

Session 3: Applying the Results

June 12, 2013



Missouri River flooding, Jefferson City, Missouri
Photo: Missouri DOT

Webinar Series

Session 1: Getting Started – Determining Assets to Study and Using Climate Information

Session 2: System-Level Vulnerability Assessments

Session 3: Applying the Results

Session 4: Hurricane Sandy - Lessons Learned

Date: Thursday, June 20, 2:00 – 3:30 pm EDT

Agenda

Introduction *Rob Hyman, FHWA*

Applying the Results - Example Applications

**Los Angeles County Metropolitan
Transportation Authority** *Cris Liban*

**Boston Region Metropolitan Planning
Organization** *Maureen Kelly*

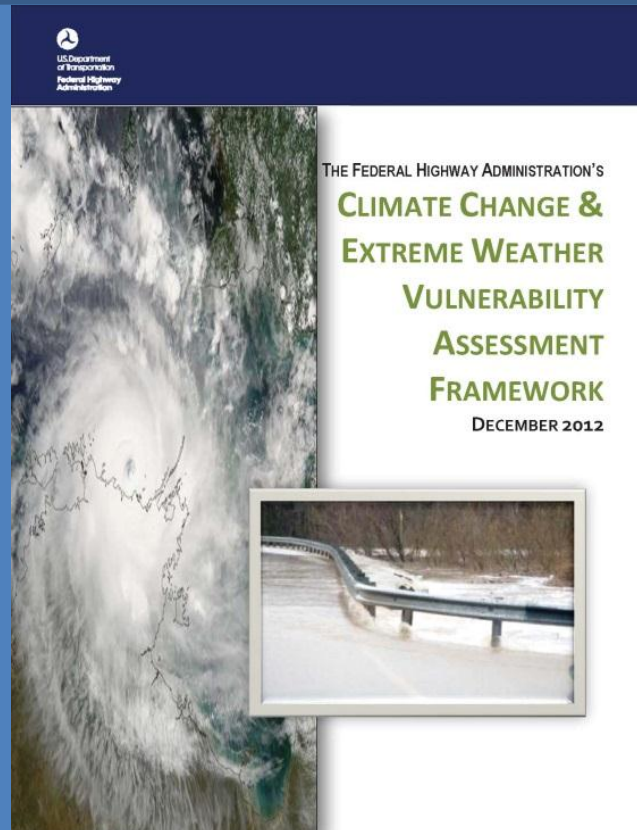
Chicago Transit Authority *Karl Peet*

Q&As

Vulnerability Assessments

Understanding how climate change effects and extreme weather will affect your transportation network is key first step for climate change planning

FHWA's Climate Change and Extreme Weather Vulnerability Assessment Framework



Climate Change & Extreme Weather Vulnerability Assessment Framework

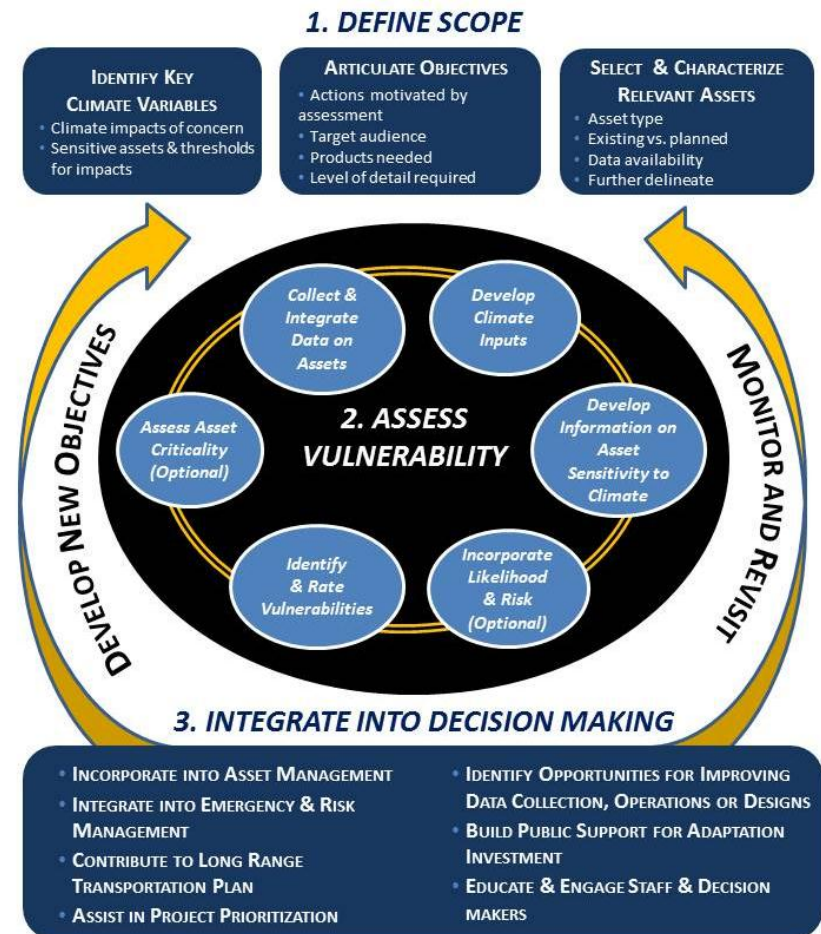
1. Define Project Scope

- Objectives
- Relevant Assets
- Climate Variables

2. Assess Vulnerability

- Climate Inputs
- Asset data, criticality, sensitivity
- Vulnerabilities, risk

3. Integrate Vulnerability Into Decision Making



Integrate Results into Decision Making

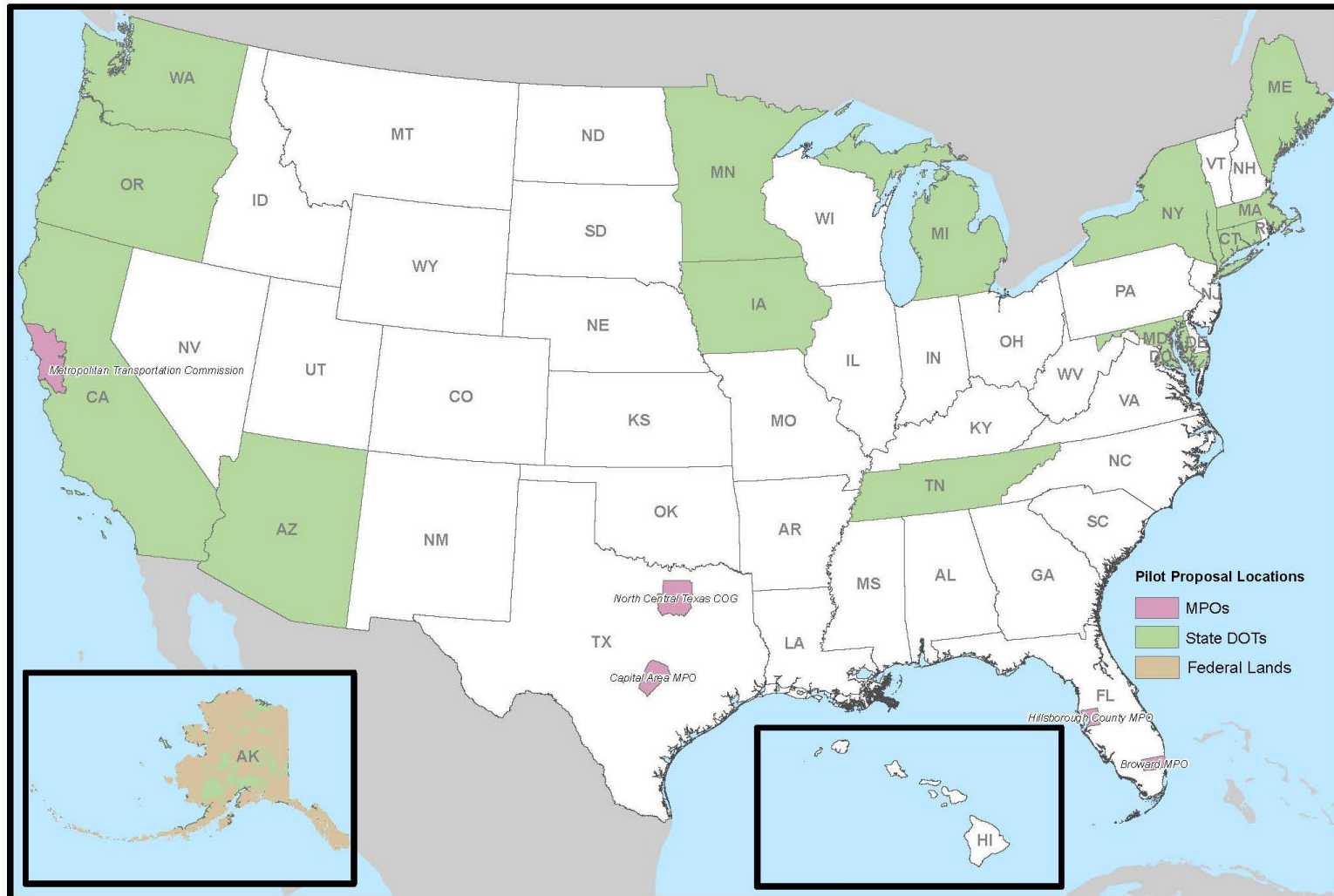
- Identify, analyze, and prioritize adaptation options;
- Incorporate assessment results into programs and processes



- INCORPORATE INTO ASSET MANAGEMENT
- INTEGRATE INTO EMERGENCY & RISK MANAGEMENT
- CONTRIBUTE TO LONG RANGE TRANSPORTATION PLAN
- ASSIST IN PROJECT PRIORITIZATION

- IDENTIFY OPPORTUNITIES FOR IMPROVING DATA COLLECTION, OPERATIONS OR DESIGNS
- BUILD PUBLIC SUPPORT FOR ADAPTATION INVESTMENT
- EDUCATE & ENGAGE STAFF & DECISION MAKERS

2013 - 2014 Pilot Locations



Metro Climate Adaptation Initiatives

By Cris B. Liban, D.Env., P.E.
Deputy Executive Officer, Environment
Los Angeles County Metropolitan Transportation Authority

FHWA Climate Change Adaptation Series
June 12, 2013

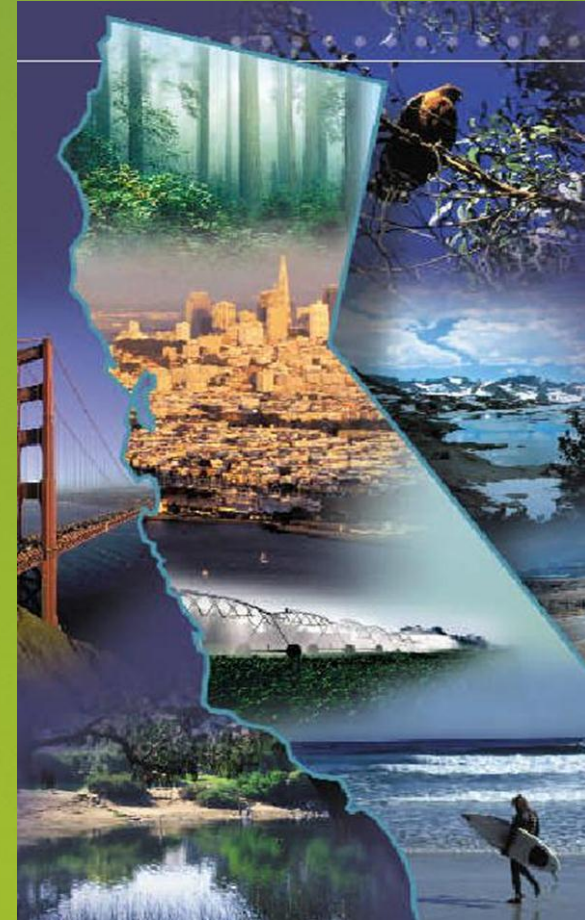


Outline

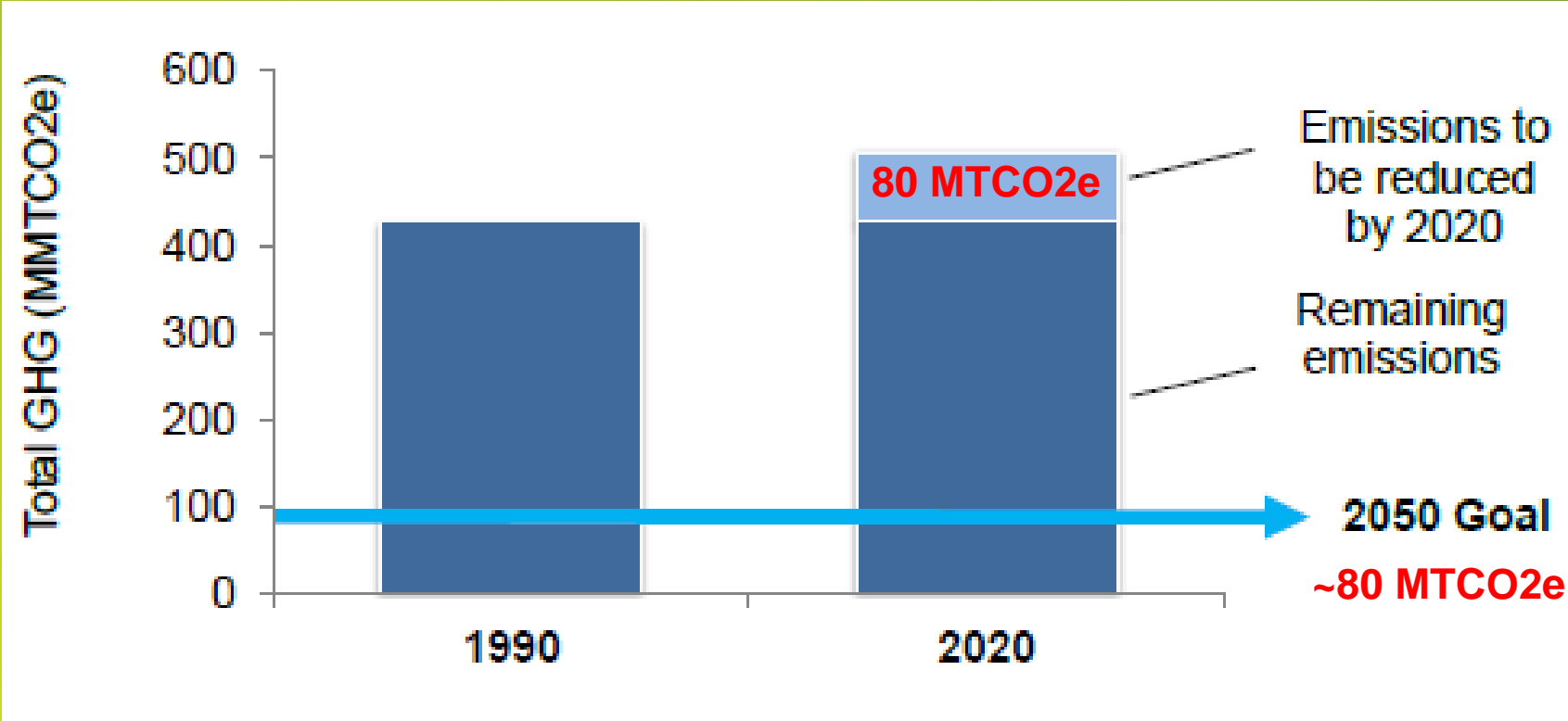
- > California and Climate Change
- > Why Are Climate Issues Important To LA Metro?
- > LA Metro Climate Adaptation Activities
- > Questions/Discussion

Climate Drivers in California

- > AB 32: Reduce state's global warming emissions 20% of 1990 levels in 2020; 80% of 1990 levels by 2050
- > SB 375: Coordinated land use and transportation planning as a means to address climate change
- > Amendments to the California Environmental Quality Act Guidelines Section 15126.2
- > 2009 California Climate Adaptation Strategy
- > California Cap and Trade Program



California GHG Inventory and Long-Term Reduction Goals



(CA Air Resources Board, 2013)

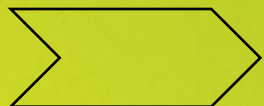
LA Metro is Los Angeles County's...



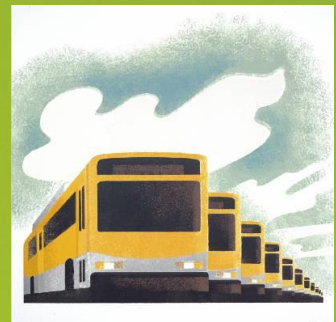
Regional Transit Planner



Regional Transit System Builder



Regional Transit Operator



Metro

LA Metro's Service Area



The LACMTA's Service Area is GEOGRAPHICALLY LARGE [1,433 mi² (3,711 km²)]

Multi-modal

- heavy and light rail
- bus
- BRT

Over 1 million daily bus boardings and approximately 300,000 daily rail boardings

LA Metro System



LA Metro System

Future Expansion over 30 Years





Why are Climate Issues Important to LA Metro?

| <i>What's happening?</i> | <i>How climate information might help.</i> |
|--|--|
| <p>Service disruptions occur now during periods of extreme heat and heavy precipitation.</p> | <p>Identifying portions of the transit system/particular services that are most vulnerable can help guide planning and operations.</p> |
| <p>Large infrastructure projects (Measure R) are in progress and being planned and built. Ensuring their performance and safety is critical, in both the current and future climate.</p> | <p>Information about impacts and adaptation can be incorporated into decisions about mode selection, siting, alternatives, materials, and operational/maintenance changes.</p> |



Goal of Adaptation Plan

We ***know*** that climate-related risk exists.

We need to understand:

- the nature and magnitude of the risk
- the planning and operational options for reducing risk
- the relative costs and benefits of the options



Impacts and Key Risks – Driven by Extreme Heat and Precipitation Events

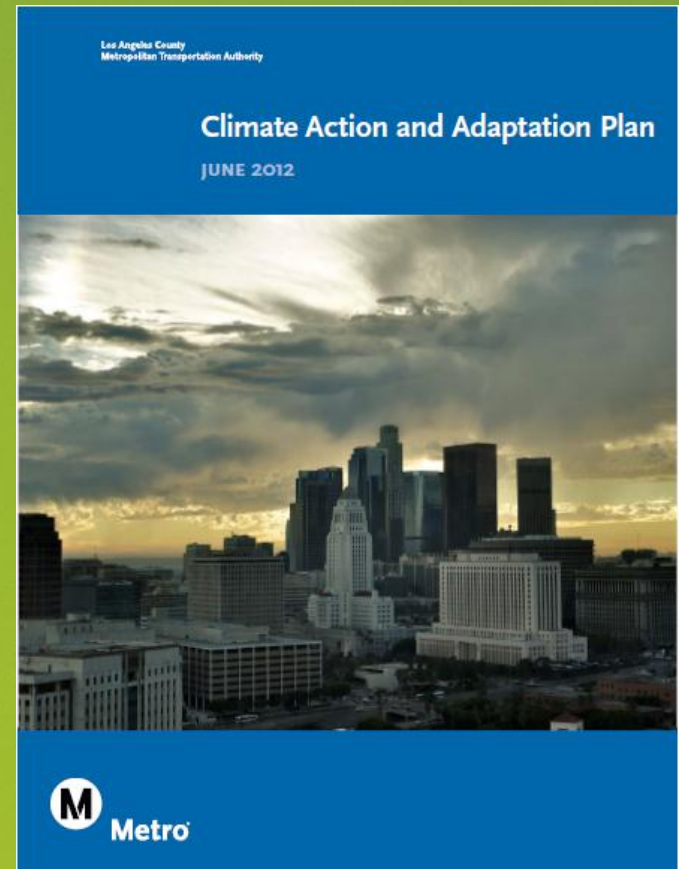


| Service/Asset | Climate Impact |
|---|---|
| Rail Operations | Equipment malfunction (electrical systems; air conditioning systems) during periods of <u>extreme heat</u> |
| | Railway buckling during periods of <u>extreme heat</u> |
| | Flooding of underground stations and tracks, at-grade railways , and Bus Rapid Transit right-of-ways during <u>heavy rainfall events</u> |
| Bus Operations | Fleet breakdowns and increased maintenance during periods of <u>extreme heat</u> |
| New Construction/ Measure R Projects | Exposing new infrastructure to episodes of <u>extreme heat</u> and <u>heavy rainfall events</u> |
| | Labor interruptions or delays during periods of <u>extreme heat</u> |



Adaptation Options

- > Combining weather/climate information with infrastructure monitoring and maintenance?
- > Exploring the use of more heat-resistant track materials?
- > Improving “flood defense” at sensitive locations (like underground stations)?
Examples: expanded “greener” stormwater management; changes to vents, or elevation of pumps
- > Options during construction?
Examples: siting, alignment alternatives, labor schedules





Other Adaptation Considerations

How to estimate the costs of adaptive actions (or lack of action)?

How to integrate adaptation into management/planning?

i.e., What are we already doing that could be considered adaptation? How might adaptation help us achieve existing management goals, including emergency planning?

How can adaptation be made iterative?

i.e., How can we monitor the impact of weather events, learn something, and update/adjust operations and planning...



What have we incorporated into our activities?

- > Adopted policies to guide our planning and management of projects
- > Change procurement requirements
- > Revise Design Criteria and Specifications
- > Active involvement in Readiness Reviews
- > Identify through environmental clearance the mitigation measures and actively implement during construction





Maintenance and Operations Options

- > Integration of Severe Weather/Climate Change Principles
- > Environmental Management System
- > Use of existing tools like M3 and GIS
- > Metrics Development and Implementation
- > Outreach





Looking Forward

- > Assessment of fixed asset vulnerabilities
- > Development of GIS Based tools
- > Criteria for asset management prioritization
- > Study of impacts to vulnerable populations
- > Training and outreach
- > Participation in the carbon market



Metro





Questions/Discussion

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Federal Highway Administration Climate Change Adaptation Webinar

June 12, 2013

**Boston Region MPO
All-Hazards Planning**



Boston Region Metropolitan Planning Organization

Boston Region MPO Planning Area



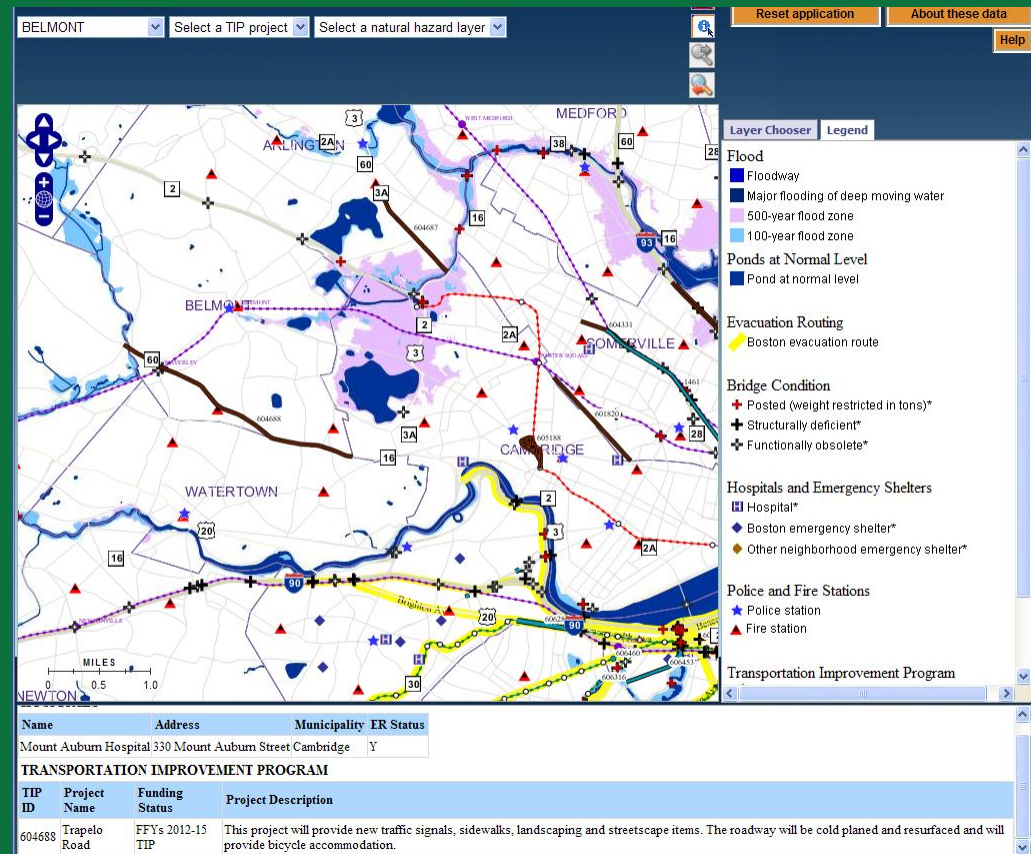
MPO Role in All-Hazards Planning

- Identifying areas of the transportation network that are vulnerable to natural hazards
- Evaluating proposed transportation projects in vulnerable areas and on emergency routes
- Informing the MPO's project selection process
- Programming federal dollars for transportation projects in order to maintain mobility in severe weather, improve redundancy, and help emergency response

Natural Hazards Mapping Flood Zones

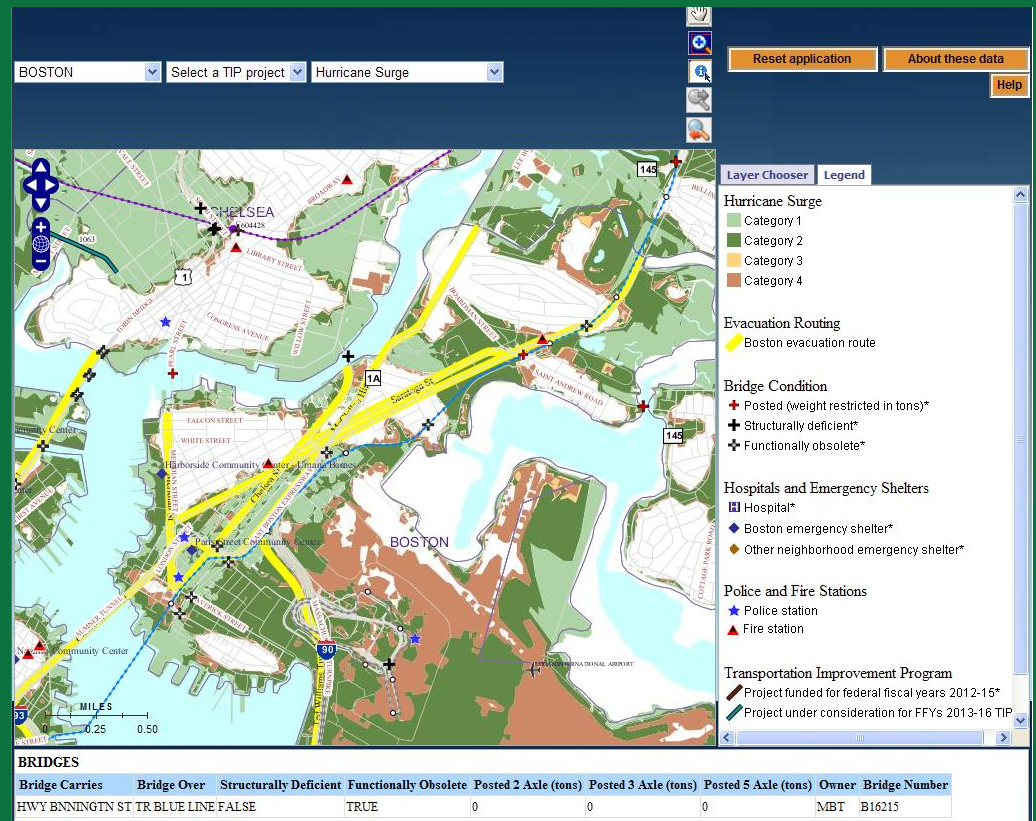
- 100-year flood zones
(1% chance of being equaled or exceeded in any given year)
- 500-year flood zones
(0.2% chance of being equaled or exceeded in any given year)

Source: FEMA



Natural Hazards Mapping Hurricane Surge Zones

Areas at risk
for storm surge
in Category 1-4
hurricanes



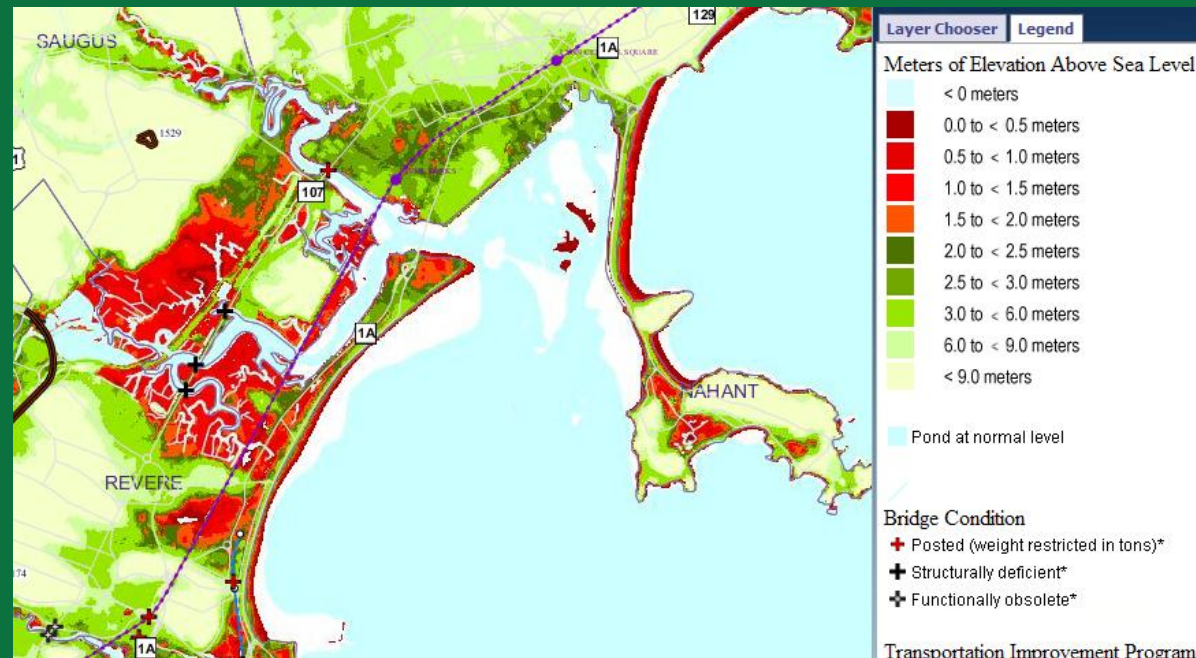
Source: NOAA SLOSH model; US Army Corps of Engineers



Natural Hazards Mapping

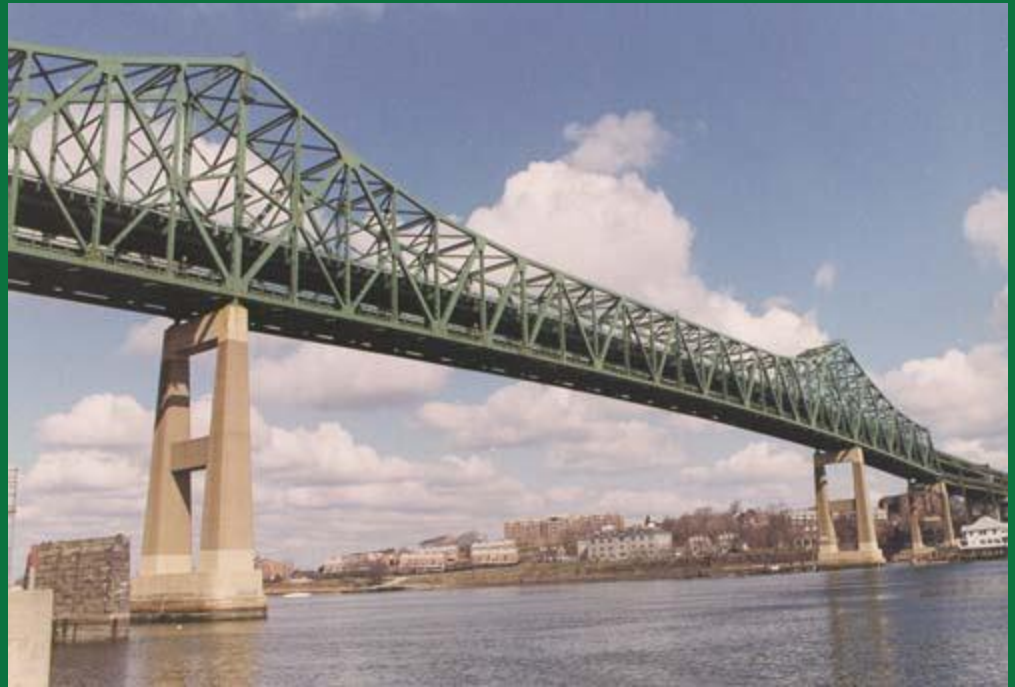
Sea Level Rise

- Areas at risk for sea water inundation during the next century
- Coastal areas as high as 6.5 feet (2 meters) in elevation
- Sea level in Boston Harbor rose 10 inches between 1921 and 2007



Infrastructure Mapping

- Proposed transportation projects
- Evacuation routes
- Operation centers
- Emergency support facilities
- Bridges
- Dams
- Traffic signals



Project Evaluations

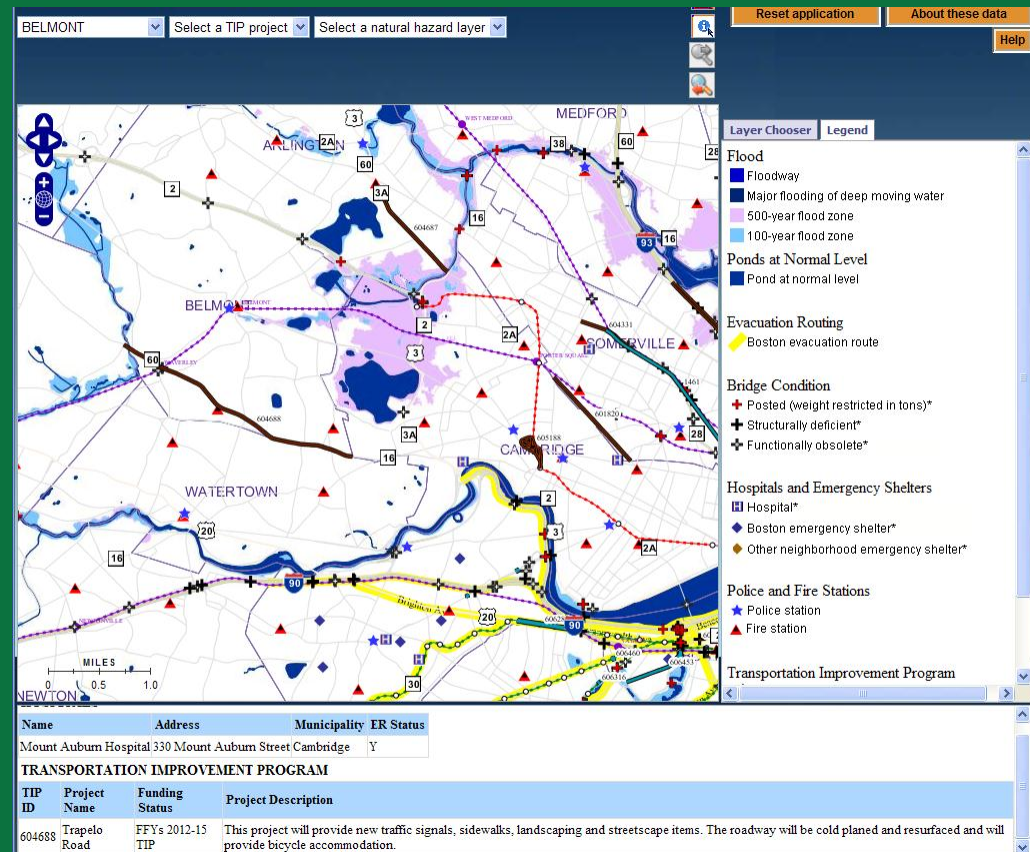
Review: Functional Design Reports (FDRs) in conjunction with maps

- Analyze:**
- Will the project improve the facility's ability to function in extreme weather?
 - Does it improve redundancy in a vulnerable area?
 - Will it help emergency-response actions?
 - Does it address a critical link in the system?

Sample Evaluation

Trapelo Road, Belmont Improvements

- Secondary evacuation route if Fresh Pond Parkway is impassable
- Flood problem documented in FDR
- Upgrades culvert at Beaver Brook for 50-year storm



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