Extreme Weather Events and Transportation Asset Management

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AASHTO commissioned a short paper on how to address Extreme Weather Events in Asset Management

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TAM Core Questions*

• What is the current state of my assets?
• What are required levels of service and performance delivery?
• Which assets are critical to sustained performance delivery?
• What are best investment strategies covering operations, maintenance, replacement and improvement?
• What is the best long-term funding strategy?

* Source: Transportation Asset Management Guide: A Focus on Implementation, AASHTO 2011
What are Extreme Weather Events?

- Extreme weather events are typically rare and cause damage, destruction and/or severe economic loss (FHWA 2012)
  - Heavy precipitation
  - Storm surge
  - Flooding
  - Drought, windstorms
  - Extreme heat and cold

- Specific definitions vary regionally
“Superstorm” Sandy

UPI Business News:

“Sandy affected U.S. industrial production”
TAM Implementation Steps

Source: Transportation Asset Management Guide: A Focus on Implementation, AASHTO 2011
TAM: Setting Agency Goals and Objectives

• Goal: Increased resilience in the face of high priority weather risks
• Objectives:
  • Prioritize Investments to target assets at risk
  • Monitor weather risk
  • Mitigate risk when thresholds are exceeded
• Performance Metrics
• Data
Enabling Processes and Tools for Service Planning (Step 10)

- **Agency-wide Strategic Performance Measurement**
  - Managing weather risk can achieve other goals of agency mission, including safety, mobility, accessibility, reliability

- **Writing and Updating Links to Levels of Service**

- **Growth and Demand Forecasts**
  - Anticipate changes to the external environment, including extreme weather events

- **Risk Management**
  - Risk of service disruption due to extreme weather events in conjunction with other risks

![Risk Management Table]

<table>
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<th>Likelihood</th>
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<th>Minor</th>
<th>Significant</th>
<th>Major</th>
<th>Catastrophic</th>
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<tbody>
<tr>
<td>Very Rare</td>
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<td>Low</td>
<td>Moderate</td>
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<td>Moderate</td>
<td>High</td>
<td>High</td>
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<tr>
<td>Seldom</td>
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<td>Moderate</td>
<td>High</td>
<td>Extreme</td>
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<td>High</td>
<td>High</td>
<td>Extreme</td>
<td>Extreme</td>
</tr>
</tbody>
</table>
Life Cycle Management and Asset Preservation (Step 11)

- Life cycle assessments includes routine maintenance, rehabilitation and renewal at regular intervals
- Weather events can impact asset condition and performance
  - Heat
  - Freeze/thaw cycles
  - Sustained inundation
- AASHTO Implementation Guide includes a continuous improvement approach
  - Need to monitor impacts of extreme weather events where unknown
  - Integrate into life cycle monitoring
TAM Integration (Step 12)

• Program planning and program delivery
  – Inclusion of extreme weather events in planning will result in more reliable service at lower cost.
  – Inclusion of anticipated changes in the frequency/intensity of extreme weather in design specifications more realistically addresses future needs.

• Asset Valuation and depreciation
  – Assets repeatedly exposed to extreme events are likely to deteriorate, and thus depreciate more quickly.
Information Systems for Decision Making (Step 13)

Source: Transportation Asset Management Guide: A Focus on Implementation, AASHTO 2011
Data Collection and Management (Step 14)

• Use of management information and maintenance management systems serve as data resources (e.g., bridge, pavement, safety)
  – Spatial referencing allows for weather events to be addressed
• Four major types of asset data: inventory, inspection, condition and work history
  – Changes can be made in data collection to include impacts from extreme weather
  – Allows for linkages between condition, work history and incidence of extreme weather.
Research Needs

- Identify reasonable and appropriate levels of service during extreme events
- Understand weather impacts and their direct and indirect costs
- Expand risk management in TAM to address extreme weather risks
- Identify and test the efficacy of extreme weather performance indicators
- Develop approaches to track and obtain data on extreme weather events
Thank you!