Achieving Emissions Reductions in the Freight Sector: Understanding Freight Flows and Exploring Reduction Options

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Acknowledgments

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- For more information about TCI see: http://www.georgetownclimate.org/state-action/transportation-and-climate-initiative

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Overview

• Understand the problem
• Characterize the data
• Identify energy and emissions reduction opportunities
• Implement results
• Questions and discussion
Understand the Problem

Freight is closely tied to economic growth and is growing; unfortunately, the bulk of freight is moved by high energy-intensive and GHG-intensive modes (truck).

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For every trillion dollar increase in GDP, we expect an additional ~140 billion ton-miles.

Source: BTS (2011)

Note:
These represent top-down averages and should not be used for blanket modal comparisons!

Source: Transportation Energy Data Book 27

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Range of typical CO2 efficiencies for various cargo carriers

NOTE: Impacts are a function of many factors related to route and modal characteristics.


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Total emissions from transportation \(~1.9\ \text{GtCO}_2\text{eq/yr}\)

Total emissions from all energy sectors \(~5.9\ \text{GtCO}_2\text{eq/yr}\)

**Percentage of Energy-Related Transportation CO2 Emissions by Mode, 2011**

- **Light-Duty Vehicles**: 56.9%
- **Freight Trucks**: 17.7%
- **Bus Transportation**: 1.0%
- **Commercial Light Trucks**: 2.2%
- **Rail, Passenger**: 0.3%
- **Rail, Freight**: 2.1%
- **Shipping, Domestic**: 0.8%
- **Shipping, Intern'l**: 3.3%
- **Air**: 9.8%
- **Military Use**: 2.9%
- **Lubricants**: 0.2%
- **Pipeline Fuel**: 1.9%

**Source:** AEO 2011

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Freight flows for the TCI region are dominated by truck (87%); about 50% of the commodities moved by weight include: gravel and stone; refined fuel; non-metallic minerals; and coal.
Overview of Characterization Project

• **Purpose**
  - Characterize freight flows for the TCI region
  - Provide EXCEL and ArcGIS datasets on freight flows

• **Value**
  - Results provide data and context for regional plans, programs, and policies to reduce improve efficiency and reduce the environmental impacts from freight transportation

• Supported by the Georgetown Climate Center
Scope of Study

- Geography

- Modes: Truck, Rail, Ship

- Commodities: All available and reported
Freight Flow (ktons) to Northeast Counties from the Northeast Region

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Freight Flow to Northeast Counties from U.S. States Outside of the Northeast Region, by Weight

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Identify Energy and Emissions Reduction Opportunities

The IF-TOLD framework provides insights into options for emissions reductions from freight; the GIFT model can be used to evaluate trade-offs across important criteria (cost, time-of-delivery, emissions, etc.).
The IF-TOLD Mitigation Framework

- The IF-TOLD framework:
  - **Intermodalism/Infrastructure** – use of efficient modes and infrastructure
  - **Fuels** – use of low carbon fuels
  - **Technology** – application of efficient technologies
  - **Operations** – best practices in operator behavior
  - **Logistics** – improve supply chain management
  - **Demand** – reduce how much STUFF we consume

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Example Using the Geospatial Intermodal Freight Transportation (GIFT) Model

GIFT has been jointly developed at the Rochester Institute of Technology (RIT) and the University of Delaware with partial support from the U.S. Department of Transportation, Maritime Administration and the Great Lakes Maritime Research Institute.

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Connect Multiple Transportation Mode Networks at Intermodal Transfer Facilities

Road Network
Rail Network
Waterway Network
Intermodal Transfer Facility

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Montreal to Cleveland (Ship 1)  Montreal to Cleveland (Ship 2)

Emissions and Time of Delivery Tradeoffs
Montreal to Cleveland

**CO₂ (kg)**

- Truck: 400 kg
- Ship (DR): 200 kg
- Rail: 100 kg
- Ship (EJ): 100 kg

**Time-of-Delivery (hrs)**

- Truck: 10 hrs
- Ship (DR): 40 hrs
- Rail: 20 hrs
- Ship (EJ): 60 hrs

*Mode*
CO₂ Comparison

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Implement Results

More analysis of policy impacts needed for the Northeast and Mid-Atlantic states; however, one could use IF-TOLD to identify potential opportunities for a menu of policies.

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# Policy Options

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Questions/Discussion