Regional Transportation Plan

Analysis Tools & Freight Modeling

Puget Sound Regional Council

We are leaders in the region to realize equity for all. Diversity, racial equity and inclusion are integrated into how we carry out all our work.

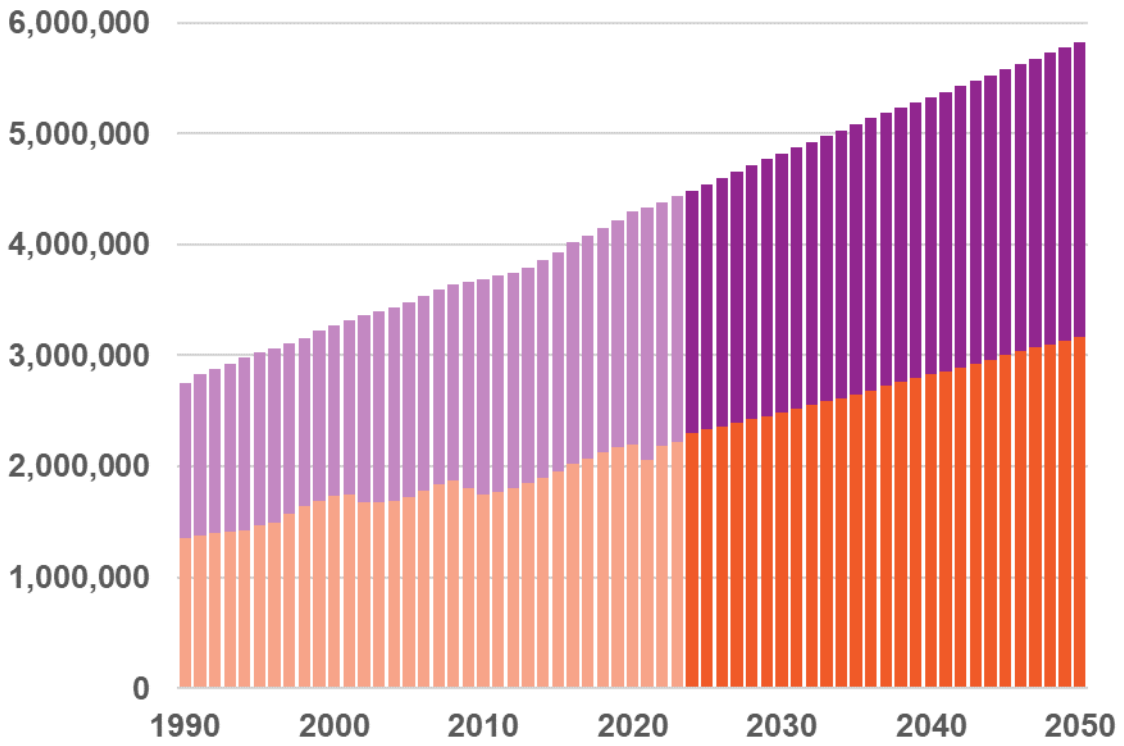
psrc.org/equity

Analysis Tools at PSRC

Population and Employment

Regional Forecast

- Provides regional estimates of population & jobs
- Informed by both local & national macro-economic trends.
- Basis for VISION 2050 & the Regional Growth Strategy



Population and Employment

Land Use Allocation: UrbanSim

- Land Use Modeling at PSRC is State of the Practice with approximately ten (10) major metro-regions doing similar analysis

- Most metro regions don't have integrated Land Use and Transportation models

Image Source: https://www.urbansim.com/about

Travel Behavior

Activity Based Model: SoundCast

- PSRC is a national leader in Travel Demand Modeling
- Currently working with 11 other agencies as part of a consortium to advance modeling

SEMCOG Southeast Michigan Council of Governments

SANDAG

Metropolitan Washington Council of Governments

Metropolitan Transportation Commission

METROPOLITAN COUNCIL

MARICOPA ASSOCIATION of GOVERNMENTS

SAN FRANCISCO COUNTY TRANSPORTATION AUTHORITY

Oregon Department of Transportation

dot transportation.ohio.gov

Chicago Metropolitan Agency for Planning

ARC Atlanta Regional Commission

Air Quality and Climate

Motor Vehicle Emission Simulator (MOVES)

- The most current regional vehicle fleet mix and age distribution data is used.

- The model accounts for the phase-in of current emissions standards, fuel standards, and engine technology, and contains assumptions regarding the rate of vehicle changeout and fleet turnover for each forecast year.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DEPARTMENT OF ECOLOGY State of Washington

Freight Modeling

Freight & Aviation Travel

- Truck demand is based on employment & observed truck patterns that are grown based on employment

- Airport users are based on enplanement surveys performed by Port of Seattle and enplanements are consistent with Port of Seattle forecasts

Freight Modeling

Freight (aka Truck) Modeling at PSRC

PSRC freight modeling is focused on **trucks**

- Medium trucks are defined as single unit, six or more tires, two to four axles and 16,000 to 52,000 lbs. gross vehicle weight

- Heavy trucks are defined as double or triple unit, combinations, five or more axles, and greater than 52,000 lbs. gross vehicle weight.

Freight Modeling

Truck Generation is Employment Based

The socioeconomic data used in the truck model are consistent with those data used in the passenger model:

- Agriculture, Forestry, Fishing
- Mining
- Construction
- Manufacturing (Products and Equipment)
- Transportation, Communication, Utilities
- Wholesale
- Retail
- FIRES
- Education and Government

Employment Category	Heavy	Medium
Agriculture, Forestry, Fishing	0.2366	0.0889
Mining	0.3405	0.0889
Construction	0.0856	0.0998
Manufacturing-Products	0.2661	0.0858
Manufacturing-Equipment	0.0953	0.0858
TCU	0.1075	0.2079
Wholesale	0.1337	0.2552
Retail Trade	0.0463	0.1637
FIRES	0.0044	0.0434
Education & Government	0.0297	0
Households	0.0031	0.0358

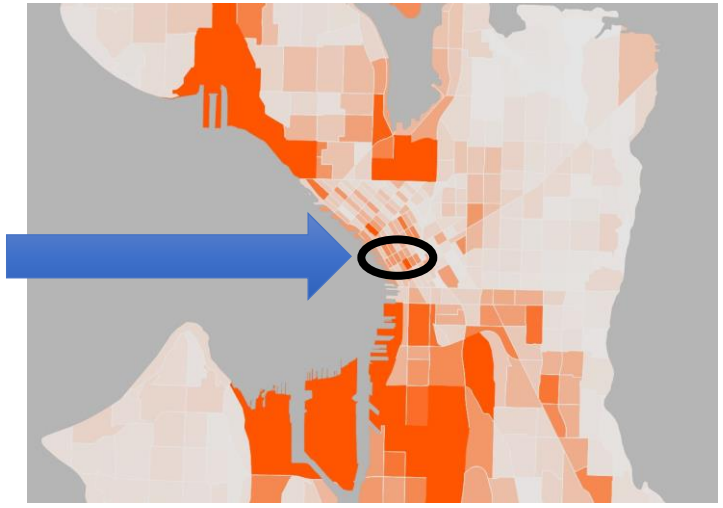
Freight Modeling

We correct for HQ based Employment Records

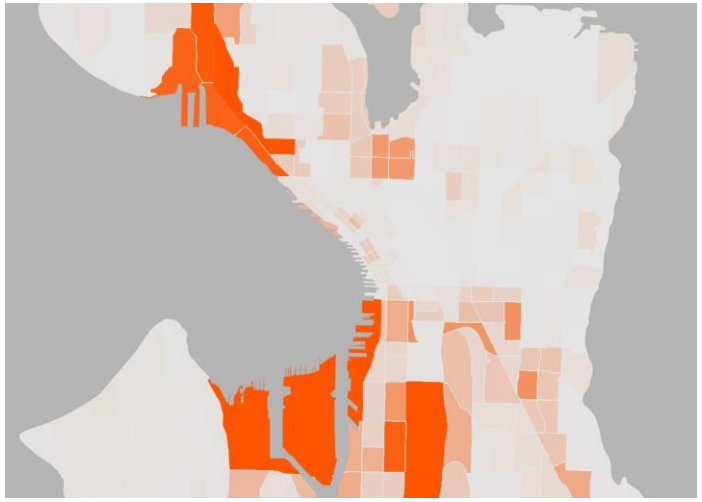
If a building has a company with manufacturing employment reported, it gets heavy trucks generated. These can lead to interesting results

- Scripted a process that creates a flag if a zone has land uses that support heavy truck generation.

Before



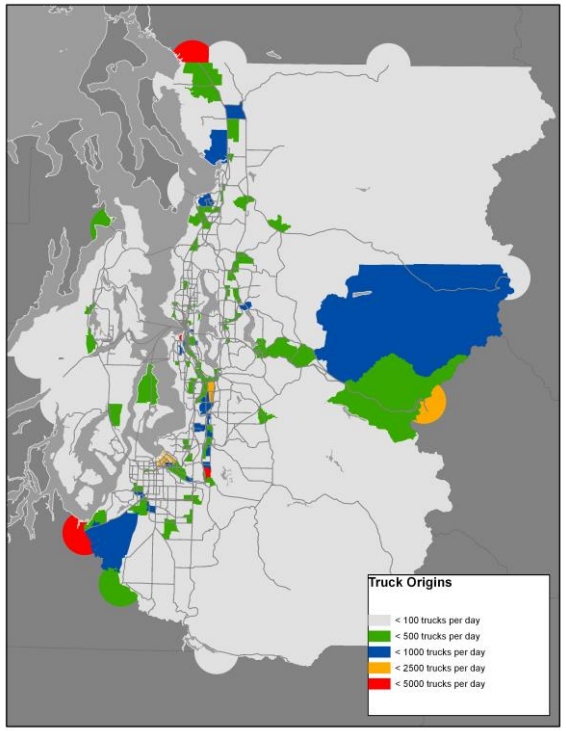
After

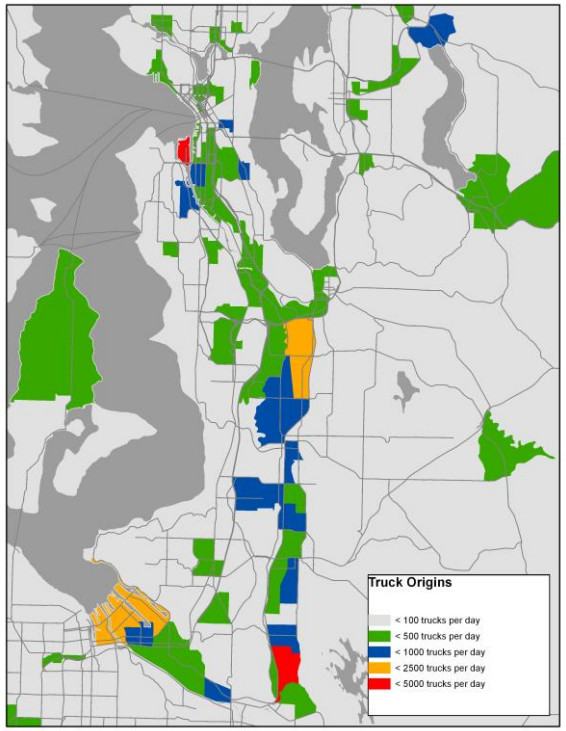


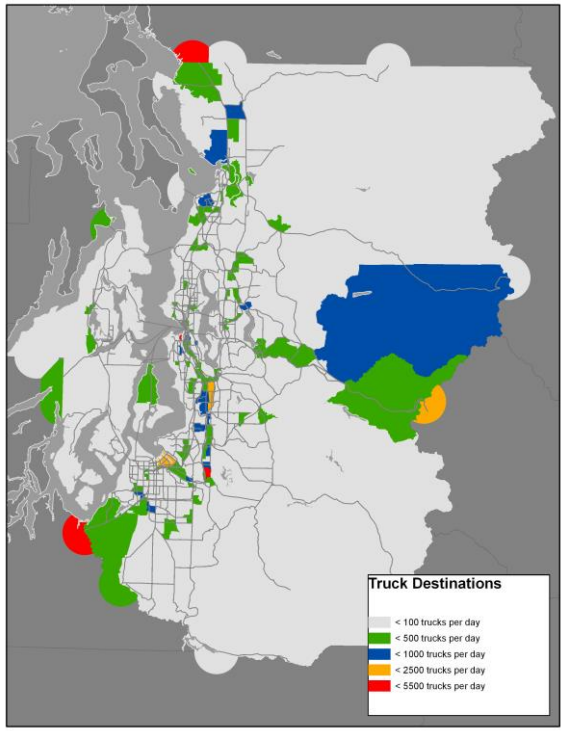
Freight Modeling

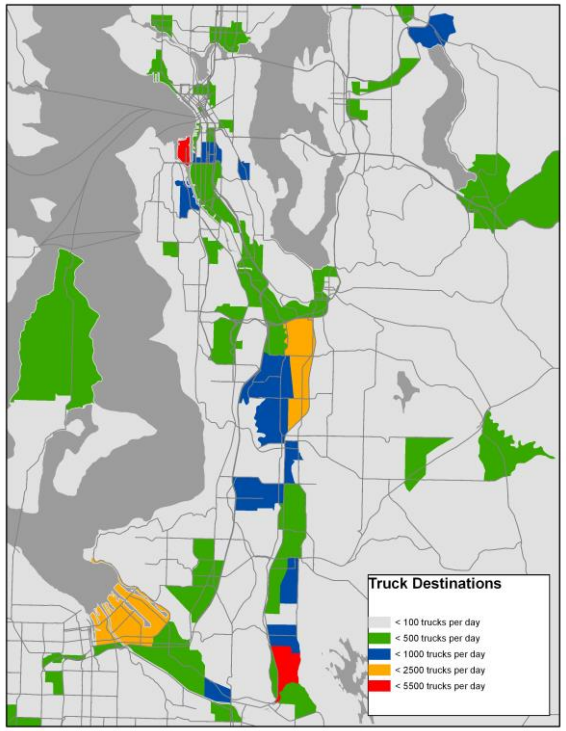
We use “Big Data” to inform Truck OD’s

PSRC has purchased both ATRI & Inrix truck data to help inform the model’s truck OD’s. These OD patterns for heavy trucks are grown into the future based on employment growth.







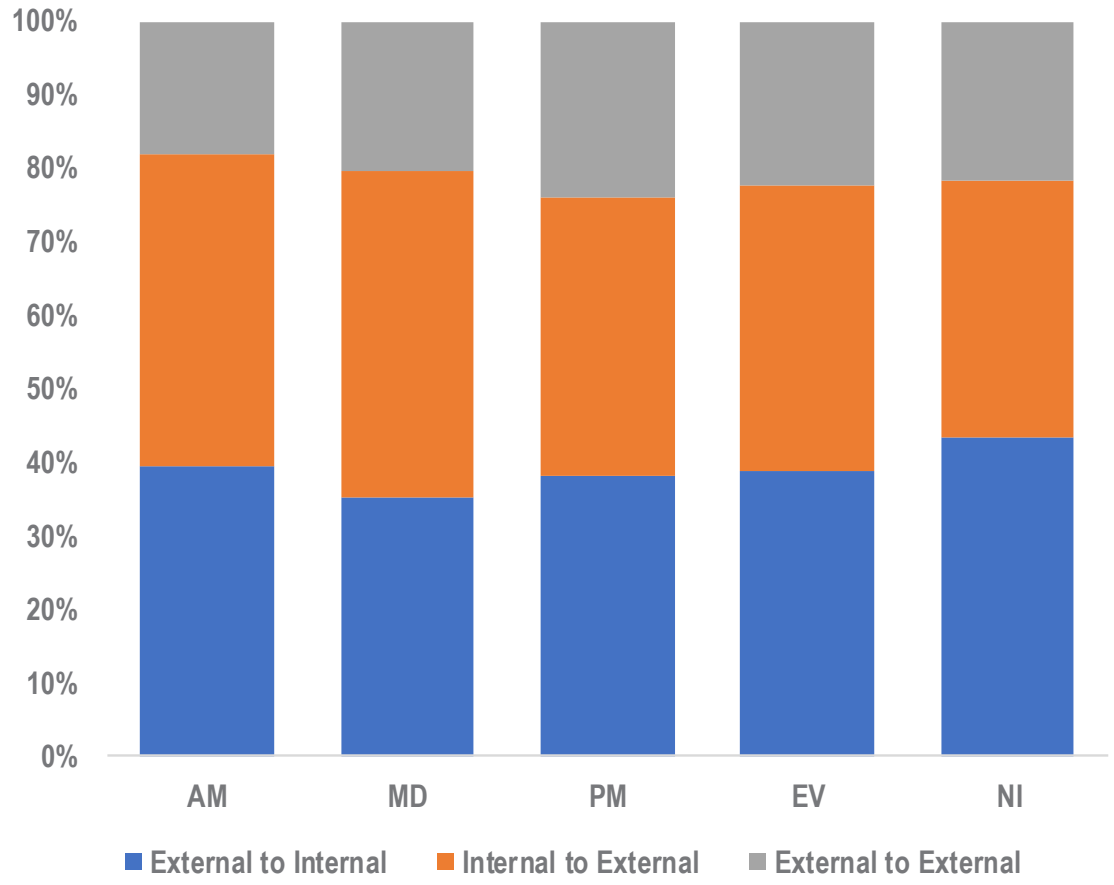


Freight Modeling

"Big Data" also informs External Truck trips

There are about 18,000 external truck trips in the region daily.

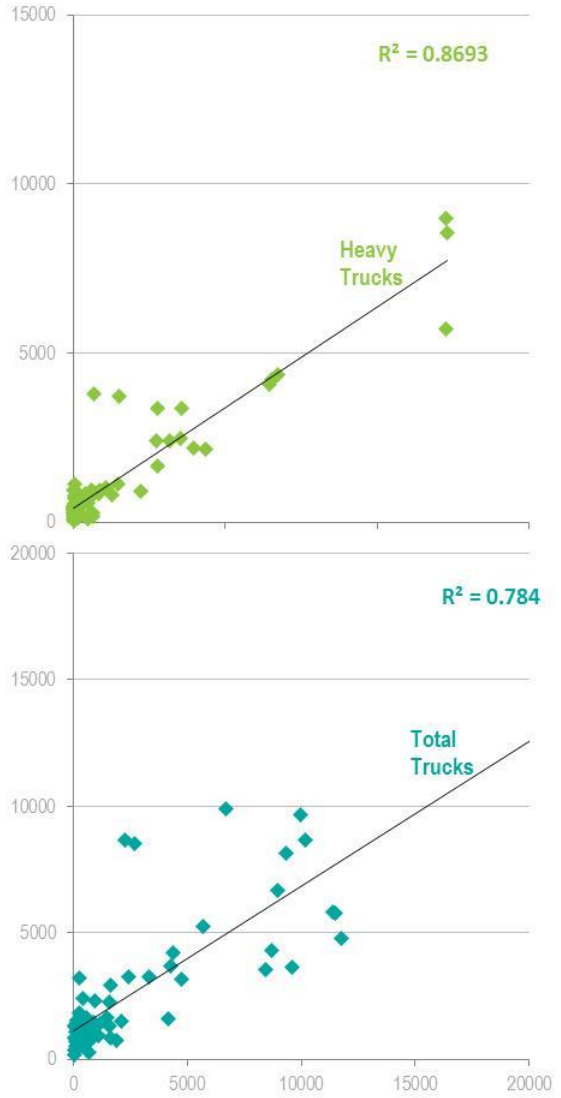
- 38% come from somewhere else to here.
- 41% go from here to somewhere else.
- 21% of truck pass through the region.



Freight Modeling

Local Data helps us calibrate the model

- Hundreds of medium and heavy truck counts on both arterials and freeways across the region
- Improved network attributes including restricting truck activity for parts of the network that do not allow heavy truck traffic.
- Updated truck special generators for the Ports of Seattle, Tacoma and Everett as well as the Kent Valley



Freight Modeling

Model Based Metrics

Network based metrics:

- Speed
- Travel Time between key OD's
- Miles Traveled
- Delay

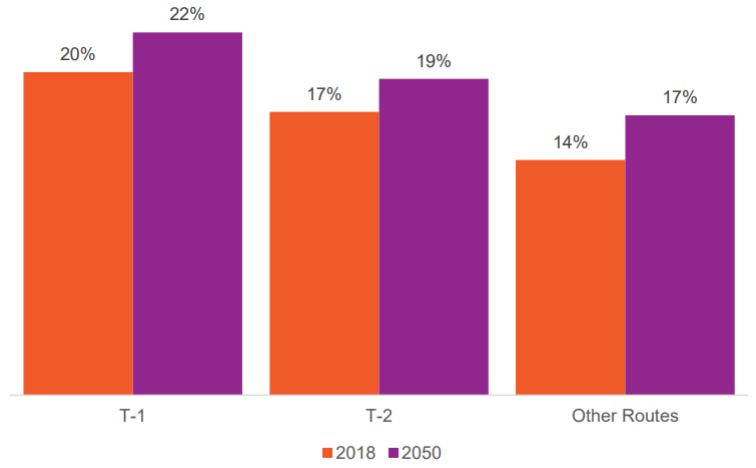
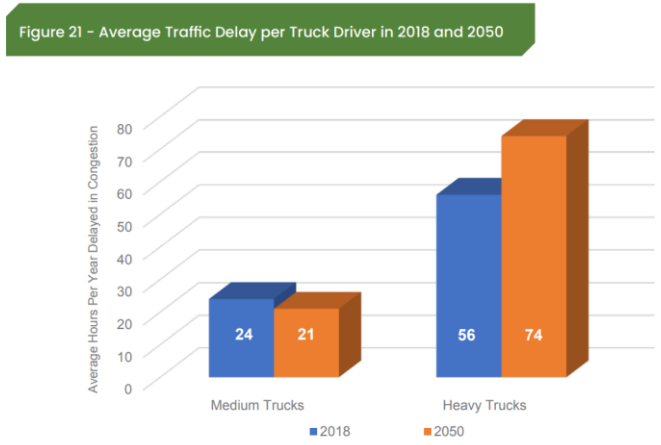


Figure 14. PM Peak Congestion by Truck Facility

Truck/Trip based metrics:

- Delay and VMT per trip
- Metrics based on where trips are

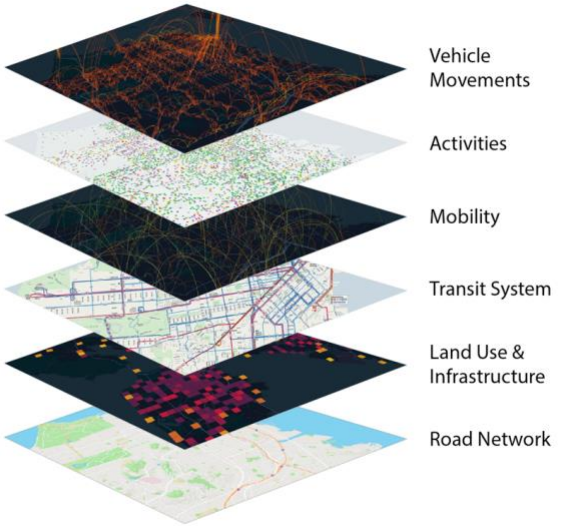


Wherever possible, a focus on Equity Focus areas are included

Freight Modeling

Freight Modeling Improvements

PSRC is working with the Berkeley Lab to implement the freight components of BEAM for the Central Puget Sound Region. The Behavior, Energy, Autonomy, and Mobility (BEAM) model is an open-source agent-based regional transportation model that overcomes the limitations of conventional transportation models.



[BEAM new | Sustainable Transportation Initiative]

This work is funded out of the Department of Energy and is not requiring any local resource other than staff time to provide the researchers model data.

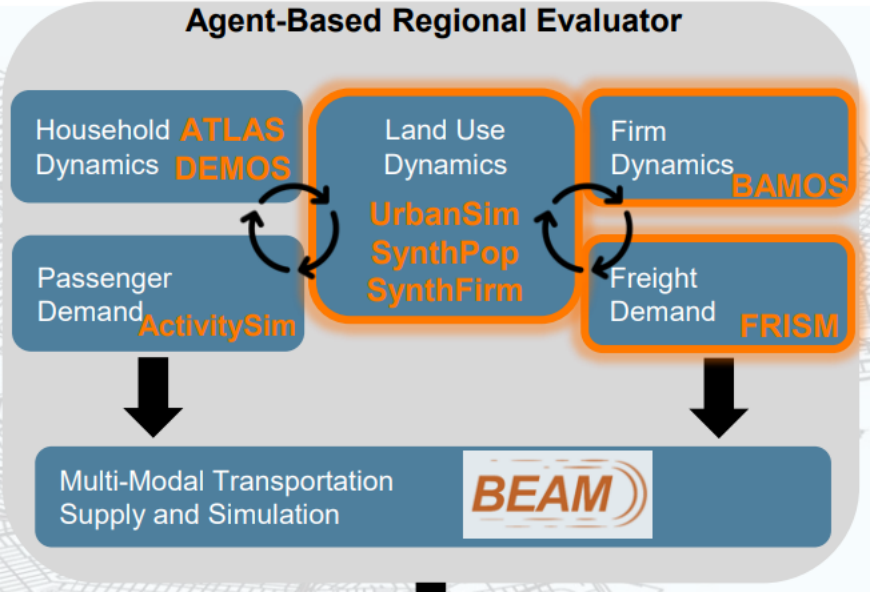
Sustainable Transportation Initiative
BERKELEY LAB

U.S. Department of ENERGY | Office of Science
Office of Scientific and Technical Information

Freight Modeling

A synthetic-freight population for the region

SynthFirm is a large-scale agent-based freight demand model which generates a complete synthetic population of firms in the U.S. and the business-to-business commodity flows between them. Using publicly available data sources as inputs, SynthFirm simulates detailed firm and fleet characteristics, commodity production and consumption, formation of supply chains, and selection of shipping modes, all of which are essential drivers of commodity flow at a disaggregate level.



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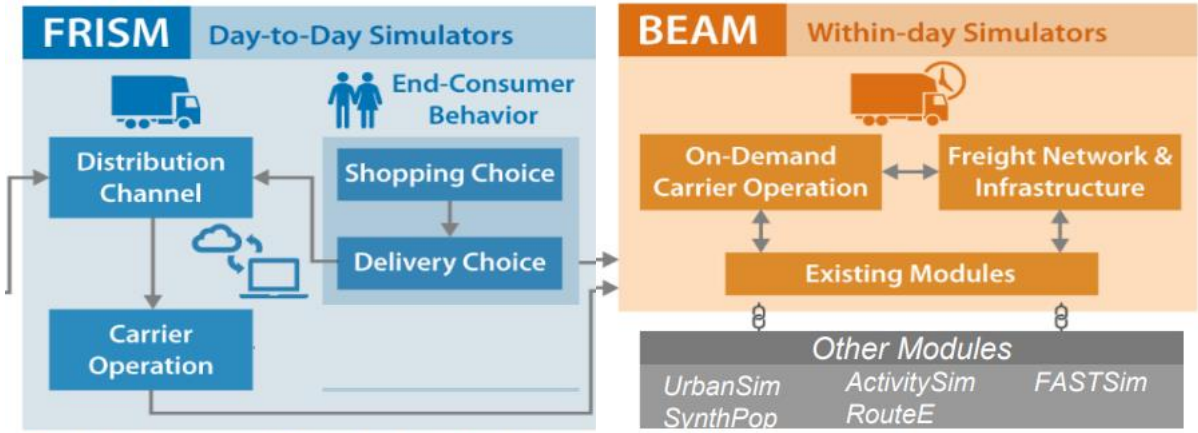
Freight Modeling

Detailed Tour Based Freight Model

FRISM simulates day-to-day freight activities including end-consumer shopping, distribution channel, and carrier operation with e-commerce dynamics between passenger and freight travel. It outputs an assignment of different shipments to carriers and tour plans of the carriers' vehicles to transport shipments from their origins to their destinations.



Freight **I**ntegrated **S**imulation **M**odel (**FRISM**): Consumer shopping behavior, fleet operation & vehicle-tour plans, and stop locations

BEAM-Freight: Vehicle routing and en-route operations, infrastructure use, and traffic assignment

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Questions?

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