Item 5

TPO Travel Demand Model Update
Scoping Overview

PRESENTER: MIKE CONGER, TPO STAFF AND VINCE BERNARDIN, CALIPER CORPORATION

NO ACTION REQUIRED

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Agenda

1. INTRODUCTION
2. REVIEW OF STAKEHOLDER SURVEY
3. OVERVIEW OF WORKSHOP

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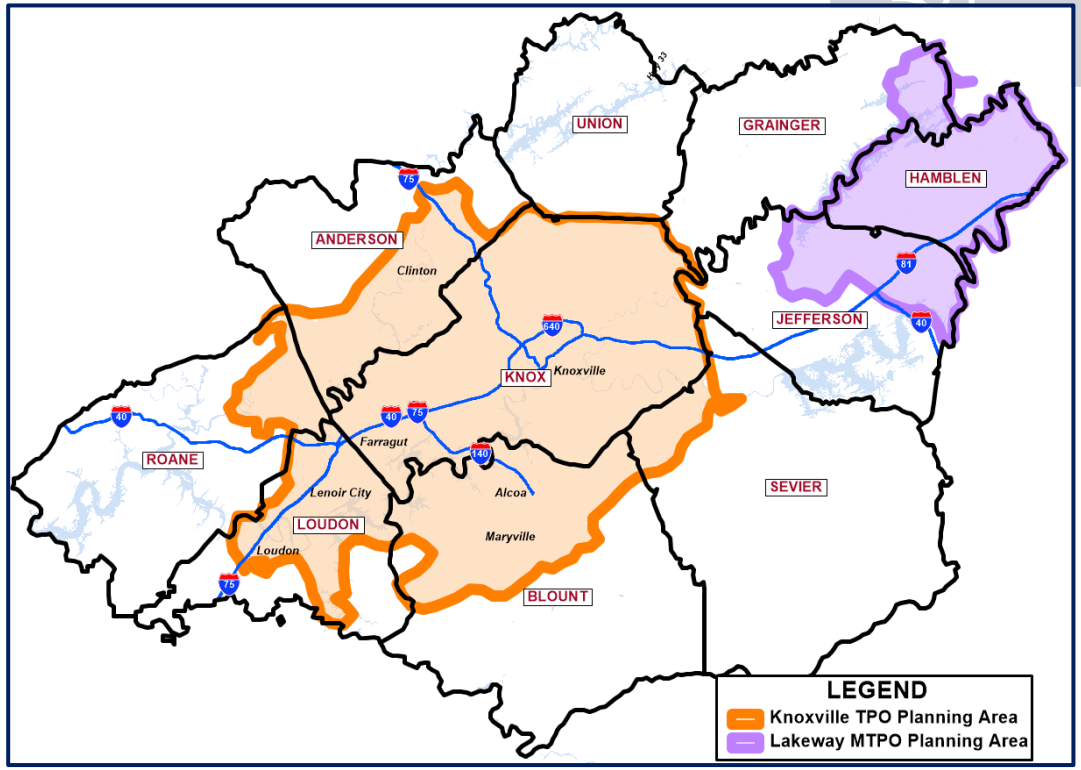
KRTM Overview & Purpose of Workshop

- Knoxville TPO Maintains a 10-County Regional Travel Demand Forecasting Model that includes all areas subject to Air Quality Conformity
  - Includes both the Knoxville TPO and Lakeway MTPO Planning Areas
- Current model validated to 2022 Base Year but based on platform originally developed in 2009/2010 – reaching end of life
  - Expectation for Mid and Large MPOs to Conduct Major Household Survey and Model Update every 10 years or so to capture changing travel behavior
- 2022 Model Update Contract with Caliper included Visioning/Scoping Exercise to lay groundwork for next major update



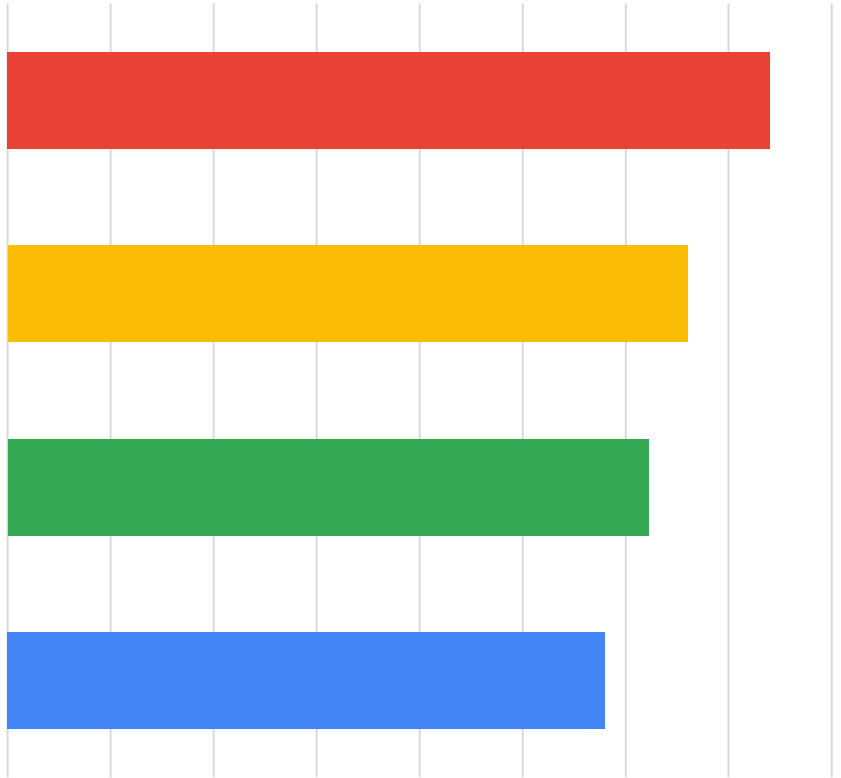
STAKEHOLDER SURVEY

RESPONDENTS

- 12 responses
- Most had not used the model
- But 1/3 claimed a technical background

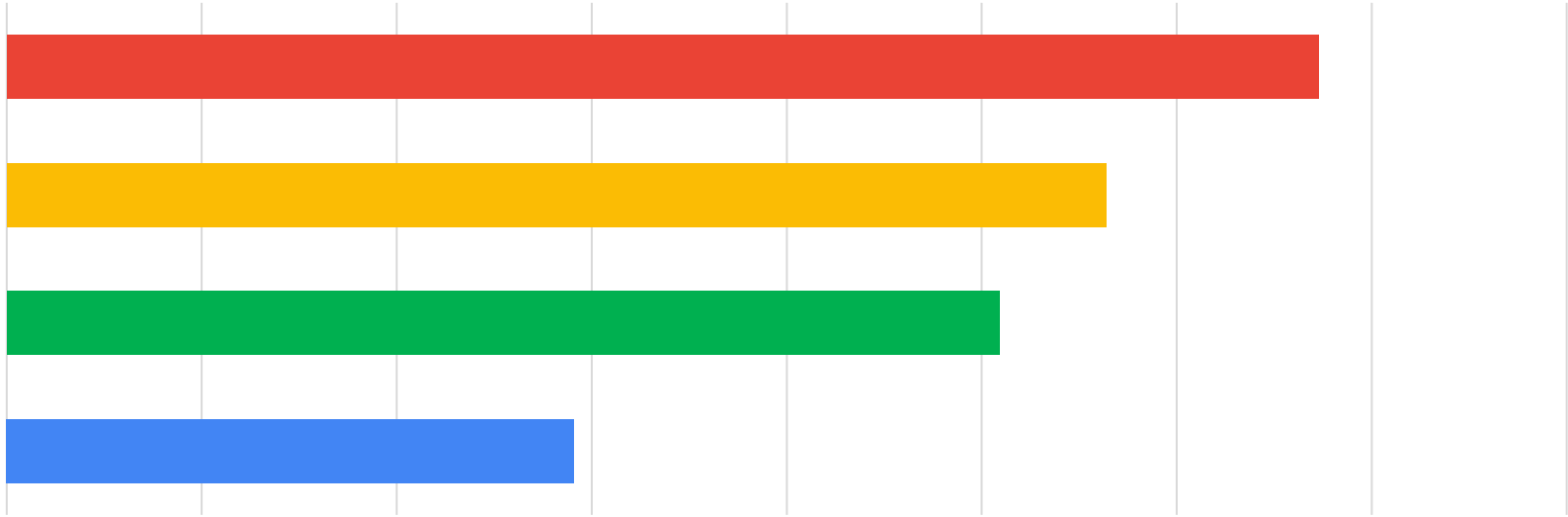
IMPORTANCE IN PRIORITIZING NEEDS

1. **Technical analysis** (quantifying objective, measurable factors, e.g., minutes of delay, vehicle-miles-of-travel)
   - All respondents thought it was very or fairly important
2. **Voter / taxpayer direct input**
3. **Principles / values** (e.g., sustainability, economic benefits, equity, etc.)
4. **Elected officials' priorities**



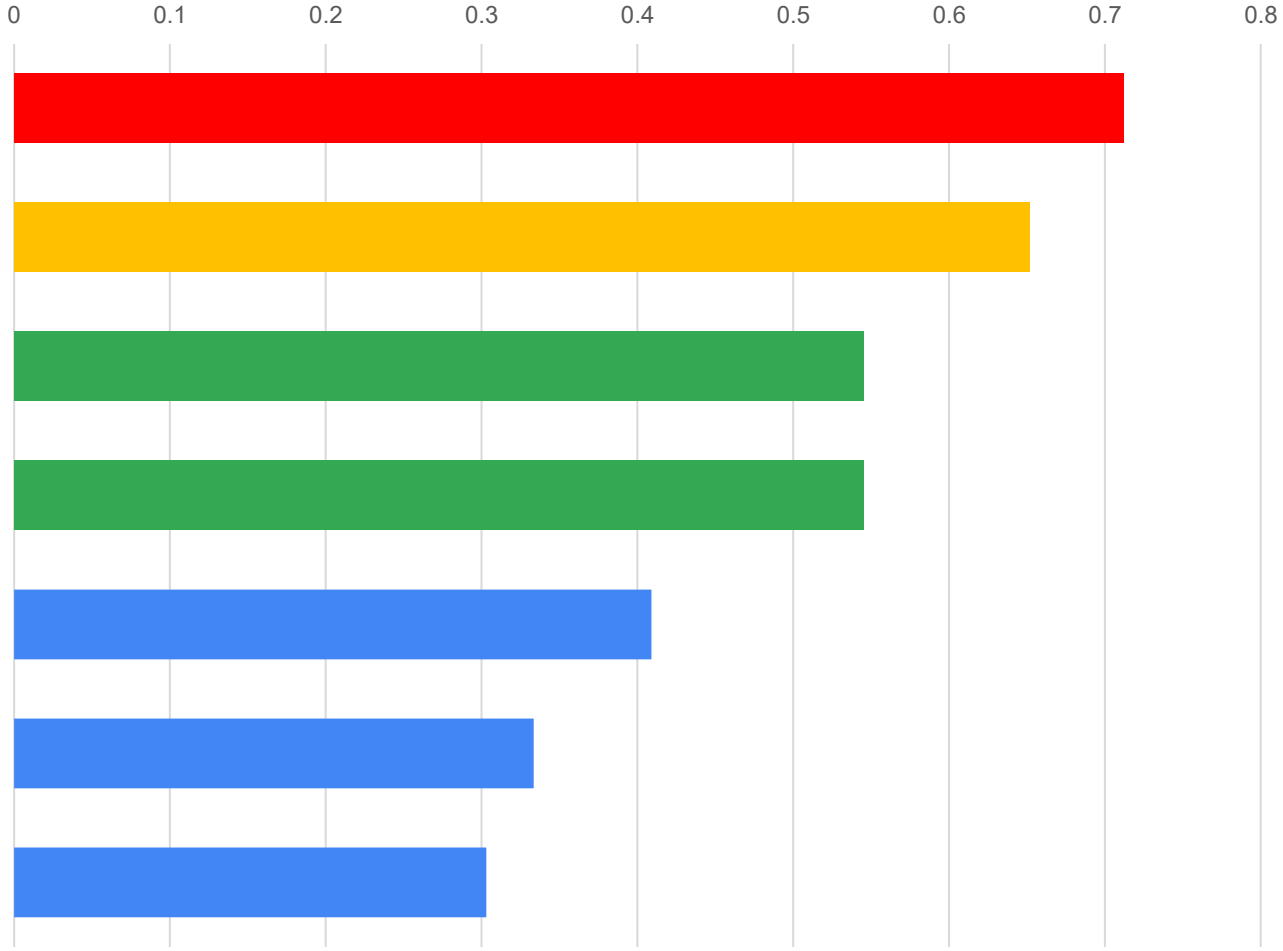
MODELING FOR SPECIAL STUDIES

1. Subarea Plans
2. Transit Studies
3. Bike/Ped Plans
4. Toll Studies



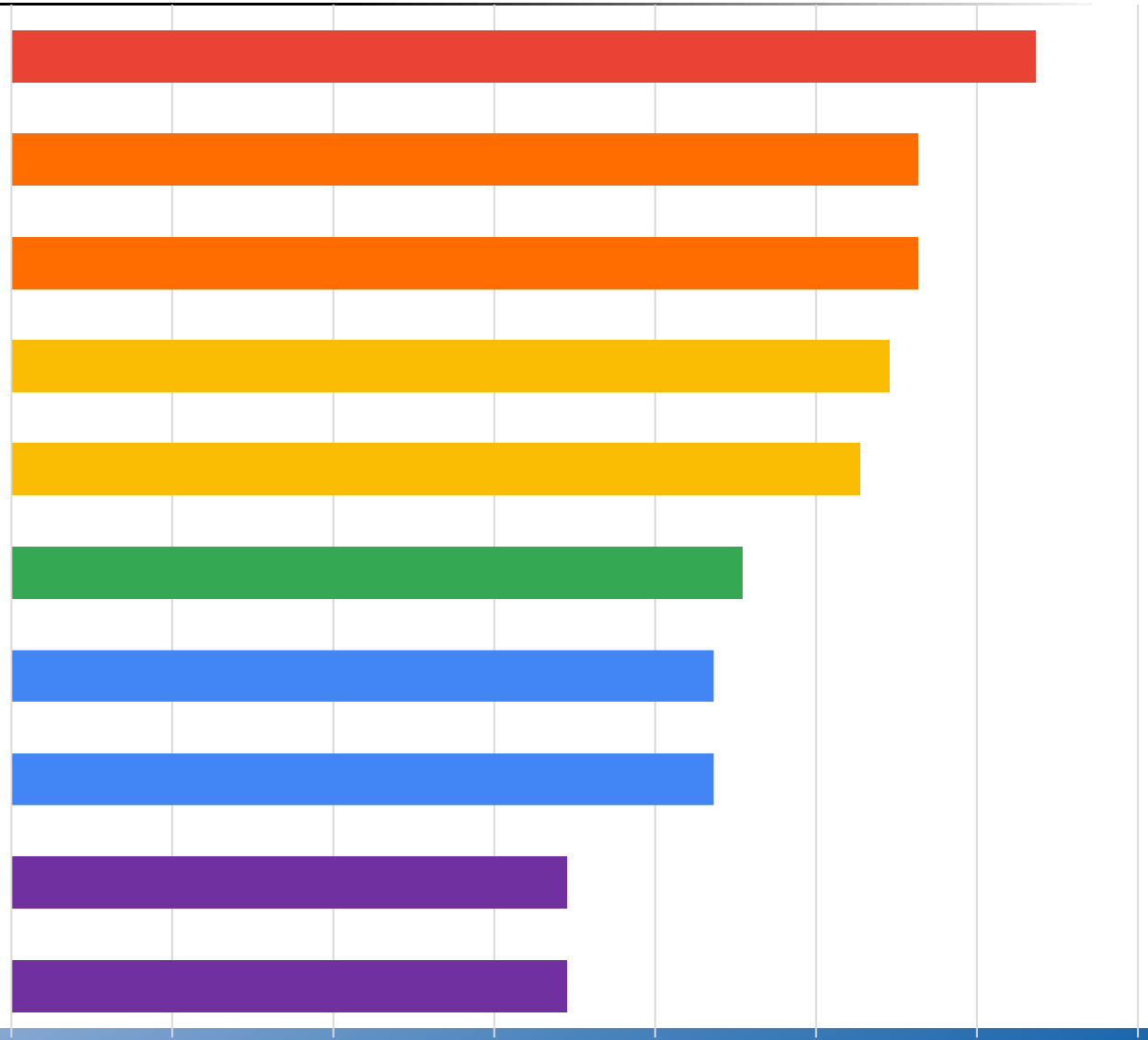
IMPORTANCE OF NEW/OTHER MODEL ANALYSES

1. **Traffic Impacts**
2. **Land Use Scenarios**
3. Accessibility
4. Benefit-Cost
5. *Modal Investment Strategies*
6. *Technology/Trends*
7. *Equity Analysis*



IMPORTANCE OF EXPLICITLY MODELING

1. Intersection Turn Lanes
2. Mulituse Paths
3. Sidewalks
4. Roundabouts
5. Amazon, Spark, etc.
6. Park & Ride / Carpooling
7. Bike Lanes
8. Food Delivery
9. Ridehailing
10. Autonomous Vehicles



OTHER RESPONSES

- Rated need for latest science and technology (AI) very high
- Rated need to report benefits/impacts by detailed demographics only moderate
- All agreed that a short (<4 hr) runtime should be the goal

TAKE AWAYS

- All agree that technical analysis is important
  - Most thought further investment in technical analysis could benefit planning for the region
- Important additional analyses identified
  - Subarea plans
  - Traffic impacts
  - Land use scenarios
  - Intersection operations
  - Bike / pedestrian planning
- Model users want short run times and more spatial resolution

OVERVIEW OF WORKSHOP

WORKSHOP AGENDA

- Crash Course in the History of Travel Modeling & the KRTM
- Spectrum of Model Designs
- Model Uses
- Key Model Design Decisions
- Data
- Costing Options

THE EARLY YEARS

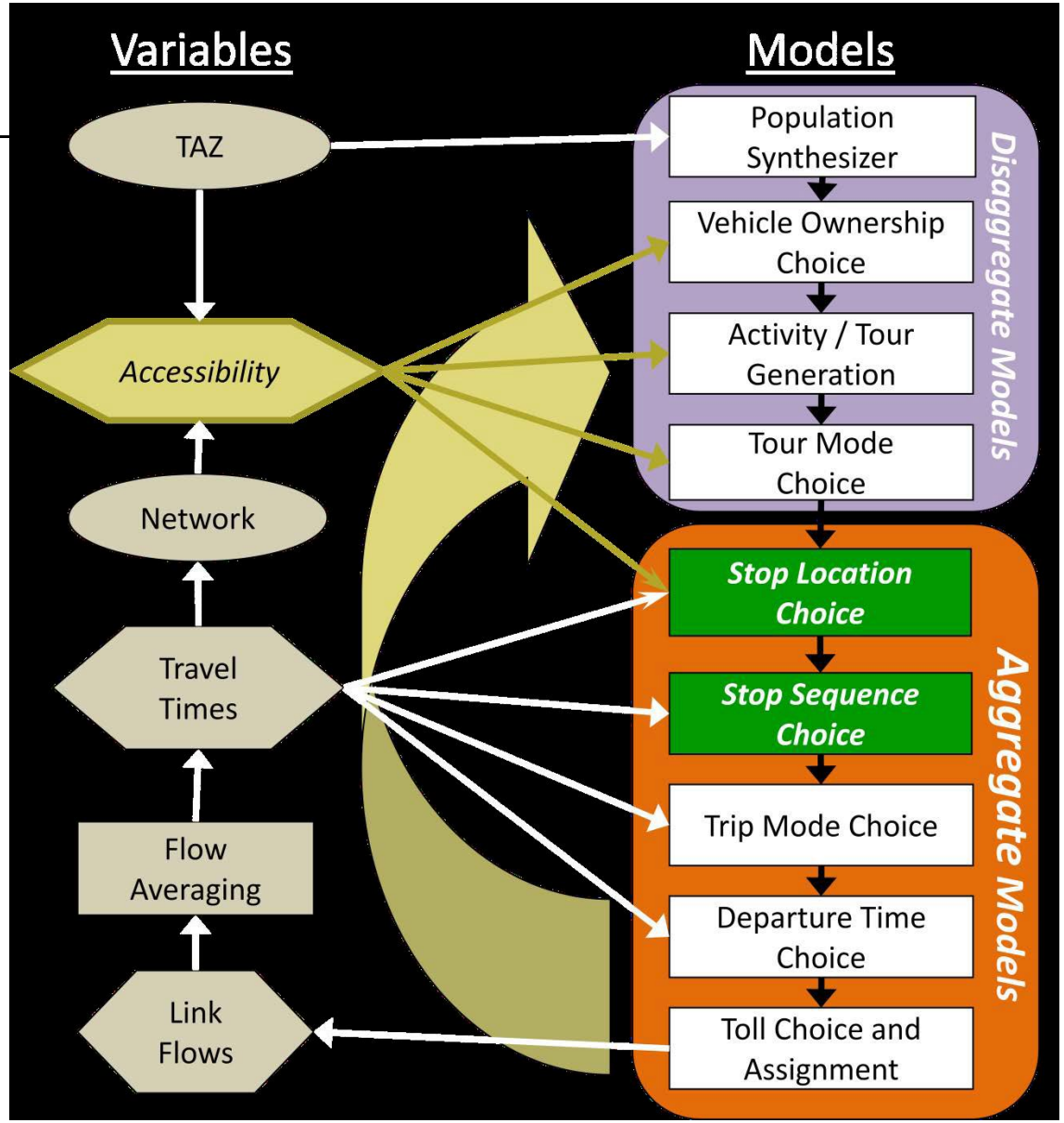
- 1950's – The First Models
  - Detroit, Chicago, etc., developed models to design Interstate highways in and through their regions
- 1960's – Transit
  - San Francisco adds a mode choice step and forecasts ridership for the new BART trains
- 1970's – Federal Standardization
  - FHWA develops and provides a standard urban model (for mainframes)
  - The standard model becomes known as the "Four Step Model"
  - Feds also standardize benefit-cost methodology
  - Academics recognize issues with Four Step Model and theorize Activity-Based

THE FOUR STEP MODEL

- Trip Generation – How many trips do people make?
- Trip Distribution – Where do they go?
- Mode Choice – Do they drive / ride the bus, etc.?
- Traffic/Transit Assignment – What roads/routes do they use?

THE KRTM HYBRID MODEL

- Developed in 2009 from household survey data from 2000 & 2008 (2006 base year)
- More accurate than preceding four-step model
- Transit and walk/bike modes
  - Sensitive to walkability
- More realistic representation of special populations (seniors, low income, students)



ADVANTAGES OF HYBRID OVER TRADITIONAL

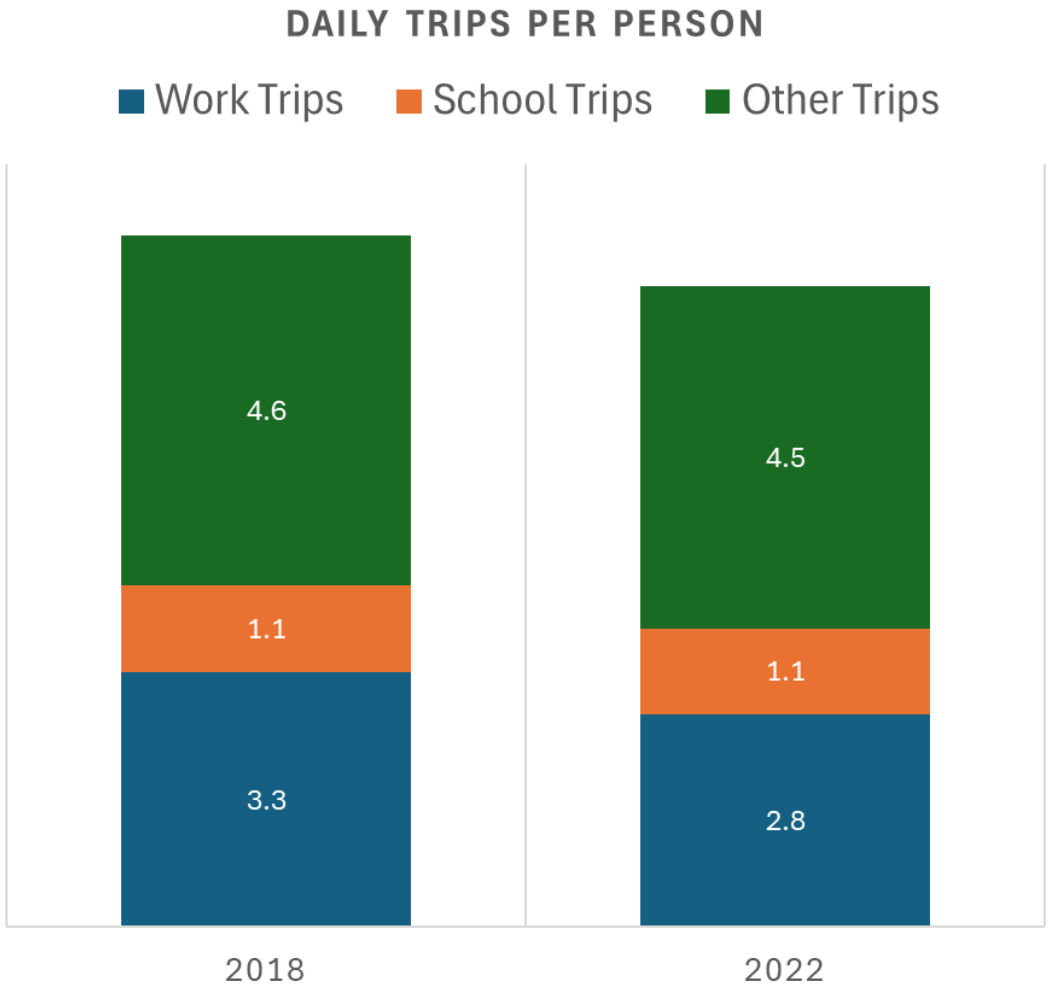
- **Guarantee** of **physically possible** travel patterns
- Sensitivity to **gas prices**, parking costs and tolls
- **Transit, bicycle** and **pedestrian** travel
- Sensitivity to **urban design** / built environment
- More realistic representation of **seniors**, the poor…
- More accurate **commuting patterns**, **traffic impacts** and **travel times**
- Ability to predict shifts in the **timing of travel**
- Improved **truck** models

HISTORY OF THE HYBRID KRTM

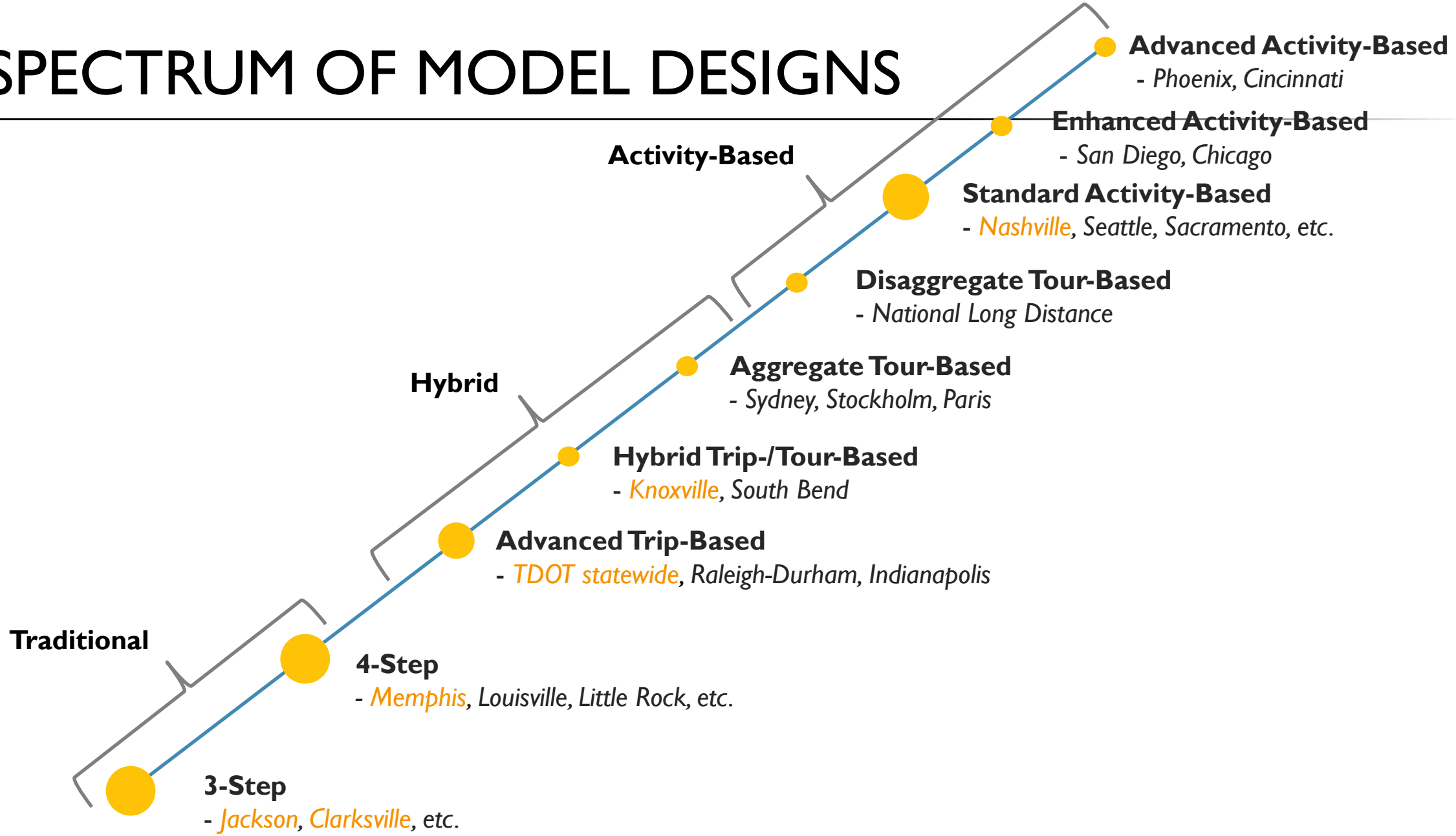
- 2009 – Base year 2006 – Model developed
- 2012 – Base year 2010 – Model expanded to cover LAMTPO
- 2020 – Base year 2018 – Update base & forecast years
- 2024 – Base year 2022 – Update base & forecast years
  - New module for remote work-from-home
  - Recalibration to post-COVID travel patterns

2024 MINOR UPDATE - DECREASED TRIP-MAKING

- Traffic counts (corroborated by surveys from other regions) revealed that trip-making in region in 2022 had fallen to 8.4 trips per day vs. 9.1 trips per day in 2018
  - 16.4% decrease in work trips
  - 7.5% overall decrease versus 2018
- Mostly work from home



SPECTRUM OF MODEL DESIGNS



KEY MODEL DESIGN DECISIONS

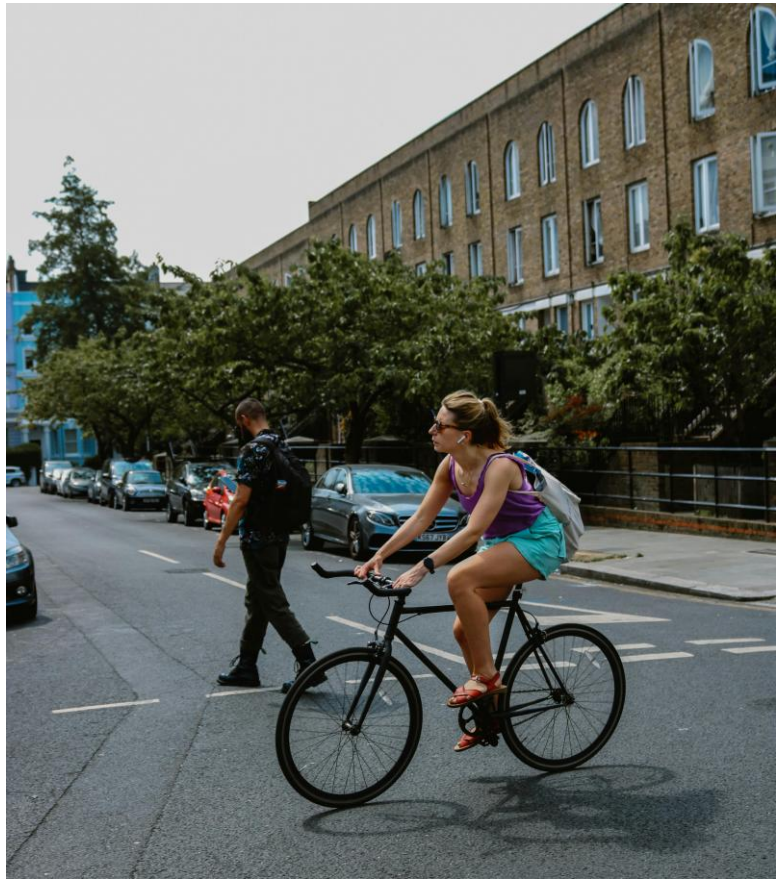
- Framework
  - Hybrid
  - ABM
- Temporal & Operational Resolution
  - Turning lane configurations?
  - Signal timings?
  - DTA?
- Post-Processing Tools
  - Air Quality
  - Accessibility
  - Benefit-Cost
- Coverage
  - Lakeway?
  - Pigeon Forge/Gatlinburg?
- Spatial Resolution
  - Number of Zones
  - All-Streets & Microzones?
- Delivery Truck Modeling?
- Technology
  - Use of new AI methods?

OPERATIONAL MODELING & DTA

- Current model only knows intersection control type (i.e., signal vs. stop sign vs. roundabout)
- Additional information can be incorporated
  - Turn lane configurations
  - Signal timings
  - Turn bay lengths
- 2D and 3D Animation

WALK & BIKE MODELING

- Current model only predicts total walk & bike trips produced by residents of each zone
- Some MPOs are attempting to model bicycle and pedestrian improvements like bike lanes & multiuse paths, but this requires investments in both data and modeling

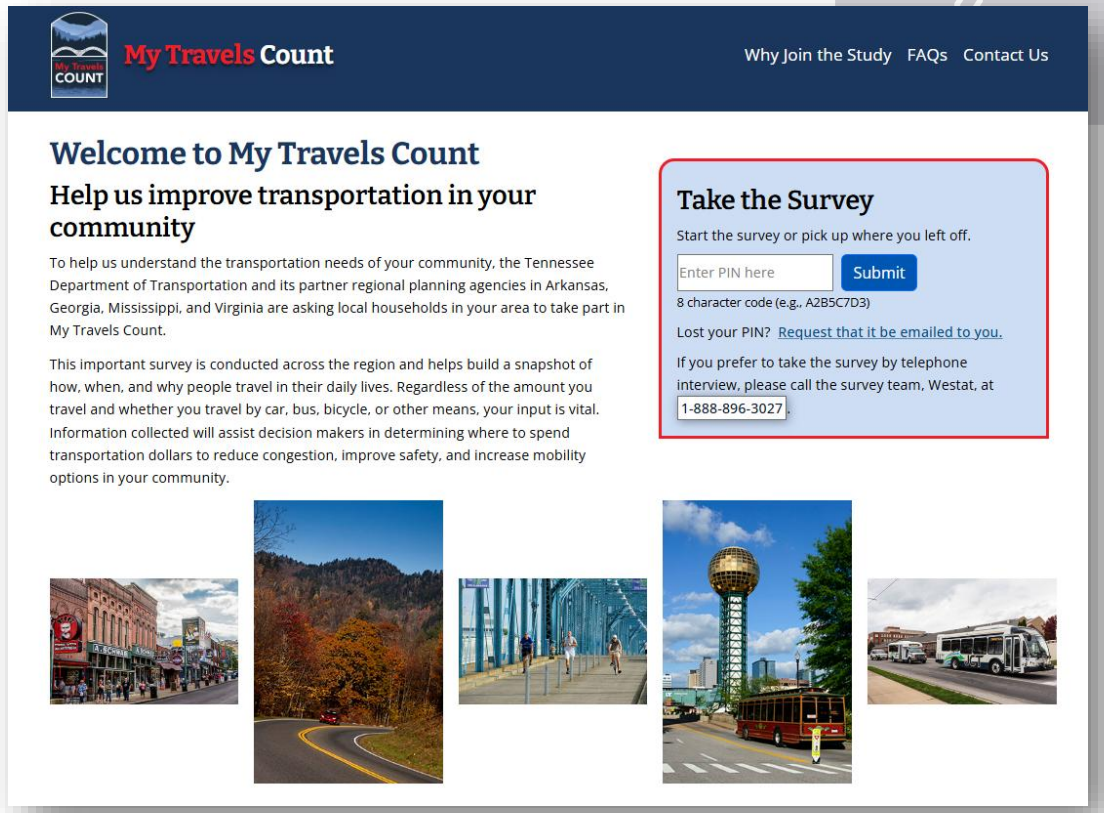


INVESTMENT CHOICES AND USE CASES

	Import	Framework		Technology	Spatial Resolution		Temporal Resolution			Post-Processing Tools		
		Hybrid	ABM	AI	# of Zones	Microzones	Turn Lanes	Timings	DTA	Air Quality	Accessibility	Benefit-Cost
Core / Required Uses												
Air Quality Conformity	10	★★★	★★★	+	+		+	+		+ + +		
Deficiency Analysis for MTP	10	★★★	★★★	+ +	+		+	+ +			+	
Project / Design Forecasts	10	★★★	★★	+ + +	+		+	+	+ + +			
Special Studies												
Subarea Studies	8.1	★★	★★	+ + +	+ + +		+ +	+	+ +			
Transit Studies	6.9	★★	★★	+	+	+						+
Bike / Ped Plans	6.7	★★	★★	+ +	+	+ + +	+	+				+
Toll Studies	3.3	★★	★★★	+ +	+		+	+	+ + +			+
New / Alternative Uses												
Traffic Impacts	7.6	★★	★	+ + +	+ +		+ + +	+ +	+ + +			
Land Use Scenarios	7.0	★★★	★★★	+ +	+		+			+		
Accessibility	4.6	★★★	★★★	+ + +	+ +		+	+			+ + +	
Benefit-Cost	4.6	★★★	★★★	+ +	+		+	+		+	+ +	+ + +
Modal Investment Strategy	3.9	★★★	★★★	+ +	+	+ + +	+	+		+	+ +	+ +
Technology / Trends	3.7	★★	★★★	+					+ +	+		
Equity Analysis	3.5	★★	★★★	+	+	+			+		+ +	+ +
Data Needs		🖳🖳	🖳🖳🖳	🖳🖳	🖳🖳	🖳🖳🖳	🖳🖳	🖳🖳🖳	🖳🖳🖳	🖳🖳	🖳	🖳
Data Costs		$$$	$$$$	$								
Development Costs		$$$	$$$$	$	$	$$	$$	$$$	$$$	$	$$	$$$
Runtime		⏲	⏲⏲⏲		+			+	+ +	+	+	+ +

Summary & Next Steps

- Model Visioning/Scoping Final Report:
  - Summarize workshop findings
  - Analysis of pros and cons for various model update approaches
  - Identify Data Needs and Costs
- New Regional Household Travel Survey Underway – My Travels Count
  - Complete by end of 2025, Will Provide Primary Data to Develop new Model
  - 3,000 sample Target in KRTM Area – roughly 1,000 collected in Spring, will resume in Fall
- Plan to Release Model Update RFP following completion of Household Survey with Refined Scoping and Final Budget once Modeling Consultant Retained



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