# Marine Transportation System Resilience – An Overview of Federal Perspectives

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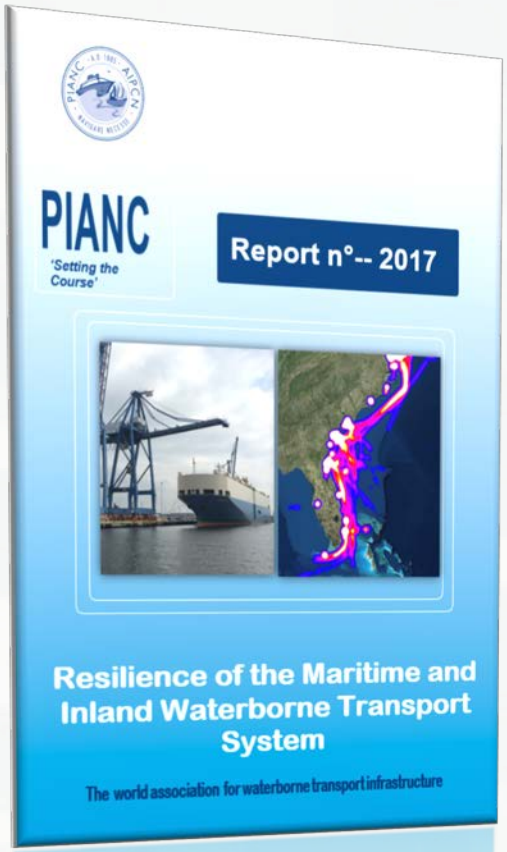
# General Outline

- Overview PIANC Task Group 193 and of CMTS Resilience Integrated Action Team
- Definition of resilience for the Marine Transportation System
- Advancements in MTS and Port Resilience
  - Stressors and disturbances affecting the resilience of the MIWTS
  - Ongoing Applications: case studies and best practices
- Next steps & future questions

# PIANC Task Group 193 – Marine and Inland Transportation System Resilience




- Established May 2016 to advance the concept of resilience.
- Summarizing the state-of-knowledge for marine and inland transportation resilience within the international community

# Committee on the Marine Transportation System (CMTS) Resilience Integrated Action Team (RIAT):

- CMTS chartered in July 2005 as Federal interagency coordinating committee
- CMTS Resilience Integrated Action Team established September 2014
- 12 Federal organizations (membership growing)

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# RIAT:
## *Mission and Objectives*

- Objectives: Leverage federal activities to assess and improve MTS resilience to short and long-term stressors

- Activities include "…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 …" to the MTS

# Resilience


**Definition of Resilience:** the capacity to

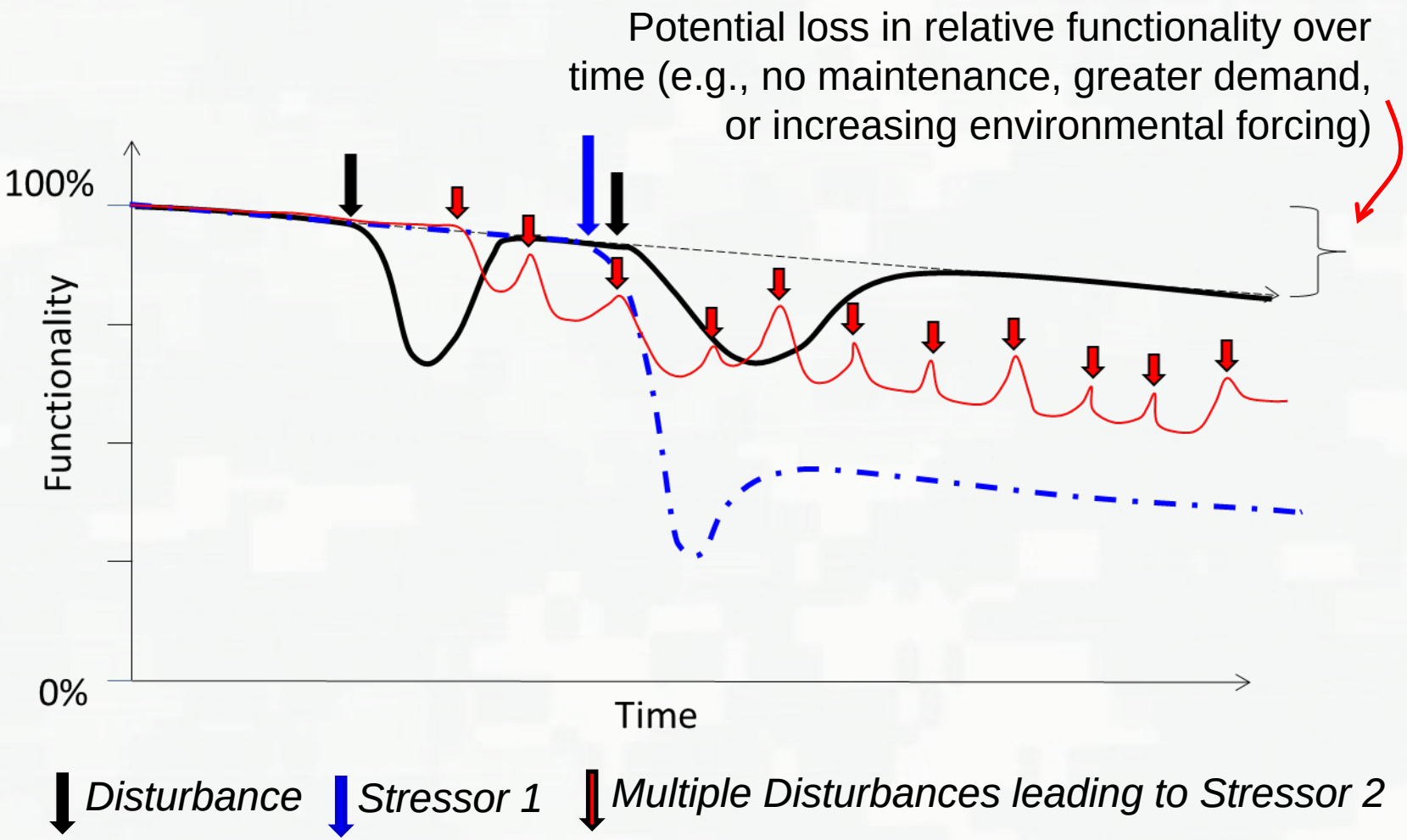
- Anticipate and plan for disruptions,
- Resist loss in operations and/or absorb the impact of disturbances or stressors,
- Rapidly recover afterwards, and
- Adapt to short- and long-term stressors, changing conditions and constraints.

## Disturbances and Stressors of the MIWTS

- ***Disturbances*** are typical disruptive events after which the system returns to a dynamic equilibrium
- ***Stressors*** are severe disruptions that force the system to evolve to a new equilibrium state

- A series of typical disturbances in rapid succession or prolonged duration may ultimately be a significant stressor that transitions the MIWTS to a new dynamic equilibrium

# Conceptual distinction between disturbance and stressor



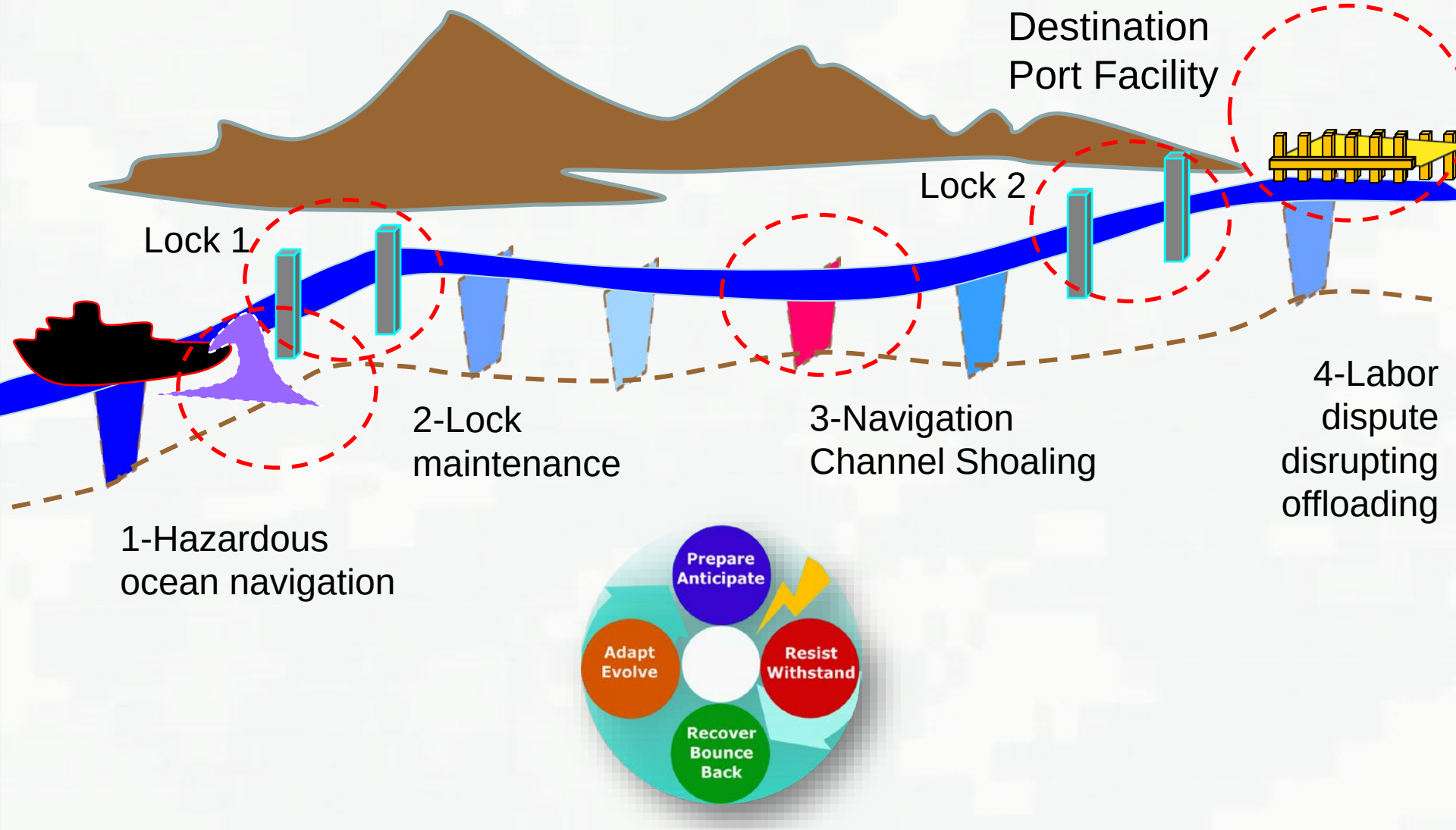
# Stressors, Disturbances, and Federal Activities addressing MTS Resilience: Summarized in *Resilience Factors Matrix Report*

www.cmts.gov

| Environmental Factors |
| --- |
| Water level/ inundation/ surge (7 agencies, 38 activities) |
| Water level extremes and long term change (7 agencies, 36 activities) |
| Invasive species (5 agencies, 39 activities) |
| Threatened and endangered species (5 agencies, 39 activities) |
| Changing migration patterns (5 agencies, 28 activities) |

| Non-Environmental Factors |
| --- |
| Infrastructure resilience (7 agencies, 37 activities) |
| Emergency response capabilities (7 agencies, 34 activities) |
| Regulation/ political/ budgetary (6 agencies, 29 activities) |
| Hazardous materials/oil spills (5 agencies, 32 activities) |
| Competing uses of land/ ocean/ coastal areas (5 agencies, 26 activities) |
| Larger vessels (5 agencies, 23 activities) |

# What does it mean for the MTS to be Resilient?
## *Example Stressors*



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# 2011 Tohoku Earthquake and Tsunami


- Long History:1964 Niigata 1978 – Miyagi-ken-oki, 1982 Urakawa, 19[illegible] Nihonkai, 1993 Kushiro-oki, 1993 Hokkaido... Tohoku was strongest recorded (9.0Mw)
- After Niigata, Japan re-built stronger. Over time, earthquake design standards continuously updated based on new extreme observations
- Japan's advanced earthquake and tsunami warnings were effective, but dependent on modeling and information. Led to updates on tsunami models.
- Earthquake standards held up, but the tsunami resulted in 94% of 20,000 lives lost. Led to recent updates for tsunamis: PIANC NavCom (2010); ASCE 7-16



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# 2012 PONYNJ Superstorm Sandy


- Damage to supporting infrastructure and utilities shut port and refineries for 1 wk, both states recognized the need to address resilience.
- Port Collaboration: years of collaboration and prior hurricane experience at the Marine Transportation System Recovery Unit had prepared and adapted them for operations.
- PONYNJ infrastructure: design guidelines for new construction resulted in well prepared infrastructure, and it could handle the effects of the storm. Since Sandy, the guidelines have been updated to include future storms and SLR.
- Confined Disposal Facilities: Many CDFs were damaged during Sandy; resulted in ongoing efforts to repair, strengthen, and elevate the facilities. The new work has increased their capacity for both dredged material storage and future storms.



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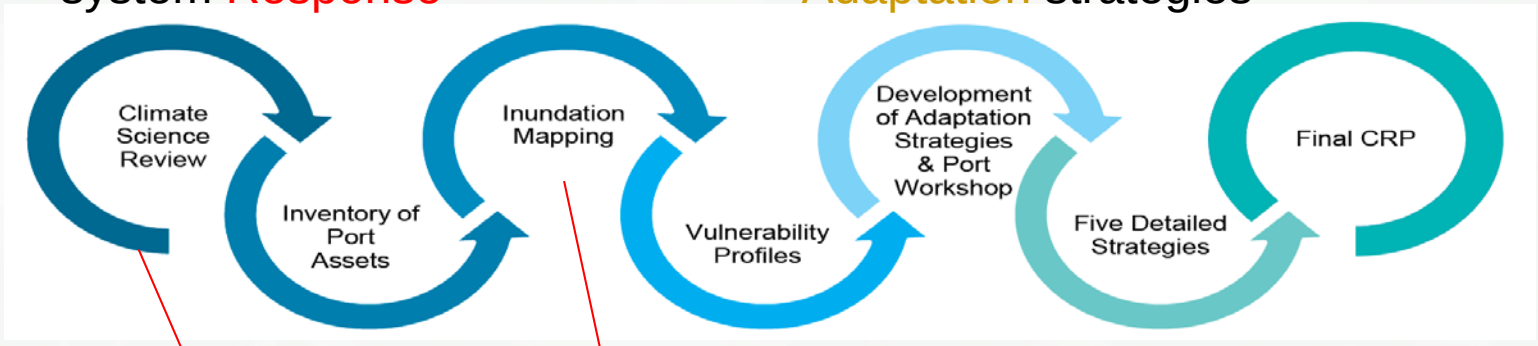
# Port of Long Beach Climate Adaptation and Coastal Resiliency Plan


Prepare for stressors, model system Response

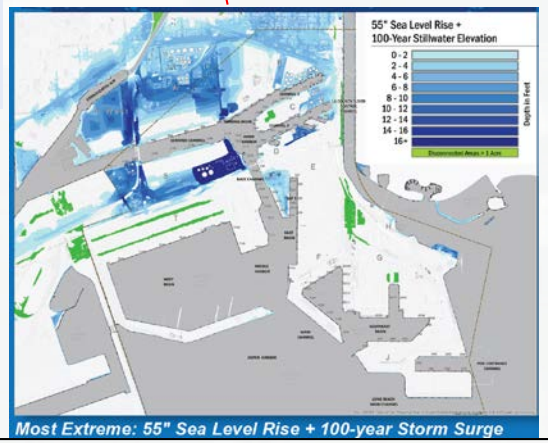
Develop Recovery and Adaptation strategies





### *Primary Stressors*

- Extreme Heat
- Sea Level Rise (SLR)
- Storm Surge




### *Governance*

- Addressing climate change impacts through Port policies, plans, and guidelines
- Adding climate change analysis to the Harbor Development Permit (HDP) process

### *Initiative*

- Piers A & B Study - Combined Impacts of Riverine and Coastal Flooding

### *Physical Infrastructure*

- Terminal Island SCE electrical substation protection
- Terminal Island shoreline protection



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# Topics for Discussion

- Future Federal work – continue to develop models and tools for understanding complex coastal and inland systems (including intermodal capabilities) and their performance over time to increase preparation, response, recovery and adaptation.

- Do these topics resonate with you? Do you have direct experience with them at your workplace, or are there challenges to implementation?

- What specific stressors and/or disturbances do you consider?

- In the next four years, Feds will *likely* be focusing on infrastructure resilience (to include natural features). What are your future challenges or focus areas?

# Thank you!

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