

Towards Next-Gen Travel Demand Modeling: Current Practices at SCAG

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RTP/SCS

- Founded in 1965, a joint powers authority to address regional issues
- A regional transportation planning agency and an MPO
- A long-term vision for how the region will address transportation and land use challenges and opportunities.

Updated every 4 years

REGIONAL TRANSPORTATION PLAN

SUSTAINABLE COMMUNITIES STRATEGY



The SCAG Region

191
CITIES

6
COUNTIES

18.7M
RESIDENTS



38,618
SQUARE MILES

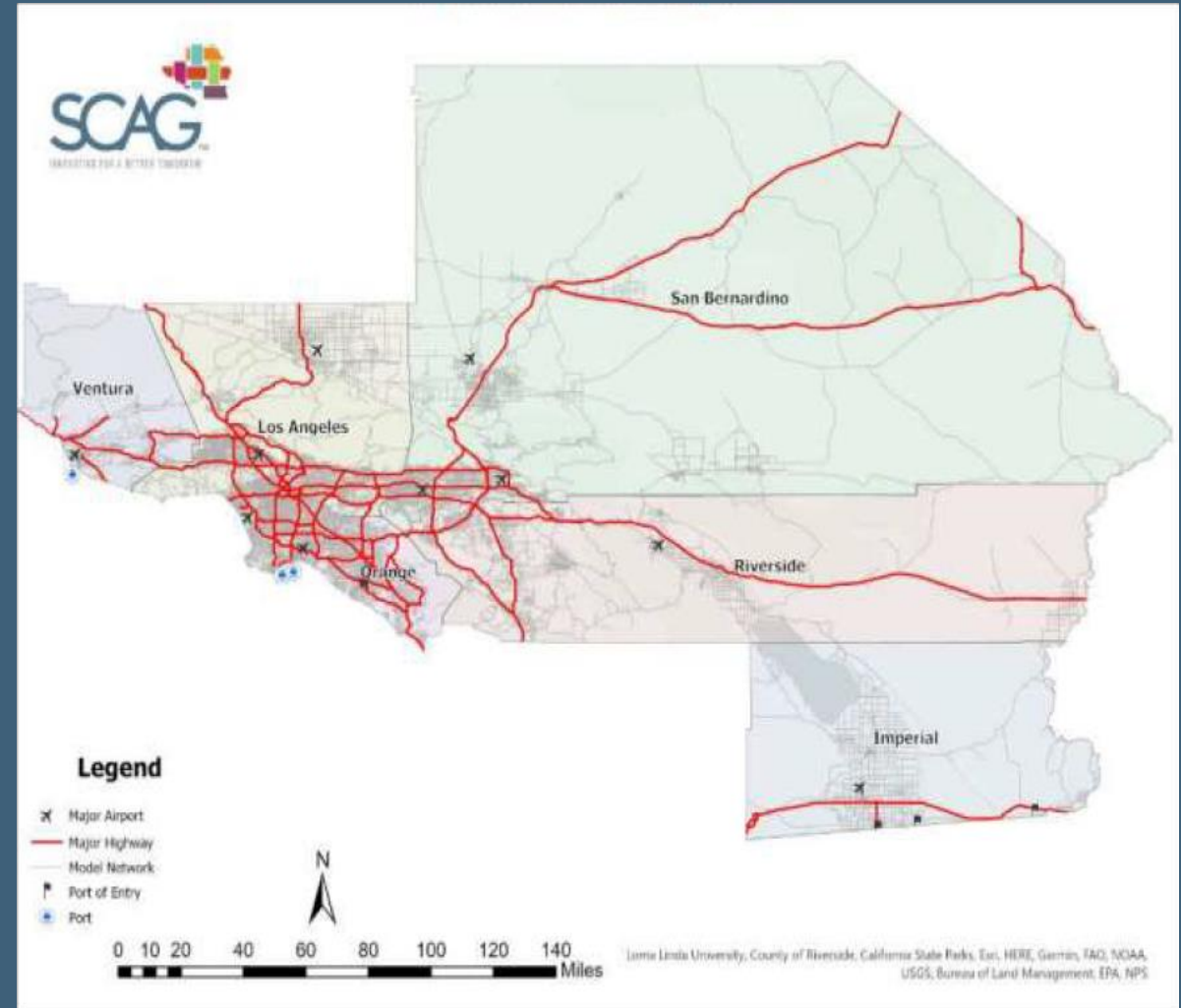
\$1.6T
REGIONAL GDP

15TH
LARGEST
ECONOMY
WORLDWIDE

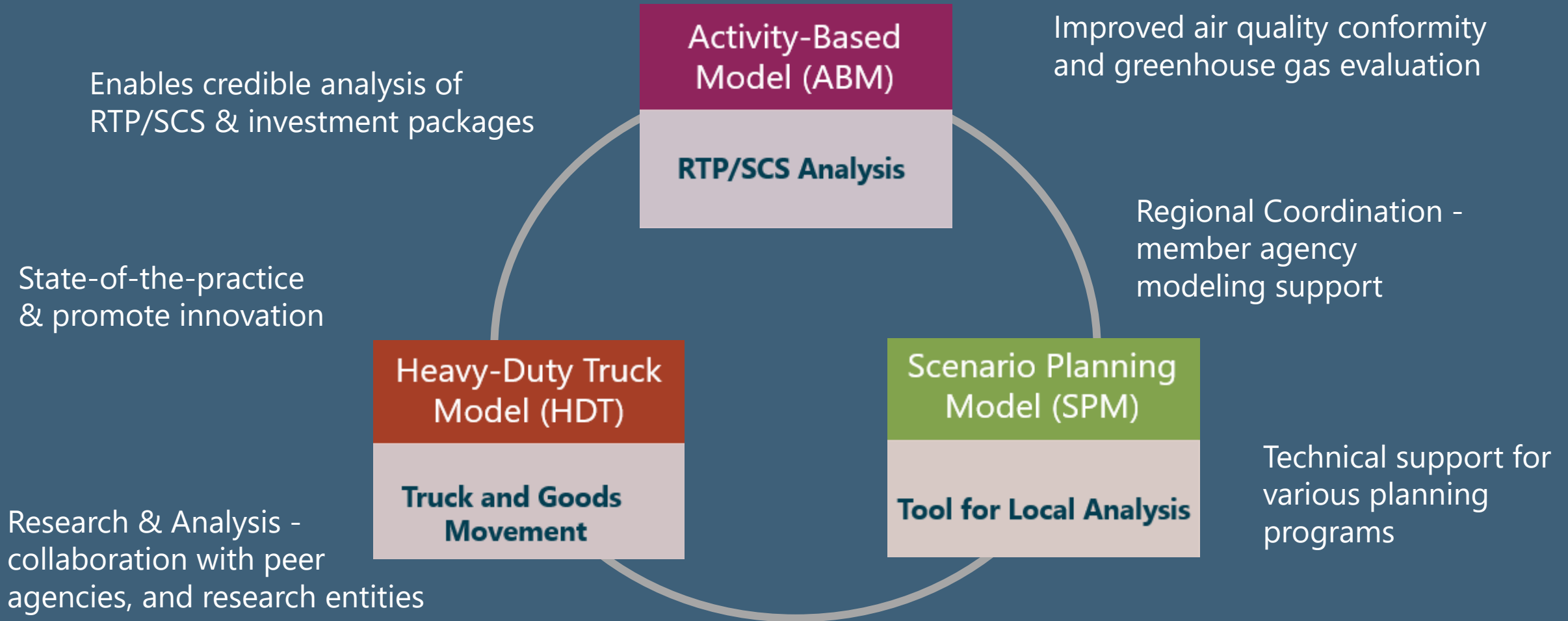
47.6%
OF STATE
POPULATION

SCAG Modeling Area

- 11,267 internal TAZs & 40 external Gateways
- Highway: 26K centerline miles and 72K lane miles, covering all freeways, managed lanes, expressway/parkway, arterials and collectors
- Transit: 3K route patterns and 627K revenue miles from fixed-route services across ~70 transit agencies

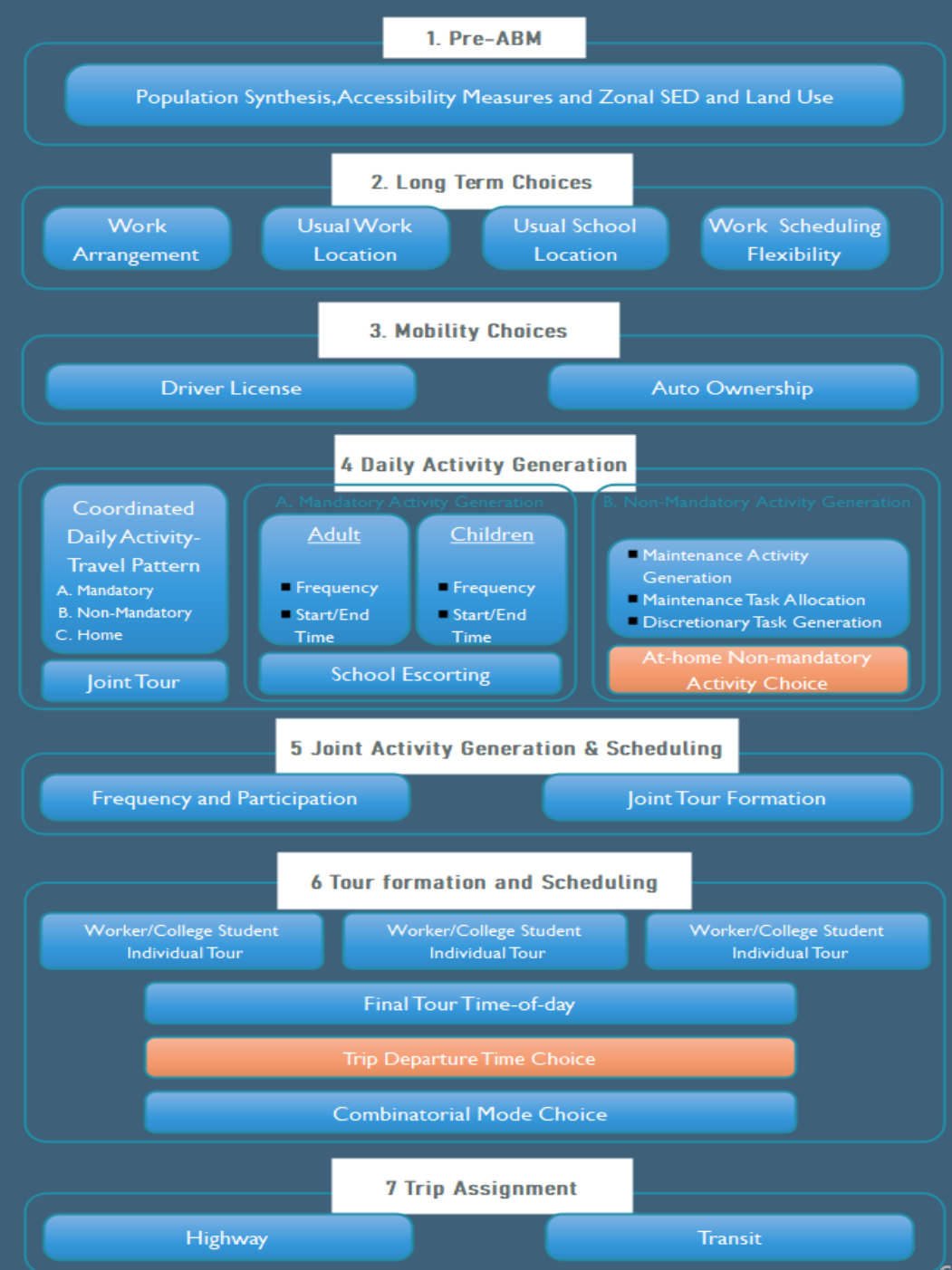


SCAG Transportation Models



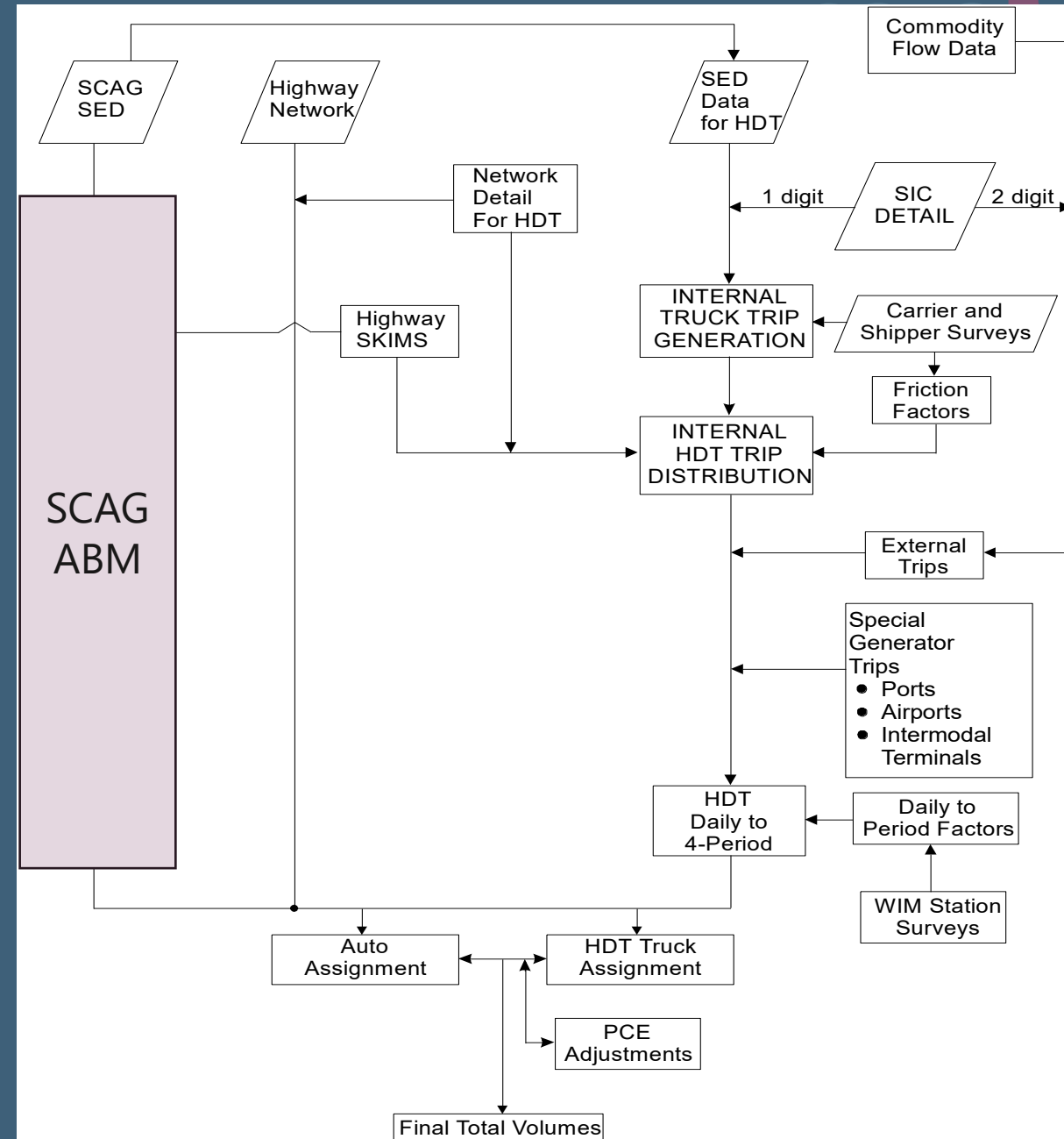
SCAG ABM

- SCAG Activity-Based Model (ABM)- developed and used for the analysis to SCAG's 2020 RTP/SCS & 2024 RTP/SCS
- **CT-RAMP2** (Coordinated Travel & Activity Modeling Platform)
- Built on the principle that travel is a derived demand, arising from the need to participate in activities at different locations.
- Activity-travel related choices are simulated for each person and household in the SCAG region
- Model improvement and enhancement for operation and analysis to SCAG's 2028 RTP/SCS



HDT Model

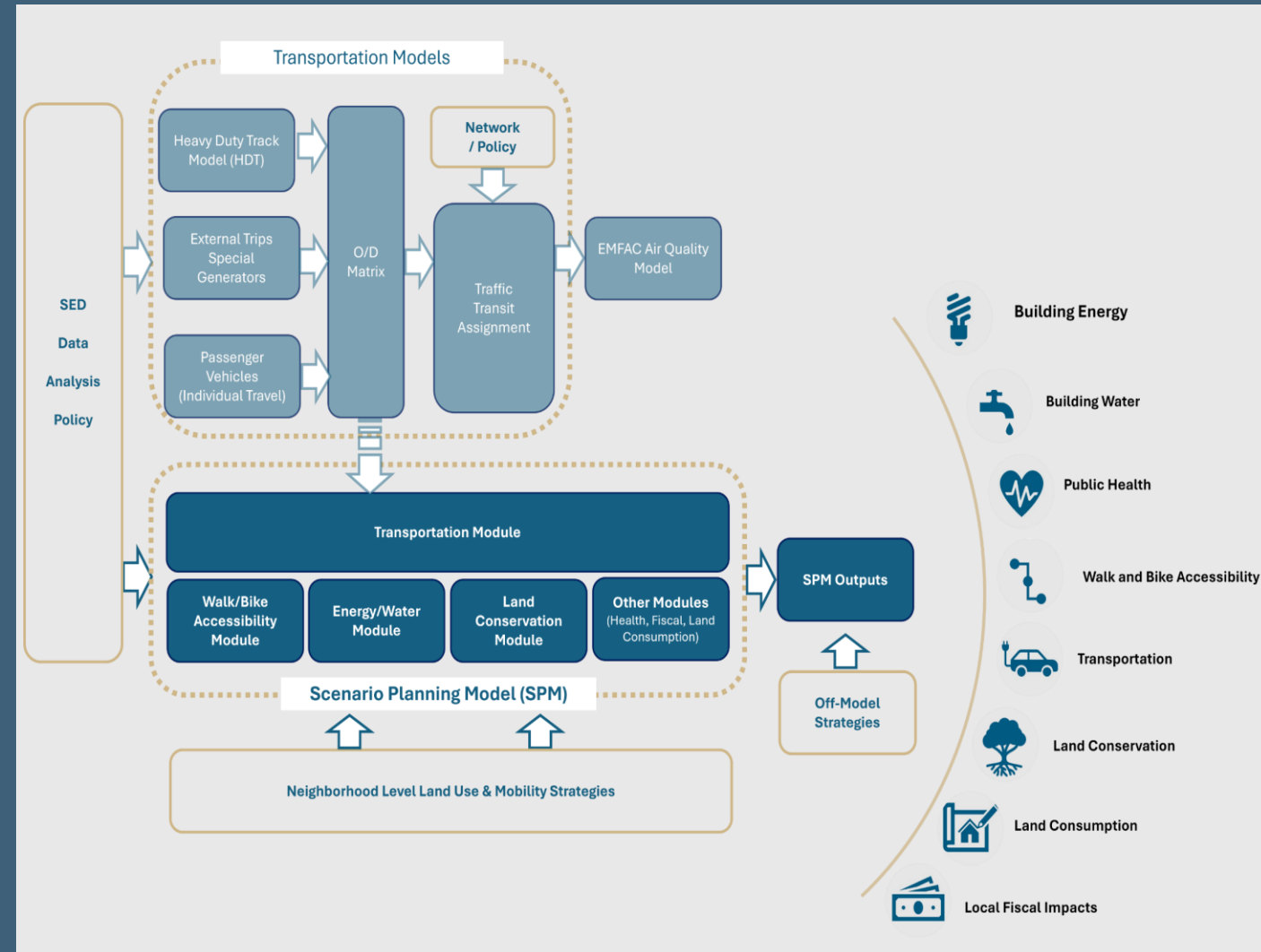
- Developed for more accurate estimation of truck VMT for emission calculation, electrification goals, impact analysis, etc.
- Forecasts for three HDT classes: Light-heavy, medium-heavy, and heavy-heavy
- Internal HDT Model
- External & special generator HDT trips
- All HDT trip tables integrated into the ABM
- An extensive set of data in model update, including:
 - Public commodity-based flows
 - Private, granular telematics data, and
 - Local truck counts



Scenario Planning Model

- A web-based land use sketch planning tool for data management, scenario development and modeling, built with open-source software and tools
- A multi-metric analysis to illustrate and compare co-benefits of alternative future scenarios
- Adopt a geographic unit with much-improved resolution - Scenario Planning Zone (SPZ) - to capture neighborhood-level land use impacts on transportation/non-travel outcomes

A total of 92,417 SPZs in SCAG region



Challenges

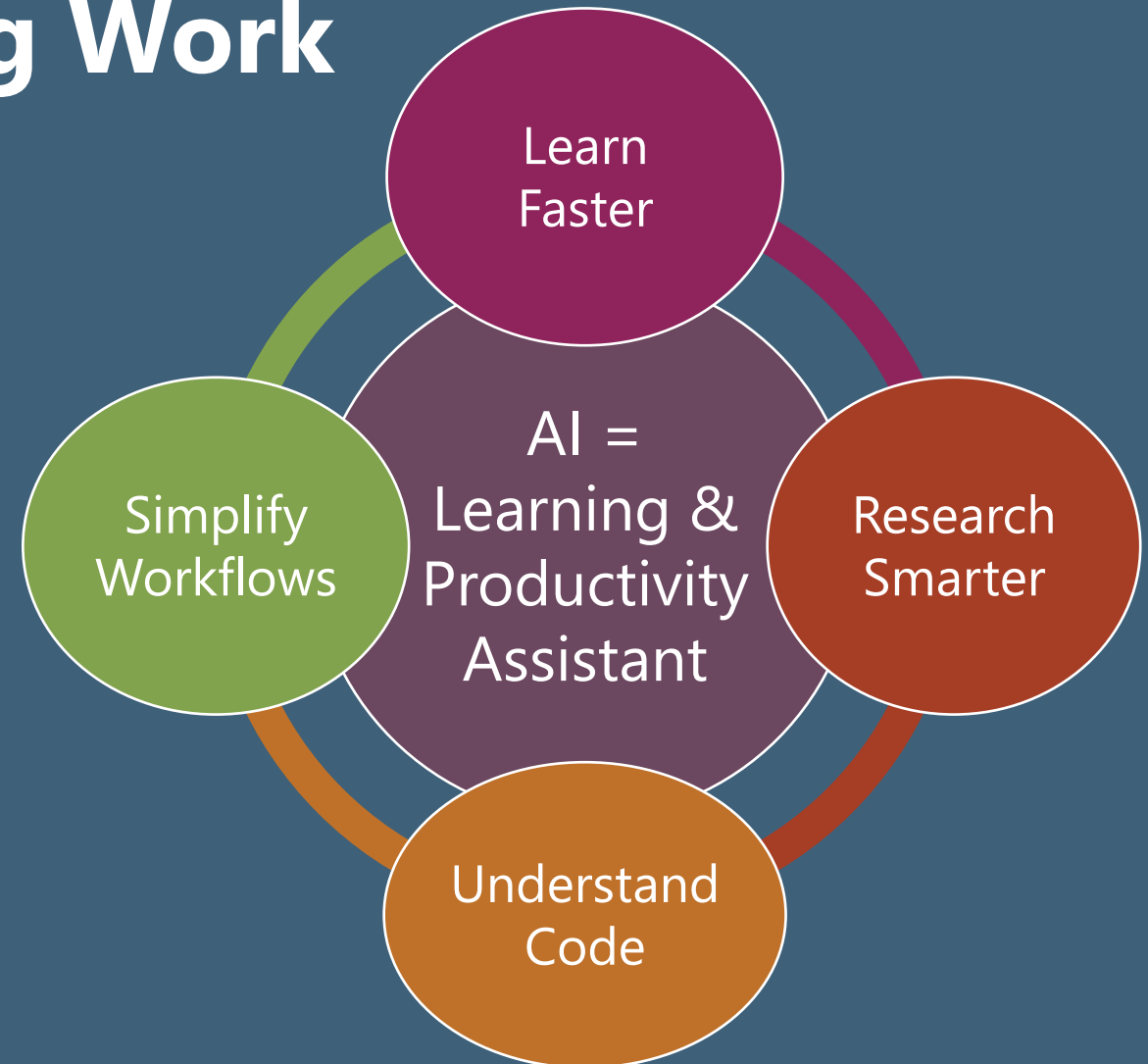
- Breakdown of Historical Travel Patterns
 - Post-Pandemic Shift: The widespread adoption of hybrid and remote work has fundamentally broken traditional travel patterns.
 - E-commerce Boom: explosion of urban delivery, gig-economy food delivery, etc., requires integrating complex urban freight logistics into passenger models. Etc.
- Integration of Emerging and Micro-Mobility
 - TNC: deadheading and curb-space congestion, etc.
 - Micromobility: requires modeling at a highly granular, street-level scale
 - Other technologies, such as AV: forecast an unpredictable future in how AVs would act
- Data, data, data!!!
 - Data integration of large-scale, dynamic, and heterogeneous data sources
 - Surveys (high cost/low sample) vs. Passive Data (high volume/low detail)
 - Enhancing data privacy vs. reducing demographic bias, etc.

Opportunities

- Emerging technologies are providing opportunity to resolve some of the challenges.
 - AI/ML Integration: agent-based or AI-enhanced modeling
 - Big Data Engineering Pipelines & Big Data analytics
 - Shift toward "Digital Twins", etc.
- While also recognizing the limitation
 - Data Privacy and Security
 - "Black Box" and Interpretability
 - Data Quality: Representation and Bias
 - Lack of Behavioral Insight, etc.

AI Use in Daily Modeling Work

- Research & Learning
- Coding & Technical Support
- Writing & Documentation
- Translation & Everyday Productivity
- Meetings & Summarization



Human-reviewed • Support tool only • Accountability stays with staff

Explore AI Use in Modeling

- Develop pilot studies regarding the use of AI in travel demand modeling
 - Focus on the “upstream” modeling pipeline, enhancing the efficiency and consistency of data cleaning, data validation, and structural model script update and maintenance.
 - Address the “downstream” modeling pipeline, leveraging AI to automate the process of high-dimensional model outputs, provide systematic interpretation of model results, and streamline the creation of interactive data visualizations for planning applications and regional stakeholders.
 - Explore the use of AI in selected modeling components and evaluate its effectiveness in enhancing model quality, maintaining transparency and explainability, improving forecasting accuracy, and supporting more robust modeling practice.
- Collaborate with research entities to explore advanced use of AI technologies in travel demand modeling



THANK YOU!

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