FHWA Freight Intermodal Connectors Study

presented to

FHWA Talking Freight Seminar

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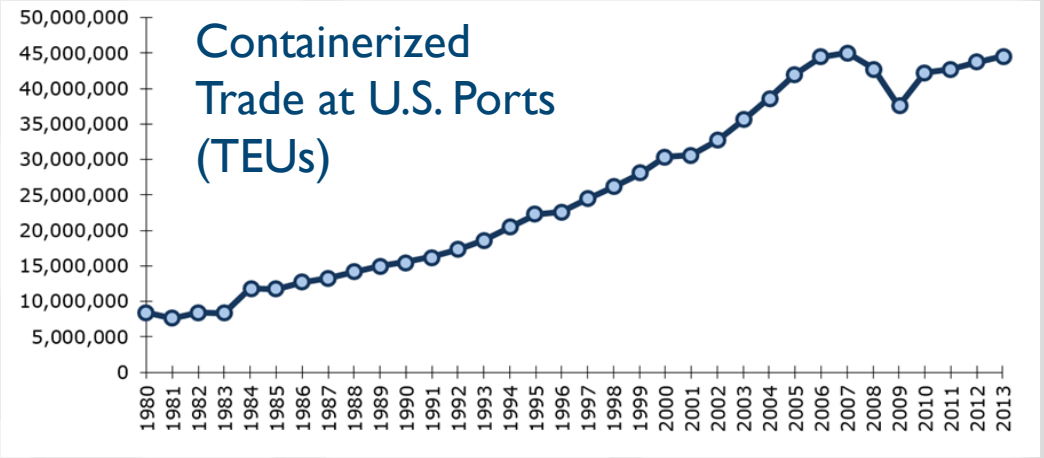
Agenda

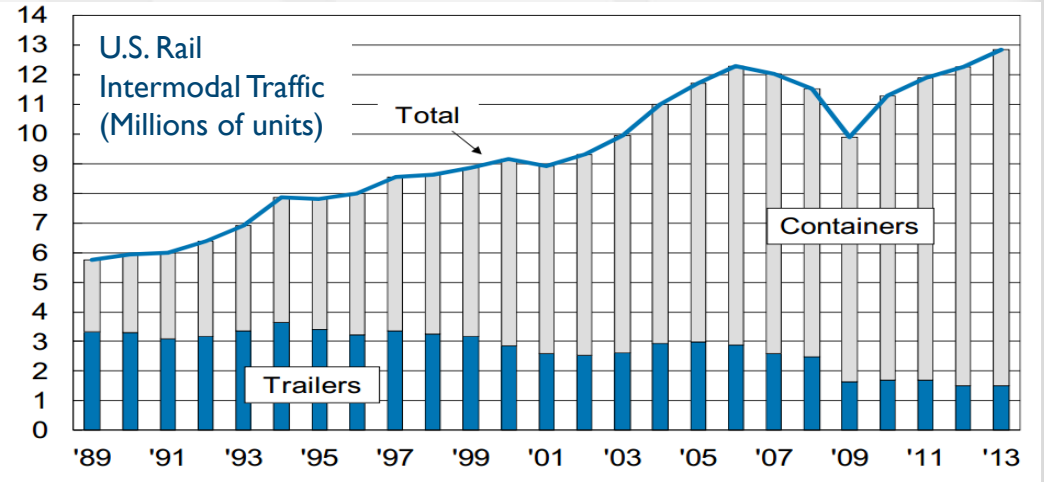
- Overview of Study
- Literature Review
- Case Studies
- Systemwide Connector Analysis
- Costs to Improve and Operate on Connectors
- Supply Chain Implications
- Next Steps/Future Research

Literature Review Key Findings

Growth by Freight Mode

- Marine port intermodal volumes have tripled since 1990
- Rail intermodal volumes have doubled since 1990
- Air cargo and barge volumes have remained relatively flat





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Literature Review Key Findings

Growth by Freight Mode (continued)

- Emergence of truck-truck terminals
  - » Matches growth in warehousing employment
  - » Examples:
    - Dallas Logistics Center in Texas
    - Pureland Ind. Complex in New Jersey
    - Coastal International Logistics in Florida

Year	U.S. Warehousing Employment	Percentage Change from 2004
2004	572,000	-
2005	615,900	8%
2006	656,600	15%
2007	675,800	18%
2008	657,400	15%
2009	620,500	8%
2010	641,400	12%
2011	664,100	16%
2012	707,000	24%
2013	725,000	27%
2014 (Aug.)	744,500	30%

Literature Review Key Findings

Data on Freight Intermodal Connectors

- Number of connectors increased for all modes since 2000
- Trends indicate that port, rail, and truck-truck intermodal terminal volumes will continue to grow
- FHWA data sources designed to provide connector characteristics, use, condition, and performance
  - » HPMS – roadway descriptors, volumes, pavement condition
  - » NPMRDS – truck speed data

Case Studies
Number, Type, and Location

- 18 freight intermodal terminals
  - » 60 freight intermodal connectors
  - » Partnered with the U.S. Maritime Administration to conduct additional port case studies

Air Cargo
Memphis (TN) International Airport
Charlotte/Douglas (NC) International Airport
Portland (OR) International Airport

Emerging Industries
Williston (ND)
City of Industry (CA)
Port of Jacksonville (FL)

Ports
Port of Baltimore (MD)
Port of Philadelphia (PA)
Port of Long Beach (CA)
Port of Savannah (GA)
Port of Catoosa (OK)
Port of Houston (TX)
Port of Cleveland (OH)
Port of Portland (OR)

Rail
Atlanta (GA) Inman Rail Yard
Edgerton (KS) Intermodal Railyard
Marion (OH) Intermodal Railyard
Chicago (IL) Area Consolidated Hub

Case Studies
Process

- Reviewed FHWA databases
- Reviewed state DOT, MPO, and local planning efforts
  - » State – Long Range Plans, STIPs, and Freight Plans
  - » MPO – LRTPs, CMPs, TIPs, and Freight Plans
  - » Corridor studies, subarea studies, and freight facility studies
- Interviewed public-sector and private-sector stakeholders

Case Study Findings

Characteristics, Use, Condition, and Performance

- Connector Use
  - » Some roads used as connectors are not officially designated
  - » Some designated connectors are no longer used
  - » Average truck volume 1,590 trucks per day
- Connector Pavement Condition
  - » Most connectors have worse pavement condition than similar roadways
- Connector Performance
  - » Over two-thirds of connectors experience congestion

Case Study Findings
Planning

- Existing data and tools are not widely used
  - » Existing truck count data sources considered not sufficiently accurate
  - » Travel demand models not calibrated or validated for connectors
  - » NPMRDS truck speed data is new relative to case study projects
  - » Planning studies often collected new data
- Studies of connectors emphasized congestion and community issues
  - » Pavement condition rarely mentioned

Case Study Findings
Stakeholder Coordination

- Connectors may be owned by a variety of stakeholders
  - » States, counties, cities and often several local jurisdictions
- Two primary motivations for intermodal connector planning
  - » States concerned about economic development
  - » Locals concerned about neighborhoods
- Stakeholder coordination relies heavily on freight champions
  - » Typically trusted planners with long-term public sector experience and extensive private sector relationships

Case Study Findings
Funding

- FDOT Freight Connector Operational Quick Fix Program
  - » NHS Connectors and SIS connectors are eligible for this program
  - » Funded $15 million across eight projects in FDOT FY 2015
- FDOT Intermodal Access Program
  - » Predates the Florida SIS Program
  - » Can be used on freight or passenger connectors
  - » Provided partial funds for over $250 million of project improvements between FY 2014 and FY 2019
- No other active and funded programs focused on connectors were identified

Characteristics of All Designated NHS Connectors

- 798 connector terminals
- 1,239 connectors
- Low capacity roadways
  - » Roughly half are just two lanes
  - » 40 percent have three or four lanes
- Average length is 1.0 mile
  - » 71 percent less than 1 mile
  - » Connectors owned by city or municipal agency average 0.7 miles
  - » Connectors owned by state agencies average 1.7 miles

Connector Use, Conditions and Performance

Data Availability

Characteristic	Source	Metric	Data Availability
Use	HPMS	Total volumes Truck volumes	88% of all connectors
Condition	HPMS	Pavement condition	82% of all connectors
Performance	NPMRDS	Truck speeds Reliability	52% of all connectors

Connector Use, Conditions and Performance

Summary Use Data

- Average truck volume on connectors is 786 AADTT
  - » 50% of connectors have less than 500 trucks per day
  - » 75% of connectors have less than 1,000 trucks per day
- 1.4 million annual truck VMT on connectors
  - » 50% of truck VMT on top 5 percent of connectors
  - » 97% of truck VMT on top 50 percent of connectors
- State vs. local ownership
  - » State agencies own 46% of connectors, but these connectors carry 71% of truck connector VMT
  - » Local agencies own 54% of connectors, but just 29% of truck VMT occurs on these connectors

Connector Use, Conditions and Performance

Summary Pavement Condition Data

Pavement Condition Categories	IRI Rating (inches/mile)	Pavement Condition Description	Number of IRI Readings on Connectors	Percent of Total
Very Good	<60	Newly built or resurfaced and distress-free.	14	1%
Good	60-94	Smooth surface with little to no cracking or rutting.	103	8%
Fair	95-170	Serviceable with shallow rutting and moderate cracks beginning to occur, but does not affect travel speed on the connector.	428	35%
Mediocre	171-220	Same problems as fair but worse, causing some reduction in speed.	236	19%
Poor	>220	Major problems with potholes, etc., causing substantial reductions in speed.	458	37%
		Total	**1,239**	**100%**

Average IRI Value for All Connectors = 211 (Mediocre)

Average City/Municipality = 257; Average State Agency = 155

Connector Use, Conditions and Performance

Summary Speed Performance Data

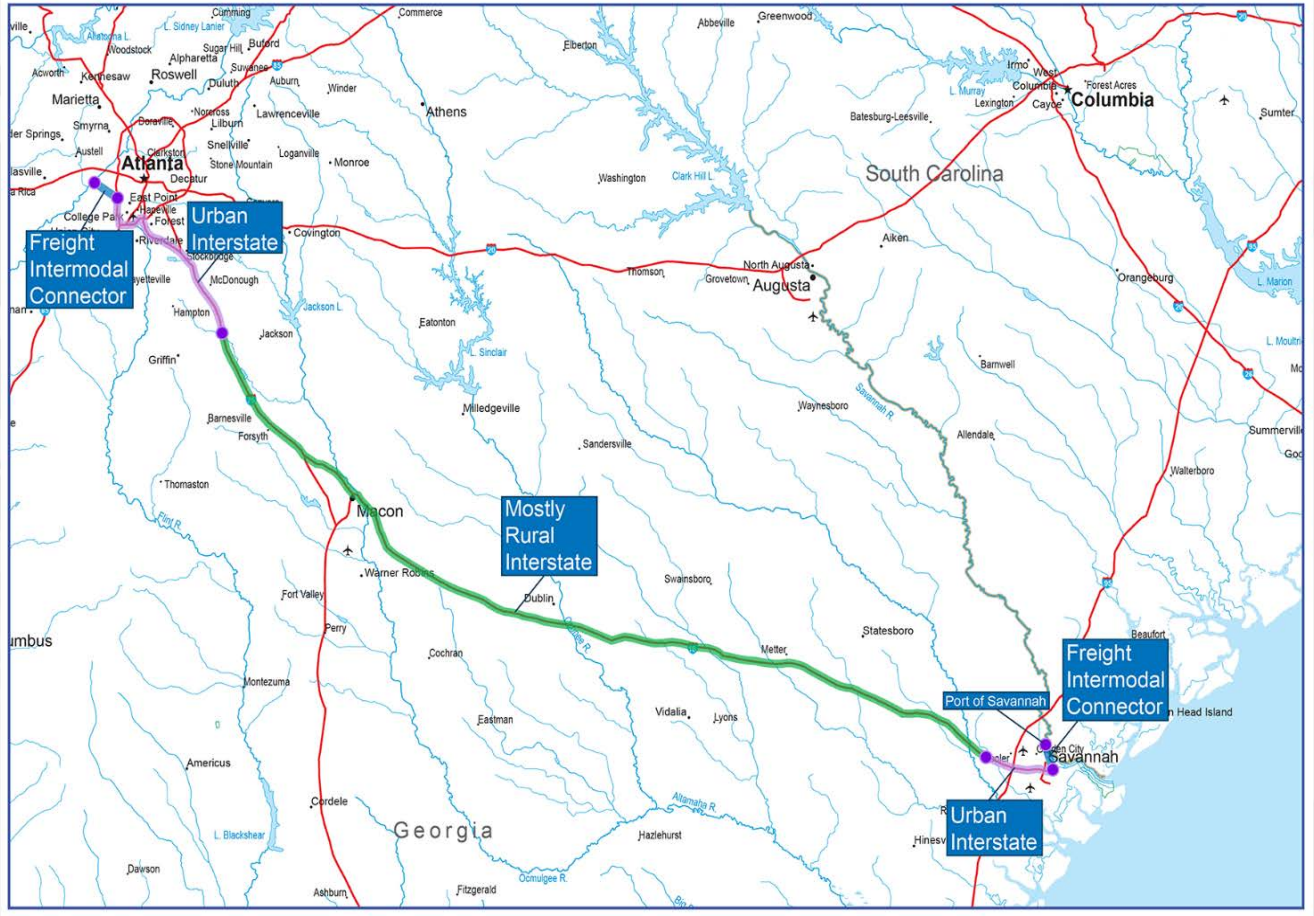
- Average speeds on freight intermodal connectors
  - » 42 mph on rural connectors
  - » 28 mph on urban connectors
- 4,237 hours of truck delay occur on freight intermodal connectors daily
- Daytime truck speeds are on average 11% less than free flow
  - » Rail and port connectors have worst congestion with 21% and 14% lower daytime speeds, respectively
- Average speeds slower on poor condition roadways

Impacts of Connector Deficiencies and Costs to Improve Connectors

- Connector pavement condition
  - » Range of annual vehicle operating costs from operating on less than "Good" roads
    - $31 million based on NCHRP 720 study, Estimating the Effects of Pavement Conditions on Vehicle Operating Costs
    - $335 million based on HERS-ST values
    - Includes truck and auto costs
  - » $2.2 billion estimated cost to improve pavement condition to "Good"
- Connector Delay
  - » $353 million cost of connector delay
  - » $3.2 billion needed to increase connector capacity
  - » Includes truck and auto costs

Supply Chain Implications

Port Example – Savannah to Atlanta



- Port connectors are small part of larger port supply chain
- Much more congestion on urban interstates
- Connectors are more important for other supply chains

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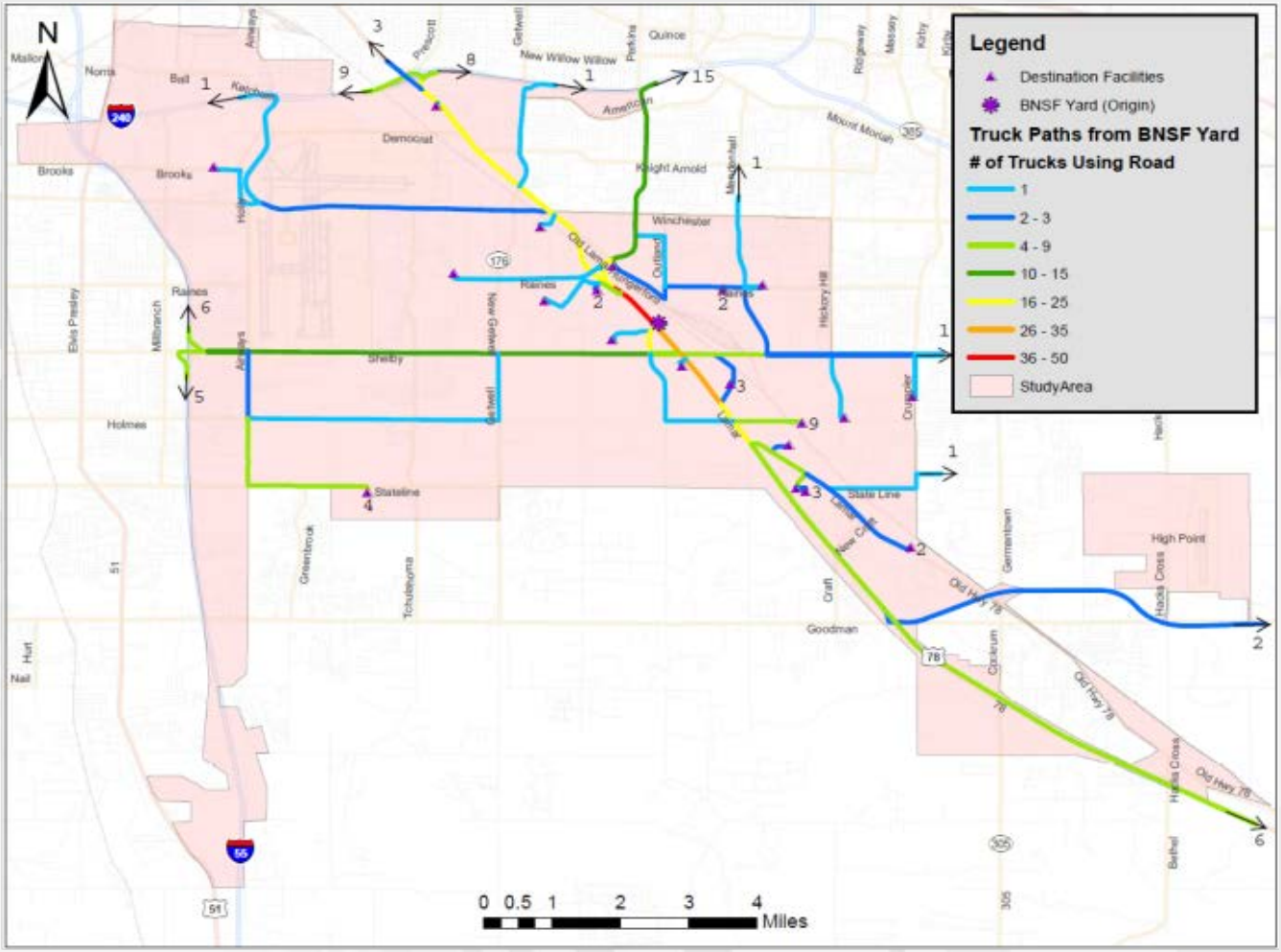
Supply Chain Implications

Rail Example – Memphis BNSF Yard



- Dispersion of trucks from rail intermodal yard does not directly align with connectors

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Next Steps/Future Research

- Next steps
  - » Complete final report
- Future Research
  - » Examine criteria for connector designation
  - » Identify options for improving connector data quality
  - » Work with existing programs to refine connector performance measures
    - Including tracking funding of connectors
  - » Develop guidelines for incorporating connectors in planning and programming processes

Questions and Comments

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