NCFRP 35: Multimodal Freight Transportation within the Great Lakes-Saint Lawrence Basin

Mid-America Freight Coalition Annual Meeting

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Bi-National Team

NCFRP 35 Panel

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Project Direction

Economic Research Development Group
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Mark Booth, MBA
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Elizabeth Ogard, Co-PI

Sustainable Ports
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Economic Analysis
Consultation & Communication
NCFRP 35: Key Research Questions

• What is the multimodal freight transportation system in the Great Lakes St. Lawrence Basin (GLSLB)?
• What is the economic impact of this freight transportation system, by mode and major industry?
• What is the multimodal freight system’s performance?
• What can be done to improve its performance, from a policy and planning standpoint?

Challenge: How to distill complex multimodal, multi-jurisdictional and multi-commodity freight system into practical insights for policy and planning?
Summary of NCFRP 35 Research Results

Overview of GLSLB Multimodal Freight Transportation System

- Economic Importance
- Major Commodities Handled
- System Performance
- Barriers to System Performance
- Opportunities to Improve System Performance
- Areas for Future Research
15 large international marine ports, 50 regional marine ports, 16 locks, Network of inland waterways
Port Throughput
Inland Waterway Traffic

Legend
- Top 20 Ports (2007)
- Marine Ports & Docks

Freight Flow Direction
- South - North
- North - South

Total Freight Movement
(In US Short Tons)

1
1,000,000
10,000,000
100,000,000
System Overview

Seven Class 1 railways (totaling 30,778 miles), 68 intermodal terminals, Several short lines and rail border crossings.
GLSLB Origins & Destinations of Rail Freight Movement by State/Province (in Thousands of US Short Tons)

(Source: Association of American Railways, Statistics Canada)
GLSLB Annual Average Daily Truck Traffic (AADTT)

Truck Traffic Volumes

Legend
- Cities

AADTT 2007
Proportional classification

1,000 5,000 10,000

Canada: On-Q, Administrative Databases (2007)
The GLSLB's 20 largest airports make up 95.2% of the regional air cargo traffic. 36 airports of 156 that handle over 10,000 tons of cargo per year are in GLSLB, majors being Chicago O'Hare and Toronto Pearson.
GLSLB Pipeline Network

Legend
- **Cities**
- **GLSLB Major Oil Refineries**
  - Capacity 2007 (bbl/d)
  - Petroleum Products: 10,000
  - Crude Oil: 50,000
  - Natural Gas: 100,000

GLSLB Pipelines
- **Type**
  - Petroleum Products
  - Crude Oil
  - Natural Gas

Source: CIA World Factbook & Oil & Gas Journal
Employment – 3.8 million jobs

- Truck: 62.6%
- Rail: 9.9%
- Water: 3.6%
- Pipeline: 2.3%
- Air: 21.5%

Value-Added – Total U.S. $311 billion

- Truck: 56.4%
- Rail: 12.2%
- Water: 3.9%
- Pipeline: 3.4%
- Air: 24.1%

Output – Total U.S. $627 billion

- Truck: 55.5%
- Rail: 11.0%
- Water: 4.0%
- Pipeline: 3.3%
- Air: 26.2%

Taxes – Total U.S. $87 billion

- Truck: 56.4%
- Rail: 11.3%
- Water: 4.0%
- Pipeline: 3.4%
- Air: 25.0%
Summary of Interim Report Research Results

- Overview of GLSLB Multimodal Freight Transportation System
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Major Commodities Handled

The major commodities moving to, from or within the GLSLB include:

- **Coal** (largely for regional power production),
- **Iron ore** (for regional steel production and export),
- **Grain and other agricultural products** (local consumption and export),
- **Automotive and machinery** (supporting local manufacturing base), and
- **Other manufactured goods** (including containerized imports for regional distribution and consumption and exports)
Top 5 commodities handled:

**Weight**
- Minerals: 24%
- Fuels and chemicals: 21%
- Agriculture and food products: 18%
- Manufact. and misc.: 11%
- Coal: 11%
- Other: 15%

**Value**
- Manufact. and misc.: 31%
- Machinery and transport. equipment: 28%
- Primary and fabricated metal products: 8%
- Agriculture and food products: 11%
- Fuels and chemicals: 14%
- Other: 8%
Summary of Interim Report Research Results

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System Performance

Barriers to System Performance

Opportunities to Improve System Performance

Areas for Future Research
Performance measurement:

- Highly complex
- Different measurement by different stakeholders
- Most salient is the shipper perspective
- Performance tradeoff:

Performance is Supply Chain Specific
Coal Supply Chains

Coal is largely captive
Flow outside-in to GLSLB

Legend
- Major ports involved in coal supply chain (more than 2.5m tons)
- Inbound parts
- Outbound parts
- Coal mines with 400 employees or more
- Coal fired power plants producing 1,500 MW or more

Total Coal Flow Movement (in US Short Tons):
- 2,500,000 - 5,000,000
- 5,000,000 - 10,000,000
- 10,000,000 - 20,000,000
- 50,000,000

Types of Flows:
- Upstream/waterway flow
- Downstream/waterway flow
- Trunk flow

Transportation Strategy Consultants

KEY SUPPLY CHAINS: COAL
Intermodal traffic moves by rail between coasts and GLSLB

Chicago is undisputed hub, thus extremely congested

Marine Containers

KEY SUPPLY CHAINS: INTERMODAL
Automotive Supply Chains

Most significant commodity by value
Grain Supply Chains

Legend
- Major ports involved in coal supply chain (more than 2.5m tons)
- Inbound ports
- Outbound ports
- Harvested acreage of grain

Transportation Strategy Consultants

Total Coal Flow Movement (in US Short Tons)
- 2,500,000 - 5,000,000
- 5,000,000 - 10,000,000
- 10,000,000 - 20,000,000
- 20,000,000

Types of Flows
- Downstream waterway flow
- Train flow
- Truck flow

Grain Supply Chains

NORTH DAKOTA
2.2m tons to MN from ND
9.3m tons to WA & Other
2.4m tons to SD from ND
4.4m tons to SD from MN
3.6m tons to IA from MN
5.3m tons
4.0m tons

IOWA

SOUTH DAKOTA

NEBRASKA

Legend
- Ethanol processing plants
  - Current Capacity (mmpy)
  - 0 - 25
  - 26 - 50
  - 51 - 100

Harvested acreage of grain

1 Dot = 7,000 harvested acres
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Areas for Future Research
Modal constraints are fairly well understood...

What is relatively less well understood are commodity or supply chain specific barriers and their potential solutions.

Some of the most significant barriers and constraints to multimodal freight transportation performance in the GLSLB, as identified by those consulted:
Capacity constraints and congestion are most significant around Chicago.

Airports and waterways have excess capacity, however, modal shift not a given.
Others Include:

- Modal integration challenges
- Lack of jurisdictional coordination
- Lack of multimodal funding mechanisms
- Modal inequality
- Lack of awareness of importance and role of freight transportation system
- Labor constraints
- Insufficiency of data and performance metrics
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Areas for Future Research
Performance Improvement Opportunities

• Improved freight transportation performance data and performance measures
• Better modal and jurisdictional coordination
• Multimodal funding and funding mechanisms
• Regional strategic framework to identify multimodal freight transportation priorities
• Gateway and corridor or supply chain specific performance analysis
GLSLB within continental and global supply chains
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Opportunities for Future Research

• Greater clarity is needed on specific regional/national/continental transportation policy goals
• More research is needed on individual supply chains, their performance needs, and related issues/opportunities
• Need for more data and key performance indicators on freight performance
• Opportunity to leverage research from NCFRP 35 to advance future research:

Data and analysis from NCFRP 35 publicly available (http://ncfrp35.utoledo.edu/Data.aspx)
NCFRP 43 Guidebook (for validation)

To obtain a copy, Google: “Chassis and CPCS”.

or, contact:
Mark Booth
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Summary of CPCS Qualifications

Management consulting & transaction advisory, specific to transportation sector (est. 1969 as consulting arm of CP, independent since 1986)

Summary of activity over last 7 years

- **Freight Rail**
  - 100+ Strategy mandates
  - 8 Transactions
  - $3+ billion in deals

- **Port & Terminals**
  - 35+ Strategy mandates
  - 30+ Transactions
  - $5+ billion in deals

- **Multi-modal Transport**
  - 30+ Strategy mandates

- **Passenger & Transit**
  - 10+ Strategy mandates
  - 3 transactions
  - $3 billion in deals