

# Clusters, Supply Chains, and the Freight Economy



Minnesota Freight Advisory Committee

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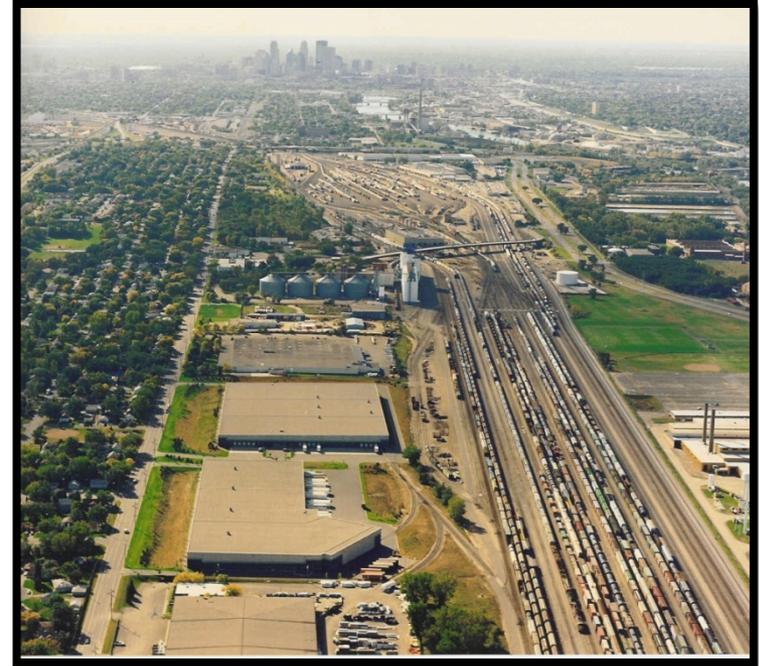


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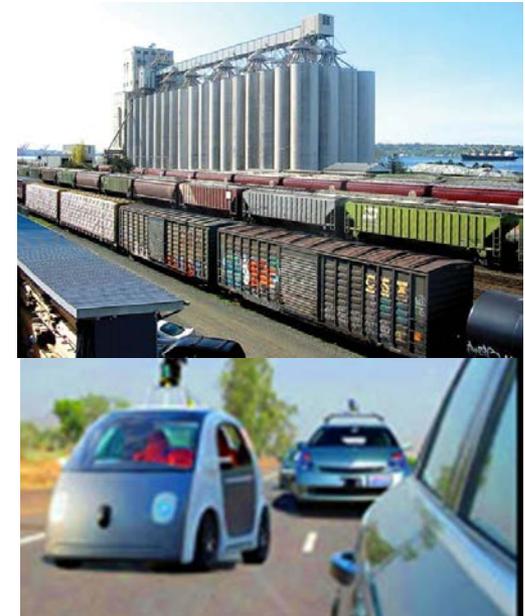
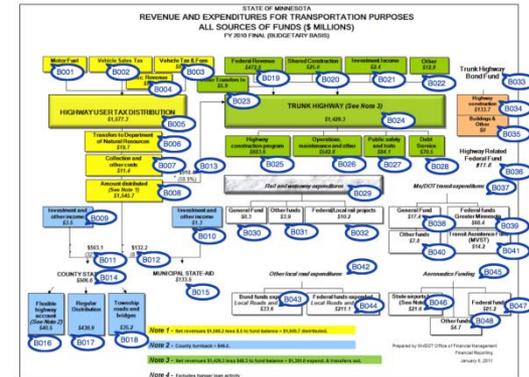
# Transportation Policy and Economic Competitiveness (TPEC)

- Ensure Minnesota is at the forefront of transportation in support of economic competitiveness.
- Provide academically-based research and insight on industry clusters, finance, technology, and other key areas.



# TPEC Three-Part Focus

- **Financing.** Funding of the surface transportation system will continue to be a critical issue at all levels for the foreseeable future.
- **Industry Clusters.** There is a large and increasing amount of research identifying a strong link between transportation and economic competitiveness.
- **Technology.** Major changes in technology are imminent and will require major changes in public policy.



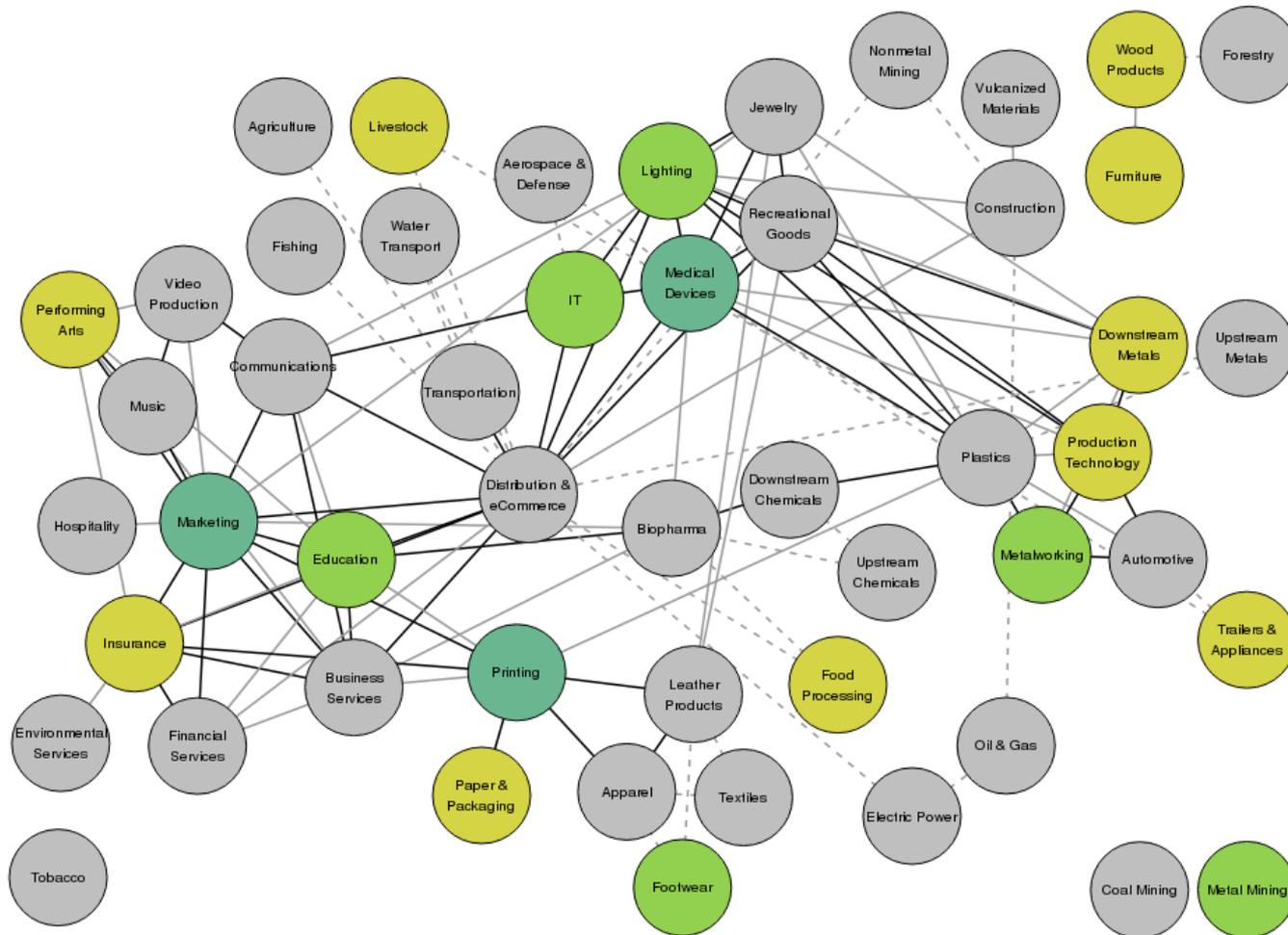
# Cluster Linkages and Economic Diversification

Minnesota, 2014

## Cluster Specialization

- Strong clusters above 90th percentile specialization
- Strong clusters above 75th percentile specialization
- Other specialized clusters (LQ > 1.0)

- BCR  $\geq$  95th pctile & RI  $\geq$  20%
- BCR 90th-94th pctile & RI  $\geq$  20%
- -** Next closest clusters not meeting above criteria



Source: US Cluster Mapping Website <http://www.clustermapping.us/>

# NATIONAL FREIGHT ECONOMY ATLAS

Home Story Maps National Maps Regional Maps Industry Clusters Documentation Reports Meet The Team 



<http://freighteconomyatlas.org/>

# Analytical Process

## Identify industry clusters:

- Apply cluster analysis to land use

## Locate commodity freight flow concentrations:

- Using hotspots analysis, identify local freight-intensive routes

## Identify state freight-intensive corridors through flow concentrations:

- Utilizing the data on commodity flows augmented with the LQ function at the state-level

## Identify regional freight corridors:

- Utilizing the data on commodity flows augmented with the LQ function at the regional-level
- FHWA criteria applied to identify regional freight corridors  
(i.e. highways segments with at least 8,500 trucks per day, highway parallel to rail lines with high volume, & rail and waterways with more than 50 million ton of bulk cargo)

## Identify national freight flows network (U.S. supply chain):

- Utilizing the data on commodity flows augmented with the LQ function nation-wide

## Analyze the economic impact of industry clusters and commodity flows

- Apply freight transportation intensity function – a ratio of total ton-miles to Gross State Product & Gross Domestic Product to show the actual freight activity required to produce one unit of goods and services at either state- or national-level (acquired from BTS)

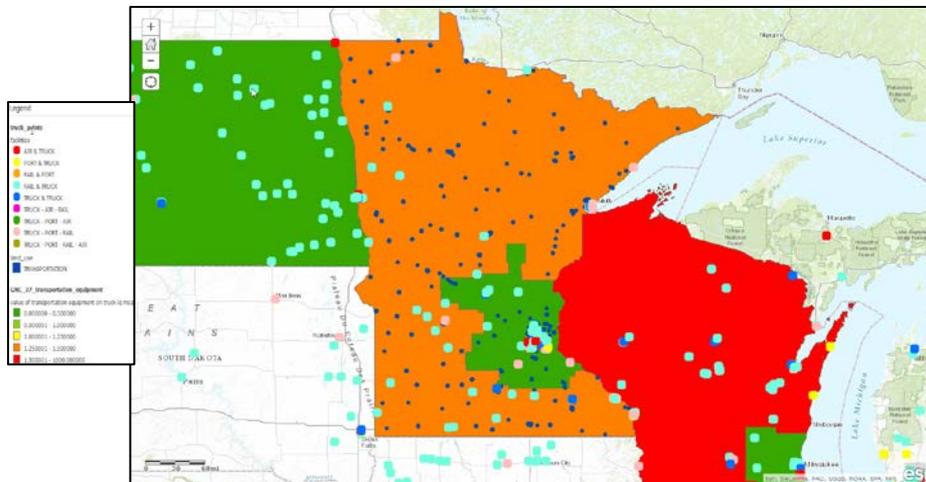
# Analytical methods: Clusters and Hotspots

## Clusters analysis:

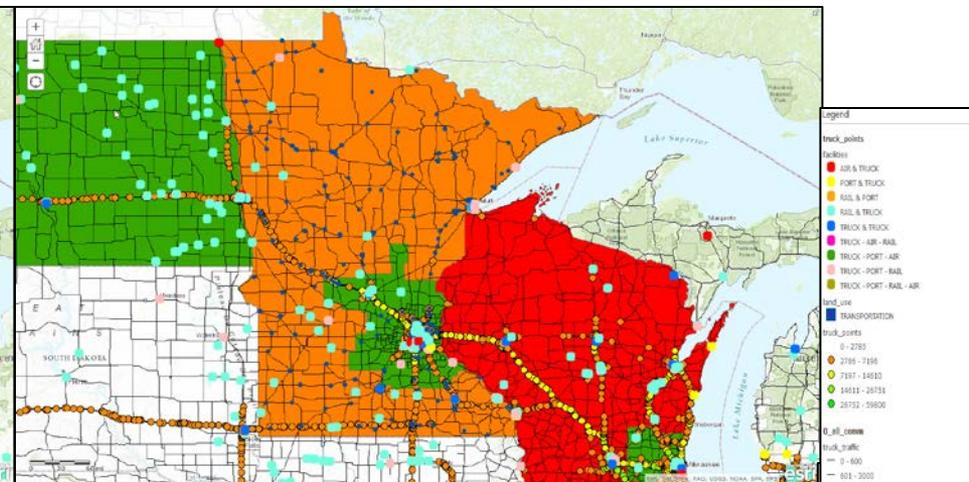
- Identifying industry clusters through land-use
  - metropolitan areas, statistical areas, and local municipalities

## Hotspot analysis:

- Locating freight-intensive corridors by freight flows
  - state, regional, and national



Note : This analysis identifies Minnesota industry clusters through land use by commodity code



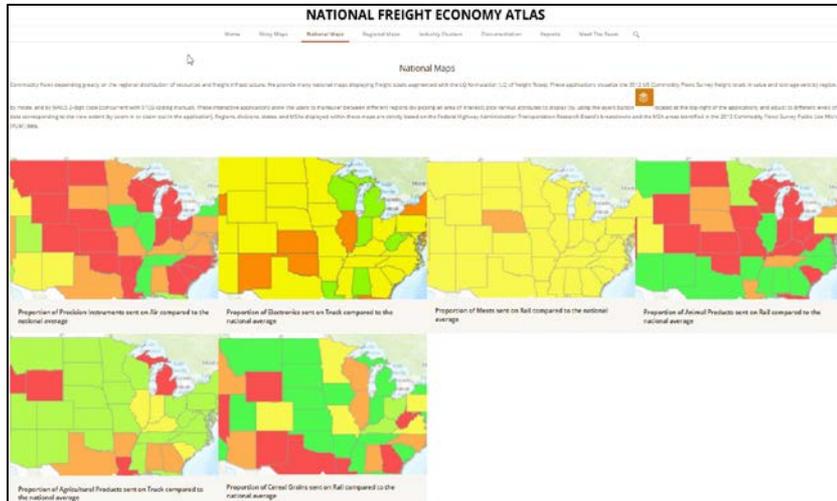
Note : The analysis identifies the Minnesota freight-intensive routes to intermodal facilities

Location of Minnesota Intermodal Facilities & Warehousing/transportation industry cluster

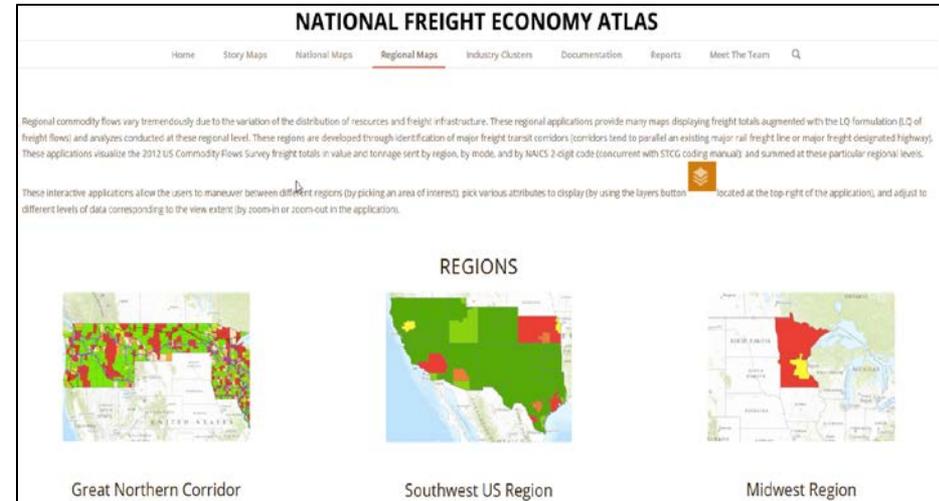
Concentration of Minnesota Average Annual Daily Truck Traffic

# Analytical methods: LQ of commodity flows

## National maps and analysis: LQ of commodity flows



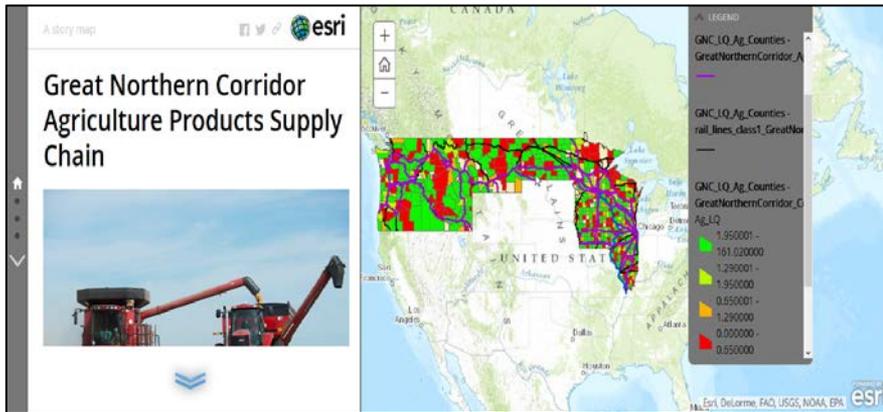
## Regional maps and analysis: LQ of commodity flows



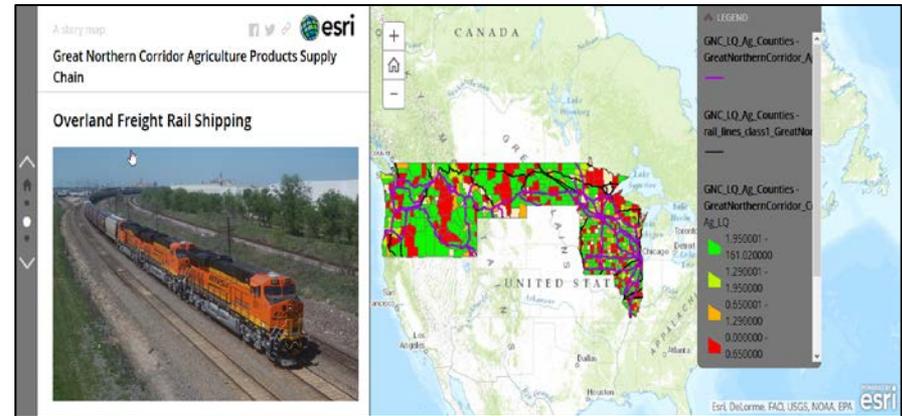
# Case Study Analysis: Story maps

A story map is a strategy of using a graphical organizer to provide a narrative of elements on a topic or a description of a series of events through a story-telling application. An example story map of the transport of agricultural products originating in Minnesota distributed across the Great Northern Corridor is provided below.

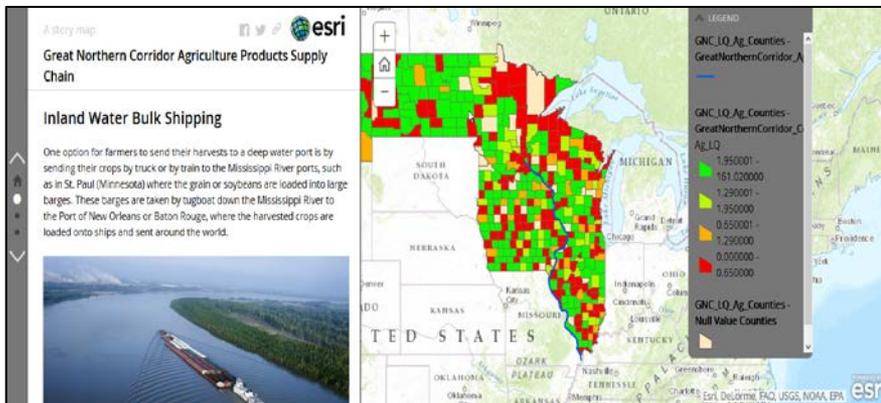
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# Case Study: Medical Devices and Health Sciences

- Medtronic: Show the supply chain for pacemakers made by Medtronic
  - Method-
    - Identify supply chain through online information
    - Create visualization representation
    - Visualize the analysis



# Medtronic

## Medtronic

- Started in a Twin Cities' garage in the 1940s
- Headquarters in Dublin, Ireland
- Pacemaker, first major product
- Product Groups:
  - Cardiac/Vascular
  - Restorative Therapies
  - Minimally Invasive Therapies
  - Diabetes
- Ships to 155 different countries, 80 distribution centers globally, and 70 manufacturing plants



# Transport, logistics, & Supply Chain

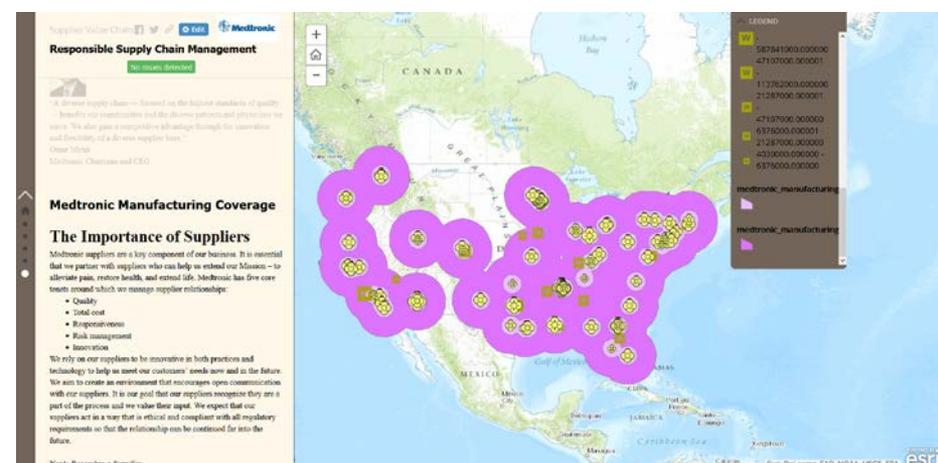
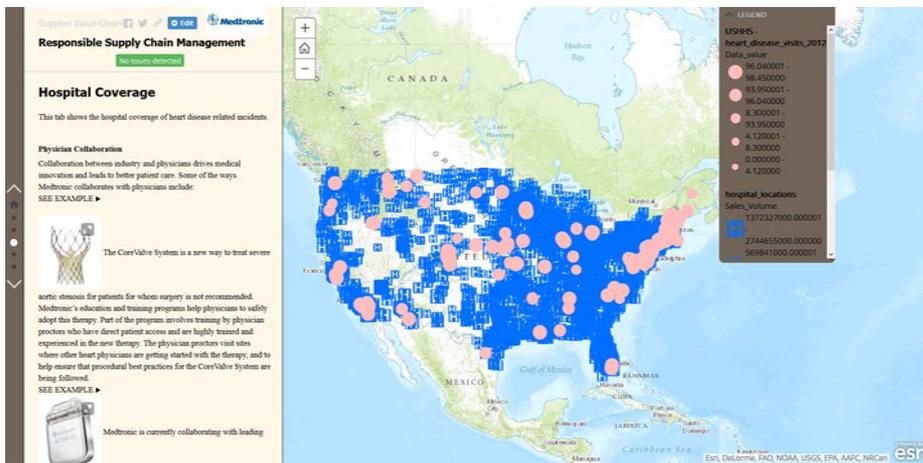
- State licensing has a significant impact on medical device distribution, manufacturing, and trade
- Lithium battery restrictions
- Uses a variety of transportation options depending on size and cost of product
- Memphis, the critical supply chain juncture



**Medtronic**



# Medtronic Supply Chain



- <http://agis.maps.arcgis.com/apps/MapJournal/index.html?appid=a5c6eb42346640378858c7beaa8cce67>

# TPEC -Quetica Collaboration

**Title:** "Midwest Supply Chain Optimization Atlas"

**Objective:**

To enhance the understanding of transportation infrastructure constraints to supply chain performance in the Midwest and consideration of alternatives to achieve supply chain optimization.

**States:** Minnesota, Iowa, Illinois, Missouri, Wisconsin, Nebraska

**Platform:** Esri GIS Platform hosted on National Freight Economy Atlas provided by TPEC/CGU

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# What is Supply Chain Network Optimization?

- Commonly used by private companies to design and optimize global supply chains to improve services and/or reduce costs
- Applying same practices to optimization of state and local freight networks to:
  - Lower the cost of transportation for businesses
  - Increase transportation responsiveness and predictability
  - Incentivize business expansion
- Identify commercial freight road networks that are irrelevant
- Reduce road freight / truck traffic
- Improve transportation network resiliency



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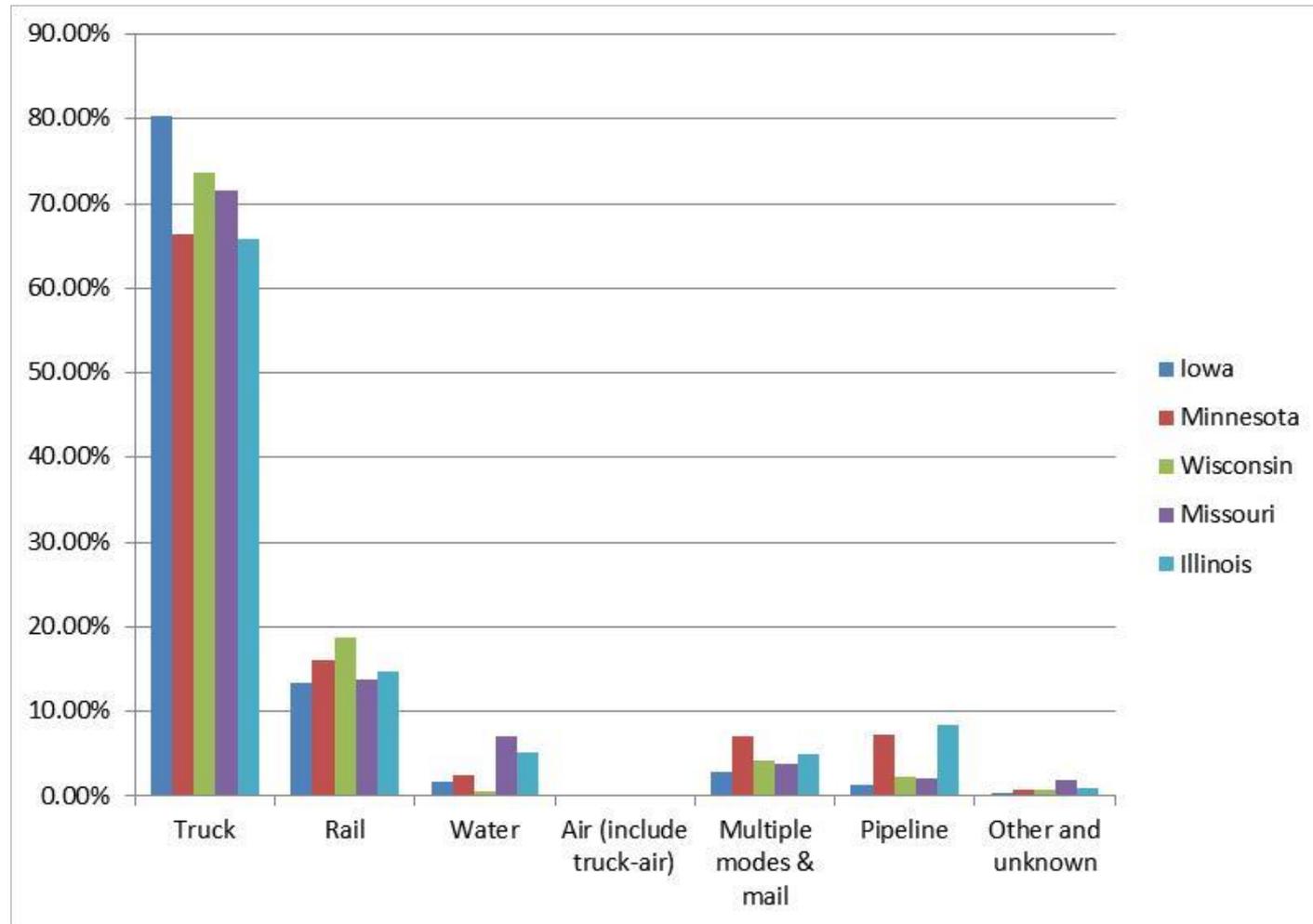
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# Comparing Base Year Domestic Freight Flows



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Data Source: FAF 3.5, Federal Highway Administration

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# TPEC Quetica Collaboration

1. Determine data to be used in Atlas and means/format for analysis.
2. Analyze Midwest supply chain constraints.
3. Create maps and case study storymaps of constraints.
4. Provide selective analysis and visualization of constraints and alternatives for optimization.



# *Questions?*

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