NCHRP Panel 20-59, Surface Transportation Security and Resilience Research

2017 Resiliency Peer Exchange On Extreme Weather and Climate Impacts

Washington DC
November 6-7, 2017

Dave Fletcher
GPC, Inc.

The Case for Resiliency to Extreme Weather Events

A Nationwide Concern

An Economic Imperative

A Leadership Requirement

Understanding Transportation Resilience

Understanding Transportation Resilience: A 2016-2018 Roadmap (2017)

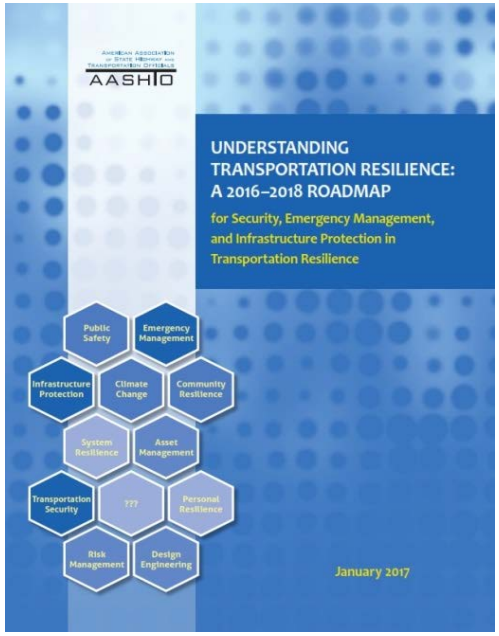
Managing Catastrophic Transportation Emergencies: A Guide for Transportation Executives (2015)

Fundamental Capabilities of Effective All-Hazards Infrastructure Protection, Resilience, and Emergency Management for State DOTs (2015)

Security 101: A Physical Primer for Transportation Agencies (2009) (Update in progress)

A Guide to Emergency Response Planning at State Transportation Agencies (2010) (Update in Progress)

Adopted by AASHTO



What is resilience?

The ability to prepare and plan for, absorb, recover from, or more successfully adapt to adverse events.

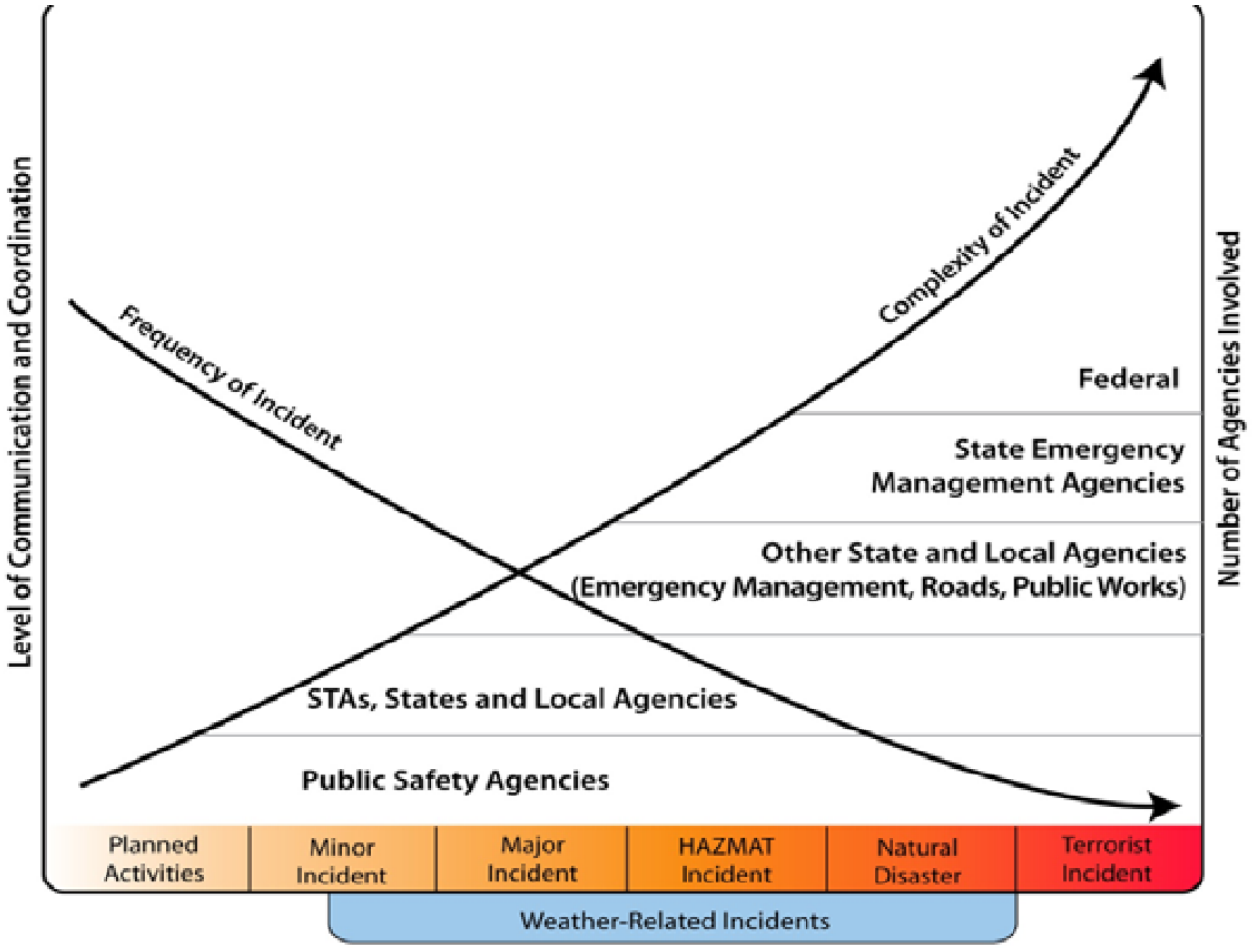
AASHTO

Resilience has many faces,

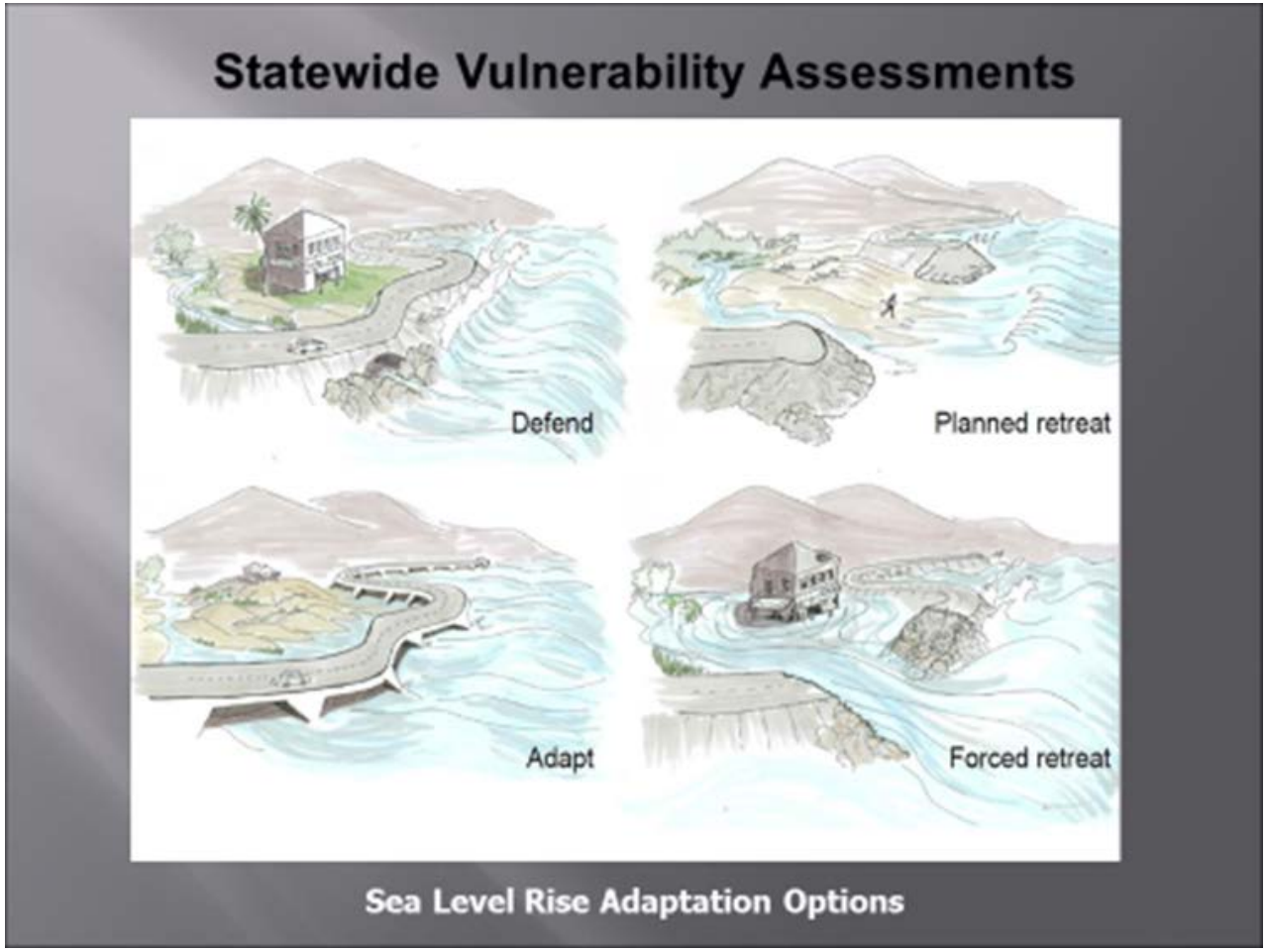
. . . many dimensions,

Dimension	Emergency Management	Design Engineering	Climate, Community and Societal Change
Mission	Prepare, Respond, Recover	Resist, Adapt	Plan, Resist, Adapt, Relocate
Duration	Hours - Months	Years - Decades	Decades or longer
Potential Disruptions	Extreme weather events Natural disasters Terrorist incidents	New loading & durability requirements	Climate change impacts Sea level rise Mass migrations
Impact	Local - Regional	Local	Superregional - Global
Governance	Varies but Public Safety Agencies (PSA) generally provide Incident Command	Varies but State DOTs generally provide Project Management	All levels of government
Transportation Agency Role	Support evacuation and emergency access activities	Engineering and construction services	Funding Planning Policies and Standards

. . . many scales,



. . . and many choices



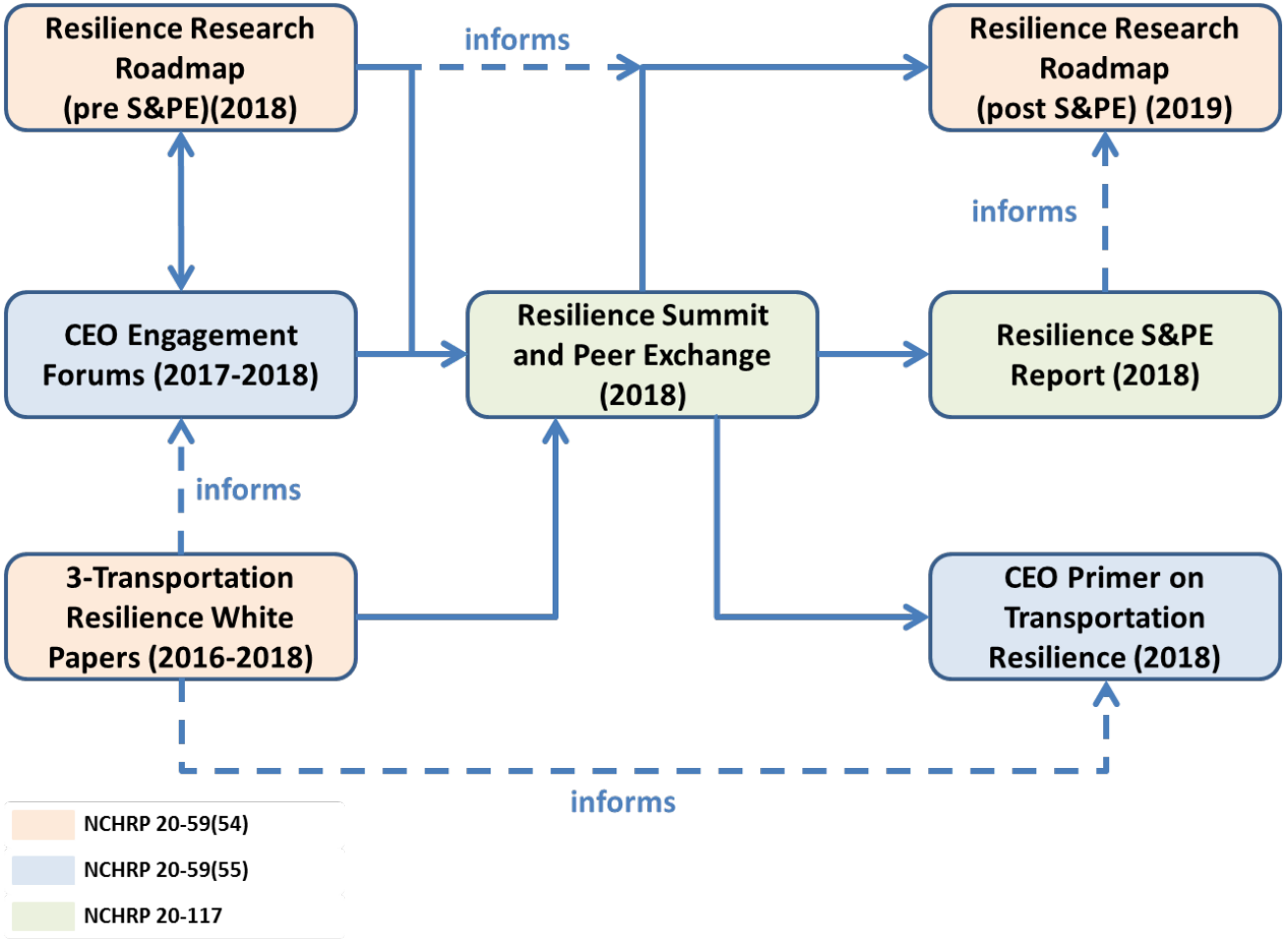
Source: Caltrans

AASHTO 2016-2018 Resilience Research Program

20-59(54)	20-59(55)	20-117
• 3 Discussion Papers • 2020-2025 Resilience Research Roadmap	• CEO Interviews • CEO Forums • CEO Primer on Resilience	• Summit & Peer Exchange • Resilience Guide • Resilience Toolkit

NCHRP Synthesis 20-05/Topic 48-13 Resilience in Transportation Planning, Engineering, Management, Policy, and Administration

AASHTO 2016-2018 Resilience Research Program

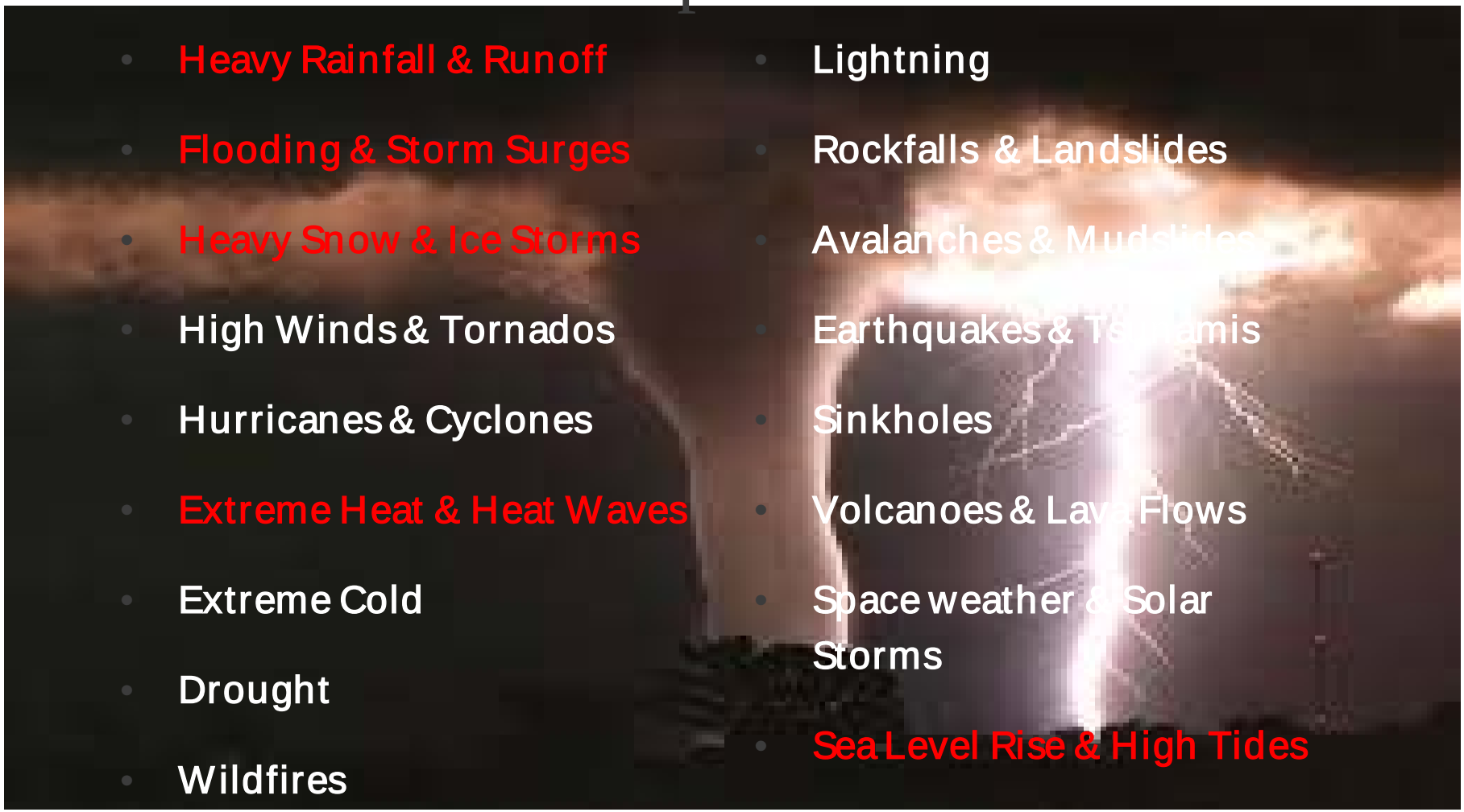


Understanding Transportation Resilience: Discussion Papers

- What is the topic?
- Why is this issue critical or important to my agency or me?
- What do you want me to do?

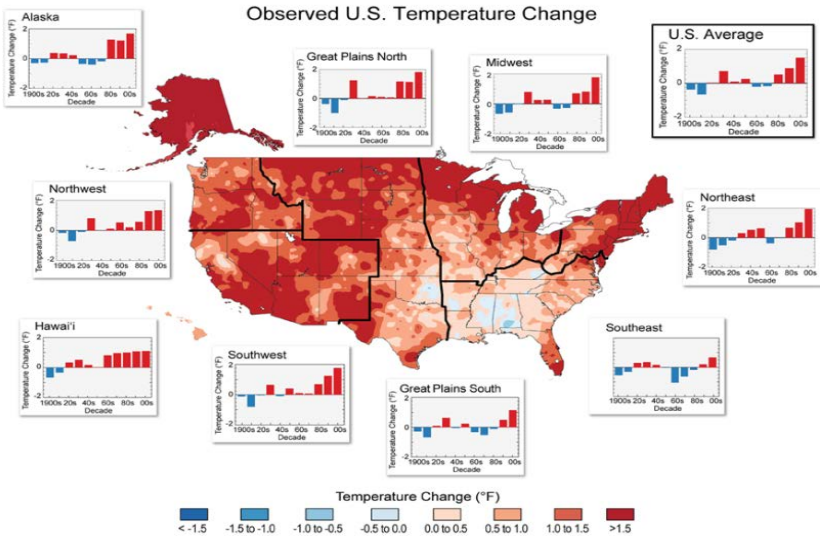
Copies of the NCHRP resilience papers are available from Stephan Parker, TRB (saparker@nas.edu)

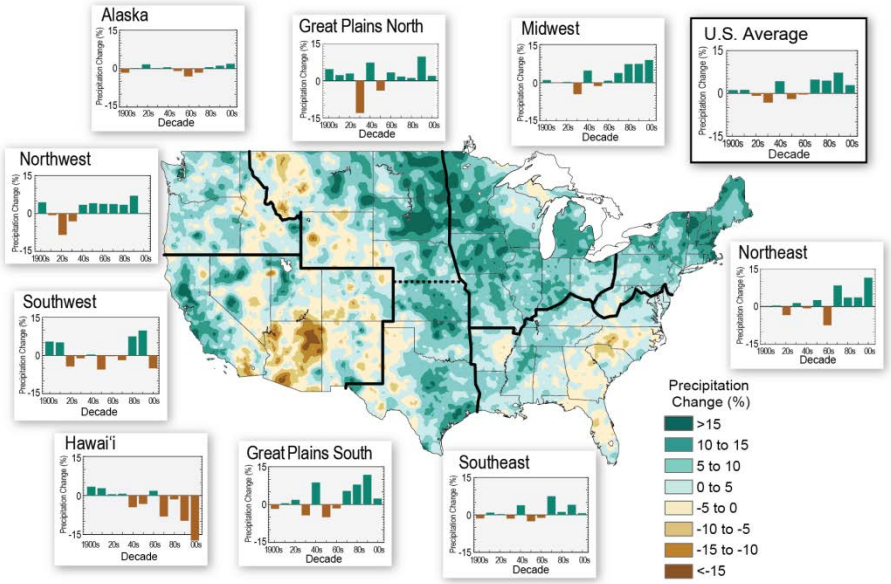
Understanding Transportation Resilience: An Environmental Perspective

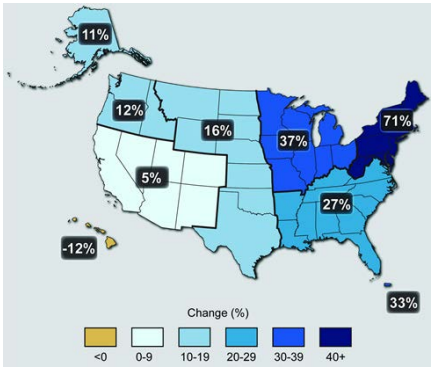


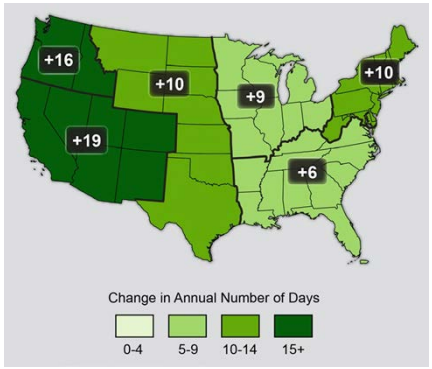
21st Century Climate Trends

- Hotter
- Wetter
- Weirder

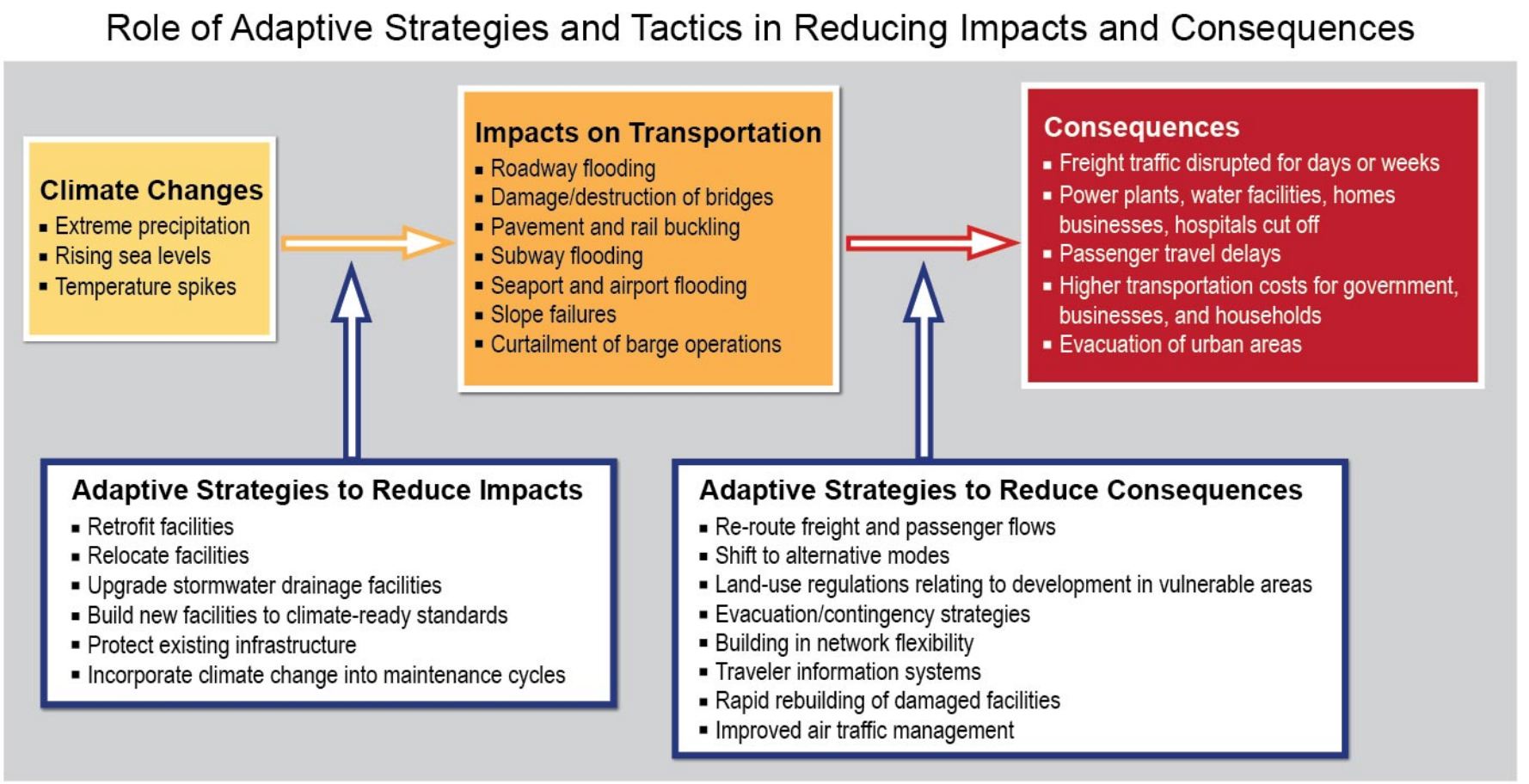








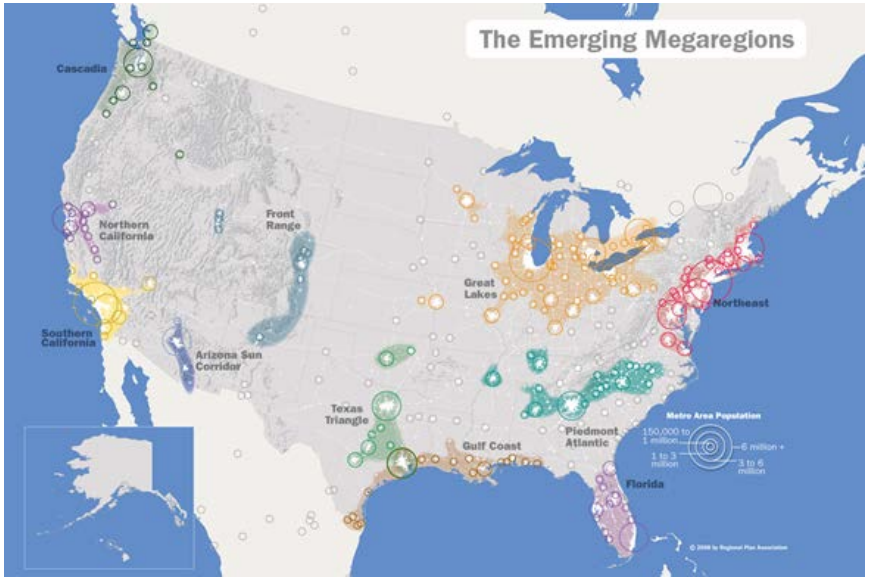
Weather and Climate Risks

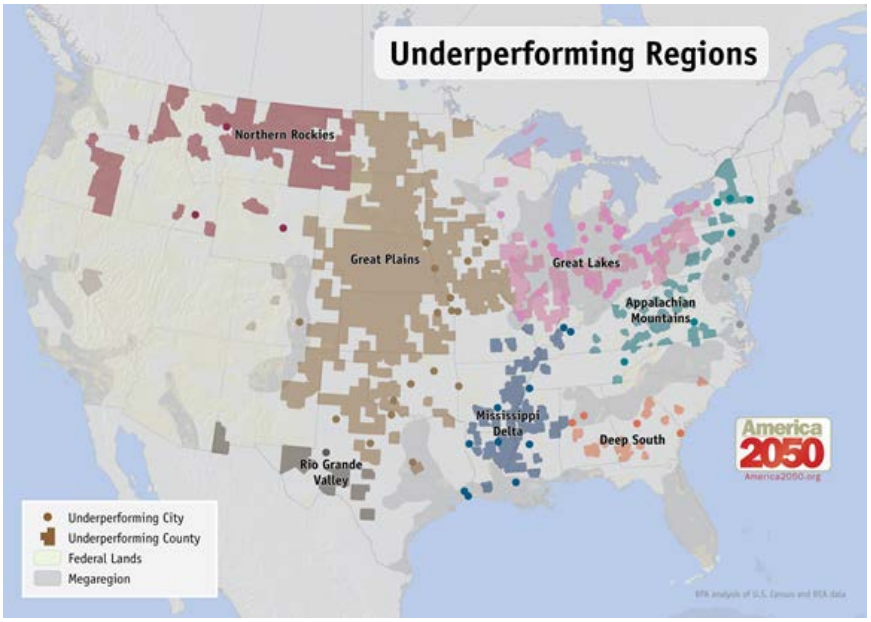


Source: National Climate Assessment

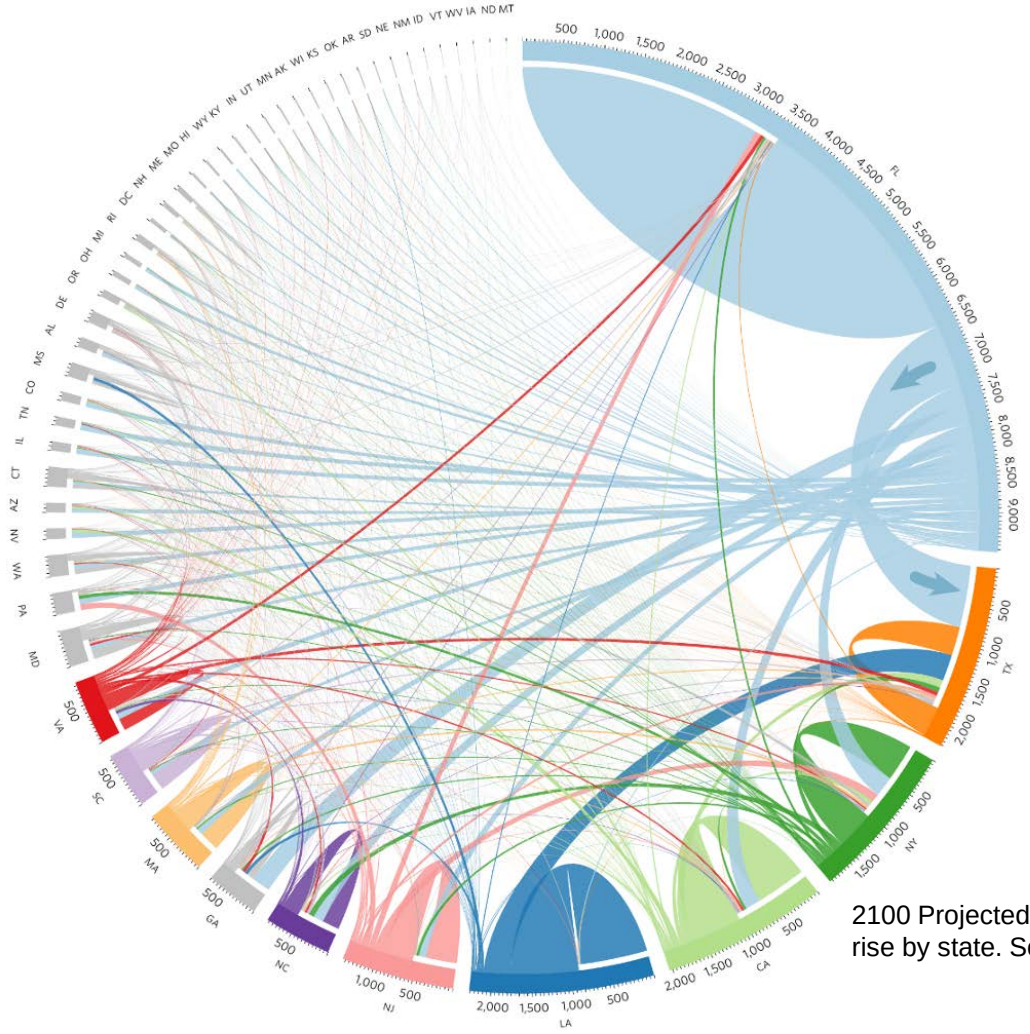
One-size won't fit all

- Major differences in
  - Population
  - Economic activity
  - Infrastructure investment
  - Resources





American Climate Refugees



2100 Projected migration linked to sea-level rise by state. Source: Nature Climate Change

Ten Essential Points

1. Resilience requires concentrated, sustained effort
2. Resilience has short-term, intermediate and long-range horizons
3. No state is immune
4. Heat waves, severe storms, and sea level rise pose the greatest threats, resulting in
5. Reduced asset performance, disruption of service, and increased costs to users and DOTs

Ten Essential Points

6. Failures erode public trust, affect local economies, and generate political blowback
7. Old disaster management approaches have been OBE'ed
8. One-size solutions don't fit all situations
9. Political, institutional, scientific, and technical barriers challenge leadership
10. DOTs cannot go it alone

Understanding Transportation Resilience: An Economic Perspective

Forget the political debate, forget the national debate, forget the debate about the science; think about what you're seeing right here. You've got to do something about it, and you've elected us to make decisions; you've elected me to make decisions, so I've got to do something about it.

Jake Day, Mayor, Salisbury, MD

Pretty grim already. . .

Disaster Type	Number of Events	CPI-Adjusted Losses (B$)	Deaths
Storms or Flooding	152	$899.8	5,328
Drought/Heat Waves	24	$232.5	2,993
Wildfire	14	$35.6	184
Winter Storm	14	$42.7	1,013
Freeze	8	$27.3	162
All Disasters	**212**	**$ 1,237.9**	**9,680**

Increasing losses, due to

- Growing economy
- Rising construction costs
- More assets in vulnerable places (e.g., coastlines)
- More recovery funds to least prepared states
- Increasing disaster severity and frequency

NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (1980-Jun 2017). https://www.ncdc.noaa.gov/billions/

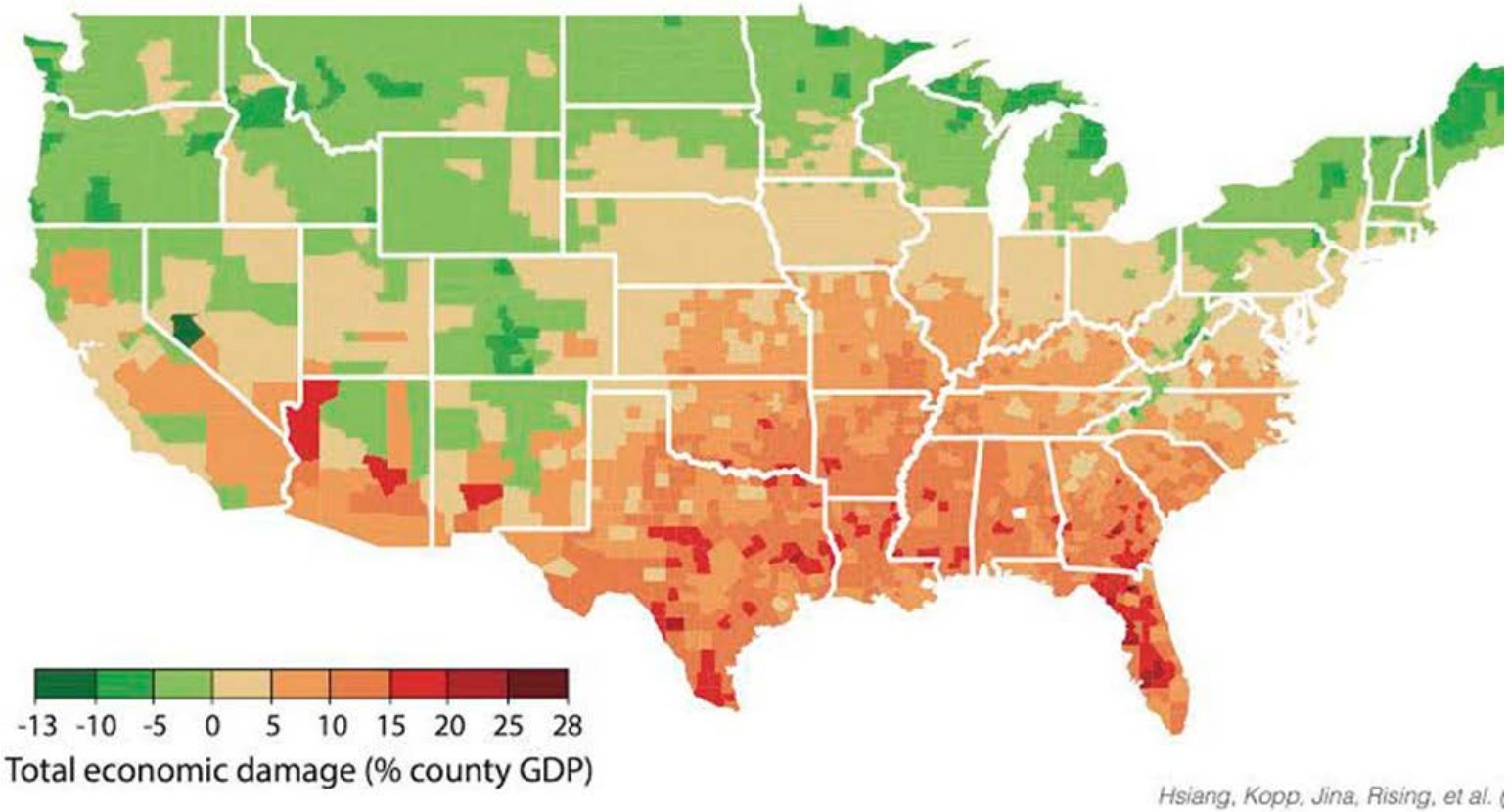
FY 17 FHWA Emergency Relief Funding

Event Type	Number (%)	Allocation (M$)
Storms or Flooding	70 (80.5%)	$579.7
Wildfire	5 (5.7%)	$19.8
Rock fall/Rockslide	5 (5.7%)	$14.3
Bridge Damage	5 (5.7%)	$25.3
Other	2 (2.3%)	$31.3
All Events	**87 (100%)**	**$670.4**

31 states received allocations

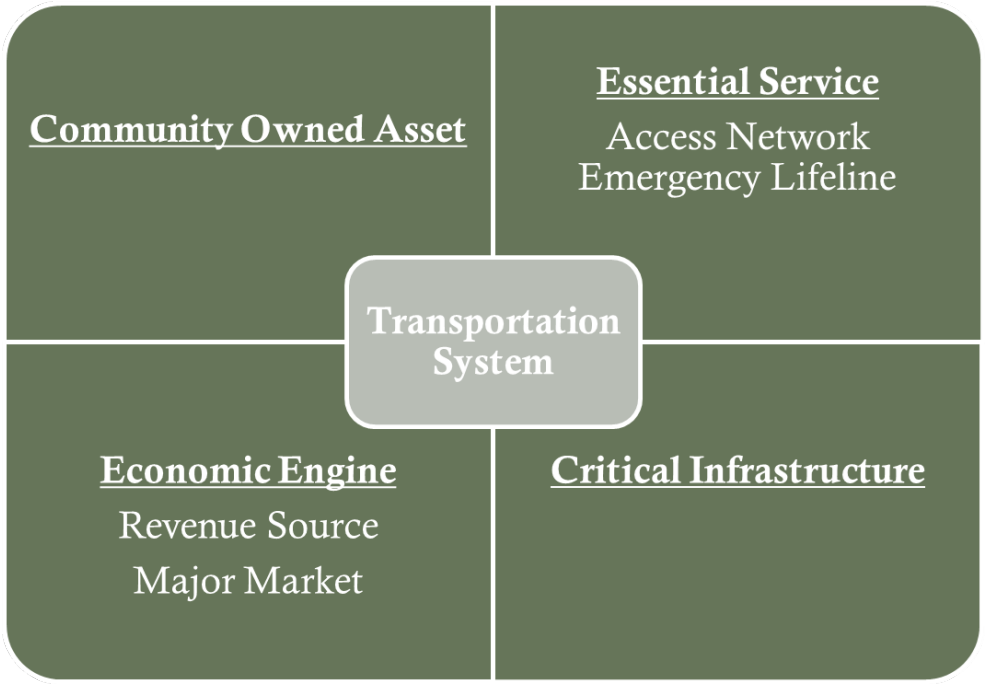
80.5% of events & 86.5% of $ were related to storm or flooding damage

. . .gonna get worse



Estimating economic damage from climate change in the United States (2080-2099)

Economic Perspectives

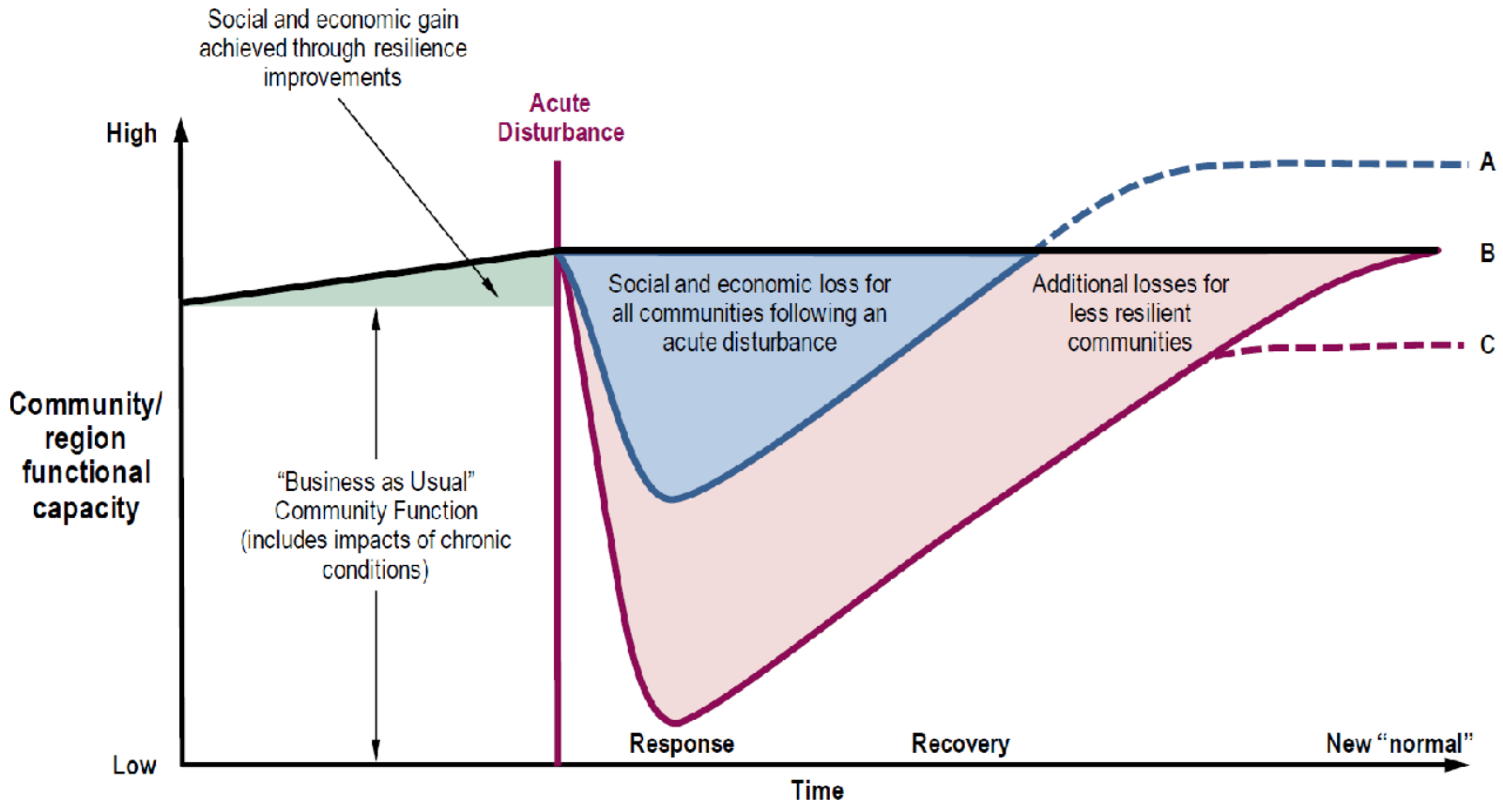


- Community investment
- Services provider
- Economic stimulant
- Revenue source
- Major market
- Enabler and user of other critical infrastructures such as Communications, Energy, and Emergency Services

Economic Goals

- Improve accessibility, mobility, and connectivity, across all modes, for all users
- Minimize service disruptions
- Preserve asset value
- Protect critical infrastructure components
- Stimulate the economy
- Maintain interconnectedness with other critical infrastructures

Resilience Loss-Recovery



Model: Dr. Mary Ellen Hynes, DHS (2001); Blair Ross, ORNL; CARRI 2008 ©

5 Myths of Transportation Resilience

Myth 1: The transportation system is neither resilient nor reliable.

Myth 2: You can engineer your way to resilience.

Myth 3: DOTs have not invested in transportation resilience.

Myth 4: Resilience is just Operations "on steroids."

Myth 5: "Extreme Weather Resilience" is the new, politically correct term for "Climate Change."

Transportation Resilience Principles

- One strategy is not sufficient
- One size does not fit all
  - Urban v. Rural contexts
  - Sufficient v. Shoestring resources
  - Life Critical v. Non-essential missions
- One agency is not in charge
  - Communicate
  - Cooperate
  - Collaborate
  - Contract

A Leadership Requirement

	EMERGENCY MANAGEMENT	DESIGN ENGINEERING	CLIMATE, COMMUNITY AND SOCIETAL CHANGE
FUNCTIONS	The assignments, tasks, and positions in a state DOT that are critical to the performance of continued transportation activities		
ASSETS	The infrastructure, equipment, resources, tools, vehicles, hardware, and facilities owned and operated by a state DOT		
NETWORKS	The relationships maintained by a state DOT with the private sector and other branches of government that ensure continuity of transportation activities		
SYSTEMS	The critical technology and applications, including data, used to operate the DOT and the infrastructure and enable reliable network communication		
PEOPLE	The necessary personnel needed by a state DOT to ensure resilient transportation activities		

Thank You

Weather related disruptions and loss of service have real impacts on individuals and our economy. People can't get to work, get to school, and get to health care. People get sick. Businesses lose productivity. Families are stressed. People die. These are the reasons we need to act. -NCHRP 20-59 Panel Member

The best time to plant a tree was 20 years ago; the second best time is now. – Traditional Proverb

Created by Freepik