Measuring the Response and Recovery of Ports to the 2017 Hurricane Season

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AAPA Finance Committee Meeting

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Overview

- MTS Resilience and Disruption
- Resilience Best Practices
- Measuring Response, Recovery, and Resilience for 2017 Hurricane Season

SOURCES:

- Committee on the Marine Transportation System (CMTS) Resilience Integrated Action Team (RIAT)
- PIANC Task Group 193 – Marine and Inland Transportation System Resilience
Marine Transportation System Resilience

• 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.
Potential loss in relative functionality over time (e.g., no maintenance, greater demand, or increasing environmental forcing)

Disturberance

Stressor 1

Multiple Disturbances leading to Stressor 2
### 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)
<table>
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<th>Stage of Resilience</th>
<th>Action</th>
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| **PREPARE**         | - Port resilience plans  
                     - Port contingency plans  
                     - Marine Transportation System Recovery Unit (MTSRU) participation  
                     - Emergency operation & recovery training |
| **RESIST**           | - Communicate and act according to standard operating procedures (SOPs) for Emergency Support Functions (ESFs) |
| **RECOVER**          | - Communicate and act according to SOPs for ESFs  
                     - Improvise as needed! |
| **ADAPT**            | - Review port and marine transportation system performance during event  
                     - Identify lessons learned and best practices  
                     - Work to implement lessons learned, identify most effective best practices |
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: 9/11 followed by 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 (raised pumps and electric, battery backups for traffic signals, flood gates, secure elevators).

- 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.
2017 Hurricane Season

Hurricane Harvey Cargo and Tanker Vessel Signal Density Plots
Created with ERDC Automatic Identification System Analysis Package (AISAP)

August 1, 2017
Tropical Storm Harvey will be named August 16

August 24, 2017
USCG declares Port of Houston under condition Yankee

August 25, 2017
USCG declares Port of Houston under condition ZULU

August 26, 2017
Hurricane Harvey makes landfall at Rockport & becomes a tropical storm over inland Texas

August 28, 2017
Harvey recedes towards the Gulf, record rainfall recorded at 51.88 in

September 4, 2017
Vessels queue at anchorage areas. Port reopens with restrictions September 6th.

ERDC Navigation Data Performance Team: Katherine Touzinsky, Kenneth N. Mitchell, Patricia Dijoseph, Marin Kress

US Army Corps of Engineers • Engineer Research and Development Center
Federal Agency Roles and Responsibilities

1. **USACE** – assists DHS and FEMA as primary for public works and engineering-related response.

2. **USCG** – safeguards maritime interests, operates Maritime Transportation System Recovery Units, ESF 10 Oil and Hazardous material response

3. **DHS Infrastructure Protection (IP)** – supports Infrastructure Systems Recovery Function, develop recovery support strategies, local Protective Security Advisors

4. **NOAA** – provision of critical data and expertise to make decisions on port reopening

5. **EPA** – assess and monitor health and safety risks
Revisiting Lessons from Sandy in the Wake of Harvey and Irma

By Ellis Calvin

As the wintry storm that hit the South

What Hurricane Sandy Should've Taught Us About Disaster Response

3. Sector Interdependencies

High emphasis on the effectiveness of implementing lessons learned from past hurricanes.
Port of Savannah - Cargo and Tanker Net Vessel Count for Hurricane Matthew

- **Pre-storm normal**
- **PREPARE**
  - Hurricane Matthew declared a tropical storm 9/28/2016 00:00 UTC
- **CLOSED**
  - Captain of the Port declares port CLOSED on 10/06/2016 at 18:00 UTC
- **RECOVER**
  - PSAV fully reopens to vessel traffic on 10/12/16 at 07:00 UTC
  - Bayesian changepoint algorithm detects changepoint from recovery to "post storm normal" on 10/22/16
Developing Metrics for 2017 Hurricane Season: Port of Savannah - Net Vessel Count

PREPARE CLOSED

Hurricane Irma passes
Developing MTS Resilience Metrics – Houston Galveston

Houston-Galveston Port Area - Cargo Tanker Net Vessel Count (NVC) and Cumulative Dwell Time (CDT)
Monthly Net Vessel Exports and Imports in Tons (x1k)

Calculating impacts on cargo

Traffic Draft vs Average Yearly Tons – Port of Houston

- closed for 6 days
- 37 ft draft restriction for 4 days
- 40 ft draft restriction for 3 days

IMPACTED CARGO in TONS - 2.8M
Networked MTS
Networked MTS

Calcasieu
CorpusChristi-PortAransas
MatagordaPortLavacaComfort
Pascagoula
PortArthur
PortBeaumont
PortEverglades
PortFreeport
PortGalveston
PortHouston
PortTexasCity
PortVictoria
PortofMiami
PortofTampa
PortofTampa
SouthwestPass
Topics for discussion

• Future work – continue to develop models and tools for understanding complex coastal and inland marine transportation 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 tools do ports need to increase their resilience to the 2018 storm season?

• What are your future challenges or focus areas?
Questions?

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