MTS System Performance Data Sources to Support Resilience Evaluations

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From Sail to Satellite,
TRB-CMTS conference

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Outline

• History of MTS performance measures project
• Existing measures, relevant tools
  • Website
  • Channel Portfolio Tool
  • AIS Analysis Package
• Looking ahead, Data.gov
• Resilience-relevant sources
• Conclusions
Current list of MTS Performance Measures

• Economic Benefits to the Nation
  • Total value and tonnage of international trade moved by MTS
  • Income and disbursement of Harbor Maintenance and Inland Waterways Trust Funds
  • Producer Price Index for Transportation Industries
  • Direct employment in MTS industries for ten states with highest reported MTS employment
  • Inland waterway shipping barge freight rates

• Capacity and Reliability
  • Navigation lock closures, hours and number of closures, unscheduled and scheduled
  • High tonnage channels with NOAA PORTS® instrumentation
  • Travel time estimates for key waterway segments

• Safety and Security
  • Number of commercial vessel accidents (collisions, allisions, groundings)
  • Number of commercial mariner and passenger casualties (personal injuries, deaths)
  • Number of U.S. Coast Guard incident investigations

• Environmental Stewardship
  • U.S. petroleum-based fuel sales to the maritime industry (diesel fuel, residual fuel)
  • Vessel pollution incidents (petroleum and other types)
  • Amount of dredged material reclaimed for beneficial use
  • Number of reported whale strikes by vessels

• Resilience
  • Physical condition ratings of critical coastal navigation infrastructure
Public website
Navigation.usace.army.mil

USACE Navigation Portal

Dredging
Coming Soon

Survey & Mapping
Hydrographic survey and National Channel Framework (NCF) maps and data

Marine Transportation System
Performance measures, including economic benefits, safety & security, environmental stewardship, system performance, capacity & reliability, and resilience

River Information Services
Coming Soon

Systems Approaches
Regional Sediment Management and Engineering With Nature

Infrastructure & Asset Management
Coming Soon
Performance Measures

Research into Marine Transportation System (MTS) performance measures is an ongoing and collaborative effort by a number of Federal agencies, including the Committee on the Marine Transportation System (CMTS), US Army Corps of Engineers (USACE), US Department of Transportation (USDOT), Maritime Administration (MARAD), US Coast Guard (USCG), National Oceanic and Atmospheric Administration (NOAA), Saint Lawrence Seaway Development Corporation (SLSDC), US Environmental Protection Agency (EPA), Bureau of Transportation Statistics (BTS), Federal Maritime Commission (FMC), National Transportation Safety Board (NTSB), Oak Ridge National Lab (ORNL), Oceanographer of the Navy, and The Voie Center.

This page visually summarizes various MTS performance measures in several different categories.

Recorded Vessel Pollution Incidents

Recorded Vessel Pollution Incidents, 2002 - 2015 (part year)

- Recreational Vessels
- Commercial Vessels
- Unresolved Pollution Investigations (from facilities, vessels, or unknown sources)

The U.S. Coast Guard investigates and reports on many types of pollution incidents in our national waterways. The four main categories used to describe types of pollution are chemical, oil, other, and unspecified. As shown in the figure, pollution can be associated with both recreational and commercial vessels.
Historical vessel data, travel times

- Historical AIS data can be used to identify ‘normal’ operating parameters
- ‘Normal’ operations can be compared to vessel movements before/during/after a resilience challenge event to identify the duration of disruption

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Query Tool

After completing the form, click ‘Submit Request’ to send your request to the Corps for processing. An email will be sent to the provided email address when the request is finished.

Email: marin.m.kress@usace.army.mil

Start Time: 2014-08-01

End Time: 2014-08-02

Which Vessels? [ ] All MMSIs [ ] Selected MMSIs

Draw a bounding box or enter the coordinates manually.

Upper Left Lat: 48.52599471662564

Upper Left Lon: -124.711113837465

Lower Right Lat: 48.34376703448586

Lower Right Lon: -124.33757868121504

Min Speed (knots): 0

Max Speed (knots): 25

Sampling Rate: 10 minutes

Num Records/Vessel: 144

Request Description: Puget Sound entrance area, 2014-08-01 to 2014-08-02 with sampling rate of 10 minutes

*Access limited to federal users

Channel Portfolio Tool*

- CPT allows queries of historical commercial shipping data from the USACE Waterborne Commerce Statistics Center
  - Reach-level detail
  - Region-to-region
  - Groups of channels
  - By commodity, year, vessel type
  - Hypothetical shoaling
- KML and XLS file outputs

*Access to CPT is limited to authorized federal users. POC: Kenneth.N.Mitchell@usace.army.mil
Coming soon: Maritime
What datasets **might** be part of the maritime topic on Data.gov

- Vessel characteristics, registry
- Labor-related statistics
- Surface-transportation (highway, rail, etc)
- Physical oceanographic (sea level, waves, storms)
- Agricultural (grain transportation)
- Law enforcement (U.S. Coast Guard)
- Infrastructure (docks list, navigation lock usage)
- Other regularly published datasets

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Resilience relevant data sources

- **FEMA cumulative loss statistics**
  - State, county, and town level detail
  - Multiple hazard types
  - [http://bsa.nfipstat.fema.gov/reports/1040.htm](http://bsa.nfipstat.fema.gov/reports/1040.htm)

- **FEMA Data Feeds, RSS, machine readable datasets**
  - [https://www.fema.gov/data-feeds](https://www.fema.gov/data-feeds)

- **Aerial imagery, Land Cover, Elevation (NOAA & USACE-JALBTCX)**
  - [https://www.coast.noaa.gov/dataviewer/#/](https://www.coast.noaa.gov/dataviewer/#/)

- **Fiscally Standardized Cities (FiSC) Database**
  - Comparisons across 120 categories of revenues, expenditures, debt, and assets for 150 large U.S. cities.
  - [https://www.lincolninst.edu/subcenters/fiscally-standardized-cities/](https://www.lincolninst.edu/subcenters/fiscally-standardized-cities/)

- **DOT TIGER discretionary grant program** [www.transportation.gov/tiger](http://www.transportation.gov/tiger)

- **DOT Commodity Flow Survey**
Examples of Frameworks & Applied Evaluations That Utilize These Data
### Resilience of the Waterway Systems – An Exploratory Study of the American, Dutch, and German Waterway Systems (Hijdra et al. 2014)

#### Table 2: Breakdown of Resilience Parameters for Waterway Systems

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Resilience Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Robustness</strong></td>
<td>- Degradation of assets&lt;br&gt;- Capacity to withstand climatologic variations&lt;br&gt;- Physical interdependency with other systems&lt;br&gt;- Geographical interdependency (size of the system, nr of independent systems)&lt;br&gt;- Logical interdependency (number of independent systems)</td>
</tr>
<tr>
<td><strong>Redundancy</strong></td>
<td>- Local workarounds or substitutions&lt;br&gt;- Availability and capability of alternative routes for shipping&lt;br&gt;- Availability and capability of alternative modalities.</td>
</tr>
<tr>
<td><strong>Resourcefulness</strong></td>
<td>- Availability of emergency funding&lt;br&gt;- Availability of expertise and manpower&lt;br&gt;- Availability of equipment and materials for restoration and repair</td>
</tr>
<tr>
<td><strong>Rapidity</strong></td>
<td>- System downtime&lt;br&gt;- Restoration time</td>
</tr>
</tbody>
</table>
New York/ New Jersey Channel Closure Case Study
Farhadi et al, 2016

Sixth-month Vessel Traffic Summary for New York Harbor Area

An initial exploration of port capacity bottlenecks in the USA port system and the implications on resilience. Trepte and Rice 2014

Analyzing dynamics of USA port system and resilience
1. Concentration of cargo volume at major ports
2. Duration of port disruptions
3. Estimate the capacity required to handle different commodities

Port disruption data gathered via Lexus/Nexus and Factiva search of news sources.
Conclusions

• Many MTS-relevant datasets exist, multiple efforts working to make them more discoverable
• Resiliency questions broaden the potential data-net, also provide framework for addressing real-world applications
• Gap: Nationwide spatially-referenced environmental data with repeat observations, spanning submerged & riparian/coastal environments
Thank you.

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