EPA's Travel Efficiency Assessment Method (TEAM)
User Guide Training

Presented by:

EPA

August 17, 2022

Housekeeping

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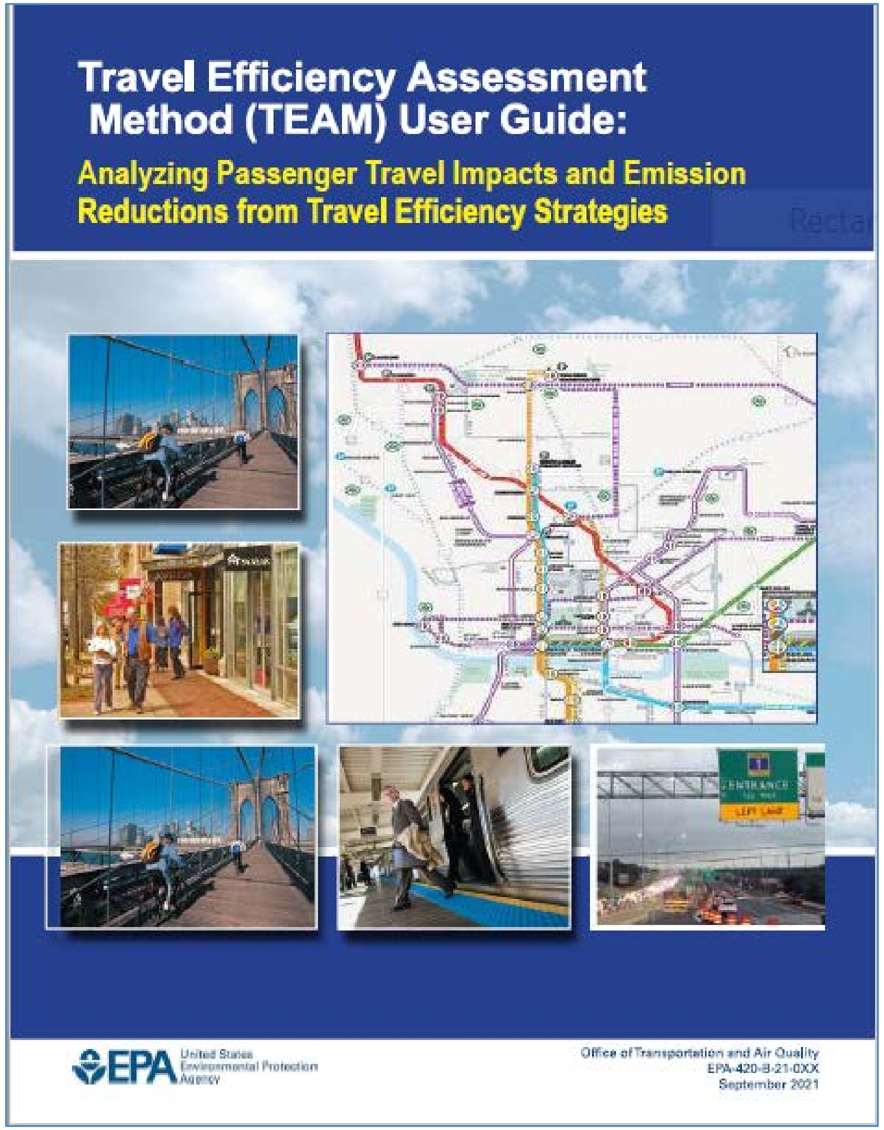
  - Call-in (audio only)
    - Phone: +1 202-991-0477
    - Conference ID: 899 949 364 #

Purpose of this Training:

- Describe travel efficiency (TE) strategies and why areas would want to adopt them.

- Demonstrate how to estimate emission reductions from these strategies, using EPA's Travel Efficiency Assessment Method (TEAM) based on EPA's Travel Efficiency Assessment Method User Guide.



TEAM User Guide Training Webinar Outline

I. Introduction and Overview
II. Planning a TEAM Analysis
III. Conducting a TEAM Analysis
IV. TEAM TE Strategy Demonstration

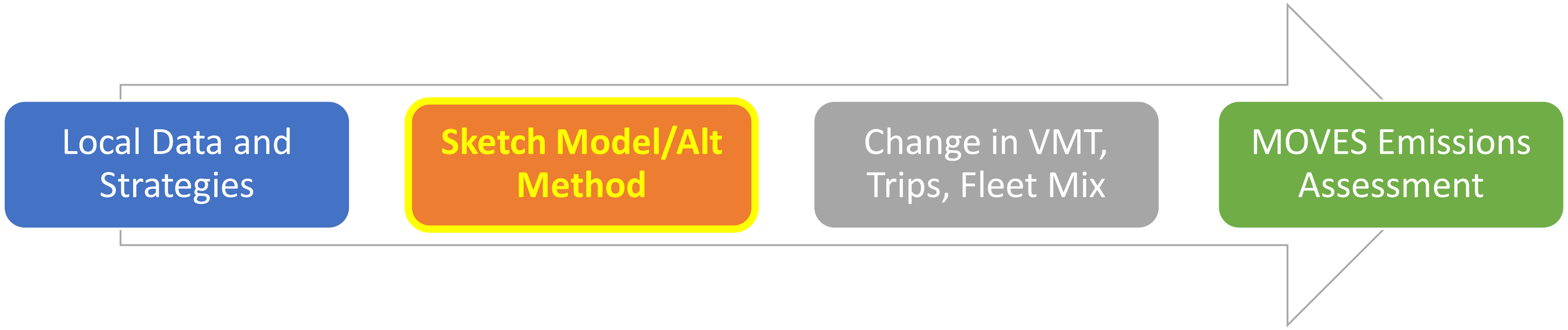
I. Introduction and Overview

Introduction to the Travel Efficiency Assessment Method

- Travel efficiency (TE) strategies affect how often, how far, and by what mode people choose to travel.

- EPA developed TEAM to rapidly assess multi-pollutant emission reductions from hypothetical travel efficiency strategies and scenarios at the local, state and national level without having to run an area's travel demand model, saving time and resources

Introduction to the Travel Efficiency Assessment Method



- TEAM begins with the collection of local data and selection of TE strategies.
- TEAM substitutes a sketch planning tool (or other method of estimating VMT) for the traditional 4-step transportation model to estimate VMT and trip impacts.
- Lastly, EPA's Motor Vehicle Emission Simulator (MOVES) is used to develop regionally representative emission rates for the emissions analysis.

TE Strategies that Can Be Assessed with TEAM:

1. Travel demand management
2. Changes to public transit
3. Travel pricing
4. Changes to land use
5. Bike and pedestrian improvements

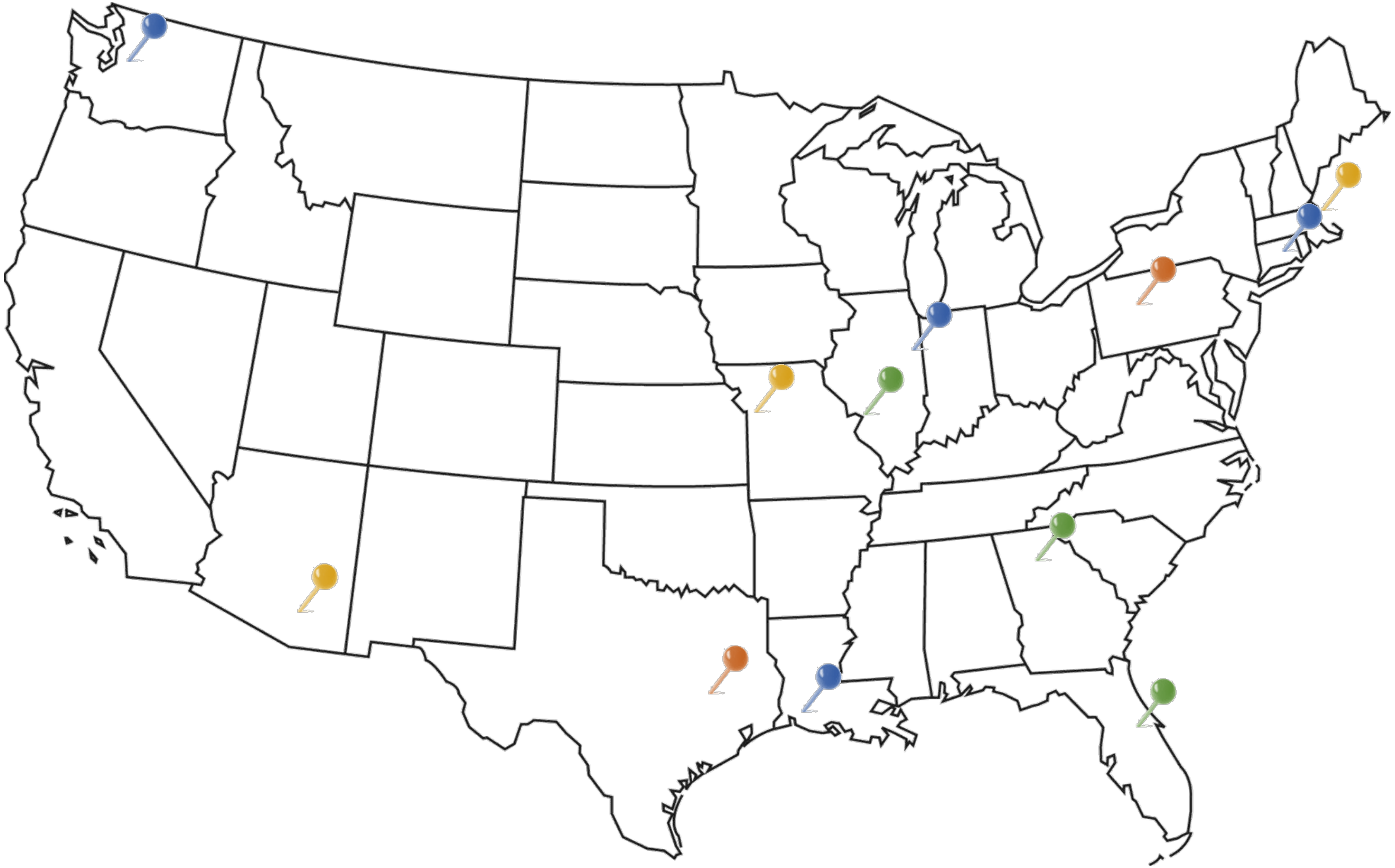
Examples of TE Strategies in Each Category

Strategy Category	Examples of Strategy Options
Travel Demand Management (TDM) and Employer Incentives	• Subsidies for alternative modes • Guaranteed ride home, ride match, telework, and flexible work schedules
Transit	• Free or reduced fares, bundled transit passes • Reduced transit travel times or wait times • Expanded service (geographic area, time of day)
Transportation Pricing	• Parking pricing • VMT pricing • Road pricing
Land Use	• Shifting population and employment growth to more compact neighborhoods/lower VMT generating neighborhoods • Workforce-housing balance initiative • Transit-Oriented Development (TOD)
Bicycle and Pedestrian Improvements	• Expanded sidewalk coverage • Expanded bike lane coverage

Why Travel Efficiency Strategies?

- Travel efficiency strategies are important to consider because:
  - Be less costly to implement, compared to road construction/expansion
  - Have both short- and long-term impacts
  - Achieve multi-pollutant reductions for air pollution and climate goals
  - Create more sustainable and livable communities when compared to the construction of additional miles of new roadway
  - Help strengthen community connections and improve access to the places where people live, learn, play, and work.
- Some can be implemented quickly, and some, such as land use changes, take time to be implemented

Case Studies Completed to Date



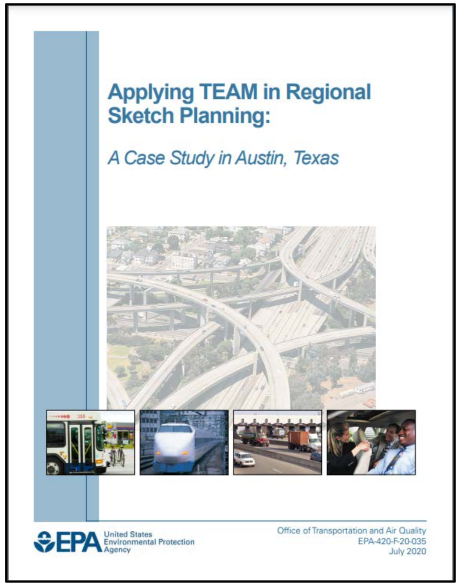
2014
- Tucson, AZ
- Kansas City
- Boston, MA

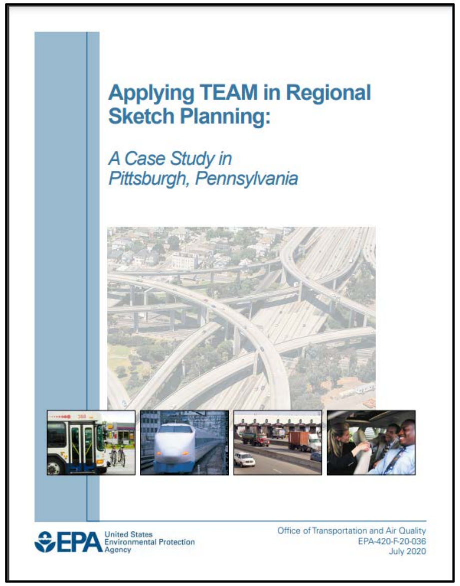
2016
- St Louis, MO
- Atlanta, GA
- Orlando, FL

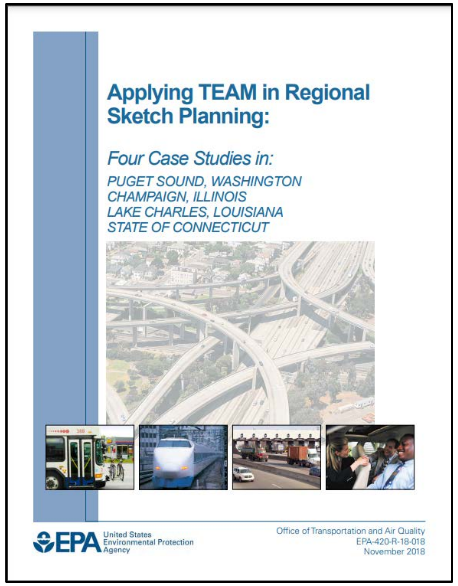
2017
- Lake Charles, LA
- Seattle, WA
- Champaign, IL
- Connecticut

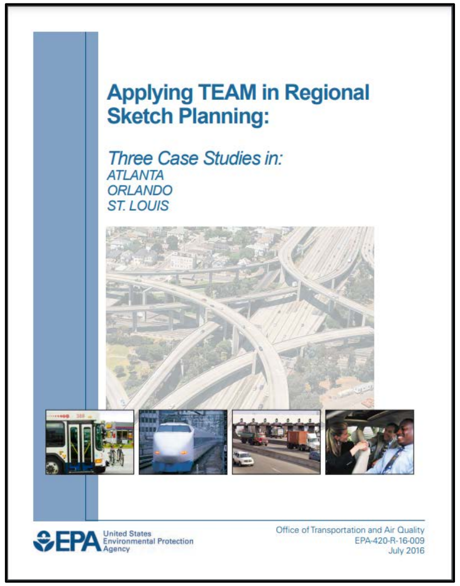
2020
- Austin, TX
- Pittsburgh, PA

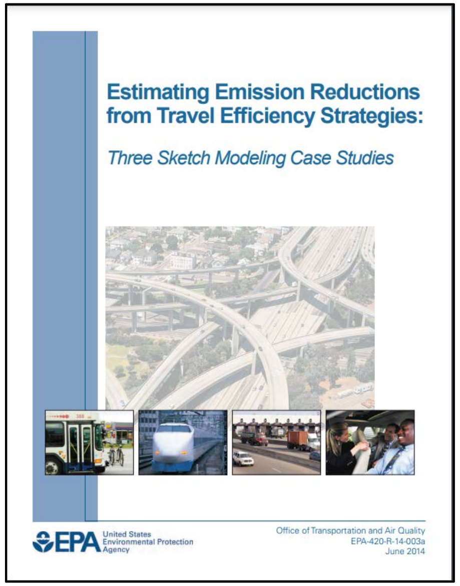
Case Studies Completed to Date











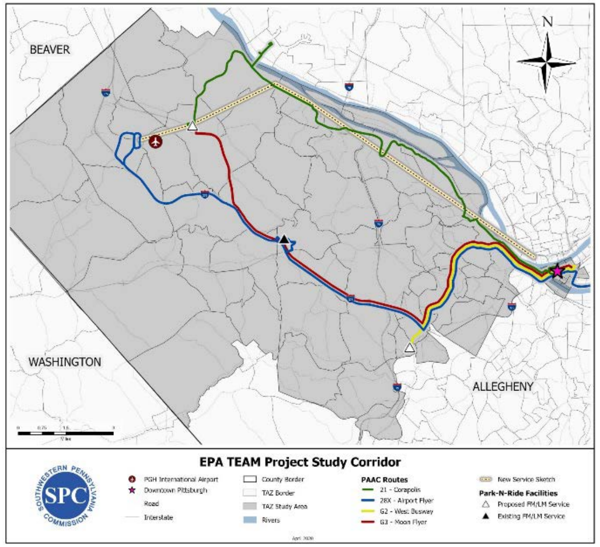
- For more information, see: https://www.epa.gov/state-and-local-transportation/estimating-emission-reductions-travel-efficiency-strategies#Case-Reports

Highlights From Past Case Studies

- Transportation pricing strategies, such as parking pricing and VMT fees, have the biggest potential to reduce light-duty VMT and emissions
  - Generally, around 3.8% - 9.6% decrease from the business-as-usual (BAU) case.
- Land use strategies also have large impact
  - Up to 6.4% decrease from the BAU
- Range of reduction potential is based on:
  - Level of implementation in proposed scenario, and
  - Policies/strategies already implemented in area, since we are comparing against the “business as usual” case
  - Ex: areas with current or planned high access to transit will have smaller additional VMT reduction from BAU than areas with limited transit access.

How have state and local agencies used TEAM?

- Scenario analyses to be considered in long range regional transportation planning
- Decision-making for transit and commuter program investment
- Selection of strategies to address new ozone NAAQS
- Selecting strategies to meet greenhouse gas reduction targets
- Hypothetical policy implementation (Vehicle miles traveled fee, etc.)



Other Applications of TEAM

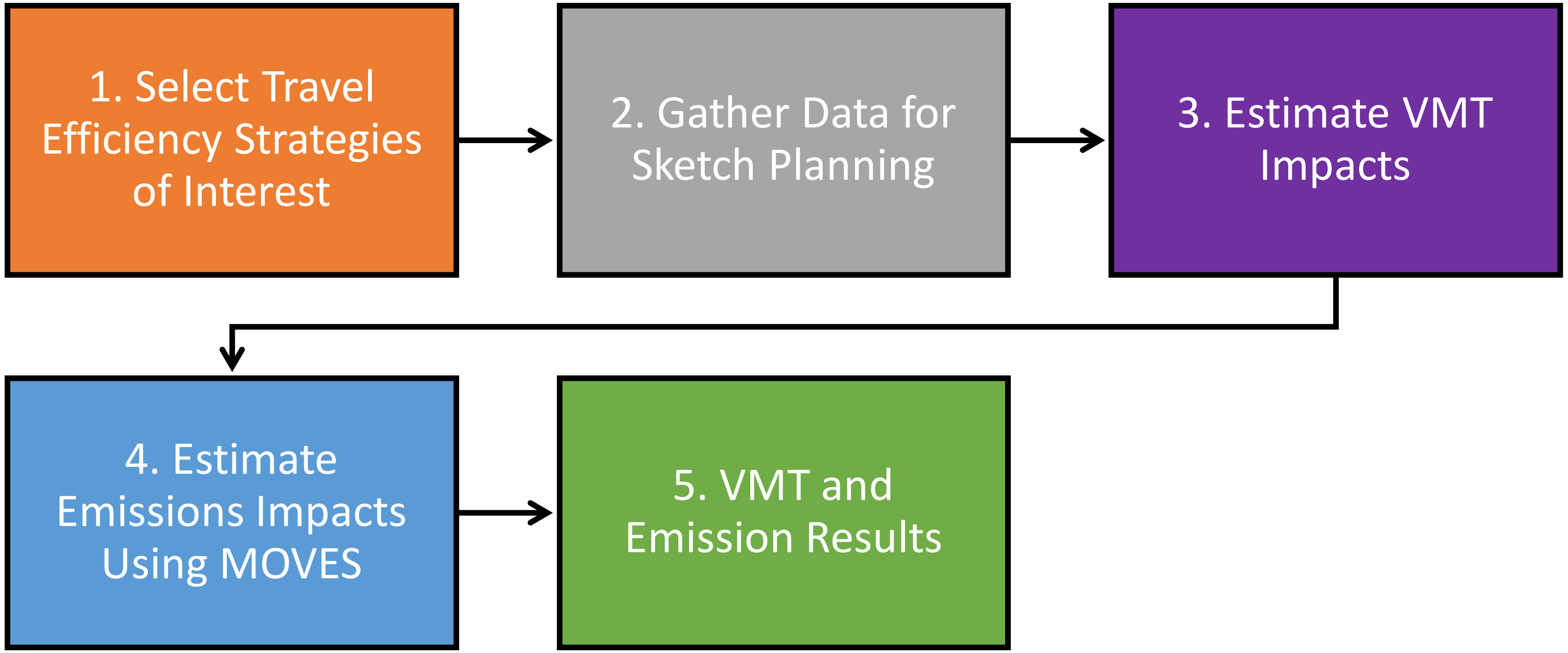
- TEAM analyses can inform different types of planning exercises, such as:
  - Air quality planning (state implementation plan development, transportation conformity analysis, etc.)
    - Note: TEAM cannot be used for calculating emission reductions for SIP development or conformity determinations, but it can be used to screen potential strategies for inclusion
  - Transportation planning (long range planning, transit planning, etc.)
  - Land use planning
  - Other general policy analysis
    - Greenhouse gas planning and goal setting
    - Public service or resource allocation

Benefits of the TEAM Approach

- TEAM is accessible to a wide variety of agencies with varying degrees of technical expertise, including:
  - large MPOs with populations in the millions and significant experience with transportation planning,
  - smaller MPOs with more limited technical expertise, and
  - Non-governmental organizations (NGOs) and non-transportation related agencies
- TEAM is flexible, and can be used for
  - hypothetical “what-if” exercises early in the planning process, and
  - tactical, program development level decision making
- TEAM is scalable, and can be used to analyze strategies:
  - applied to a corridor/project, up to an entire state
  - applied to a region’s entire population, or to a specific subset of that population

II. Planning a TEAM Analysis

Overview of TEAM Process



What You Will Need to Conduct a TEAM Analysis

- TEAM User Guide
- Travel and population data (discussed later in this training)
- Sketch Planning Tool such as TRIMMS
  - TRIMMS User Manual (available in the TRIMMS zip folder at download)
  - TRIMMS Training Webinar
- EPA's MOVES Emissions Model
  - MOVES3 Technical Guidance
- Access to public datasets (i.e. Census) and/or GIS Software (helpful for determining affected population)

Key Concepts: Analysis Years

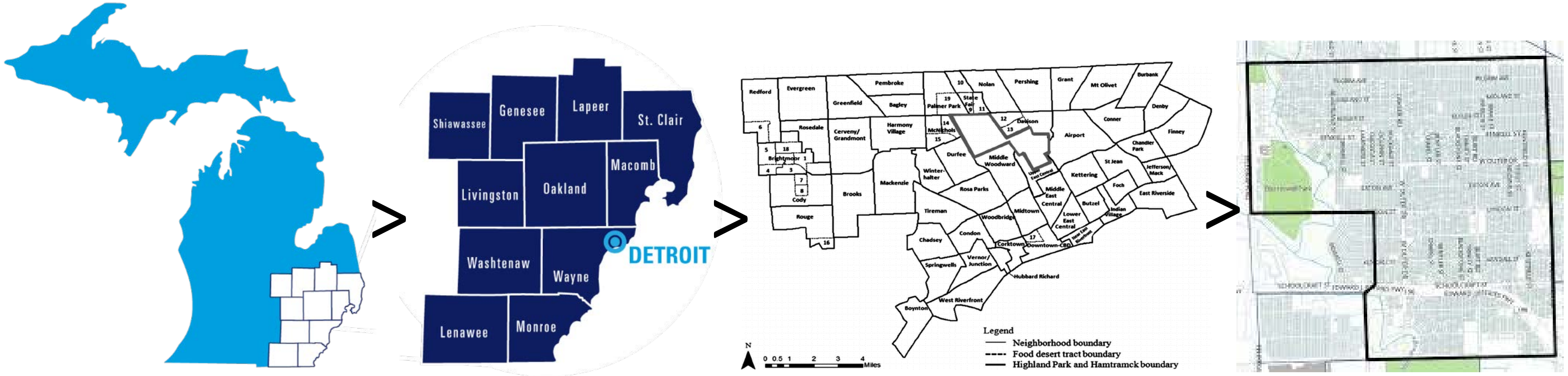
- A TEAM analysis consists of 3 run cases that will be compared:

Case	Description	Analysis Year
Base Year Case (optional)	a starting point analysis year that is used to measure relative changes in VMT and emissions	Convenient reference year (current year)
Business as Usual (BAU) Case	a specified future year and associated future-state consistent with latest long-range transportation planning assumptions without the TE strategies included.	Future year (same as scenario case)
Scenario Case	a specified future year and associated future-state consistent with latest long-range transportation planning assumptions with the TE strategies included.	Future Year (same as BAU case)

- Data collection should reflect the analysis years for each case.

Key Concepts: Analysis Geography

- A TE strategy can be applied broadly to an entire region or can be tailored to a specific subarea (e.g., neighborhood).
  - Regional examples: area-wide VMT pricing, large-scale land use changes
  - Subarea/populations examples: transit enhancements within a specific neighborhood or corridor, parking pricing for university employees, etc.
- Analyses can be performed at different scales

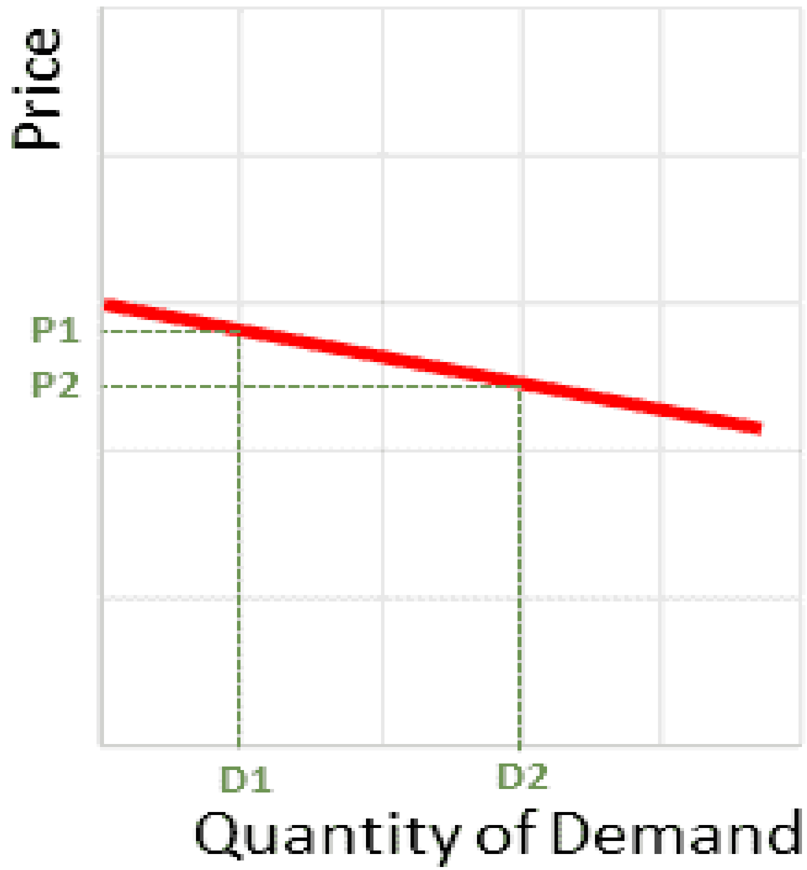


Key Concepts: Commuters Affected

- A TE strategy can also be applied to the regional population or tailored to a specific population (e.g., low-income households, worker-specific industry, etc.)
- For strategies affecting a particular geographic area, GIS software or US Census data can be used to determine the population
  - Census tract or block group population data can be directly used or imported into GIS software to determine population affected
  - For strategies impacting a particular employer or employment sector, explore the selected economic characteristics tables from Federal datasets
- Determining the analysis geography and commuters affected for the selected travel efficiency strategy is likely the most important aspect of the analysis

Key Concepts: Understanding Elasticities & Operationalizing Strategies

- People's transportation choices reflect sensitivities to factors like travel cost, travel time (also comfort, safety)
- An elasticity is the percent change in demand for a good or service expected in response to a one percent change in price or travel time



Key Concepts: Understanding Elasticities & Operationalizing Strategies (cont’d)

- When considering a strategy, consider how to define the strategy in terms of how it may impact:
  - travel cost (both trip cost and parking cost if applicable) and
  - travel time (access time and travel time).

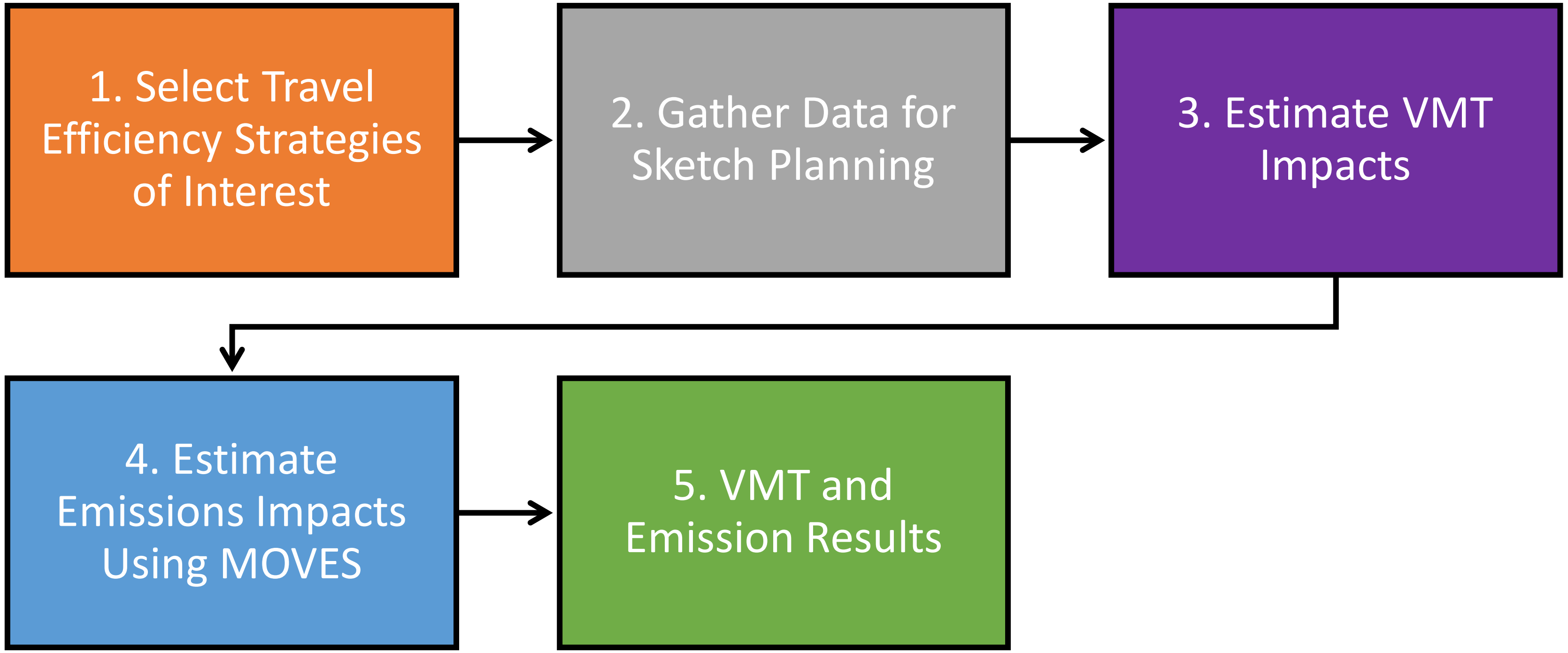
- Examples for defining strategies:
  - A 50% reduction in transit fares for public sector employees
  - Increasing parking meter rates by $1.00 per hour during peak hours
  - Reduce transit headway by 10 minutes during peak travel hours
  - Expand the geographic area covered by transit routes: this would reduce transit time for a larger group of people
  - Add dedicated bus-only lanes at intersections: this would also reduce transit time

Elasticities in TEAM

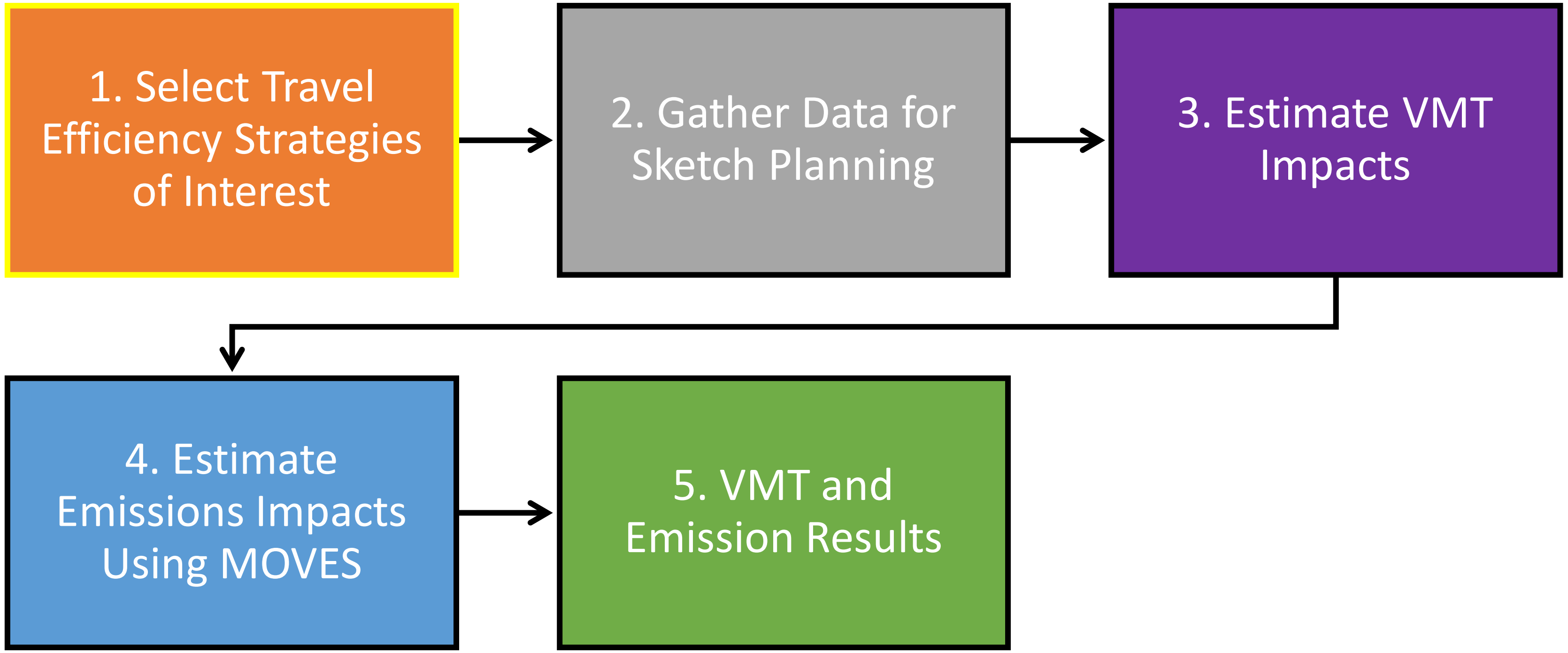
- Travel demand management, Transit, and Pricing strategies are assessed with TRIMMS
  - TRIMMS estimates reduction in VMT that occurs as a result of changes in travel time and costs from built-in elasticities within the model
  - EPA recommends not changing the built-in elasticities unless there is significant supporting evidence for using a different value
- Land Use and Bicycle and Pedestrian strategies are assessed using “off-model,” spreadsheet-based methods that utilize elasticities from literature
  - Land Use method focuses on ‘D’ variables, particularly those that have become known in the field as the ‘5Ds’:
    - Density
    - Diversity (land use mixing)
    - Design
    - Destinations (distance to regional destinations)
    - Distance to transit
  - Bicycle and Pedestrian strategies rely on calculating increases in facility miles by an elasticity value developed by Dill and Carr

III. Conducting a TEAM Analysis

Overview of TEAM Process



1. Select Travel Efficiency Strategies of Interest



a. Determine the affected geographic area (or subarea) or population (e.g., commuters affected) to which the strategy will be applied.
b. Determine how the strategy will be "operationalized" (described or defined) within sketch planning tool platform. Effects of some strategies need to be estimated "off-model".
c. Select the analysis years.

1. Select Travel Efficiency Strategies of Interest

- Consider ways that the region could reduce VMT in the general categories
- What are the policy questions or general categories of interest that are consistent with regional goals? Some examples of hypothetical questions to start considering TE strategies may be:
  - What if transit service is increased in a particular part of the region?
  - What might happen if a ridesharing/matching service is provided, either generally or to a specific sector of the workforce?
  - What would be the impact of increasing the cost of parking in downtown?
  - What would be the travel impacts of increasing residential density and mixed-use development in the area?
- See examples of strategies selected for analysis in EPA's TEAM Case Studies: www.epa.gov/state-and-local-transportation/estimating-emission-reductions-travel-efficiency-strategies#Case-Reports

1. Select Travel Efficiency Strategies of Interest

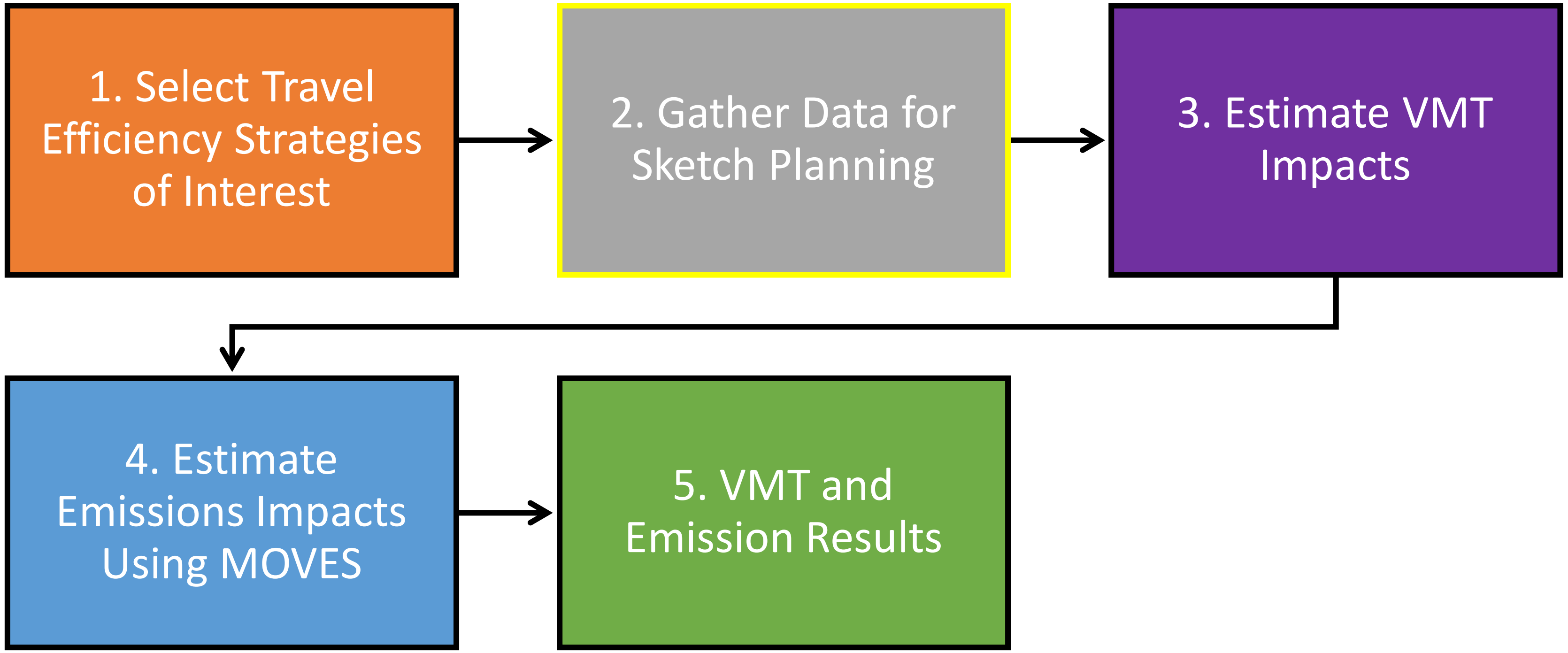
- Strategies should be specific so that they can be operationalized in the sketch model (or analyzed off-model):

Strategy Category	Examples of Strategy Options	Examples of Specific Affected Geographic Area or Population	Examples of Strategy Operationalization
Travel Demand Management (TDM) and Employer Incentives	Subsidies for alternative modes	University students	Provide a 50% reduced transit fare for university students
	Guaranteed ride home, ride match, telework, and flexible work schedules	Hospital employees	Provide guaranteed ride home services for hospital employees

Strategy Category	Examples of Strategy Options	Examples of Specific Affected Geographic Area or Population	Examples of Strategy Operationalization
Transit	Reduced transit travel times or wait times	Residents living along the “orange” transit line	Increase the frequency of buses along the “orange” transit route by 2 buses per hour during peak travel hours, reducing wait time by 10 minutes
	Expanded service (geographic area, time of day)	Residents in the “north end” neighborhood	Expand transit service into the “north end” neighborhood consistent with the service level regionally
Transportation Pricing	VMT pricing	Full region	Add a $0.08/mile VMT fee for all regional light-duty vehicle travel
	Parking pricing	Downtown parking customers	Increase the price of metered and structured parking by $0.50 per hour within the downtown boundary

Strategy Category	Examples of Strategy Options	Examples of Specific Affected Geographic Area or Population	Examples of Strategy Operationalization
Land Use	• Shifting population and employment growth to more compact neighborhoods/lower VMT generating neighborhoods • Workforce-housing balance initiative • TOD program	Residents along the "blue" transit line	Increase residential density by 20% within ½ mile of the "blue" transit line
Bicycle and Pedestrian Improvements	Expanded bike lane coverage	Full region	Expand bike lane miles by 10% within the region

2. Gather Data for Sketch Planning



Gather the data needed to describe the regional demographic and travel conditions and how the TE strategy will be implemented within the sketch planning tool selected, including:

a. "Regional parameters" data to define the regional or subarea population, travel behavior, employment, etc. for use in the sketch planning tool.
b. Data to define how the strategy will be described ("operationalized") in the sketch planning tool.

2. Gather Data for Sketch Planning

- Step 2 of a TEAM analysis involves reviewing and gathering “regional parameter” and strategy data
  - Regional parameters are data inputs that define the regional or subarea population, travel behavior, employment, etc. profile for use in sketch planning analysis
  - Strategy data is used to operationalize the TE strategy of interest

- TRIMMS utilizes two sets of parameters to inform the conditions of the analysis: global and regional parameters:
  - Global parameters are default values that do not change by metropolitan statistical area (MSA). For TEAM, EPA recommends not changing the global parameter values
  - Regional parameters are values that are specific to a given area. These involve things like:
    - Population characteristics, employment characteristics, and travel behavior (mode share, vehicle occupancy, trip length)
    - Users can either accept the default data or provide “user defined” values

2. Gather Data for Sketch Planning

- Once regional parameter data has been collected, the next step is to gather data to specify
  - the "commuters affected" by the strategy and
  - further define strategy operationalization.

- The data needed and the level of effort required to collect the TE strategies selected in Step 1 depend on:
  1. The type of strategies selected, and
  2. The specific geographic area, or sub-area, or population to which each of the strategies applies.

- A discussion of data needs, by TE strategy category, is included later in this presentation.

2. Gather Data for Sketch Planning

- Local travel and population data can be sourced from locally collected data or accessed via Federally collected datasets, some sources of data may include:
  - US Census
  - American Community Survey (ACS)
  - National Household Travel Survey
  - National Transit Database
  - US Department of Transportation Compiled Datasets

2. Gather Data for Sketch Planning

User defined regional parameter values can come from a variety of sources:

<table>
<tr><th colspan="2">Regional Parameter Inputs</th><th>Typical Data Sources</th></tr>
<tr><td rowspan="2">Selected Region data</td><td>Population Density</td><td>• U.S. Census Bureau
• Local planning assumptions</td></tr>
<tr><td>Total working population (16 and over)</td><td>• U.S. Bureau of Labor Statistics
• Local planning assumptions</td></tr>
<tr><td rowspan="3">• Modal information for:
• Auto-drive alone
• Auto-rideshare
• Vanpool
• Public transit
• Cycling
• Walking
• (Other modes)</td><td>Mode share</td><td>• American Community Survey
• Local travel demand model</td></tr>
<tr><td>Average trip length (miles)</td><td>• National Household Travel Survey
• Local travel demand model</td></tr>
<tr><td>Average vehicle occupancy for motorized modes (number of persons)</td><td>• Travel Demand Model
• Local Transit Agencies
• U.S. Bureau of Transportation Statistics</td></tr>
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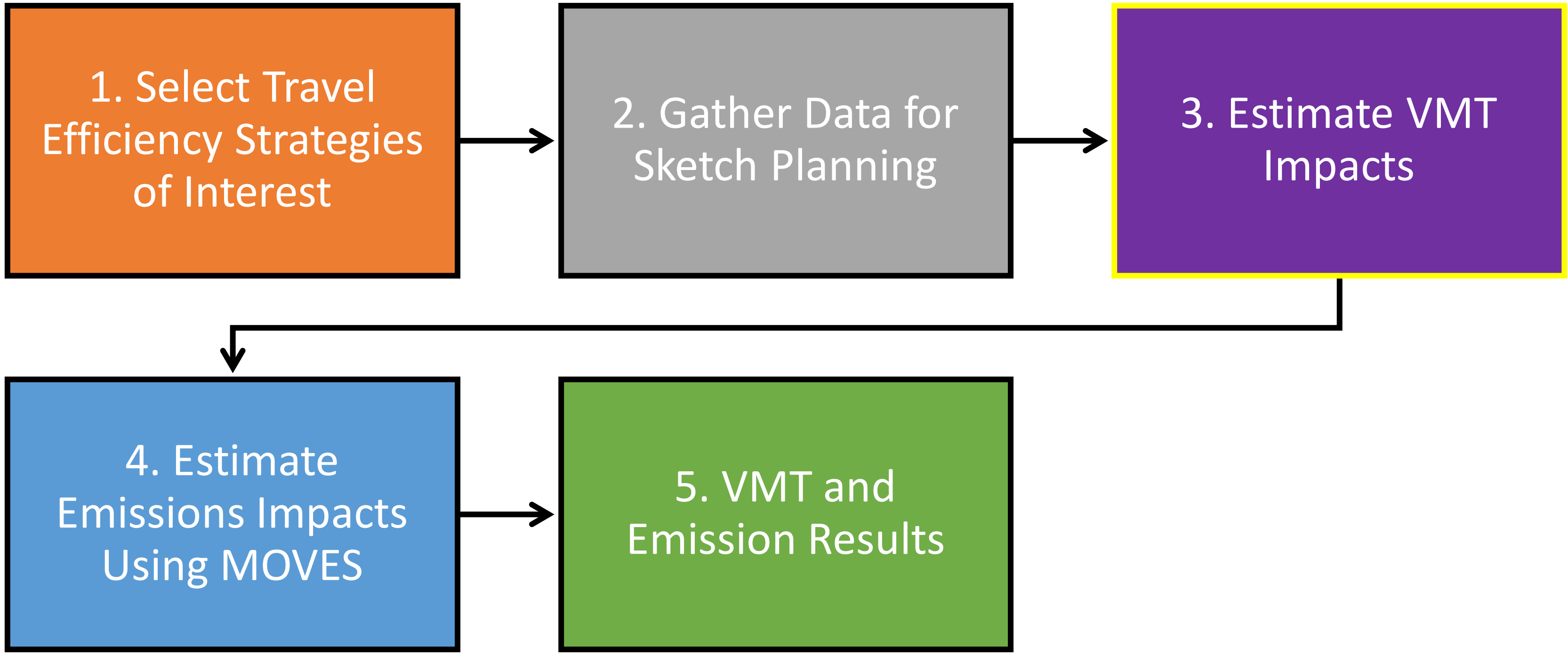
3. Estimate VMT Impacts



Estimate VMT impacts through sketch planning tool analysis for the analysis cases and process the VMT results to compare changes in travel demand between cases.

a. Perform sketch planning tool analysis to get VMT, mode share, and trip results.
b. Process sketch planning tool results for use in emissions analysis.

Overview of TRIMMS

- Trip Reduction Impacts for Mobility Management Strategies (TRIMMS) was developed by Center for Urban Transportation Research at the University of South Florida.

- TRIMMS is a sketch-planning tool that evaluates the strategies directly affecting cost of travel:
    - Price (subsidies, mile-based charges)
    - Travel Time

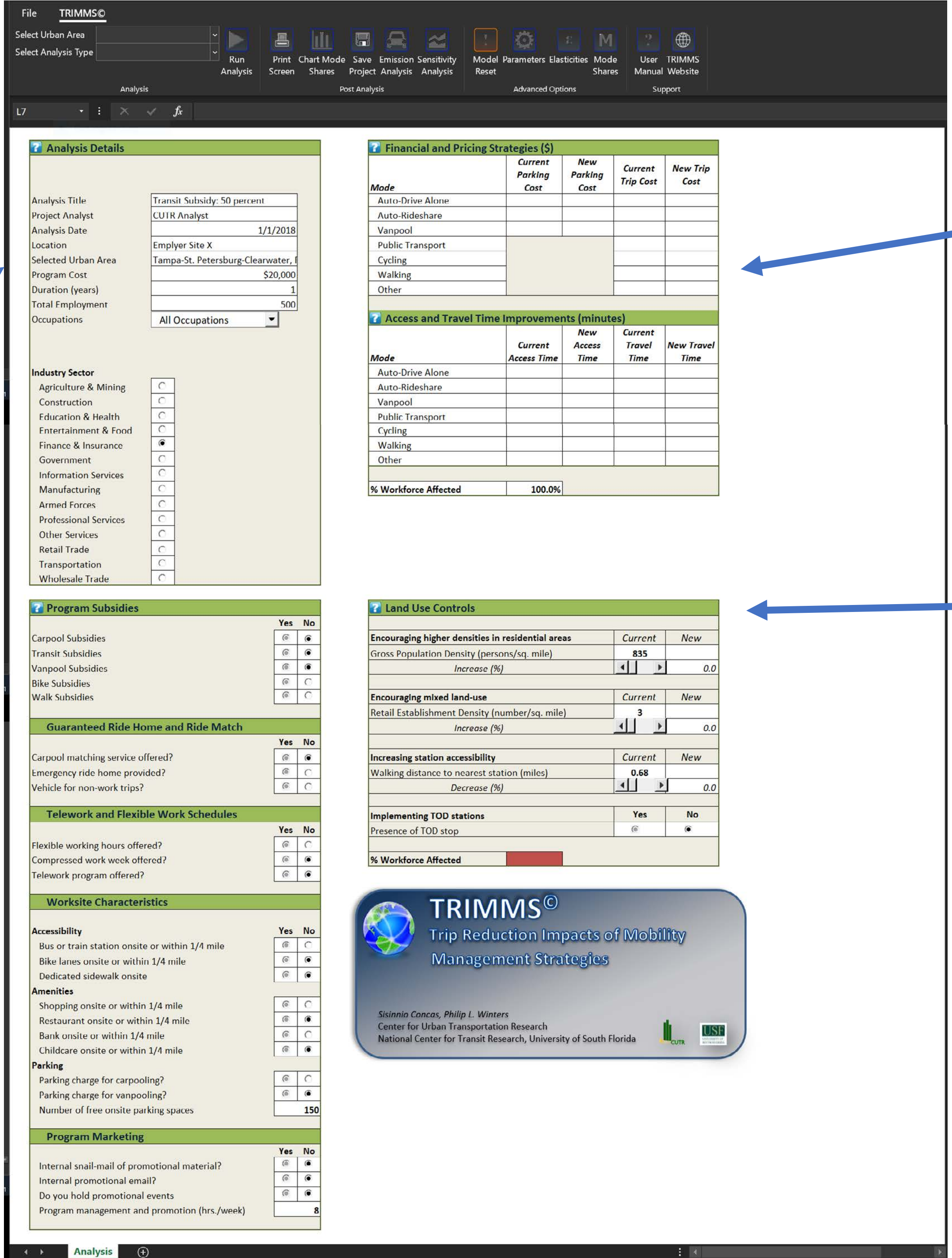
- The level of analysis can be regional or employer-based

Overview of TRIMMS (cont'd)

- Interface consist of 3 main worksheets:
  - Analysis Worksheet
  - Parameters Worksheet
  - Results Worksheet
- Input consists of:
  - Analysis Worksheet – analysis details and strategy operationalization
  - Parameters Worksheet - mode shares and other regional factors
    - Default values for 85 metropolitan statistical areas (MSAs) or User supplied
- Output consists of:
  - Results Worksheet - predicted mode share, trip, and VMT changes

Analysis Worksheet

1. Analysis Details
2. Employer-Based Commuter Programs

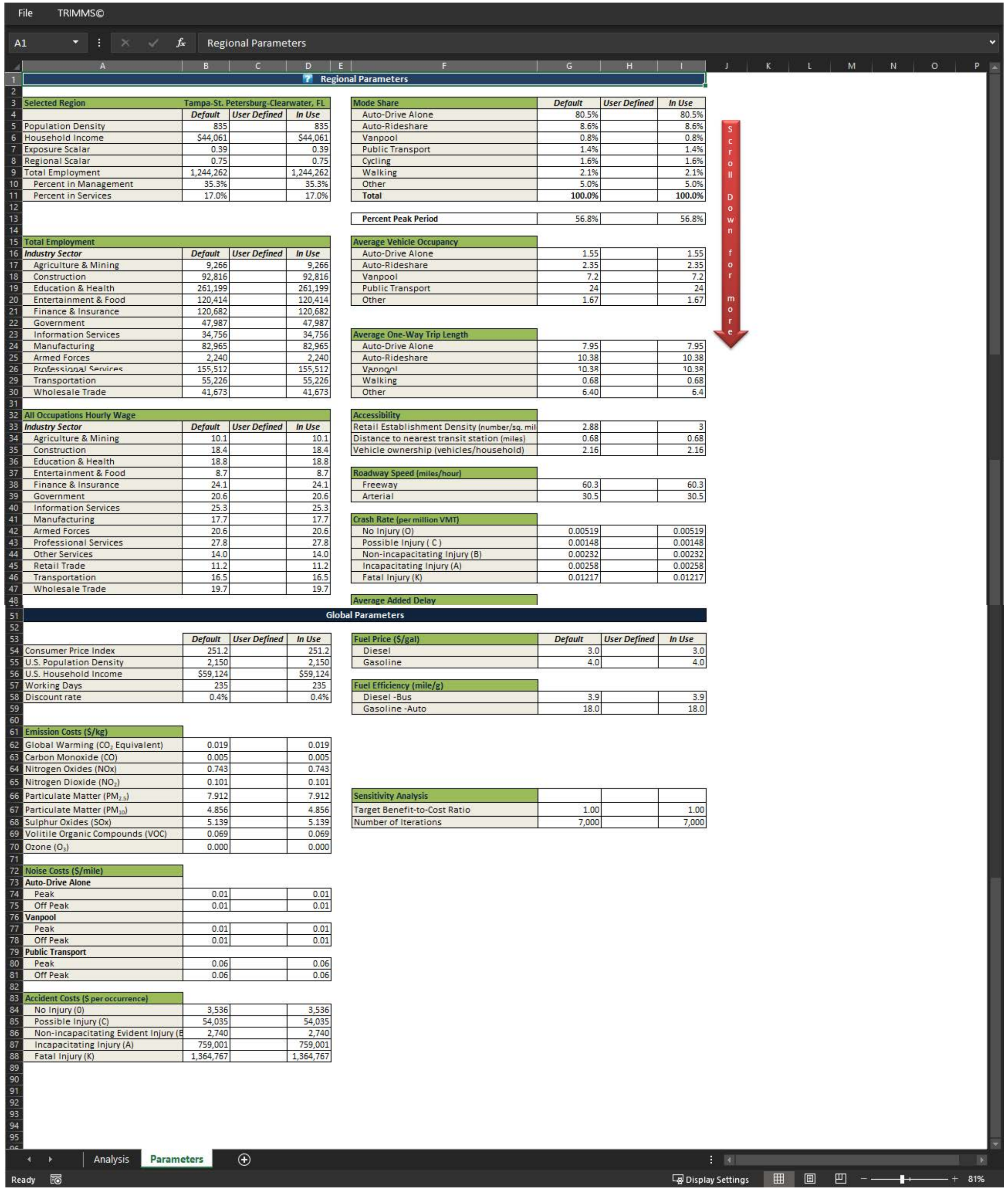


3. Strategies Affecting Travel Costs and Travel Times
4. Land Use Controls (not used in TEAM)

Parameters Worksheet

1. Regional Parameters

2. Global Parameters (generally not used in TEAM)



File TRIMMS©

A1 Regional Parameters

Regional Parameters

Selected Region	Tampa-St. Petersburg-Clearwater, FL		
	Default	User Defined	In Use
Population Density	835		835
Household Income	$44,061		$44,061
Exposure Scalar	0.39		0.39
Regional Scalar	0.75		0.75
Total Employment	1,244,262		1,244,262
Percent in Management	35.3%		35.3%
Percent in Services	17.0%		17.0%

Mode Share	Default	User Defined	In Use
Auto-Drive Alone	80.5%		80.5%
Auto-Rideshare	8.6%		8.6%
Vanpool	0.8%		0.8%
Public Transport	1.4%		1.4%
Cycling	1.6%		1.6%
Walking	2.1%		2.1%
Other	5.0%		5.0%
Total	**100.0%**		**100.0%**

Percent Peak Period	56.8%		56.8%

Total Employment			
Industry Sector	Default	User Defined	In Use
Agriculture & Mining	9,266		9,266
Construction	92,816		92,816
Education & Health	261,199		261,199
Entertainment & Food	120,414		120,414
Finance & Insurance	120,682		120,682
Government	47,987		47,987
Information Services	34,756		34,756
Manufacturing	82,965		82,965
Armed Forces	2,240		2,240
Professional Services	155,512		155,512
Transportation	55,226		55,226
Wholesale Trade	41,673		41,673

Average Vehicle Occupancy			
Auto-Drive Alone	1.55		1.55
Auto-Rideshare	2.35		2.35
Vanpool	7.2		7.2
Public Transport	24		24
Other	1.67		1.67

Average One-Way Trip Length			
Auto-Drive Alone	7.95		7.95
Auto-Rideshare	10.38		10.38
Vanpool	10.38		10.38
Walking	0.68		0.68
Other	6.40		6.4

All Occupations Hourly Wage			
Industry Sector	Default	User Defined	In Use
Agriculture & Mining	10.1		10.1
Construction	18.4		18.4
Education & Health	18.8		18.8
Entertainment & Food	8.7		8.7
Finance & Insurance	24.1		24.1
Government	20.6		20.6
Information Services	25.3		25.3
Manufacturing	17.7		17.7
Armed Forces	20.6		20.6
Professional Services	27.8		27.8
Other Services	14.0		14.0
Retail Trade	11.2		11.2
Transportation	16.5		16.5
Wholesale Trade	19.7		19.7

Accessibility			
Retail Establishment Density (number/sq. mil	2.88		3
Distance to nearest transit station (miles)	0.68		0.68
Vehicle ownership (vehicles/household)	2.16		2.16

Roadway Speed (miles/hour)			
Freeway	60.3		60.3
Arterial	30.5		30.5

Crash Rate (per million VMT)			
No Injury (O)	0.00519		0.00519
Possible Injury (C)	0.00148		0.00148
Non-incapacitating Injury (B)	0.00232		0.00232
Incapacitating Injury (A)	0.00258		0.00258
Fatal Injury (K)	0.01217		0.01217

Average Added Delay

Global Parameters

	Default	User Defined	In Use
Consumer Price Index	251.2		251.2
U.S. Population Density	2,150		2,150
U.S. Household Income	$59,124		$59,124
Working Days	235		235
Discount rate	0.4%		0.4%

Fuel Price ($/gal)	Default	User Defined	In Use
Diesel	3.0		3.0
Gasoline	4.0		4.0

Fuel Efficiency (mile/g)			
Diesel -Bus	3.9		3.9
Gasoline -Auto	18.0		18.0

Emission Costs ($/kg)			
Global Warming (CO_2 Equivalent)	0.019		0.019
Carbon Monoxide (CO)	0.005		0.005
Nitrogen Oxides (NOx)	0.743		0.743
Nitrogen Dioxide (NO_2)	0.101		0.101
Particulate Matter ($PM_{2.5}$)	7.912		7.912
Particulate Matter (PM_{10})	4.856		4.856
Sulphur Oxides (SOx)	5.139		5.139
Volitile Organic Compounds (VOC)	0.069		0.069
Ozone (O_3)	0.000		0.000

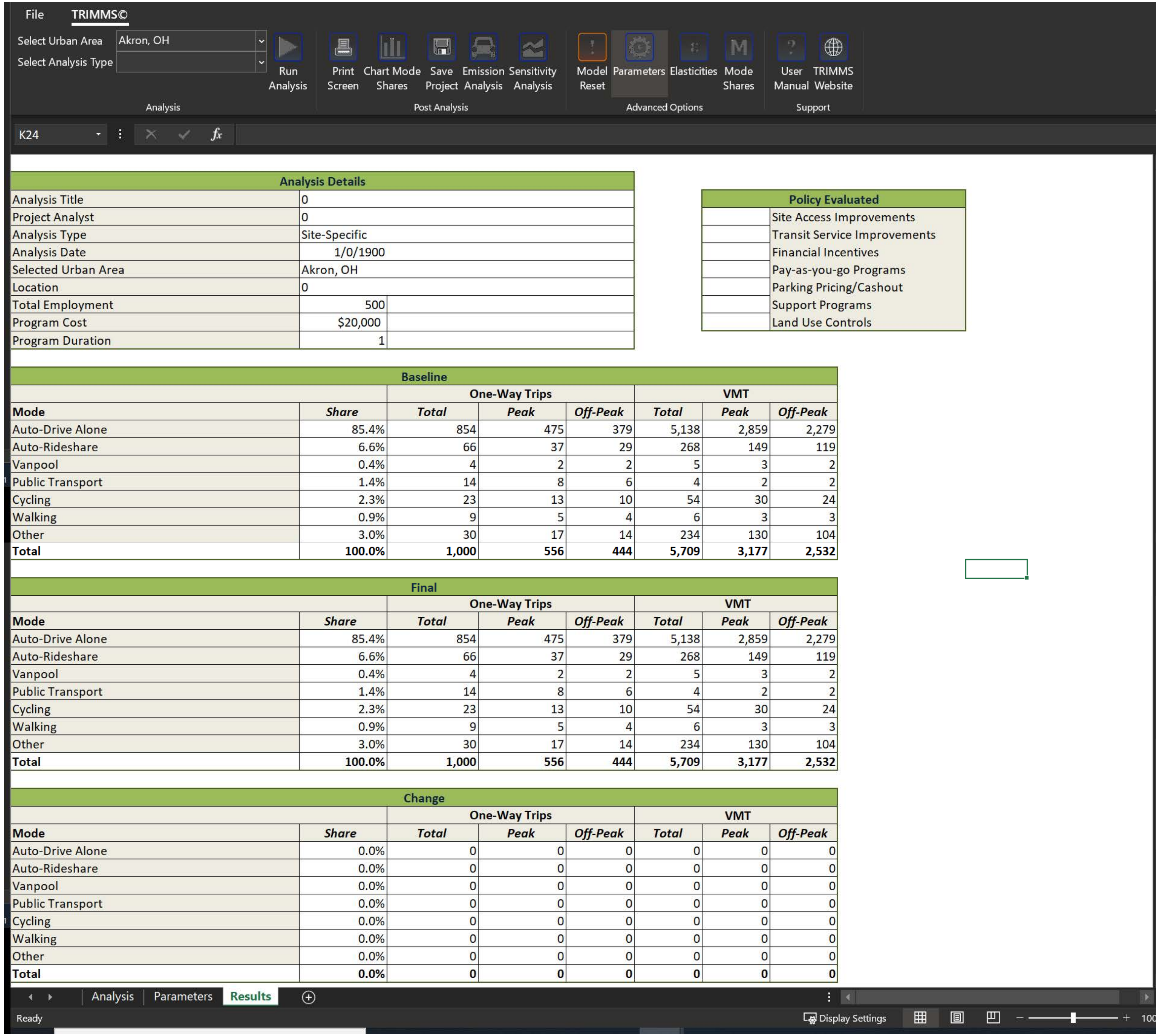
Sensitivity Analysis			
Target Benefit-to-Cost Ratio	1.00		1.00
Number of Iterations	7,000		7,000

Noise Costs ($/mile)			
Auto-Drive Alone			
Peak	0.01		0.01
Off Peak	0.01		0.01
Vanpool			
Peak	0.01		0.01
Off Peak	0.01		0.01
Public Transport			
Peak	0.06		0.06
Off Peak	0.06		0.06

Accident Costs ($ per occurrence)			
No Injury (0)	3,536		3,536
Possible Injury (C)	54,035		54,035
Non-incapacitating Evident Injury (E	2,740		2,740
Incapacitating Injury (A)	759,001		759,001
Fatal Injury (K)	1,364,767		1,364,767

Results Worksheet

1. Final Results →



Analysis Details	
Analysis Title	0
Project Analyst	0
Analysis Type	Site-Specific
Analysis Date	1/0/1900
Selected Urban Area	Akron, OH
Location	0
Total Employment	500
Program Cost	$20,000
Program Duration	1

	Policy Evaluated
	Site Access Improvements
	Transit Service Improvements
	Financial Incentives
	Pay-as-you-go Programs
	Parking Pricing/Cashout
	Support Programs
	Land Use Controls

Baseline

		One-Way Trips			VMT		
Mode	***Share***	***Total***	***Peak***	***Off-Peak***	***Total***	***Peak***	***Off-Peak***
Auto-Drive Alone	85.4%	854	475	379	5,138	2,859	2,279
Auto-Rideshare	6.6%	66	37	29	268	149	119
Vanpool	0.4%	4	2	2	5	3	2
Public Transport	1.4%	14	8	6	4	2	2
Cycling	2.3%	23	13	10	54	30	24
Walking	0.9%	9	5	4	6	3	3
Other	3.0%	30	17	14	234	130	104
Total	**100.0%**	**1,000**	**556**	**444**	**5,709**	**3,177**	**2,532**

Final

		One-Way Trips			VMT		
Mode	***Share***	***Total***	***Peak***	***Off-Peak***	***Total***	***Peak***	***Off-Peak***
Auto-Drive Alone	85.4%	854	475	379	5,138	2,859	2,279
Auto-Rideshare	6.6%	66	37	29	268	149	119
Vanpool	0.4%	4	2	2	5	3	2
Public Transport	1.4%	14	8	6	4	2	2
Cycling	2.3%	23	13	10	54	30	24
Walking	0.9%	9	5	4	6	3	3
Other	3.0%	30	17	14	234	130	104
Total	**100.0%**	**1,000**	**556**	**444**	**5,709**	**3,177**	**2,532**

Change

		One-Way Trips			VMT		
Mode	***Share***	***Total***	***Peak***	***Off-Peak***	***Total***	***Peak***	***Off-Peak***
Auto-Drive Alone	0.0%	0	0	0	0	0	0
Auto-Rideshare	0.0%	0	0	0	0	0	0
Vanpool	0.0%	0	0	0	0	0	0
Public Transport	0.0%	0	0	0	0	0	0
Cycling	0.0%	0	0	0	0	0	0
Walking	0.0%	0	0	0	0	0	0
Other	0.0%	0	0	0	0	0	0
Total	**0.0%**	**0**	**0**	**0**	**0**	**0**	**0**

3. Estimate VMT Impacts

- In step 3, the sketch planning or off-model tool is used to estimate VMT impacts of selected strategies.
  - Data from step 2 is entered into the sketch planning or off-model tool for the cases needed for the analysis.

- The process for this step will depend on if the strategy can be analyzed with the sketch planning tool or off-model tool
  - We include examples of both later in this webinar

3. Estimate VMT Impacts

In TRIMMS, the general steps for each analysis run are as follows:

- Analysis Worksheet
  1. In the TRIMMS Toolbar, click the "Select Urban Area" drop down and select the MSA for which the analysis is being conducted.
  2. In the TRIMMS Toolbar, click the "Select Analysis Type" drop down and select "Area-Wide".
  3. In the Analysis Details section, input the "Commuters Affected" value for the selected TE strategy.
  4. In the Analysis Details section, ensure that "All Occupations" is selected in the Occupations drop down.
  5. In the Access and Travel Time Improvements (minutes), ensure 100% is entered in the %Workforce Affected field.

3. Estimate VMT Impacts

In TRIMMS, the general steps for each analysis run are as follows:

- Parameters Worksheet – (Click the “Parameters” button on the ribbon at the top of the screen to access the “Parameters” tab).
  1. Review ‘Default’ values and provide ‘User Defined’ values where necessary, based on the data collected (see Section 4.3 Regional Parameter Data), in four areas:
     a) Selected Region
     b) Mode Share
     c) Average Vehicle Occupancy
     d) Average One-Way Trip Length

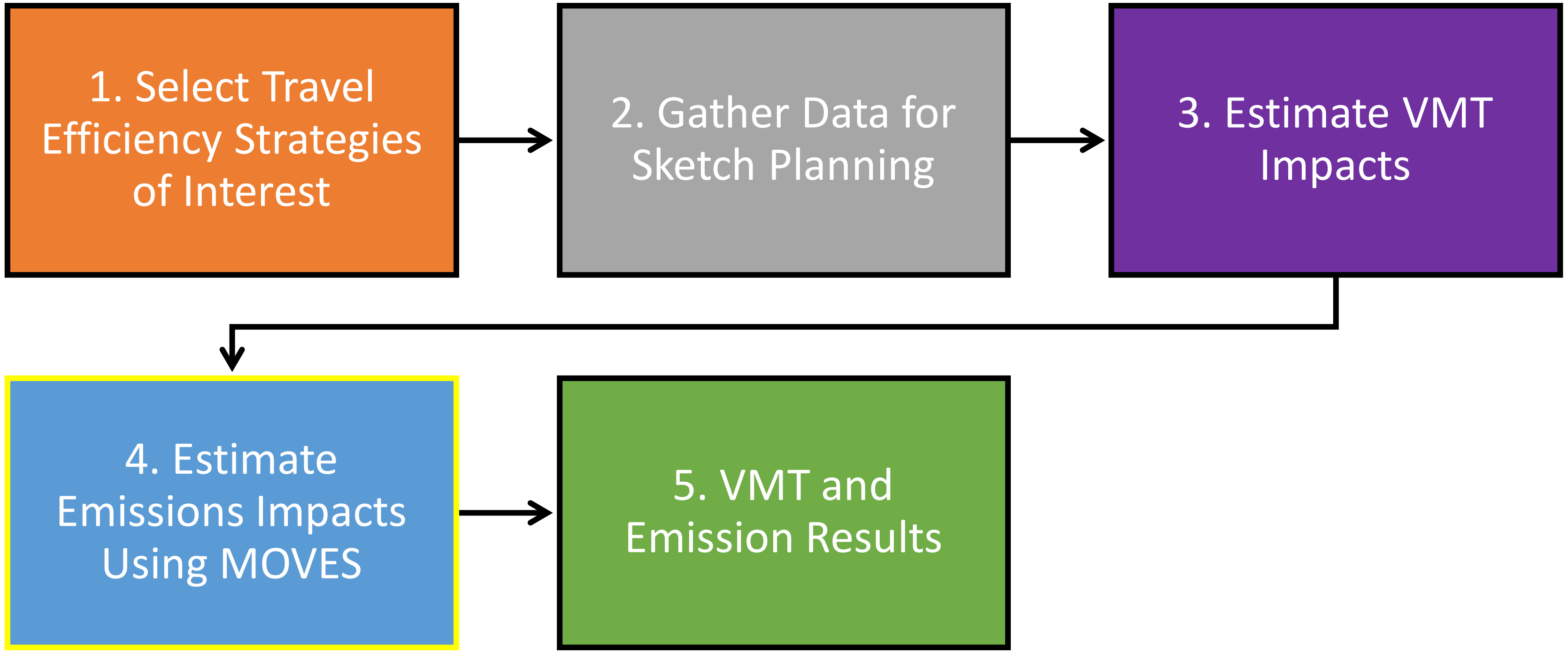
3. Estimate VMT Impacts

- Once the Analysis Worksheet and Parameters Worksheet have been completed, click “Run Analysis” button on the TRIMMS toolbar.
- This will open the TRIMMS Results worksheet.

Sample TRIMMS VMT Results

Scenario:	Scenario 1			
Commuters Affected:	500			
Mode	BAU Total VMT	Scenario Total VMT	Change Total VMT	Percent Change VMT
Auto-Drive Alone	1,708,183	1,673,029	-35,154	-2.06%
Auto-Rideshare	160,728	158,887	-1,842	-1.15%
Vanpool	5,087	5,029	58	-1.15%
Public Transport	1,603	2,655	1,052	65.66%
Cycling	14,965	14,965	-	0.00%
Walking	6,205	6,205	-	0.00%
Other	124,465	124,465	-	0.00%
Total	2,021,370	1,985,235	-36,135	-1.79%

4. Estimate Emissions Impacts Using MOVES



Perform emissions analysis using MOVES emissions model to produce emission rates and combine with VMT results

4. Estimate Emissions Impacts Using MOVES

In this step, users will:

- Prepare and run EPA's MOVES model
- Obtain output data from MOVES
- Use the output data to calculate regionally representative emission rates

Overview of MOVES

- MOVES is EPA’s state-of-the-science model for estimating air pollution emissions from mobile sources under a wide range of user-defined conditions.

- Using MOVES to obtain emission rates for TEAM involves three main steps:
    1. Set up a run specification (“RunSpec”) by filling out the various panels of the MOVES graphic user interface (GUI). The RunSpec serves to specify the characteristics of the region, analysis years, etc. to be modeled in MOVES
    2. If local data is available, users will enter regionally specific data through the “County Data Manager.” If no local data is available, MOVES will use default data in the emissions calculation
    3. Users will run the model and process results and obtain emission rates using a post-processing script

Processing MOVES Output

- Once the MOVES run is completed, an output table is generated
- EPA provides a script (emissionrates.sql) to quickly extract vehicle activity and emissions information to produce a gram-per-mile emission rate (see example table below).

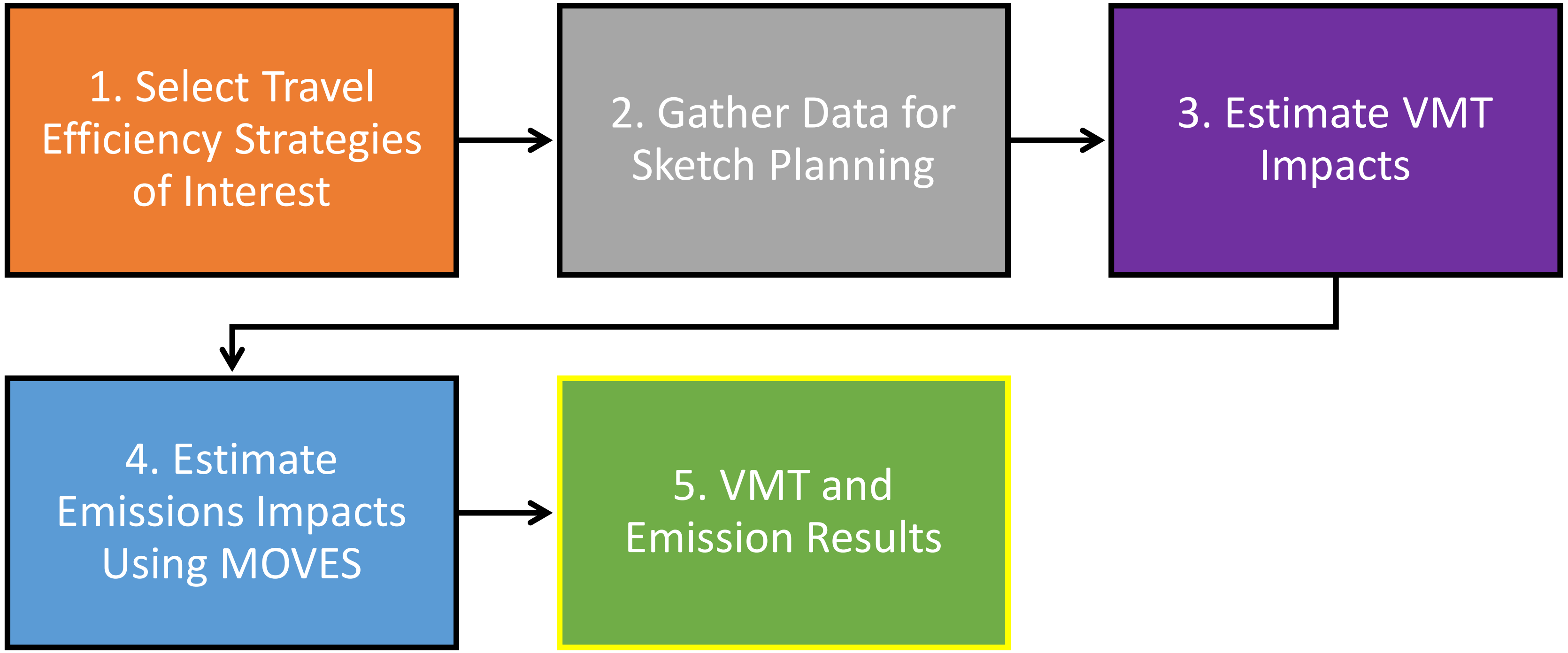
MOVESRunID	yearID	monthID	dayID	stateID	countyID	pollutantID	emissionQuant	activityTypeID	activity	emissionRate	massUnits	distanceUnits
1	2025	7	5	26	26161	119	0	1	12036010	0	g	mi
1	2025	7	5	26	26161	118	30141.85	1	12036010	0.002504	g	mi
1	2025	7	5	26	26161	115	1463.104	1	12036010	0.000122	g	mi
1	2025	7	5	26	26161	112	32240.79	1	12036010	0.002679	g	mi
1	2025	7	5	26	26161	110	62382.67	1	12036010	0.005183	g	mi
1	2025	7	5	26	26161	98	4.42E+09	1	12036010	367.0681	g	mi
1	2025	7	5	26	26161	91	6.1E+13	1	12036010	5071423	g	mi
1	2025	7	5	26	26161	90	4.39E+09	1	12036010	364.8251	g	mi
1	2025	7	5	26	26161	87	2762386	1	12036010	0.22951	g	mi
1	2025	7	5	26	26161	79	2630800	1	12036010	0.218577	g	mi
1	2025	7	5	26	26161	6	73419.16	1	12036010	0.0061	g	mi
1	2025	7	5	26	26161	5	204788.5	1	12036010	0.017015	g	mi
1	2025	7	5	26	26161	1	2838260	1	12036010	0.235814	g	mi

Sample Emission Rates

- The data from MOVES can be used to develop the regional emission rates used for the emissions analysis. An example summary table is below.

TRIMMS Mode	Emission Rates (g/mi)			
	$PM_{2.5}$	CO2e	VOCs	NOx
Auto (Auto-Drive Alone and Auto-Rideshare)	0.002	209.593	0.005	0.026
Vanpool	0.003	283.852	0.009	0.047
Transit	0.011	1335.72	0.050	1.008

5. VMT and Emission Results



Evaluate how the different strategies impact VMT and emissions individually and compared to one another within the region.

5. VMT and Emission Results

- From Step 3 and Step 4, the user should have:
  - VMT impacts, by mode, for the BAU and strategy scenarios
  - Emission rates by mode and pollutant.

- The last step involves combining these values to estimate the emissions reductions by scenario.

Combining VMT and Emissions Results

- Sample VMT Results

Scenario:	Scenario 1			
Commuters Affected:	500			
Mode	BAU Total VMT	Scenario Total VMT	Change Total VMT	Percent Change VMT
Auto-Drive Alone	1,708,183	1,673,029	-35,154	-2.06%
Auto-Rideshare	160,728	158,887	-1,842	-1.15%

- Same Emission Rates

TRIMMS Mode	Emission Rates (g/mi)			
	$PM_{2.5}$	CO2e	VOCs	NOx
Auto (Auto-Drive Alone and Auto-Rideshare)	0.002	209.593	0.005	0.026
Vanpool	0.003	283.852	0.009	0.047
Transit	0.011	1335.72	0.050	1.008

Combining VMT and Emissions Results

- Sample Final Emissions Results (Emissions quantities in grams/year)

Scenario:	Scenario 1			
Commuters Affected:	500			
Mode	Total VMT	$PM_{2.5}$	CO2e	VOCs
Auto-Drive Alone	-35,154	70	7,368,011	176
Auto-Rideshare	-1,842	4	386,018	9

IV. TEAM Demonstration

Demonstration 1: Transit Example

Transit Scenario Example:

- Scenario:
  - A transit provider in Ann Arbor, Michigan wants to explore the impact of offering a 50% reduced transit fares government workers.
- Current single round-trip fare: $3.00
- For simplicity, we're only interested in the VMT and emissions reductions from shifting away from light-duty passenger vehicle use and not any potential offsets from increased transit vehicle use, though it is possible to perform such an analysis.

Transit Scenario Example, Steps

1. Ensure that the appropriate regional parameters have been entered in the Parameters tab for the scenario in TRIMMS.
2. Define the number of regional commuters affected.
3. Operationalize the strategy impact within the Financial and Pricing Strategies ($) section or Access and Travel Time Improvements (minutes) section within the Analysis worksheet.
4. Run the analysis.
5. Examine the results.

Demonstration 2: Bicycle Strategy Example

TEAM User Guide Method to Calculate Impacts of a Bicycle Strategy

1. Prepare data on total existing and future bike lane miles, and geographical size of area
2. Calculate BAU and scenario bike lane miles per area (miles bike lane/square mile) and the percent increase
3. Use Dill and Carr elasticity to determine increase in bike mode share:
   - 1% increase for every 1 bicycle lane miles per square mile
4. Determine expected BAU bike mode share (from American Community Survey or similar dataset)
5. Calculate increase in bike mode share from strategy
6. Decrease non-cycling mode shares, so total continues to be 100%
7. Calculate trips reduced for non-cycling modes
8. Calculate reduction in VMT using bike trip length

Team User Guide Section 8.3.3

Bicycle Scenario Data

- Geographic size of area: 2500 square miles
  - This area is larger than most U.S. cities; can be considered a regional analysis
- Existing bike lane miles: 500
- Strategy: add 500 more miles of bike lanes, for a total of 1000
- BAU bike mode share is 0.5%
- Total regional daily trips: 5,000,000 trips
- Average bike trip length: 2.5 miles
- Average carpool vehicle occupancy: 2 people

Example, Steps 1 – 5

1. Based on the total existing and future bike lane miles, and geographical size of area, we:

2. Calculate BAU and future scenario bike lane miles/sq. mi.:

    BAU: 500 lane miles/2,500 sq. mi = 0.2 lane miles/sq. mi

    Future scenario: 1000 lane miles/2,500 = 0.4 lane miles/sq. mi

3. Using Dill and Carr elasticity (1% increase for every 1 bike lane mi/sq. mi):

    Increase in bicycle mode share: 0.4 - 0.2 = 0.2%

4. Expected BAU bicycle mode share: 0.5%

5. Calculate increase in bicycle mode share: 0.5% + 0.2% = 0.7%

    Total change in other modes: -0.2%

Step 6: Calculate new mode shares

Mode	(A) BAU Mode Shares Provided by agency (or TRIMMS default)	(B) Percentage of Non-Bike Mode Shares = A ÷ Sum of Non-Bike Modes (99.5%)	(C) Change in Mode Share = -0.2% * B	(D) Future Mode Shares = A + C
Auto-drive alone	52.00%	52.26%	-0.10%	51.90%
Auto-rideshare	38.00%	38.19%	-0.08%	37.92%
Vanpool	0.00%	0.00%	0.00%	0.00%
Public transit	3.50%	3.52%	-0.01%	3.49%
Cycling	0.50%	-	0.20%	0.70%
Walking	5.00%	5.03%	-0.01%	4.99%
Other	1.00%	1.01%	0.00%	1.00%
Total	100.00%	100.00%	0.00%	100.00%

Steps 7 & 8: Calculate trips reduced from non-cycling modes and total VMT reduced

Total trips = 5,000,000; average bike trip length = 2.5 miles; average carpool vehicle occupancy = 2; the change in trips and VMT is:

Mode Share	(E) Change in Trips = C * 5,000,000	(F) Change in VMT = E/vehicle occupancy * 2.5
Auto-drive alone	-5,226	-13,065
Auto-rideshare	-3,819	-4,774
Vanpool	0	0
Public transit*	-352	0
Cycling	10,000	25,000
Walking	-503	-1,256
Other	-101	-251
Total	*0*	*0*

* Assume that reductions in transit trips do not affect overall transit VMT.

The total reduction in VMT =
13,065
\+ 4,774
17,839

Wrap-Up & Questions

Wrap-Up

- Today, we’ve demonstrated that TEAM is accessible, flexible, scalable approach for evaluating travel efficiency strategies
- This webinar includes just two TEAM User Guide example calculations however, the TEAM User Guide includes additional example calculations, including:
  - Transportation pricing
  - Pedestrian infrastructure
  - Both land use approaches

Available Resources

All found at: www.epa.gov/state-and-local-transportation, under the "Greenhouse Gas Planning" heading:

- TEAM User Guide
- TEAM national and case study reports and presentations
- Transportation Control Measures information document
- Guidance: Using MOVES for Estimating State and Local Inventories of Onroad GHGs

Questions