The **T**ravel **E**fficiency **A**ssessment **M**ethod(**TEAM**): Development and Case Studies

Mobile Sources Technical Review Subcommittee Meeting

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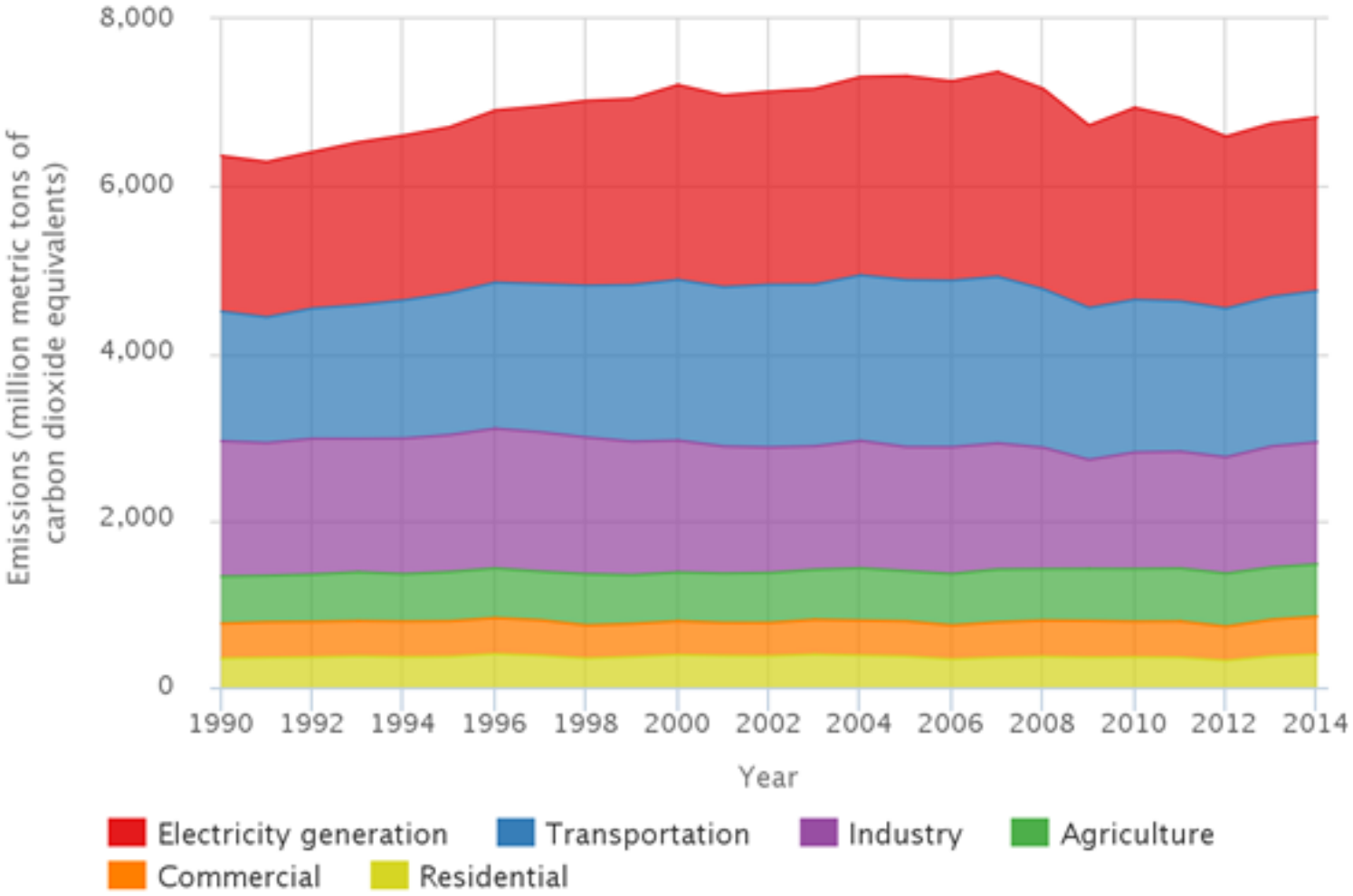
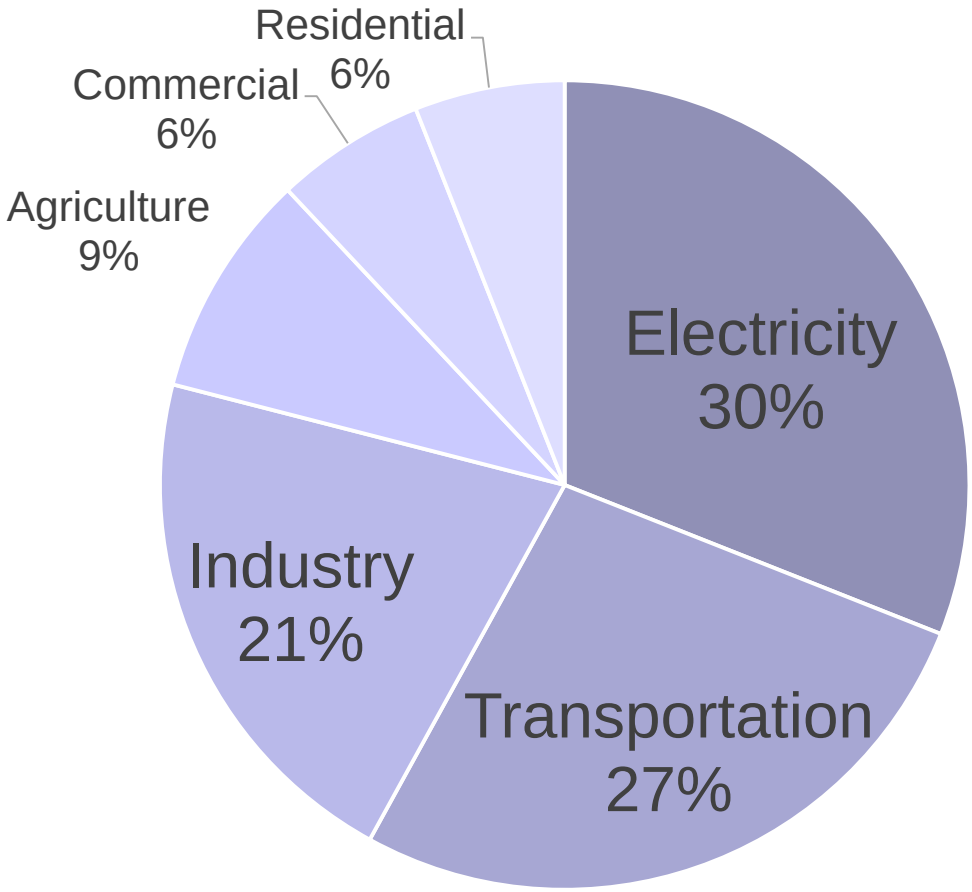
U.S. Greenhouse Gas Emissions by Economic Sector, 1990–2014



Source: U.S. EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014.
http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html

U.S. GHGs by Economic Sector

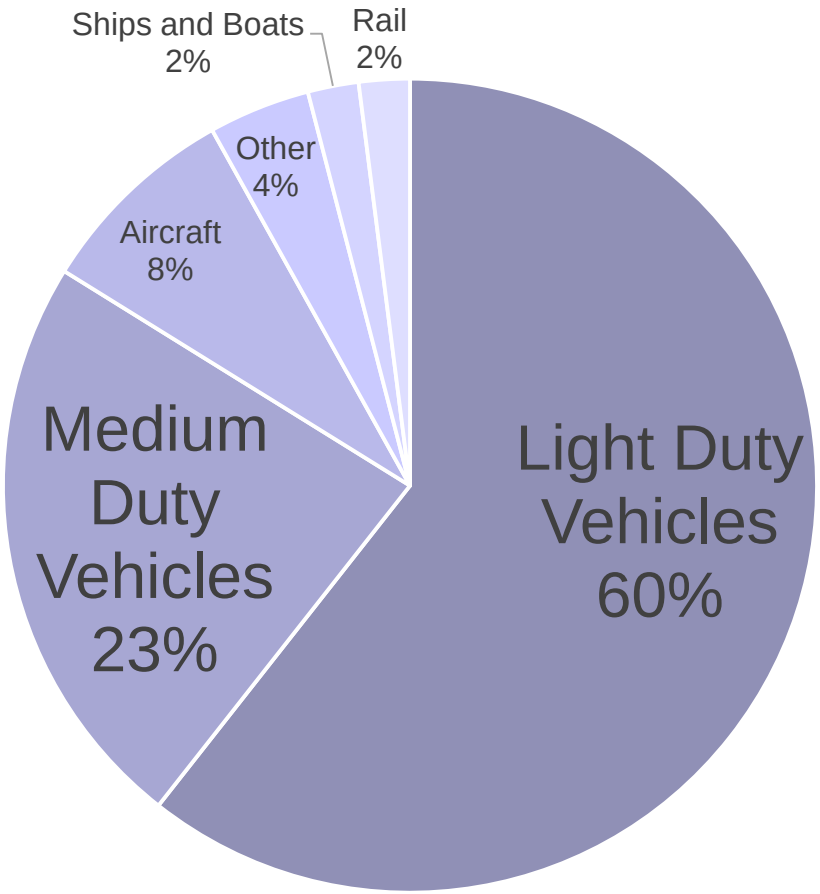
After electricity generation, ***transportation*** is the next largest source of U.S. GHG emissions



Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014 (April 2016)

U.S. Transportation GHG Emission Sources

Light duty passenger vehicles contribute the largest share of GHG emissions from transportation



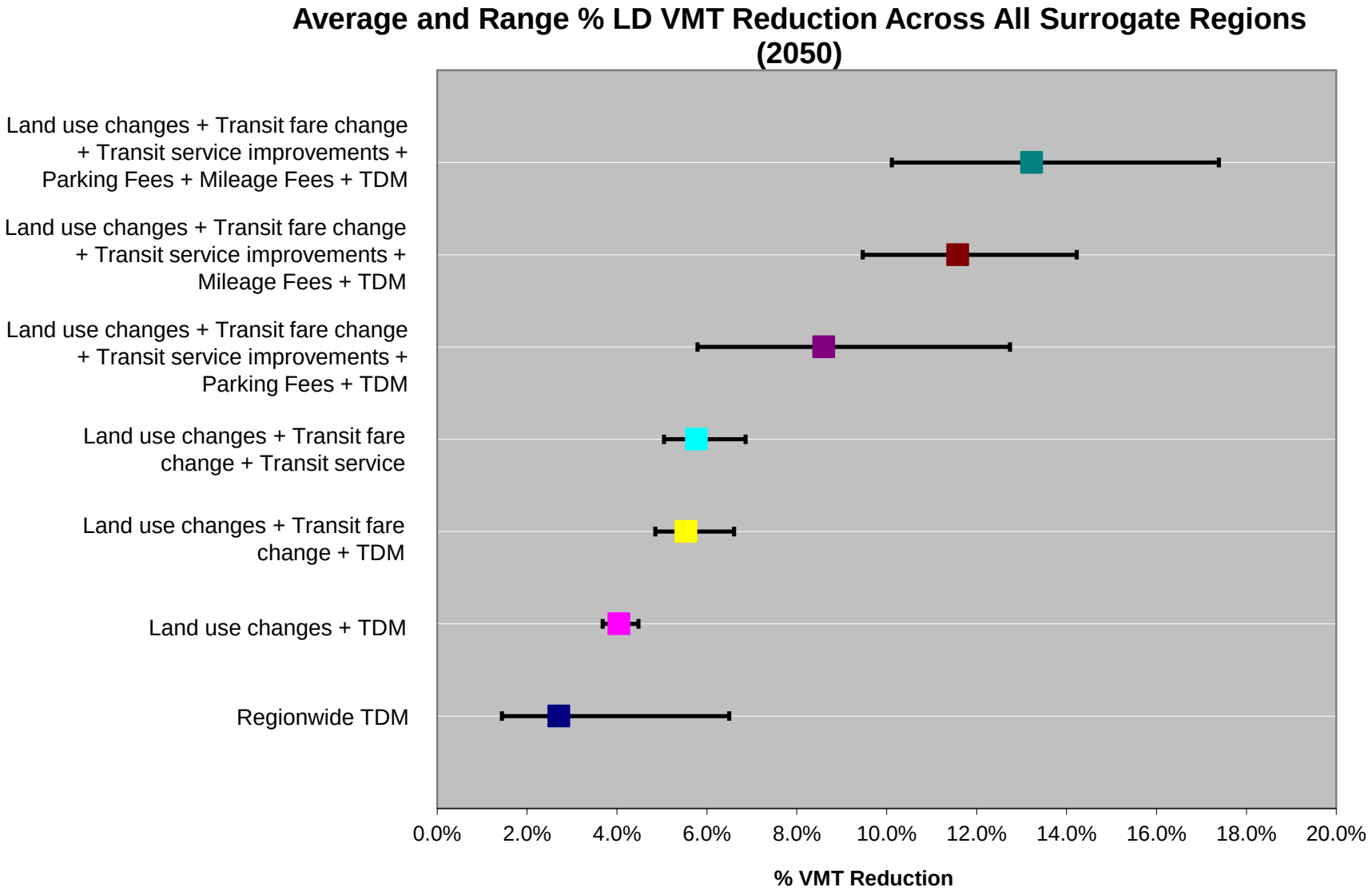
Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014 (April 2016)

What are Travel Efficiency (TE) Strategies?

Strategies to reduce emissions by affecting travel activity – examples:

- Travel demand management
  - Telecommuting
  - Transit Subsidies
  - Carpool and Vanpool Programs
- Changes to public transit
  - Reduced Fares
  - Increased Frequency, Range
- Travel pricing
  - Road Pricing, Parking Pricing
- Changes to land use
  - TOD, Mixed Use, Jobs/Housing Balance

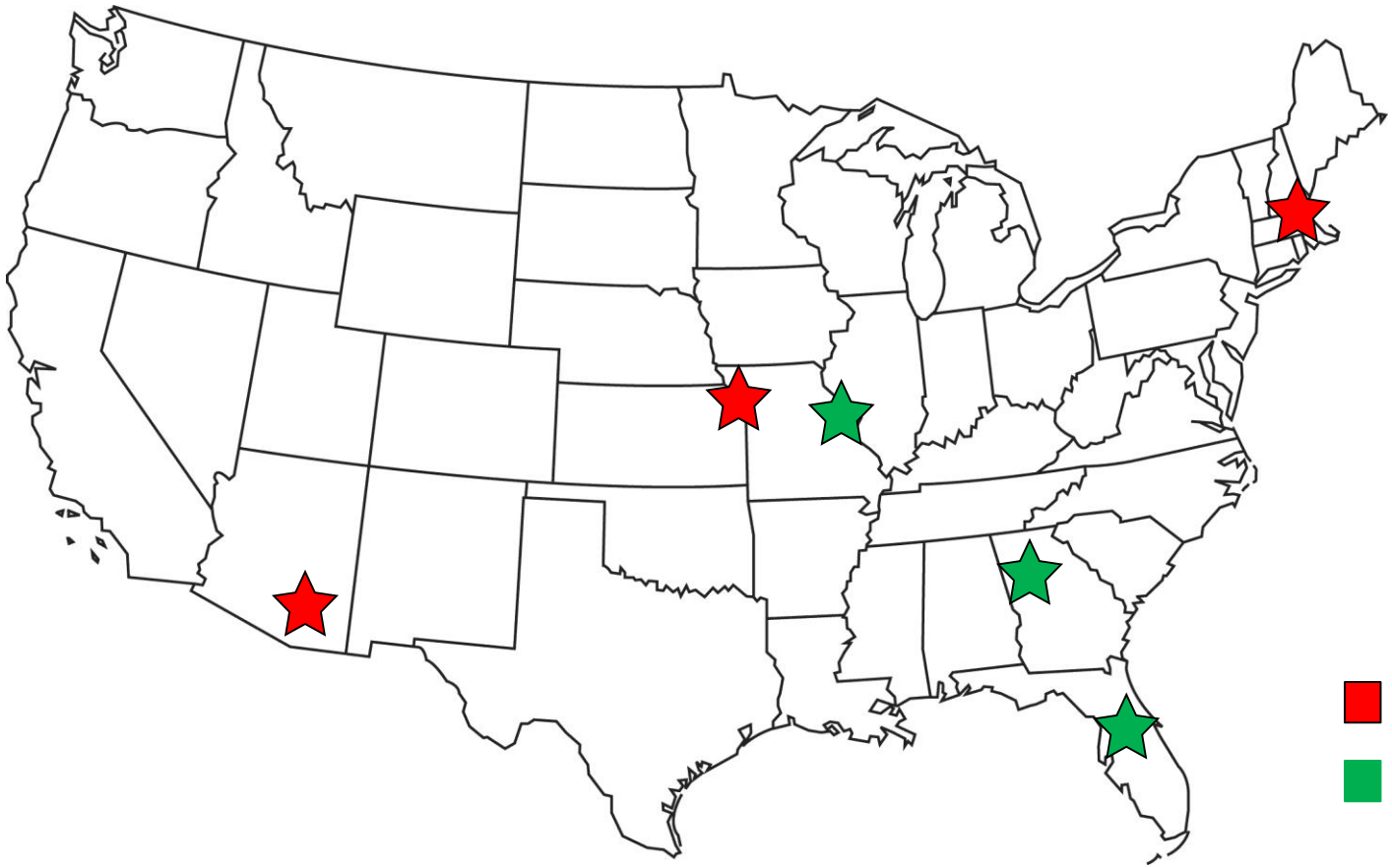
TEAM Report Results– National Analysis



OTAQ's Travel Efficiency Program

- Develop TE assessment tools
  - Evaluate existing tools
  - Travel Efficiency Assessment Method (TEAM)
  - Test new and improved approaches
- Assess TE strategies for reducing VMT and emissions
  - Partner with planning agencies
  - Identify strategies of interest
  - Perform modeling and analyses
- Inform and encourage TEAM use
  - Case studies
  - Outreach

Application of TEAM at the Regional Scale - Case Studies



- Tucson
- Kansas City
- Boston
- St. Louis
- Atlanta
- Orlando

2013 Case Studies

2015 Case Studies

TEAM Regional Case Studies

- 2013
  - Demonstrate the capabilities of the TEAM approach at the regional scale
  - In partnership with State, regional or local planning agencies
  - EPA oversight and contracted technical support, local data and strategy specifications
  - Analysis based on TEAM User's Guide and MOVES GHG Guidance
- 2015
  - New approaches to land use and pedestrian/bicycle strategies
  - Account for Transit VMT and emissions

2015 Results in Overview

Area	Scenarios	Applied to	Total 2040 Reductions
Atlanta	• Expand telework and guaranteed ride home • Improve transit access times • Parking pricing • Increase density and mixed use land use	Employees in 5 county core area of 20+ counties 5 county area 5 county area 5 county area	• 12 million VMT/day • 2.8 million kg/day GHG • 124 kg/day PM2.5 • 535 kg/day NOx • 414 kg/day VOC
St. Louis	• TOD near existing light rail stations • Increase residential density and mixed development • Complete bicycle and pedestrian network • Complete light rail system	3 county core area Entire 5 county area Entire 5 county area Entire 5 county area	• 1.9 million VMT/ day • 440,000 kg/day GHG • 16 kg/day PM2.5 • 103 kg/day NOx • 80 kg/day VOC
Orlando	• Expand employer programs including transit pass • Improve transit access and travel times • VMT pricing for entire region • Unlimited transit pass for with tuition and university employment	Sub-population of 3 county area Sub-population of 3 county area 3 county VMT Sub-population of 3 county area	• 4.6 million VMT per day • 1.1 million kg/day GHG • 39 kg/day PM2.5 • 201 kg/day NOx • 117 kg/day VOC

Case Study Findings

- Where comparable, the range of reductions for these strategies and regions are similar to previous EPA studies and other peer reviewed studies and research.
- 2015 land use approaches improved results and reductions consistent with other major studies in the literature
- Transit strategy effectiveness is highly dependent on sufficient supportive land use. Transit doesn't work well everywhere
- When the modeled population or geography represents a subset of the region, the reductions may be large for the subset, but relatively small for the whole region
- Where local data is not readily available, default inputs are sufficient to compare and contrast different scenarios for non-regulatory purpose

Travel Efficiency Resources

- Potential Changes in Emissions Due to Improvements in Travel Efficiency
  - Development of **T**ravel **E**fficiency **A**ssessment **M**ethod
  - National assessment of select TE strategies in urban areas
- Supplemental Report
  - Evaluates other benefits such as improved health, reduced traffic congestion, reduced user operating costs, improved energy security, and reduction in traffic accidents
- Users Guide
  - Guidance for using the TEAM approach for assessing emission reductions from travel efficiency strategies
- MOVES GHG Guidance
  - Guidance for using MOVES to estimate state and local inventories of on-road GHG emissions

For More Information:

www.epa.gov/otaq/stateresources/ghgtravel.htm

Thank You!

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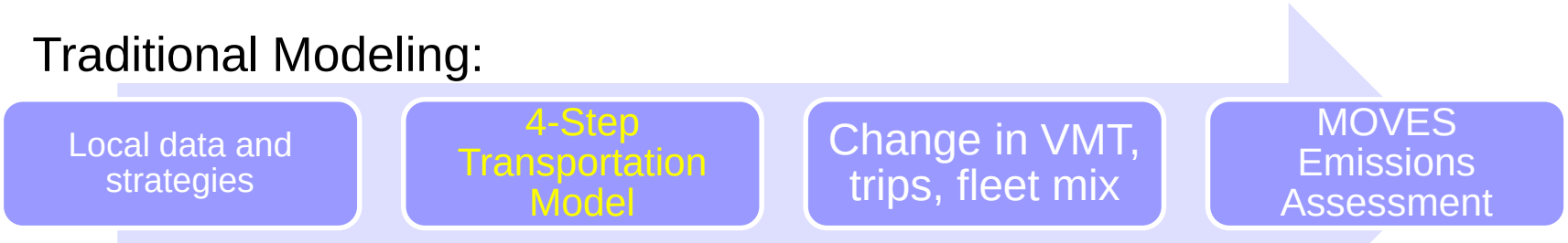
Driving Innovation in Clean Transportation

Appendix:

What is the **Travel Efficiency Assessment Method**?

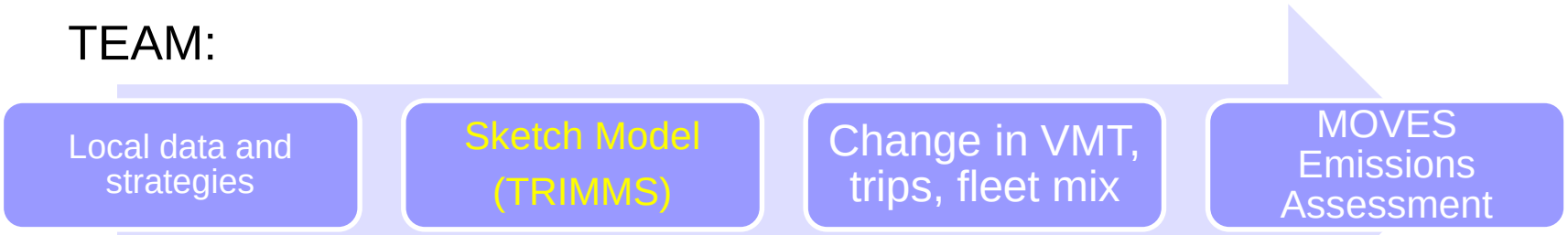
A methodology to assess multi-pollutant emission reductions from TE strategies at the local, state and national level

Traditional Modeling:



Traditional 4-Step transportation models are insensitive to many TE strategies

TEAM:



Sketch models, like the ***Trip Reduction Impacts of Mobility Management Strategies (TRIMMS)*** model, are a cost-effective way to assess the travel activity effects of TE strategies

Atlanta Results

Scenario	Light-Duty VMT	GHGs (CO2 equivalent)	PM2.5	NOx	VOC
Scenario 1: Expanded TDM	-0.69%	-0.68%	-0.68%	-0.67%	-0.66%
Scenario 2: Scenario 1 + Transit Frequency Improvement	-0.86%	-0.86%	-0.86%	-0.85%	-0.83%
Scenario 3: Scenario 2 + Parking Pricing	-2.85%	-2.85%	-2.85%	-2.82%	-2.81%
Scenario 4: Scenario 3 + Land Use					
Neighborhood Approach	-8.82%	-8.81%	-8.81%	-8.79%	-8.78%
Multivariate Approach	-9.28%	-9.27%	-9.27%	-9.25%	-9.24%

St. Louis Results

Scenario	Light-Duty VMT	GHGs (CO2 equivalent)	PM2.5	NOx	VOC
Scenario 1: Regional TOD					
Neighborhood	-0.16%	-0.16%	-0.16%	-0.16%	-0.16%
Multivariate	-0.54%	-0.54%	-0.54%	-0.54%	-0.54%
Scenario 2: Scenario 1 + Workforce – Housing Balance					
Neighborhood	-2.13%	-2.13%	-2.13%	-2.13%	-2.13%
Multivariate	-1.66%	-1.66%	-1.66%	-1.66%	-1.66%
Scenario 3: Scenario 2 + Expanded Bike/Ped Network					
Neighborhood	-2.21%	-2.22%	-2.24%	-2.37%	-2.56%
Multivariate	-1.73%	-1.75%	-1.76%	-1.89%	-2.08%
Scenario 4: Scenario 3 + Transit Expansion					
Neighborhood	-2.54%	-2.56%	-2.57%	-2.70%	-2.90%
Multivariate	-2.07%	-2.11%	-2.13%	-2.39%	-2.79%

Orlando Results

Scenario	Light-Duty VMT	GHGs (CO2 equivalent)	PM2.5	NOx	VOC
Scenario 1: Expanded TDM	-0.65%	-0.65%	-0.65%	-0.65%	-0.65%
Scenario 2: Scenario 1 + Enhanced Transit	-0.92%	-0.92%	-0.92%	-0.92%	-0.92%
Scenario 3: Scenario 2 + Road Pricing	-4.75%	-4.75%	-4.75%	-4.74%	-4.73%
Scenario 4: Scenario 3 + University Transit Pass	-6.08%	-6.08%	-6.07%	-6.06%	-6.05%

Boston Results

Scenario	Light-Duty VMT	GHGs (CO_2 equivalent)	PM2.5	NOx	VOC
Scenario 1: Expanded Healthy Modes Program	-2.80%	-2.80%	-2.80%	-2.79%	-2.77%
Scenario 2: Scenario 1 + Land Use	-3.89%	-3.89%	-3.88%	-3.88%	-3.84%
Scenario 3: Scenario 2 + HOV Lanes	-4.07%	-4.06%	-4.06%	-4.05%	-4.02%
Scenario 4: Scenario 3 + Expanded Transit	-4.41%	-4.41%	-4.40%	-4.39%	-4.36%

Kansas City Results

Scenario	Light-Duty VMT	GHGs (CO2 equivalent)	PM2.5	NOx	VOC
Scenario 1: Expanded TDM	-0.93%	-0.93%	-0.93%	-0.92%	-0.92%
Scenario 2: Scenario 1 + Enhanced Transit	-2.35%	-2.35%	-2.35%	-2.35%	-2.34%
Scenario 3: Scenario 2 + Land Use	-2.49%	-2.49%	-2.49%	-2.49%	-2.49%
Scenario 4: Scenario 3 + Pricing	-12.06%	-12.05%	-12.05%	-12.03%	-12.02%

Tucson Results

Scenario	Light-Duty VMT	GHGs (CO_2 equivalent)	PM2.5	NOx	VOC
Scenario 1: SunTran All Access Pass	-0.99%	-0.97%	-0.94%	-0.86%	-0.77%
Scenario 2: Expanded Employer-based Incentives	-0.43%	-0.43%	-0.42%	-0.40%	-0.44%
Scenario 3: BRT on 2 Corridors	-0.02%	-0.02%	-0.02%	-0.02%	-0.02%
Scenario 4: Parking Pricing in Downtown-University Corridor	-0.26%	-0.25%	-0.25%	-0.24%	-0.26%

Combined with EPA Land Use Scenario (IGT):

Land use changes plus PAG scenarios 1-4	-1.95%	-1.87%	-1.69%	-1.43%	-0.71%

TRIMMS Data

TRIMMS Inputs	
By modes, to the extent available	
Specific Values	***Yes/No***
Model Years	Guaranteed Ride Home and Ride Match
Peak Hour Trips (%)	Telework and Flexible Work Schedules
Populations (modeled, change)	Accessibility (transit, bike, sidewalks)
Vehicle Occupancy	Amenities (shopping, other within ¼ mile)
Mode Shares	Program subsidies
Trip Lengths	Program marketing/management
Access Times	
Travel Times	
Parking Costs	
Trip Costs	
Retail density	
Transit station distance	
Vehicle ownership	
Population density	
Parking charges	

MOVES Data

Data Type Description	Data Elements	
Fields without default values available at the county scale	Source (Vehicle) Type Population	
	Vehicle Type VMT	
	Road Type Distribution	
Local data, available from MOVES defaults when local data is unavailable	Meteorological Data	Ramp Fraction
	Age Distribution	Fuel Supply/Formulation
	Month, Day, Hour VMT Fractions	I/M (Inspection and Maintenance) Program
	Average Speed Distribution	Alternative Vehicle and Fuel Technology (AVFT)
Modeling decision elements, typically not requiring local data	Domain/Scale	Geographic Bounds
	Calculation Type	Vehicle Type
	Time Aggregation	Road Type
	Calendar Year	Pollutants and Processes
	Evaluation Month	Strategies
	Type of Day	Activity
	Evaluation Hour	Emissions Detail