The Landscape of Resilience Measures

Photos by S. Cutter

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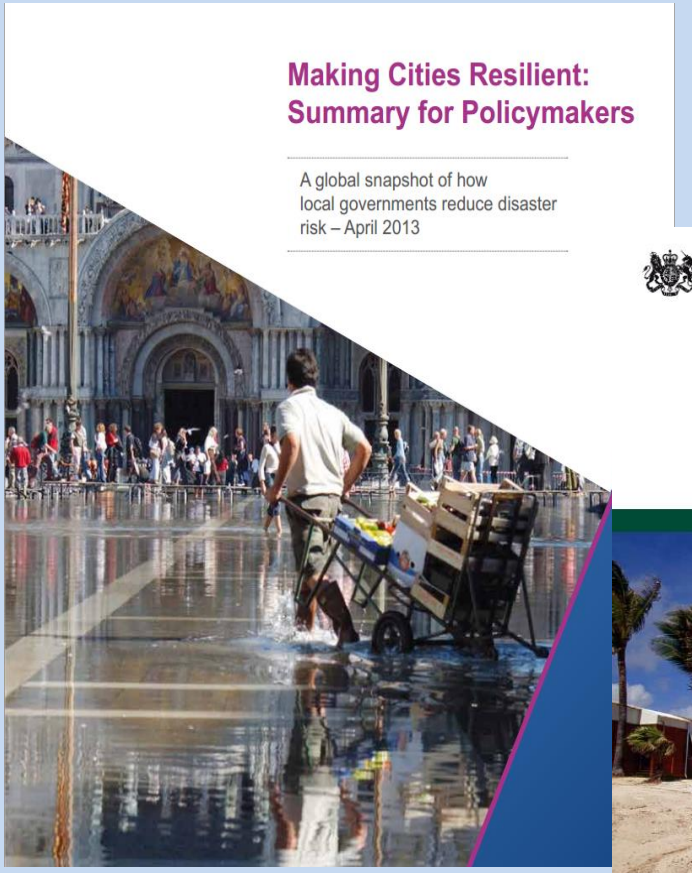
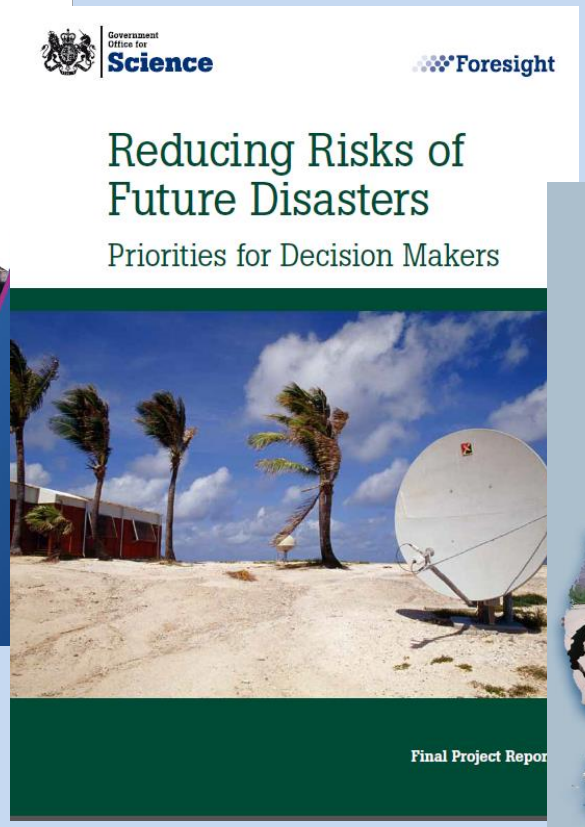
Resilient America Roundtable
Workshop on Measures of Community Resilience
September 5, 2014

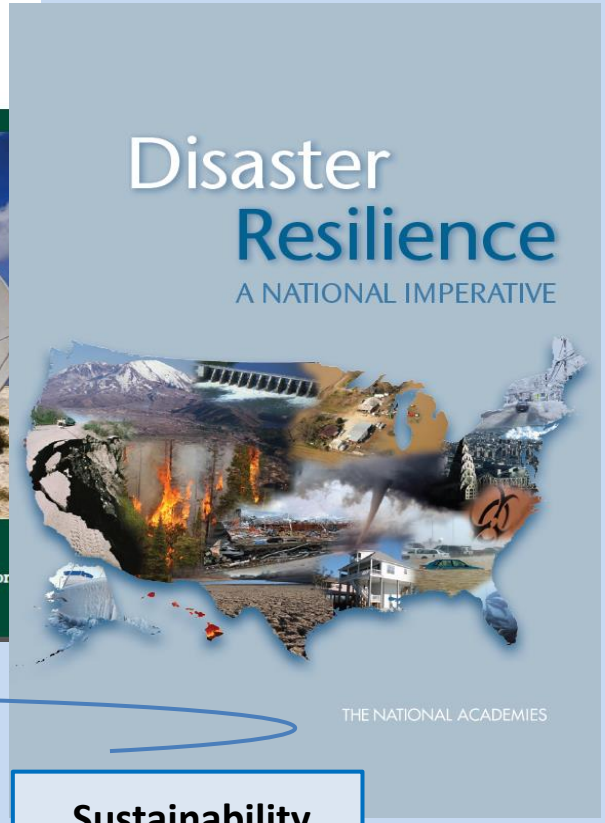
UNIVERSITY OF SOUTH CAROLINA

HVRI

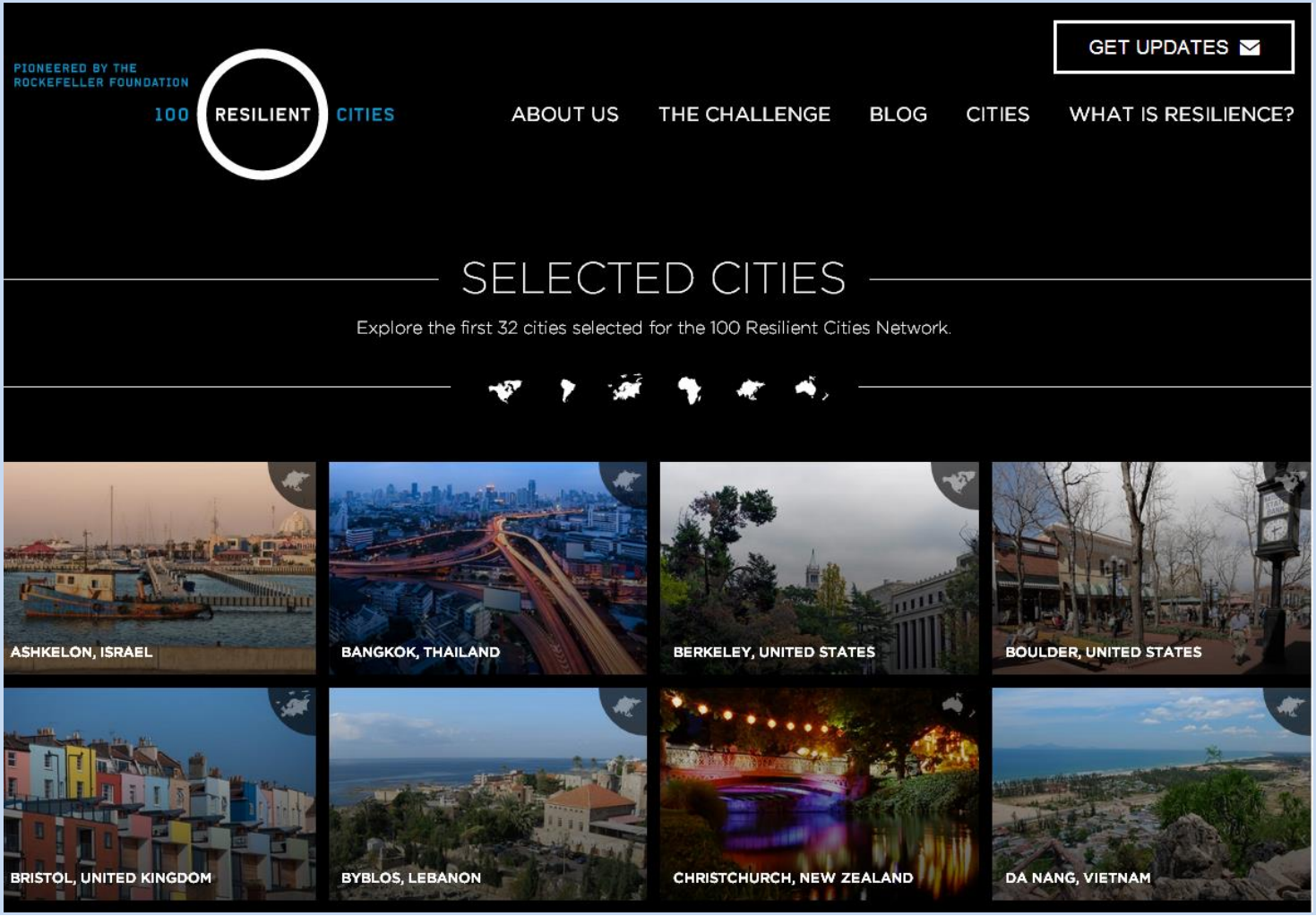
Recent Consensus Reports







Disaster Risk Reduction → ***Resilience*** → **Sustainability**



WHAT IS RESILIENCE?

100 Resilient Cities defines resilience as "the capacity of individuals, communities, institutions, businesses and systems within a city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience."

Simply put, resilience enables people to bounce back stronger after tough times, and live better in good times. What we have learned from our initiative work over the past several years is that, no matter what the city's conditions, resilient systems share and demonstrate certain core characteristics.

http://www.100resilientcities.org/resilience

CONSTANT LEARNING | RAPID REBOUND | LIMITED OR "SAFE" FAILURE | FLEXIBILITY | SPARE CAPACITY

Resilience: Ability to prepare and plan for, absorb, recover from or more successfully adapt to actual or potential adverse events

1979

2013

Great Egg Harbor Inlet, NJ

Photo: S. Cutter

Why Should a Community Measure its Resilience?

To understand the potential impacts of adverse events & evaluate the capacity of community to respond to, recover from, and adapt to such events.

A resilience measurement tool can help

- assess/prioritize needs and goals
- establish baselines
- monitor progress and recognize success
- understand costs (investments) and benefits (results)
- evaluate the effects of different policies/approaches

Sea Bright, NJ with Navesink River (right); and Ocean Ave (left)

What's Been Done? By Whom?

Disaster Resilience: A National Imperative (2012) outlines 17 resilience assessment tools and systems. BUT, there are many, many more!

- **Developed by** federal agencies, national and international organizations, communities/cities, non-governmental organizations, private sector, academia

- **Range and purposes vary**: qualitative to quantitative, top down to bottom up, hazard specific to general, narrow to broad, local to global, pre to post event and on it goes

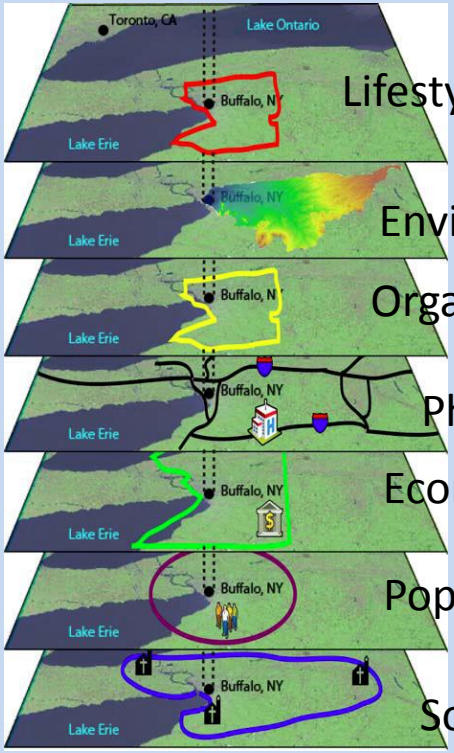
The landscape is messy and littered with indices, indicators, variables, and approaches! How do we find our way forward?

Photo: http://4.bp.blogspot.com/-tUUDOdUb9M4/T4wKttXV6rI/AAAAAAAAAi8/sYqWtj_Dh3A/s1600/MessyDesk28.jpg

What’s Out There?

TOP DOWN:	Hyogo Framework for Action (HFA) - United Nations	DFID Interagency Group	San Francisco Planning and Urban Research Association (SPUR)	Baseline Resilience Indicator for Communities (BRIC)	ResilUS	PEOPLES Resilience Framework
Purpose	Prioritize risk reduction (RR) in communities	Shows what a disaster resilient community might look like	Measure ability to recover from earthquakes	Measure overall pre-existing community resilience	recovery over time of critical services and community capital	Holistic framework for designing and measuring resilience
Target categories	Institutions and actions promoting risk reduction, preparedness, response	Governance, risk assessment; knowledge & education; risk management; disaster prepare and response	Buildings and infrastructure, services restoration	Infrastructure, ecosystems, institutions, economic, social, community capacity	Ability to perform; opportunity to perform of critical infrastructure	Population; environment; government services; physical infrastructure; lifestyle; economic; socio-cultural capital
Scale? Who measures? Hazards?	National	Local, national	Local, earthquakes	Local, national comparisons	Local, earthquake case study	Local, no case study
Quant or Qual?	Qualitative	Qualitative	Semi-quantitative	Quantitative	Quantitative	Quantitative, qualitative
Costs to measure	$$	$$	$$	$	$$	$$$
Info sources	Existing institutional reported info	Local, field work, interviews	Existing engineering info	Academic research and community info	Academic research	Academic research

PEOPLES (Renschler et al. 2009)



SPUR (Spur 2009)

TARGET STATES OF RECOVERY FOR SAN FRANCISCO'S BUILDINGS AND INFRASTRUCTURE

INFRASTRUCTURE CLUSTER FACILITIES	Event occurs	Phase 1 Hours			Phase 2 Days		Phase 3 Months		
		4	24	72	30	60	4	36	36+
CRITICAL RESPONSE FACILITIES AND SUPPORT SYSTEMS									
Hospitals								X	
Police and fire stations			X						
Emergency Operations Center									
Related utilities						X			
Roads and ports for emergency				X					
CalTrain for emergency traffic					X				
Airport for emergency traffic				X					
EMERGENCY HOUSING AND SUPPORT SYSTEMS									
95% residence shelter-in-place								X	
Emergency responder housing				X					
Public shelters							X		
90% related utilities								X	
90% roads, port facilities and public transit							X		
90% Muni and BART capacity						X			
HOUSING AND NEIGBORHOOD INFRASTRUCTURE									
Essential city service facilities							X		
Schools							X		
Medical provider offices								X	
90% neighborhood retail services									X
95% of all utilities								X	
90% roads and highways						X			
90% transit						X			
90% railroads							X		
Airport for commercial traffic					X				
95% transit							X		
COMMUNITY RECOVERY									
All residences repaired, replaced or relocated									X
95% neighboorhood retail businesses open								X	
50% offices and workplaces open									X
Non-emergency city service facilities								X	
All businesses open									X
100% utilities									X
100% roads and highways									X
100% travel									X

Source: SPUR analysis

TARGET STATES OF RECOVERY

Performance measure — Description of usability after expected event

BUILDINGS — LIFELINES

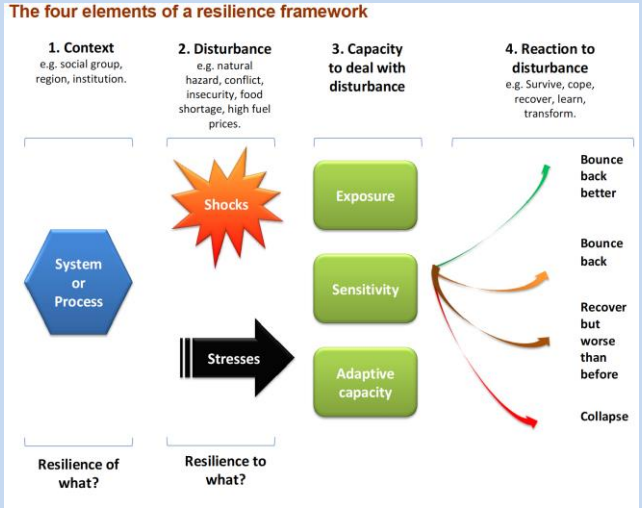
Category A: Safe and operational

Category B: Safe and usable during repairs — 100% restored in 4 hours

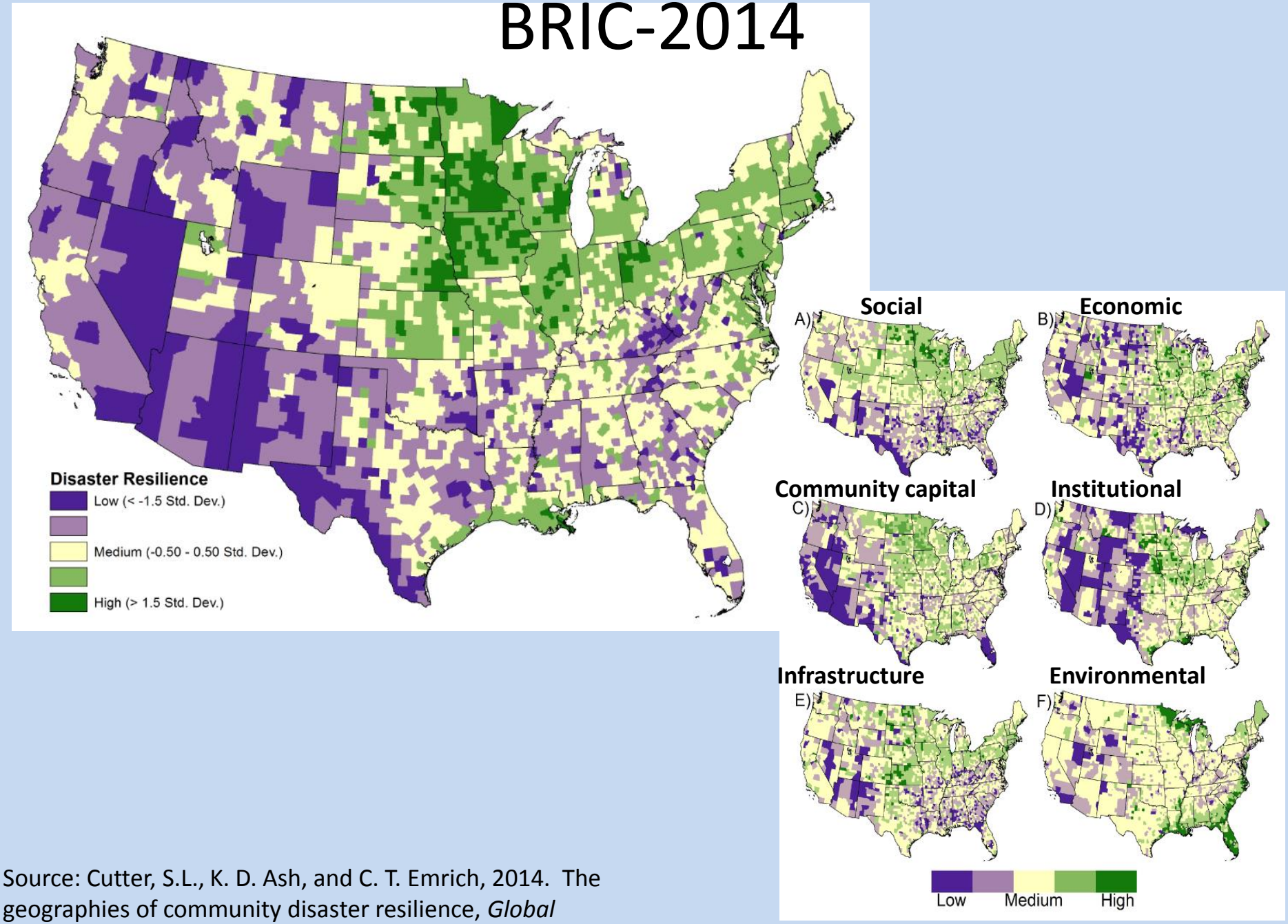
Category C: Safe and usable after moderate repairs — 100% restored in 4 months

X — Expected current status

DFID
(Twigg 2009)

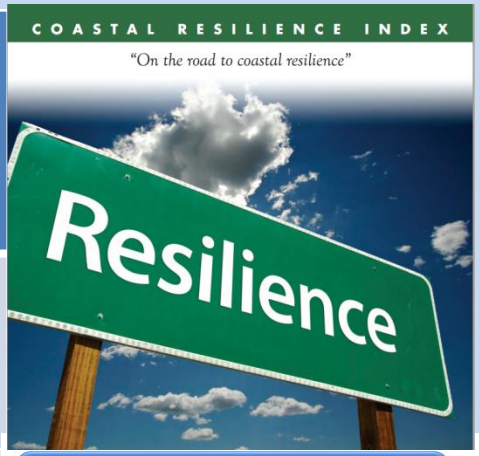


BRIC-2014



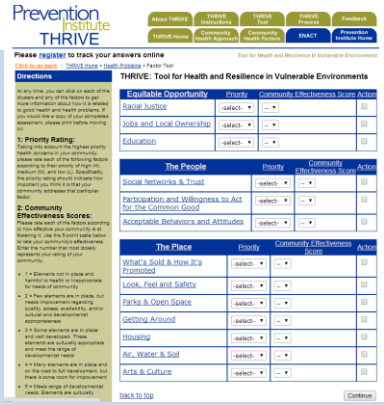
Source: Cutter, S.L., K. D. Ash, and C. T. Emrich, 2014. The geographies of community disaster resilience, *Global Environmental Change*, in press.

BOTTOM UP:	NOAA Coastal Resilience Index	Communities Advancing Resilience Toolkit (CART)	Toolkit for Health and Resilience in Vulnerable Environments (THRIVE)
Purpose	Help community predict if they will function well after disaster	Enhance community resilience through planning and action	Help communities bolster health outcomes
Target categories	Critical infrastructure and facilities; transportation, community plans; mitigation measures; business plans; social systems	Connection and caring, resources, transformative potential, disaster management	Communities of color to remedy health disparities
Scale? Who measures?	Local; bottom-up	Local; bottom up	Local; bottom-up and top-down
Hazard-specific?	Adaptable to community's hazards	All hazards	No
Quant or Qual?	Qualitative	Qualitative	Semi-quantitative
Costs to measure	$	$ $	$
Info sources	Existing community info	Existing community info, surveys, key informant interviews	Academic research and community info



Communities Advancing Resilience Toolkit (CART):

The CART Integrated System©

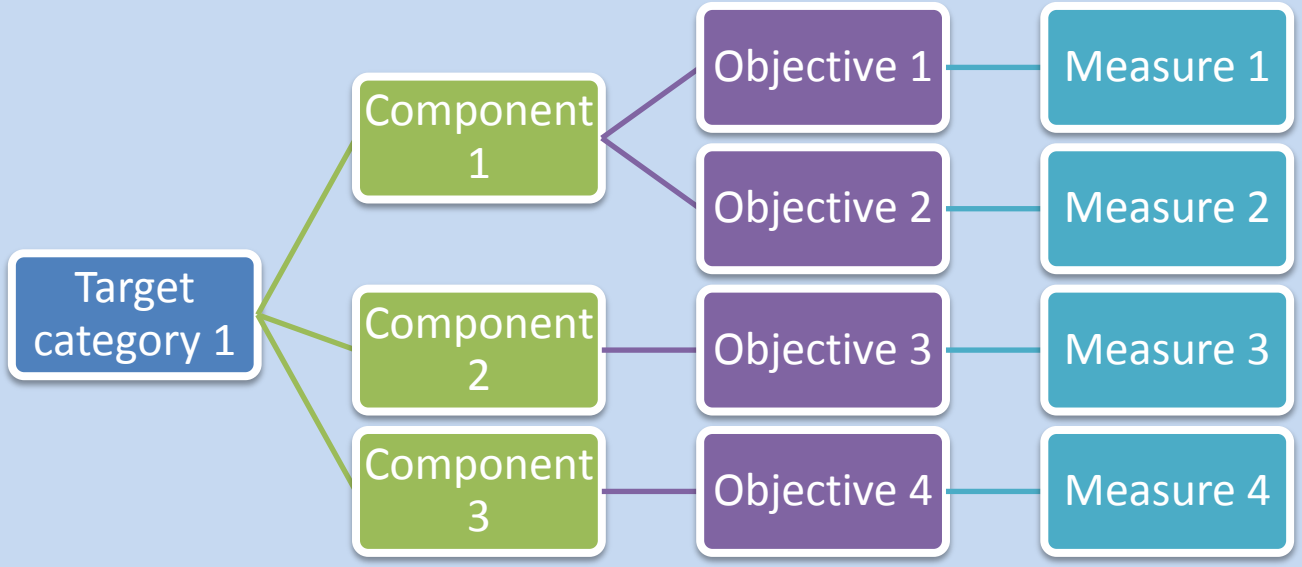


What Should a Community Expect from its Own Resilience Measurement Tool?

- Open and transparent
- Aligns with the community's goals & vision
- Measurements
  - are simple, well documented
  - can be replicated
  - address multiple hazards
  - represent community's areal extent, physical (manmade and environmental) characteristics, and composition/diversity of community members
  - are adaptable and scalable to different community sizes, compositions, changing circumstances

Developing Community-Based Resilience Measures—What's Important?

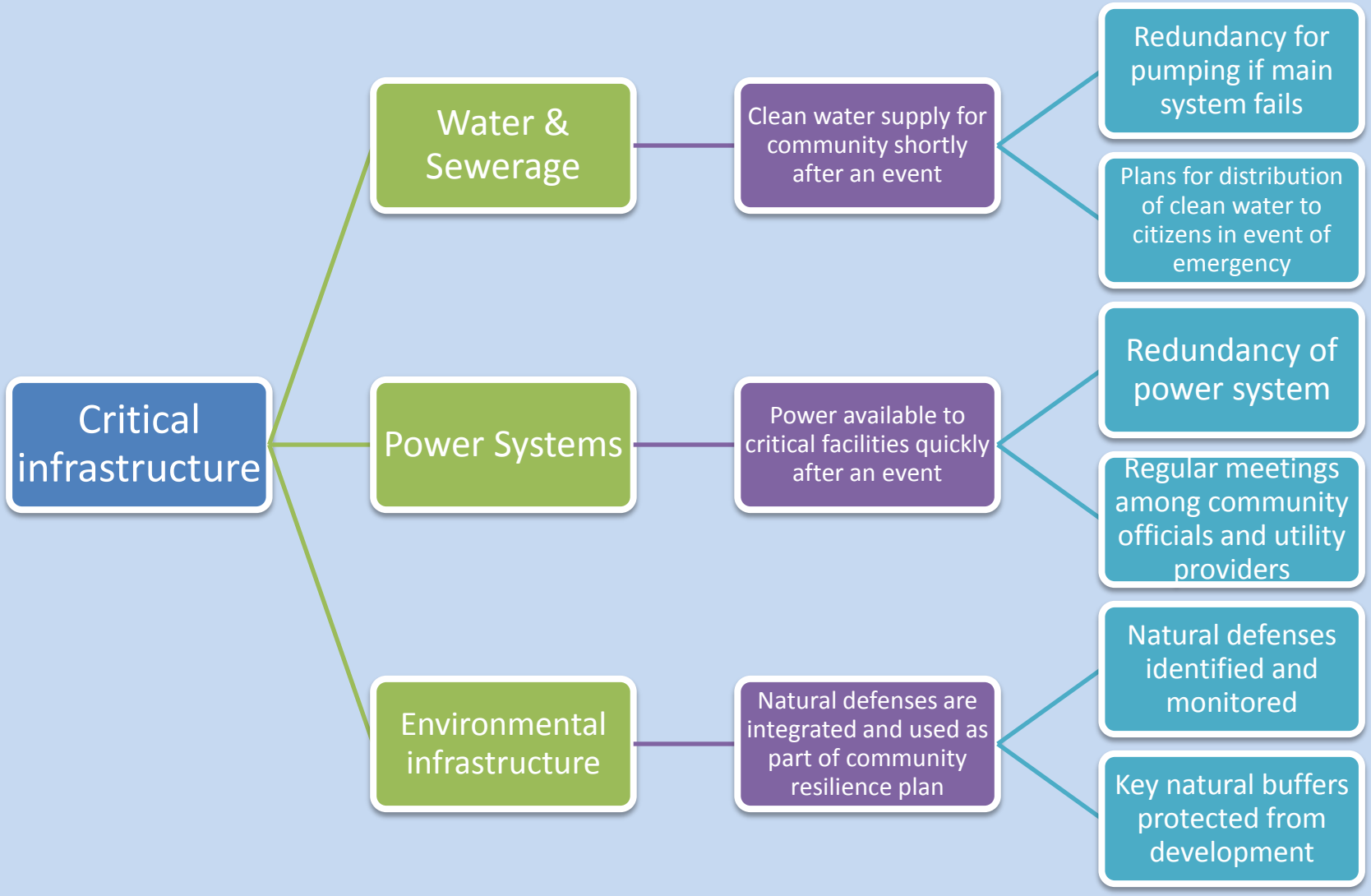
Goal: To increase community's overall resilience to adverse events



Four overarching target categories in the *Disaster Resilience* report:

1. ***Critical Infrastructure*** (components = power, water, environment, communication…)
2. ***Social factors*** (components = financial structure, governance, community networks…)
3. ***Buildings, structures*** (components = businesses, homes, bridges…)
4. ***Vulnerable populations*** (components = minority status, health, mobility, education…)

Example: Critical Infrastructure



Target Category	Components	Objectives	Measures/Indicators	Challenges/ Incentives	Costs
Critical & Environmental Infrastructure	Water & Sewage				
	Power Systems				
	Communications				
	Environmental				
Social Infrastructure	Governance				
	Economic				
	Institutional				
	Language				
Buildings & Built Infrastructure	Commercial				
	Residential				
	Institutional				
	Bridges/Roads				
Vulnerable Populations	Special needs	Identify and locate by address	Nursing home residents, infirmed, homeless	Need inventory from each facility	$$
	Mobility limited	Assess needs for evacuation	Population without private cars or public transportation	Census collects	$
	Incarcerated	Planning and preparedness	population in prisons, mental institutions	Need inventory from each facility	$$
	Elderly, children	Locate and determine needs	Dependency ratio (those not in the workforce supported by those in it)	Not collected annually	$

Why Resilience?

Increasing resilience helps to save lives and money before an event occurs and builds stronger, safer, and more secure communities.

- Helps in understanding current levels of exposure and potential impacts from adverse events, thereby helping a community take responsibility for its own disaster risk.

- Helps identify the community's capacity to cope with adverse effects and where improvements are needed.

- Fosters a culture of self-sufficiency, helping-behavior and betterment.

- Fosters cooperation among all members of the community in working toward a common goal.

- A resilience measurement tool can help by
  - Assessing/prioritizing needs and goals
  - Establishing baselines for monitoring progress and recognizing success
  - Understanding costs (investments) and benefits (results)
  - Evaluating the effects of different policies/approaches

But……

- A single, one-size metric for all facets of resilience may not work at the bottom-up community scale.
- Lots of tools out there, few are used (too complex, too simple, not known…..)
- Communities have potential to develop or adapt simple measurement systems/tools to gauge their own baselines.
- Measurement tools are helpful in identifying disaster risk, taking steps toward reducing it, assessing how they are doing, and getting stakeholders to work together.

Measurement tools cannot **create** a resilient community, but they can help show the path towards becoming safer, stronger, and more vibrant in the face of unanticipated events.

Satellite images from Google Maps show the Red River and Rivershore Drive S in Moorhead north of Interstate 94. The dashed line in the river is the state line of North Dakota and Minnesota. Most homes on this stretch of that road were bought out in 2010. http://minnesota.publicradio.org/collections/special/2013/floods/before-after-homes/#2

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