MObile Source Emission Reduction Strategies (MOSERS)

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STAQS – Louisville, KY

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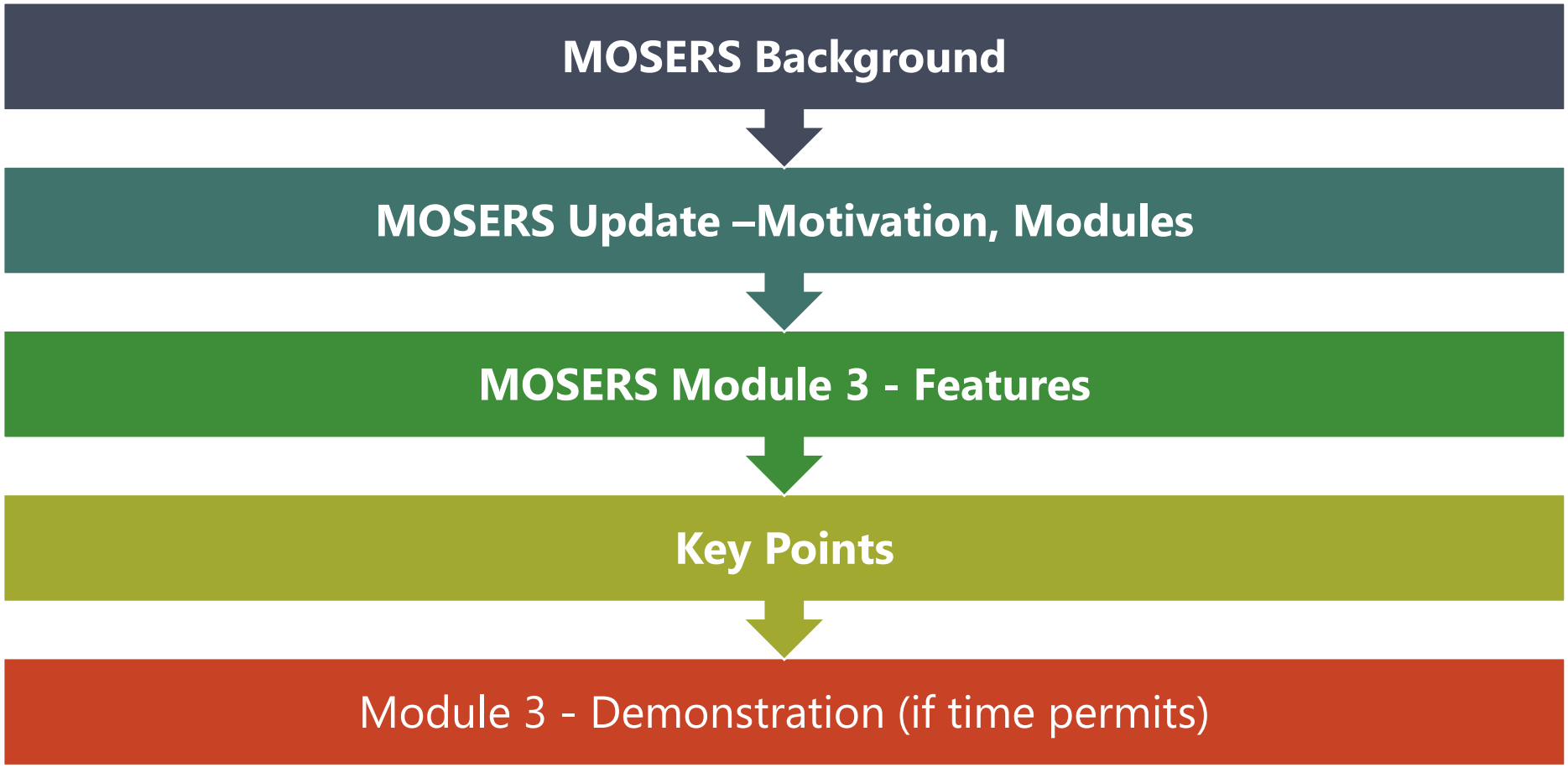
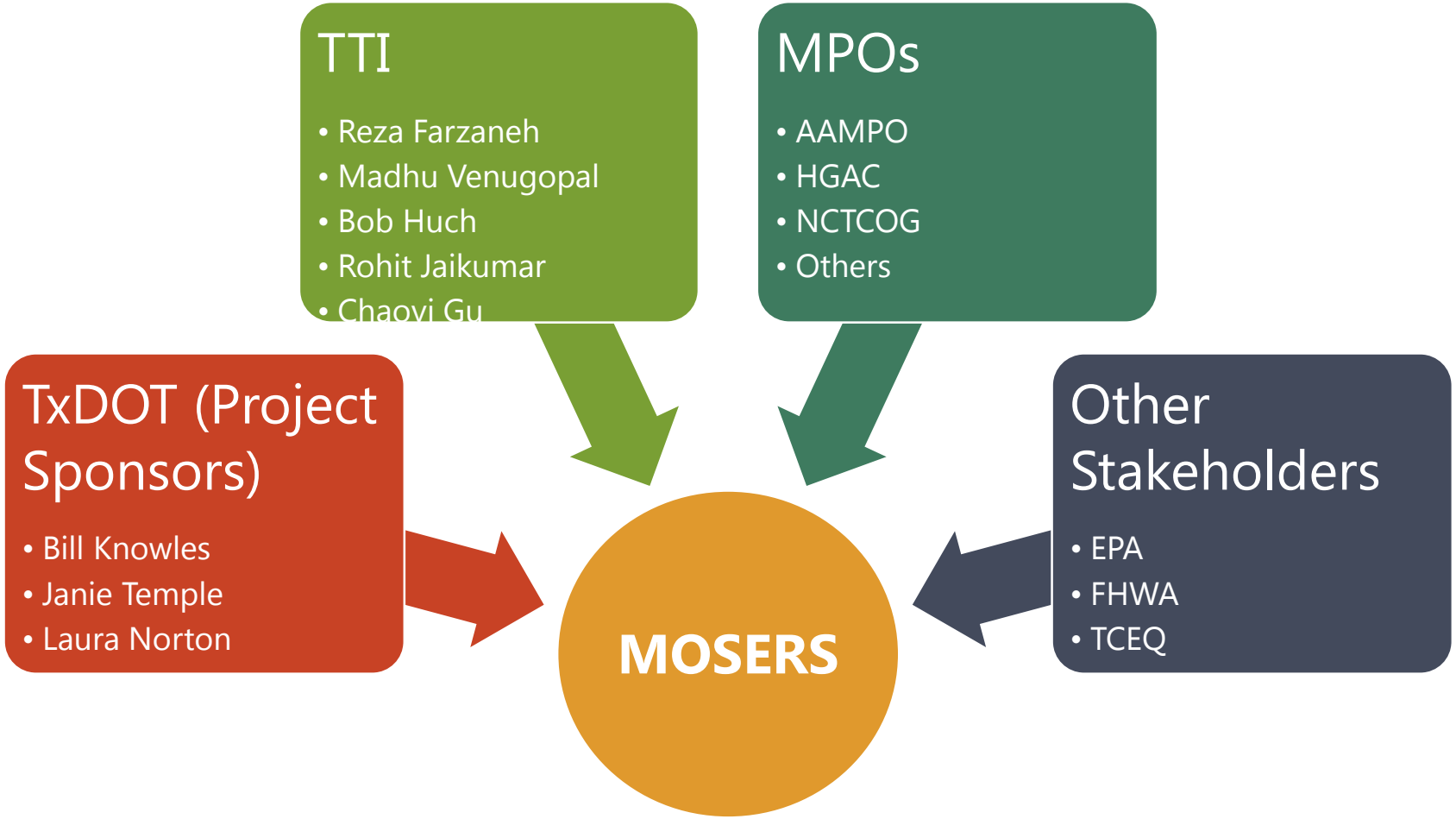
Overview


MOSERS Background
MOSERS Update –Motivation, Modules
MOSERS Module 3 - Features
Key Points
Module 3 - Demonstration (if time permits)

Project Team



MOSERS Background

Hand calculations

- Simple equations
- Require assumptions
- Less time and data needed

Models

- More accurate
- Complex and data intensive
- Require skills such as software programs

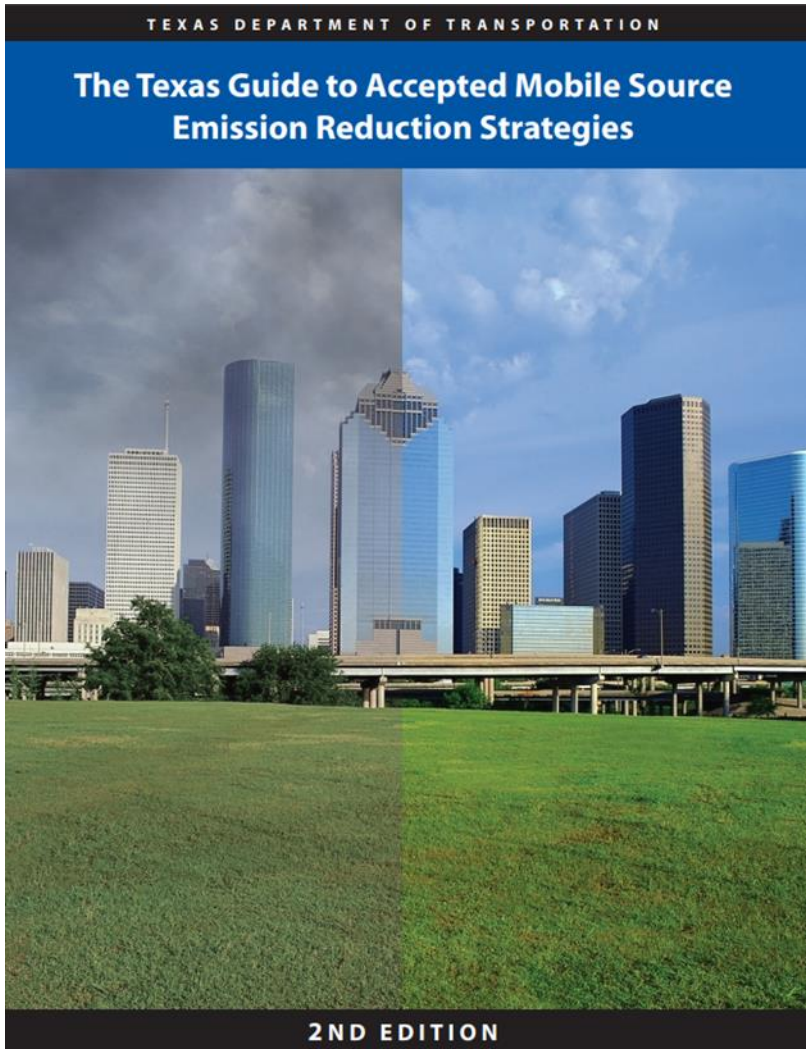
MOSERS Background– Current Official Version

MOSERS First Edition 2003

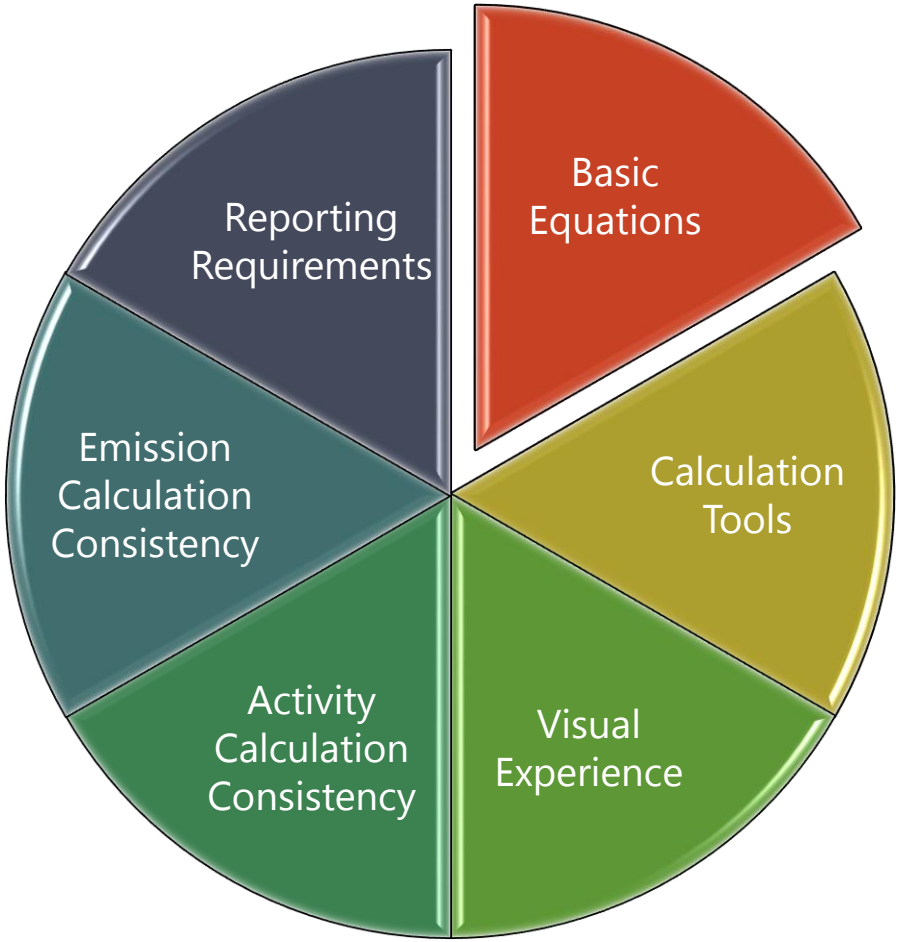
- Review agencies needed consistency
- Uniformity in emission reduction strategies

MOSERS Second Edition 2007

- Modifications to the equations as recommended by users
- Added new strategies



MOSERS Update - Motivation



MOSERS - Modules

Module 1

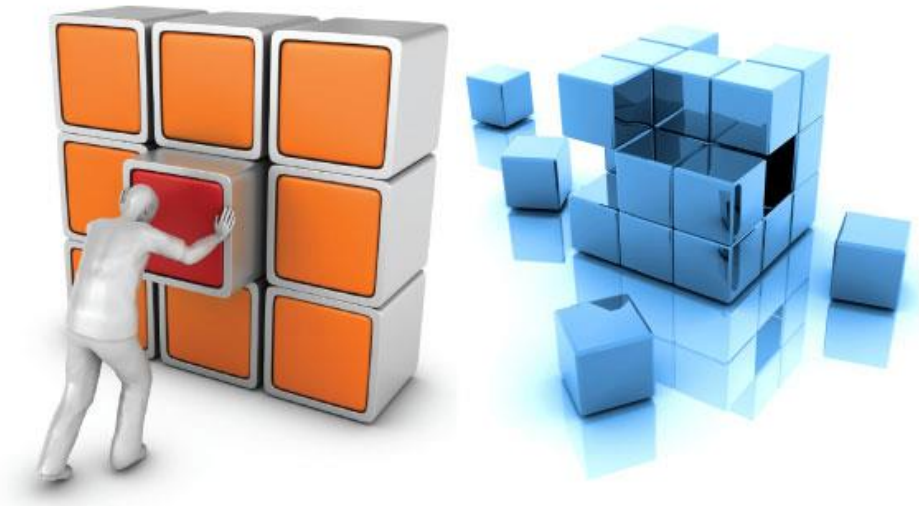
- Background Document
- NAAQS, SIP, Conformity, etc.

Module 2

- Strategies
- Emissions Calculation Equations

Module 3

- Excel Workbook
- Activity and Emissions Calculation



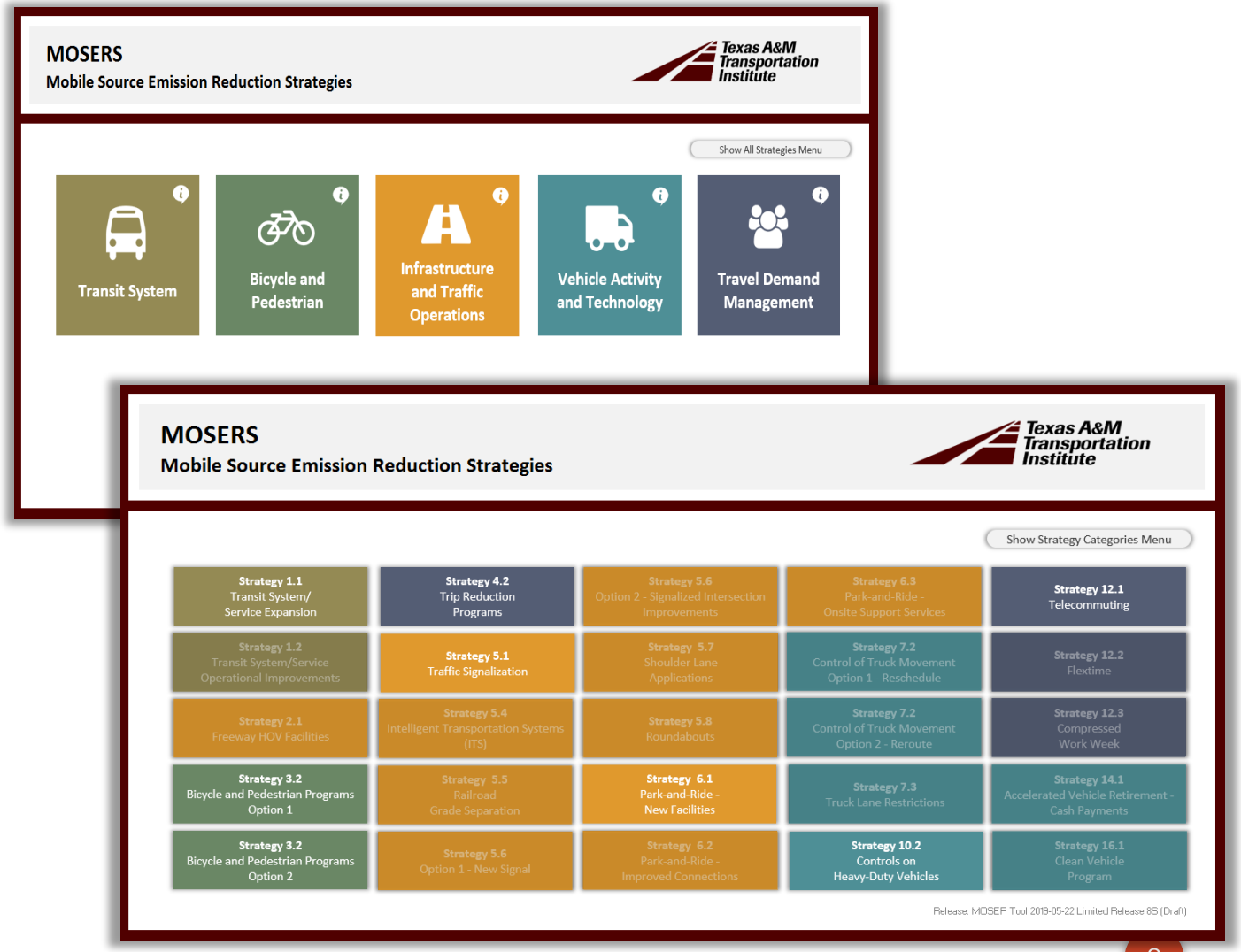
Module 3 –Introduction

Spreadsheet tool

User experience

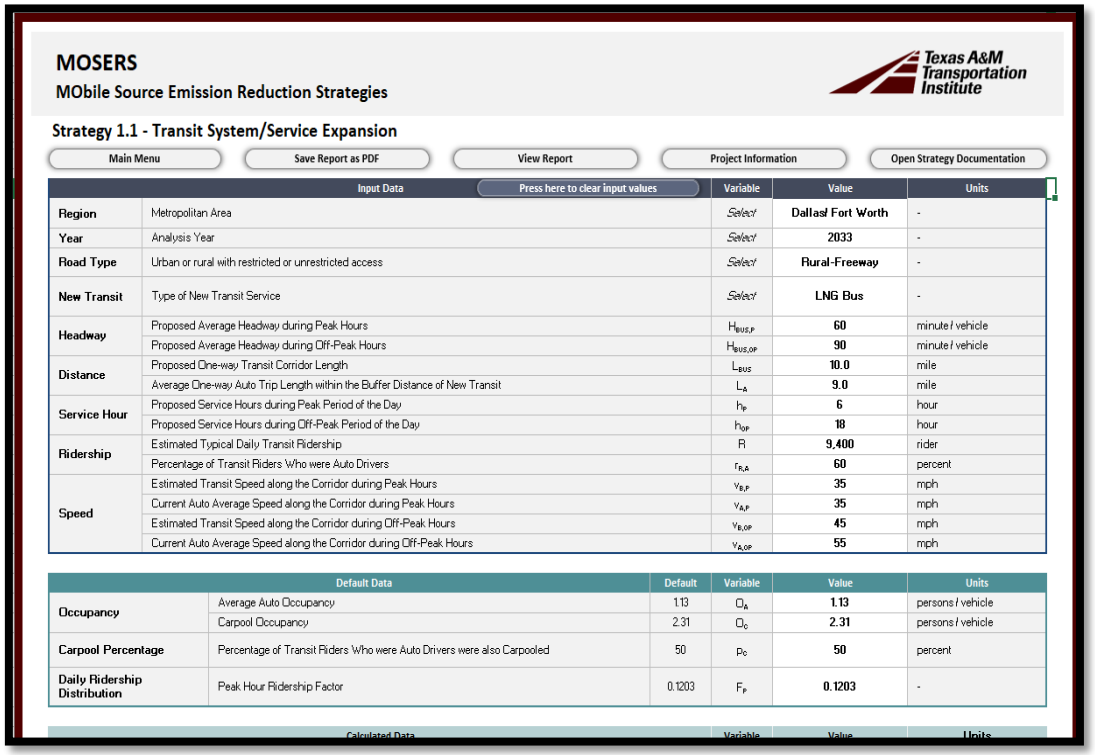
Strategy & worksheet Menus

Web Integration



Module 3 –Inputs

- Main Menu
- Save Report as PDF
- Project Information
- Open Strategy Documentation
- Input Values Range
- Default Values Range



MOSERS

MObile Source Emission Reduction Strategies

Texas A&M Transportation Institute

Strategy 1.1 - Transit System/Service Expansion

Main Menu | Save Report as PDF | View Report | Project Information | Open Strategy Documentation

Input Data	Press here to clear input values	Variable	Value	Units
Region	Metropolitan Area	*Select*	Dallas/ Fort Worth	-
Year	Analysis Year	*Select*	2033	-
Road Type	Urban or rural with restricted or unrestricted access	*Select*	Rural-Freeway	-
New Transit	Type of New Transit Service	*Select*	LNG Bus	-
Headway	Proposed Average Headway during Peak Hours	$H_{BUS,P}$	60	minute/ vehicle
	Proposed Average Headway during Off-Peak Hours	$H_{BUS,OP}$	90	minute/ vehicle
Distance	Proposed One-way Transit Corridor Length	L_{BUS}	10.0	mile
	Average One-way Auto Trip Length within the Buffer Distance of New Transit	L_A	9.0	mile
Service Hour	Proposed Service Hours during Peak Period of the Day	h_P	6	hour
	Proposed Service Hours during Off-Peak Period of the Day	h_{OP}	18	hour
Ridership	Estimated Typical Daily Transit Ridership	R	9,400	rider
	Percentage of Transit Riders Who were Auto Drivers	$r_{R,A}$	60	percent
Speed	Estimated Transit Speed along the Corridor during Peak Hours	$v_{B,P}$	35	mph
	Current Auto Average Speed along the Corridor during Peak Hours	$v_{A,P}$	35	mph
	Estimated Transit Speed along the Corridor during Off-Peak Hours	$v_{B,OP}$	45	mph
	Current Auto Average Speed along the Corridor during Off-Peak Hours	$v_{A,OP}$	55	mph

Default Data		Default	Variable	Value	Units
Occupancy	Average Auto Occupancy	1.13	O_A	1.13	persons/ vehicle
	Carpool Occupancy	2.31	O_C	2.31	persons/ vehicle
Carpool Percentage	Percentage of Transit Riders Who were Auto Drivers were also Carpooled	50	p_C	50	percent
Daily Ridership Distribution	Peak Hour Ridership Factor	0.1203	F_P	0.1203	-

Calculated Data	Variable	Value	Units

Module 3 - Activity Calculation

Calculated Data range

- Interim data used for calculation of the Activity Output. No input is required in this range.

Activity Output data range

- Calculated data used for future emission calculations.

Consistency with the Module 2 Formulas

Calculated Data		Variable	Value	Units
Ridership	Off-Peak Hour Ridership Factor	F_{OP}	0.0155	-
	Estimated Transit Ridership during Peak Hours	R_P	6,782	person
	Estimated Transit Ridership during Off-Peak Hours	R_{OP}	2,618	person
	Estimated Typical Day Transit Ridership	R	9,400	person
Transit Trips	Transit Trips during Peak Hours (Two-way)	$VT_{BUS,P}$	12	trips / day
	Transit Trips during Off-Peak Hours (Two-way)	$VT_{BUS,OP}$	24	trips / day
Transit VMT	Daily Transit VMT	VMT_{BUS}	360	vehicle mile
Trip Summary	Reduction in Number of Auto Vehicle Trips during Peak Hours	$VT_{R,P}$	2,681	trips
	Reduction in Number of Auto Vehicle Trips during Off-Peak Hours	$VT_{R,OP}$	1,035	trips
VMT Summary	Reduction in Number of Daily Auto VMT	VMT_R	33,447	vehicle mile

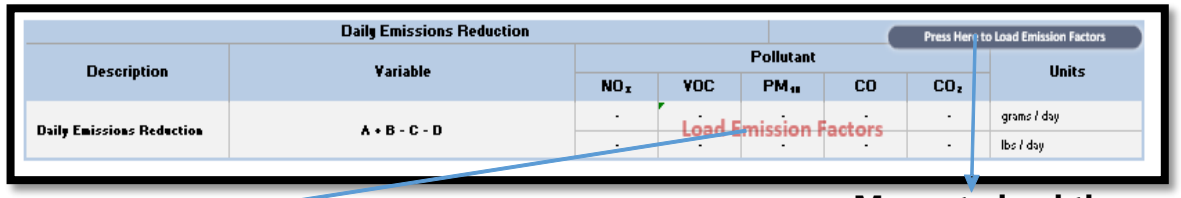
Activity Output		Variable	Value	Units
Trip Summary	Reduction in Number of Daily Auto Vehicle Trips	VT_R	3,716	trips
	Increased Number of Daily Transit Vehicle Trips	VT_{BUS}	36	trips
VMT Summary	Reduction in Number of Auto VMT during Peak Hours	$VMT_{R,P}$	24,133	vehicle mile
	Reduction in Number of Auto VMT during Off-Peak Hours	$VMT_{R,OP}$	9,314	vehicle mile
	Increased Number of Transit VMT during Peak Hours	$VMT_{BUS,P}$	120	vehicle mile
	Increased Number of Transit VMT during Off-Peak Hours	$VMT_{BUS,OP}$	240	vehicle mile
Speed Summary	Average Transit Speed along the Corridor in Peak Hours	$v_{BUS,P}$	35	mph
	Average Auto Speed along the Corridor in Peak Hours	$v_{AUTO,P}$	35	mph
	Average Transit Speed along the Corridor in Off-Peak Hours	$v_{BUS,OP}$	45	mph
	Average Auto Speed along the Corridor in Off-Peak Hours	$v_{AUTO,OP}$	55	mph

Module 3 –Emission Rates

Texas ERLT for Seven Regions

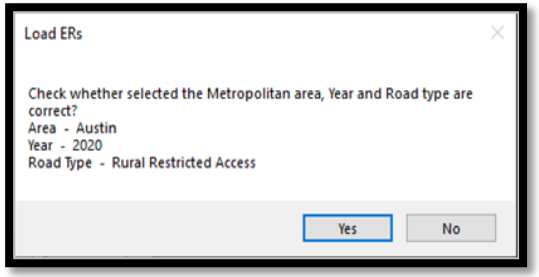
Strategy-Specific Rates (Bike peds, Signals, etc.)

Rates by metropolitan area, year, road type, road description, and speed



Flag to check correct emission factors are loaded

Macro to load the correct emission factors



AREA	YEAR	Vehicle Type	CO	NOX	VOC	CO2	PM10
Austin	2014	Longhaul Truck	89.6	195.4	47.2	9120.9	3.9
Austin	2015	Longhaul Truck	89.5	193.7	44.0	9108.4	3.3
Austin	2016	Longhaul Truck	89.5	192.4	41.4	9097.7	2.8
Austin	2017	Longhaul Truck	89.5	191.8	40.1	9087.7	2.6
Austin	2018	Longhaul Truck	89.5	191.2	39.0	9079.0	2.4
Austin	2019	Longhaul Truck	89.5	190.6	37.9	9073.3	2.2
Austin	2020	Longhaul Truck	89.4	189.6	36.3	9069.1	1.9
Austin	2021	Longhaul Truck	89.3	188.7	34.4	9062.7	1.6
Austin	2022	Longhaul Truck	89.3	187.8	33.1	9060.5	1.3
Austin	2023	Longhaul Truck	89.3	187.1	32.2	9057.3	1.1
Austin	2024	Longhaul Truck	89.3	186.7	31.5	9056.8	1.0
Austin	2025	Longhaul Truck	89.2	186.2	30.9	9056.0	0.9
Austin	2026	Longhaul Truck	89.2	185.7	30.1	9054.6	0.7
Austin	2027	Longhaul Truck	89.2	185.4	29.6	9054.3	0.6

Module 3 –Emission Calculation

1.Daily Emission Reductions

2.Emission Factors

3.Emission Calculations

1

Daily Emissions Reduction

Description	Variable	Pollutant					Units
		NO_X	VOC	PM_{10}	CO	CO_2	
Daily Emissions Reduction	A + B - C - D	0.7877	1.0094	0.0449	21.0394	3,791	kg / day
		1.7365	2.2254	0.099	46.3838	8,357	lbs / day

2

Emission Factors

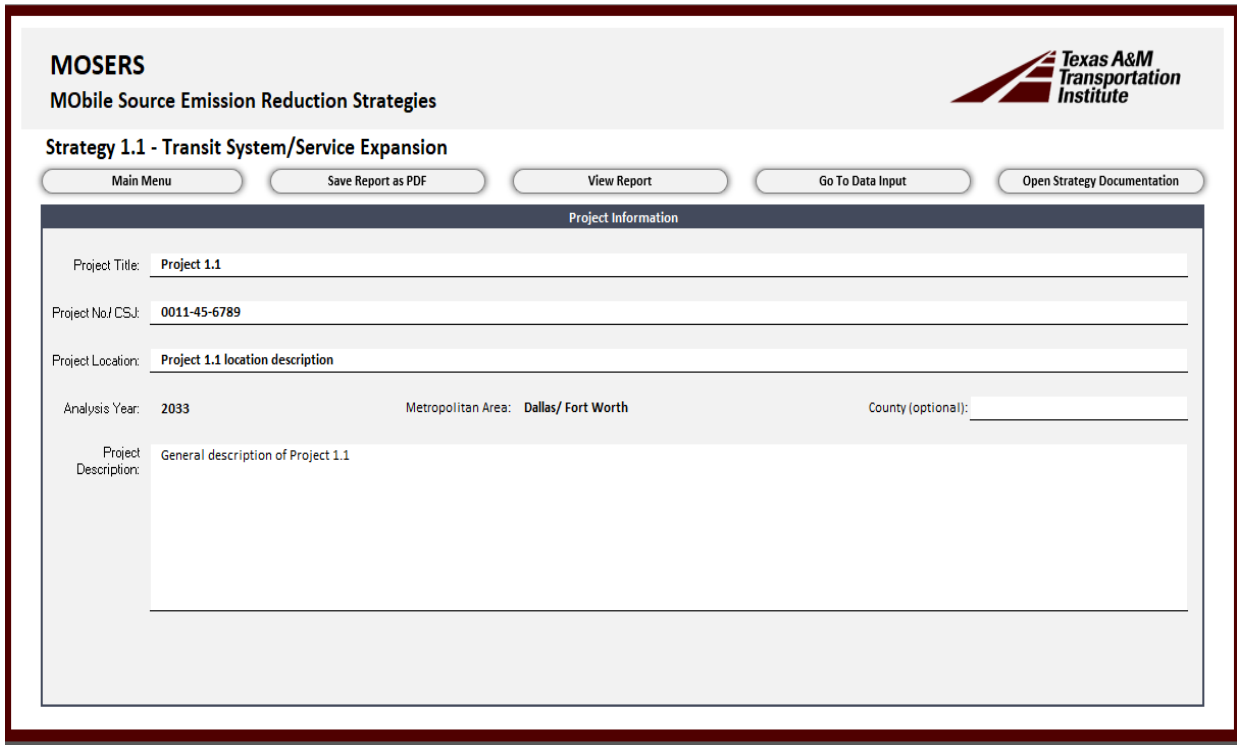
Description	Variable	Pollutant					Units
		NO_X	VOC	PM_{10}	CO	CO_2	
Speed-based running exhaust emission factor for affected roadway before implementation during peak hours - auto	$EF_{AUTO,P}$	0.022438	0.018711	0.002116	0.868743	228.755	grams / mile
Speed-based running exhaust emission factor for affected roadway before implementation during off-peak hours - auto	$EF_{AUTO,OP}$	0.029413	0.014234	0.002001	0.825682	205.592	grams / mile
Speed-based running exhaust emission factor for transit vehicle during peak hours - bus	$EF_{BUS,P}$	1.377081	0.075980	0.042126	0.461858	1,575.408	grams / mile
Speed-based running exhaust emission factor for transit vehicle during off-peak hours - bus	$EF_{BUS,OP}$	1.257079	0.061585	0.034447	0.420714	1,460.115	grams / mile
Auto trip-end emission factor	TEF_{AUTO}	0.139953	0.185789	0.003361	2.089417	49.842	grams / trip
Bus (or other transit vehicle) trip-end emission factor	TEF_{BUS}	0.000000	0.000324	0.002854	6.287976	81.310	grams / trip

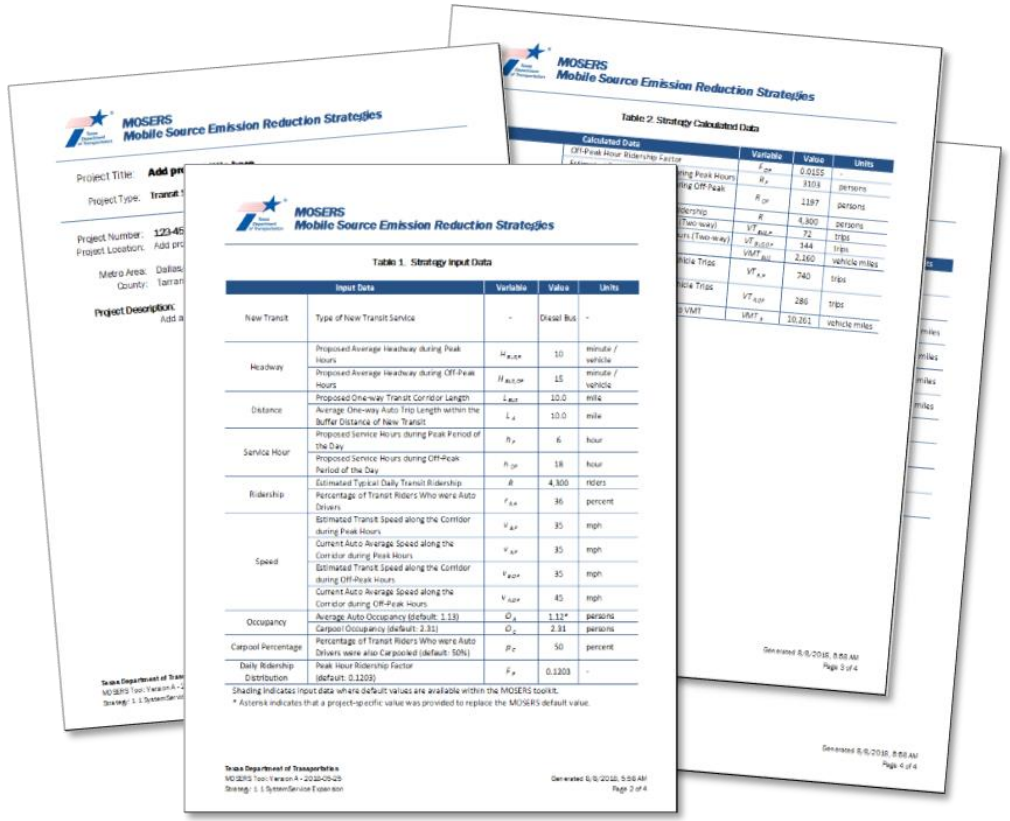
3

Emission Calculations

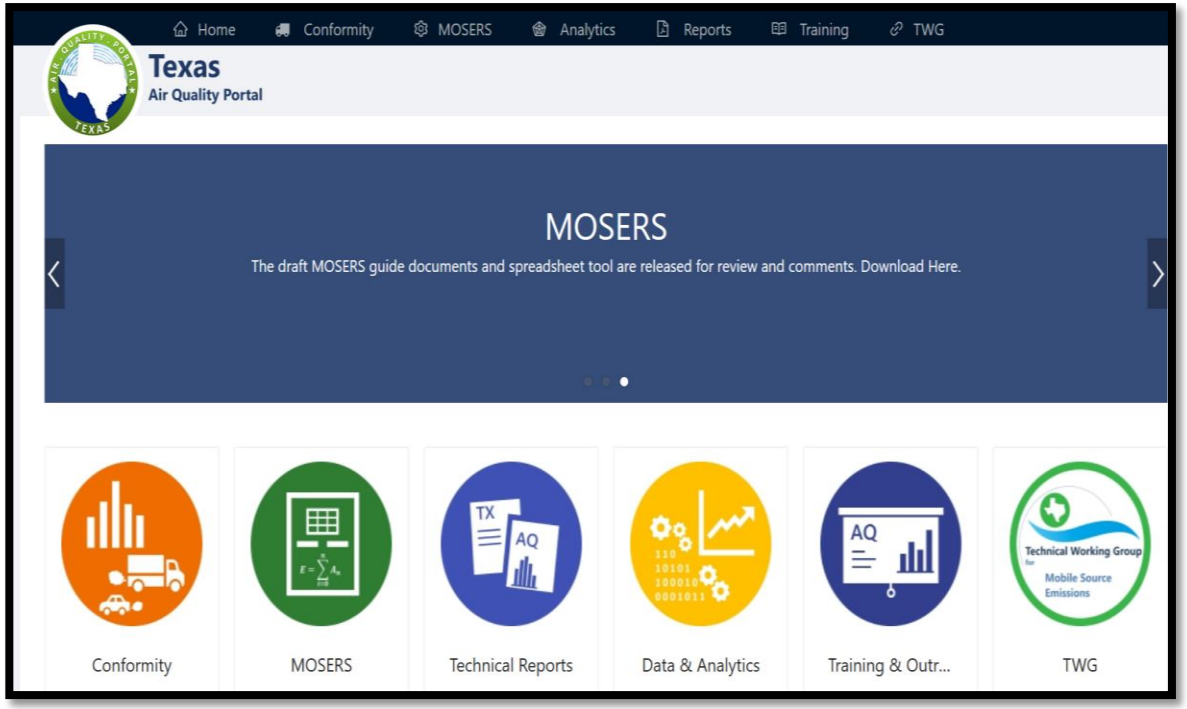
	Variable	Pollutant					Units
		NO_X	VOC	PM_{10}	CO	CO_2	
Reduction in auto start emissions from trips reduced	$A = VT_{R,P} * TEF_{AUTO} + VT_{R,OP} * TEF_{AUTO}$ (trips * g / trip + trips * g / trip)	520	690	12	7,765	185,229	grams / day
Reduction in auto running exhaust emissions from VMT reductions	$B = VMT_{R,P} * EF_{AUTO} + VMT_{R,OP} * EF_{AUTO}$ (vehicle miles * g / mile + vehicle miles * g / mile)	268	319	32	13,274	3,605,492	grams / day
Increase in emissions from additional bus starts	$C = VT_{BUS,P} * TEF_{BUS} + VT_{BUS,OP} * TEF_{BUS}$ (trips/day * g/trip + trips/day * g/day)	-	-	-	-	-	grams / day
Increase in emissions from additional bus running exhaust emissions	$D = VMT_{BUS,P} * EF_{BUS,P} + VMT_{BUS,OP} * EF_{BUS,OP}$	-	-	-	-	-	grams / day

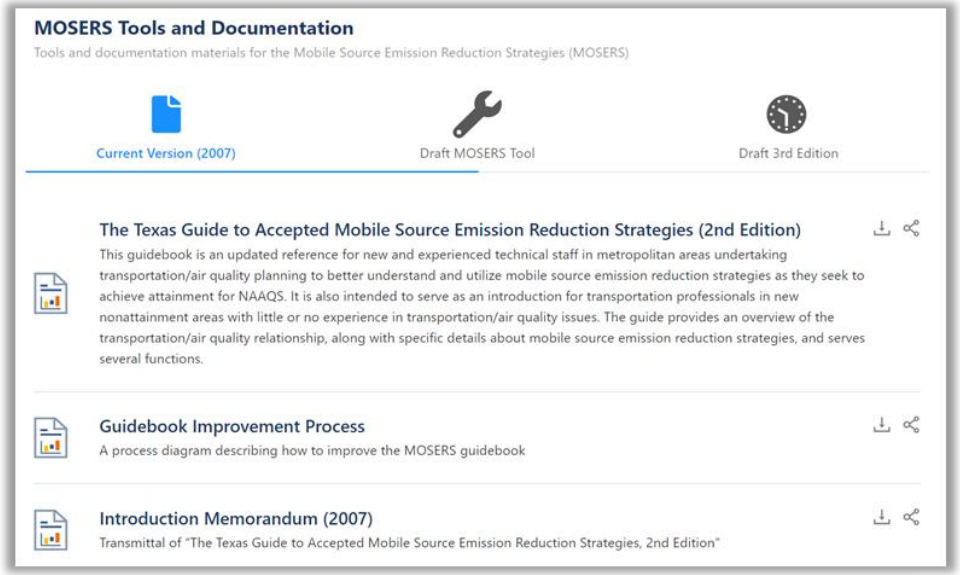
Module 3 –Reporting

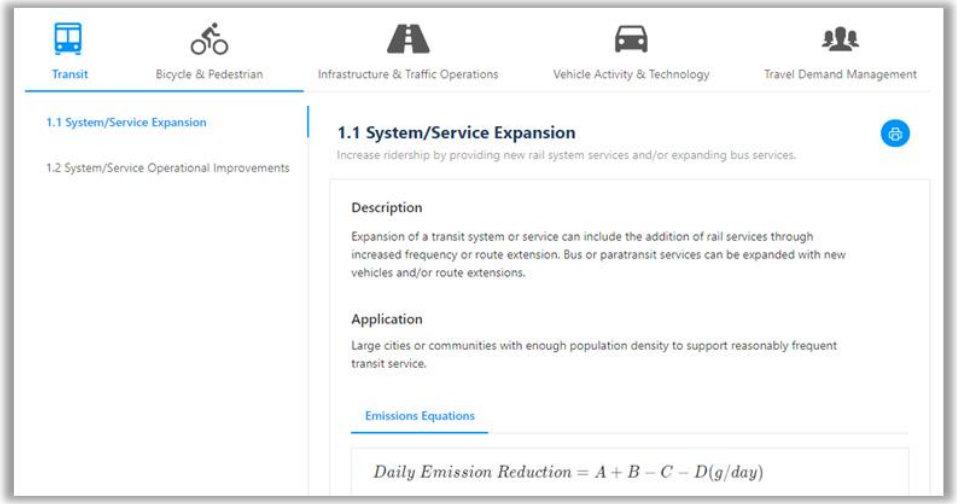




Module 3 – Access and Support



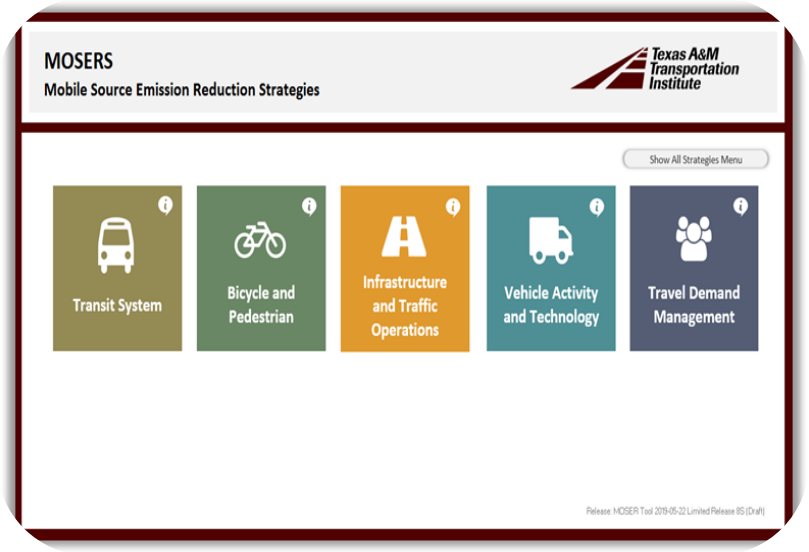




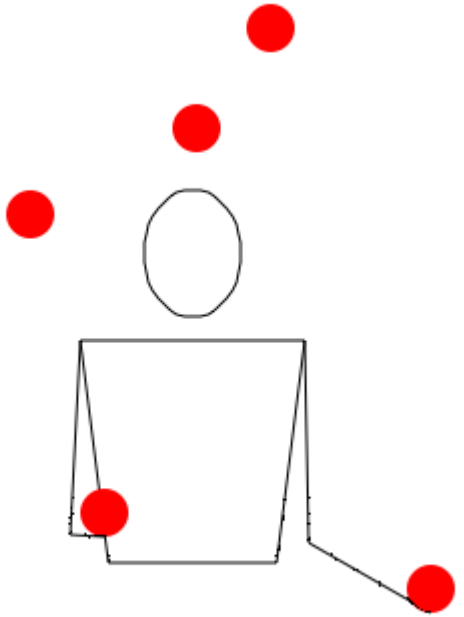
Website - https://txaqportal.org/

Key Points

- Stakeholders Participation Key for Successful Implementation
- Available Data at the User level
- Compatibility - Excel Version Used
- Initially Target Most Used Strategies
- Strategy and Emission Factor Matrix



MOSERS Tool Demonstration



Questions and Comments

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