Design For The Future Transportation Infrastructure

A Risk-Based Approach

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Why Plan?

- Predictable changes in the climate will increase the stress on our transportation infrastructure
- Stresses on system will result in decreased capacity
- Decreased capacity will impact congestion
- Transportation infrastructure impacts every part of our lives

Cost of Routine Delay

- $121 billion
- 5.5 billion extra hours
- 2.9 billion gallons of extra fuel
- 56 billion pounds of additional carbon dioxide
- Reductions in capacity

Source: 2012 Urban Mobility Report, Texas A&M Transportation Institute

Gap Analysis Process

Identify Threats and Hazards

- Natural
- Technological
- Human Caused
- Based on historical occurrences and probability models.
- Assess Probability and Impact of each threat/ hazard

Step 1

Identify Critical Infrastructure and Key Resources (CI/KR)

- What the CI/KR is required to do
- Identify dependencies and interrelationships

Step 2

Assess Vulnerabilities

- Functionality
- Structural Integrity
- Environmental Considerations
- Accessibility

Step 3

Current and Planned Activities

- Vulnerabilities already being addressed
- Improvement plans

Step 4

Gap Analysis

- Gap between CI/KR requirement and existing or planned capability

Step 5

Findings

- Identify resolutions to minimize or eliminate the gap
  - ✓ Resiliency
  - ✓ Redundancy
  - ✓ Development

Step 6

Vulnerability Assessment

- Identify Hazards
- Provide Context
- Identify Critical Infrastructure
- Assess Probability
- Assess Consequences
- Prioritize Efforts

Identify the Hazards

Natural	Technological	Human-caused
Resulting from acts of nature	Involves accidents or the failures of systems and structures	Caused by the intentional actions of an adversary
▪ Avalanche ▪ Disease outbreak ▪ Drought ▪ Earthquake ▪ Epidemic ▪ Flood ▪ Hurricane ▪ Landslide ▪ Tornado ▪ Tsunami ▪ Volcanic eruption ▪ Wildfire ▪ Winter storm	▪ Airplane crash ▪ Dam/levee failure ▪ Hazardous materials release ▪ Power failure ▪ Radiological release ▪ Train derailment ▪ Urban conflagration	▪ Civil disturbance ▪ Cyber incidents ▪ Sabotage ▪ School violence ▪ Terrorist acts

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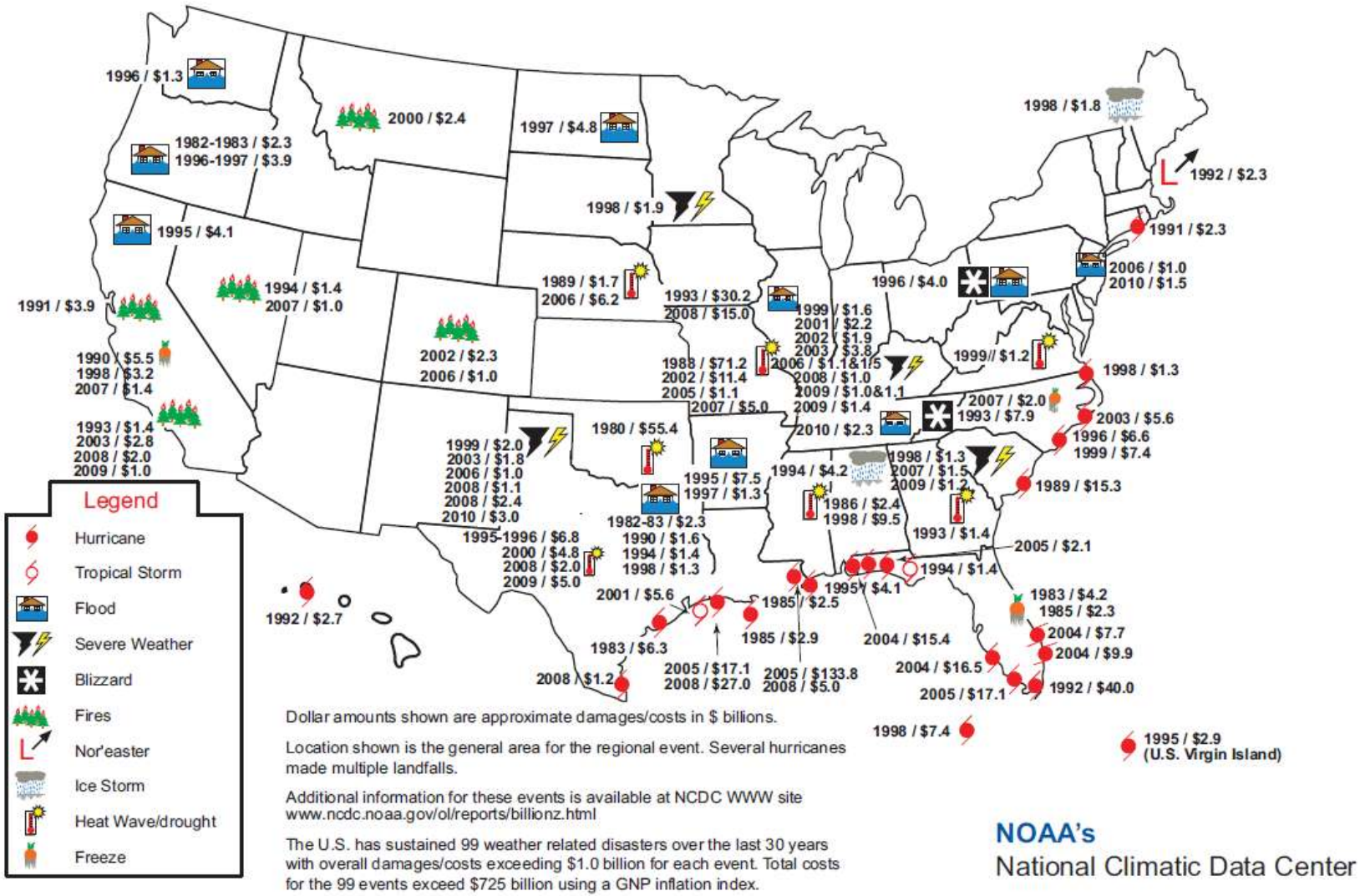
Billion Dollar Weather Disasters 1980-2010



Dollar amounts shown are approximate damages/costs in $ billions.

Location shown is the general area for the regional event. Several hurricanes made multiple landfalls.

Additional information for these events is available at NCDC WWW site www.ncdc.noaa.gov/ol/reports/billionz.html

The U.S. has sustained 99 weather related disasters over the last 30 years with overall damages/costs exceeding $1.0 billion for each event. Total costs for the 99 events exceed $725 billion using a GNP inflation index.

NOAA's
National Climatic Data Center

Components of Transportation Infrastructure

- Fixed Node
- Fixed Route
- Vehicles
- People

Lifecycle Management – Planning Horizon

- Roads built with 20-50 year lifespan
- Bridges built with 30-75 year lifespan
- Rail built with 25 year* lifespan

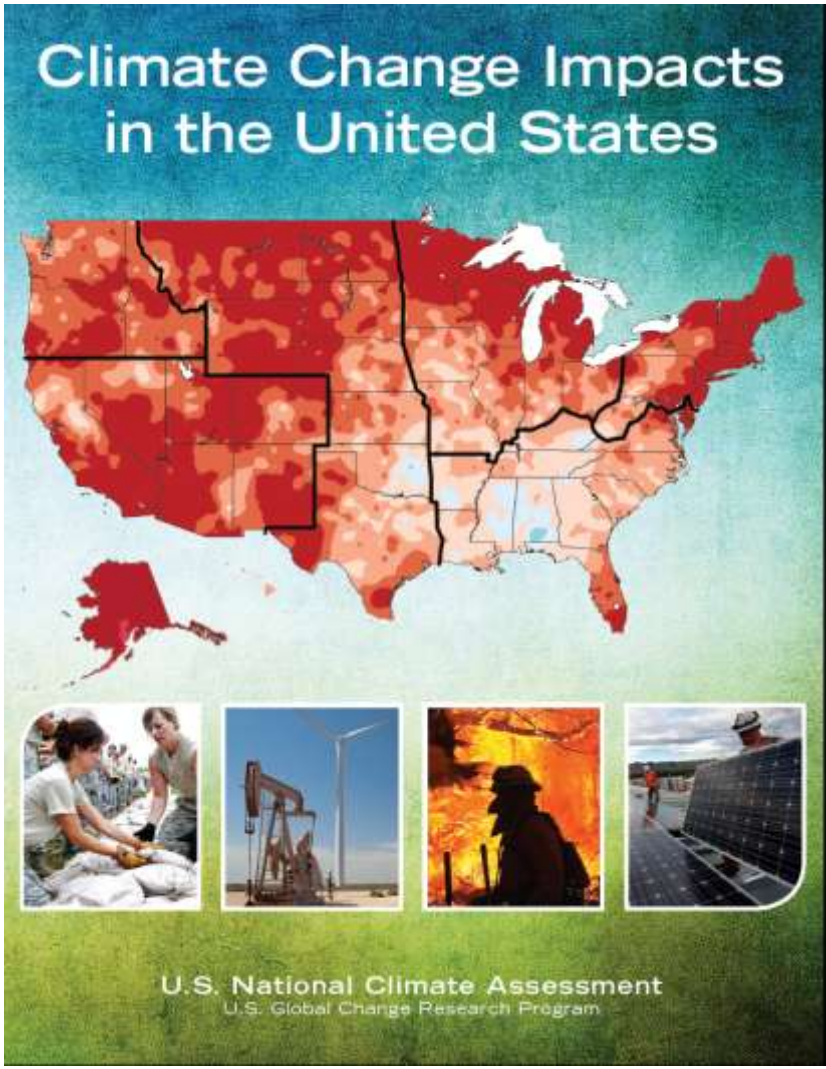
Assessing Vulnerabilities

- Capacity
- Materials
- Functionality

U.S. National Climate Assessment

Transportation Key Messages

- Reliability & Capacity at Risk
  - Systems not designed for extreme weather events
- Coastal Impacts
  - Increased temporary and permanent flooding
- Weather Disruptions
  - Increased frequency
- Costs &Adaptation Options
  - Land use planning
  - Risk assessment
  - New Design
  - Asset Management
  - Response



Addressing the ~~Problem~~ Consequences

- Adapt existing infrastructure
- Eliminate unnecessary infrastructure
- Replace existing infrastructure
- Design for the future

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