

# ITS AND CLIMATE CHANGE ADAPTATION

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SS23 – WEDNESDAY, APRIL 23, 2013

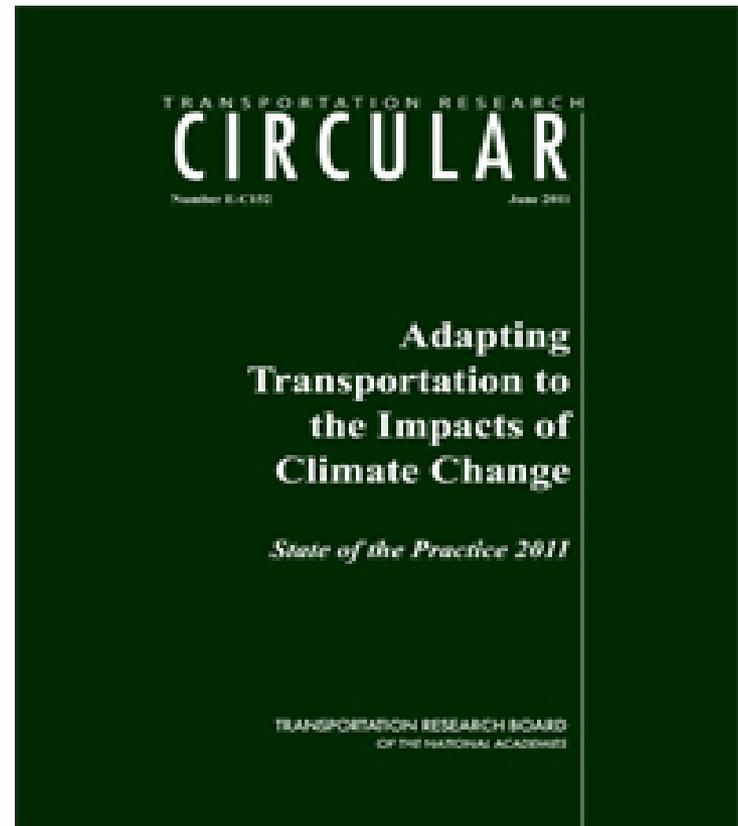
Karen Timpone for  
Laurel Radow  
FHWA Office of Operations  
Federal Highway Administration

# Sustainability

- One of the FHWA's Office of Operations  
***Top 11 for 2013.***

# Working with our Partners

- *Transportation Adaptation's Bearing on Planning, Systems Management, Operations, and Emergency Response*
- **Co-authors: Laurel J. Radow, Federal Highway Admin.** and **Louis Neudorff, CH2M HILL**



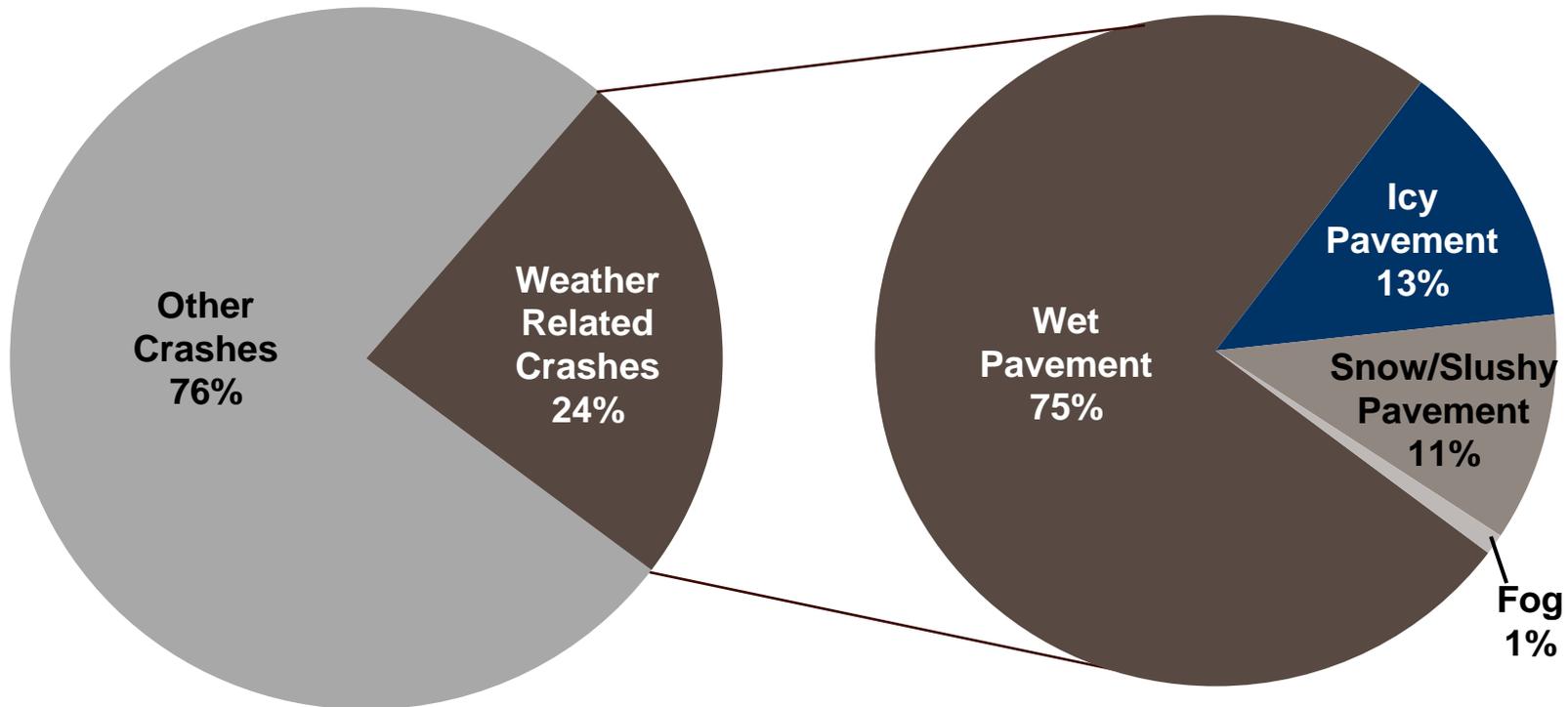
# Overview of Presentation

- Explore the weather and climate challenge
- Describe how our current efforts provide a solid foundation for highway operations
  - Highlight the role of ITS
- Consider the emerging changes and how we could respond
- Define agency considerations and next steps

# Crash History Under Adverse Weather

**Total Annual Crashes**  
**Average = 6,301,000**

**Weather Related Crashes**  
**By Road Weather Condition\***



**Source:** Road Weather Management Program, Table: Weather-Related Crash Statistics (Annual Averages), Available at: [http://www.ops.fhwa.dot.gov/weather/q1\\_roadimpact.htm](http://www.ops.fhwa.dot.gov/weather/q1_roadimpact.htm)

# Weather-related Costs

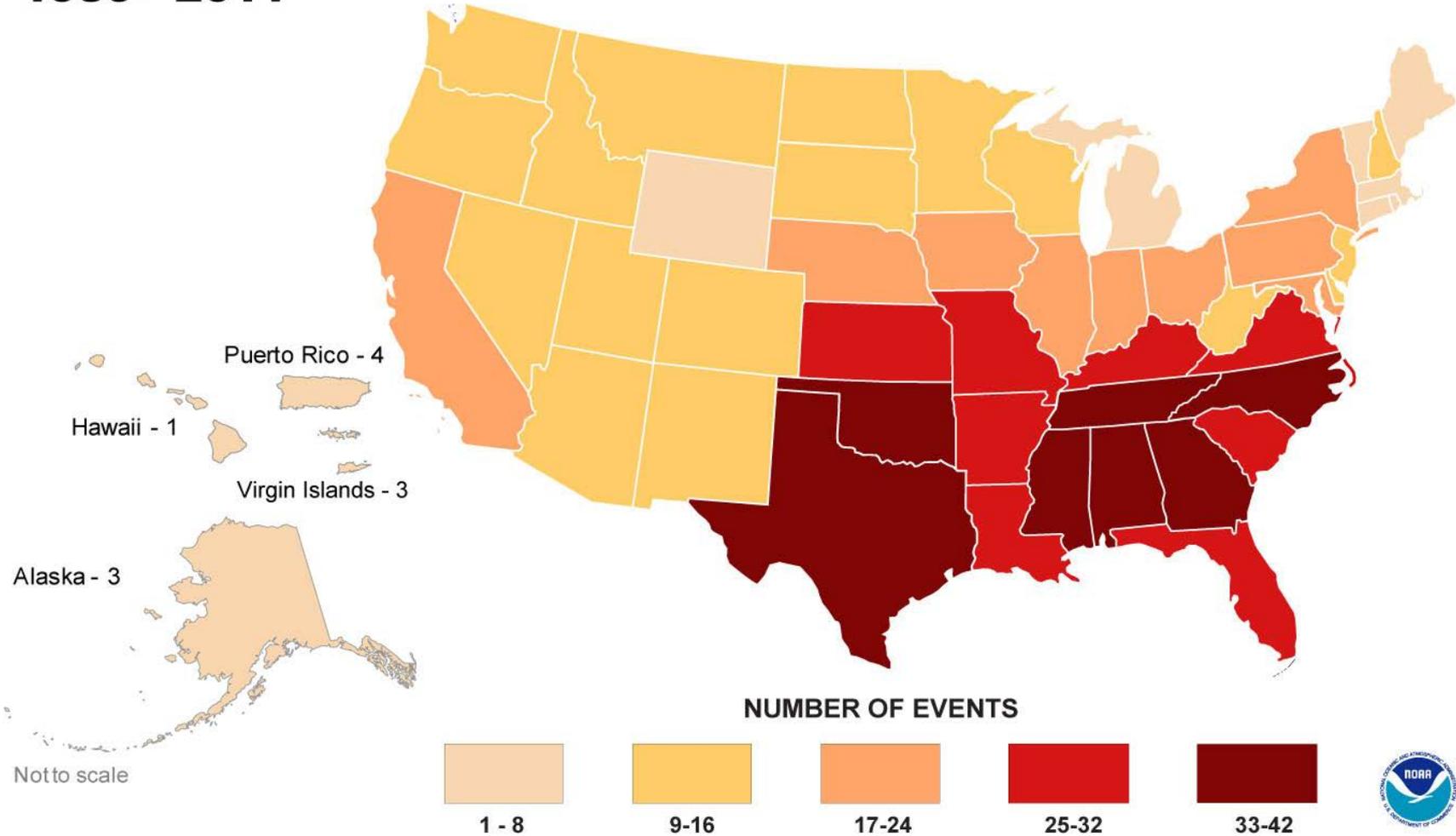
- **Direct costs to State DOTs are:**
  - \$2 billion/yr on snow and ice control
  - \$5 billion/yr on snow & ice infrastructure repairs
- **Indirect costs in terms of travel time delay for...**
  - all travelers is \$11.6 billion/yr from snow/ice/fog
  - the freight community is \$8.7 billion/yr nationwide; \$3.1 billion/yr in the 50 largest cities
- **Considering lost wages, taxes and retail sales of a one-day shutdown, the costs are estimated to be \$3.8 billion across 15 northern states**

# Significant Weather & Climate Events in 2008

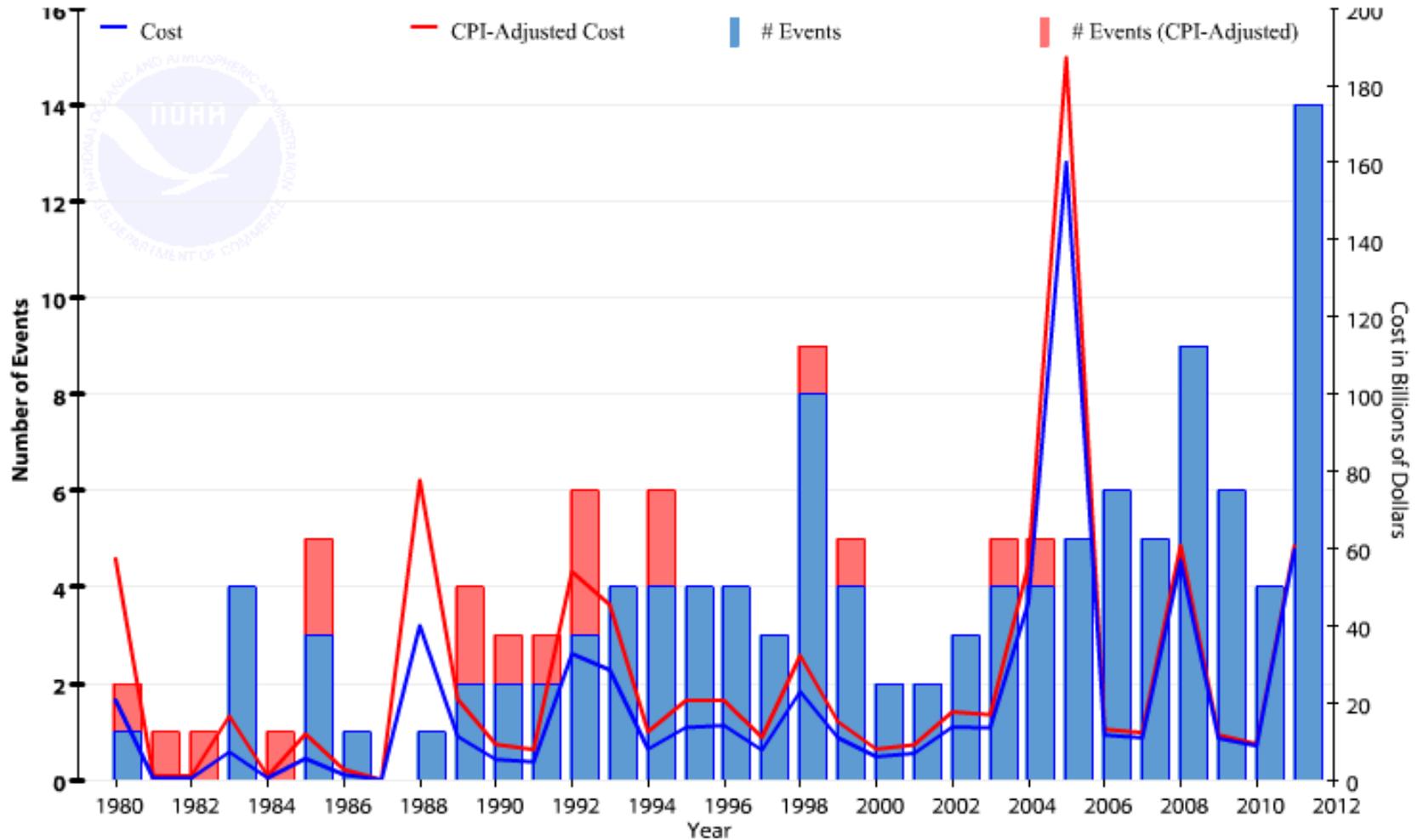


# Billion Dollar Weather Disasters

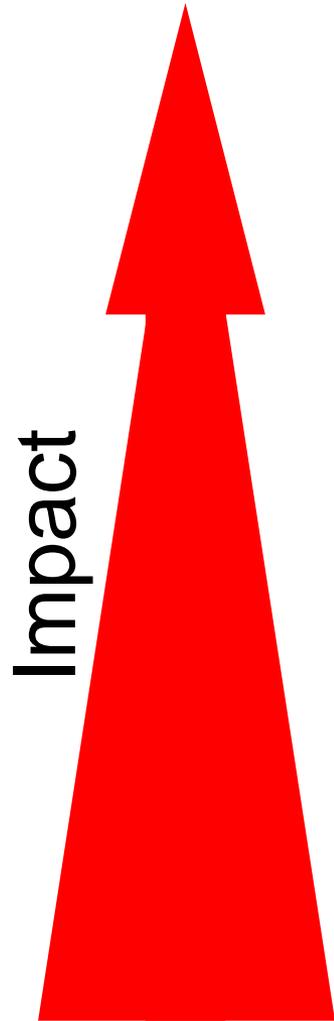
1980 - 2011



# Billion Dollar Weather Disasters



# Impacts: Scale Versus Frequency



10 9 8 7		<b>Complete Failure</b>
6 5 4		<b>Temporary Operational Failure</b>
3 2 1		<b>Reduced Capacity</b>

# Pre-emptive Operations of the Transportation System Requires:

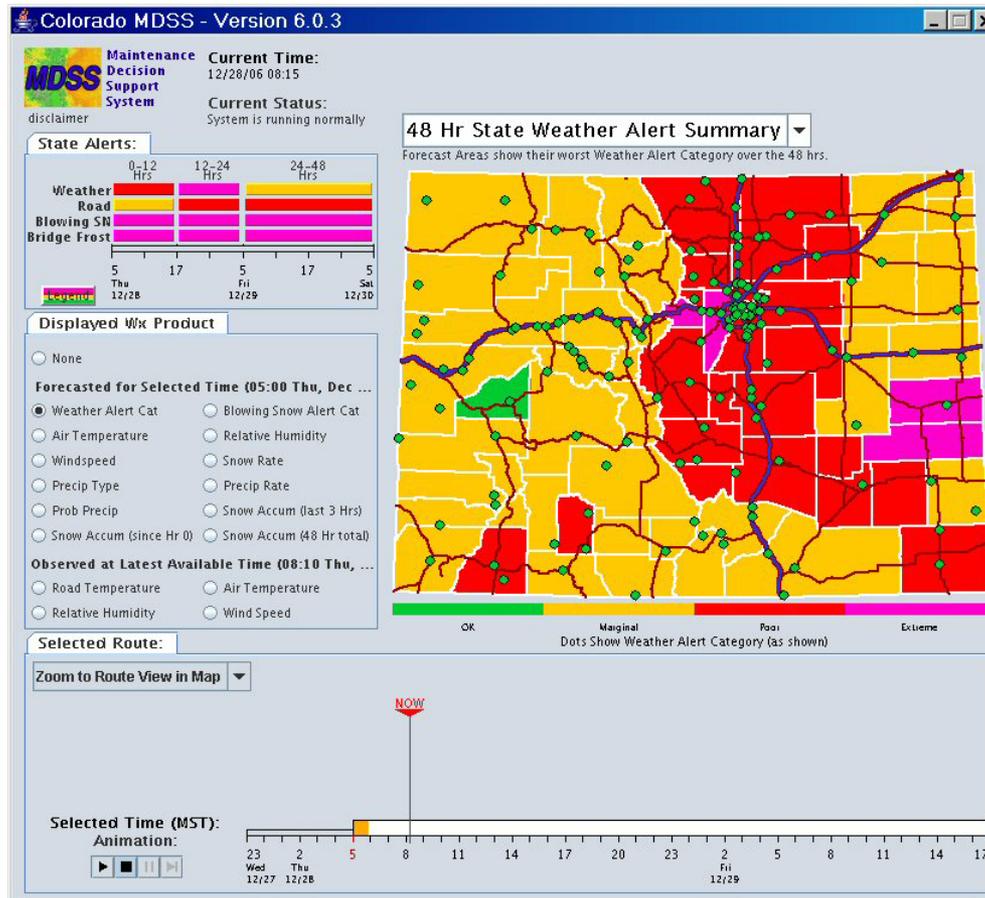
- **Real-time and forecasted information**
- **Measuring / monitoring performance**
- **Good analytical foundation / tools**
- **State of the art technologies and strategies**
- **Integration across system elements, jurisdictions, and modes**
- **An organization and workforce capable of managing all of the above**

# The Role of ITS

- **ITS encompasses managing the transportation system for ever-changing conditions, including:**
    - **Incident and Emergency Management**
    - **Active Traffic and Demand Management**
    - **Integrated Corridor Management**
    - **Road Weather Management**
- and all the supporting technologies and institutional relationships to make them work**

# Road Weather Management

## Maintenance Decision Support System



# Emerging Changes to the System

- Our work today is based on current conditions.
- What happens when the climate changes?
  - What are the impacts to highway operations if there's an increase in coastal flooding?
  - What are the impacts to highway operations if we experience more icing events instead of snow events
  - Or what if we have more frequent and severe thunderstorms and flash floods?

# Responding to the Changes

- FHWA Office of Operations White Paper, November 2012: *Planning for Systems Management & Operations as part of Climate Change Adaptation-*
- We are exploring the climate effects, the transportation impacts of these effects, and the potential responses for the following sectors:
  - System Maintenance
  - System Operations
  - Travelers (including Traveler Behavior)
  - Freight Transportation

# Climate Change Effects and Potential Responses: System Maintenance

- Shifting rain/snow/ice line will mean...
  - Changes in resource needs (e.g., less snow fighting, more ice fighting, more flooding)
  - Altered construction and maintenance schedules
- Increased frequency, duration and intensity of droughts
  - Changes in vegetation management
- Increased coastal and inland flooding
  - Increased and more frequent use of resources (e.g., staff, evacuation materials)
- Increase in magnitude & duration of severe heat waves
  - Altered construction and maintenance schedules
  - Deploy “quick maintenance” patrols to address potholes and buckling issues

# Climate Change Effects and Potential Responses: System Operations

- **Increased coastal and inland flooding will mean...**
  - Increased and more frequent use of resources (e.g., staff, evacuation materials)
- **Increase in intensity of tropical cyclones, rising sea levels, increased occurrence of wildfires**
  - Broader preparedness for potential evacuation
  - Increase TMC staff and ITS resources to provide traveler information during evacuations
  - More frequent disaster preparation, operations and recovery
- **Increase in energy demand**
  - Need for more resilient TMC communications and ITS hardware

# Climate Change Effects and Potential Responses: Travelers and Traveler Behavior

- **Increased exposure to hazardous driving conditions (e.g., flooding, road conditions, smoke from wildfires) and human health impacts**
  - Increased need for timely, accurate and relevant traveler information from TMC's and private sector information service providers to support route & mode choice, departure times
  - Less consistent mode split impacting day-to-day congestion and safety issues
  - Potential mode shift to/from alternate modes, e.g., using transit, biking, or walking
  - Increased emphasis on carpooling and teleworking to reduce impacts to highways

# Climate Change Effects and Potential Responses: Freight Transportation

- **Increased frequency, duration and intensity of droughts; increased coastal and inland flooding**
  - Restricted access to ports and shipping channels for inland waterways
  - Mode shift – e.g., from inland waterways to highways due to changes in reliability
- **Increase in magnitude & duration of severe heat waves**
  - Mandatory freight diversion to more robust alternate routes
  - Dynamic or seasonal restrictions for trucks or rail during times of high heat, reducing either acceptable speed or weight
  - Policy and regulation changes to restrict truck size and weights

# Framing the Questions: Agency Considerations

- **What can we do to improve our abilities to manage the system?**
  - **Build more robust, resilient and flexible Intelligent Transportation Systems**
  - **Integrate sophisticated weather & road condition information into transportation operations centers**
  - **Establish greater inter- and intra-agency cooperation, especially for resource/asset management and resource allocation**
  - **Examine Standard Operating Procedures for rapid mobilization and deployment**
  - **Cross-train staff, especially for unusual events**

# Our Next Steps

- Information sharing across agencies and countries
  - Schedule a follow up to the December 2012 conference call with our partners
  - Work with the weather and climate communities to better understand the emerging changes
- Capture the state-of-the-practice
- Conduct gap analyses
  - Technical capabilities
  - Institutional capabilities
- Explore more formal ways to incorporate risk and uncertainty

# Thank you

- Questions?
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