FHWA Climate Change Adaptation Activities and Lessons Learned

Transit and Climate Change Adaptation Webinar

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FHWA and Climate Change Adaptation

Goal: systematic consideration of climate change vulnerability and risk in transportation decision making

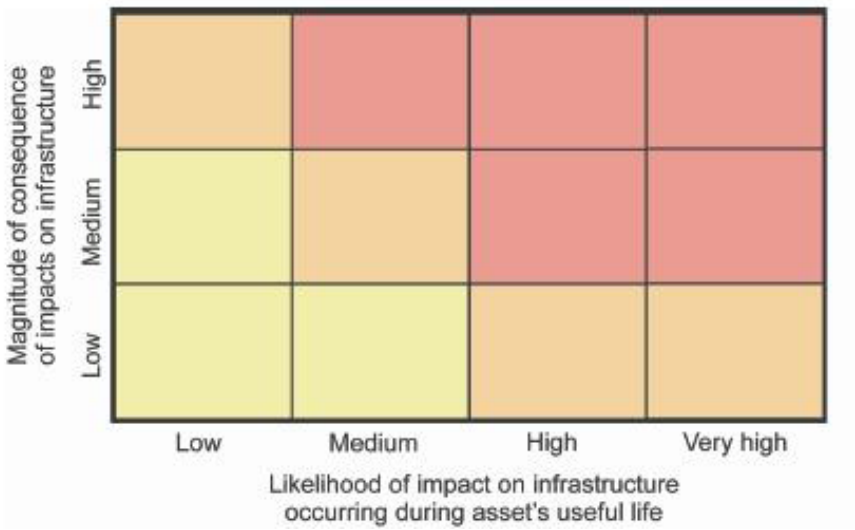
- Systems level (Metropolitan, Statewide planning) & individual projects, as appropriate

- **Motivations**
  - Internal: protect integrity of transportation investments, safety
  - External: CEQ guidance on addressing climate change in NEPA and Adaptation Planning

- **Interdisciplinary cooperation is key to effort**
  - Represents cooperative effort of multiple offices in FHWA, U.S. DOT, AASHTO, AMPO, and partnerships with science agencies such as USGS

FHWA Adaptation Initiatives

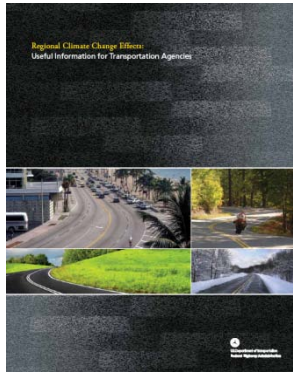
- **FHWA is developing and sharing information on tools and methodologies that states and MPOs can use to assess risk and prioritize actions:**
  - **Climate projections**
  - **Critical asset identification**
  - **Vulnerability assessment methodologies**



Source: City of New York

Regional Climate Change Effects (2010)

- **Report synthesizes information on climate change projections for transportation decision makers**
  - **Snapshot: Summarizes recent science**
- **Projected *changes* by region**
  - **Annual, Seasonal Temperature (change in ºF)**
  - **Seasonal Precipitation (% change)**
  - **Where information exists:**
    - Sea level rise, Storm activity

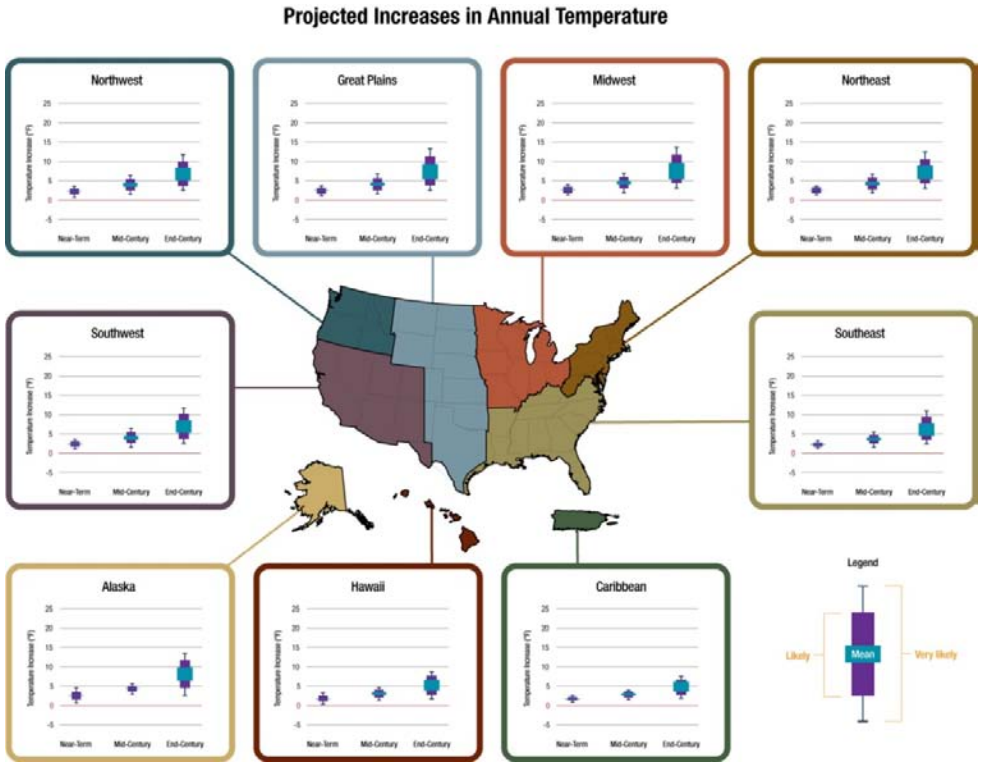


- **Also includes information at local, state scales**
- **Received assistance from climate experts at NOAA, USGS, DOE, etc.**

http://www.fhwa.dot.gov/hep/climate/climate_effects/

How Can This Information Be Applied?

- **Inform planning efforts with a <u>consistent</u> set of projections**
- **Inform consideration of vulnerability of key assets**
- **Not detailed/certain enough for definitive decisions on specific projects**



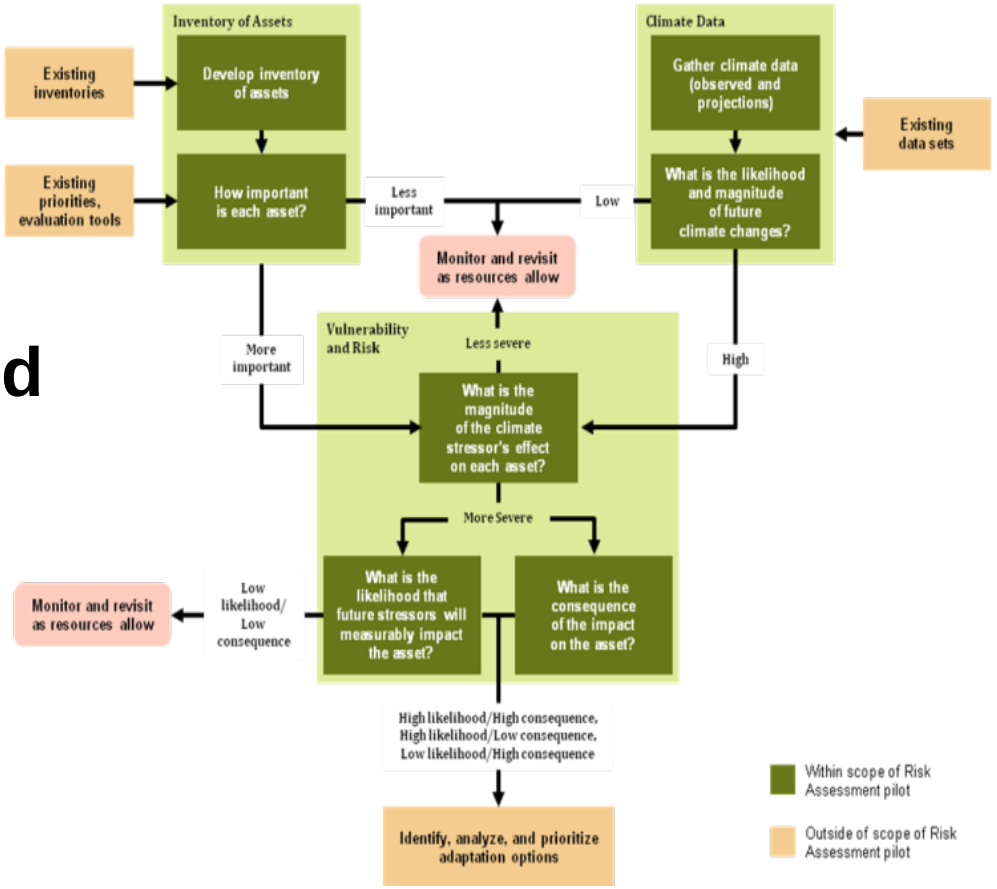
Vulnerability/Risk Assessment Conceptual Model

- **Goal: Help transportation decision makers identify vulnerable assets and adaptation strategies**
  - **most exposed to the threats from climate change; and/or**
  - **could result in the most serious consequences as a result of those threats**
- **Conceptual model completed**
- **Pilots - Use by State DOTs and MPOs (2010-2011)**
- **Update the conceptual model**

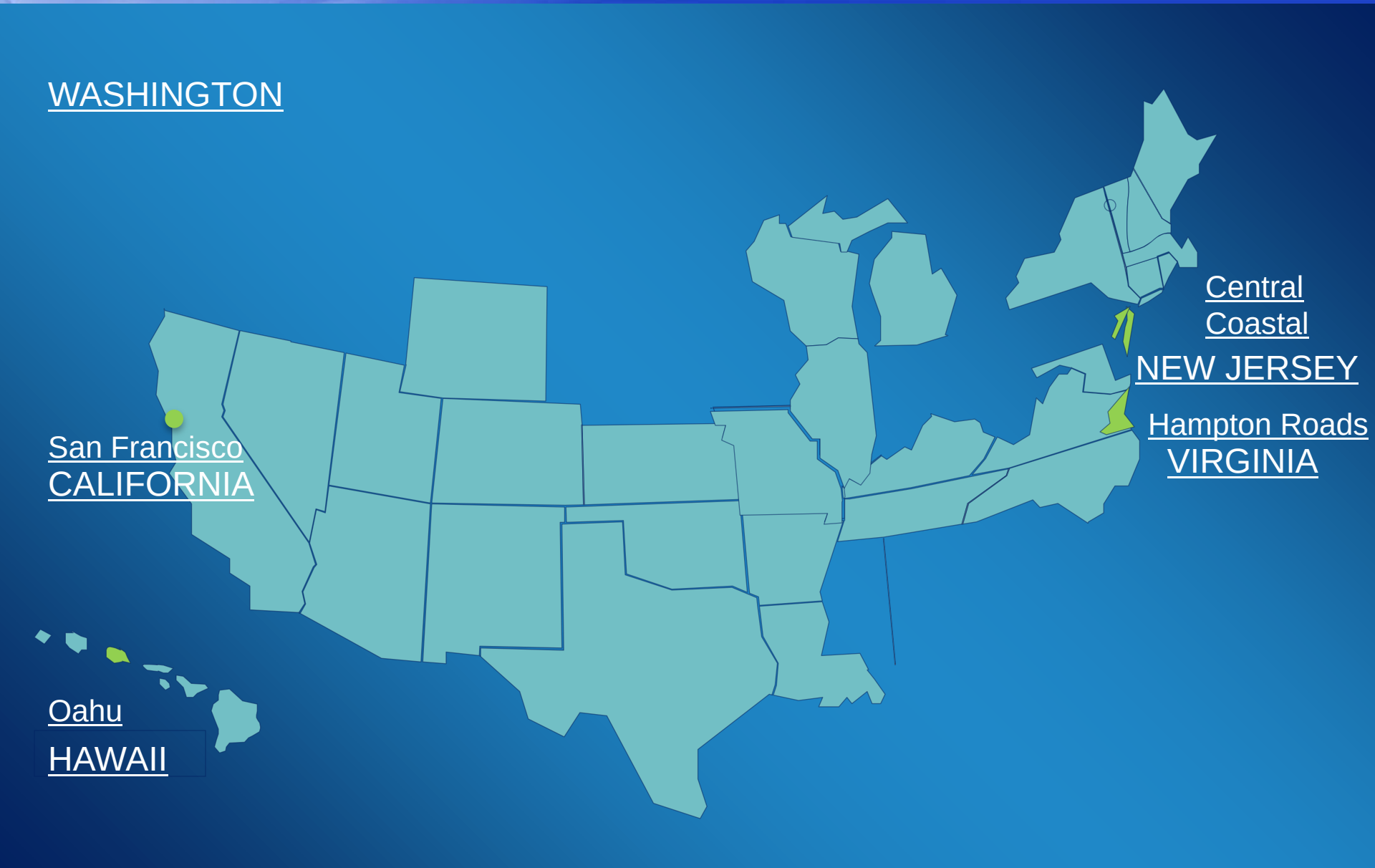
http://www.fhwa.dot.gov/hep/climate/pilots.htm

Vulnerability/Risk Assessment Conceptual Model

- Develop inventory of infrastructure assets
- Gather climate data
- Assess vulnerability and risk of assets to projected climate change
- Analyze, prioritize adaptation options
- Monitor and revisit

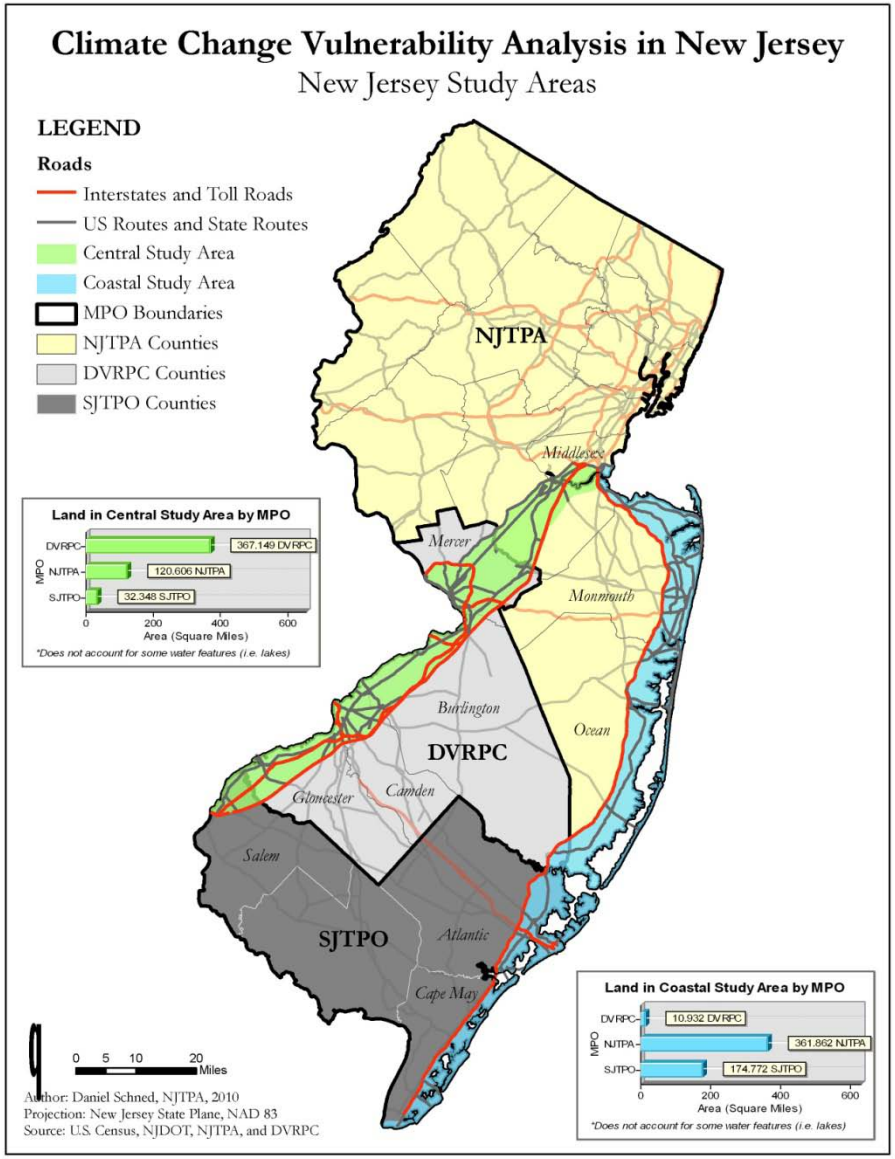


Climate Change Vulnerability and Risk Assessment Pilot Locations



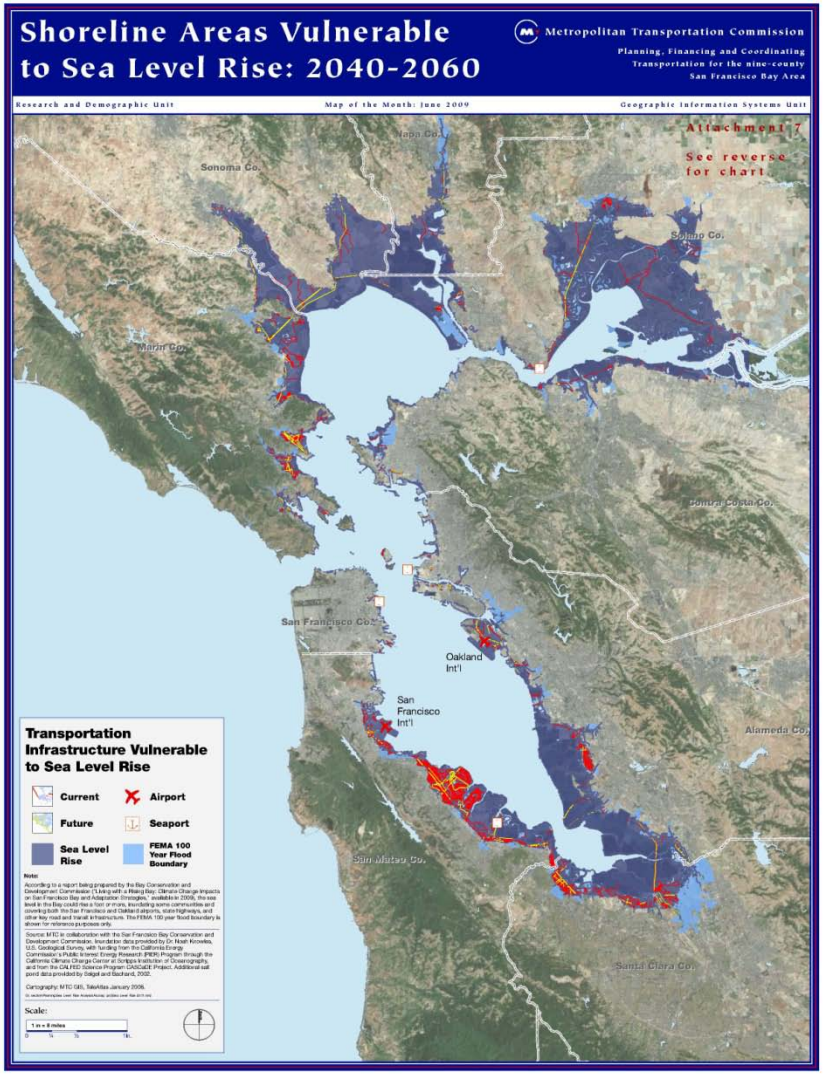
Pilot: New Jersey DOT

- Study Areas:
  - New Jersey Coastal
  - Central New Jersey
- Partners:
  - New Jersey DOT
  - North Jersey Transportation Planning Authority,
  - South Jersey Transportation Planning Organization,
  - Delaware Valley Regional Planning Commission,
  - New Jersey Department of Environmental Protection

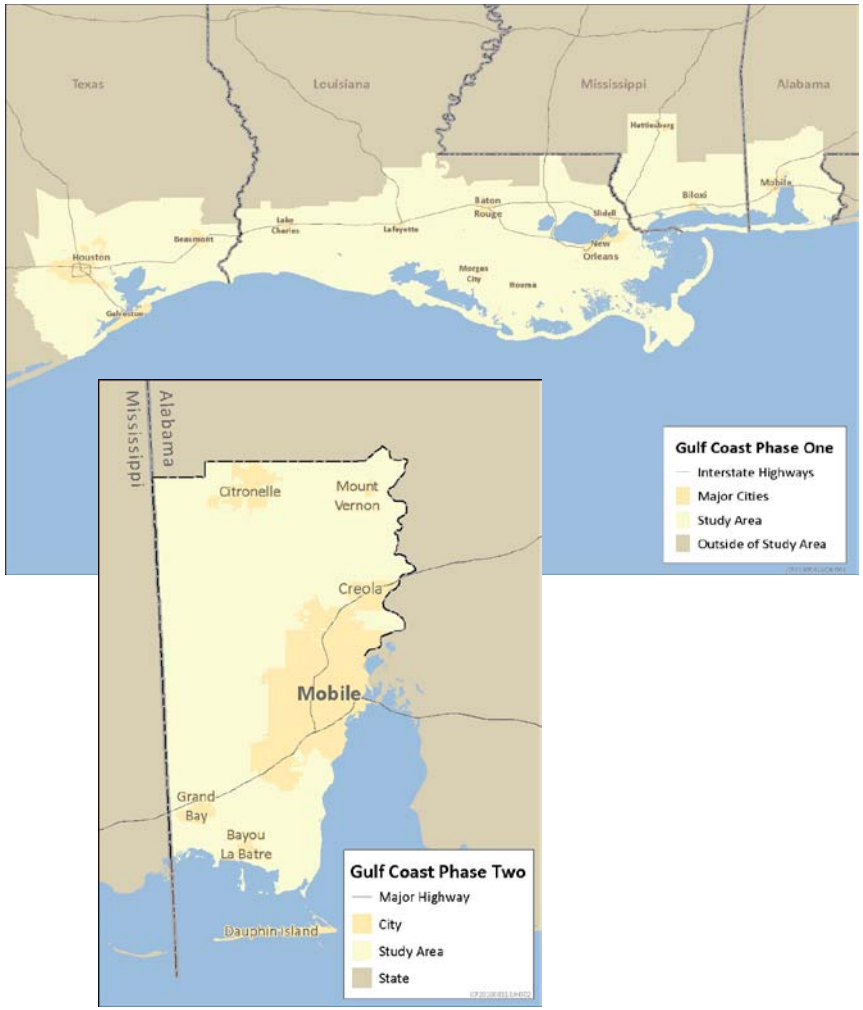


Pilot: Metropolitan Transportation Commission

- Focus on San Francisco Bay
- Complements a NOAA funded sub-regional project
- Partners:
  - MTC,
  - CalTrans District 4,
  - San Francisco Bay Conservation and Development Commission,
  - NOAA,
  - Association of Bay Area Governments,
  - Bay Area Air Quality Management District



Gulf Coast Project Examines Issues at Metropolitan Scale



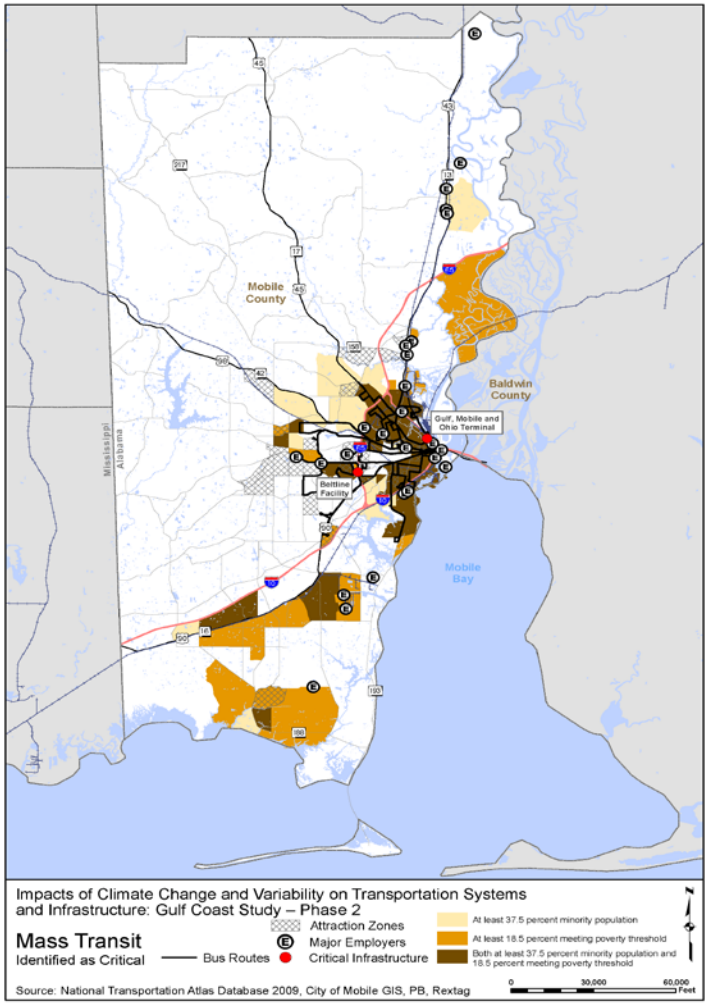
- **Phase 1**
  - Overview of climate change impacts on transportation infrastructure in central Gulf Coast (completed 2008)
- **Phase 2**
  - Focus on one metropolitan area – Mobile, AL
  - Development of adaptation tools and strategies that will be transferable to other areas
  - Timeframe: 2010-2013

Task 1: Identify Critical Transportation Systems

- **Delineate important assets**
- **Develop scoring summary based on available data**
- **Apply engineering judgment to fill data gaps**
- **Consider redundancy**

	HIGHWAYS											
	SocioEconomic					Ops.		Health and Safety				
	Component of National/International Commerce System	Important Multi-Modal Linkage	Functions as Community Connection	No System Redundancy	Serves Regional Economic Centers	Functional Classification (Interstate, etc.)	Usage	Identified Evacuation Route	Component of Disaster Relief and Recovery Plan	Identified Hazardous Materials Route	Component of National Defense System	Provides Access to Health Facilities
Facility List												
Facility A												

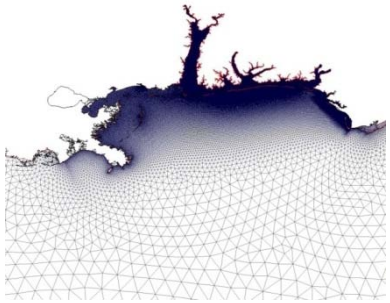
Task 1: Identify Critical Transportation Systems (continued)

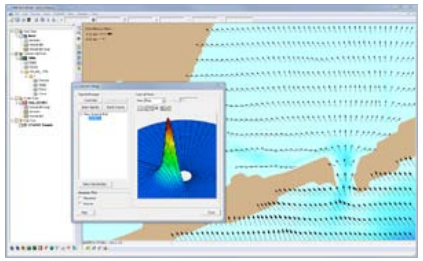


- **What is "critical" will vary by community**
- **Important to consider community priorities as well as traditional measures**
- **Professional judgment is important:**
  - **Cannot always find data for the "boxes"**
  - **Not all critical criteria are quantifiable**

Task 2: Projected Climate Data

- **USGS providing statistically downscaled projections for T and P**
  - 4 to 7 Climate models (PCM, Hadley, …)
  - 3 emission scenarios (A1fi, A2, B1); 3 time horizons out to 2100
  - Secondary variables calculated from daily T and P, e.g., 24-hr precip with 5%/yr prob
- **Sea level rise analysis**
  - Range of recent global SLR scenarios used
  - Accounts for local subsidence
- **Storm Surge Modeling – ADCIRC**
  - Range of storm intensities
  - Output includes surge distribution and dynamics
- **Wave Modeling – STWAVE**
  - Inputs from ADCIRC output and boundary conditions
  - Outputs include key aspects of wave energy





- **Exposure of transportation systems will be assessed using a GIS analysis**

Lessons Learned: Needed Data Can Be Difficult to Obtain

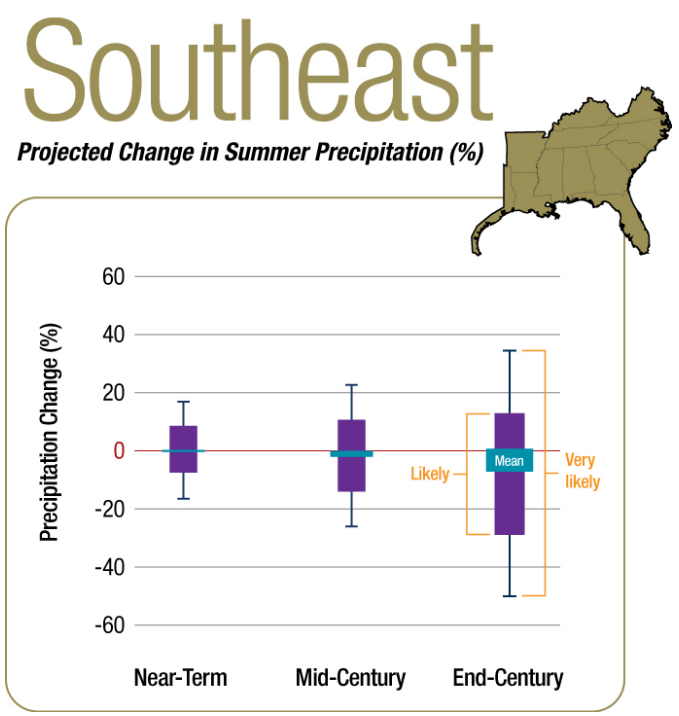
- **Site specific climate projections are difficult to find**
  - **Downscaling global models is a complex activity**
  - **Universities are often important players in developing this data – have been partners in many assessments (Washington State and Oahu pilots, for instance)**
- **Transportation asset inventory data time consuming to assemble**
  - **Many different sources even within one agency**
  - **Many different formats**
  - **LIDAR data does not capture all needed details**

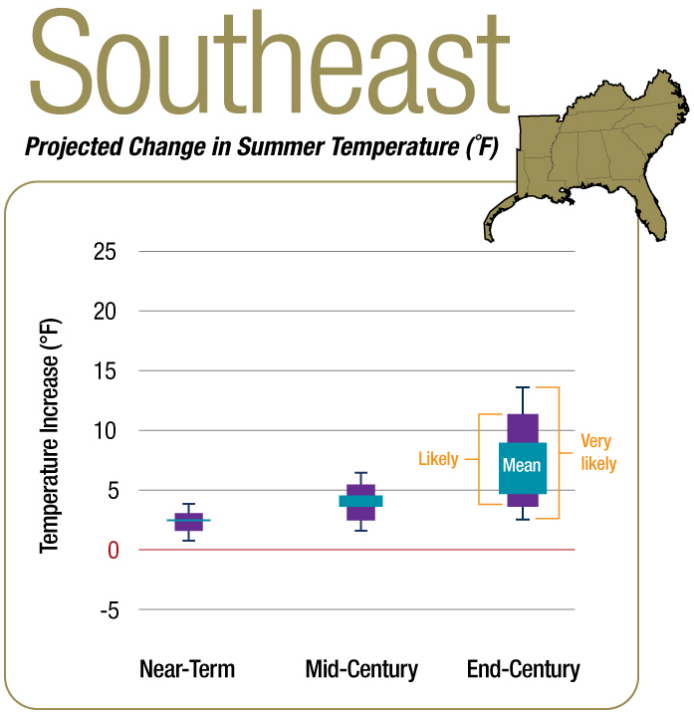
Lessons Learned (continued)

- **Interdisciplinary cooperation is key**
  - **Need to include science information, engineering specifications, planning processes, etc.**
  - **Multi-disciplinary stakeholder communication is not easy**
  - **Understand existing decision-making processes and frameworks**
- **Impacts and concerns will vary by region – no one-size-fits-all answers**

Lessons Learned: Embrace the Uncertainty

- **Must be comfortable with range of climate projections**
- **Not all climate trends are clear**





Thank You

http://www.fhwa.dot.gov/hep/climate/index.htm

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