The National Center for Secure and Resilient Maritime Commerce

CSR Port Resilience Report

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CSR – A Department of Homeland Security National Center of Excellence for Port Security
CSR Port Resilience Report

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Matt Mattingley
Agenda

• Research timeline (How we got here)
• Our latest work (Portmapper)
• How it works
• Scenarios of how it can be used (Today)
  • Food and Farm
  • Explosives
  • Disruption at PoLA (containers)
• Possible Future Development
  • Scenarios integrating FAF
• Questions
Year 3 Summary and Year 4 Plans

• Year 3 Summary Highlights
  • Port Resilience Survey – Structural Equation Modeling
  • Port Capacity Study/Model updated with 2008-2009 data
  • Framework for Port Capacity Analysis
  • Ocean conveyance/Port Delay Study (contin thru Year 4)

• Year 4 Plan Highlights
  • Port Mapper & Capacity Study Scenarios
  • Port Resilience Action List
  • Provide critical data and input to modeling effort
  • Port Case Study Database – add Sendai disaster
  • Field visits to inland waterways (Port of Catoosa +)
Most recent developments

• Capacity work very insightful
  • But impact and insights not available without an analyst
  • No visceral feel for the magnitude of the data
  • E.g. Regional concentration of certain products lead to vulnerabilities – Hurricane Katrina caused $800 MM in lost imports, raised food costs in the US by 3%*
  • E.g. Disruptions at top ports require 16% (petroleum), 26% (container), 50% (food & farm) additional capacity

• It would be useful to visually illustrate where resilience and security issues exist

To address this need we created a tool to help visualize cargo handed at US ports

* Per Federal Reserve Bank
MIT PORT MAPPER

Welcome to the MIT Port Mapper beta site. The Port Mapper was designed to identify domestic US ports that could possibly absorb cargo in the event of a disruption at a port. However, are there other ways that this tool could be useful? The research team has posted the Port Mapper tool online to gather input from users on how we might possibly further develop the tool.

Application Overview

At present, the application is set up to plot and link ports based on the commodities that they handle. The user makes two selections:
- Choice of state or choice of SIC Group/SIC Family or SIC Description
- Choice of all ports or top ten ports, or a specific port by name (note that once you select a specific SIC type, only those ports that handle that SIC will be displayed)

Located at
http://portmap.mit.edu/ApplicationOverview.htm

User should refresh the page.

The user is invited to provide additional comments by clicking on Additional
We want feedback & input

again after you use the tool. Once you provide your input below, click on Submit Comments... and you will be redirected to the application page.
### Portmapper Option: SIC Group

<table>
<thead>
<tr>
<th>State</th>
<th>SIC Group</th>
<th>SIC Family</th>
<th>SIC Desc</th>
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<tr>
<td>All</td>
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<td>Ports to View</td>
<td>All</td>
<td>Add More Comments</td>
<td></td>
</tr>
</tbody>
</table>

- **Container**
  - **Food and Farm Products**
  - **Manufactured Equipment**
  - **Manufactured Goods**
  - **Petroleum**
  - **Raw Materials**
  - **Waste and Scrap**

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*MIT Center for Transportation & Logistics*
Portmapper Option: SIC Description
Portmapper Option: Port to Fail

[Map of ports with details]

MIT Center for Transportation & Logistics

Map Ports

Clear Map
Portmapper Option: All or Top 10 Ports
Use of Portmapper

- Uses publicly available data coupled with data collected through CSR project to plot ports on map
- Allows for the selection of:
  - States
  - Commodities
  - Ports
- Currently only considers data from ACoE, continental US (excluding islands, Alaska)

To demonstrate potential uses we offer several scenarios of possible application
Scenario: Food and Farm Ports
All Food and Farm ports
Choose only Top 10 F&F Ports
Top 10 F&F Ports
Observations

- High concentration of F&F ports in one region
  - List shows top three in NO/So La region
- Long distances to the other top 10 ports which have major F&F capacity
  - Five ports of the remaining top 10 require Panama Canal crossing or cross-country rail/truck movements
- Analysis:
  - Significant vulnerability at PoNO/So La
  - Consider options to spread F&F cargo handling
  - Consider options for movement of F&F in the event of a disruption
Scenario: Ports handling explosives
All ports handling explosives
### Top 10 ports handling explosives

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- **LOS ANGELES HARBOR, CA**
- **LONG BEACH HARBOR, CA**
- **SEATTLE HARBOR, WA**
- **SUMMARY OF TRAFFIC TOTAL WATERBORNE COMMERCE OF THE PORT OF NEW YORK, NY**
- **TACOMA HARBOR, WA**
- **WILMINGTON, NC**
- **CHARLESTON HARBOR, SC**
- **OAKLAND HARBOR, CA**
- **SAVANNAH HARBOR, GA**
- **PORT OF PORTLAND, OR**
Top 10 ports handling explosives
Observations

- Majority of ports handling explosive appear to be on east coast
  - Somewhat balanced spread of the top 10; 6 on west coach and 4 on east coast
- Long distances to the other top 10 ports which have major explosives capacity
- Analysis:
  - What is the tradeoff between constraints/investment in special explosives handling processes and need for cargo handling ports?
  - Does it make sense to have explosives handled in ports that are otherwise already highly vulnerable? E.g. Port of New Orleans?
Food & Farm and Explosives vulnerability

- Top Food & Farm ports handle explosives
- Amount of explosives in these ports is relatively small
- A port closure due to an **explosives incident** closes 3 of the Top 10 Food & Farm ports causing damage to exports and the national economy
Scenario: Disruption at Port of LA
### All Container Ports in US

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<td>Container</td>
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**Ports to View**
- All

**Port To Fail**
- LOS ANGELES HARBOR, CA

**Add More Comments**

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**Map Ports**

**Clear Map**
Top 10 Container Ports in US

- Los Angeles Harbor, CA
- Long Beach Harbor, CA
- Summary of Traffic Total Waterborne Commerce of the Port of New York, NY
- Savannah Harbor, GA
- Oakland Harbor, CA
- Norfolk Harbor, VA
- Tacoma Harbor, WA
- Seattle Harbor, WA
- Houston Ship Channel, TX
- Charleston Harbor, SC
- Miami Harbor, FL
- Port Everglades Harbor, FL
- Jacksonville Harbor, FL
- Baltimore Harbor and Channels, MD
- Port of New Orleans, LA
- Port of Portland, OR
- Wilmington Harbor, DE
- Port of Boston, MA
- Gulfport Harbor, MS

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Map Ports
Clear Map
# Top 10 Container Ports in US

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**Ports to View**

| Port To Fail       | LOS ANGELES HARBOR, CA | Add More Comments |

**Map**

- **Google Maps**
- **Map data ©2013 Esri, Tele Atlas, INEGI, MapLink, Tale Atlas - Terms of Use**

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- **Map Ports**
- **Clear Map**
Observations

- Top container ports – LA, then LB, then NY/NJ, then Savannah
- Majority of larger ports handling containers are on east coast
- Long distances to the other top 10 ports which have major container capacity
- Analysis:
  - Vessels rerouted to east coast may be too big for Panama Canal
  - Possible and likely for cargo to offload in Mexico or Canada (Prince Rupert) – but at what cost to US economy in terms of lost port trade, additional delays and costs?
Possible Future Developments
Possible Future Developments

• Integrate Port Mapper with other sources of data for comprehensive assessment of cargo flows: specifically Freight Analysis Framework (FAF) data
  • Look at aggregate policy planning tool
  • Look at macro trends and issues
  • Look at overall port system resilience issue

• Focus application on ports (port-specific data)
  • Look at individual port planning tool
  • Look at marketing initiatives to capture additional cargo volume
  • Look at individual port resilience issues
Scenario Integrating FAF: Impact of Disruption on Freight Flows
What is FAF data

- Freight analysis framework (FAF) compiled by Department of transportation (http://www.ops.fhwa.dot.gov/freight/freight_analysis/faf/faf3/netwkdbflow/index.htm)
- Model of commodity movements in United States
- Captures commodity, mode, state and use for 2007, 2009 with a forecast through 2040
- Provides the potential to link port data with transport data to develop scenario planning tool for policy makers and port managers
Linking port data with FAF data

• Develop mapping of commodity flows in the United States

• Understand interaction between ports and transportation

• Develop methodology to allocate resources among ports to maximize system resilience

• Create regional resilience plans and checklists for handling port failures when they occur
Inbound Container Flows into/out of Ports

Legend:
Purple = water
Black = rail

Note: only rail and waterborne flows considered
A disruption changes flows at ports & between

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Purple = water
Black = rail

Note: only rail and waterborne flows considered
FAF Data Enables Resilience Scenario Planning

• Consider change of flows with disruption at PoLA/LB

• Integrating FAF may highlight changes in flows:
  • Additional cargo flows via vessels into Seattle
  • Additional cargo flows via rail into LA/LB from Seattle, Houston
  • Additional cargo flows via vessels into Houston, New York
  • Additional cargo flows via rail and vessel into Houston

• What infrastructure investments are necessary to accommodate potential shifts in flow?
  • Intermodal?
  • Infrastructure at ports?
Questions

• Future development depends upon potential user
  • Potential users: Planners, analysts charged with considering infrastructure investments, resilience analysis and planning for system resilience. Others?
  • What are the most important developments to pursue?

• Lots of potential enhancements
  • Port capacity look up, distance calculation, integrate FAF....

• Online tool solicits user feedback
  • [http://portmap.mit.edu/ApplicationOverview.htm](http://portmap.mit.edu/ApplicationOverview.htm)
  • Would you be willing to speak with our developer about the application?

• Thank you – Jim Rice, Kai Trepte, Matt Mattingley
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