NATIONAL ACADEMIES Sciences Engineering Medicine

Freight Transportation Resilience in Response to Supply Chain Disruptions

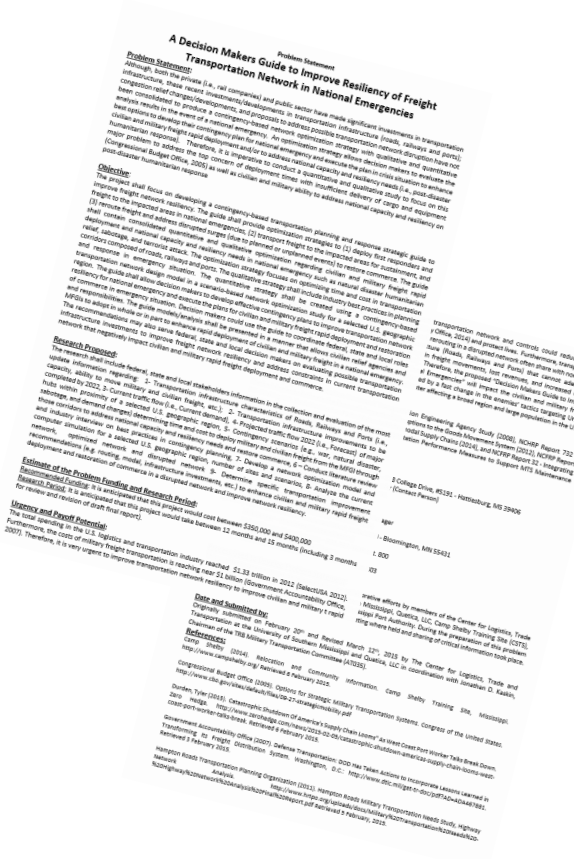
MARINE BOARD FALL MEETING

November 18, 2024 Washington, DC

Shannon McLeod, Vice President, American Association of Port Authorities

Initial Selection Process

- Research Problem Statements (RPS) submitted to Cooperative Research Program “Oversight Committee”
- “Oversight Committee” annually reviews RPS, selects highest priority projects, and defines funding levels and expected products
- RFPs issued → Research contractor team is selected to complete each project
- A panel appointed by TRB is assigned to each project team


Problem Statement

A Decision Makers Guide to Improve Resiliency of Freight Transportation Network in National Emergencies

Problem Statement:

Objective:

Research Proposed:

Estimate of the Problem Funding and Research Period:

Urgency and Payoff Potential:

Date and Submitted by:

References:

Overview

- NCFRP Project 50 → NCRFP Report 39
- Cost: $600,000
- Timeline: 7/2016 to 3/2019
- Contributors
  - WSP: Michael D. Meyer, Shannon McLeod, Tracy Fidell, Hardik Gajjar, Divit Sood
  - Cambridge Systematics: Mohammedreza Kamali, Rebecca Wingate, David O. Willauer
  - Frank Southworth
- Panel Members
  - Thomas Wakeman, Chair
  - Dennis Decker
  - Richard Larrabee
  - Jon Meyer
  - Craig Philip
  - Mark Stehly
  - Allison Yoh
  - Steven Beningo
  - Eric Shen
  - Jerry Thomas
  - Scott Brotemarkle

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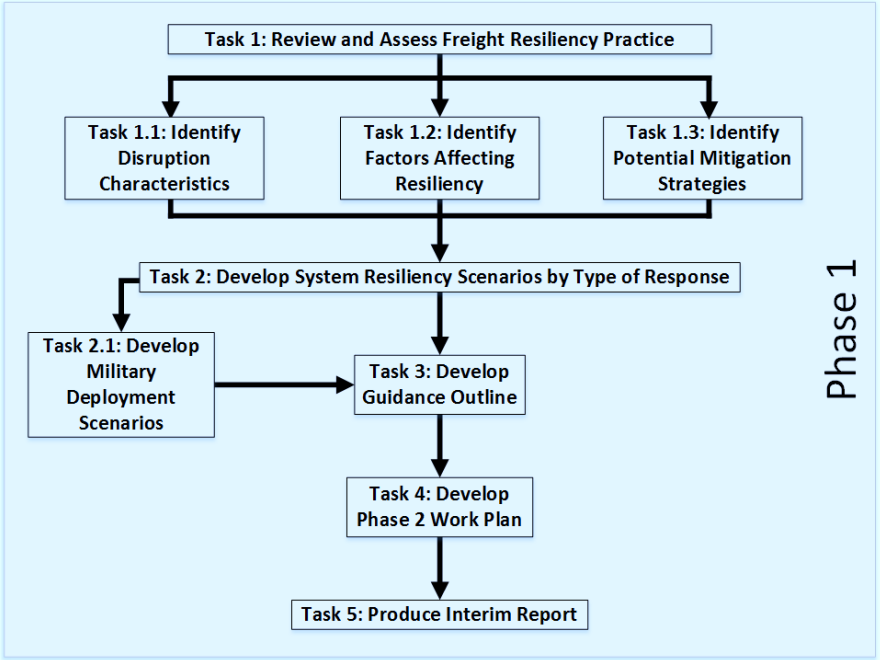
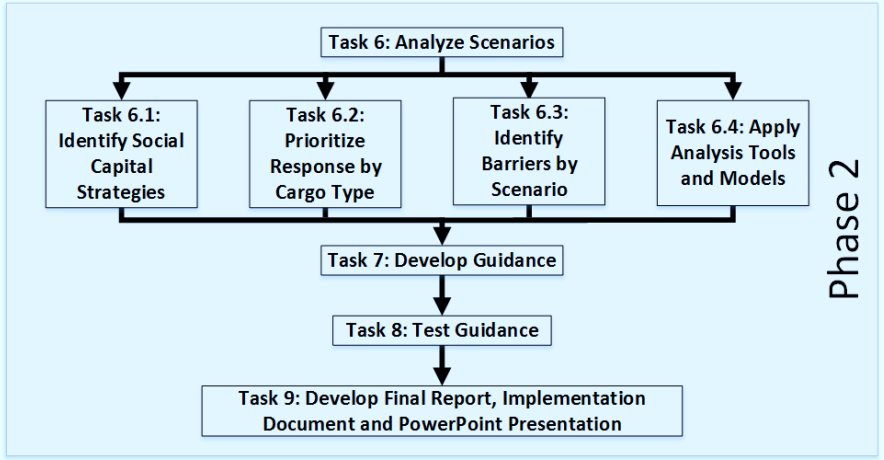
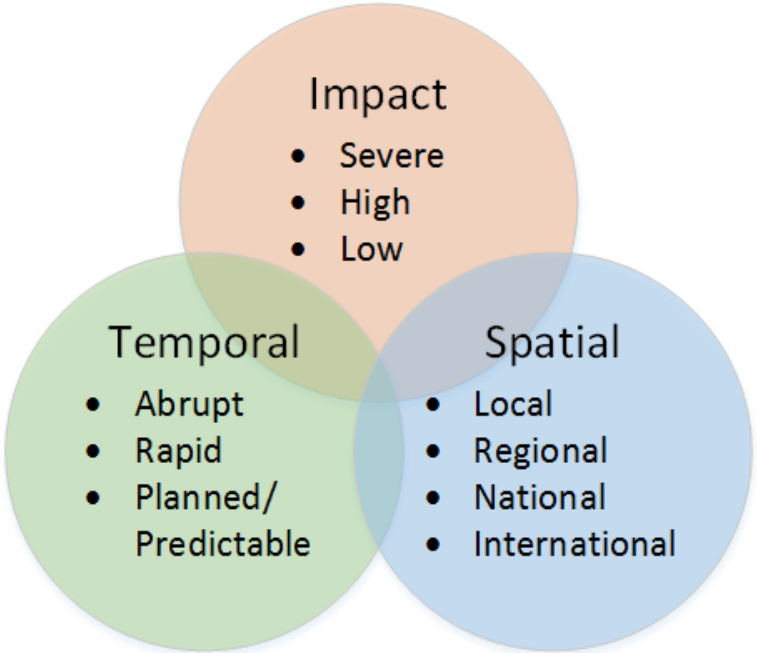
Research Plan

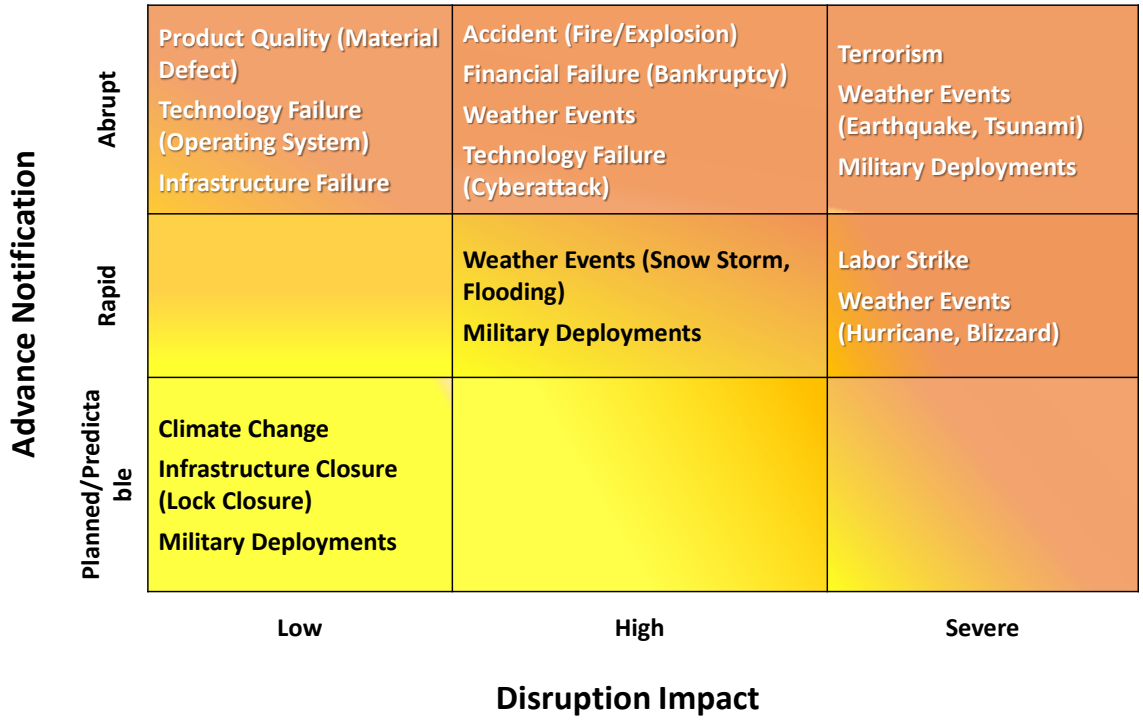




Disruption Characteristics and Classification



System Resiliency Scenarios



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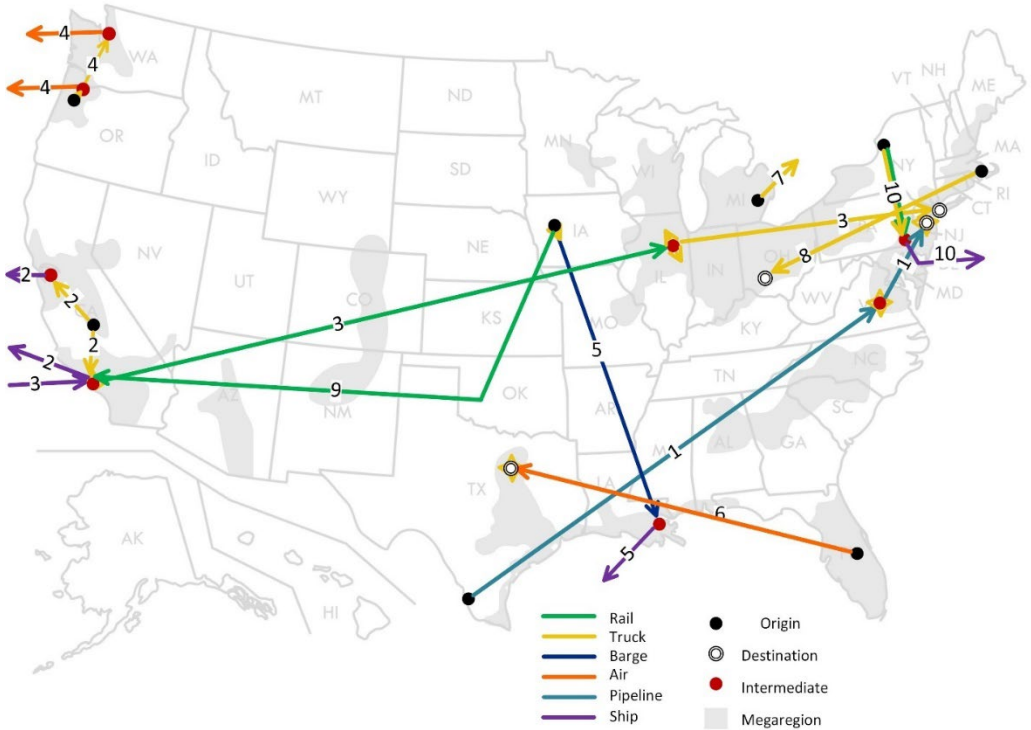
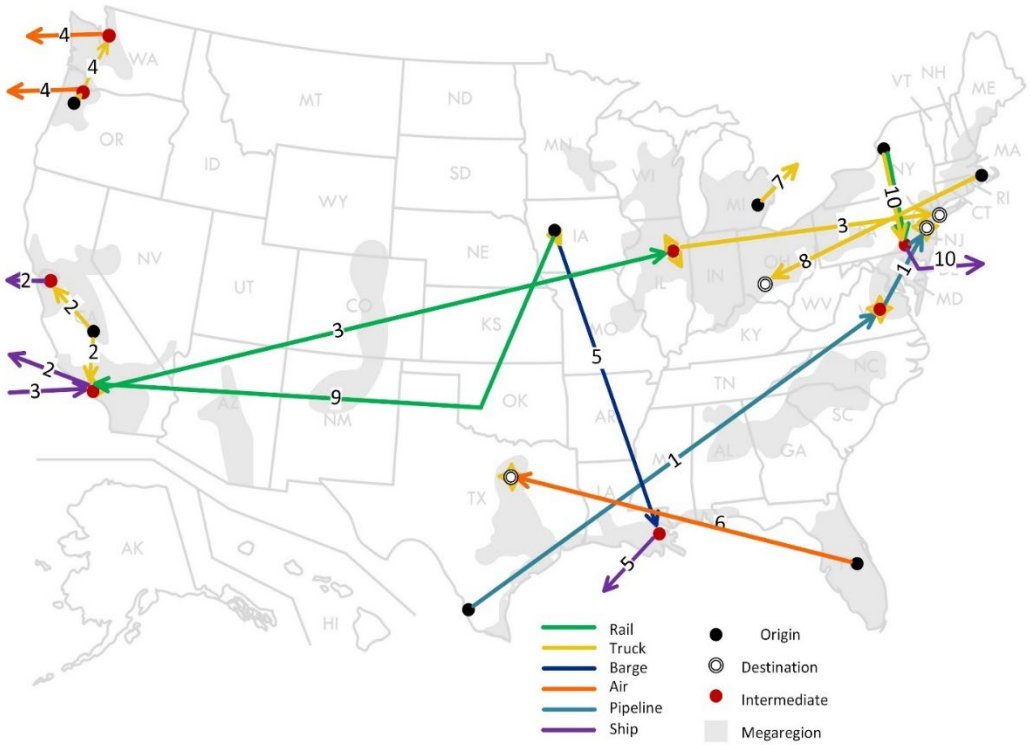


1. Pipeline – Infrastructure closure/failure due to a weather event or pipeline rupture – Gulf Coast to East Coast
2. Marine Terminal/Harbor – Infrastructure closure/failure due to cyber terrorism – Exports of agricultural products from San Joaquin Valley, CA
3. Port/Rail – Failure due to labor activity or pandemic – Imported consumer electronics from Southern California to Illinois
4. Roads/Bridges/Airports – Infrastructure closure/failure due to geological event – PNW exports of computer chips
5. Inland waterway/Locks – Infrastructure closure/failure due to accidents (locks) or low water levels – Mississippi River barged grains from the Midwest to New Orleans

System Resiliency Scenarios



6. Distribution Center/Airports/Highway – Infrastructure closure/failure due to theft – Florida to Texas pharmaceutical movement
7. Truck/Border crossing – Infrastructure closure/failure – U.S. to Canada motorized vehicles
8. Highway/Airport – Infrastructure closure due to extreme weather – Northeast to Great Lakes precision medical instruments
9. Rail – Rail bridge or track failure – Ethanol movement from the Midwest to California
10. Military – Infrastructure closure/failure due to terrorist activity: Commodity – Corridor: Northeast – Philadelphia commercial cargo and military equipment/supplies

Illustrative Interview Questions of Supply Chain Participants

1. Introductory
What is your interest/role in improving resiliency for the U.S. freight transportation system?

2. Plans and Strategies
What level of preparation has your agency undertaken for handling disruptions such as the one(s) considered in the scenarios? Please describe.

3. Physical
In considering how to maintain or resume service and cargo flow in times of disruption, what are the most important considerations in improving resiliency with regard to physical infrastructure?

4. Logistical
What types of logistics strategies are important in improving resiliency?

5. Regulatory
What is the most important consideration in improving resiliency with regard to regulatory efforts?

6. Social Capital
Are there any strategies you would recommend to improve the quality of life specifically for freight transportation workers/responders in times of a disruption?

7. Communication
Can you please describe the process your agency uses to communicate with stakeholders before, during, and after a disruption?

Recurring Themes

- Advance Planning
- Collaboration
- Communication
- Past Lessons Learned
- Prioritized Decision Making
- Infrastructure Maintenance

Strategies and Barriers

Pre-Disruption, During and Post Disruption Strategies

- Prioritizing Strategies
- Informational Strategies
- Logistical Strategies
- Institutional Strategies
- Physical Strategies

Barriers to Recovery

- Regulatory Factors
- Organizational Culture
- Collaboration
- Resources

Guidance to Supply Chain Participants

- Detailed steps for resilience self-assessment
- Allows user to identify good practices
- Guidance questions lead user to identify strategies that will provide a more resilient supply chain

STEP 3: ASSESS CURRENT PRACTICE	Yes	No
Internal to your Organization		
Have you assessed how your agency is doing with respect to enhancing the resilience of supply chains/transportation systems?		
Have you conducted an internal hazards and threats role-playing exercise to assess your organization's readiness to respond to disruptions?		
Have you conducted an assessment of the training and professional development needs of the staff responsible for enhancing supply chain/transportation system resilience?		
Have you examined past supply chain/transportation system disruptions to identify where improvements to organizational capacity can be made?		
Have you examined the project planning protocols/design criteria for the physical infrastructure that is part of your responsibility in the supply chain for their sensitivity to system resilience?		
External to your Organization		
Have you engaged with external stakeholders to identify concerns/opportunities they have with respect to your organization's response to disruptions?		
Have you assessed the effectiveness of your agency's for interacting with external stakeholders in order to enhance supply chain resilience (in a pro-active sense)?		
Have you assessed the effectiveness of your agency's strategy for interacting with external stakeholders for responding to system disruptions (in a reactive sense)?		
Have you conducted a multiple-participant hazards and threats response role-playing exercise to assess the readiness to respond to disruptions?		
Have you looked at peer organizations to identify best practice in identifying how organizations assess their effectiveness in supply chain/system management efforts?		
	Yes	No
Total		

8 -10 Yes	Your organization has done a good job at assessing its capacity to provide resilient supply chains; efforts should be made periodically to strengthen this capacity by conducting self-assessments.
5 - 7 Yes	Your organization is well-positioned to enhance the self-assessment process by identifying targeted strategies for improving the assessment process; additional steps are necessary to enhance this assessment capability.
0 - 4 Yes	Your organization needs a better strategy for critical self-assessments, with more attention given to key gaps identified above.

Key Conclusions

- Future disruptions due to natural and manmade causes are likely to be more numerous and more impactful
- Supply chain is inherently resilient due to evolution of events
- Most agencies/firms in silos with respect to disruptions; very little attention to public/private sector collaboration prior to a disruption
- Leadership buy-in and support for resiliency efforts are a key to success
- Understand interconnected systems and cascading effects; rank the importance of potentially malfunctioning systems
- Strengthen existing infrastructure; build new infrastructure with adaptive design standards
- Practice! Practice! Practice! and include affected communities/participants in planning

Questions?

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