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# TRB Webinar: Collaborative Metrics for Strategic Freight Demand Performance Management

*February 19, 2025*

*10:30 AM - Noon*



# PDH Certification Information

1.5 Professional Development Hours (PDH) – see follow-up email

You must attend the entire webinar.

Questions? Contact Andie Pitchford at [TRBwebinar@nas.edu](mailto:TRBwebinar@nas.edu)

***The Transportation Research Board has met the standards and requirements of the Registered Continuing Education Program. Credit earned on completion of this program will be reported to RCEP at RCEP.net. A certificate of completion will be issued to each participant. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the RCEP.***



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1.5 American Institute of Certified Planners Certification  
Maintenance Credits

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Log into the American Planning Association website to claim your  
credits

Contact AICP, not TRB, with questions

# Purpose Statement

This webinar will focus on performance management for freight demand and demand elasticity. Presenters will share factors which drive freight demand, operations and infrastructure improvements decisions, and common performance measures planners use for decision making.

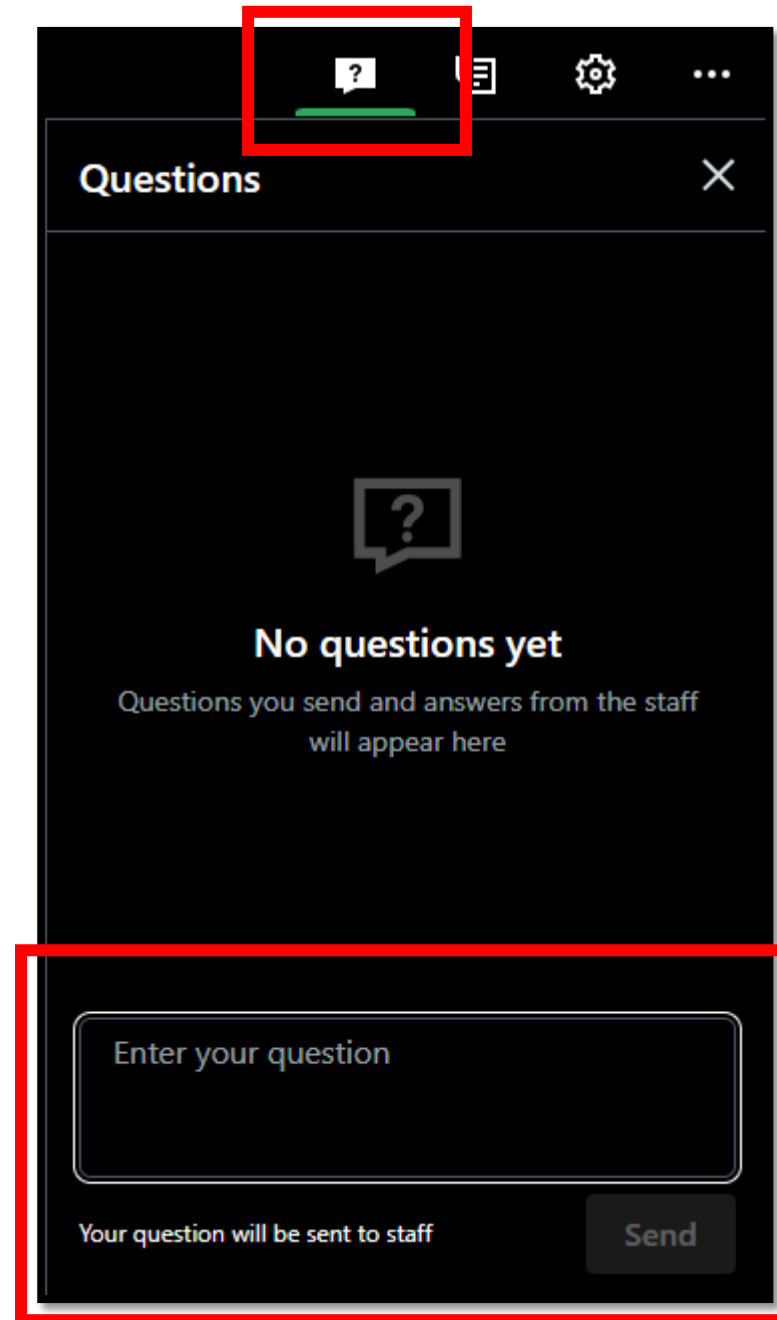
## Learning Objectives

At the end of this webinar, participants will be able to:

- Optimize time needed for collaborative decision-making
- Optimize targeting of fiscally constrained funds
- Validate best-choice implementation through collaborative buy-in

# Questions and Answers

- Please type your questions into your webinar control panel
- We will read your questions out loud, and answer as many as time allows



# Today's presenters



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Ben Zietlow  
[Benjamin.zietlow@quetica.com](mailto:Benjamin.zietlow@quetica.com)



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# Presentations

- Introductions of Speakers
- Setting the framework for discussion
- Perspective: Private Sector freight planning practitioner
- Perspective: Public Sector freight planning practitioner
- Perspective: Academia Sector freight planning practitioner
- Purpose Recap

# Setting the Framework: Need for Practitioners' Harmonization

1. What factors drive freight demand that shape operations and infrastructure improvements decisions
2. What tools are used for decision making – PMs in this case
3. Which tool(s) can we use to synchronize decision-making between public and private practitioners

# Setting the Framework: Learning Objectives

1. Optimize time needed for collaborative decision-making
2. Optimize targeting of fiscally constrained funds
3. Validate best-choice implementation through collaborative buy-in with the "no one is unhappy" philosophy



Private

Title: Optimizing Freight  
Performance: a Data-Driven  
Approach

*Ben Zietlow, Quetica, LLC*

*Date: 2/19/2025*

# Factors that Shape Operations Decisions: Supply Chain KPIs

**Total Landed Costs:** the total cost of getting a product from the producer to the customer

- Product
- Shipping
- Taxes
- Risk
- Overhead



# Factors that Shape Operations Decisions: Supply Chain KPIs – continued

## Order Tracking:

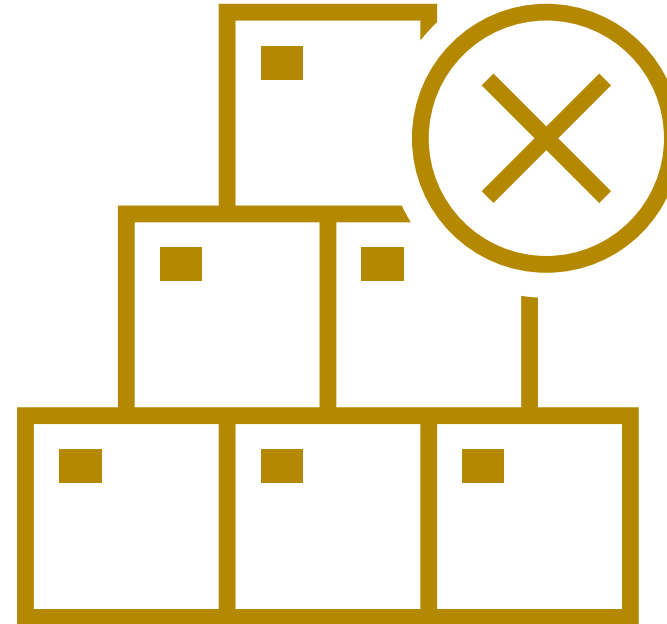
- Perfect order rate
- Order fill rate
- Order accuracy
- On-time delivery
- Supplier on-time delivery
- Lead time



# Factors that Shape Operations Decisions: Supply Chain KPIs – continued

## Inventory:

- **Turnover:** How quickly inventory is sold and replaced
- **Days on hand:** How long it takes to sell inventory
- **Inventory carrying cost:** storing and holding
- **Inventory to Sales Ratio:** compares inventory to number of sales
- **Cash-to-cash cycle time:** How long it takes to convert cash to cash

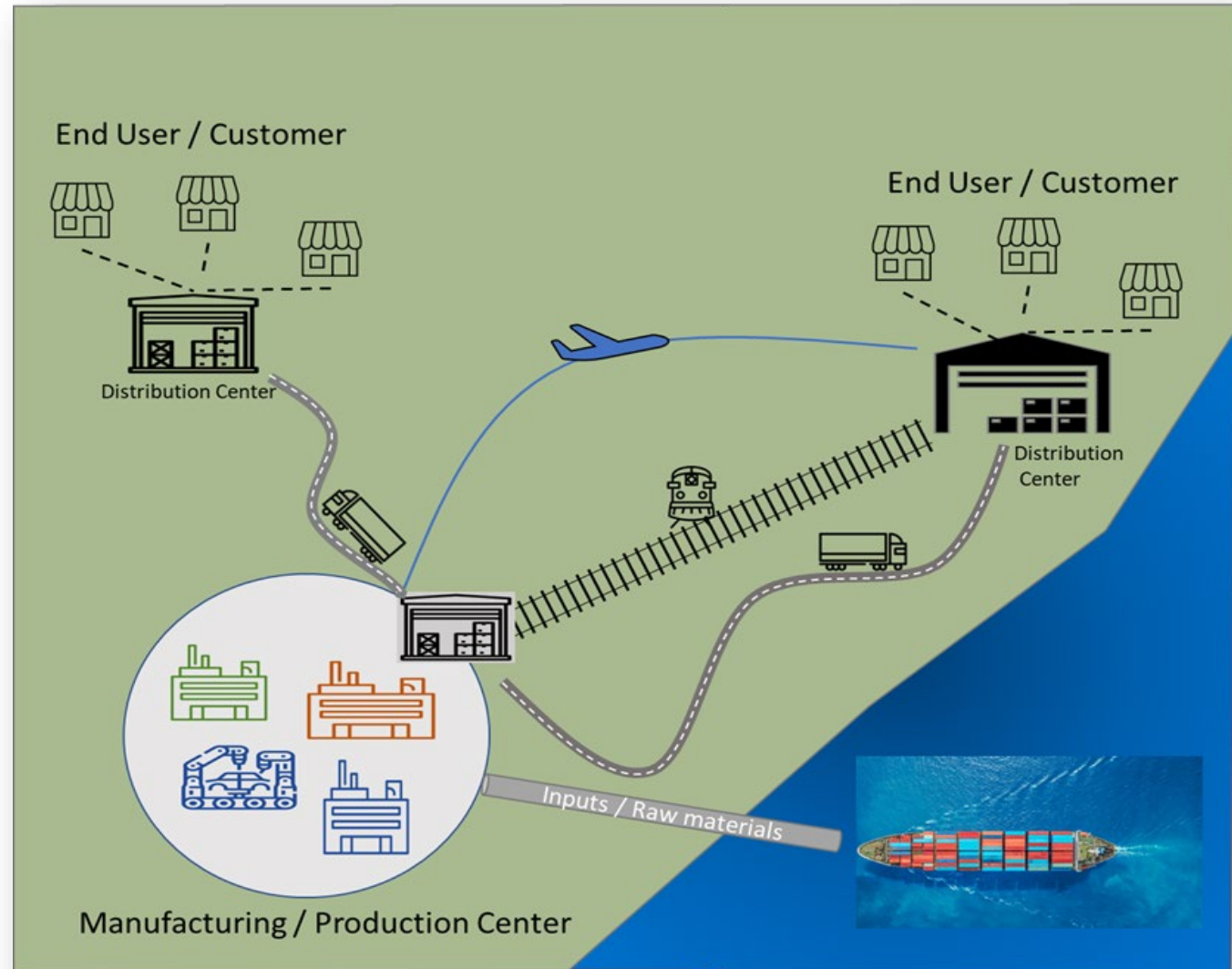


# Factors that Shape Operations Decisions: Supply Chain Network Design

## Freight Planning = Supply Chain Management

### Considerations

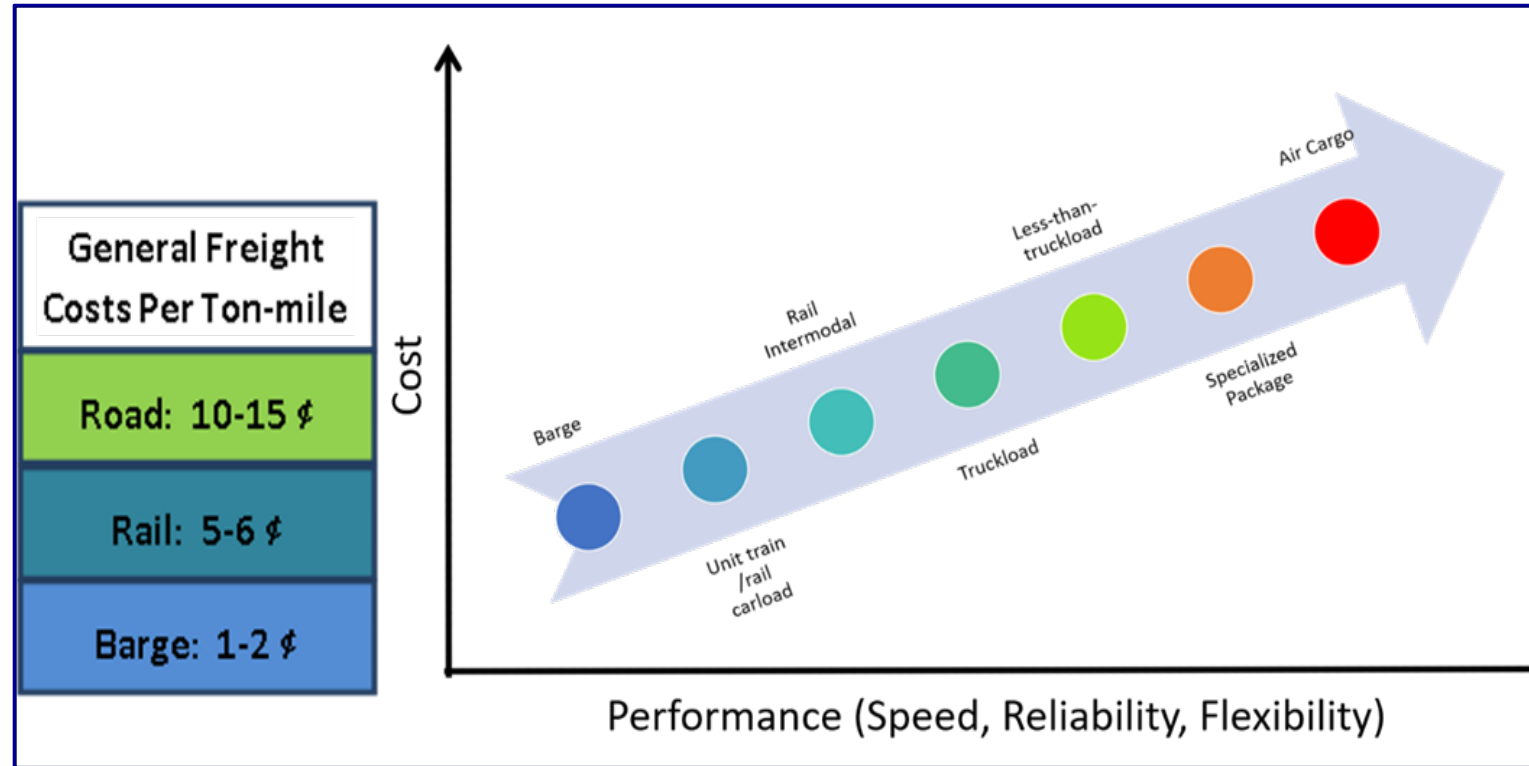
- Products
- Sites
- Demand
- Inventory
- Sourcing
- Transportation



Source: NCHRP 08-125 Playbook, Play 2: Build and Prepare the Resilience Team

# Factors that Shape Operations Decisions: Supply Chain Network Design - continued

- Supply chain service needs play a major role in determining the modes used by specific industries for the freight they consume and produce.
- Ease of access to a particular modal service may alter its ability to be substituted for a similar service



Source: Quetica, adapted from the Geography of Intermodal Transport Systems, Jean-Paul Rodrigue

# Tool(s) Used for Decision-Making: Supply Chain Network Optimization

Optimization models are a math-based approach using AI/machine learning and big data to find the optimal solution to complex problems.

- Used by private sector for over 20 years
- Can solve for cost, time, risk/reliability
- Up to 80% of a product's **Total Landed Cost** is built-in to the supply chain network design

## CURRENT



## FUTURE



# Freight Planning Decision-Making Harmonization: Private to Public

**Freight Fluidity**<sup>1</sup> examines multimodal supply chains to assess freight transportation performance to support transportation professionals in State, regional, and local agencies to improve and enhance:

- Freight planning and decision making
- Cross-sector, multidisciplinary dialogue and coordination
- Assessments of freight investment needs and opportunities

<sup>1</sup> FHWA Freight Professional Capacity Building Program

# Freight Planning Decision-Making Harmonization: Private to Public – continued

**Freight Fluidity<sup>2</sup>** aims to add the perspectives of shippers, carriers, and receivers by focusing on supply chains and understanding the end-to-end performance of an individual freight trip or shipment moving across multiple modes and jurisdictions.

- How well do the Nation's freight transportation systems serve business and industry?
- How can we make our freight transportation systems and supply chains more efficient and reliable?

<sup>2</sup> The Eastern Transportation Coalition

# Freight Planning Decision-Making Harmonization: Private to Public – continued

- **Reliability**
- Transportation Costs
- Resiliency
- Quantity



Public

Title: Transforming Data into  
Performance Measures and  
Indicators

*Tyrone Scorsone, Kittelson & Associates*

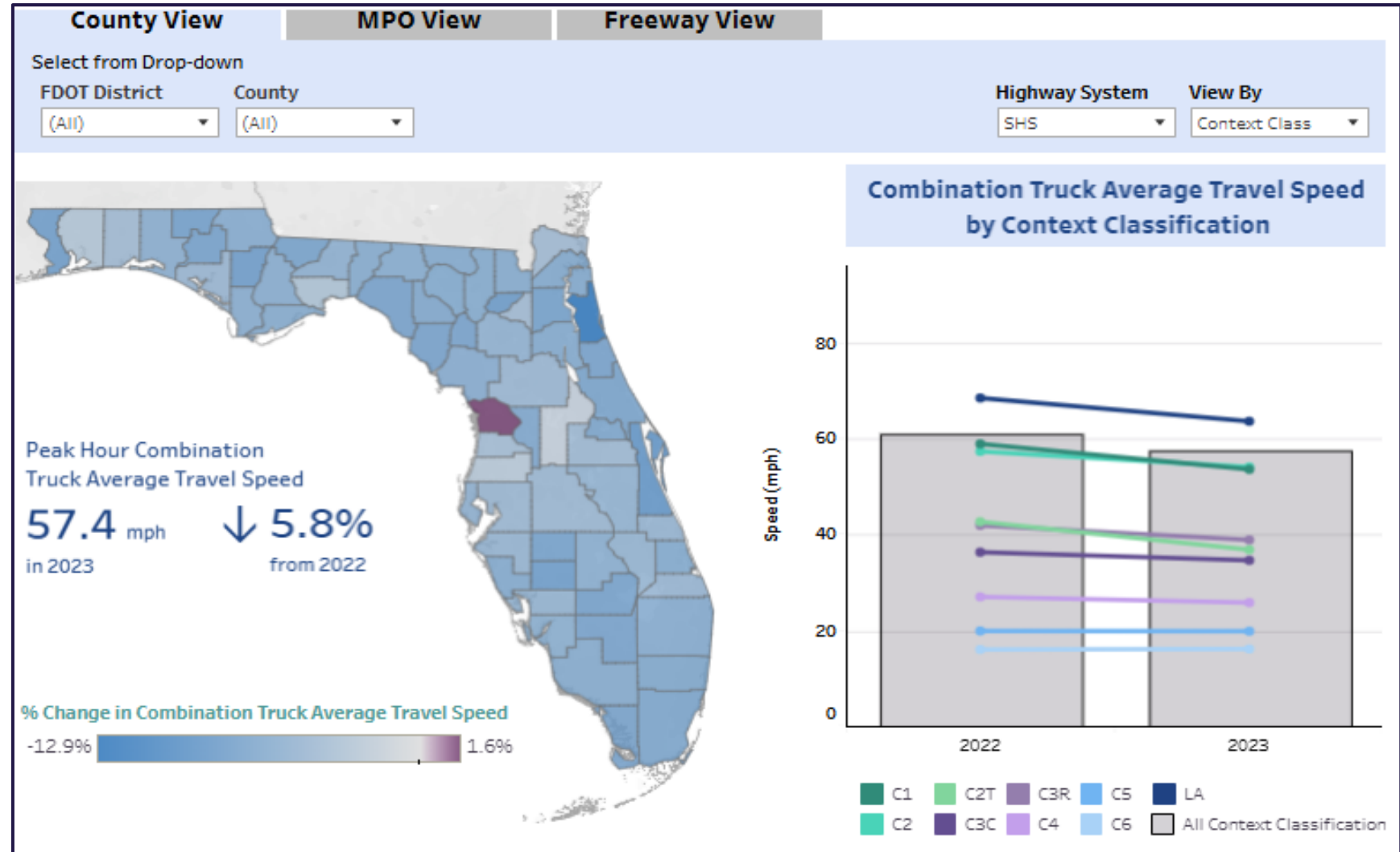
*Date: 2/19/2025*

# Factors that Shape Infrastructure Improvement Decisions: Reporting, Identifying, and Resolving

- Initial focus on areawide reporting
- Identification of needs based on granular data
- Provide findings as inputs into project prioritization

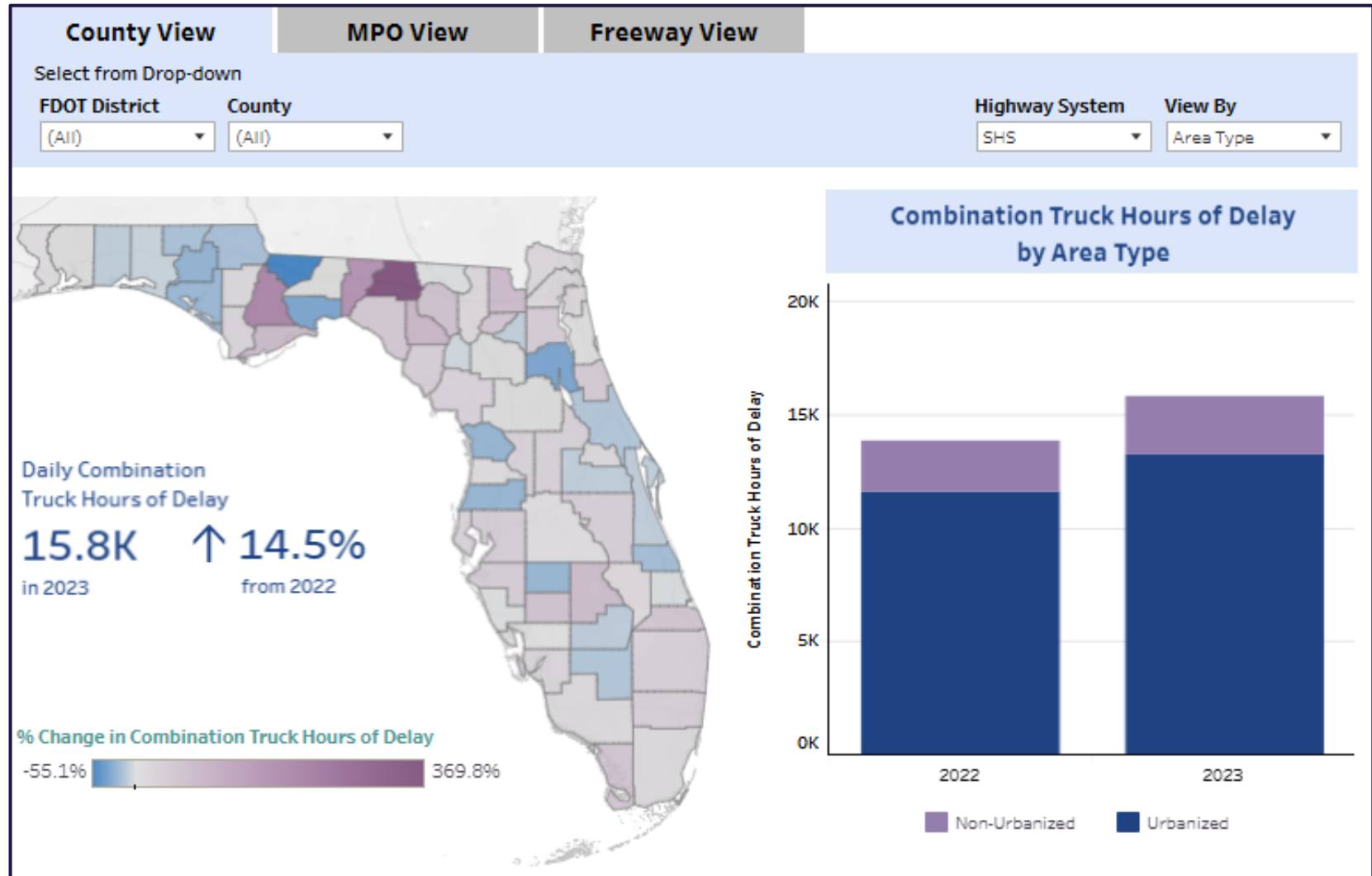
# Tool(s) Used for Decision-Making: Analyze Truck Speeds

- Provides statewide figures
- Includes county and MPO level reporting- as well a limited access facility reporting



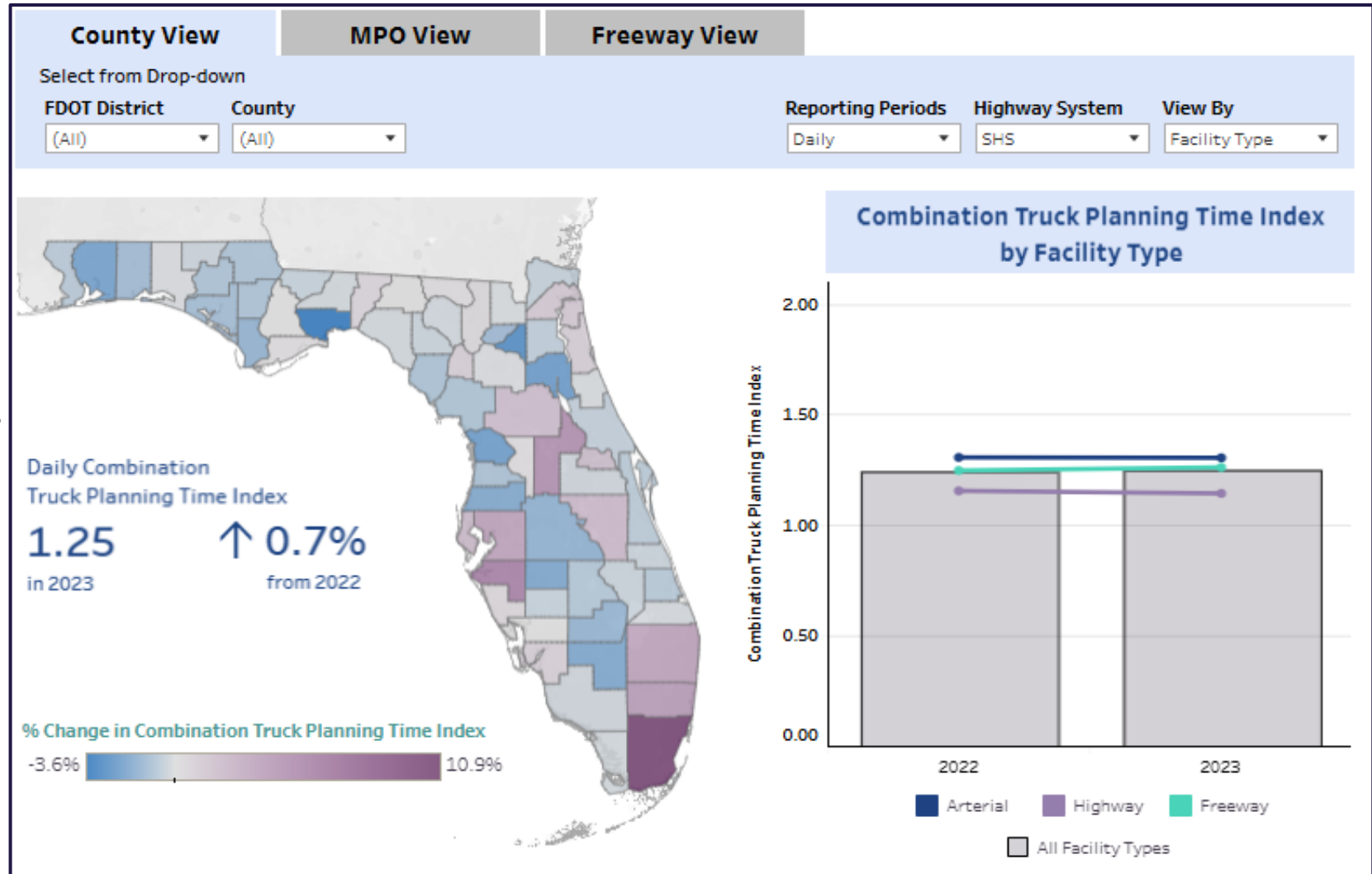
# Tool(s) Used for Decision-Making: Combination Truck Hours of Delay

- The additional travel time experienced by a combination truck beyond what would be experienced during uncongested conditions
- Delay is at times monetized to provide a narrative of how much money is being wasted because of congestion



# Tool(s) Used for Decision-Making: Assessing Truck Travel Time Variability

- The combination truck planning time index is the ratio of the 95<sup>th</sup> percentile combination truck travel time to the combination truck travel time at reference speed, defined as the 85<sup>th</sup> percentile speed during weekday off-peak hours.
- This measure represents the total travel time that a combination truck driver should budget to ensure on-time arrival at least 95% of the time.



# Freight Planning Decision-Making Harmonization: Incorporating Measures into Business Practices

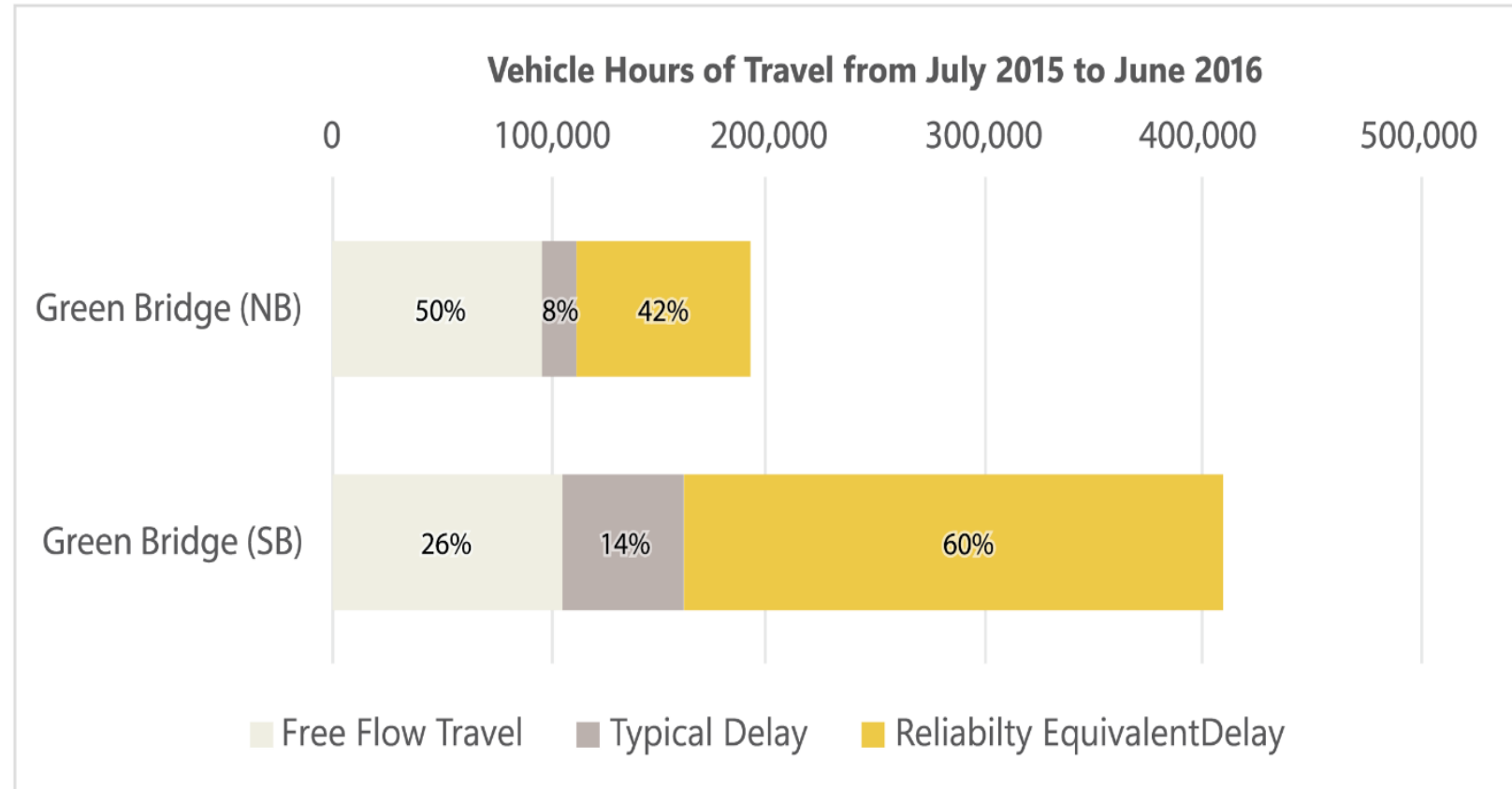
- Identifying vehicle and freight bottlenecks is a first step in addressing critical mobility needs.
- The performance management regulations define a truck freight bottleneck as “a segment of roadway identified by the State DOT as having constraints that cause a significant impact on freight mobility and reliability” (23 CFR 490.101). Bottlenecks may be determined based on a variety of mobility measures.



# Freight Planning Decision-Making Harmonization: Accounting for Truck Travel Time Reliability

The **Reliability** equivalent delay metric applies a lateness penalty whenever travel times exceed the median travel time for that quarter of the year and hour of the day, and an earliness penalty whenever travel times are below the median.

Vehicle Hours of Travel on the Green Bridge on Weekday Daytime Hours



Source: NPMRDS travel times for weekday daytime hours from July 2015 to June 2016. Daytime is defined as 6 AM-9 PM.

# Freight Planning Decision-Making Harmonization: Project Prioritization Process

- Florida DOT works with its partners to determine investment needs based on the performance of the transportation system relative to its policy objectives.
- Detailed information about each proposed investment is gathered to help determine which improvements should be the highest priorities.
- All these data points are uploaded into the Strategic Investment Tool which then outputs a score.

# Freight Planning Decision-Making Harmonization: Bottleneck Scoring in Project Prioritization

- Infrastructure investments must adequately target traffic congestion hotspots and bottlenecks.
- Addressing key hotspots mitigates a significant amount of the observed delay and unreliable travel conditions on the network.



# Freight Planning Decision-Making Harmonization: Travel Time Reliability in Project Prioritization

- This measure is part of the Interregional Connectivity objective.
  - Of the performance measures included in this objective, travel time reliability scores the second highest.
- Uses the methodology and outputs from the annual analysis of truck travel variability.



# Academia

Title: Developing freight  
decision-support tools for  
government practitioners

*Seckin Ozkul, University of South Florida*

*Date: 2/19/2025*

# Understanding the Foundation for Factors that shape decisions: Key Research Gaps in Freight Decision-Making

- **Data Uncertainty & Bias**
  - Many freight datasets are incomplete, inconsistent, or private
- **Multimodal and Systems Thinking**
  - Freight movement is not limited to a single mode or node
- **Behavioral & Market Responses**
  - Industry adjusts to policy changes in unpredictable ways
  - Need empirical studies to capture behaviors
- **Decision Science & Optimization**
  - Moving from descriptive analysis (what happened?) to prescriptive solutions (what should be done?)
  - Multi-objective optimization techniques to balance cost, efficiency, and resilience



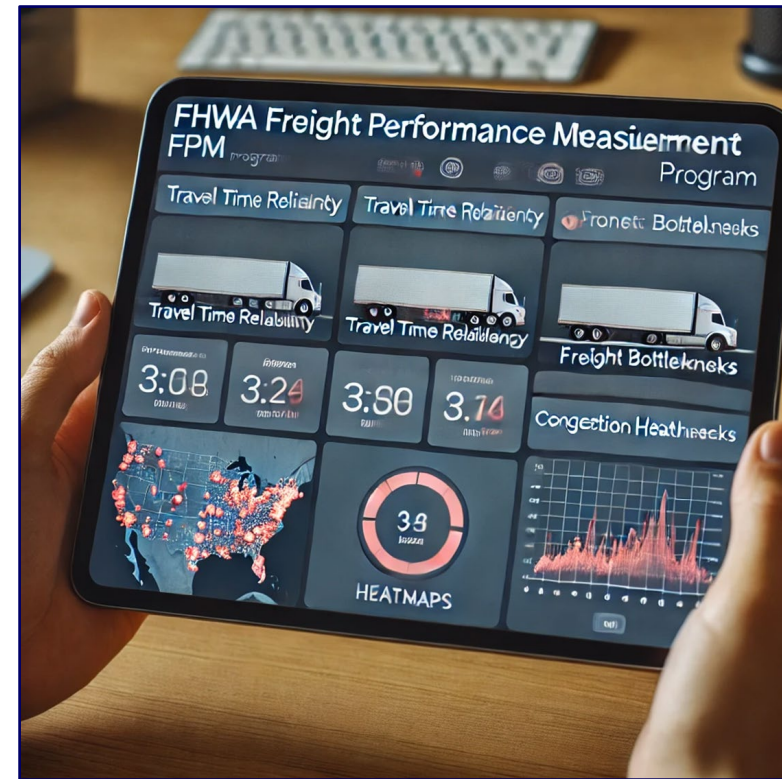
# Understanding the Foundation for Tool(s) Used for Decision-Making: Theoretical Frameworks Underpinning Decision-Support Tools

- **Network Equilibrium Models**
  - How congestion, route choice, and delays impact overall freight system efficiency
  - Application of dynamic traffic assignment models
- **Economic Input-Output Models**
  - Understanding regional and national impacts
- **Agent-Based & Simulation Models**
  - Simulating the behavior of industry and consumers
  - Exploring policy scenarios through computational experiments
- **Data-Driven Approaches**
  - Incorporating machine learning and statistical inference to improve forecasting accuracy



# Understanding the Foundation for Tool(s) Used for Decision-Making: Case Study - The FHWA Freight Performance Measurement (FPM) Program from an Academic Lens

- **Methodological Strengths**
  - Uses probe data to assess freight corridor efficiency
  - Empirical evidence provides for mitigation strategies
- **Limitations**
  - Data is primarily truck-focused
  - Limited ability to capture supply chain disruptions and shifts
- **Potential Enhancements**
  - Add predictive analytics for proactive decision-making
- **Academic Contributions**
  - Identifying methodological refinements for measuring freight fluidity
  - Developing new key performance indicators (KPIs) to enhance decision support



# Understanding the Foundation for Tool(s) Used for Decision-Making: Case Study - The FHWA Freight Performance Measurement (FPM) Program from an Academic Lens

MOBILITY, RELIABILITY, AND CONGESTION	
Highway	Percent of interstate providing reliable travel times
	Percent of interstate where peak hour travel times meet expectations*
	Percent of non-interstate National Highway System (NHS) providing reliable travel times*
	Percent of non-interstate NHS where peak hour travel times meet expectations*
	Annual hours of excessive delay per capita*
	Urban: Average hours of delay per day for freight vehicles on freight-significant links
	Urban: Travel Time Index (TTI) on freight-significant links (ratio of the 95th percentile to the 50th percentile)
	Percent of interstate mileage providing for reliable truck travel times*
	Percent of interstate mileage that is uncongested*
	Clearance time for incidents, crashes, or hazardous materials
	Number of intersections and ramps with inadequate turning radii for large trucks
	Urban: Buffer Index on freight-significant links (ratio of the 95th percentile to the 50th percentile)
	Rural: Average hours of delay per day for freight vehicles on freight-significant links
	Number of truck rest areas and their capacities
Rural: Average travel time on freight-significant links	
MOBILITY, RELIABILITY, AND CONGESTION	
Railway	Tons or ton-miles of freight over relevant period
	Average terminal dwell time train-hours of delay
	Percent of rail track-miles with 286,000-pound railcar capacity rating
	Railroad corridor level of service
	Percent of rail track-miles with 286,000-pound railcar capacity rating
Water	Tons of traffic arriving at a port
	Twenty-Foot Equivalent Units (TEUs) passing through port (port throughput)
	Gate reliability or truck turn time
	Ship unload rate (time per container)
	Ship load rate (time per container)
	Average delay per barge tow on river
Air	Flight frequency by airlines with cargo capacity (number per day)
	Average time between flights by airlines with cargo capacity (minutes)
	Percent of on-time departures at freight significant airports
	Percent of on-time arrivals at freight significant airports

Source: <https://ops.fhwa.dot.gov/publications/fhwahop16089/chp6.htm>

# Freight Planning Decision-Making Harmonization: Translating Academic Research into Policy and Investment Tools

- **Data-Driven Policy Recommendations**
  - How to convert findings into actionable policy
  - Peer-reviewed validation before policy adoption
- **Quantitative vs. Qualitative Approaches**
  - Data analytics vs. Surveys and stakeholder input
- **Scalability & Transferability**
  - Ensuring findings apply beyond case studies
  - Regions and industries adaptability to their needs
- **Validation & Calibration**
  - Continuous model refinement based on empirical data
  - Aligning model outputs with real-world operations



# Freight Planning Decision-Making Harmonization: Challenges in Implementing Research-Based Freight Decision-Support Tools

- **Bridging Academia and Practice**
  - Overcoming barriers between theory and application
  - Need better university and government collaboration
- **Data Accessibility Issues**
  - Private-sector concerns over data confidentiality
  - Need for creating anonymized yet usable datasets
- **Interdisciplinary Collaboration**
  - Combining expertise in engineering, data science, economics, and policy
- **Scalability & Generalizability**
  - Addressing regional variations in freight patterns
  - Avoiding overly complex models that hinder practical adoption



# Freight Planning Decision-Making Harmonization: Prospective Common Freight Performance Measure?

- Freight Travel Time **Reliability** (FTTR)
  - **Why It's Common:** Both public agencies and private companies value predictability in freight transportation. For public entities, reliability supports infrastructure planning, while private stakeholders need it for operational efficiency and customer satisfaction
  - **How It's Measured:** Metrics like the Buffer Index (extra time required for on-time delivery) or the Planning Time Index (total time required to ensure on-time delivery) can be used



# Conclusion

- **Encouraging interdisciplinary research**
  - Bridging gaps between economics, engineering, and policy disciplines
  - Fostering research networks for collaborative knowledge exchange
- **Public-Private Collaboration in Research**
  - Overcoming data-sharing barriers through innovative agreements
  - Encouraging industry-funded research projects for real-world impact
- **Future Research Directions**
  - AI-driven freight modeling and predictive analytics
  - Expansion of behavioral freight economics research
  - Development of digital twins for freight network simulation



The background of the slide is a photograph of a highly ornate, vaulted ceiling. The ceiling is covered in intricate mosaics and gold leaf decorations. There are several circular medallions containing various figures and symbols. The overall color palette is dominated by gold, blue, and white. The ceiling is part of a larger architectural structure with arched openings visible at the bottom.

# Purpose Recap

# Freight Planning Decision-Making Harmonization

Performance Management based on Reliability provides a common denominator for all three practitioners to harmonize their decision-making without compromising their required objectives.

Where:

- **Freight Planning Decision-Making Harmonization:** (FPDMH)
- **Reliability:** (REL<sub>1</sub>,...REL<sub>3</sub>)
- **Private:** (PMMJ) performance and moving across multiple modes and jurisdictions
- **Public:** (SPPO) system performance relative to policy objectives
- **Academia:** (USVP) understanding the shared value of predictability

$$\text{FPDMH} = \frac{(\text{REL}_1 * \text{PMMJ}) + (\text{REL}_2 * \text{SPPO}) + (\text{REL}_3 * \text{USVP})}{\text{REL}_1 + \text{REL}_2 + \text{REL}_3}$$



# Questions/Answers

# Today's presenters



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Dr. Seçkin Özkul  
[sozkul@usf.edu](mailto:sozkul@usf.edu)



# Upcoming events for you

**March 26, 2025**

TRB Webinar: Implications of Artificial Intelligence Technologies for Systems, Enterprise, and Cyber Resilience in Transportation

**June 2025**

8<sup>th</sup> EU-US Transportation Research Symposium; Brussels, Belgium

<https://www.nationalacademies.org/our-work/symposium-on-the-future-of-transportation-and-the-role-of-europe-u-s-research-collaboration-2025-event>

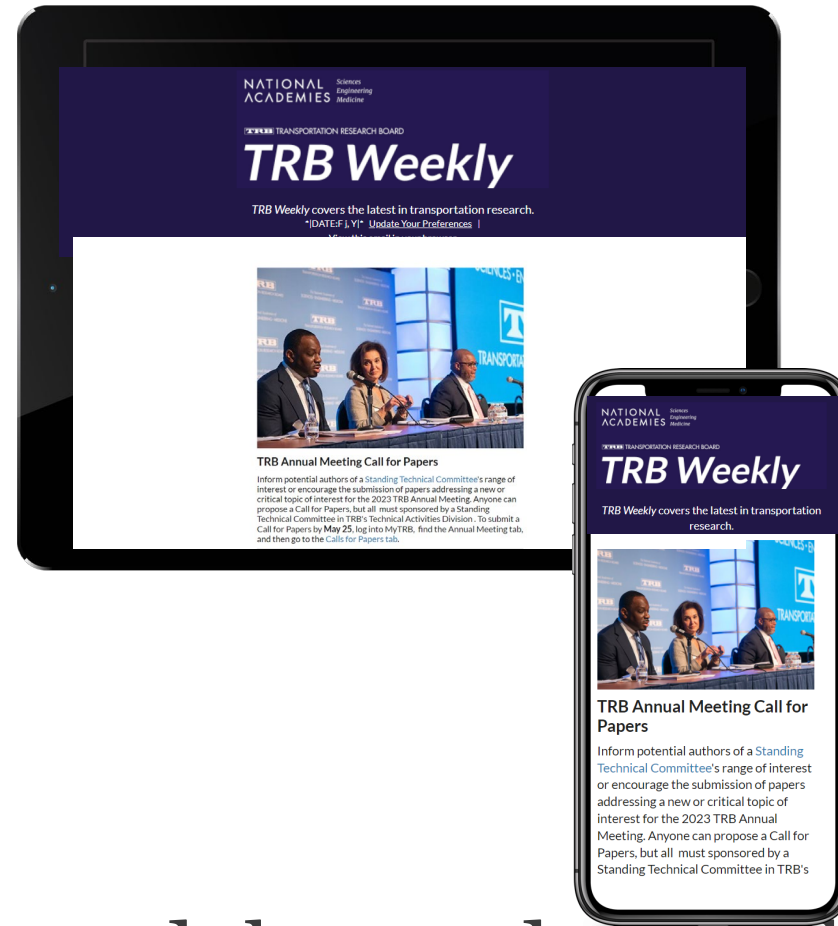


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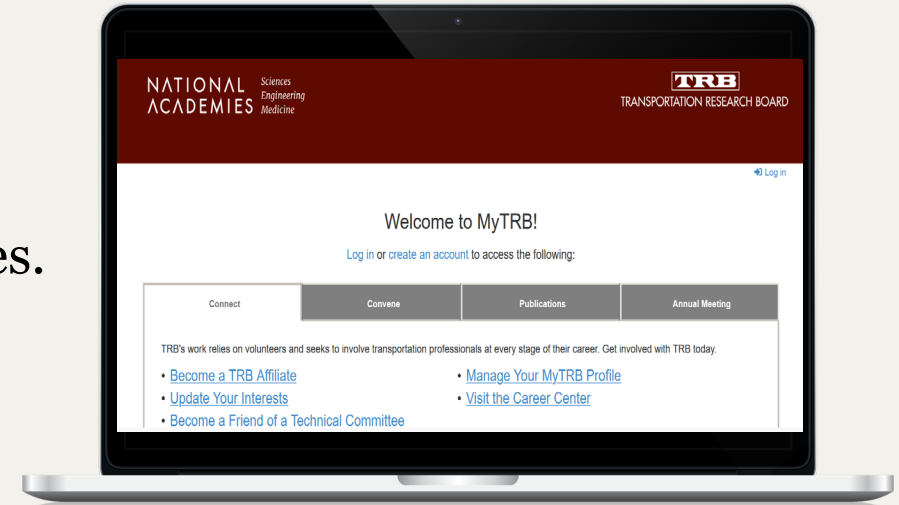


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