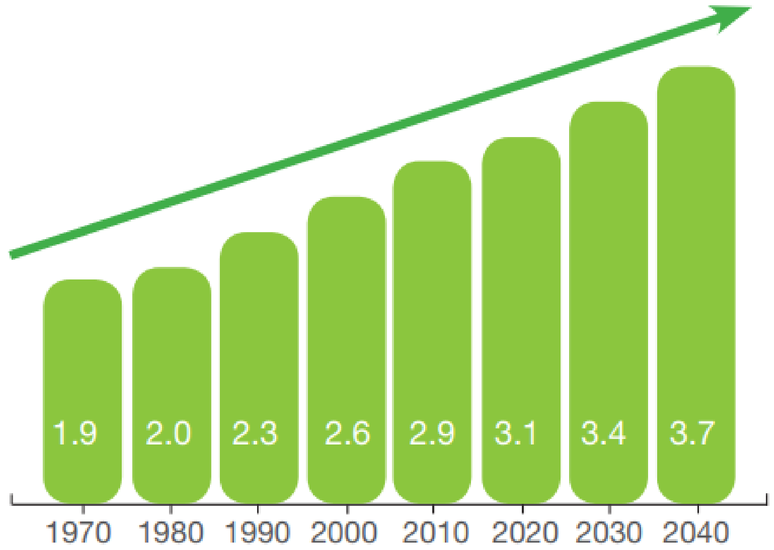
# Minnesota's Metropolitan Area

- **The Twin Cities Region continues to grow**
  - 3.1 million by 2020
- **Many jurisdictions are taking ambitious action on climate change mitigation**
  - Lack of data access can be a problem
- **The Metropolitan Council has been tasked with supporting communities with technical resources for climate action planning**




**Twin Cities Population**
(in millions)

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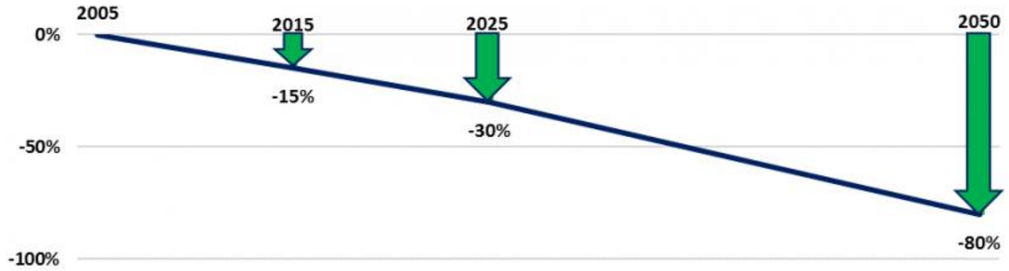
# Minnesota's Climate Goals

- **Greenhouse Reduction Goals**
  - 15% below 2005 by 2025 and 80% below 2005 by 2050 according to the Minnesota Legislature

- **Transportation Sector is the second largest contributor of greenhouse gas emissions in Minnesota**

- **To reduce emissions from the transportation sector local governments need to do data informed strategic planning**

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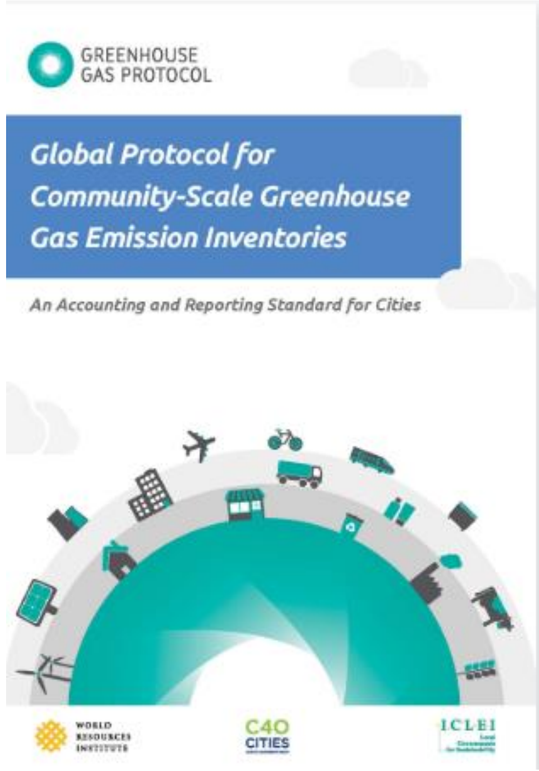
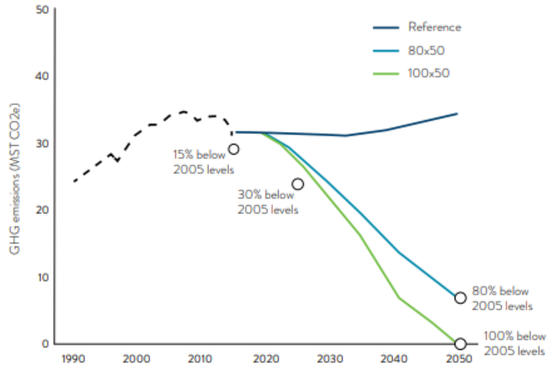
# Climate Action Planning Tools

- **Greenhouse Gas Inventories**
  - For cites, townships, and counties

- **Scenario Planning Tools**
  - Greenhouse gas emissions forecasting
  - Strategy prioritization
  - Understanding the impact electric vehicles, transit-oriented development, autonomous vehicles

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# A brief introduction to StreetLight

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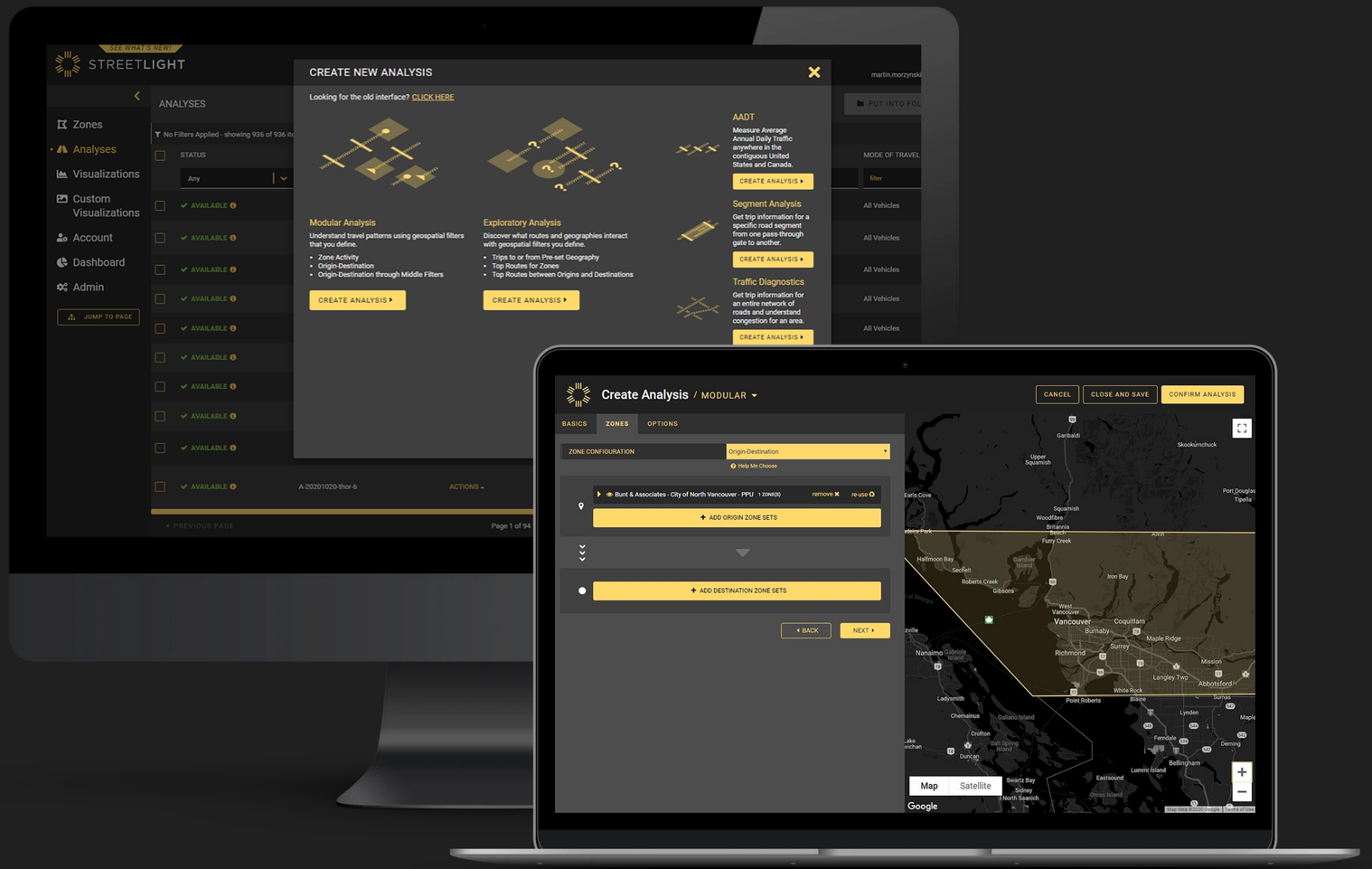
# StreetLight InSight® is an only **interactive** transportation data platform



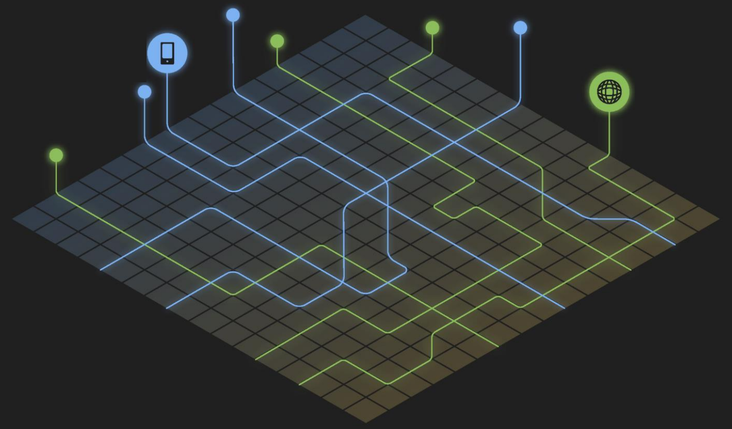

- It's NOT a model, a report or a static heatmap.
- It's your self-serve desktop software with **on-demand access to accurate mobility metrics.**

# At your fingertips:
# Analytics for every road, bike lane and Census Block

## LBS and Contextual Data

**DATA SOURCES:**

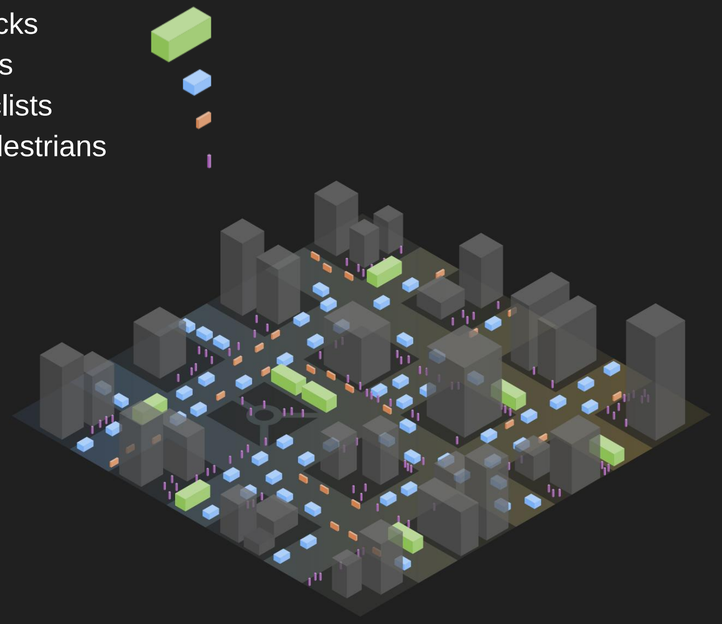
Location-based  Services Data
GPS Data
Contextual Data (Road, Census, etc.)



## Machine Learning + Algorithmic Processing

**MODES:**

Trucks
Cars
Cyclists
Pedestrians



## StreetLight InSight® Metrics

**FUNDAMENTALS:**

- Origin Destination
- Routing
- Select Link
- AADT, MADT, hourly traffic

**TRIP ATTRIBUTES:**

- Trip speed, duration, length
- Travel time
- Trip circuity

**TRAVELER ATTRIBUTES:**

- Inferred trip purpose
- Demographics

Every month, StreetLight processes over ~40 billion anonymized location records from **smart phones** and **GPS navigation devices** in cars and trucks.

Our proprietary data processing engine **Route Science®** transforms them into contextualized, normalized, aggregated, **multimode** travel patterns.

StreetLight InSight® lets you analyze how vehicles, bicycles and pedestrians move on virtually every road and Census Block.

# Calculating Greenhouse Gas Emissions from Vehicle Miles Traveled

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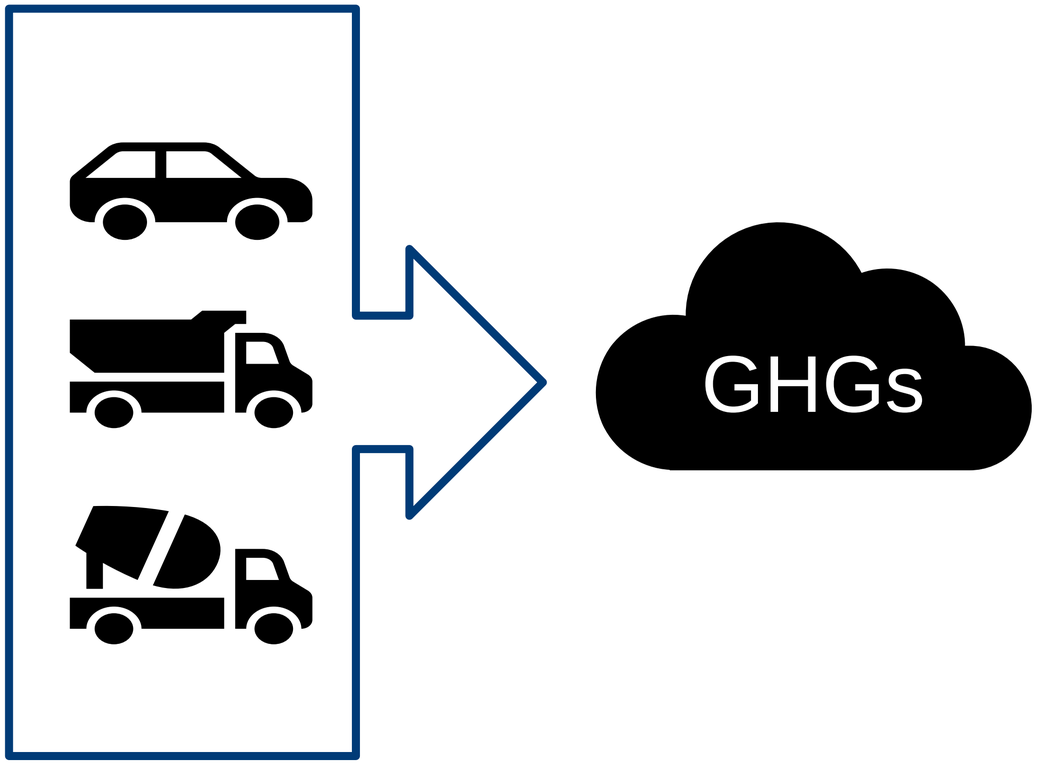
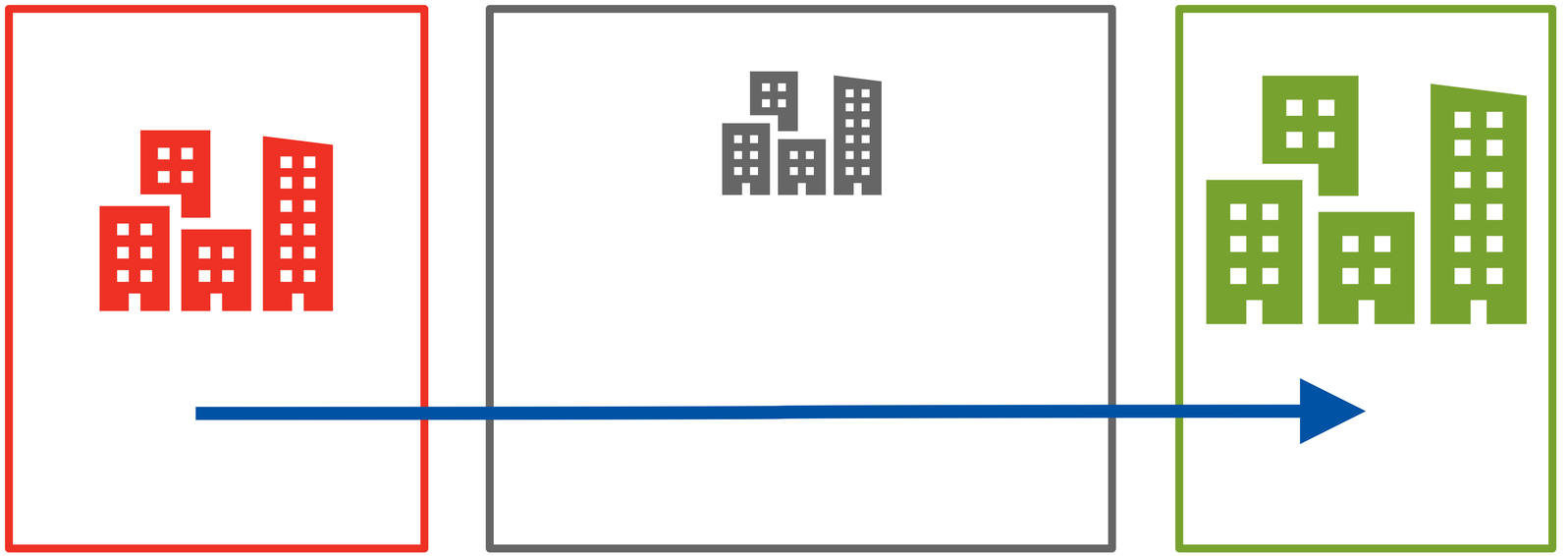
# Goal: convert vehicles to emissions




1. Origin and Destination cities
2. Vehicle count by class
3. Average miles traveled
4. Fuel efficiency
5. Emission rates



| | | | | |
|---|---|---|---|---|
| Pass-Through (AADT) | 10 | 15 | 5 | = 30 |
| Origin-Destination (StreetLight) | 15 | 0 | 15 | = 30 |

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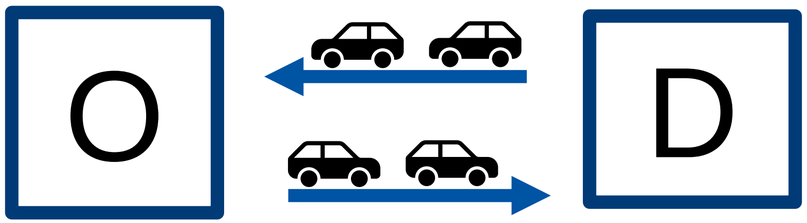
# Vehicle Count

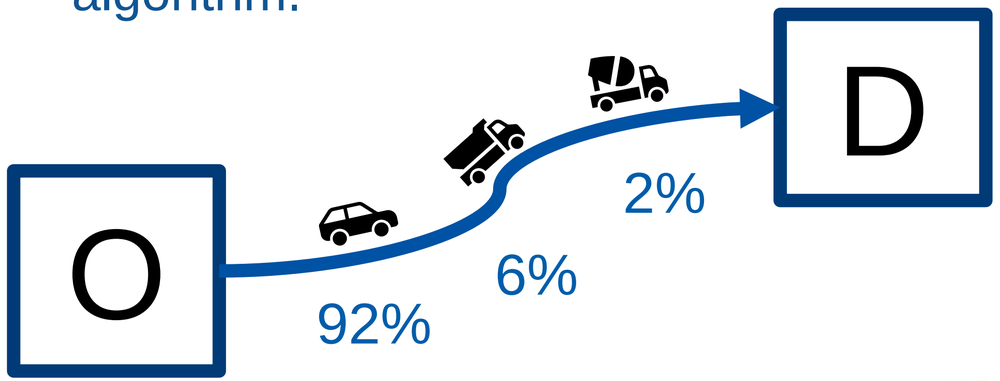
## Passenger Vehicles

- StreetLight Volume©
  - Estimated number of vehicle trips
  - Based on machine learning models that consider traffic patterns during the entire year, not just a sample month
  - Uses location-based services (LBS) data




## Commercial Vehicles

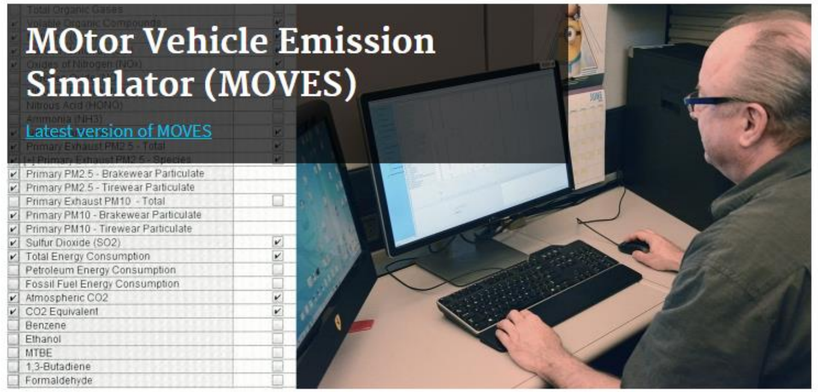
- Calibrated StreetLight Index©
  - We provide vehicle classification distribution for a sample of roads
  - StreetLight applies the distribution in the algorithm.




Vehicle count x avg. trip length = Vehicle miles traveled (VMT)

# Fuel efficiency (gallons per mile) and Emission rates (grams per gallon)

- Region-specific emission rates by vehicle class
  - Vehicle registration data (DVS)
  - Vehicle age distribution (MPCA)
  - Travel demand model (Met Council)




EPA's MOtor Vehicle Emission Simulator (MOVES) is a state-of-the-science emission modeling system that estimates emissions for mobile sources at the national, county, and project level for criteria air pollutants, greenhouse gases, and air toxics.

**Twin Cities vehicle emissions rates (grams per mile)**

| | $CO_2$ | $CH_4$ | $N_2O$ | $CO_2$ and $CO_2$ equivalent |
|---|---|---|---|---|
| Light-duty ('19) | 353.4 | 0.01 | 0.01 | 355.4 |
| Medium-duty ('19) | 473.2 | 0.01 | 0.01 | 473.2 |
| Heavy-duty ('18) | 1,212.4 | 0.021 | 0.04 | 1,213.9 |

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Background
StreetLight data
Vehicle Miles Traveled
Greenhouse Gas Emissions
Regional Emissions Rates
Final data
Authors
References

# Passenger and Commercial Transportation Methodology

## Background

This document provides data sources and methodology for the greenhouse gas emissions inventory for passenger and commercial vehicles.

### StreetLight data

StreetLight Data is a transportation analytics platform that uses aggregated location-based services (LBS) data from cell phones and navigation/GPS data to deliver insights on travel patterns. For this project, we used StreetLight to find the volume of traffic going from each city or township unit (CTU) to each CTU for personal and commercial traffic during 2019.

## Vehicle Miles Traveled

To find the estimate number of vehicle miles traveled (VMT), we used the estimated number of vehicles and the average trip length in miles for all origin - destination pairs. VMT is calculated as follows:

$$VMT = trips \times length$$

where

$$trips = \text{number of trips}$$
$$length = \text{average trip length in miles}$$

### Passenger vehicle miles traveled

StreetLight provides multiple metrics to describe travel patterns. For passenger vehicle traffic, we used *StreetLight Volume*, which represents an estimated number of vehicle trips. StreetLight uses machine learning models to estimate the expected seasonal changes at a given location and then applies their Average Annual Daily Traffic (AADT)[1] values to calibrate seasonal changes to an estimated volume (StreetLight Data 2019b). Expected seasonal changes are generated from permanent traffic recorders, which count vehicles constantly. Under 500 counters are used to calculate seasonal changes, but a validation study in Hennepin County yielded promising results for origin-

# Applications

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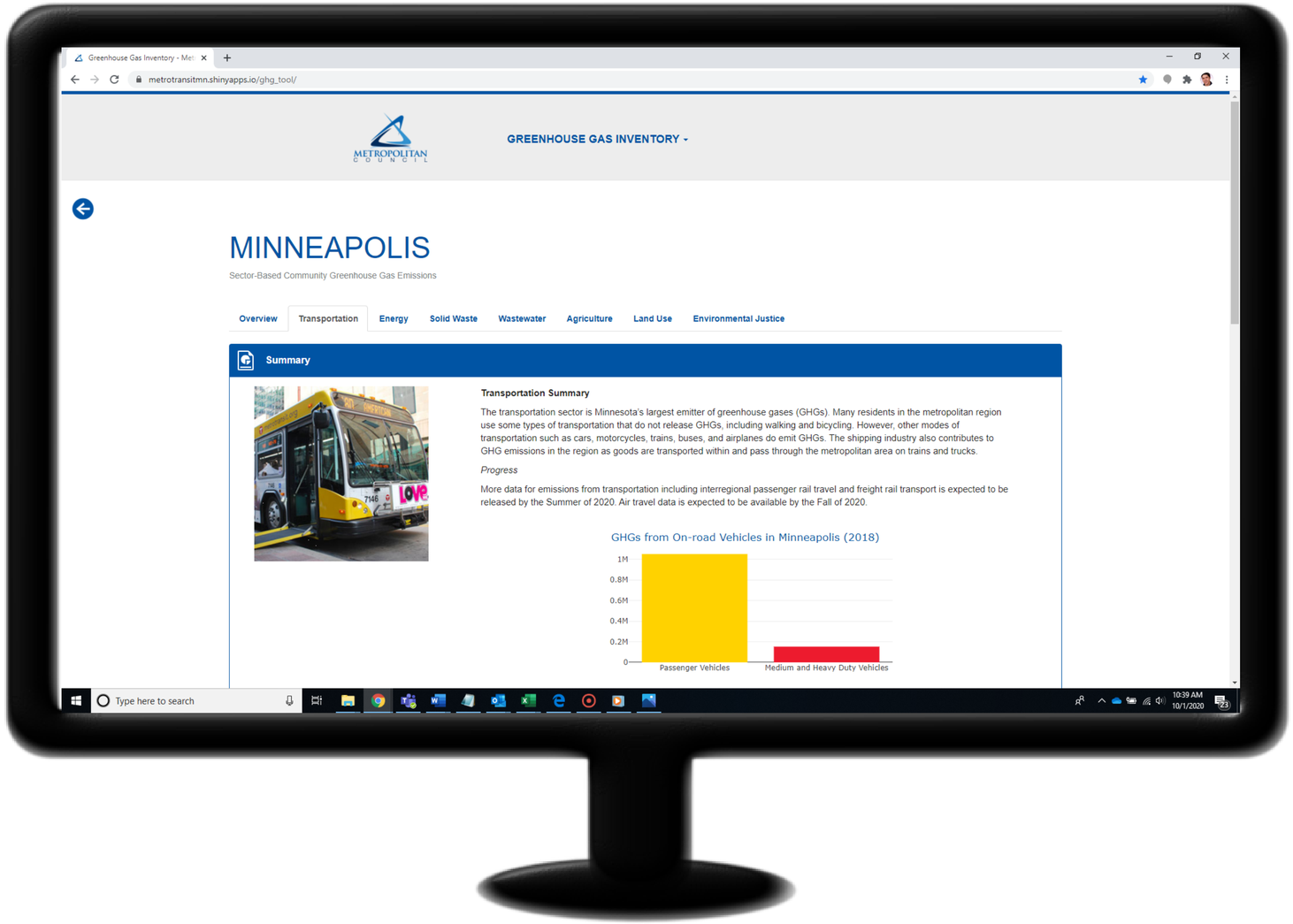
# GHG Emissions Inventories for Local Governments



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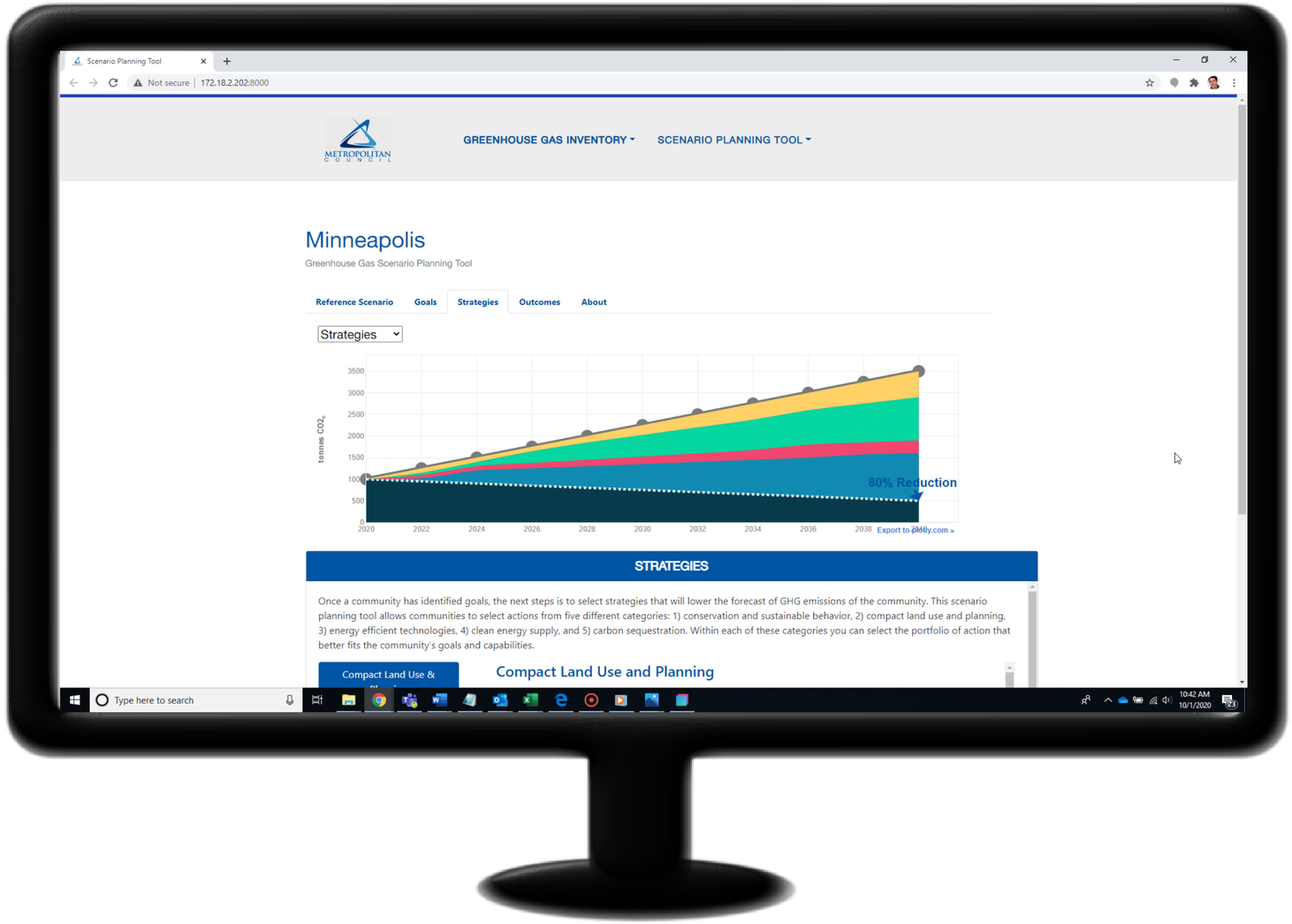
# GHG Emissions Scenario Planning for Local Governments



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Catherine Manzo, Catherine.Manzo@streetlightdata.com

# Sources

- Passenger and Commercial Transportation Methodology (2020) https://rpubs.com/lizroten/metroclimate_method_on_road
- US Environmental Protection Agency MOVES https://www.epa.gov/moves



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# Thank you

# Question & Answer

For additional information regarding today's presentations, please contact staff@ampo.org