Marine Transportation System Resilience: A Federal Agency Perspective

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CMTS

U.S. Committee on the Marine Transportation System

Resilience Integrated Action Team:
Mission and Objectives

- September 2014, the MTS Resilience IAT was approved and established by the CMTS Coordinating Board to formally assess resilience within the MTS
- 12 Federal agencies and groups (membership continues to grow)
- 4 co-leads from NOAA and the USACE
- Monthly meetings to generate approach to meeting goals

United States Coast Guard
U.S. Department of Homeland Security

CMTS
U.S. Committee on the Marine Transportation System

Resilience Integrated Action Team: *Mission and Objectives*

- Activities include "…the identification of short and long-term risks and vulnerabilities associated with climate change, extreme weather, global and domestic markets to include existing and future infrastructure, and the development and implementation of strategies to plan for and adapt to potential transportation disruptions associated with these risks…" (R-IAT Terms of Reference)
- Resilience is:

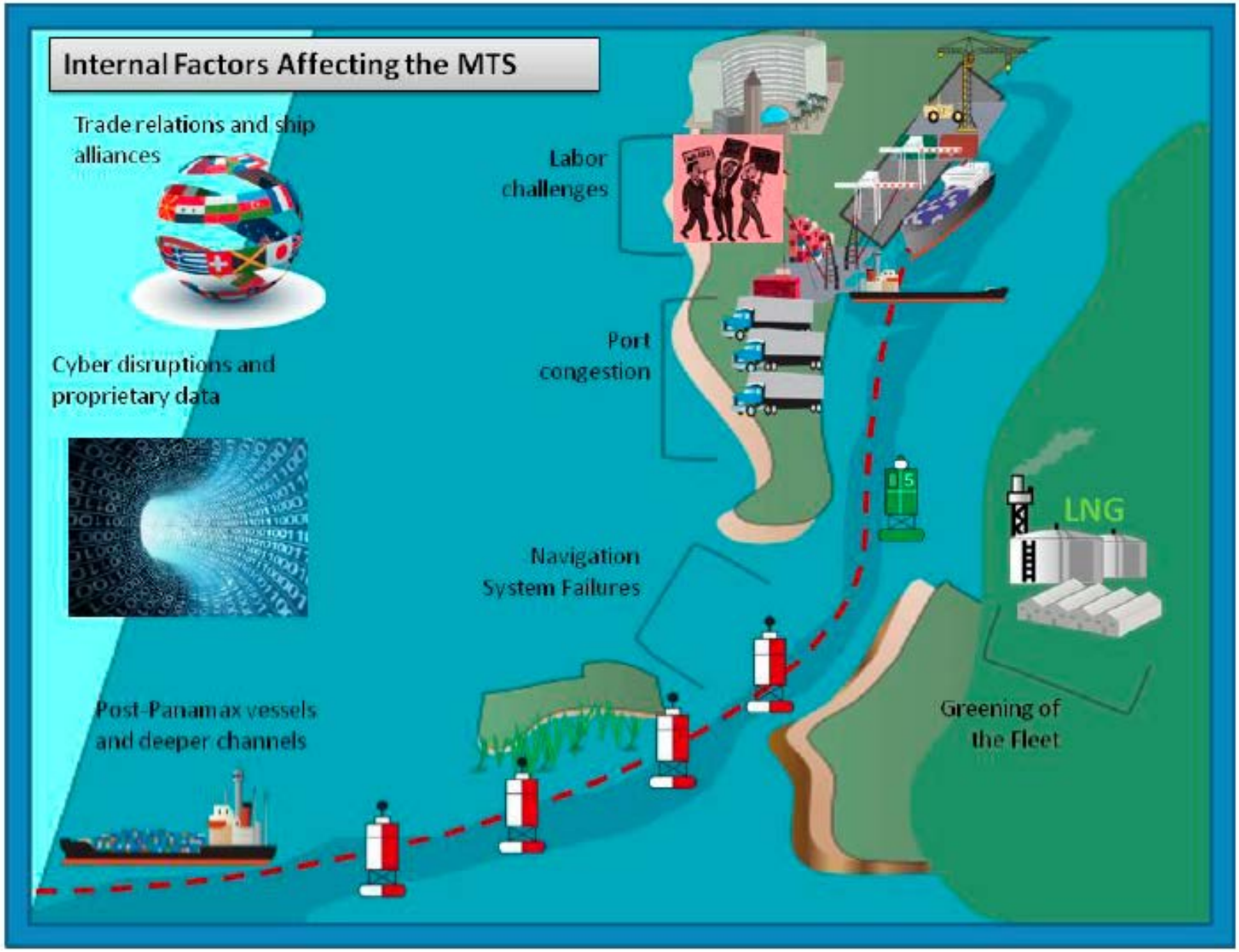
  "The ability to prepare, resist, recover, and more successfully adapt to the impacts of adverse events." (NAS 2014; PPD 21)

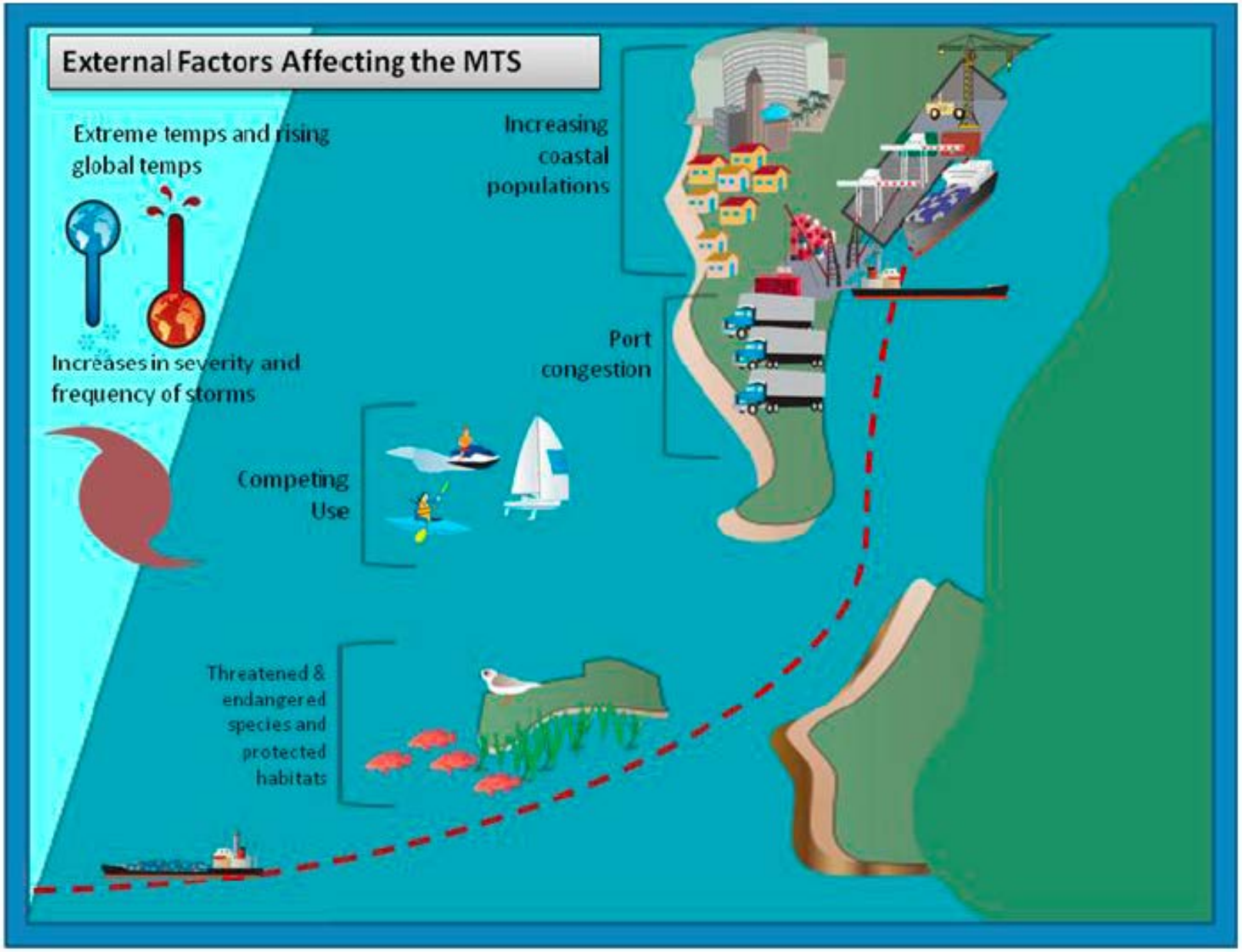
The Marine Transportation System & Resilience

The Components of the MTS[1]:

- **Navigable Waterways** – coastal and associated inland waterways
- **Ports** – private and public operations
- **Intermodal Connections** – railroad, shipping, trucking, pipeline, air freight and access routes
- **Vessels**
- **Users** – direct (operators) and indirect (consumers)

CMTS 2008. "National Strategy for the MTS: A Framework for Action"


Internal Factors Affecting the MTS
Trade relations and ship alliances
Labor challenges
Port congestion
Cyber disruptions and proprietary data
LNG
Navigation System Failures
Post-Panamax vessels and deeper channels
Greening of the Fleet


External Factors Affecting the MTS
Extreme temps and rising global temps
Increases in severity and frequency of storms
Increasing coastal populations
Port congestion
Competing Use
Threatened & endangered species and protected habitats

MTS Resilience Factors Matrix

Disturbances & constraints affecting successful operation of MTS

- 31 factors that relate to the environment
- 40 factors that relate to non-environmental issues

Environmental Factors*			
Extreme Events	**Climate Change**	**Operations**	**Species**
• Water level extremes • Tidal extremes • Frequency and severity of storms • Extreme precipitation • Extreme heat/thaw • Extreme cold/ice • Seismic disruptions • Tsunamis • Tornadoes • Volcanic activity • Wildfire • Waves • Coastal and riparian erosion	• Water level/ inundation/ surge • Arctic shipping routes opening • Frequency and severity of storms	• Navigation and channel shoaling • Corrosion • Inland waterways/ river conditions • Hazardous debris • Silting • Spill response capabilities • Visibility • General changing sea conditions • Ice • Solar weather	• Invasive species • Threatened and endangered species and protected habitats • Subsistence fishing • Changing migration patterns • Nuisance species

MTS Resilience Hazards Matrix

Disturbances & constraints affecting successful operation of MTS

Non-Environmental Factors					
Logistics/ Operations	**Infrastructure**	**Government/ Political**	**Technology**	**Security**	**Energy**
• Larger vessels • Hazardous materials/ oil spills • Emergency response capabilities • Industrial accidents • Maintenance and upkeep • Operational disruptions • Throughput • Personnel/Labor challenges	• Competing demands for space of multimodal systems • Aging infrastructure • Port congestion • Lock and dam features • Levee breaches • Intermodal connectors	• Community/ environmental justice • Competing uses of land/ocean/coastal areas • Regulatory/ political/ budgetary • State and federal funding • Trade relations • Distribution of management for MTS • Ship alliances • Jurisdictional conflicts • Coastal manage-ment	• Cyber disruptions • Proprietary data • Electromagnetic spectrum disruption • Navigation system failures • Greening of the fleet	• Terrorism • Criminal activity • Piracy • Law enforcement	• Electric/ power disruptions • Marketplace drivers • Energy availability • Limited alternative fuel options • Operational redundancy • Energy infrastructure redundancy • Vessel capabilities • Changing offshore resource use

MTS Resilience Hazards Matrix

Disturbances & constraints affecting successful operation of MTS

Human-related Factors

Logistics/Operations

	NOAA	MARAD	USCG	DHS/IP	USACE	BSEE	ODCS	FMC	TRANSCOM	DOE
Larger vessels	1, 2, 3, 4, 6, 7,	7, 9, 11			1 - as related to					7
Hazardous materials/oil spills	1, 2, 3, 4, 5, 6,								1,6	
Emergency response capabilities	1, 2, 3, 4, 5, 6,				6,7 - Silver				1,8	
Industrial accidents	1, 2, 3, 4, 5, 6,								1,6	
Maintenance and upkeep					1, 2, 3, 4, 5, 6,					1
Operational disruptions		7, 8, 9, 11							1,6	
Throughput			7							

Infrastructure

	NOAA	MARAD	USCG
Competing demands (for physical		1, 7, 8, 9, 10	
Aging infrastructure	1, 2, 3, 4, 5, 6,	1, 5, 7, 8, 9, 10,	
Port congestion			10
Lock and dam features		1, 10	
Levee breaches		1, 6, 7, 8	
Intermodal connectors (i.e.			

Infrastructure

	NOAA	MARAD
Competing demands (for physical		1, 7, 8, 9, 10
Aging infrastructure	1, 2, 3, 4, 5, 6,	1, 5, 7, 8, 9, 10,
Port congestion		10
Lock and dam features		1, 10
Levee breaches		1, 6, 7, 8
Intermodal connectors (i.e.		

- R-IAT members worked together with others from their agency to compile involvement in actions related to resilience – each number is affiliated with a type of action. (Ex: 1= data and physical monitoring, 2=numerical models and studies, 3=metrics, 4=existing tools, 5=studies with spatial domain, etc.)

U.S. FEDERAL ACTIVITIES ANALYZING MARINE TRANSPORTATION SYSTEM RESILIENCE

REPORT OF THE MTS RESILIENCE INTEGRATED ACTION TEAM

Environmental Factors	Non-Environmental Factors
Water level/ inundation/ surge (7 agencies, 38 activities)	Infrastructure resilience (7 agencies, 37 activities)
Water level extremes and long term change (7 agencies, 36 activities)	Emergency response capabilities (7 agencies, 34 activities)
Invasive species (5 agencies, 39 activities)	Regulation/ political/ budgetary (6 agencies, 29 activities)
Threatened and endangered species (5 agencies, 39 activities)	Hazardous materials/oil spills (5 agencies, 32 activities)
Changing migration patterns (5 agencies, 28 activities)	Competing uses of land/ ocean/ coastal areas (5 agencies, 26 activities)
	Larger vessels (5 agencies, 23 activities)

Report Available at www.cmts.gov

R-IAT Workshop Roundtable on Ports and Climate Resilience

May 26th, 2016, Washington D.C.

- *What is the Federal Government doing?*
  - Identify Federal Datasets and Programs to measure impacts and analyze vulnerabilities
- *What future decisions need to be made about ports and climate change?*
  - Federal agency role in decisions that must be made regarding climate resilience
  - What do we need to know to make those decisions?
- *What opportunities exist for Federal agencies to promote MTS climate resilience for ports?*

What is the Federal Government Doing?

Federal Datasets

System Health	Resilience of commercial ports (USCG) Criticality of ports Vulnerability of ports
System Operations	Commerce and speed of shoaling (USACE CPT) Use of container ports for loadouts (USCG) Communication of data Port closures New port designs
System Infrastructure	Sea level rise scenarios and nuisance flooding Elevation and bathymetry Recent weather events Tides and currents (incl. anomalies) Silting and shipwrecks within channels Energy grid Next assets (shallow draft vessels for post-storm access) Airgap under bridges

What is the Federal Government Doing?

Federal Programs and Partners

- Grants and Funding
  - FASTLANE grant program (DOT), TIGER discretionary grants (DOT), Congestion Mitigation and Air Quality (C-MAQ; FHWA) funding, We Can't Wait Initiative (USACE, DOT, USCG), Regional Resilience Grants Program (NOAA)
- Non-federal partnerships
  - Resilient America Roundtable, Charleston Resilience Network, 2012 White House Task Force on Ports
- Cyber and Energy Security Programs
  - Mature methodologies and resources to protect cyber and energy infrastructure from disruptions
  - Source for resources, mitigations, and lessons learned

What is the Federal Government Doing?

Federal Programs and Partners

Strengthening Regional Resilience Through National, Regional, and Sector Partnerships (National Infrastructure Advisory Council Report, 2013)

"Over the past decade, adjacent regions and infrastructures have become more interconnected, enabling local disasters to ripple across multiple jurisdictions and sectors... Resilience is especially important in the lifeline sectors**—energy, communication, water, and transportation—** because they underpin the most essential functions of business, government, and communities."

What future decisions need to be made?

Federal Role and Decisions

- The needs of ports to continue positive growth are outpacing Federal funds for maintenance and improvements.
- Federal agencies have individual missions to achieve, but decisions need to be made at on a national scale for economic and national security.
- We have to invest smart and we can't afford to be wrong.
  - Quality Federal investments have to be backed by data,
  - consider the long term,
  - And utilize a systems perspective.

http://media.cmgdigital.com/shared/img/photos/2014/09/30/e0/a0/092414_port_deepening_bs22.JPG

Supporting future decisions

In the past, reactive triggers have created resilience actions. We need proactive decisions.

- Federal decisions are often a political process!

1. ID port resilience data and frameworks to systematically measure resilience.
2. Assess criticality among multi-port systems
3. Examine criticality through the lens of vulnerability – cyber, nuisance flooding, climate change projections
4. Bring information to stakeholders – Congress, other agencies, public – to inform future climate resilience investment strategy

What opportunities exist for Federal agencies to promote MTS resilience?

Research and Development

1) Develop unbiased decision-support tools for understanding climate change impacts to seaports on a national scale.
   - Numerous federal datasets can inform these tools
   - Evaluate port criticality
     - How do ports support critical lifelines and how do critical lifelines support ports?
   - Evaluate port vulnerability
   - Evaluate climate vulnerability

2) Lessons learned from Energy and Cyber Security sectors – both have developed mature responses to crises

What opportunities exist for Federal agencies to promote MTS resilience?

Outreach and Collaboration

1) Grants and funding– potential to either create or refine prioritization mechanisms for port (or multi-modal MTS) resilience projects
2) Convening power – gathering Federal government and stakeholder actions/data/information creates solid scientific foundation to build public support and political will for climate resilience actions

Questions and Discussion

Thank you!

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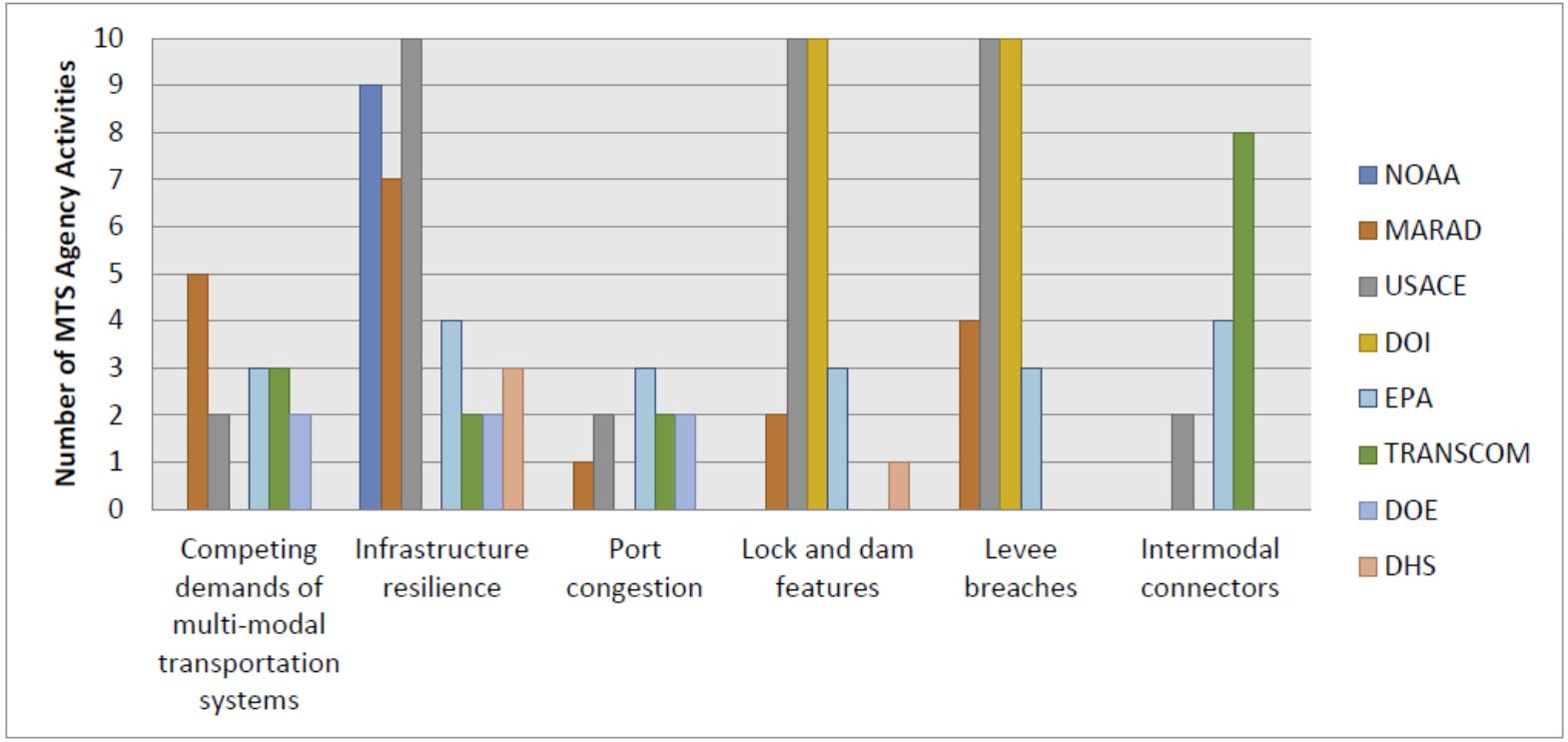
Figure A.6 Non-environmetnal Factors: Infrastructure