Freight and Logistics
Trends to Watch

James J. Corbett, University of Delaware
jcorbett@udel.edu; http://www.ceoe.udel.edu/our-people/profiles/jcorbett
Transportation Planning and Policy is a priority at Local, Regional, National, International scales

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

engaged in Critical Transportation Issues

- Making systems safe and secure
- Achieving a state of good repair
- Automation/technology/innovation
- Efficient Freight/Goods movement
- Resilience/Climate Change/Clean energy
- Economic development/growth
- Reliability/Congestion relief
- Equity issues
- Governance Issues

Three freight connections

1. **International freight becomes domestic freight;**
   long-haul goods movements become short-haul and local deliveries

2. Freight trends are not the same as traffic trends (across modes)

3. Big freight patterns emerge in our regional corridors from:
   • Small, enterprising firms taking *separate actions*, aggregated
   • Large firm(s) making *big decisions*, maybe game changers
   • Community *mobility patterns shifting* in or out of sync with road system
Port of Wilmington Freight Change (%/yr)

Data prior to new port management

- All Port Cargo
- Dockside Ship Traffic
- Containerized Cargo
- Gate Truck Traffic

-4.0% -2.0% 0.0% 2.0% 4.0% 6.0% 8.0%
Logistical Freight Questions

• What is the trend horizon of interest?

• What starting time do we use for the trend?

• Is our business in equilibrium, stable, or predictable now?

What would punctuate change or disturb our business?
Transforming Example: Zero-Carbon Freight

• Decarbonizing freight is a challenge
• Delay in logistics is a resource

• Ship financing takes into account low-carbon performance
• Social cost of carbon ≠ Supply chain cost of carbon

• Recapitalizing the fleet needs some messy experimenting

• The value proposition for goods movement is growing
What is happening to supply chain now?

- Container shipments have grown by 290% since 2000
- Vessel overcapacity, “right-steaming”
- Supply chain is more intermodal
- Distribution Centers now twice the size from a decade ago
- Alternative ports are on the rise

http://www.capacityllc.com/blog/7-striking-stats-logistics-global-local/
Recall 2009?

- **Maersk Parent Projects Loss of $1 Billion**
  - JOC NEWSWIRE, *12 November 2009*
  - Danish shipping giant A.P. Moller-Maersk, hit by sharply falling demand and freight rates, lost $706 million in the first nine months of 2009 on a 31.7 percent drop in container shipping revenue and said Thursday it expects to lose $1 billion in the full year.

- **Maersk introduces 'super slow steaming'**
  - Sustainableshipping.com, *12th November 2009 11:51 GMT*
  - Maersk opts for 'super slow steaming'. A.P. Moller-Maersk has introduced “super slow steaming” in an effort to cut bunker consumption.

Sustainableshipping.com, *27th November 2009 00:13 GMT*

**Super slow steaming will cut costs and help the environment**

- In order to maintain similar levels of service in terms of frequency ZIM will add a 4,250 TEU vessel to each service. The company added that there will be only minor changes in transit times.
- **This allowed containerships to sail at half speed, reducing fuel costs and emissions by 10%-30%.**
Recognize that the entire supply chain has adjusted to long-run signals by shipping:

1. Higher energy costs for ocean transport
2. Slower speeds to help hold freight rates
3. Increased warehousing (“right-shoring”) 
4. Increased value-added handling enroute

Balancing Supply Chain Drivers for Least Cost

Total Cost of Transportation plus Inventory

Fuel Price 3: ~$1000/ton fuel

Vessel Service Speed (knots)

- Total $/FEU-mile
- Time Cost
- Fuel Cost

Costs Incurred per FEU-Mile

Higher Inventory Costs  Higher Transportation Costs

Transportation Costs  Inventory Costs
Freight mobility is important and changing

• Container shipments have grown by 290% since 2000
• Vessel size/speed, “right-steaming”
• Alternative ports are on the rise
• Supply chain is more intermodal
• Distribution Centers: larger size and greater number over last decade
Slower supply chain: value-added (not delay)

Indexed Growth in Warehouse Space in US
(Amazon, Target, and Walmart data, 2000 = 100)

Source: http://www.mwpvl.com/index.html
**Freight trends have been closely related to Economic trends**

Crossplot of GDP and US Freight Ton-miles

The trend line equation is:

\[ y = 205.73x + 3E+06 \]

with an \( R^2 = 0.926 \).
The time penalty of intermodal must be offset by value added or very strong CBA benefits

~60% decarbonization => 3 to 9 X more time in motion

So two elephant-in-room questions: What does a supply chain do with the time available? Can the good tolerate it?
Our National Corridor study ID’d diversion delays
3x to 9x more delay for ~60% GHG reductions

Freight Diversions (for low-GHG) Impose Time Penalty

<table>
<thead>
<tr>
<th>Percent Change in Travel Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000%</td>
</tr>
<tr>
<td>800%</td>
</tr>
<tr>
<td>600%</td>
</tr>
<tr>
<td>400%</td>
</tr>
<tr>
<td>200%</td>
</tr>
<tr>
<td>0%</td>
</tr>
</tbody>
</table>

- West Coast Gateway
- New York Gateway
- Charleston/Savannah Gateway
- Houston Gateway
- Norfolk Gateway

Percent Change in CO₂ Footprint

56% 58% 60% 62% 64%

https://ww3.arb.ca.gov/research/apr/past/07-314.pdf
https://www.dropbox.com/s/vvktlm0yi6u/Delay%20Final%20Report%2020101102refs.pdf?dl=0
Economic Geography or Dire Straits?

Paths of least resistance and routes of greatest value

Where to Where?

When to When?

• **Least Distance** – a proxy for time, ignores posted or effective speeds
• **Least Time** – a function of distances and speeds, plus delays and dwell
• **Low Cost** – a function of labor, vehicle technology, payload characteristics
• **High Value** – the relationship between cost and freight rate (profit)

• Dire Straits analogy ... *six lanes of traffic; three lanes moving slow*?

• What variables and responses fall under control of a decision actor?
  • Fleet, dispatch, route – trucking company, logistics provider
  • Road infrastructure, transport rules – transportation planning authority, engineer
  • Location, Location, Location – shipper, value-added processor, receiver
## Innovative change space

**Example: environmental performance**

<table>
<thead>
<tr>
<th>New efforts</th>
<th>Reinforce positive trends</th>
<th>Reverse negative trends</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Existing efforts</strong></td>
<td><em>Complementing</em></td>
<td><em>Restricting</em></td>
</tr>
</tbody>
</table>
| | • Do more environmental actions  
  e.g., voluntary reporting | • Do fewer harmful actions  
  e.g., green-ops, discharge controls |
| **New efforts** | *Incentivizing* | *Transforming* |
| | • Considered architectural  
  • Disrupts status quo  
  • New systems emerge, modes adjust  
  e.g., eco-speeds, changing networks | • Disrupts traditional metrics  
  • New dominant designs  
  e.g., EEDI and SEEMP, ECAs |

Doing freight right – what is changing?
...new investments, new energy outlook

Key trends changing this decade(s)

• Right-shoring
• Right-steaming
• Right-routing
• Right-timing
• Right-bundling
• Right-mode mixing
Thank you