



— THE EASTERN  
TRANSPORTATION  
COALITION

CONNECTING FOR SOLUTIONS



# Freight Data and Planning Working Group Web Meeting

*December 14, 2023*

# Welcome

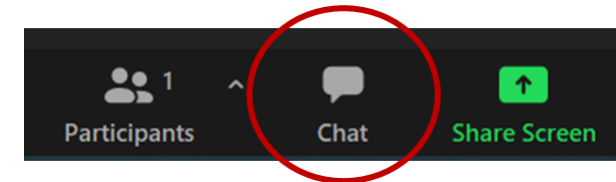
- We are using **Zoom Meeting**
- **VIDEO:** You are welcome to turn on your camera by pressing the camera icon in the bottom left corner of your screen
- **AUDIO (Computer):** Use your computer speakers and microphone by clicking the “Join Audio” button at the bottom left of the screen.
- **Alternate Audio (Phone):** Call into the meeting by dialing the phone number based on your location (provided in the confirmation email) and enter the Meeting ID at the prompt.
- Please keep your line muted when you are not speaking.
- **This web meeting is being recorded.**
- **Questions** with the audio or web? Please contact Esther directly via the chat box or email ([ekleit@kmjinc.com](mailto:ekleit@kmjinc.com))



# Asking Questions in Zoom Meeting

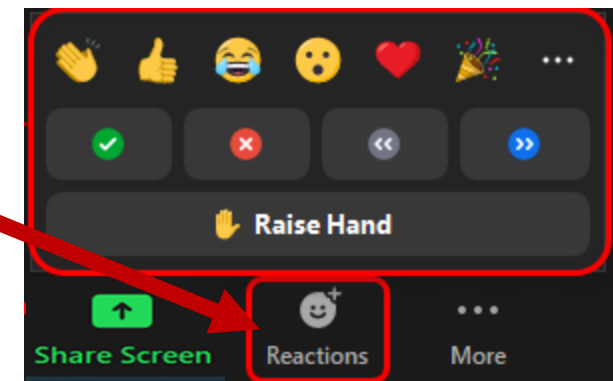
- **In the Chat Box**

- You may pose your question using the Chat Box. Click on the chat icon at the bottom of your screen

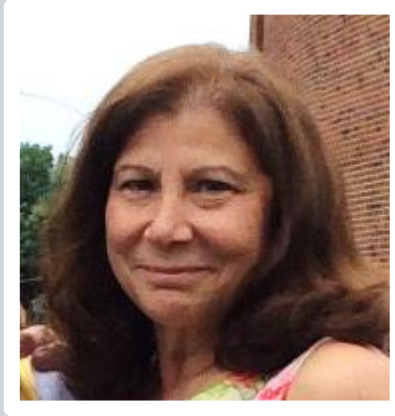


- **Verbally**

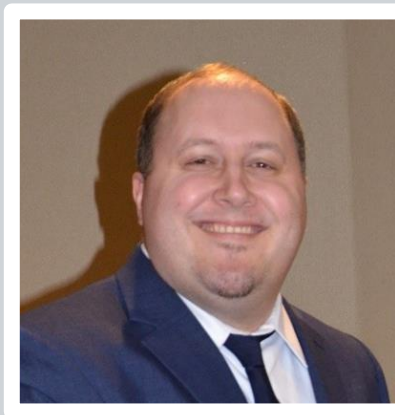
- Please raise your hand (click on the reactions button at the bottom of the screen then select the “Raise Hand” button), then you can unmute your line.
- Please give your name and organization before asking your question
- All questions will be monitored and answered at the end of the session.
- Please mute yourself when you are finished speaking



# Welcome



**Marygrace Parker**, Freight Program Director  
The Eastern Transportation Coalition



**Josh O'Neill**, Supervising Planner  
Rhode Island Statewide Planning  
Freight Data and Planning Working Group Chair





# Coalition Update – Recent & Upcoming Events

## RECENT

- ✓ Regional HOGs In-person Exchanges with Virtual Reality TIM Training Sessions (*invite only*) – Sep-Dec 2023
- ✓ RITIS User Group Meeting – Oct 19, 2023
- ✓ Travel Information Summit, Raleigh, NC & via web (*invite only*) – Oct 24 & 25, 2023
  - ✓ **Trucking Session (Virtual) – Nov 24, 2023**
- ✓ Truck Parking Working Group Meeting – Nov 3, 2023
- ✓ Virtual Information Exchange: Mileage-Based User Fee (MBUF) International Truck Pilot *A Scalable Approach toward Sustainable Transportation Funding* – Nov 21, 2023
- ✓ RITIS Workshop: New PDA & RITIS Tools - Dec 5, 2023

## UPCOMING

- Virtual Exchange: NYSDOT's Bridge Hit Strike Task Force Initiative – Dec 15, 2023



# Agenda

Topic	Speaker
Welcome & Introductions	Marygrace Parker, The Eastern Transportation Coalition Josh O'Neill, RI Statewide Planning/Freight Data & Planning Working Group Chair
Spotlight Presentation: Maryland's Statewide Transportation Model - "C" 20 Freight Model	Rana Shams, Division Chief, Traffic for Travel Forecasting & Analysis Division, Maryland DOT-SHA Mark Radovic & Sabya Mishra, Gannett Fleming
Freight Data & Working Group Agency Updates	Facilitated by Josh O'Neill
Next Meeting, Topics to Consider, and Wrap Up	Josh O'Neill



# Participating Agencies

<b>Alabama</b> Alabama DOT	<b>Kentucky</b> KYTC	<b>New Hampshire</b> New Hampshire DOT	<b>Tennessee</b> Tennessee DOT
<b>Connecticut</b> ConnDOT	<b>Maine</b> Maine DOT	<b>New Jersey</b> NJDOT NJTPA	<b>Virginia</b> Virginia DOT
<b>Delaware</b> Wilmapco	<b>Maryland</b> Baltimore Metro Council Maryland DOT - SHA	<b>Pennsylvania</b> PennDOT DVRPC Southwestern PA Commission	<b>Washington DC</b> District DOT
<b>Georgia</b> Georgia DOT	<b>Massachusetts</b> Boston Region MPO MassDOT	<b>Rhode Island</b> RI Statewide Planning	<b>USDOT</b> BTS FHWA



# Spotlight Presentation: Maryland's Statewide Transportation Model "C" 20 Freight Model



**Rana Shams**

Division Chief, Traffic for Travel Forecasting and Analysis Division  
Maryland DOT-SHA





# FREIGHT MODELING ACTIVITIES AT MDOT-SHA



Presentation to  
**The Eastern Transportation Coalition**  
December 14, 2023

# INTRODUCTIONS/PRESENTATION OUTLINE

MDOT Organizational Structure/Role/Responsibility of TFAD (Rana)

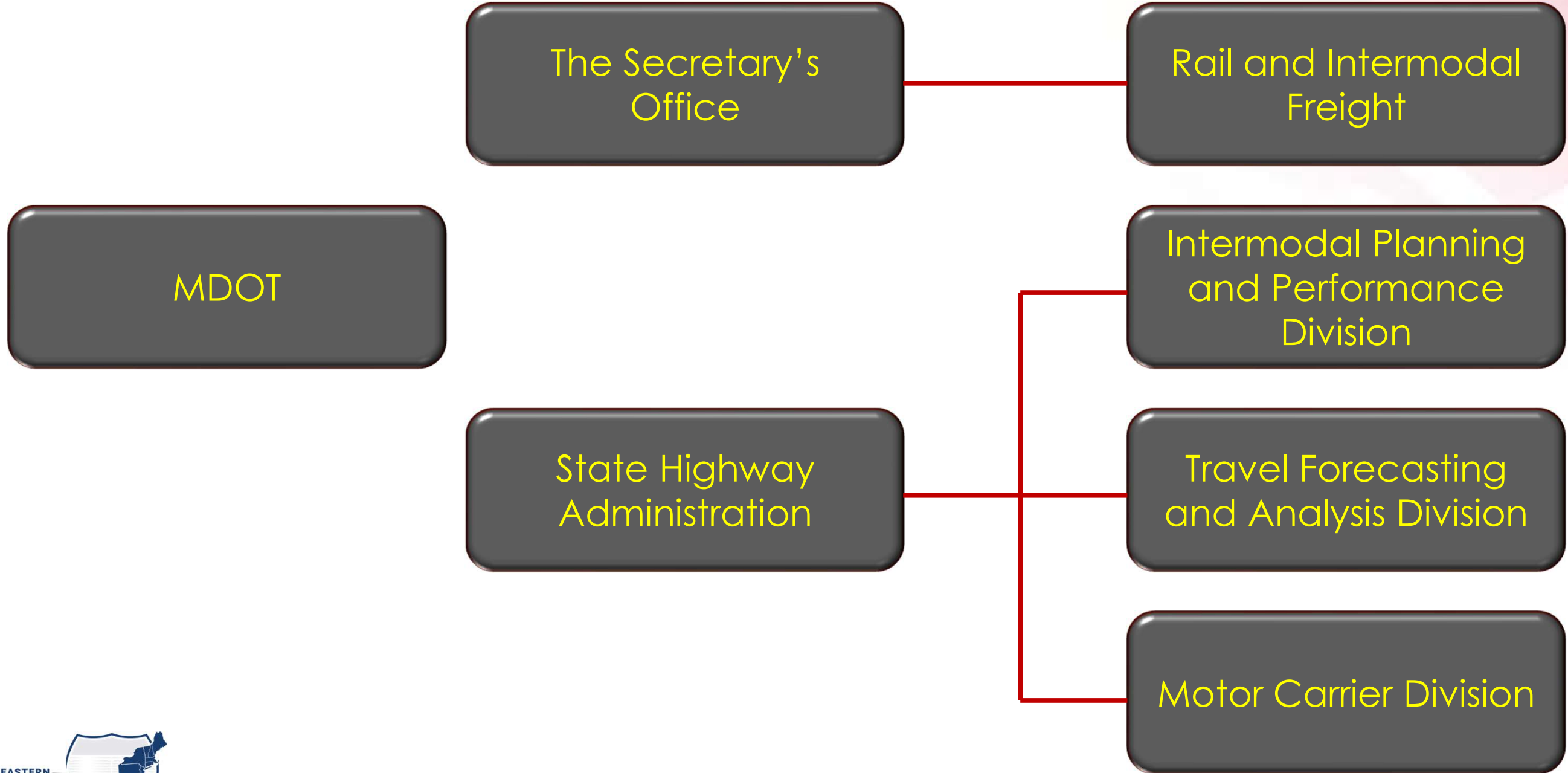
Background/Development of MSTM (Mark)

Freight Sub-Model (Sabya)

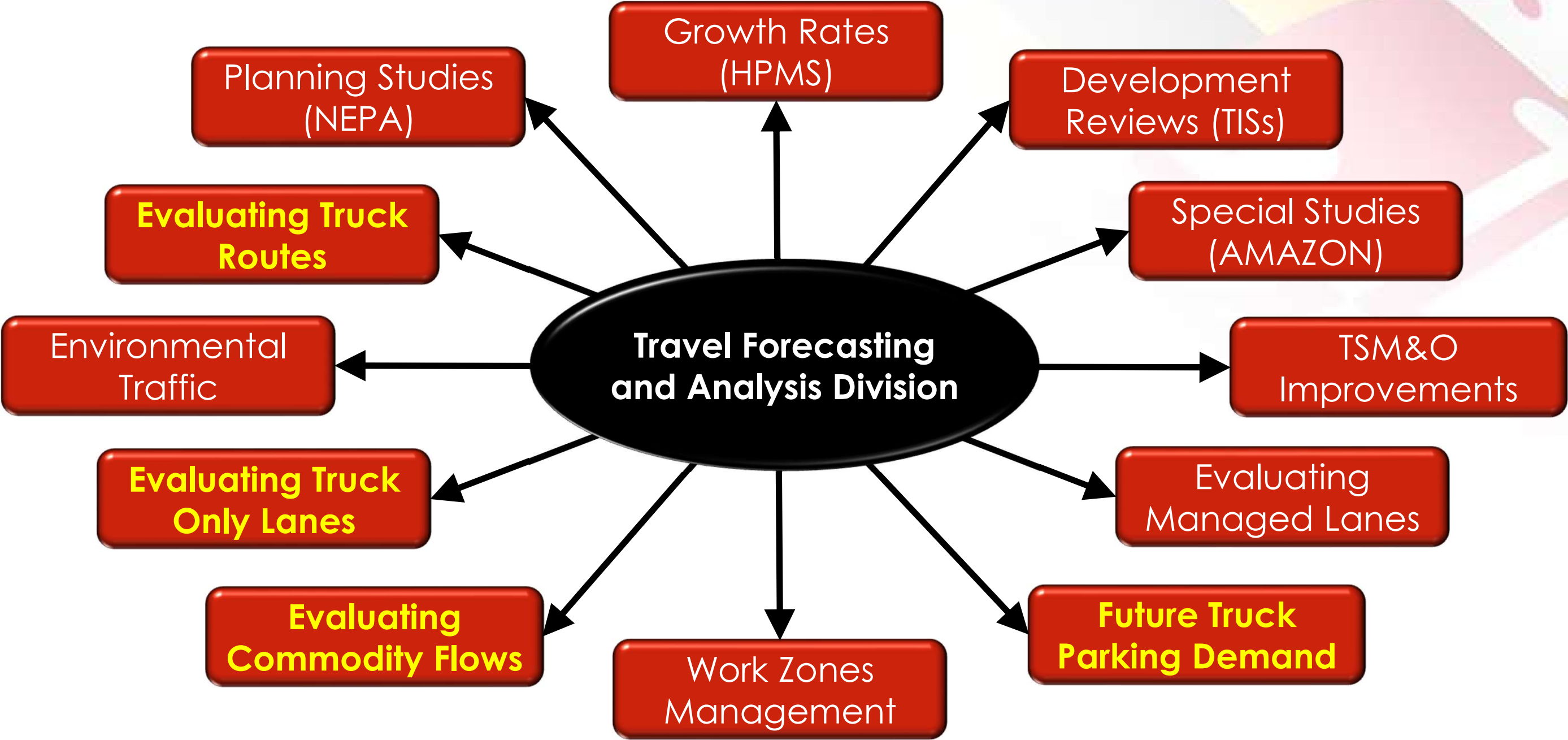
Conclusions/Next Steps (Rana)



# FREIGHT PLANNING, ANALYSIS AND OPERATIONS

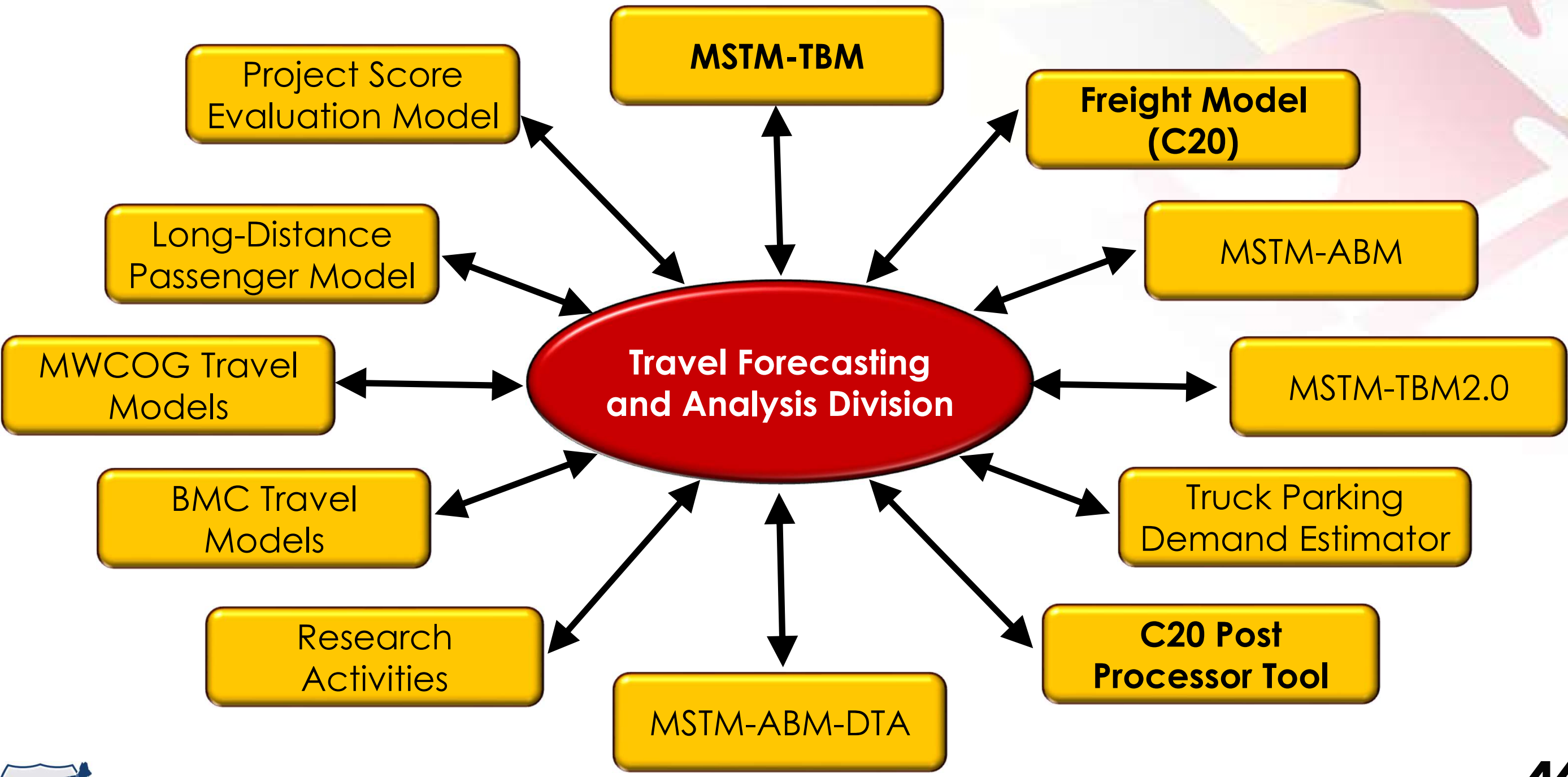


# OUR EVOLVING TECHNICAL NEEDS



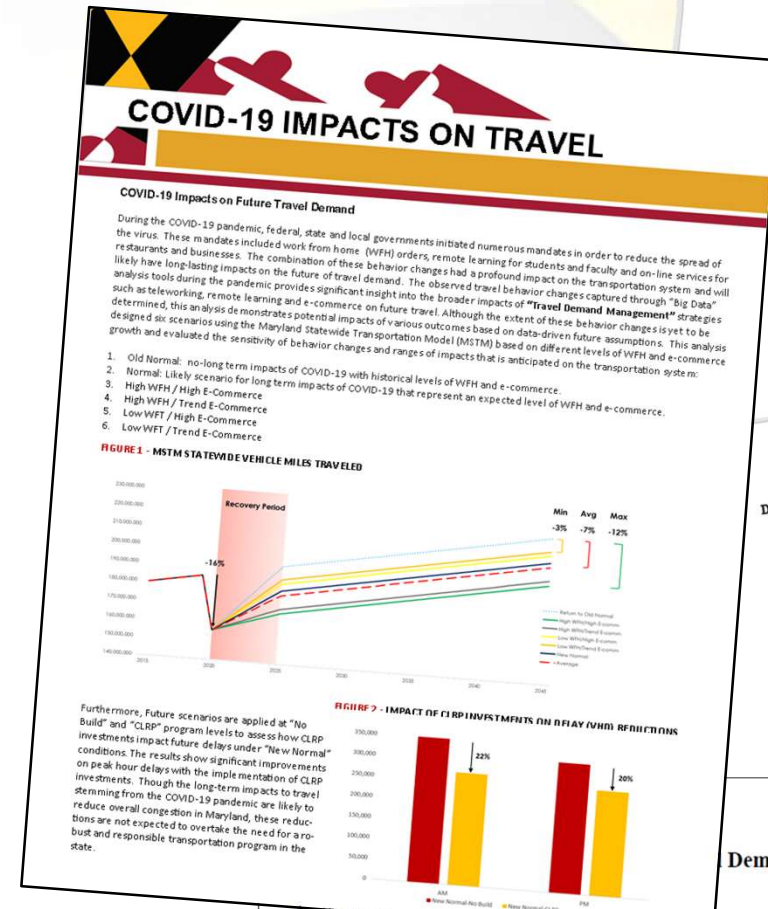


# OUR EVOLVING TECHNICAL TOOLS



# BALANCED RESEARCH APPROACH

- Active in TRBs Statewide Model Subcommittee
- Participation in Multiple Pooled Fund Studies
- Ongoing academic collaboration with Office of Policy and Research



**Resolving Challenges in Assembling Land Use and Socioeconomic Datasets: Experiences from the Development of Maryland Statewide Transportation Model**

**Mark Radovic**  
Senior Transportation Engineer  
Gannett Fleming, Inc., 7133 Rutherford Road, Suite 300, Baltimore MD, 21244  
Phone: 443-348-2017, e-mail: [mradovic@gfnet.com](mailto:mradovic@gfnet.com)

**Sabyasachee Mishra, Ph.D., P.E.**  
Assistant Professor  
Department of Civil Engineering, University of Memphis, Memphis, TN 38152  
Phone: (901) 678-2746, e-mail: [smishra@memphis.edu](mailto:smishra@memphis.edu)

**Timothy F. Welch, Ph.D.**  
Assistant Professor, School of City and Planning  
Georgia Institute of Technology  
Phone: 404.387.1111

**Developing a Multi-Resolution, Routable Centerline Dataset for DOT Performance Planning and Operations**

Mark Radovic, Scott Thompson-Graves, Subrat Mahapatra

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Gannett Fleming, Inc.  
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2. Vice President  
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Office of Planning and Preliminary Engineering  
Maryland State Highway Administration  
[smahapatra@sha.state.md.us](mailto:smahapatra@sha.state.md.us)

word count: 343

Demand

Highway Administration (SHA) continues to move toward here is a greater need to link asset data with travel models. networks for statewide modeling, regional modeling and some, inefficient and difficult to maintain. Current ad hoc during the interaction of long distance travel, regional travel area. Being able to evaluate projects in a multi-resolution of local traffic impacts, while accounting for regional trips, trucks. A multi-resolution platform also allows for greater performance outputs at multiple levels. Additionally, FHWA's underscores the need for a universal highway network for state

able version of their statewide centerline data to facilitate simulation modeling. This dataset identifies many of the state's with ongoing data collection efforts. A 3-tiered zone structure are Level 1 represents larger statewide model zones (SMZs), transportation analysis zones (TAZs) and Level 3 representing the state's statewide study area, major facilities in Level 3 that are model, and Level 2 functioning as a buffer area around Level 1 or Level 1 and 2.

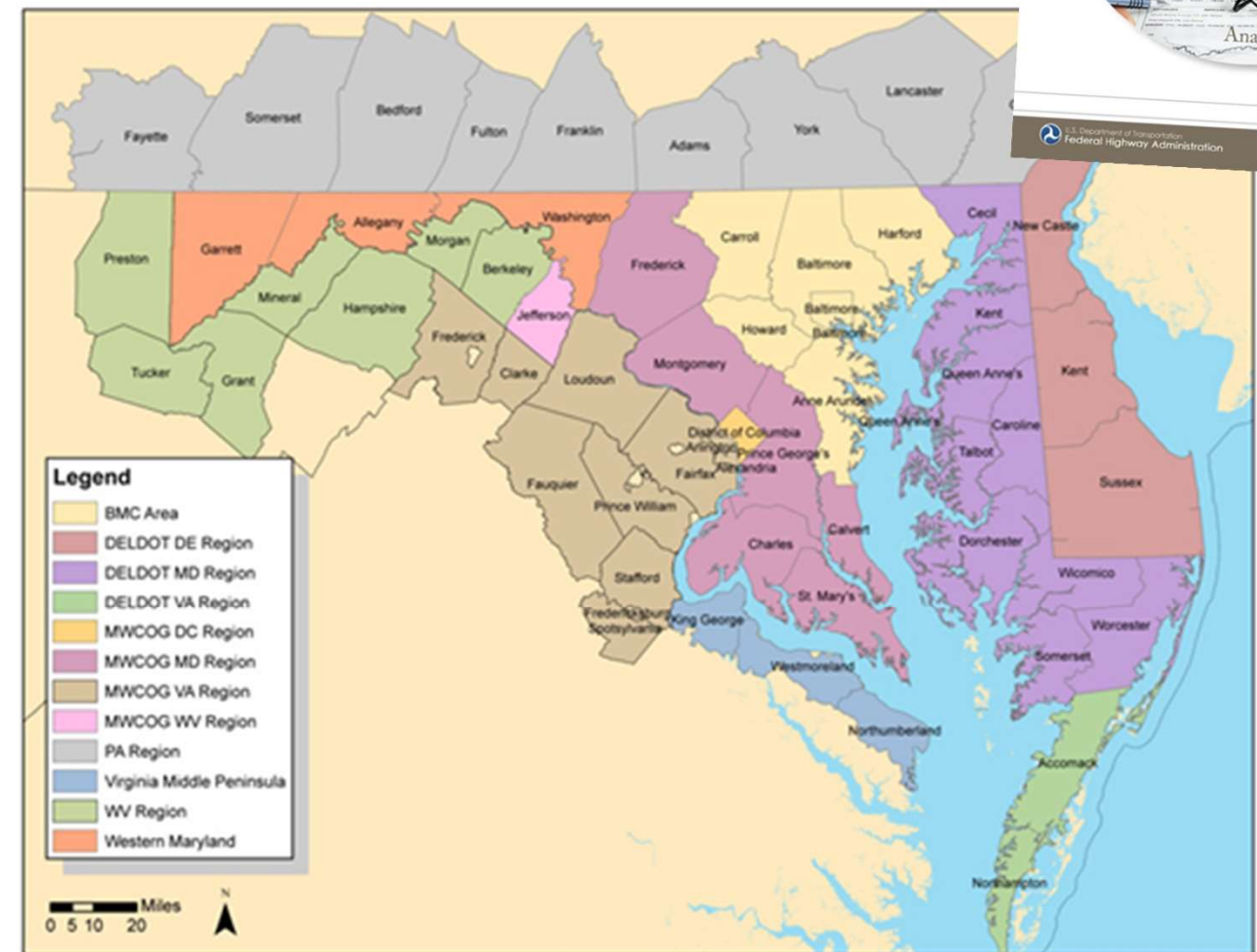
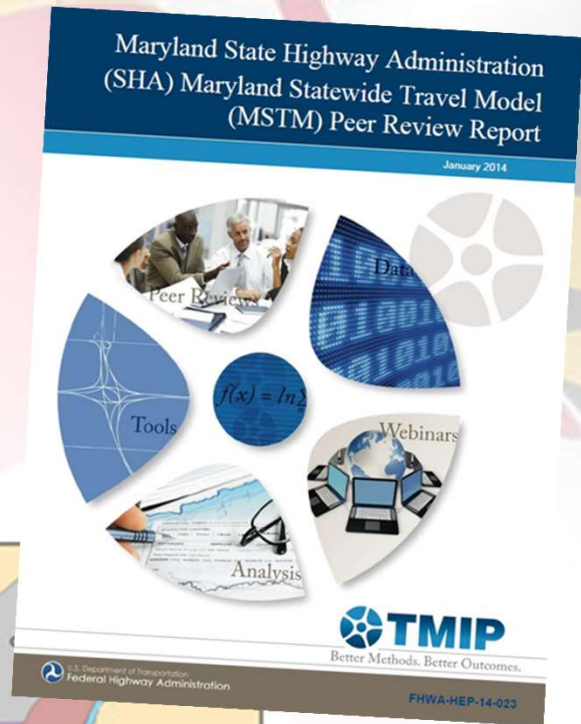
- 5 Maryland State Highway Administration
- 6 Travel Forecasting and Analysis Division, Office of Planning and Preliminary Engineering
- 7 Baltimore, MD 21202
- 8 Email: [lsheemer@mdot.state.md.us](mailto:lsheemer@mdot.state.md.us)
- 9 Elham Shayanfar, Ph.D.
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- 12 Columbia, MD 21045
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- 33 Baltimore, MD 21244
- 34 Email: [mradovic@mdot.state.md.us](mailto:mradovic@mdot.state.md.us)
- 35
- 36 Date Submitted: June 30, 2021
- 37 Number of Figures: 13
- 38 Number of Tables: 2
- 39 Total Word Count: 5,153 words text + 2 tables \*250= 5,653 words
- 40





# MARYLAND STATEWIDE TRANSPORTATION MODEL (MSTM-TBM)

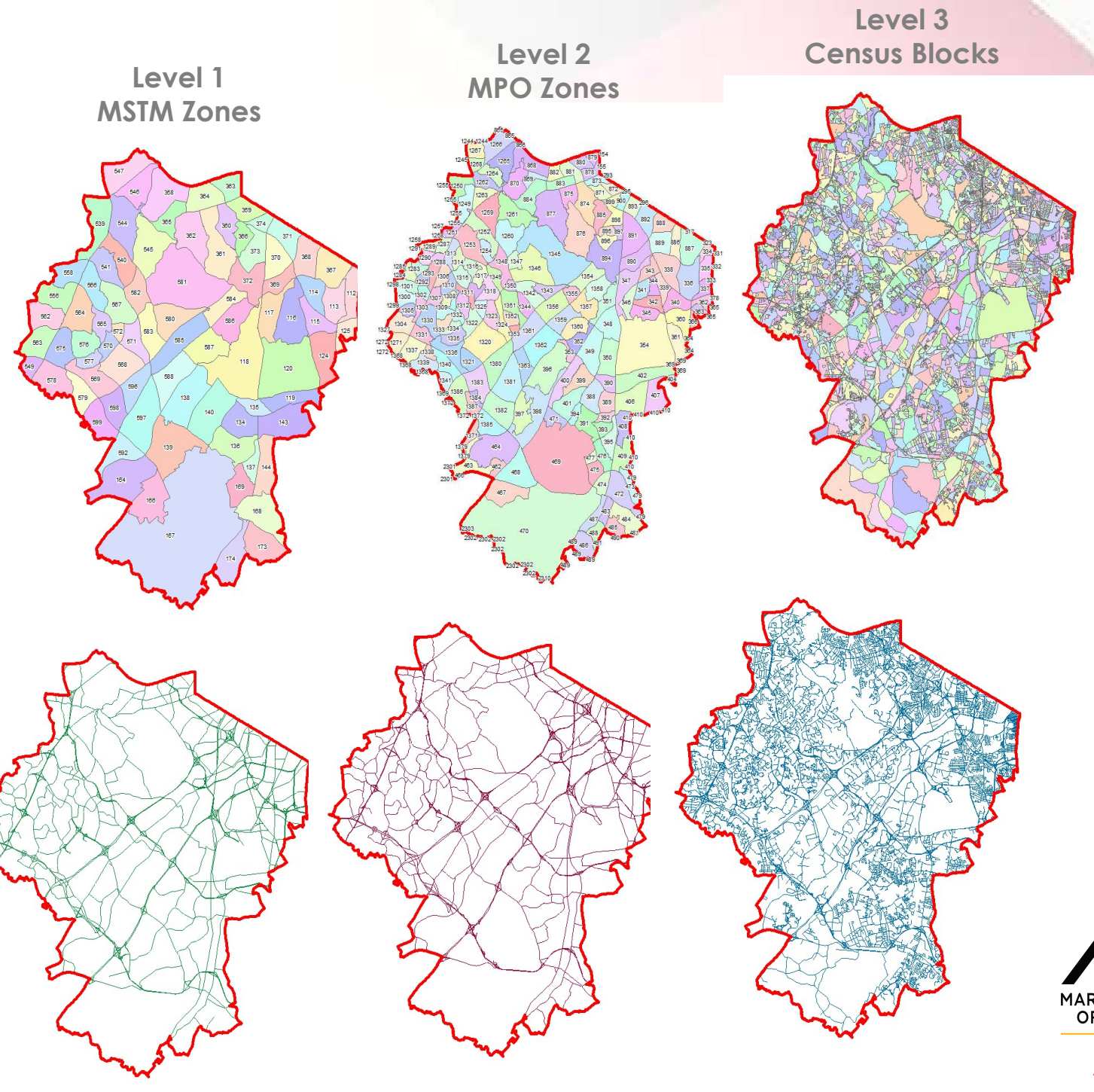
- Developed and in production for over 15 years
- Trip-based model with  $\approx 1,500$  zones *within* Maryland
- Includes a 'halo' region around the state  $\approx 1,800$  zones
- Traditional 4-step model
- 4 time periods
- Runtimes of  $\approx 16$  hrs
- FHWA peer reviewed
- Developed to be complimentary with existing MPO models
- Socioeconomic inputs consistent with approved Cooperative Forecasts





# MARYLAND STATEWIDE TRANSPORTATION MODEL (MSTM)

- Highway network based on MDOT-SHA roadway centerline data
  - ✓ Linkage with other asset data (Counts, ADT Segments, etc.)
  - ✓ Single point intersection coding
  - ✓ Multi-resolution database allows for greater flexibility and scalability
- Zone structure nesting
  1. SMZs
  2. TAZs
  3. Census blocks





# ONGOING MDOT - FHWA PARTNERSHIPS

## Strategic Highway Research Program (SHRP2) and other FHWA funded initiatives

- **Organizing for Reliability (L06)**: SHA will develop a TSM&O Strategic and Implementation Plan
- **Advanced Travel Analysis Tools (C10)**: SHA will develop multi-resolution and time-dependent travel demand models for integrated planning and operations
- **Behavior Based Freight Models (C20)**: SHA/ BMC will develop supply chain based statewide freight models and tour based commercial vehicle models
- **Reliability Data and Analysis Tools (L Bundle)**: SHA will implement tasks identified under the SHA Reliability Roadmap
- ***National Highway Freight Program (NHFP) Formula Funds***: SHA will refine MSTM to enhance truck travel demand modeling efforts with Maryland centric datasets

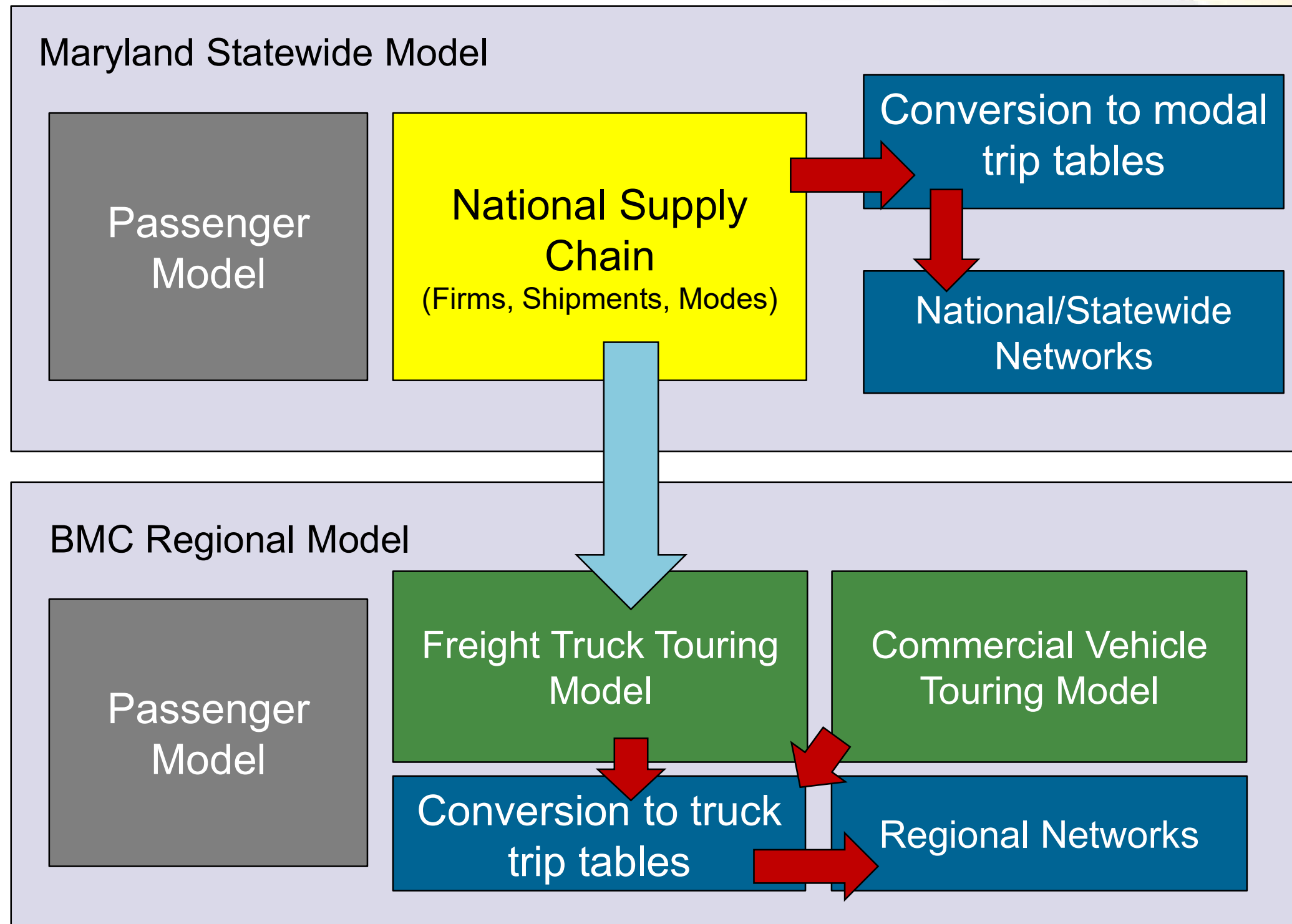


# DEVELOPMENT OF BEHAVIOR-BASED FREIGHT MODEL

- Based on SHRP2/C20 research grant
- Includes national supply-chain model, regional truck model, and commercial vehicle truck touring model
- Freight tours available
- O-D's can be based on any time slice (e.g., every 15 minutes)
- Truly multimodal model (not just truck based)
- Freight mode choice can easily be done
- Truck touring model for the entire modeling region
- Open source model structure in R (no installations needed)
- New enhanced dashboard for visualization

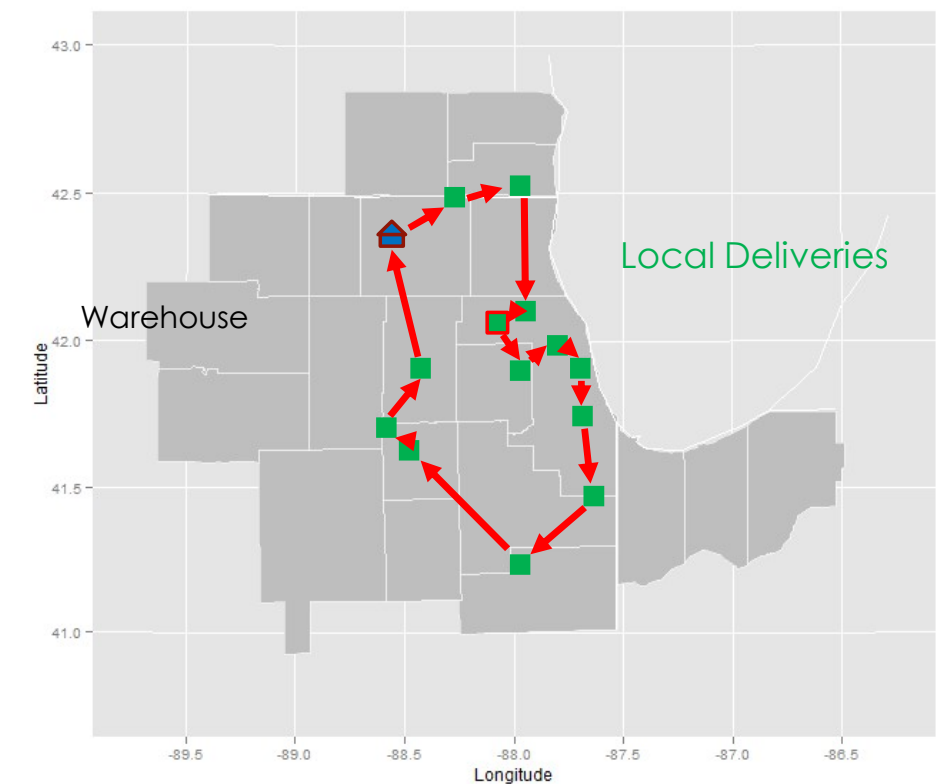
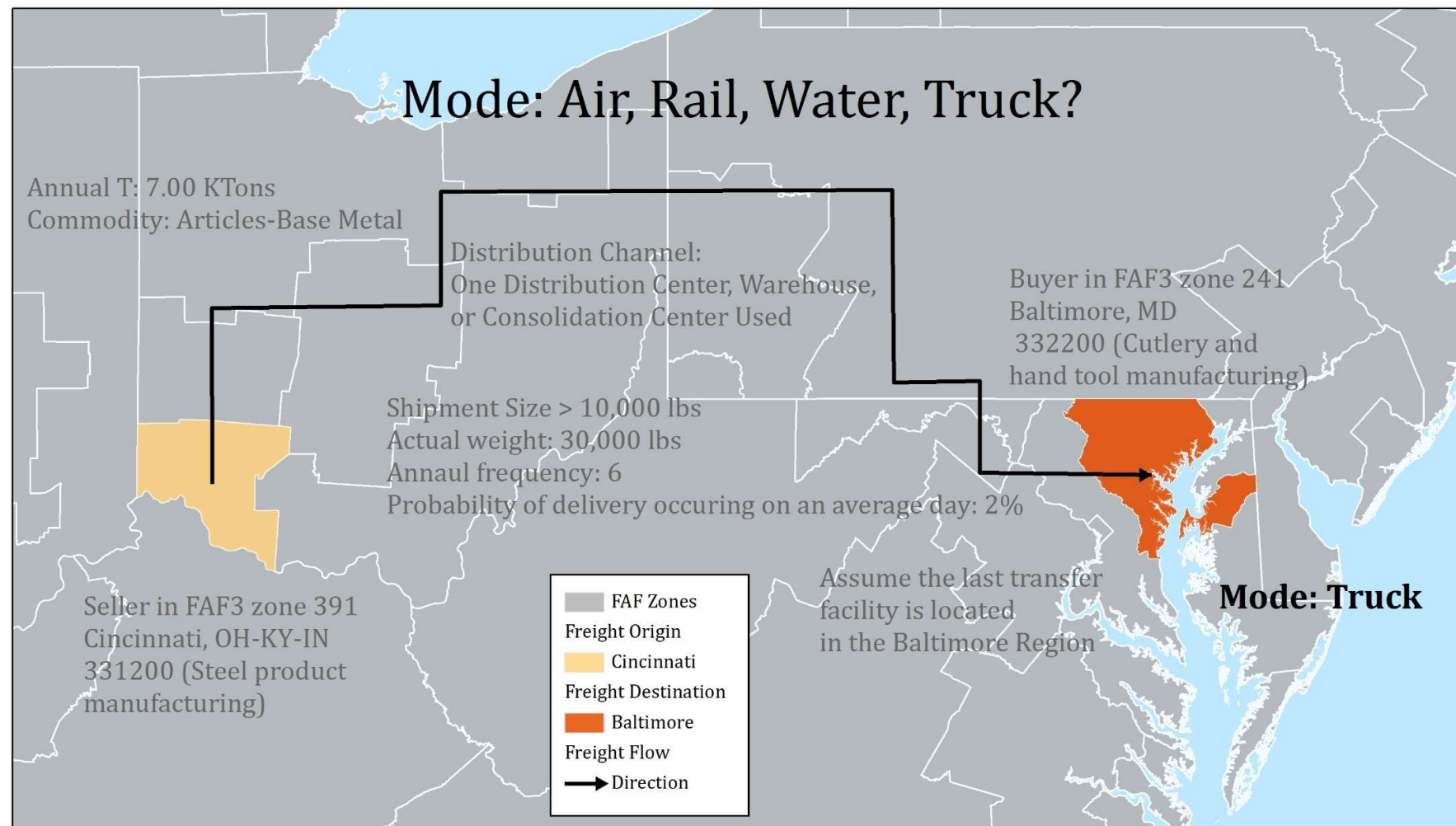


# OVERALL MODEL DESIGN



# FREIGHT MODELING APPLICATIONS

- Volume and Value of Freight flows (current & future)
- Infrastructure needs and effects for freight movement
- Effect of supply chains, external variables and agency policies (e.g Post-Panamax, Amazon Distribution Center etc.)





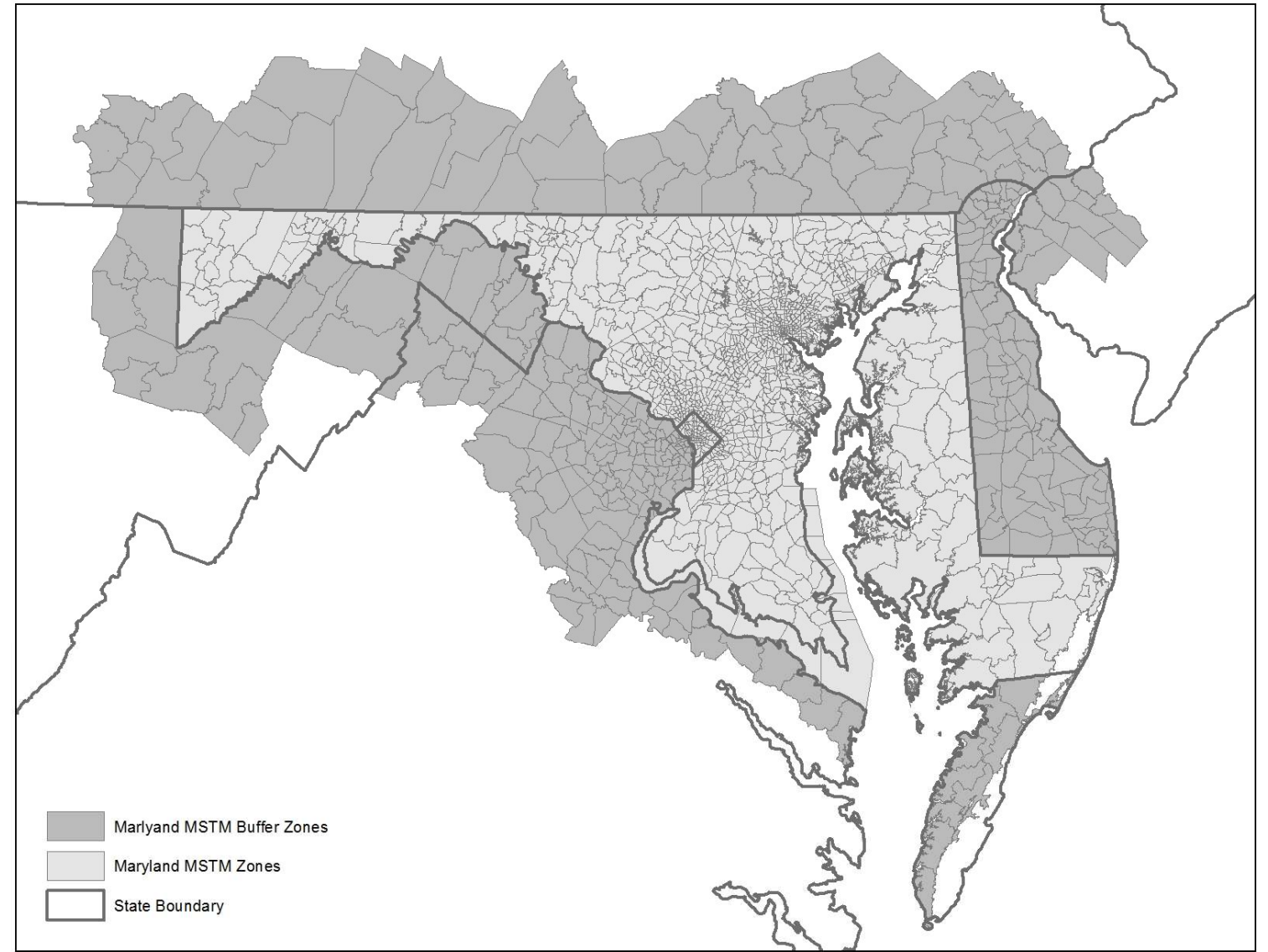
# MODEL SPATIAL STRUCTURE

The freight model uses both the MSTM and BMC zone systems:

- National zones are MSTM SMZs
- Buffer zones around Maryland are MSTM SMZs
- Zones within Maryland:
  - Firms are associated with both SMZs and BMC TAZs inside the BMC region
  - Supply chain model uses MSTM SMZs for skims and trip tables
  - Truck touring model uses BMC TAZs for skims and trip tables



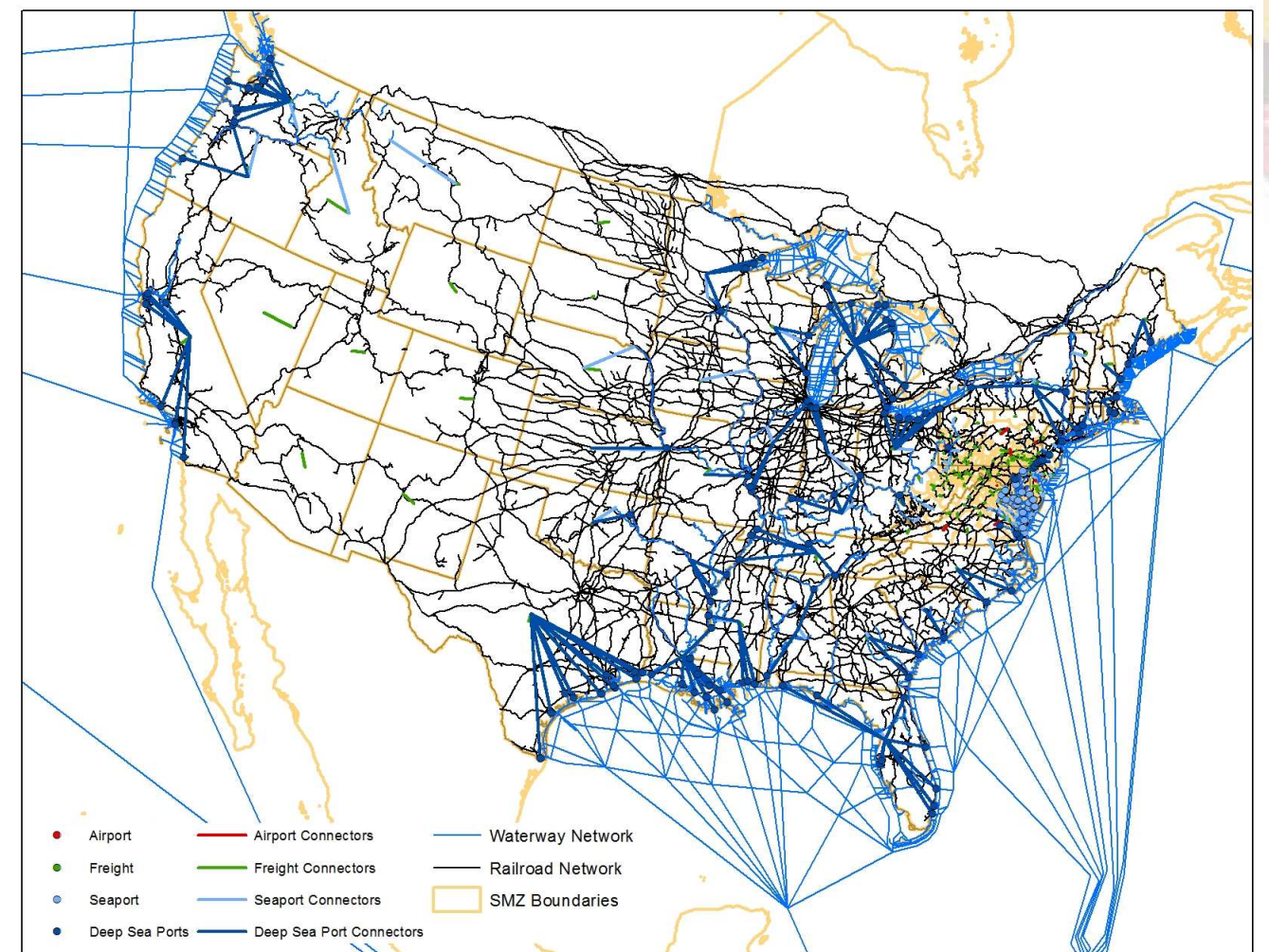
# MSTM ZONE SYSTEM



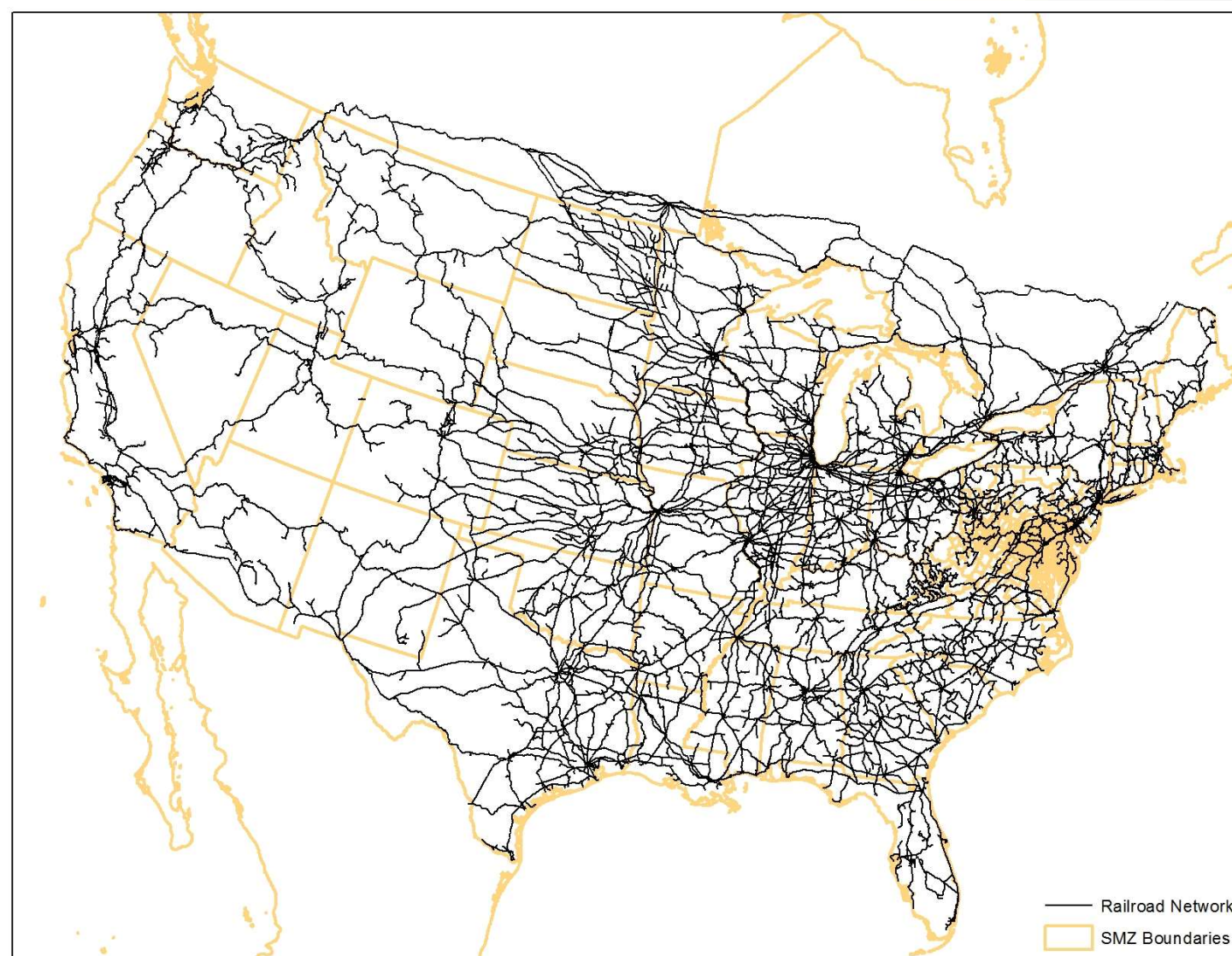


# C20 INPUT DATA

- National multimodal network and properties
  - Road/Rail/Waterway/Pipeline
  - Higher resolution in study area
- Zone system
  - Internal and external
- Network skims
- Desired time of days
  - Eight times of day
    - 3-AM Peak (early, peak, late)
    - 1-Midday
    - 3-PM Peak (early, peak, late)
    - 1-Nighttime



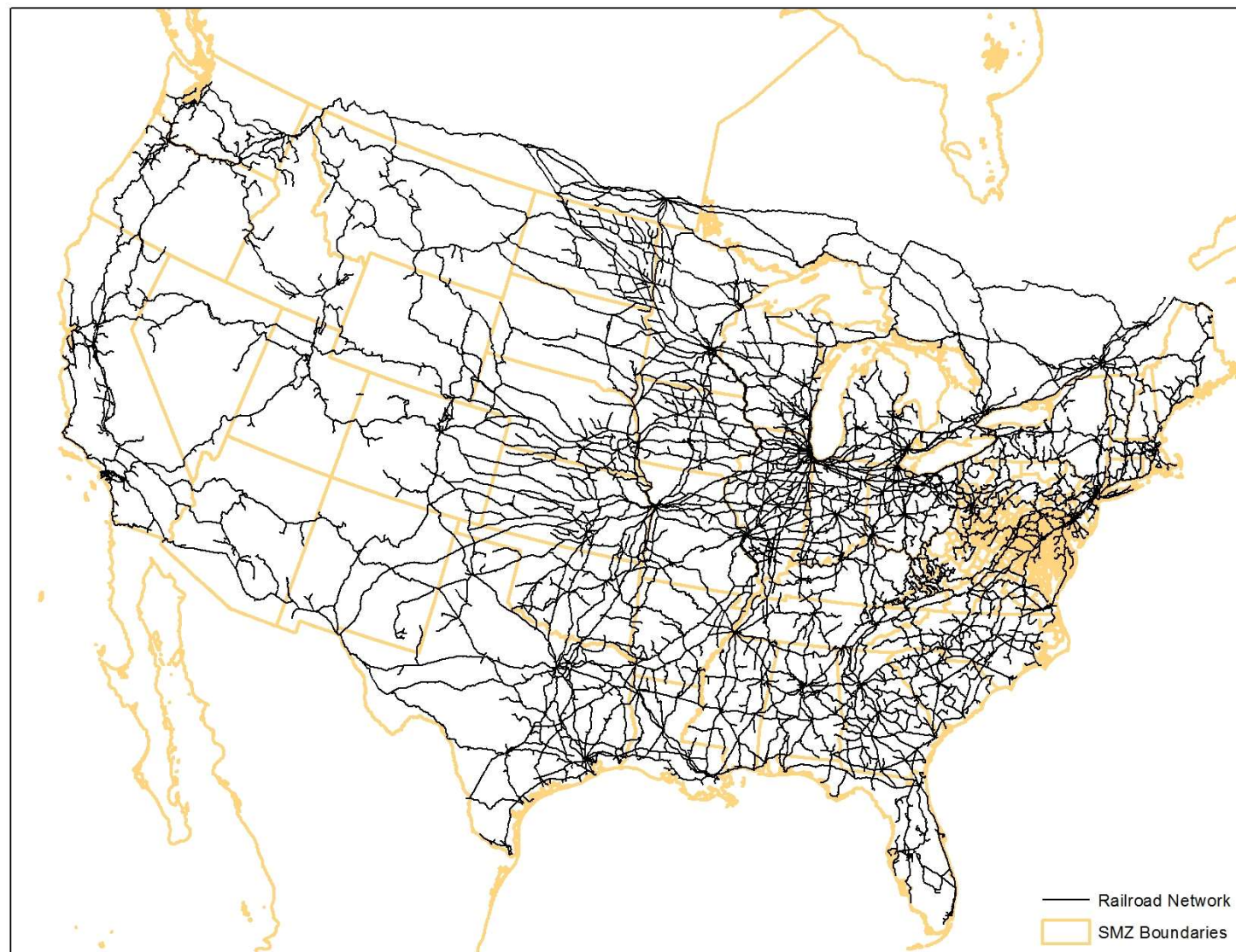
# C20 INPUT DATA



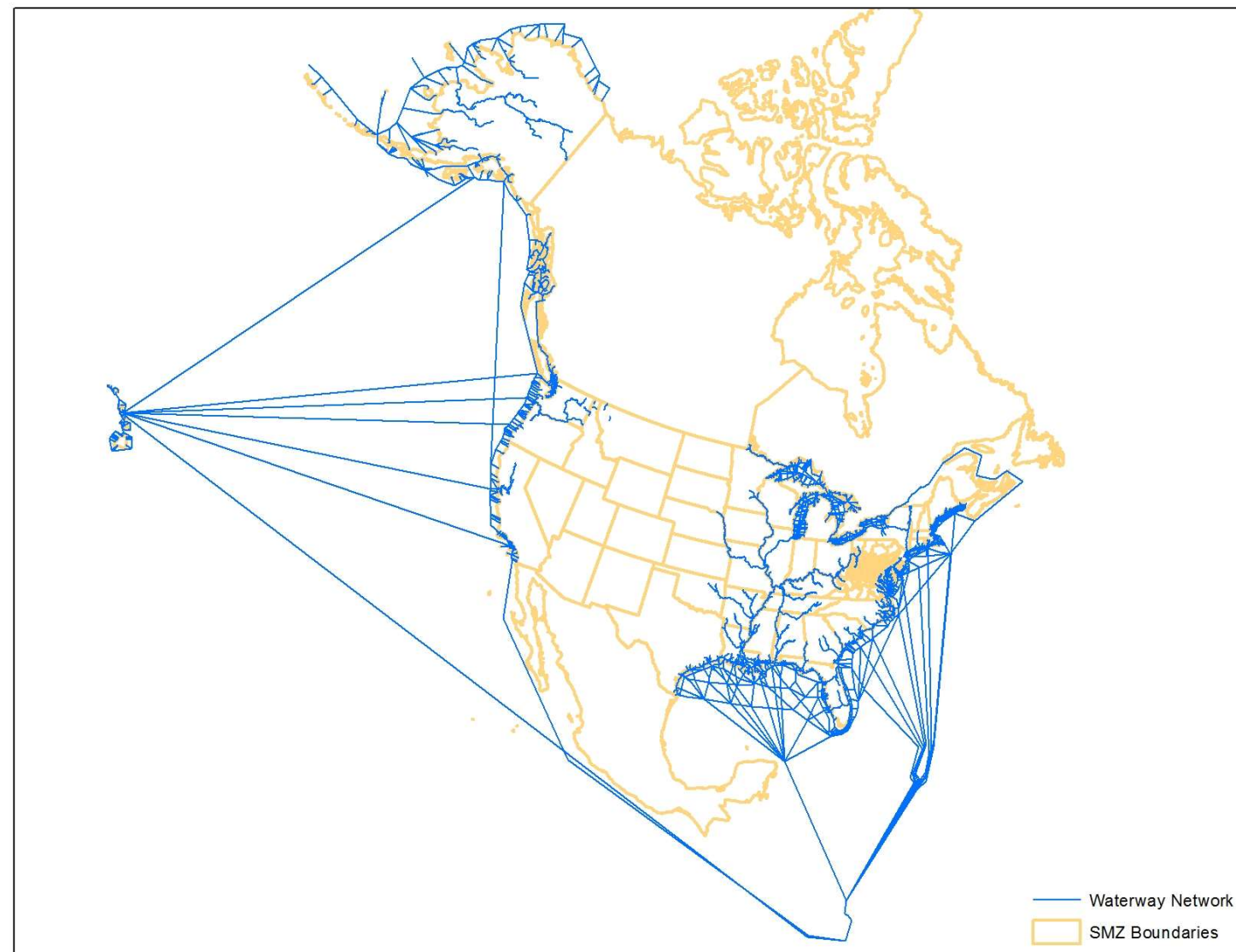
**Railroad Links**



# C20 INPUT DATA



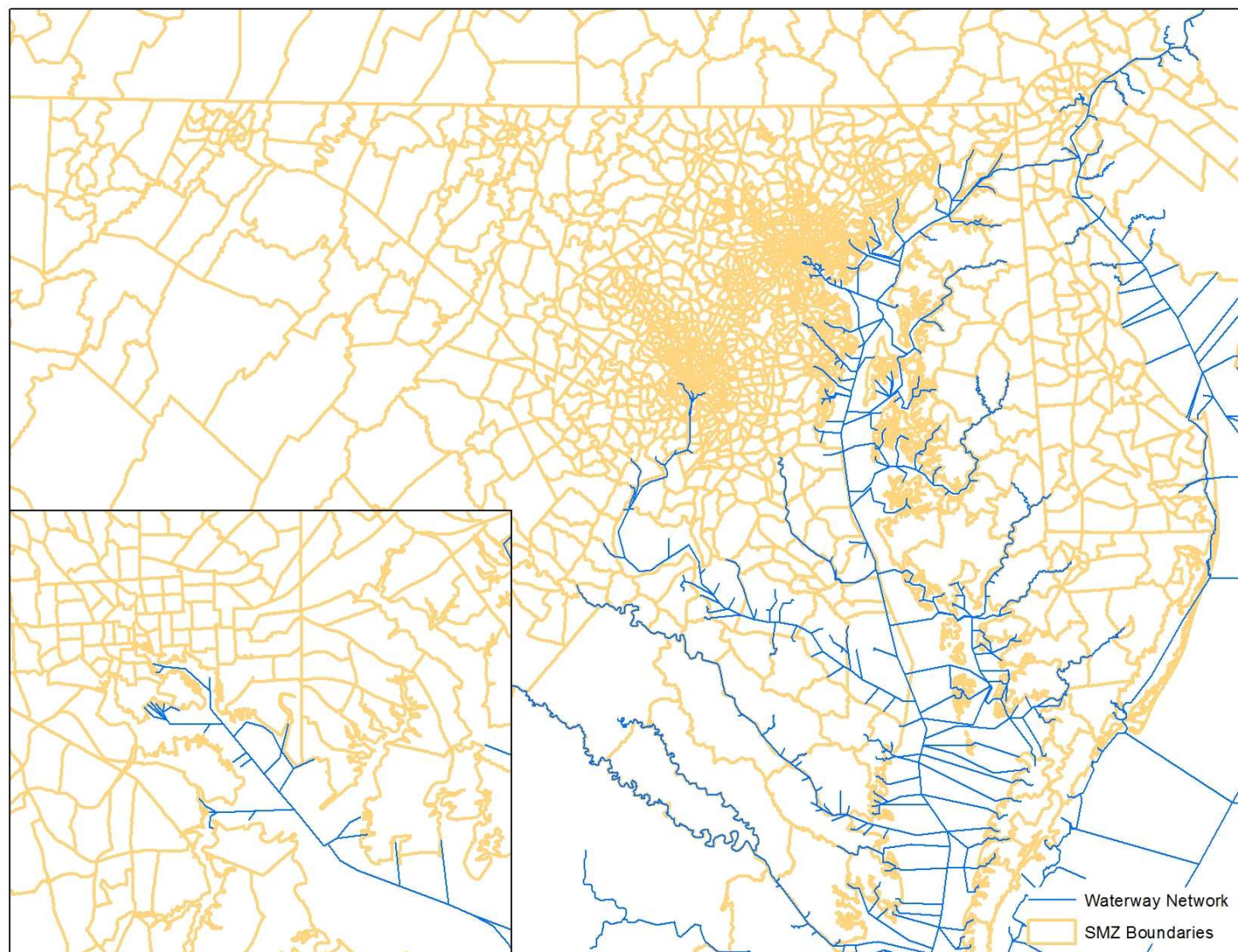
**Railroad Links**



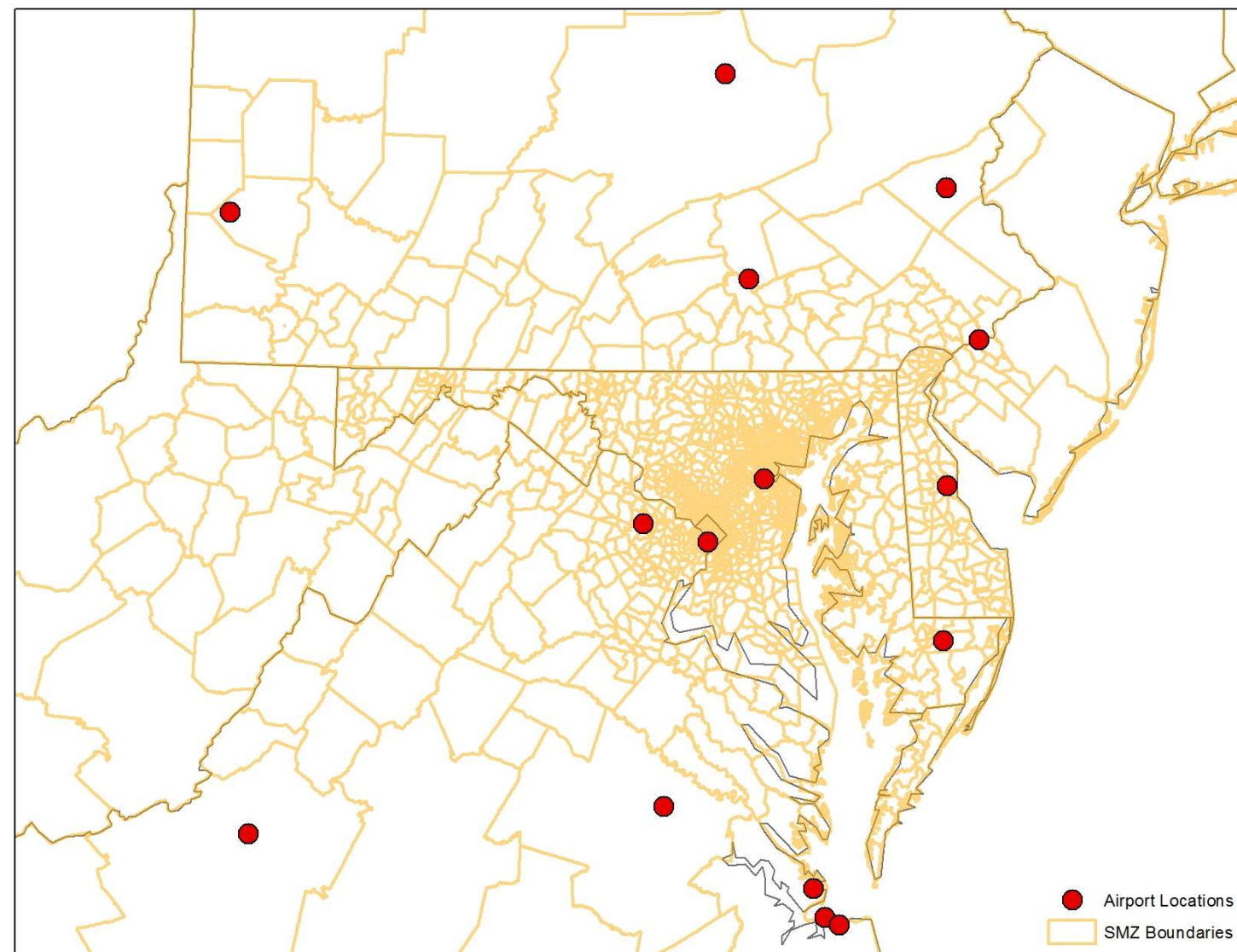
**Waterway Links**



# C20 INPUT DATA



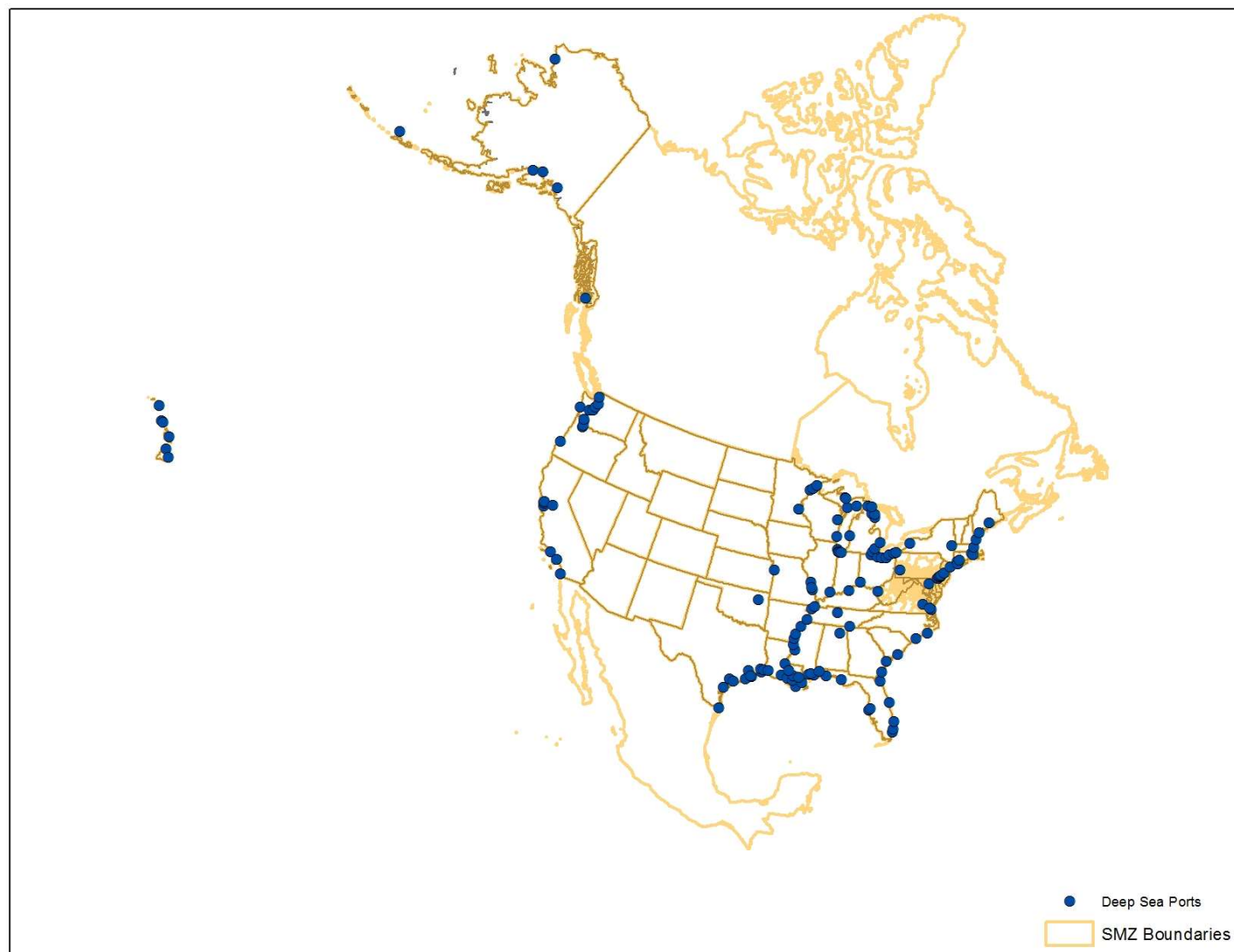
**Waterway Links Maryland**



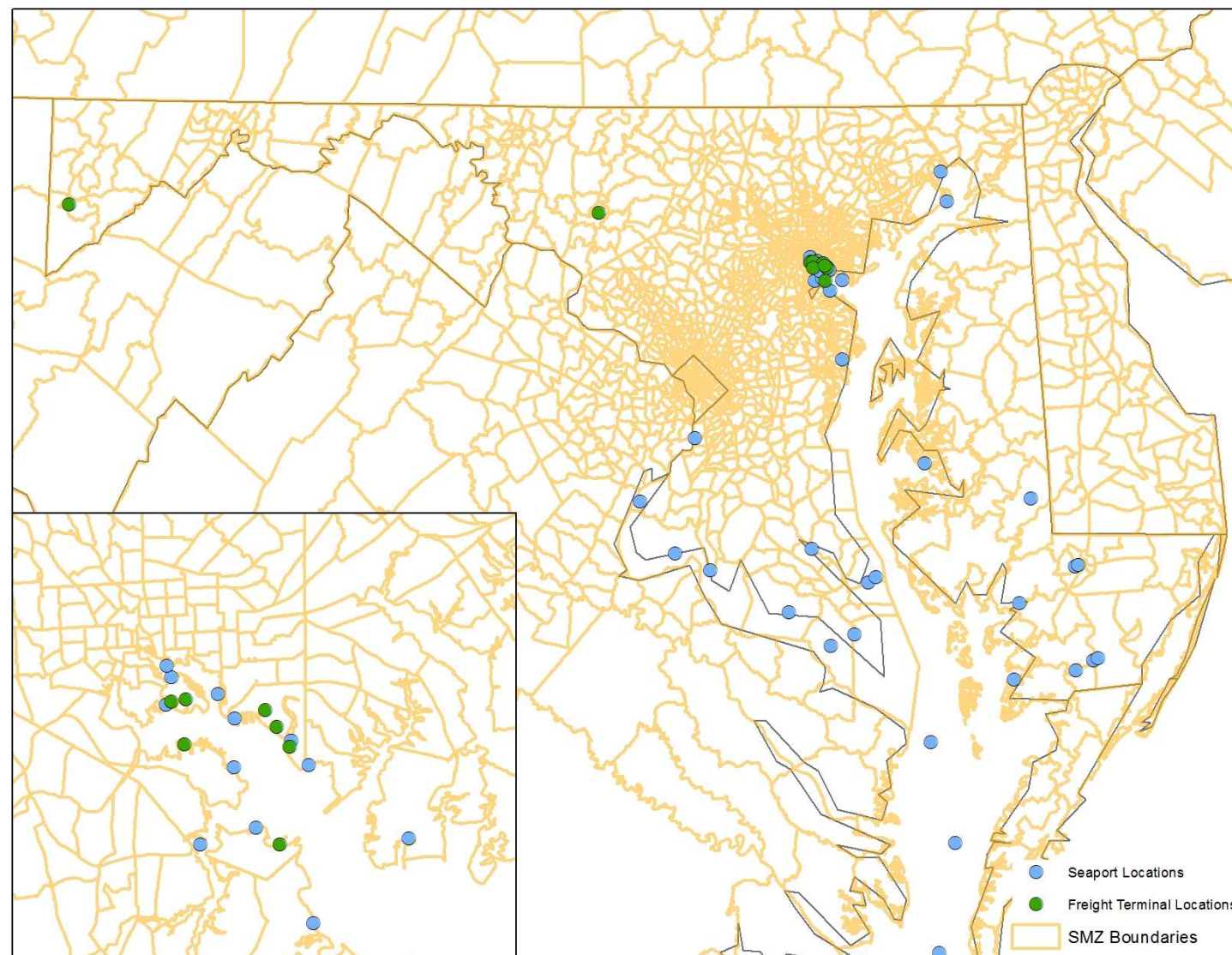
**Airports**



# C20 INPUT DATA



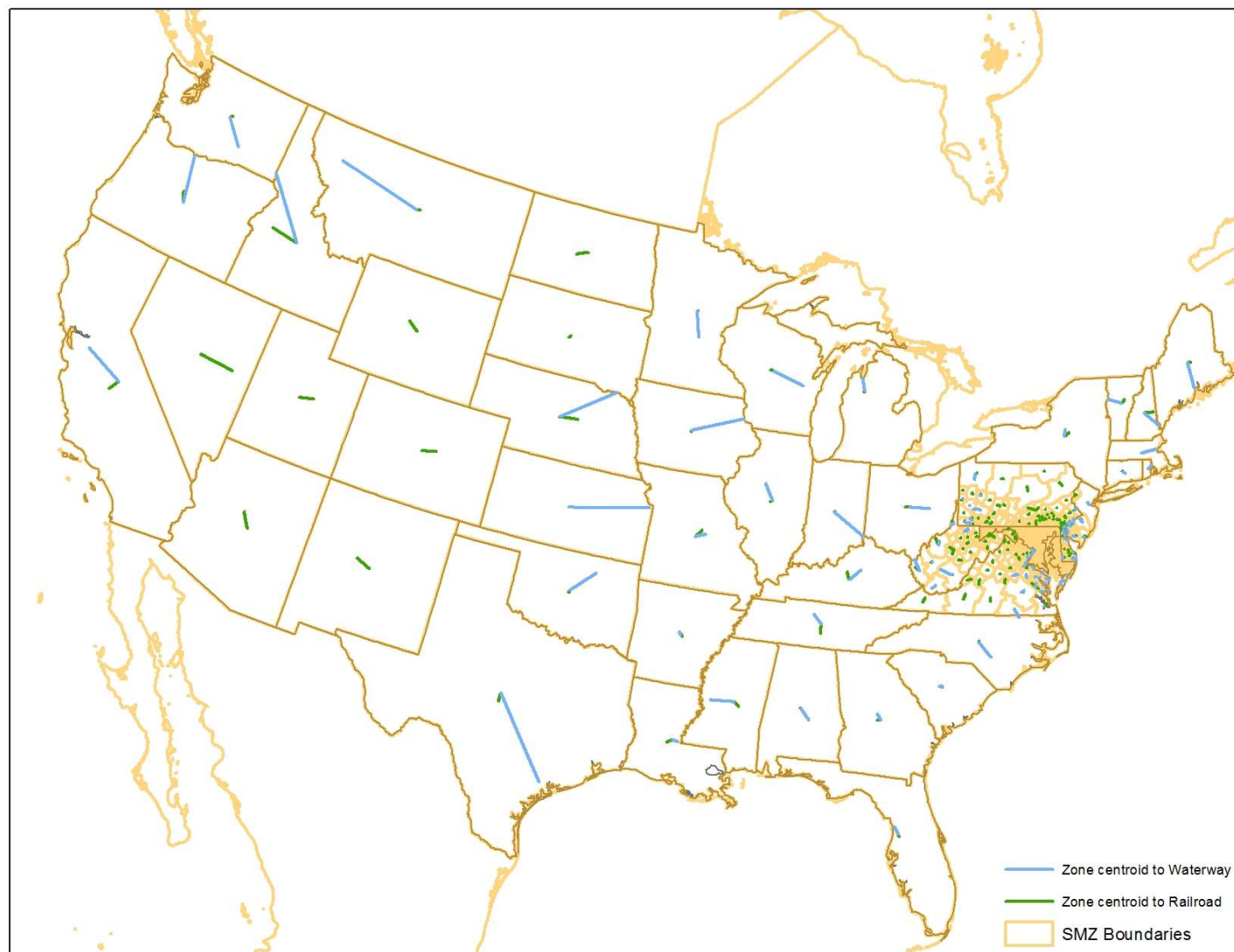
US Major Seaports



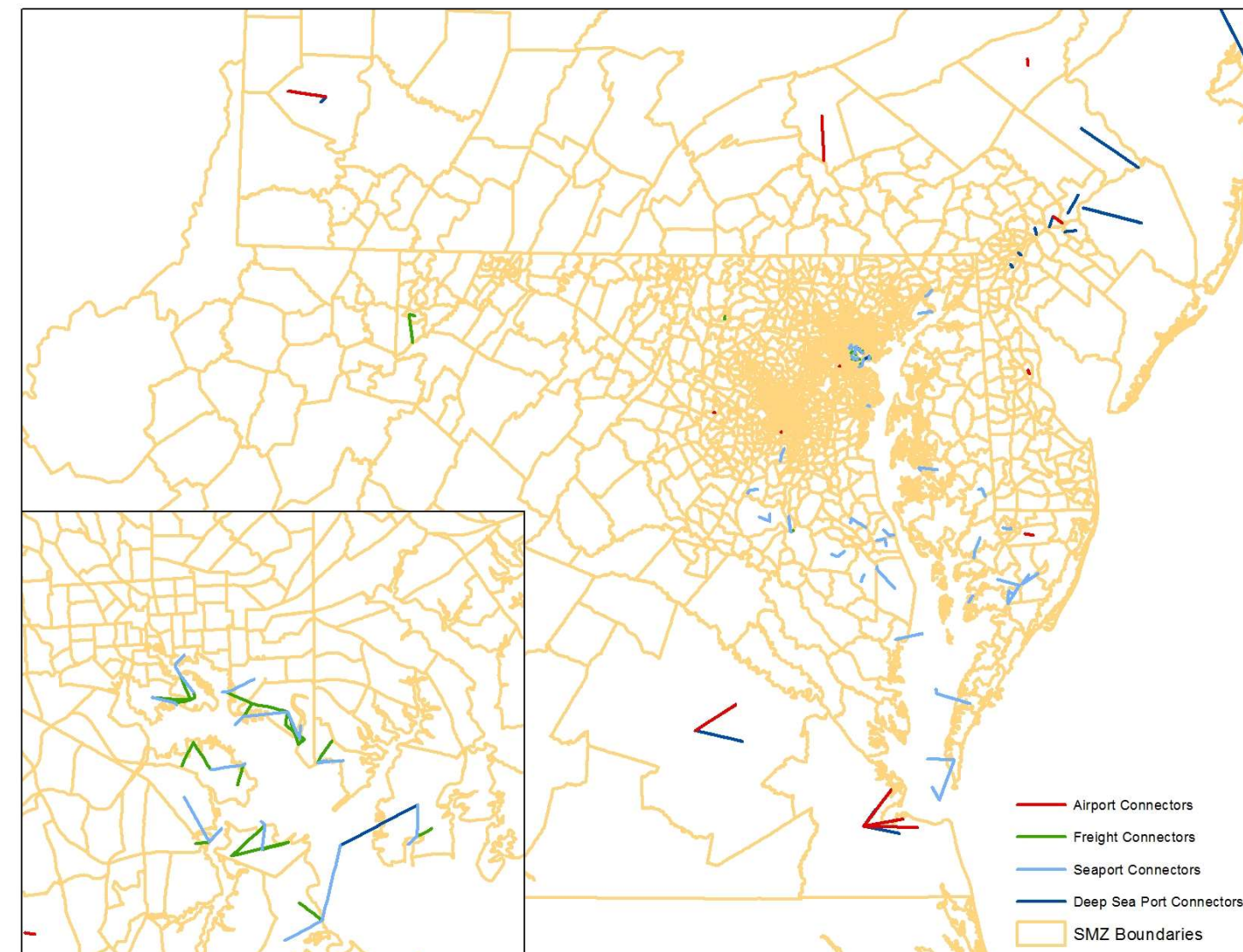
Seaports and Freight Terminals



# C20 INPUT DATA



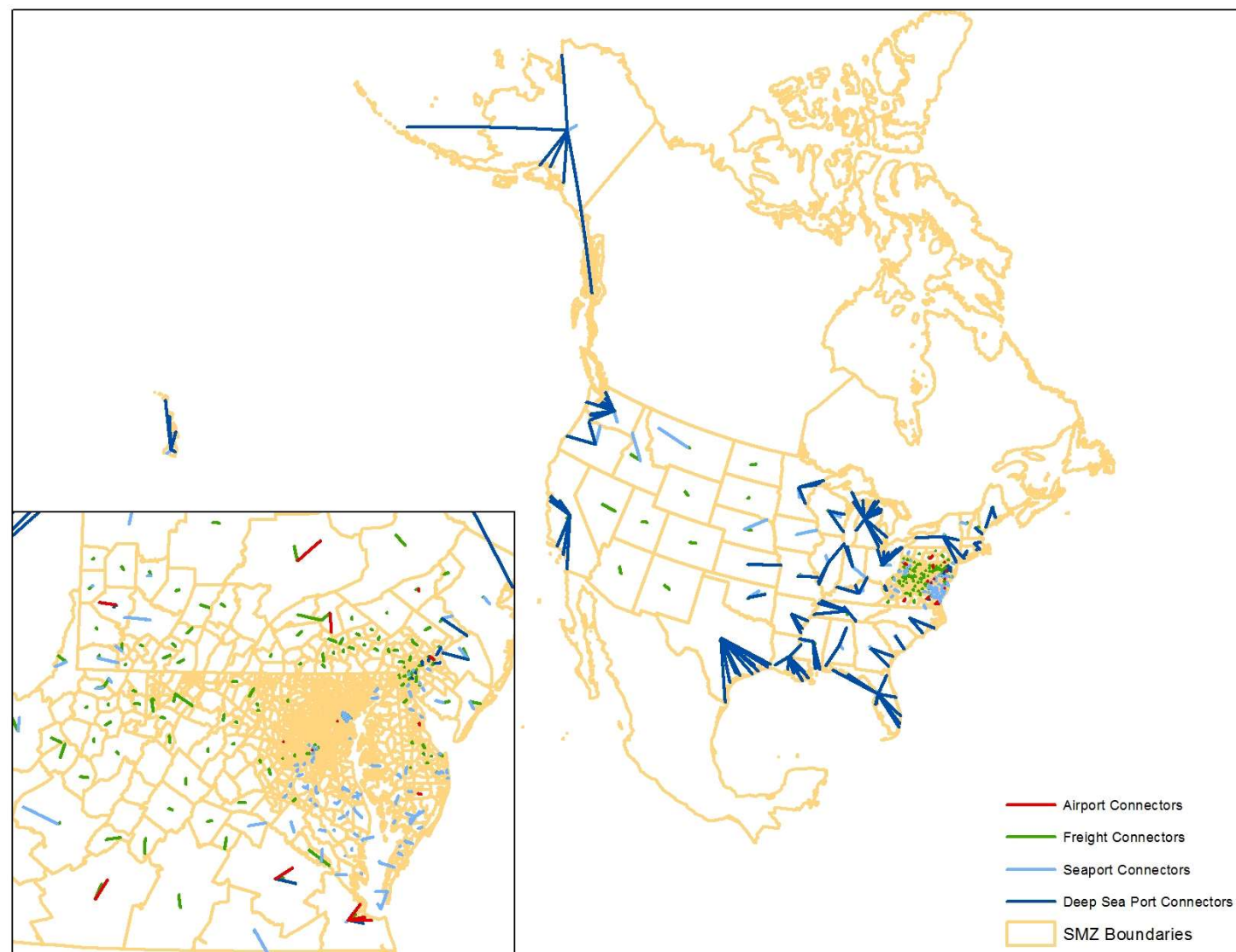
**Zone Centroid to Network Connectors US**



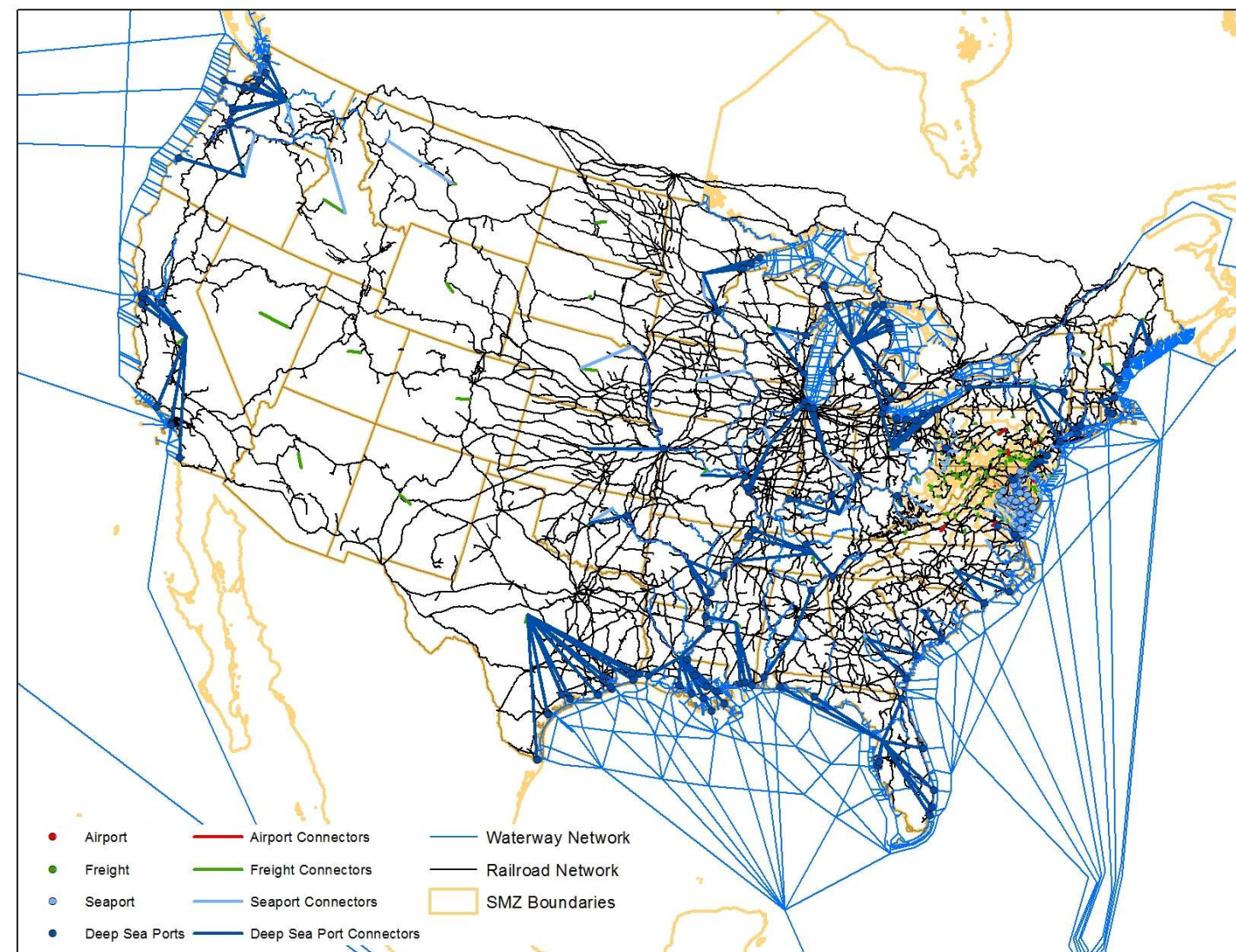
**Intermodal Facility to Zone Centroid to Network Connectors Maryland**



# C20 INPUT DATA



All Network Connectors



Final Freight Network

# DATA DEVELOPMENT SUMMARY

## National data for model inputs

- Firm locations from CBP
- I/O data from BEA
- Commodity flow data from FAF
- Shipment data from CFS
  - Modal networks

## Borrowed data for model estimation, calibration and validation

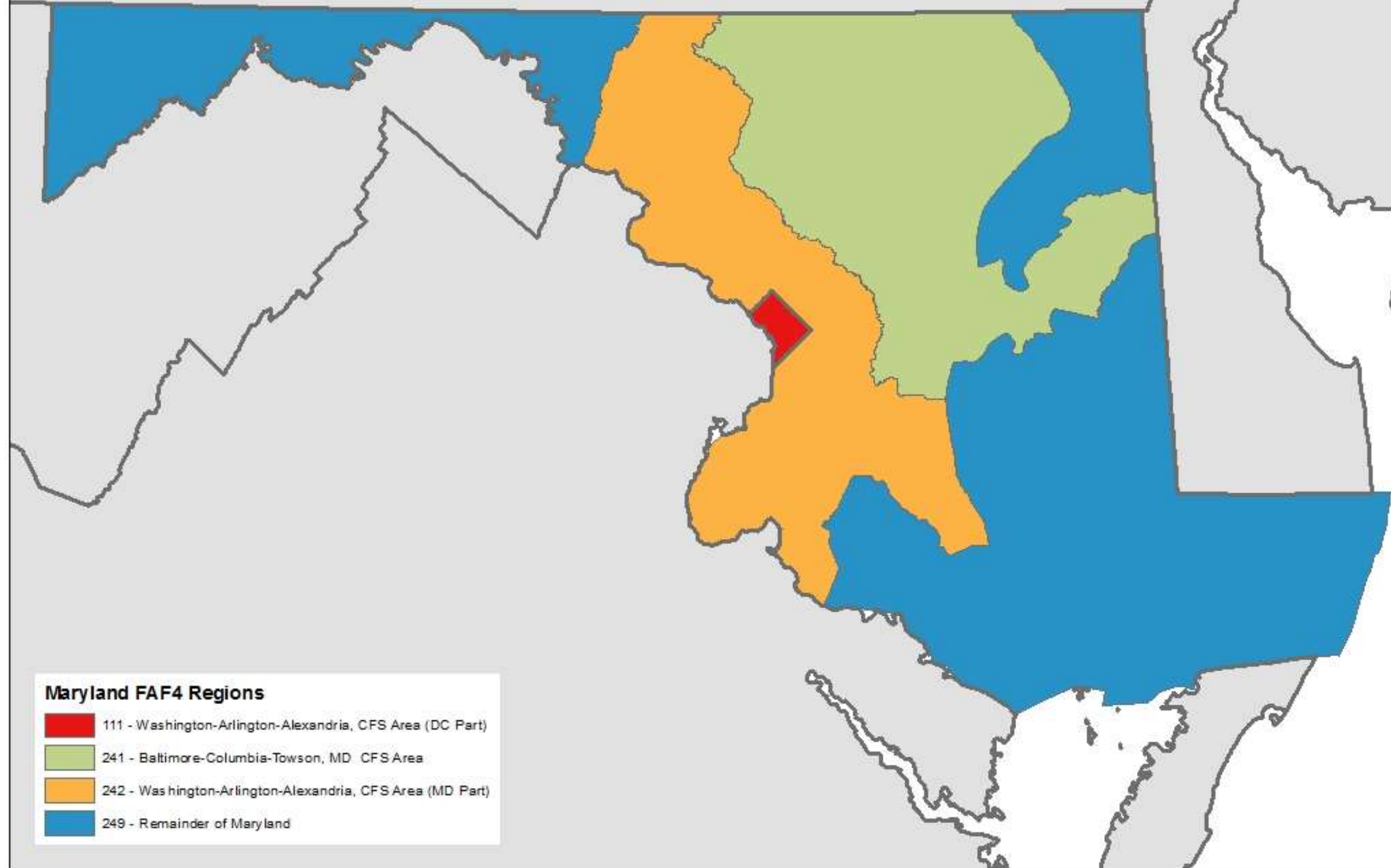
- Ohio establishment data
- Texas establishment data (previously used to estimate models)

## Local data for model inputs, calibration, validation:

- Model highway networks
- ATRI GPS data for MD
  - Traffic counts
- Distribution and intermodal center location data

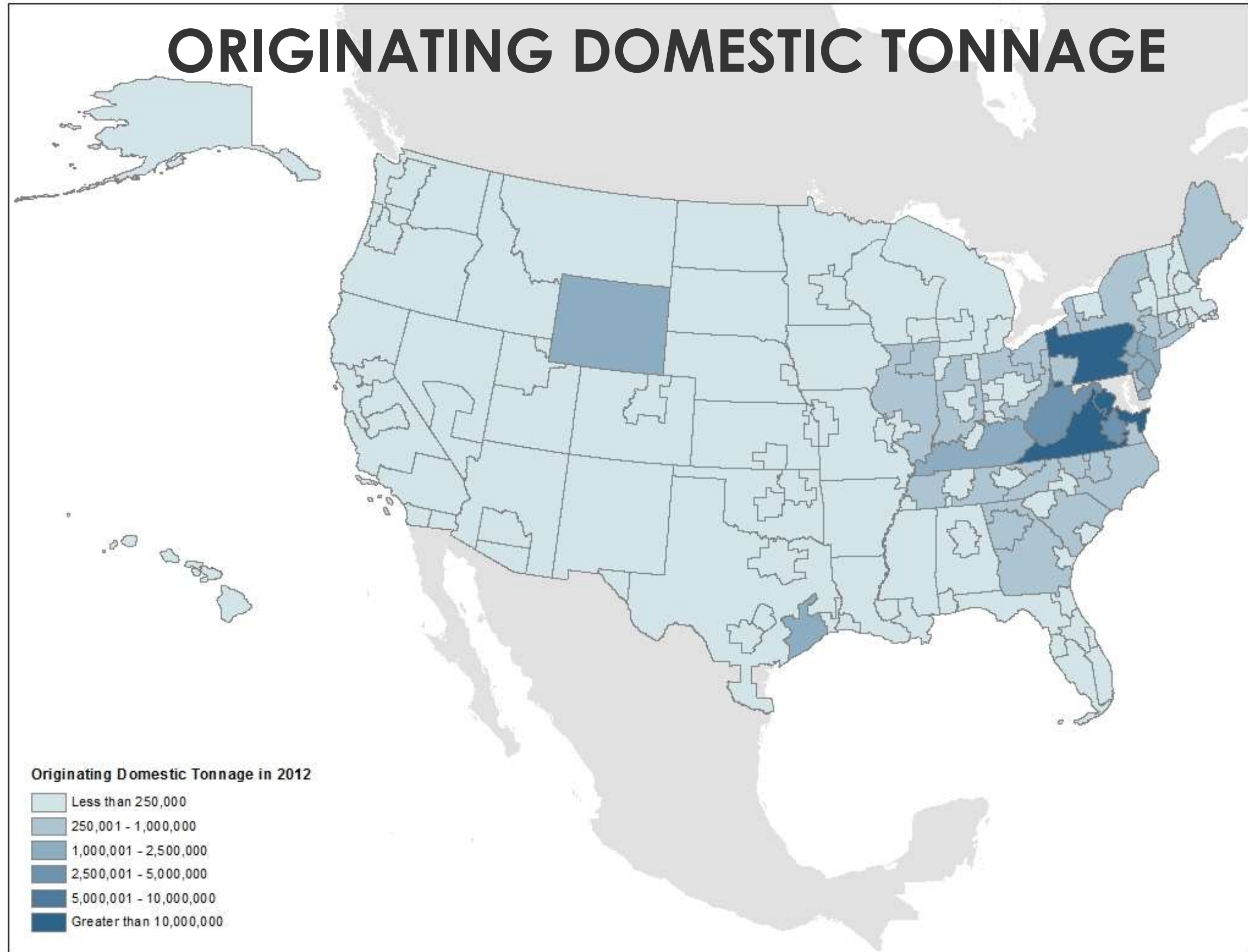


# FAF ZONAL STRUCTURE IN MARYLAND

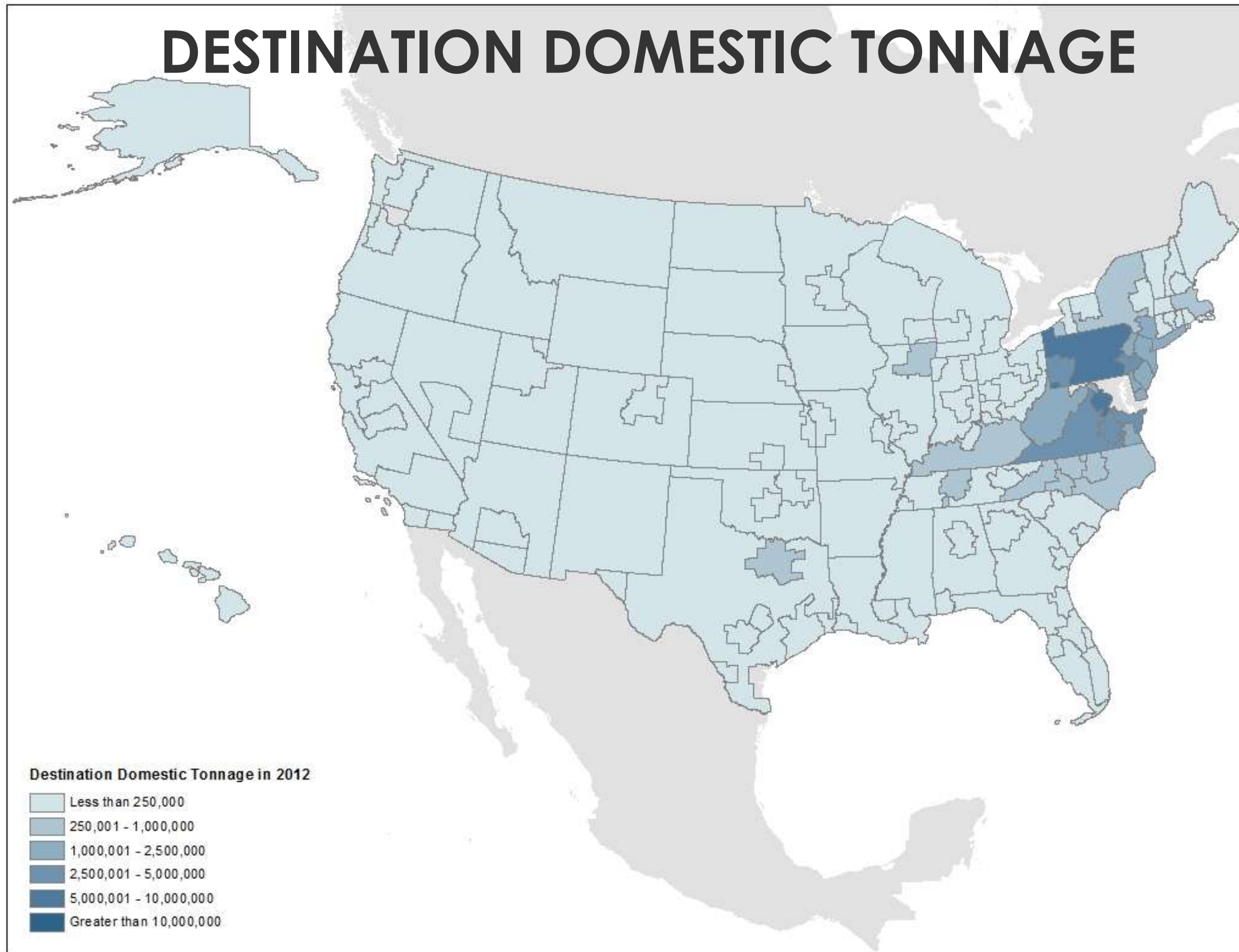




# ORIGINATING DOMESTIC TONNAGE



# DESTINATION DOMESTIC TONNAGE



THE EASTERN  
TRANSPORTATION  
COALITION

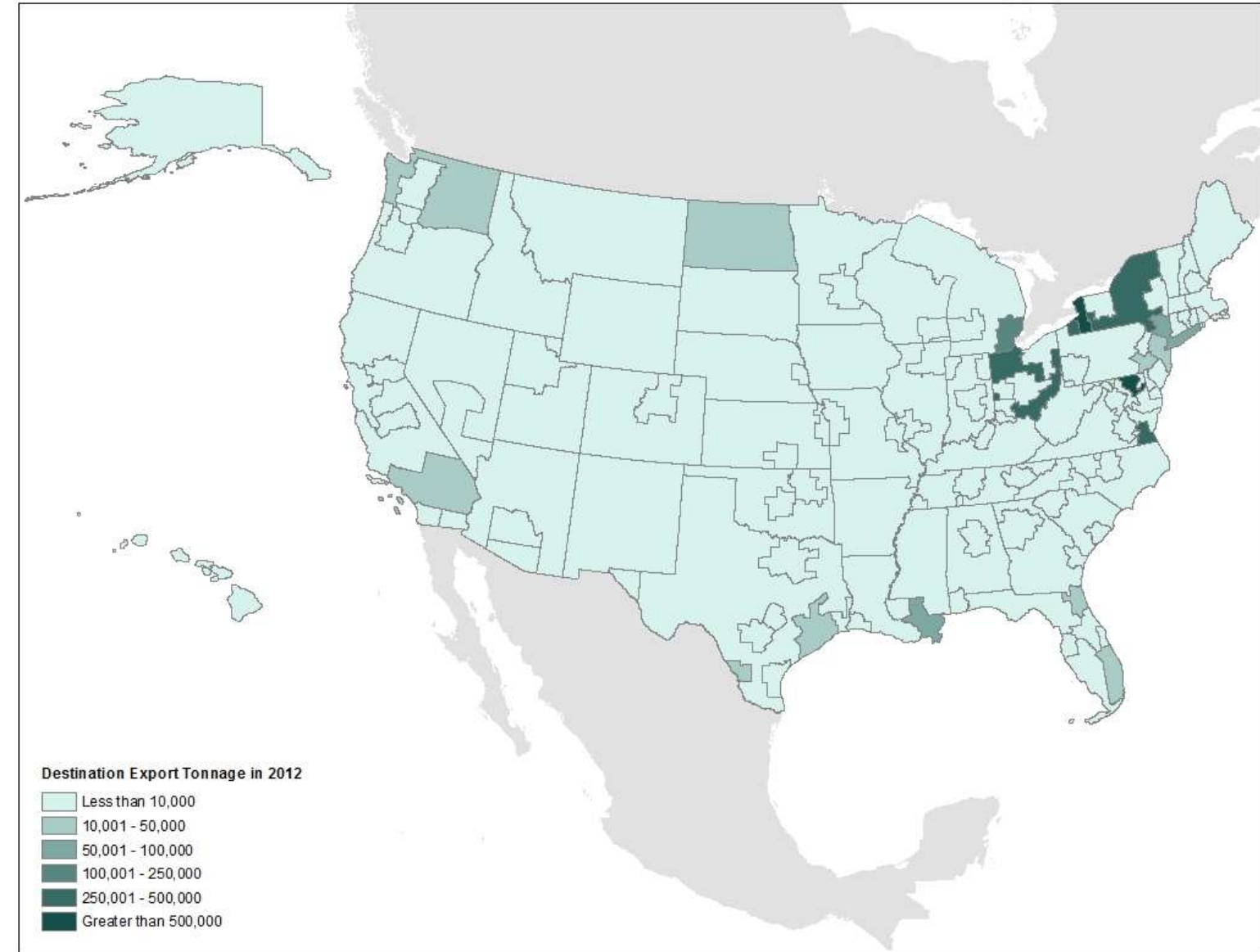
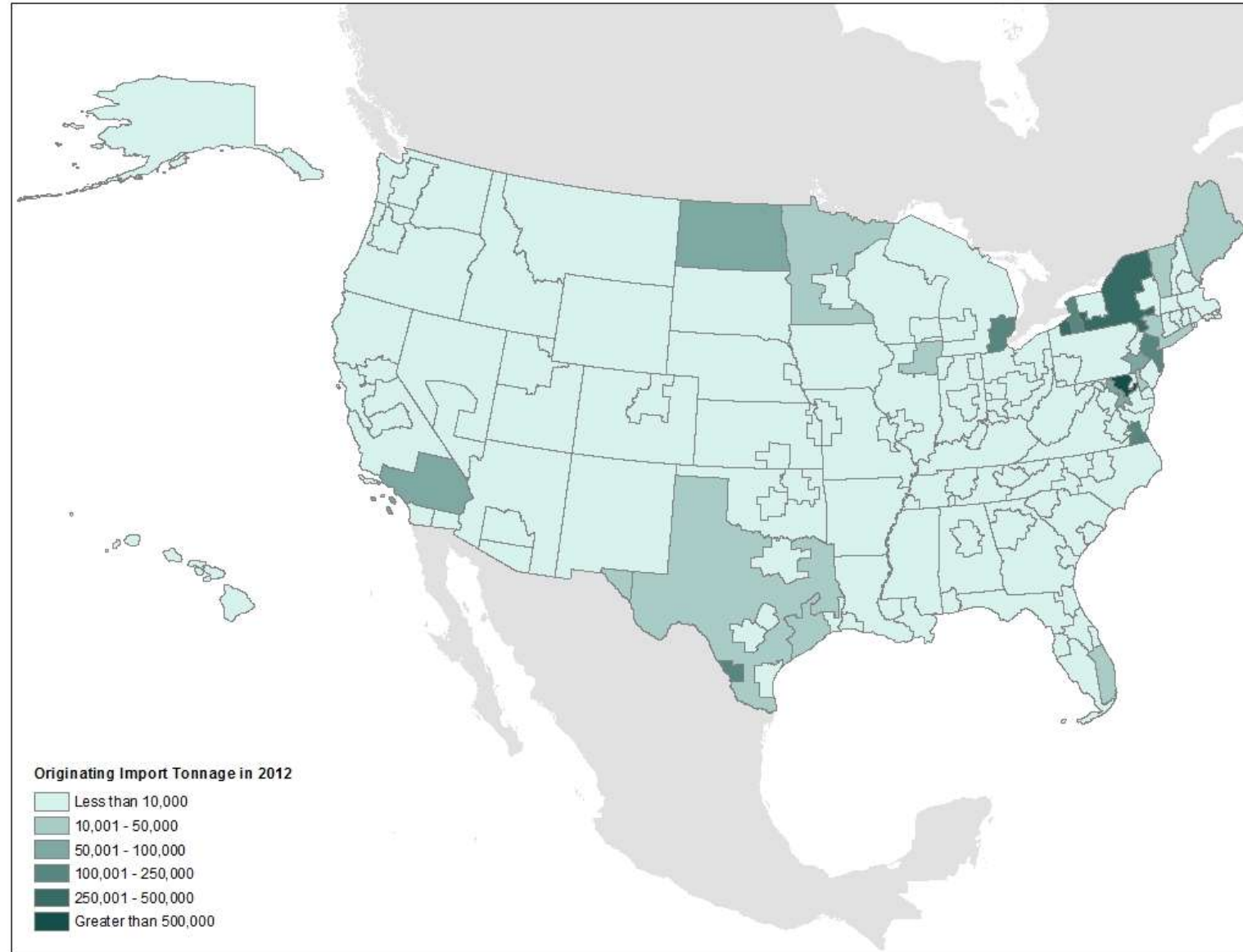


**MDOT**  
MARYLAND DEPARTMENT  
OF TRANSPORTATION

STATE HIGHWAY  
ADMINISTRATION



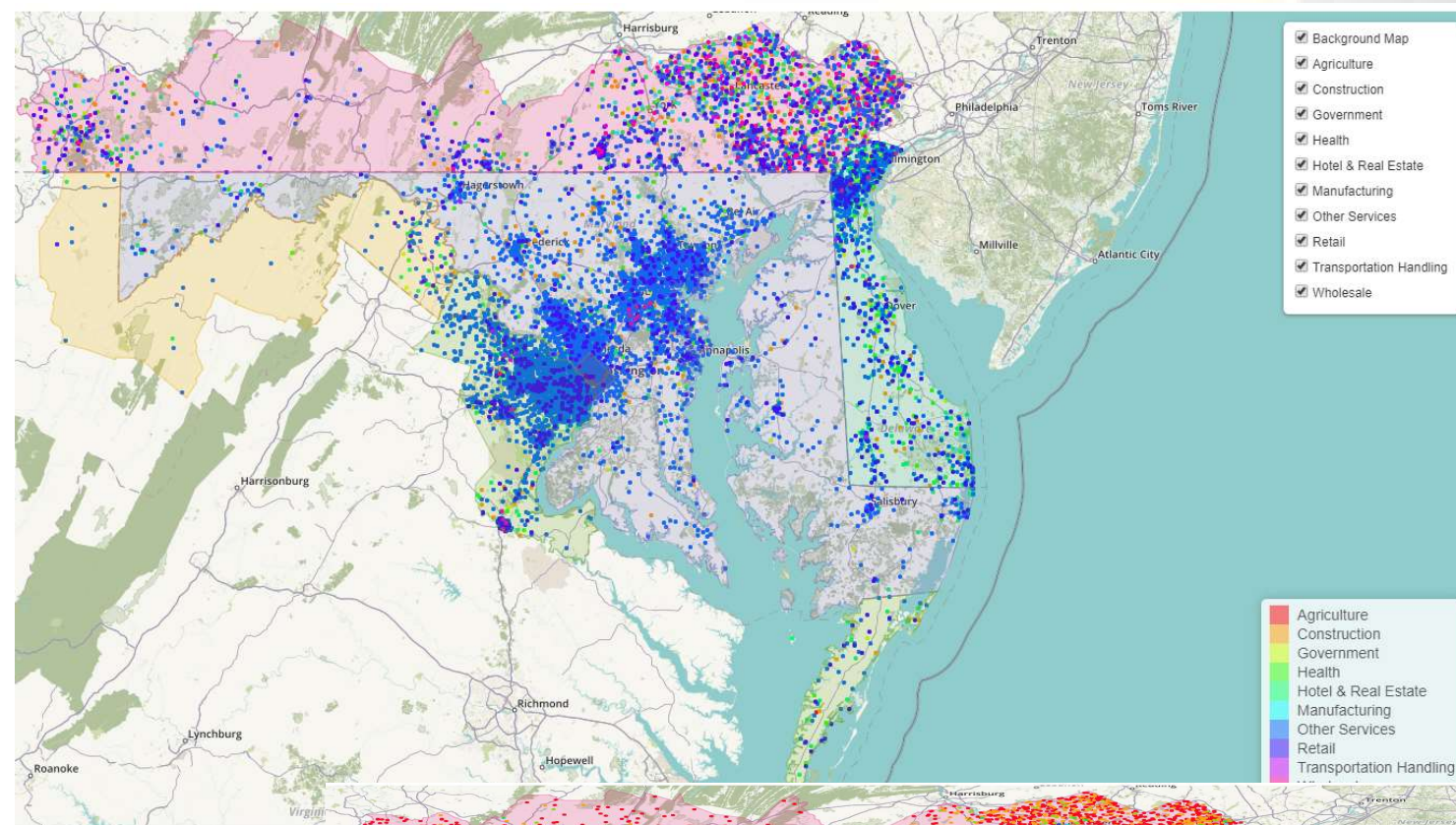
# ORIGINATING IMPORT AND DESTINATION EXPORT TONNAGE



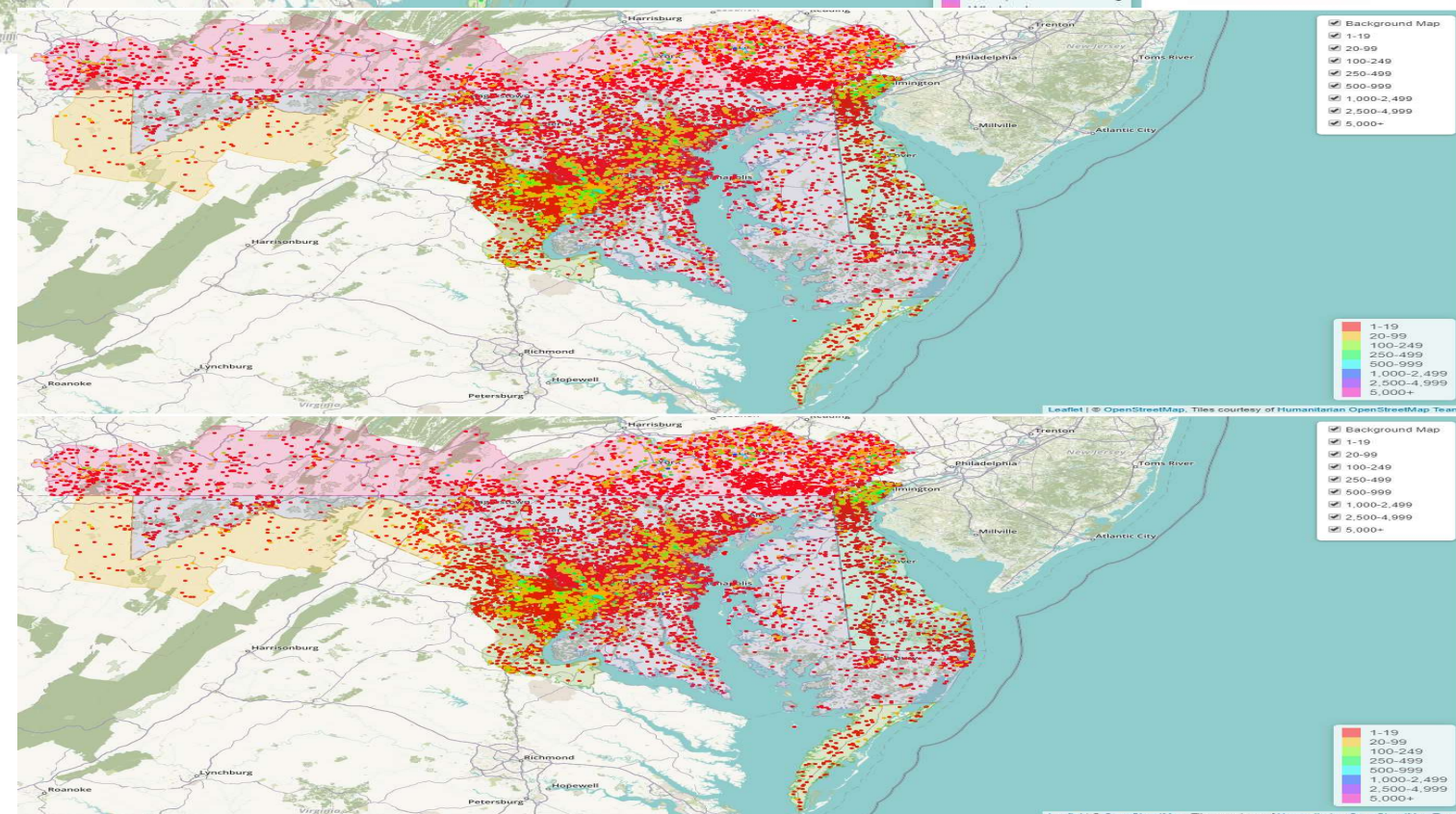


# FIRM ALLOCATION

By industry

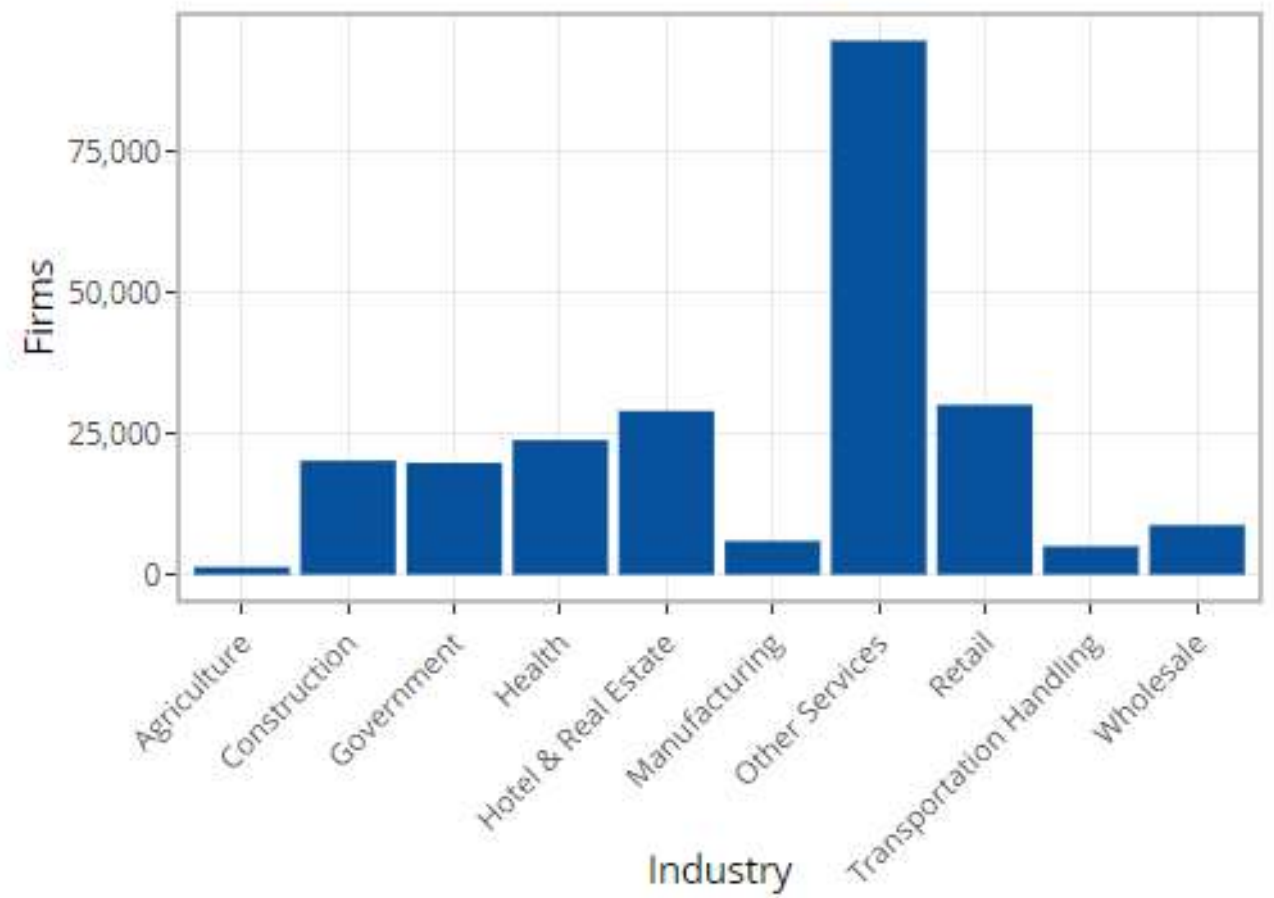


By size

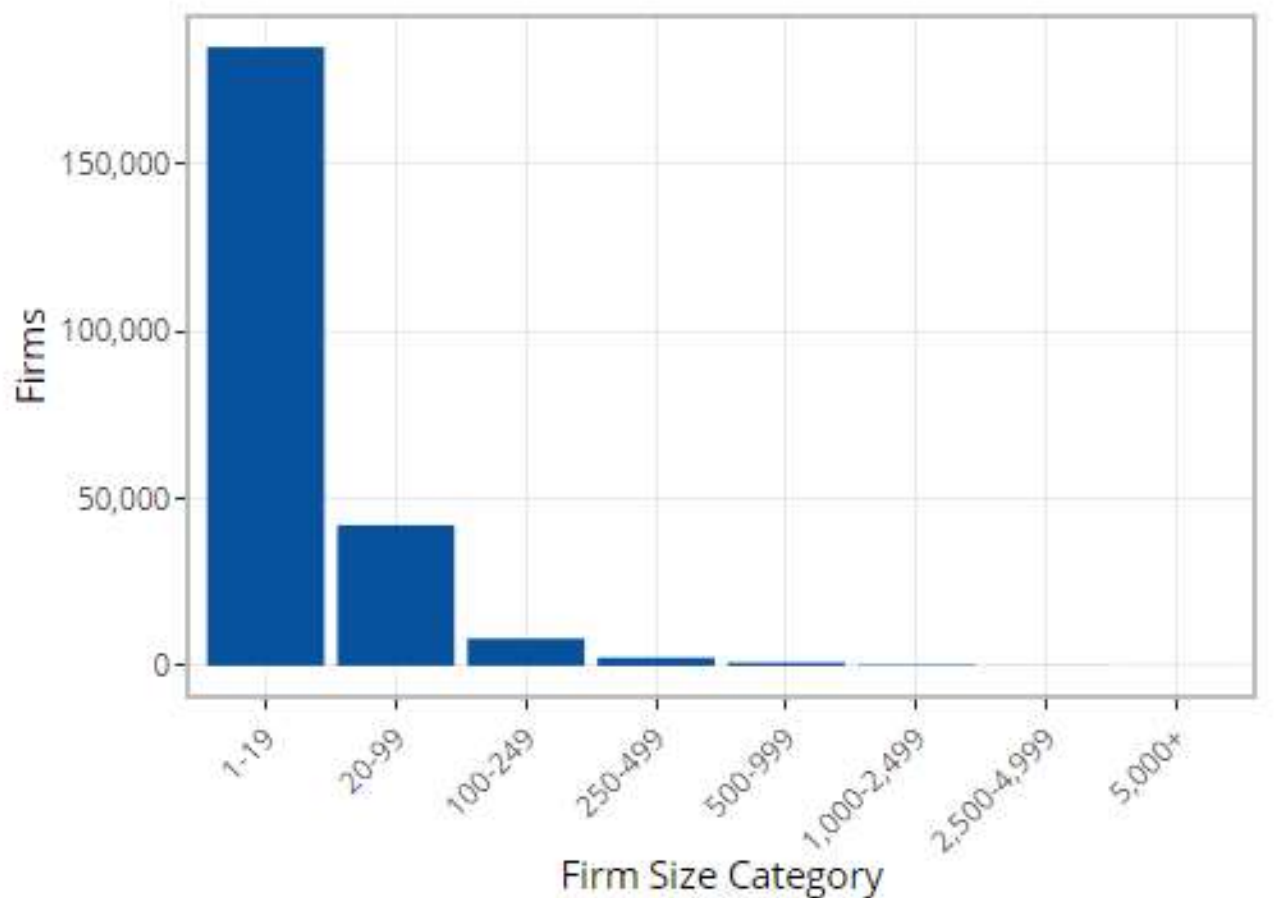


# FIRM ALLOCATION-SUMMARY

Firms by Industry



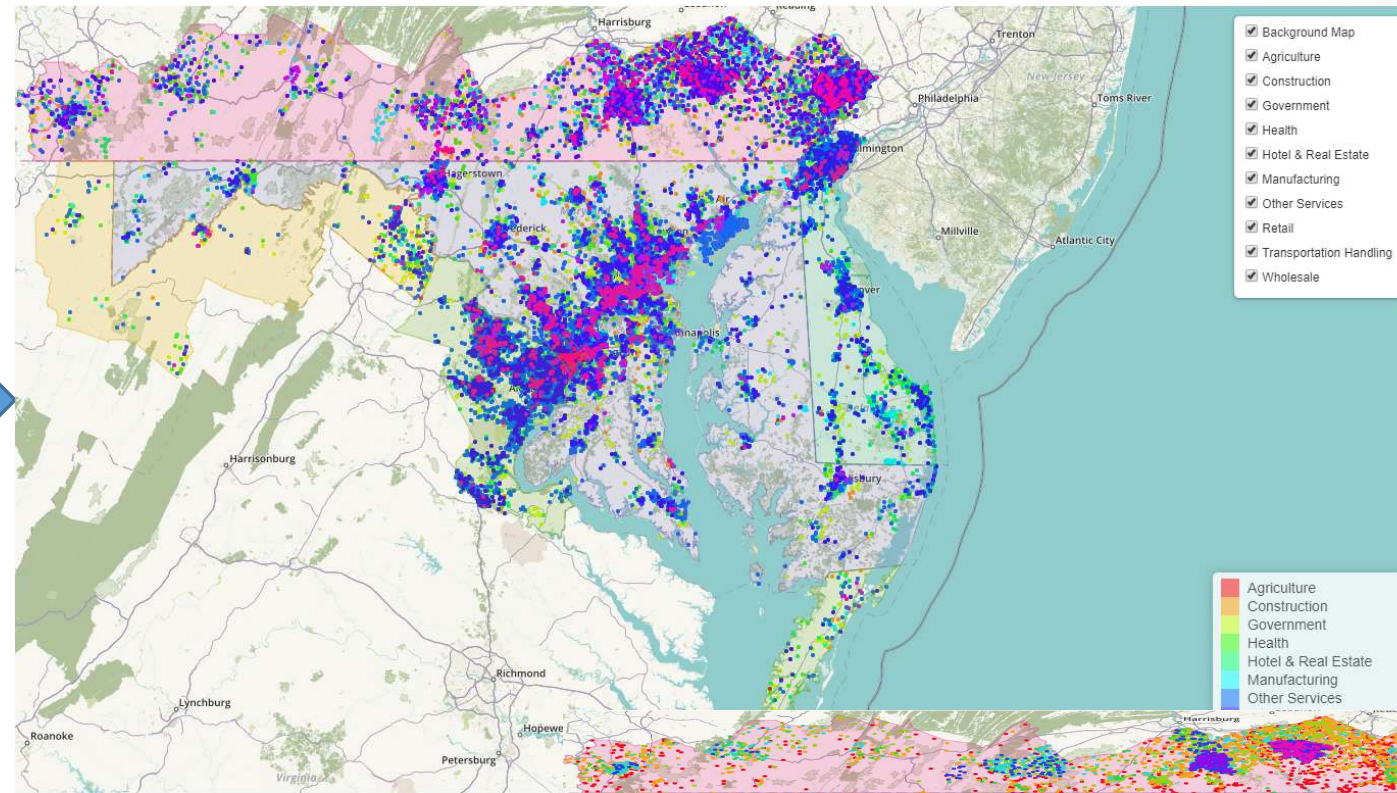
Firms by Size



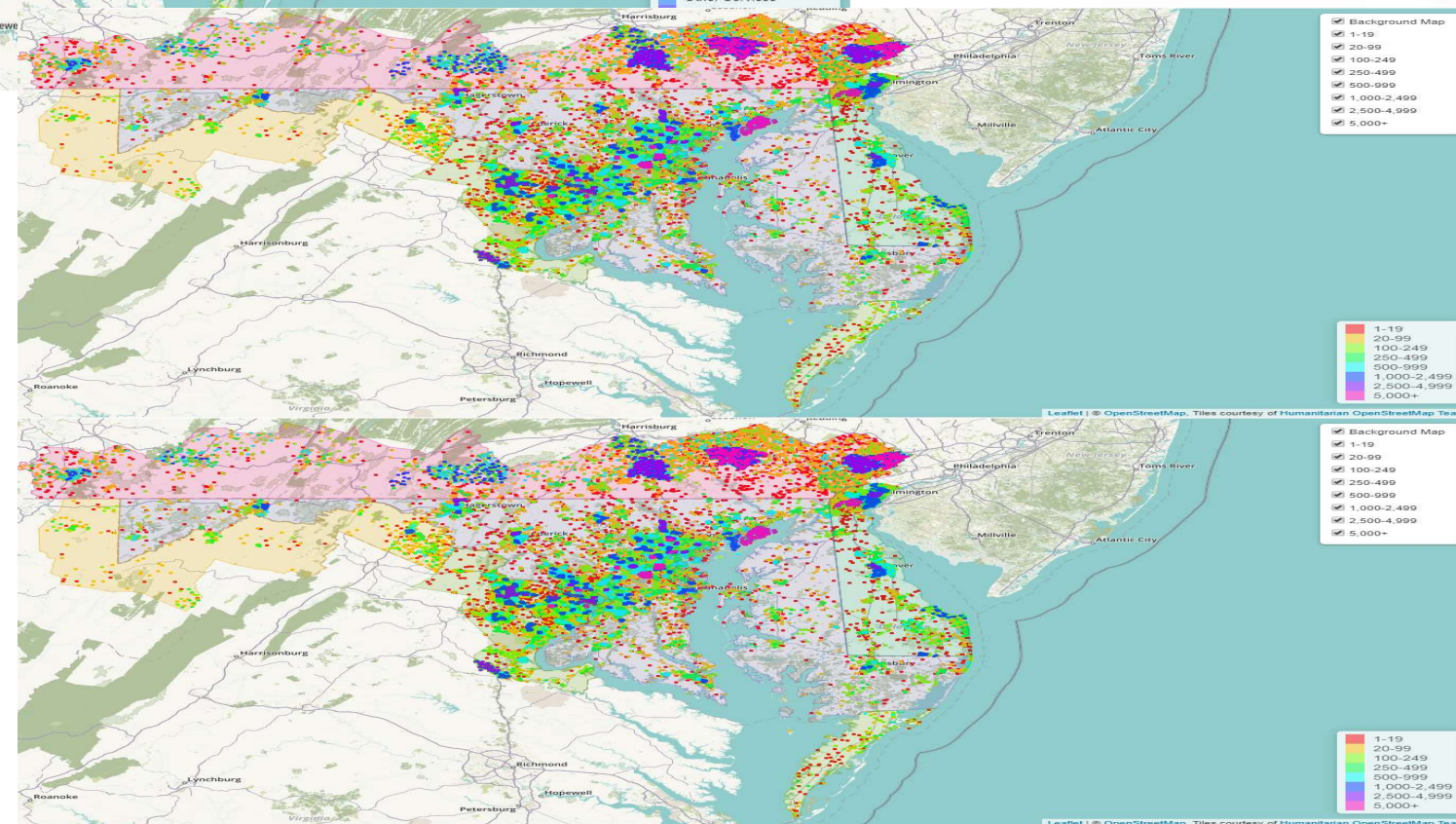


# EMPLOYMENT ALLOCATION

By industry

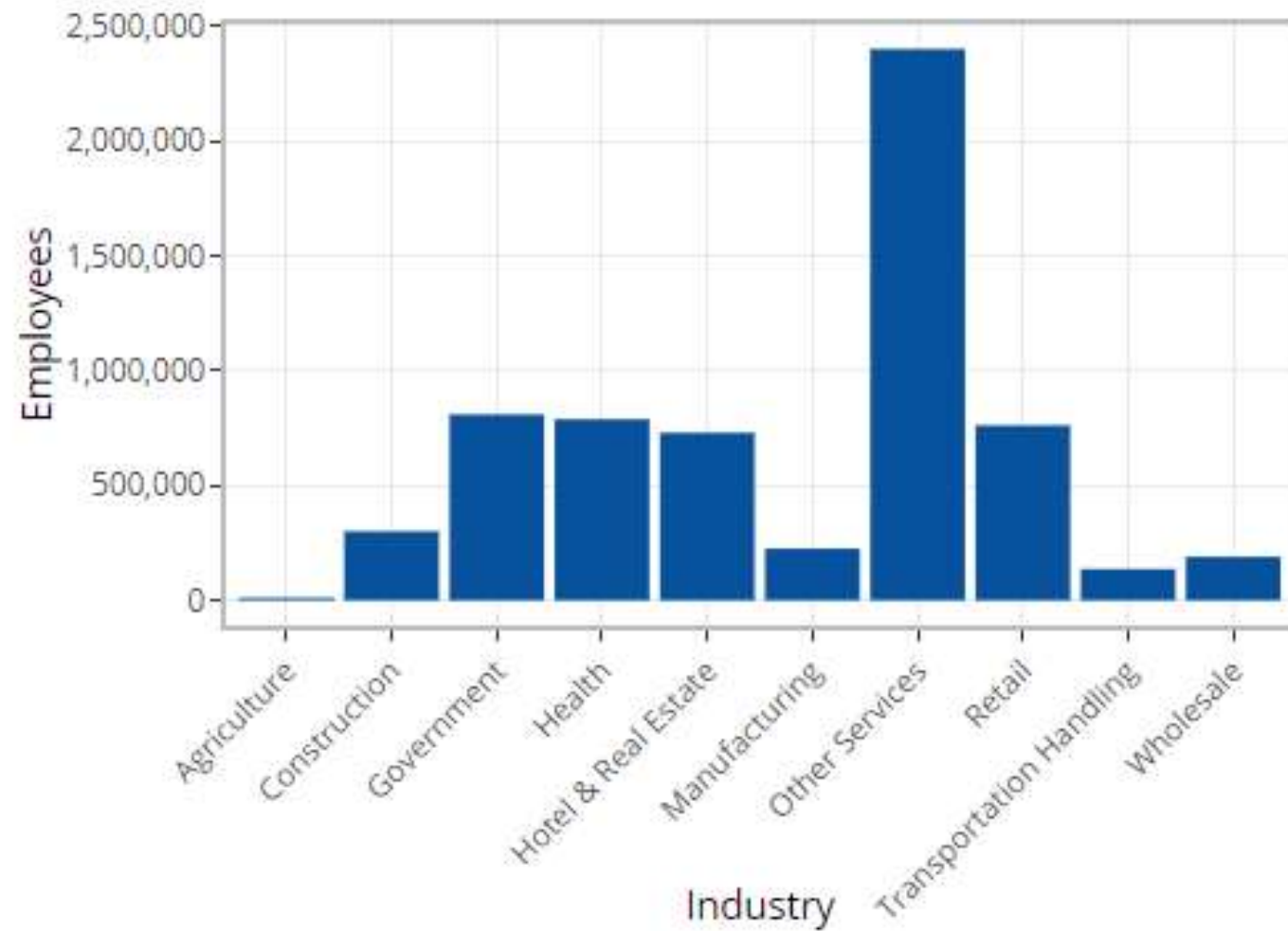


By size

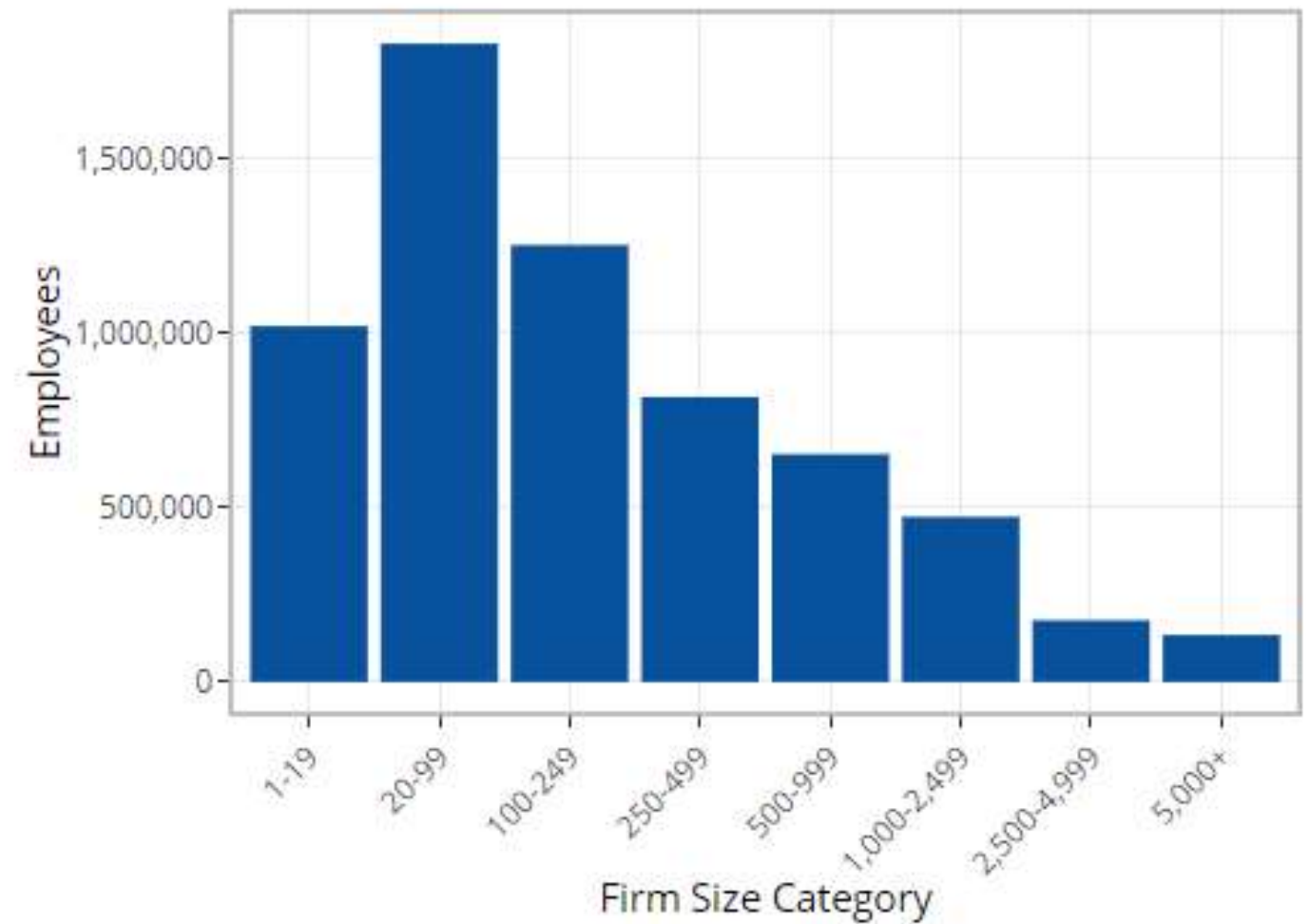


# EMPLOYEE ALLOCATION-SUMMARY

Employment by Industry

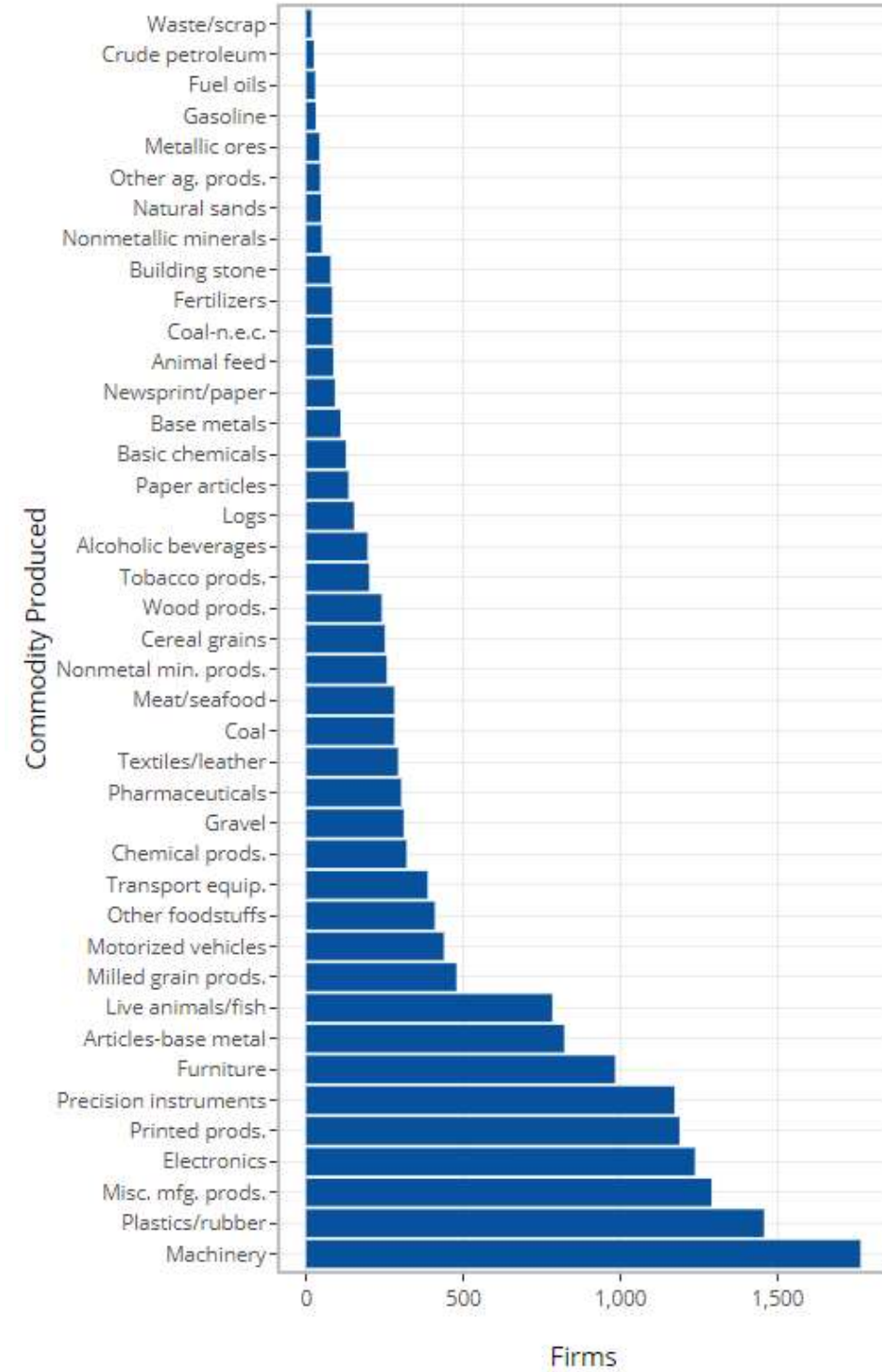
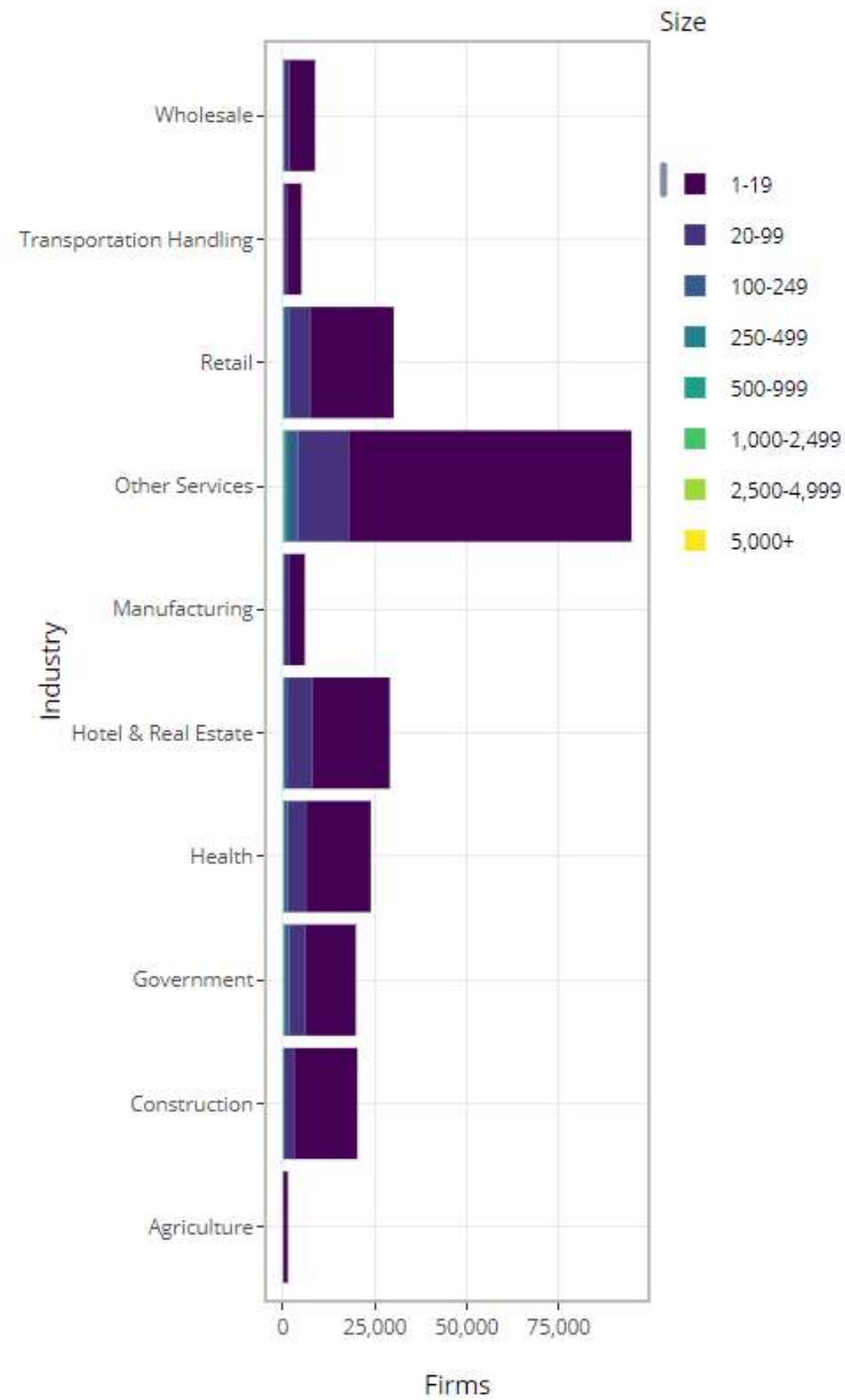


Employment by Size



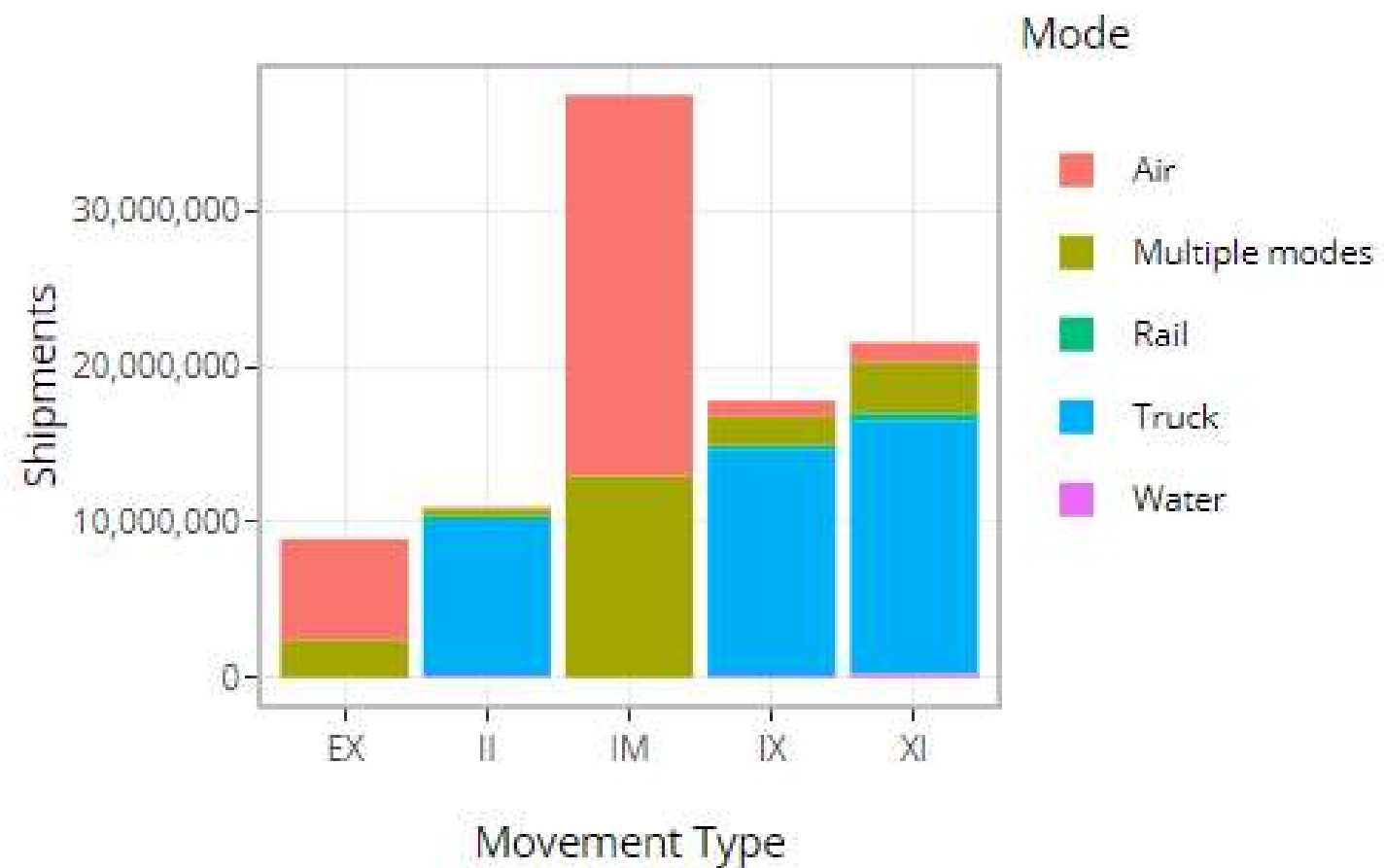


# COMMODITIES PRODUCED BY INDUSTRY

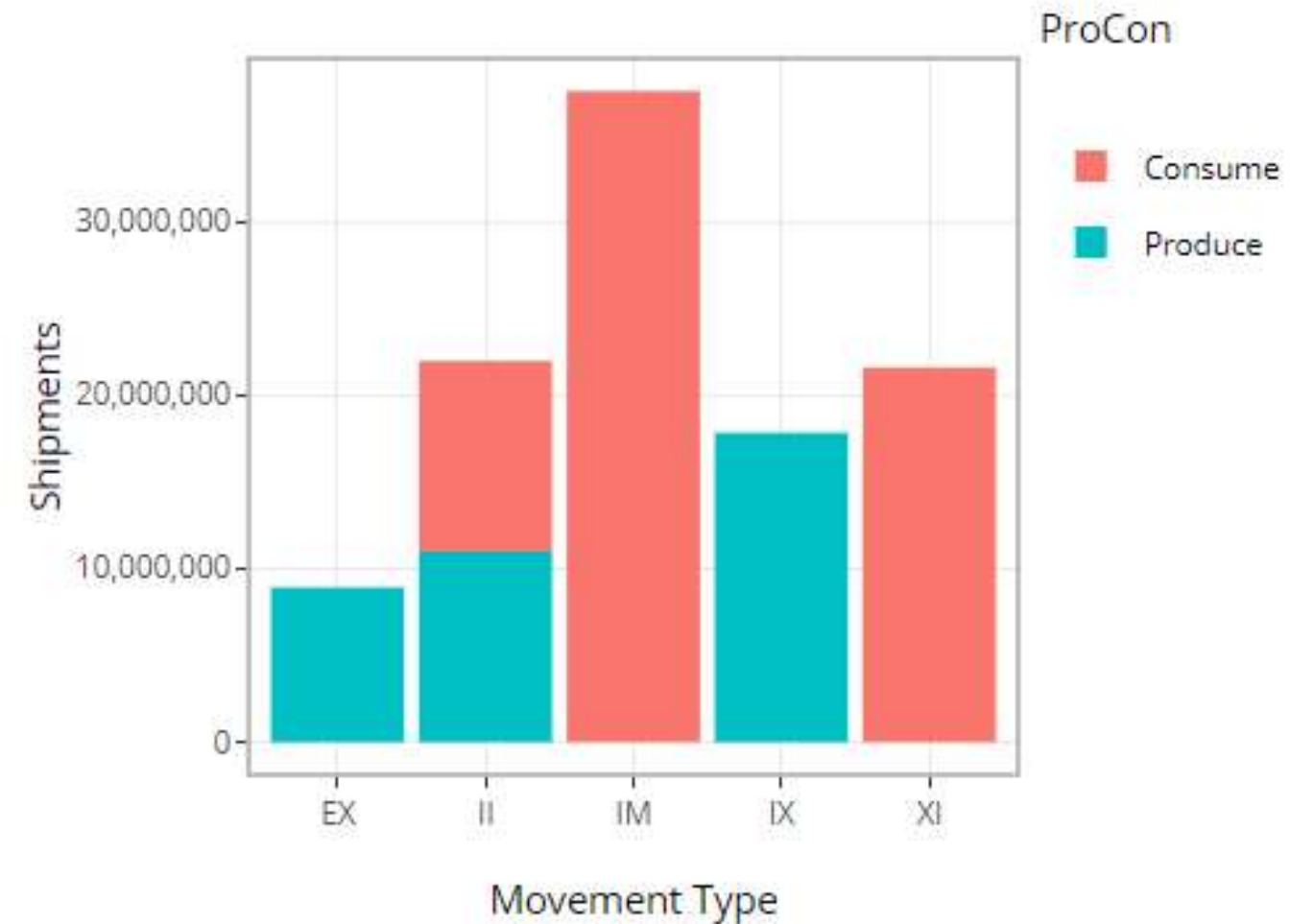


# MOVEMENT TYPE AND MODE

Movement Type and Mode



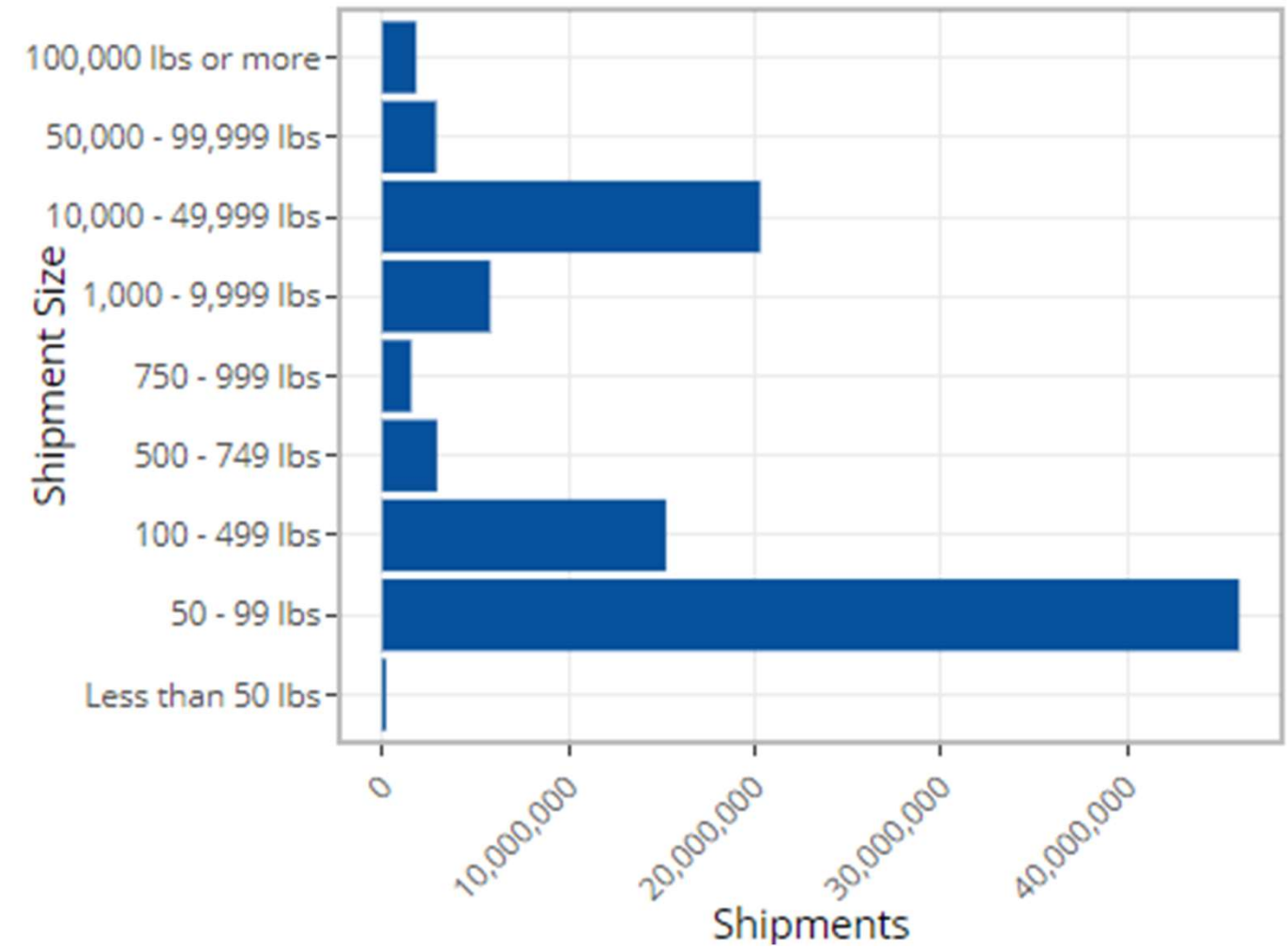
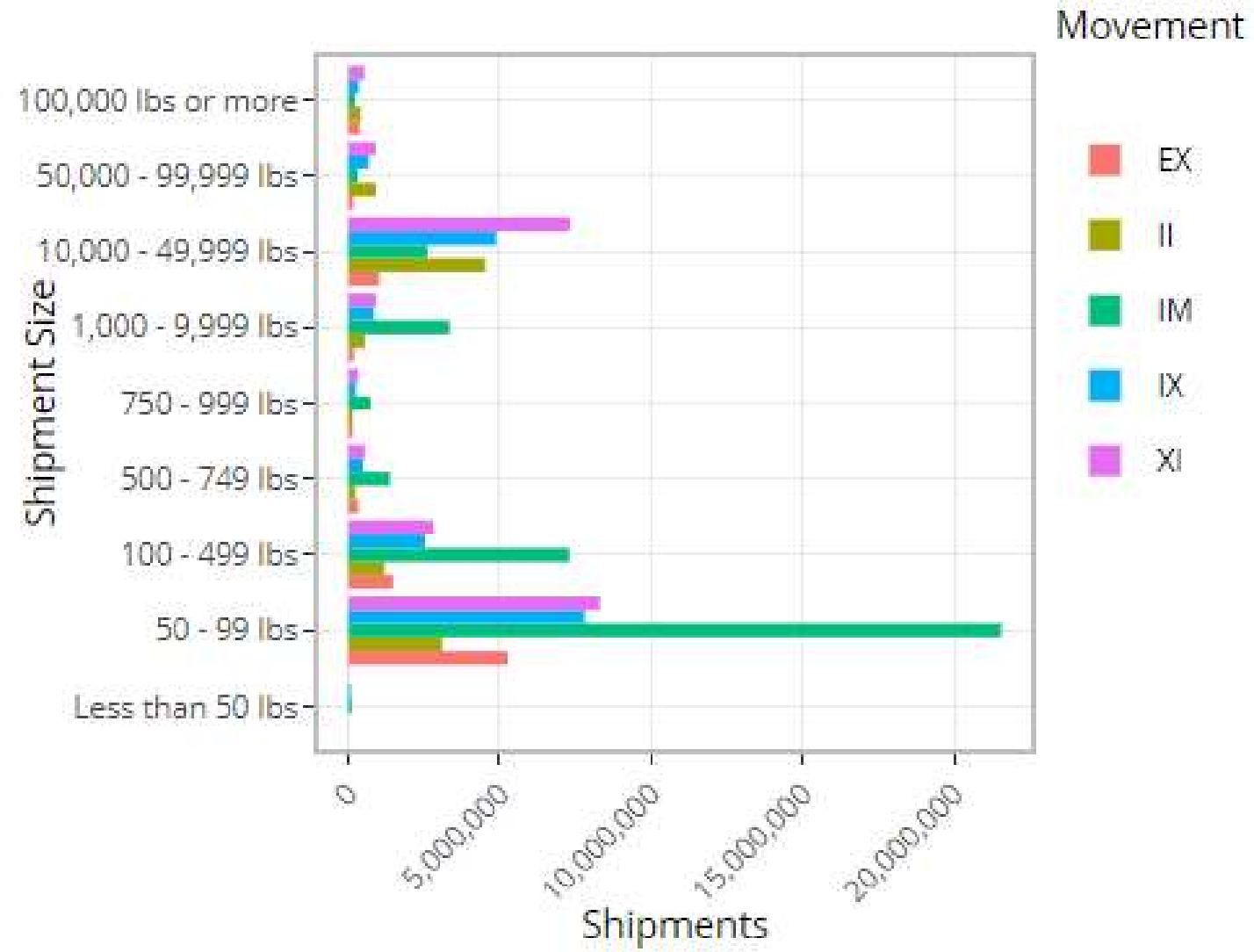
Note: "Mode" refers to the mode of the long distance movement.



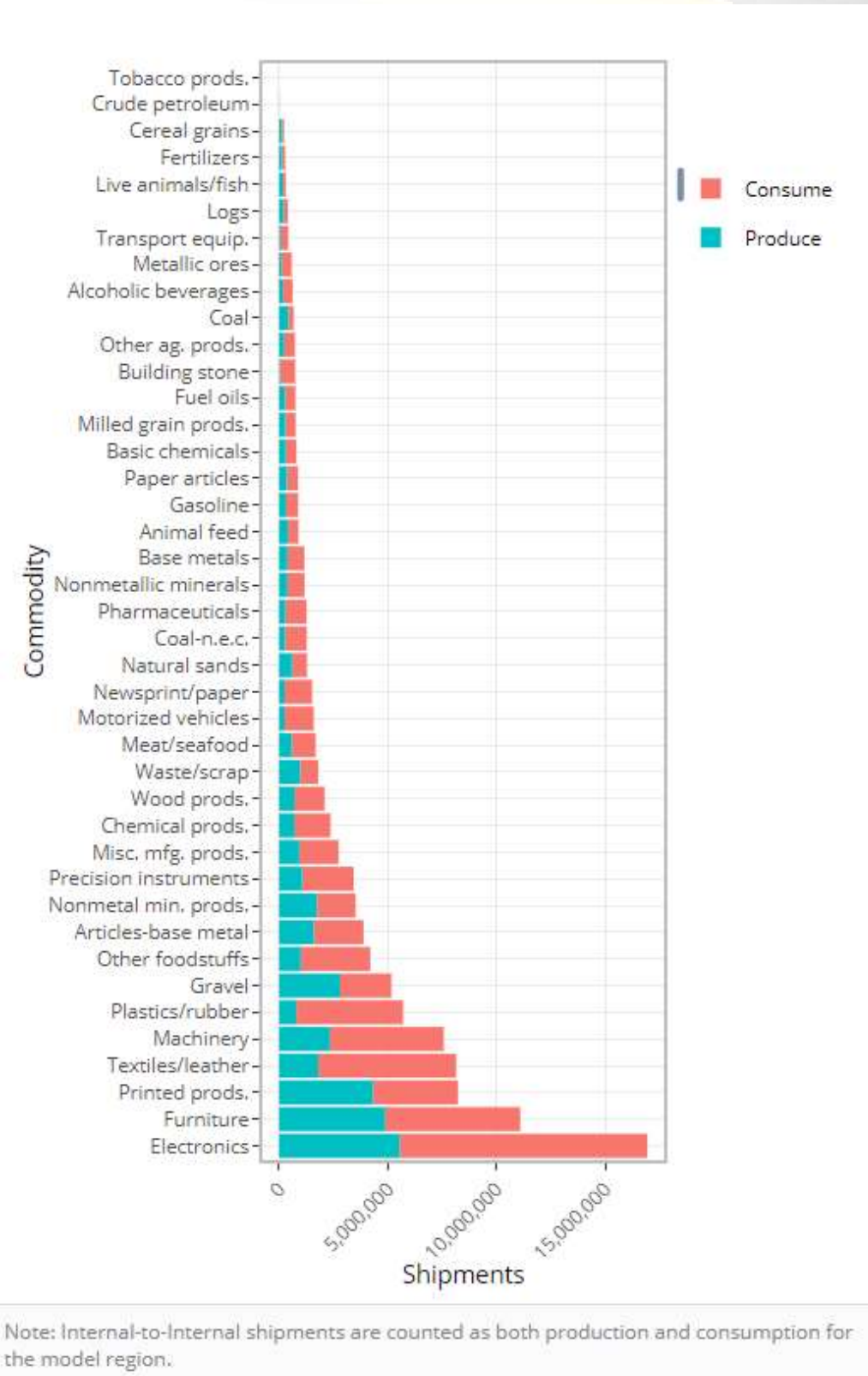
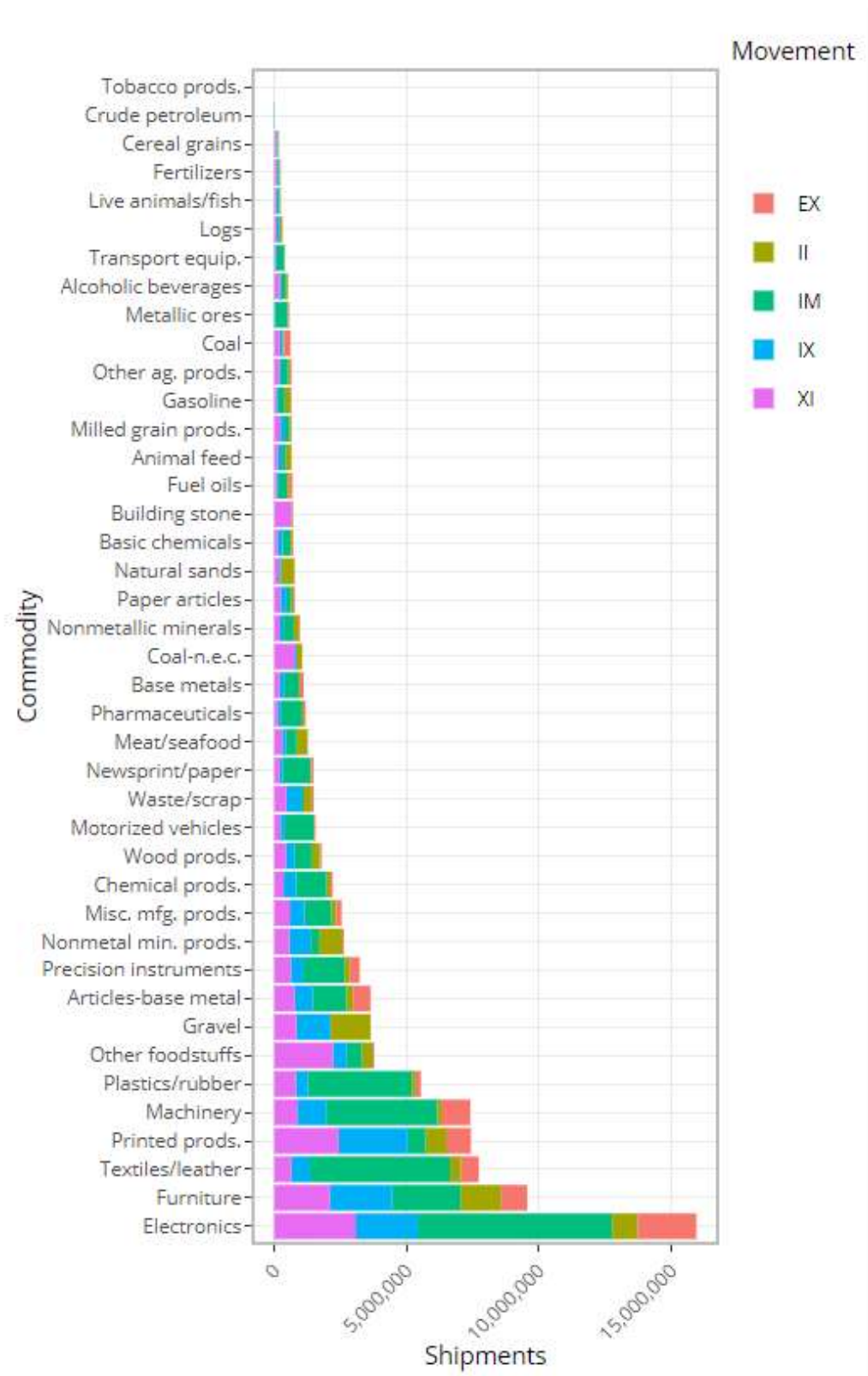
Note: Internal-to-Internal shipments are counted as both production and consumption for the model region.



# SHIPMENTS AND SHIPMENT SIZE



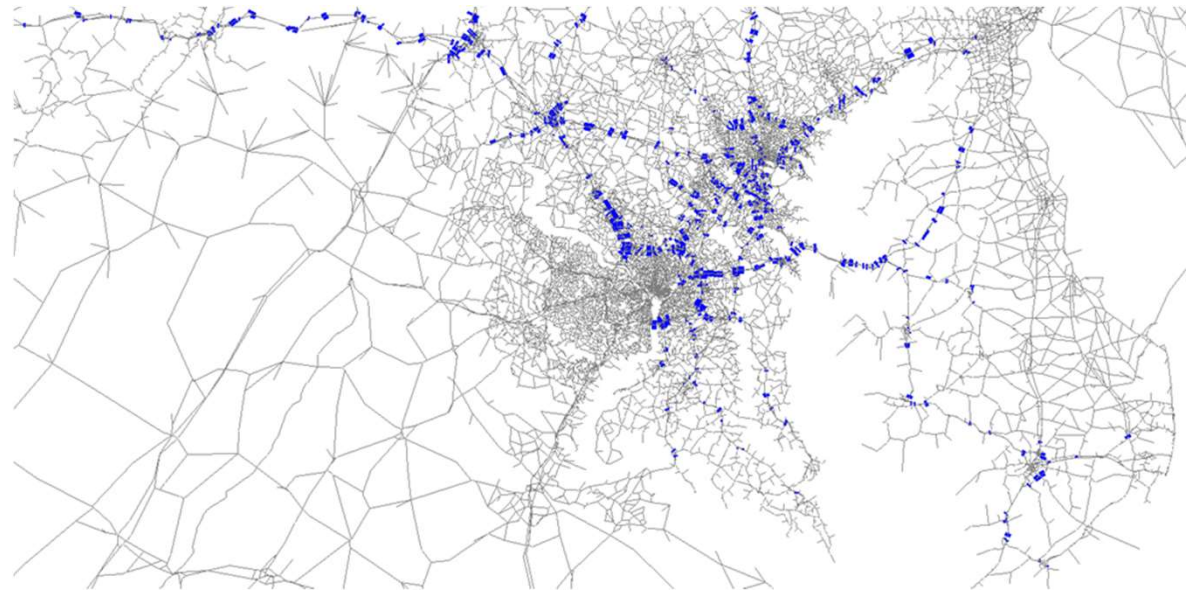
# COMMODITY AND MOVEMENT TYPE



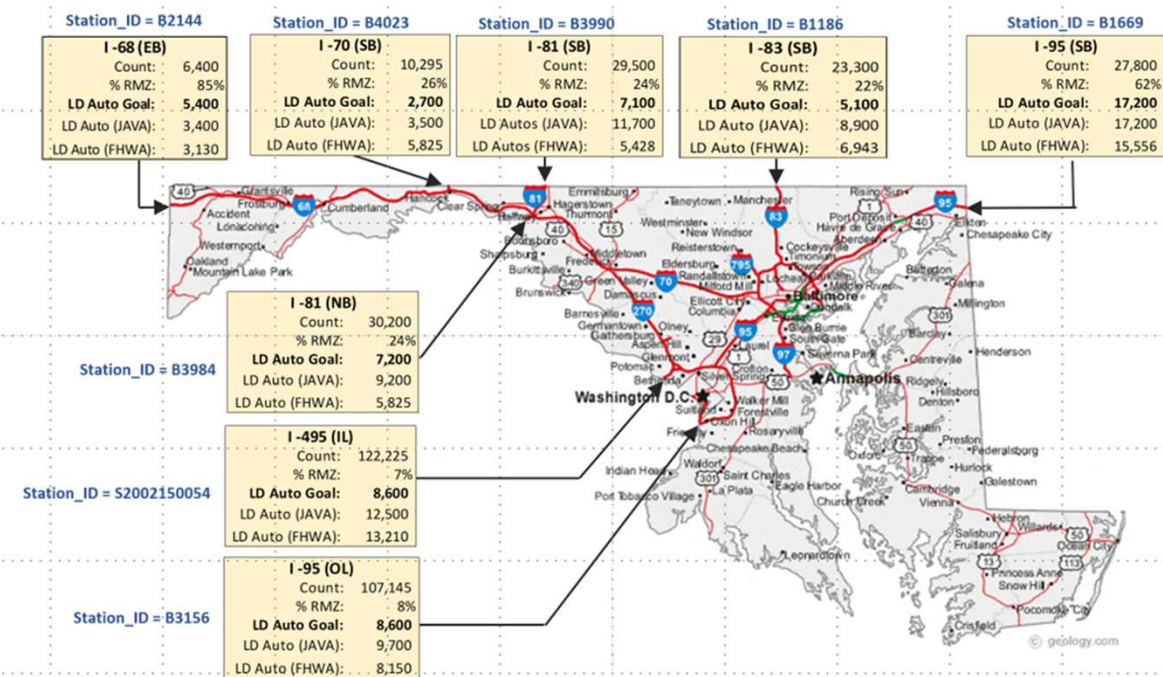
Note: Internal-to-Internal shipments are counted as both production and consumption for the model region.

# VALIDATION (1)

## Count Data Locations



## Volume at entry/exit points



## VMT by Functional Class

Functional Class	Model VMT	Observed VMT	Difference	% Difference	Model Proportion VMT	Observed Proportion VMT
Interstates	160,717	164,375	(3,658)	-2%	70%	69%
Fwy+Exp+Maj. Arterials	61,871	66,628	(4,757)	-7%	27%	28%
Minor Arterials	8,625	8,587	38	0%	4%	4%

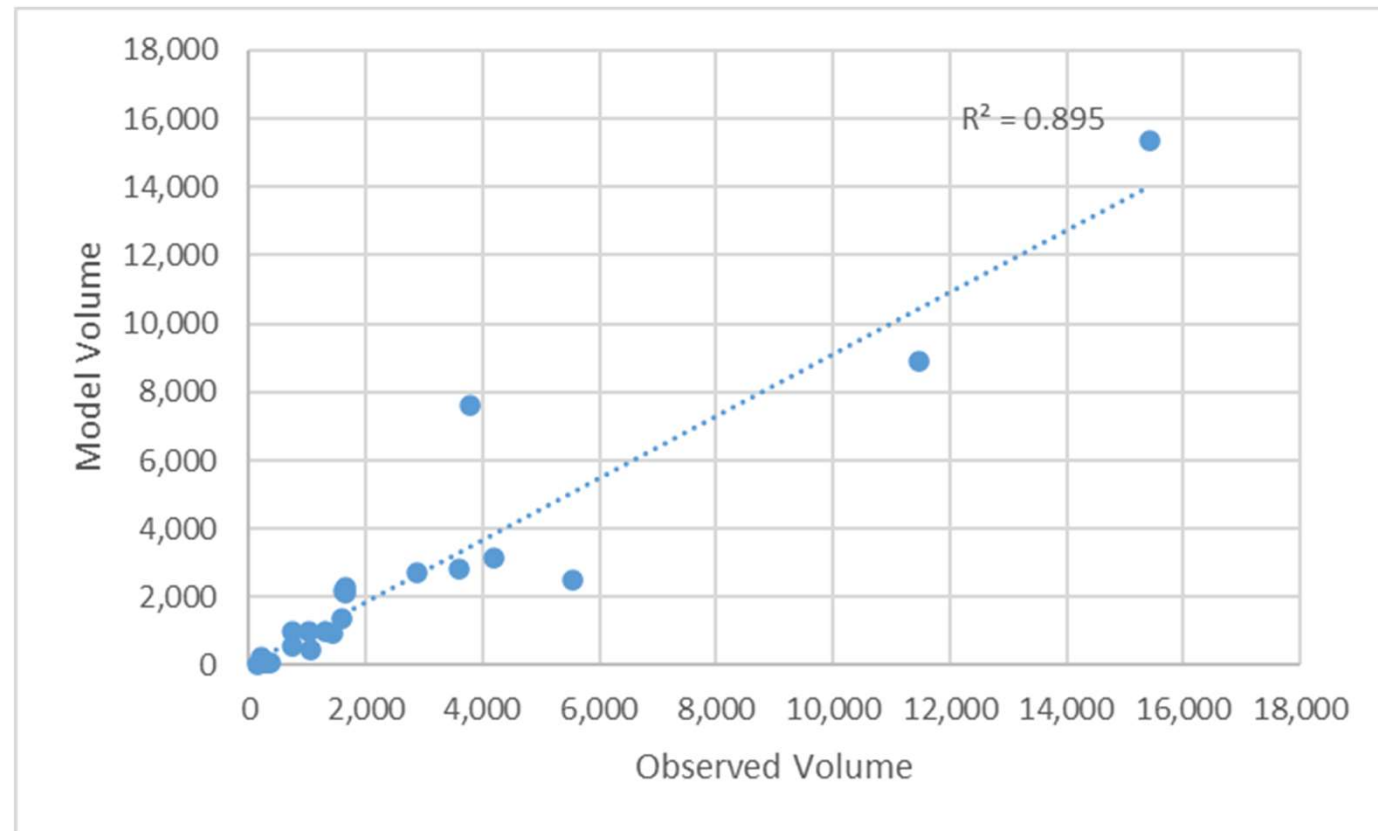
## VMT by Area Type

Area Type	Model VMT	Observed VMT	Difference	% Difference	Model Proportion VMT	Observed Proportion VMT
Rural	77,926	76,300	1,626	2%	33%	31%
Suburban	120,840	135,133	(14,293)	-11%	51%	55%
Urban	36,651	35,709	942	3%	16%	14%

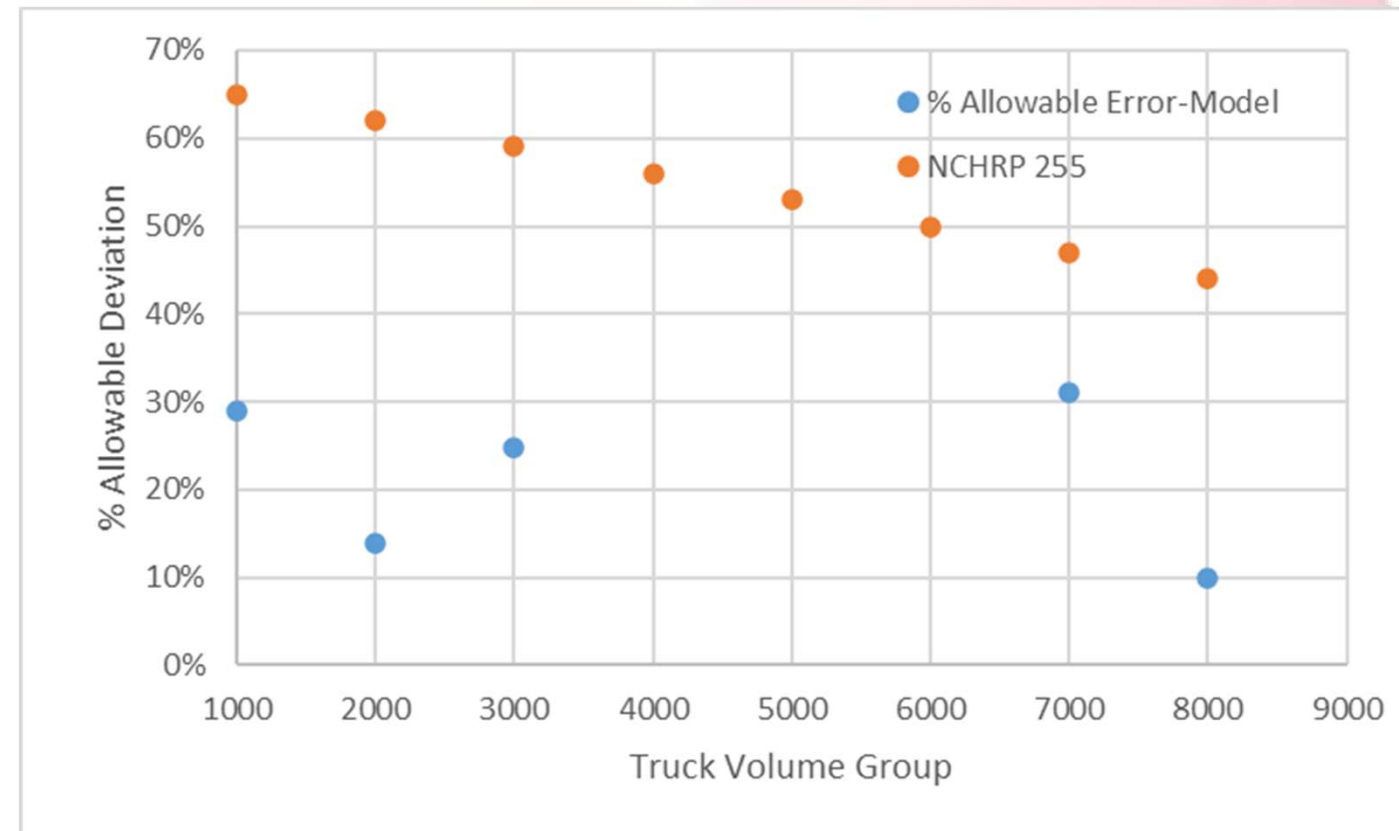


# VALIDATION (2)

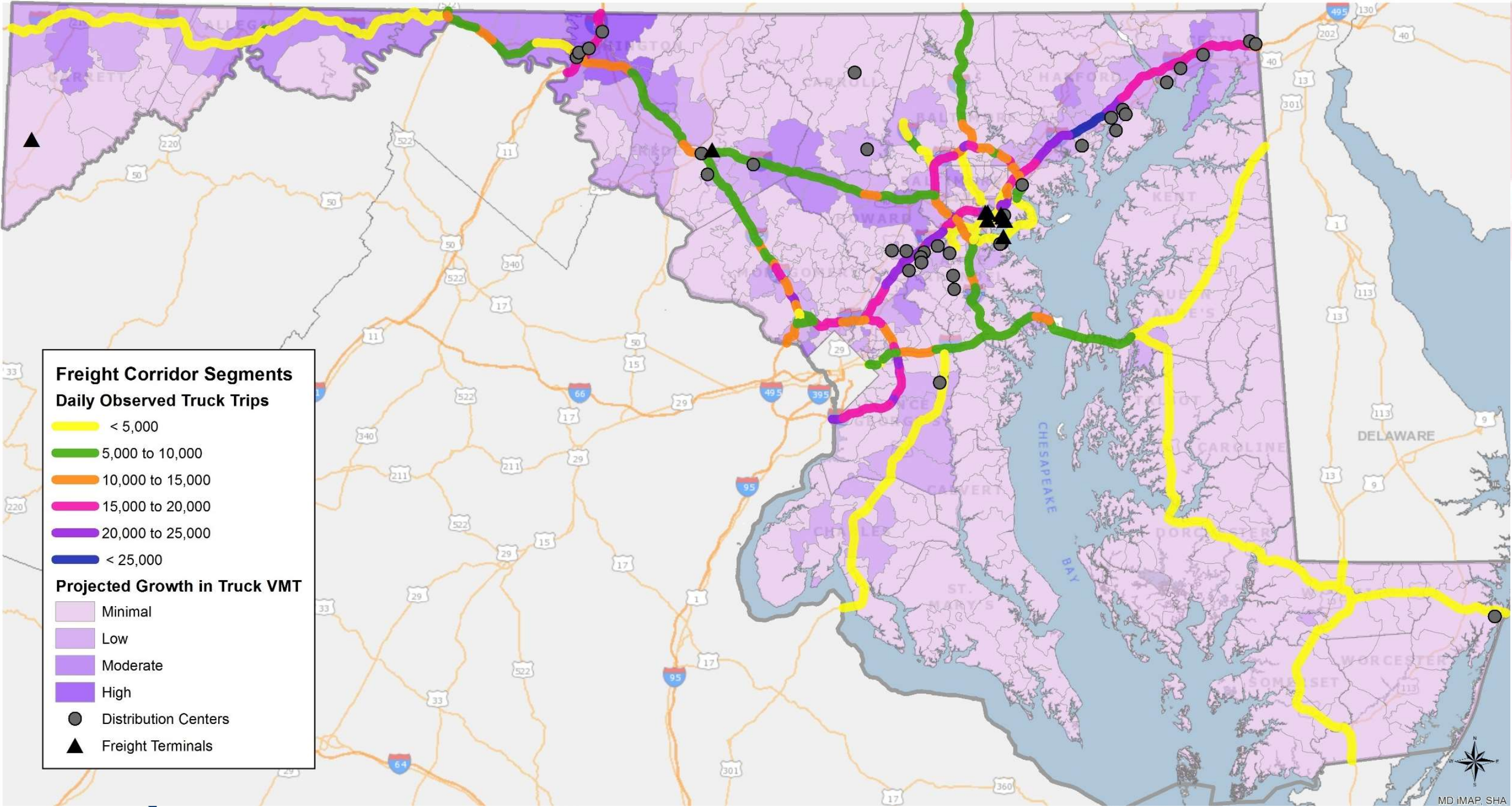
Screenline Validation (Observed vs. Model)



Allowable Deviation Comparison

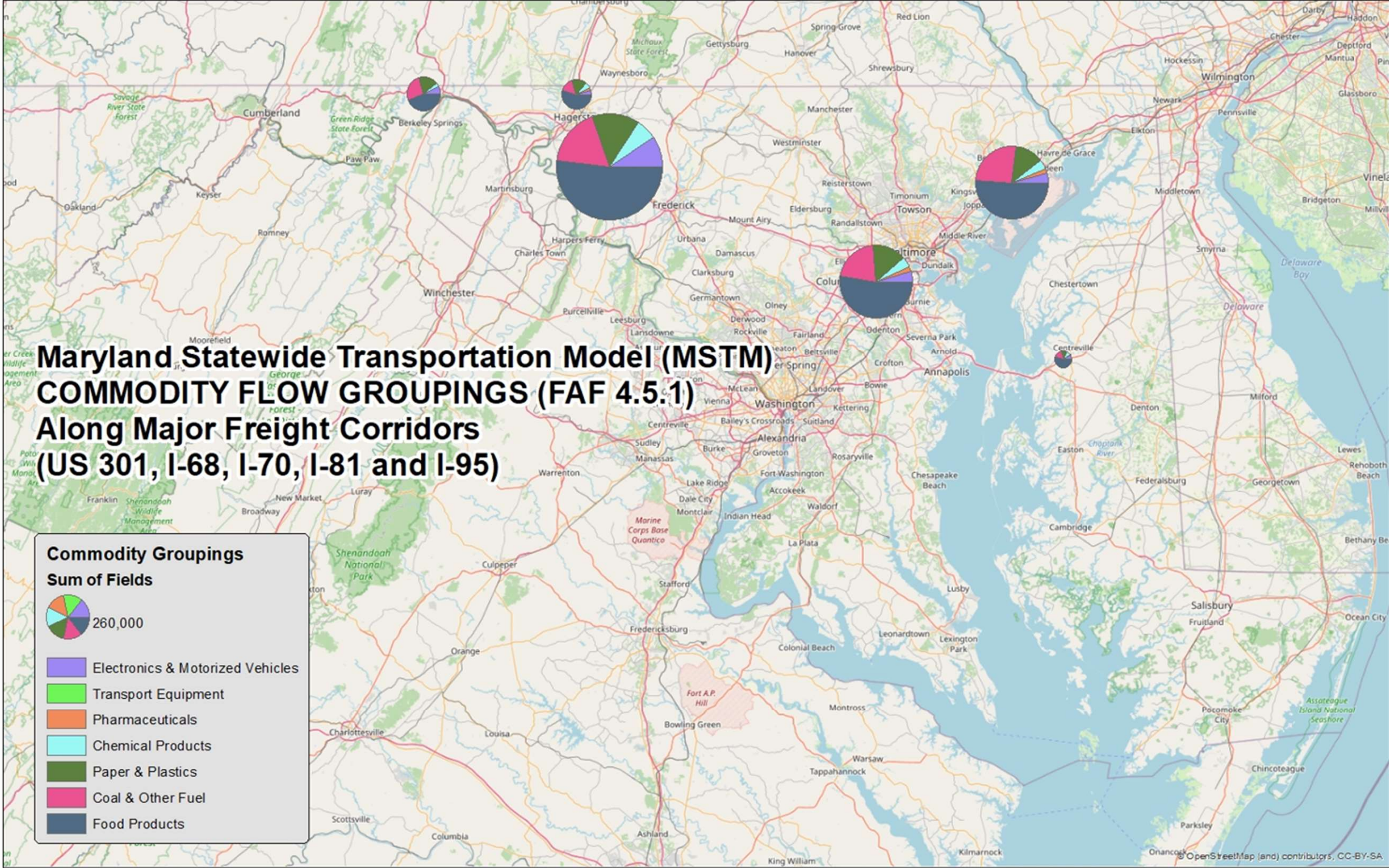


# GROWTH IN DAILY TRUCK VMT



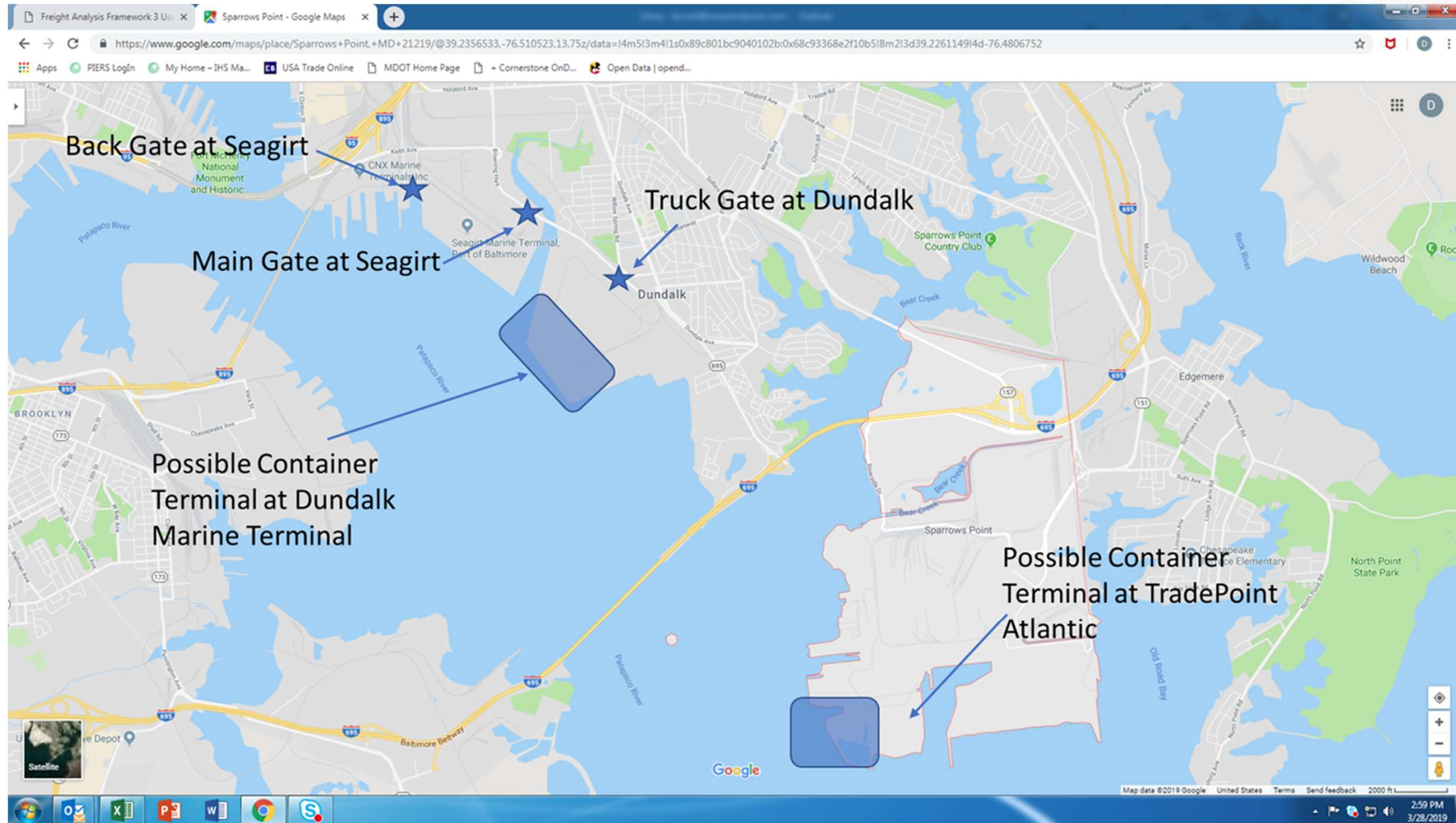


# APPLICATION-1: VOLUME BY COMMODITY TYPE





# APPLICATION-2: PORT GROWTH



- Baltimore handles \$27 million tons
- Sparrows point handles \$8.6 million tons
- Overall MD port tons ~ 35 tons
- Current share of Baltimore port is 76%
- The growth will be ~25%

# APPLICATION-3: MARYLAND TRUCK PARKING DEMAND TOOL

**MDOT** MARYLAND DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION

## Maryland Statewide Truck Parking Demand Estimator (2018) (SHRP2/C20 Freight Model Post-Processor)

**Parking Facility/Rest Area:** I-95 South Welcome Center Map it  
**Freight Corridor:** I-95  
**Upstream Rest Area:** Adelphi Park and Ride Map it  
**Downstream Rest Area:** TA Truck stop Map it  
**Field Observations:** Well marked spots. 49 in south bound, and 27 north bound.

<b>Current Parking Status:</b>	Over-Utilized <span style="color: red;">✘</span>	<b>Existing</b>	<b>2040</b>	
<b>Current Utilization Factor:</b>	4.2	<b>Short-Haul</b>	2,009	2,412 truck trips
<b>Current Capacity:</b>	76 spaces	<b>Long-Haul</b>	3,572	4,288 truck trips
<b>Current Utilization:</b>	318 spaces	<b>Total Trucks</b>	5,581	6,700 truck trips
<b>Current Parking Demand:</b>	242 spaces (new)	<b>Parking Demand</b>	318	382 total spaces
<b>Future Parking Demand:</b>	382 spaces (new)			

**Growth in Truck Trips Along Segment of I-95:** 20%

<b>Existing</b>	5,581
<b>2040</b>	6,700

**Truck Parking Type:** Rest Area

### Summary of Truck Parking in Maryland: Capacity, Utilization and Demand

Category	Value
Current Capacity	76
Current Utilization	318
Future Parking Demand	382

Office of Planning and Preliminary Engineering ©2020



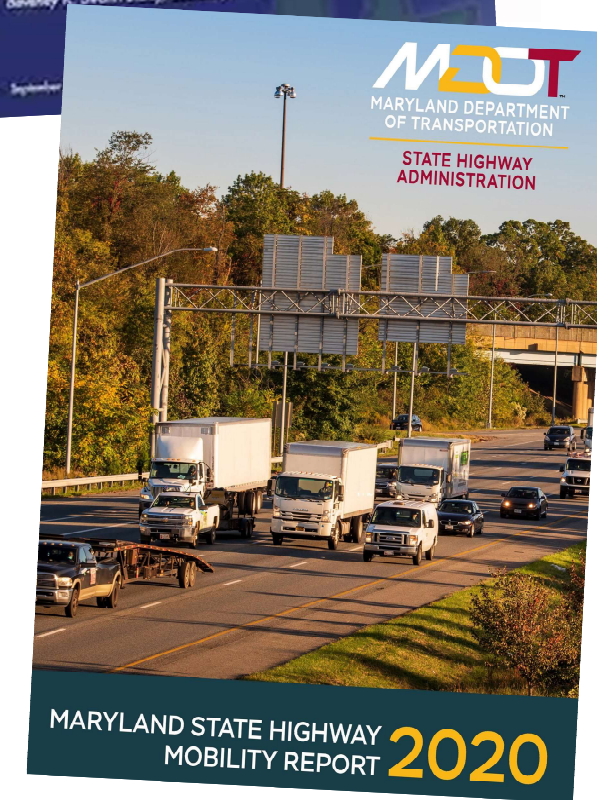
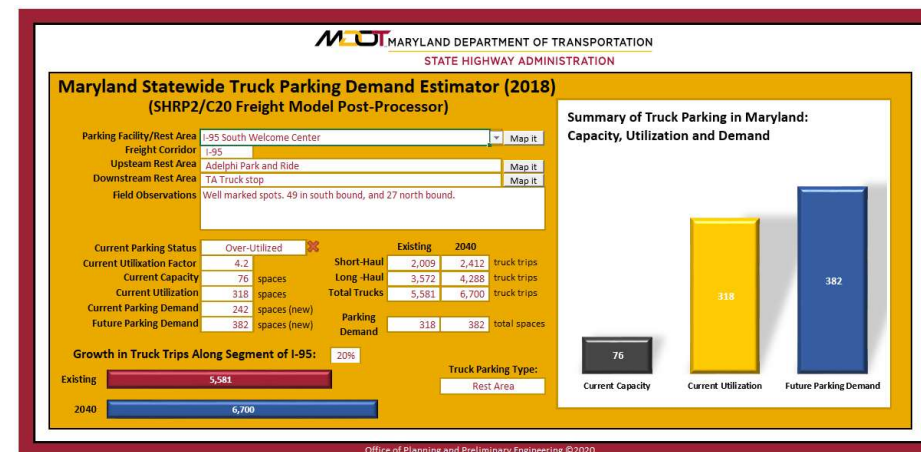
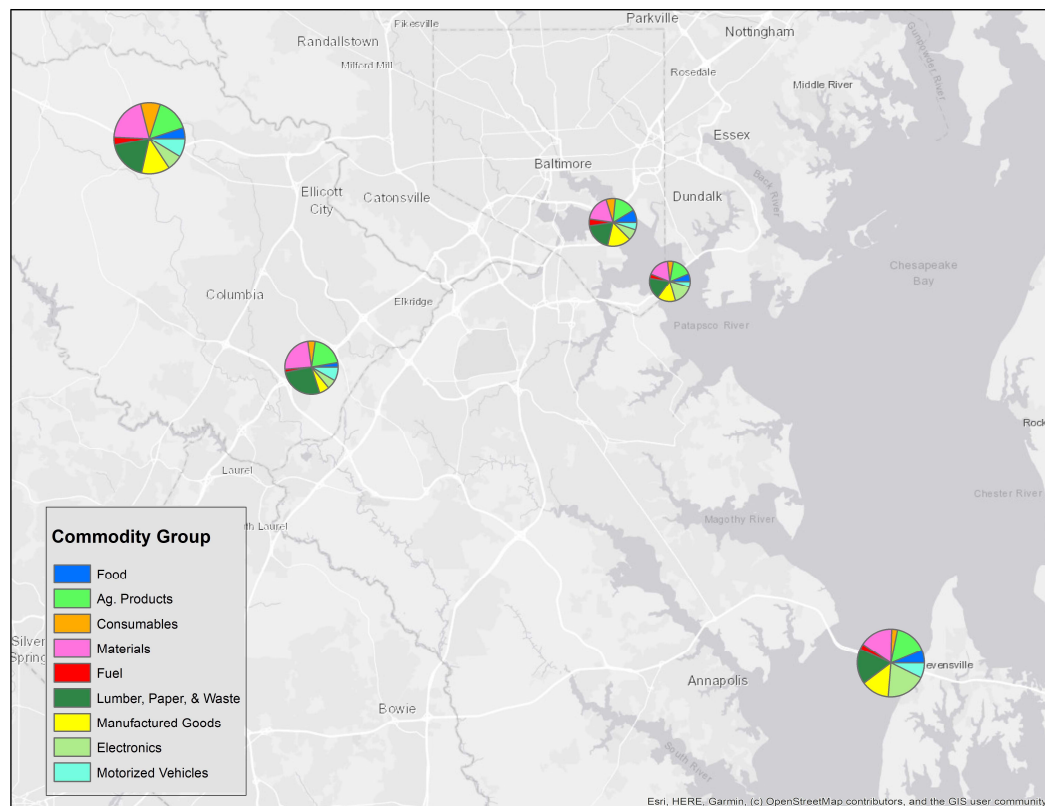
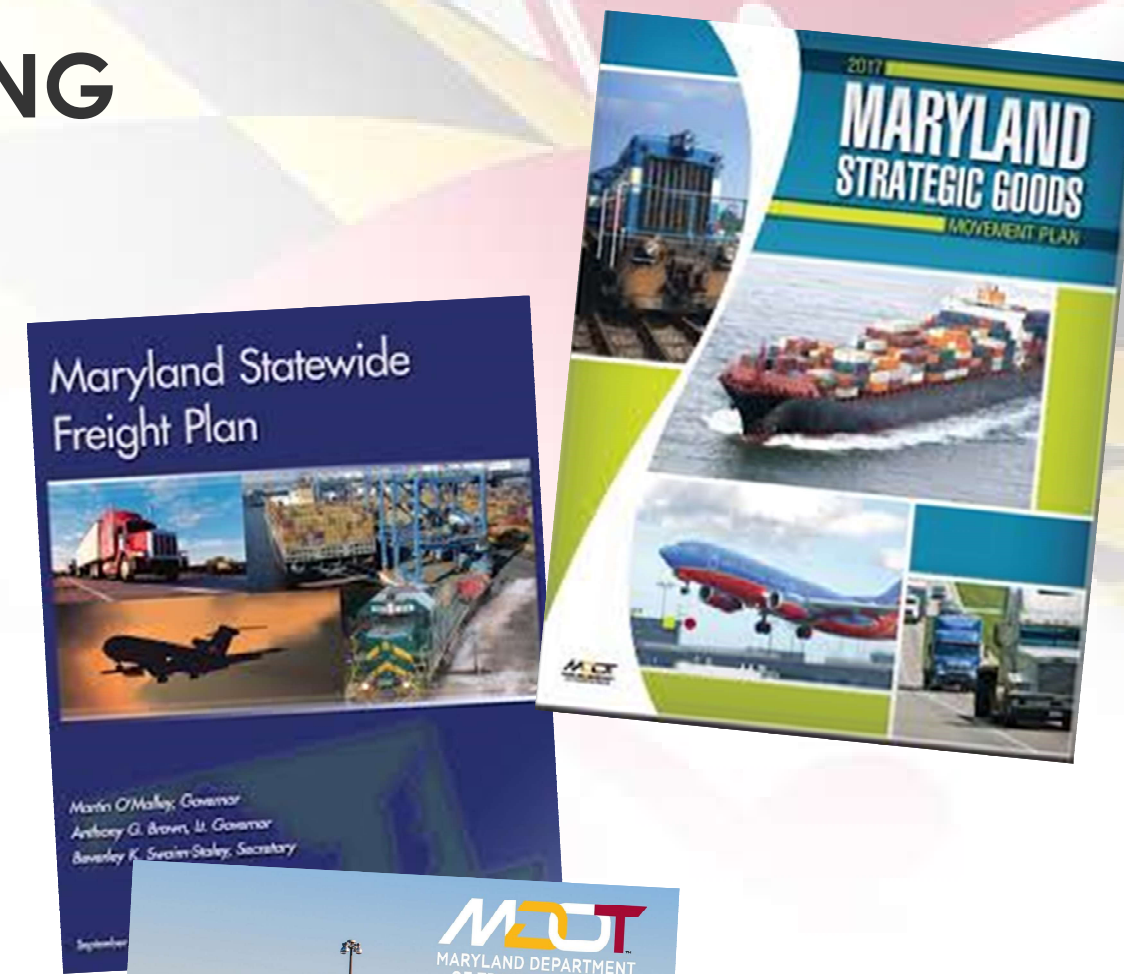
# C20: LESSONS LEARNED

- Use of FAF data for Maryland applications has been very useful for decision-making at multiple levels
- Use of FAF data in travel models provides key insights on MD infrastructure needs on a system and corridor level
- Has to be used with complimenting regional datasets/ tools for a comprehensive picture
- Helps us tell our freight story and make a business case - stakeholder communication and outreach activities



# TRAVEL FORECASTING AND ANALYSIS DIVISIONS COMMITMENT TO DATA DRIVEN DECISION MAKING

- Statewide Freight Plan
- Statewide Strategic Good Movement Plan
- Estimate truck parking demand
- Commodity-based assignment on freight corridors
- Scenario planning





# Future Working Group Activities



# Future Working Group Activities





# Next Meeting, Topics to Consider, and Wrap up



# Upcoming Freight Activities



## COMING SOON

- December 15, 2023 – Virtual Exchange: NYSDOT’s Bridge Hit Strike Task Force Initiative

## SAVE THE DATE

- March 13, 2024 – Freight Data & Planning Working Group Meeting
  - 1:30pm-3:00pm, ET
  - Topic – in development



— THE EASTERN  
TRANSPORTATION  
COALITION

CONNECTING FOR SOLUTIONS



# THANK YOU

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The Eastern Transportation Coalition

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