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

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Marc-André Roy
Principal Investigator
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The Study Area
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?
• How does this multimodal freight system perform?
• What can be done to improve its performance, from a policy and planning standpoint?
Bi-National Team

NCFRP 35 Panel

CPCS
Marc-Andre Roy, IMBA
Principal Investigator
Project Direction

Economic Research Development Group
Glen Weisbrod, PhD, Co-PI
Steve Fitzroy & Co.

CPCS
Mark Booth, MBA
JF Arsenault, MSc
Eric Seguin, GIS Specialist & Co.

Richard Stewart, PhD
Co-PI of the
Great Lake Maritime Research Institute

Prime Focus LLC
Elizabeth Ogard, Co-PI

Sustainable Ports
Roberta Weisbrod

University of Toledo
Peter Lindquist, PhD, Co-PI

Economic Analysis
Consultation & Communication
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
GLSLB Port System

Legend
- Top 20 GLSLB Ports (2007)
- Water Locks
- Other Marine Ports (handled < 9,000,000 US Short Tons in 2007)
- Inland Waterways
Port Throughput

Legend
- Size = 11,000,000 US Short Tons
- Unloaded
- Loaded
- Other Marine Ports (handled < 9,000,000 US Short Tons in 2007)
Inland Waterway Traffic
System Overview

GLSLB Rail System

Legend
- Cities

GLSLB Class “1” Railways
Ownership
- BNSF
  *Burlington Northern Santa Fe
- CN
  *Canadian National
- CP
  *Canadian Pacific
- CSX
  *CSX Transportation
- KCS
  *Kansas City Southern
- NS
  *Norfolk Southern
- UP
  *Union Pacific

United States: National Transportation Atlas Databases 2010
Canada: National Atlas of Canada Rail Network 2010
GLSLB Origins & Destinations of Rail Freight Movement by State/Province

(Source: Association of American Railways, Statistics Canada)
GLSLB Airports

Legend

Top 20 GLSLB Airports in Tons (2007)

- Size = 180,000 US Short Tons
- Loaded
- Unloaded
- Other Airports (handled ≥ 10,000 Tons in 2007)
GLSLB Pipeline Network
Summary of Interim Report Research Results

- Overview of GLSLB Multimodal Freight Transportation System
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Economic Impact

Employment – 3.8 million jobs

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

Output – Total U.S. $627 billion

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

Value-Added – Total U.S. $311 billion

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

Taxes – Total U.S. $87 billion

- Truck: 56.4%
- Rail: 11.3%
- Pipeline: 3.4%
- Air: 25.0%
- Water: 4.0%
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
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)
Major Commodities Handled

Top 5 commodities handled:

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

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%
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
Performance measurement:

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

- Coal is largely captive
- Flow outside-in to GLSLB

Key Supply Chains: Coal

Legend:
- Inbound ports
- Outbound ports
- Coal mines with 400 employees or more
- Coal-fired power plants producing 1,500 MW or more

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

Map annotations include:
- Coal Supply Chains
- Transit Time
- Risk
- Logistics Cost
- Reliability

Key Supply Chains:
- WA
- KANSAS
- MINNESOTA
- NORTH DAKOTA
- SOUTH DAKOTA
- NEW YORK
- MARYLAND
- ILLINOIS
- VIRGINIA
- WEST VIRGINIA
- KENTUCKY
- FL
- KY
- IA
- AL

CPCS: 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
- 50,000,000

Coal from Powder River (CO, WY & MT) to Duluth-Superior (20.6m tons)
- 125m tons to 20m tons to Port of Duluth-Superior

Map highlights:
- Transportation strategies for efficient coal supply systems
Intermodal traffic moves by rail between coasts and GLSLB

Chicago is undisputed hub, thus extremely congested
Automotive Supply Chains

Most significant commodity by value

KEY SUPPLY CHAINS: AUTOMOTIVE & MACHINERY MANUFACTURING
(locations with 40m or more in sales)
Overview of GLSLB Multimodal Freight Transportation System

Economic Importance

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Barriers to System Performance

Opportunities to Improve System Performance

Areas for Future Research
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
• Insufficiency of data and performance metrics
• Lack of awareness of importance and role of freight transportation system
• Labor constraints
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Performance Improvement Opportunities

- Opportunity for better freight transportation performance data and performance measures
- Opportunity for gateway and corridor or supply chain specific performance analysis
- Opportunity for better modal and jurisdictional coordination
- Opportunity for regional strategic framework to identify multimodal freight transportation priorities
- Opportunity for multimodal funding and funding mechanisms
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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
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
- 30+ Transactions
- $5+ billion in deals

Passenger & Transit
- 10+ Strategy mandates
- 3 transactions
- $3 billion in deals
Marc-André Roy
Principal Investigator
mroy@cpcstrans.com
613 237 2500 x 306