

Measuring Supply Chain Performance with Fluidity Data

*Findings from I-95 Corridor Coalition Freight Fluidity
Measures Pilot Project*

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**Marygrace Parker, I-95 Corridor Coalition
Joseph Bryan, Parsons Brinckerhoff**

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Project Background

- **Objective**

- Demonstrate and improve the measurement of freight transportation performance using a supply chain perspective
- ➔ **End to end** conception of performance and measurement, across modes and stages

- **Case Study Sponsors**

- I-95 Corridor Coalition, Intermodal Committee
- FHWA, Office of Freight Management
- U.S. Department of Commerce, Advisory Committee on Supply Chain Competitiveness

Why the I-95 Corridor Coalition is Sponsoring

Supply chains and supply chain performance are multi-jurisdictional. So are we:

- 16 states with District of Columbia:
 - \$4.7 trillion economy (40% of US GDP)
 - 21% of nation's road miles; 35% of nation's VMT
 - 5.3 billion tons of freight shipments annually
 - Multimodal corridor
- 2 Canadian Provinces (Quebec, New Brunswick)



Multimodal Supply Chain Case Studies

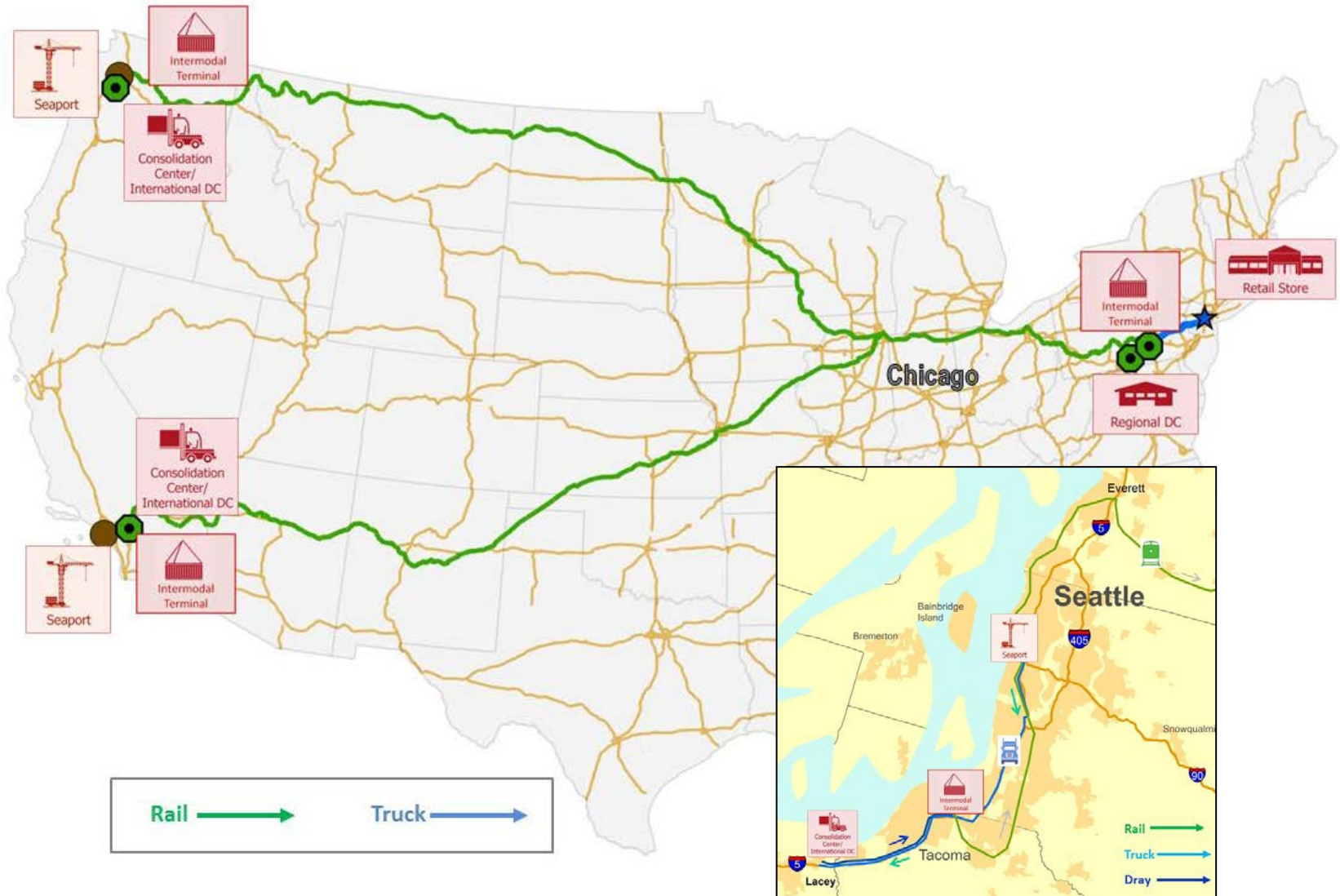
- **Autos – General Motors auto parts**
 - From US and NAFTA suppliers to auto assembly plant in Tennessee
- **Retail – Target® consumer goods**
 - From Ports of Los Angeles/Long Beach and Seattle/Tacoma via Chicago to metropolitan New York
- **Electronics – Panasonic electronics**
 - Between manufacturing and assembly facilities in San Diego and Tijuana
- **Agriculture – Soybean exports**
 - From Illinois farms to Louisiana port
- **Food – Perdue processed chicken**
 - From DelMarVa region to Mid-Atlantic markets

What Data: Performance Measures and Metrics

Market-Driven Factors

Measure	Metric
Transit time	Travel time in days (or hours)
Reliability	95% travel time in days (or hours)
Cost	Dollars
Safety	Fatality and injury rate
Risk	Disruption <i>(storms, labor, infrastructure failure, political forces...)</i>
	Capacity expansion delays <i>(physical, regulatory limitations and delays...)</i>

Case Example: Retail Supply Chain (*Target*)



Retail Supply Chain Measures

Seattle to New York

Links and Nodes	Sources	Notes
West Coast port (Seattle)		
Dray move	ATRI, Chainalytics	
<i>Transload or Consolidation Center</i>		
Dray move	ATRI, Chainalytics	
West Coast rail intermodal terminal	TransCore, Chainalytics	
Rail move	TransCore, Chainalytics	
Midwest rail intermodal interchange	TransCore, Chainalytics	
Rail move		Available for purchase
East Coast rail intermodal terminal		Available for purchase
Dray move	ATRI, Chainalytics	
<i>East Coast Regional Distribution Center</i>		
Truck P&D move	ATRI, Chainalytics	
<i>Retail Store</i>		

Retail Supply Chain Performance

Seattle to New York

Links and Nodes	Transit Time/Dwell Time (Hours)	Reliability (95% travel time)	Cost (2014 \$'s)
<i>West Coast port (Seattle)</i>			
Dray move	1.0	1.4	\$299
<i>Transload or Consolidation Center</i>			
Dray move	1.0	2.25	\$308
<i>West Coast rail intermodal terminal</i>			
Rail move	104	154	\$3,178
<i>Midwest rail intermodal interchange</i>			
Rail move	71	160	
<i>East Coast rail intermodal terminal</i>			
Dray move	1.1	1.4	\$318
<i>East Coast Regional Distribution Center</i>			
Truck P&D move	6.0	9.5	\$775
<i>Retail Store</i>			
Totals			\$4,878

Estimated using **ATRI** data for truck transit times, **TransCore** data for rail times, **Chainalytics** data for costs. Reliability factor for Midwest interchange was produced for sum of West Coast plus Midwest dwell, but most of delay is in Midwest (Chicago)

Sources for Modal Fluidity Data

Measure	Mode	Sources
Transit Time & Reliability	Truck	ATRI, NPMRDS, Google/TTI (& others)
	Rail Intermodal	TransCore (& Railinc)
	Rail Carload	RSI Logistics (& Railinc)
	Waterway	ACE Automatic Identification System
	Port (dwell)	ATRI (some)
Cost	Truck	Chainalytics
	Rail Intermodal	Chainalytics
	Rail Carload	STB Waybill
	Waterway	ACE (partial)

Comment on Fluidity Data Sources

Speed & Reliability: Truck

- **ATRI quality and coverage strong, accessibility below national/federal level a limitation**
 - Custom work at a cost
 - But readily repeatable for tracking
- **NPMRDS (“HERE”) data derive from ATRI, need tools to manage**
 - Loss of detail (e.g., real route)
 - Indirect instead of direct (subsidized) cost
 - Computationally intensive to assemble highway segments into routes (but tools could be developed to automate the process and statistical analyses)
- **Google/TTI cheap and widely available, but an approximation**
 - Factual but general basis

Comment on Fluidity Data Sources

Speed & Reliability: Rail

- **TransCore covers major intermodal lanes**
 - Transit and dwell times available
 - No Mexico traffic; full scope unclear
 - Cost seems manageable at federal level
- **RSI Logistics covers carload traffic**
 - From car tracking; should include dwell time
 - Cost and full scope TBD (not needed in pilot)
- **Railinc presumably captures everything**
 - Requires rail industry cooperation (as in Canada)

Comment on Fluidity Data Sources

Speed & Reliability: Water

- **Army Corps Automatic (vessel) Identification System (AIS) a high quality, public source**
 - Waterway coverage expanding
 - No acquisition cost issues
 - Custom analysis required, but tools could be developed to automate route definition and statistical analyses
- **Port dwell to be determined**
 - ATRI capable of capturing truck turnaround via geofencing
 - Broader definition requires port/operator cooperation

Comment on Fluidity Data Sources

Cost: Truck and Rail

- **Chainalytics a high quality, repeatable primary source, covering:**
 - Truckload: dry van, reefer, flatbed
 - No bulks, LTL
 - No private/dedicated, but can use proxies
 - Rail: intermodal only
 - STB Waybill a fallback source for carload
 - US and NAFTA, long and short haul
- **Cost to be determined**
 - Consortium, and not their normal business model
 - Expect practical at federal level, at least

Comment on Fluidity Data Sources

Cost: Water

- **No direct sources identified**
 - Army Corps has cost data; price data may be possible
 - Others may have spot coverage
 - Charge for access, and not necessarily repeatable

Findings: Feasibility

- **We can measure and track the high-level performance of representative supply chains with market-driven metrics**
 - Demonstrated feasibility
- **Key measures and metrics are common across supply chains and can be scaled for national, multistate and metropolitan use**
 - Travel time and travel time reliability are available from public and private sources, but “some assembly is required...”
 - Cost data can be purchased from private suppliers
 - Safety data are available, but not readily accessible
 - Risk data can be estimated, but are not readily available

Findings: Data Application Issues

- **Data characteristics?**
 - Definitions
 - Reliability and validity
 - Continuous or periodic or seasonal
 - Time series and historical
- **Data availability, access and cost?**
 - National and nationwide
 - Downward scalability (proliferation)
- **Who acquires & marshals fluidity data?**
 - Public program should *not* be limited to public sources
 - Federal role for main constructs (akin to FAF, NPMRDS)
 - Corridor coalition model for pooling regional resources: acquisition and application (akin to I-95 ICAT/INRIX)

Questions?



**Marygrace Parker: i95mgp@ttlc.net
www.i95coalition.org**

Joseph Bryan: BryanJG@pbworld.com