

Disaster Risk Reduction, Resilience, and Sustainability: The Path Forward

Susan L. Cutter
University of South Carolina
scutter@sc.edu

SDR Briefing
January 6, 2011
Washington D. C.



Organizing Schema



Ecological
Infrastructure
Economic
Organizational
Social & Behavioral
Community

Organizing Principles

1. DRR is the practice of lessening disaster risks through systematic efforts to reduce exposures, lessen vulnerability of people and structures, wise land and environmental management, and improved preparedness (UNISDR 2009).
2. Resilience is both a process and an outcome. The process is to build local capacity to withstand adverse impacts before , during , and after the event. The outcome is the restoration of basic functioning of the systems.
3. Achieving sustainability will entail responsiveness to current conditions and constraints, but also the ability to adapt to uncertain and changing conditions.
4. Managing disaster risks entails a systematic process of multi-scale , multi-actor, and multi-institutional strategies and policies to enhance resilience. Such management recognizes the continuum on initiating events ranging from sudden onset events to longer term slow onset ones.
5. Adaptation to climate change is part of disaster risk management and if DRM strategies enhance resilience in the short term; they will also facilitate climate adaptation in the longer term , thus insuring a sustainable future.



Paths Toward Sustainability

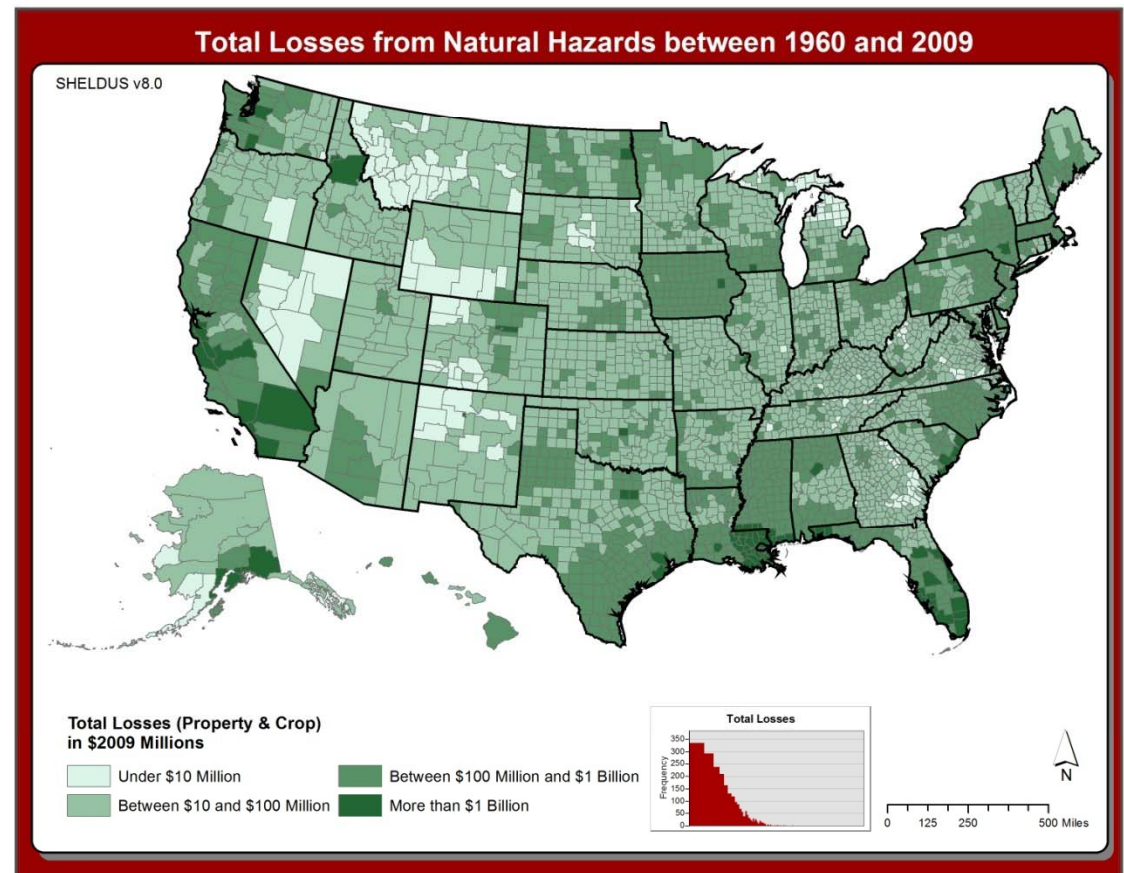
1. Make progress towards the Grand Challenges

- √- 1. Provide hazard and disaster information where and when it is needed.
- √+ 2. Understand natural processes that produce hazards
- √- 3. Develop hazard mitigation strategies and technologies
- √ 4. Reduce vulnerability of interdependent critical infrastructure
- √- 5. Assess disaster resilience
- √- 6. Promote risk wise behavior

Needs and Opportunities

Systematic inventory on losses (where, how much, causal agent)

- o county-level natural hazard dataset
- o 18 different natural hazard events types: avalanches, coastal hazards, droughts, earthquakes, floods, fog, hail, heat, hurricanes incl. tropical storms, landslides, lightning, severe storms, tornados, tsunamis & seiches, volcanic eruptions, wildfires, wind events, winter weather
- o Version 8.0: 1960 through 2009
- o about 650,000 records
- o SHELDUS does not include Puerto Rico, Guam, or other U.S. territories.



www.sheldus.org

Gall, M., K. Borden, and S. L. Cutter, 2009. "When do losses count? Six fallacies of natural hazards loss data," *Bulletin of the American Meteorological Society* 90 (6): 799-809.

Systematic and long-term data on the nature and dynamics of social systems and their built environment for predictive understanding of DRR

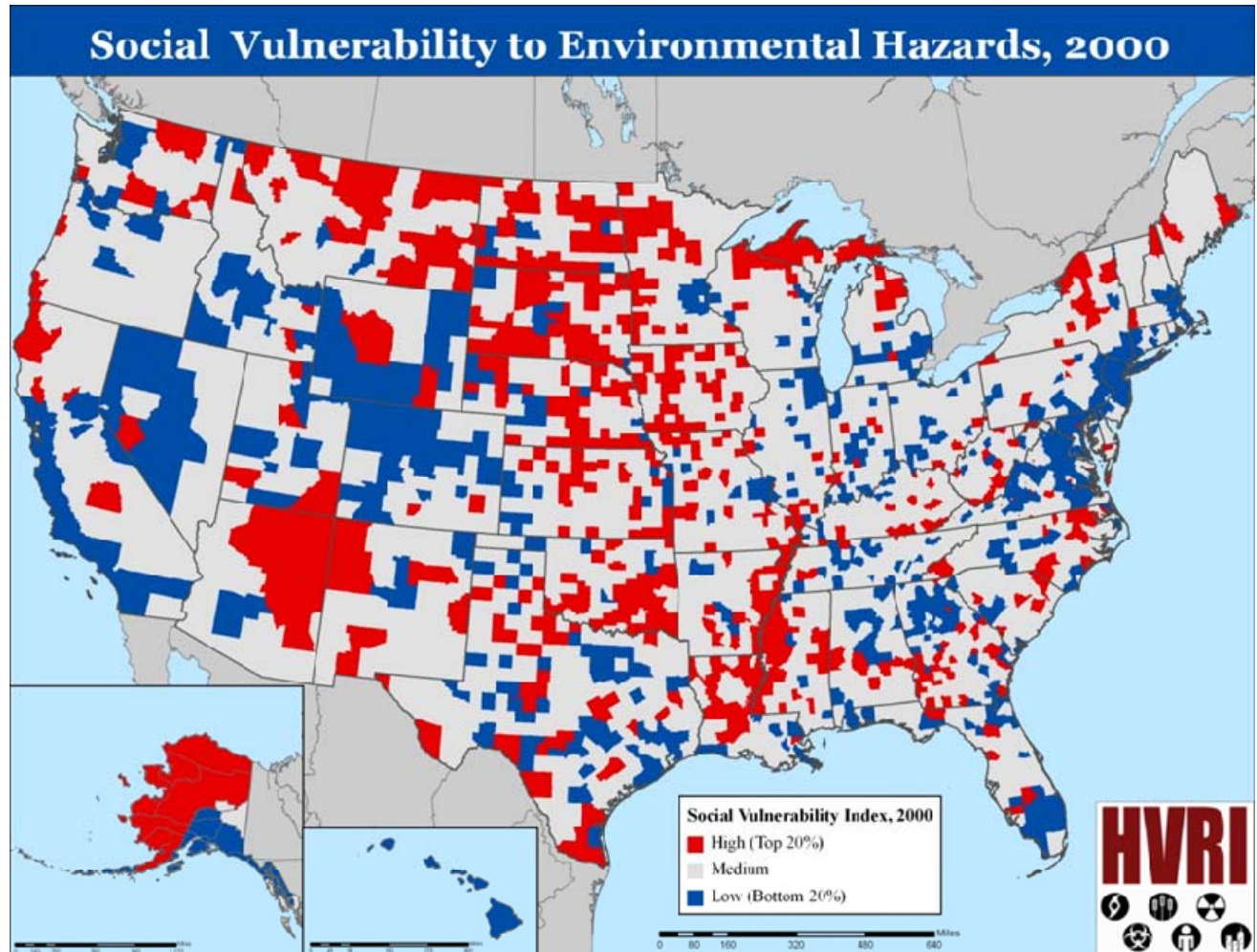
RAVON's Research Agenda:

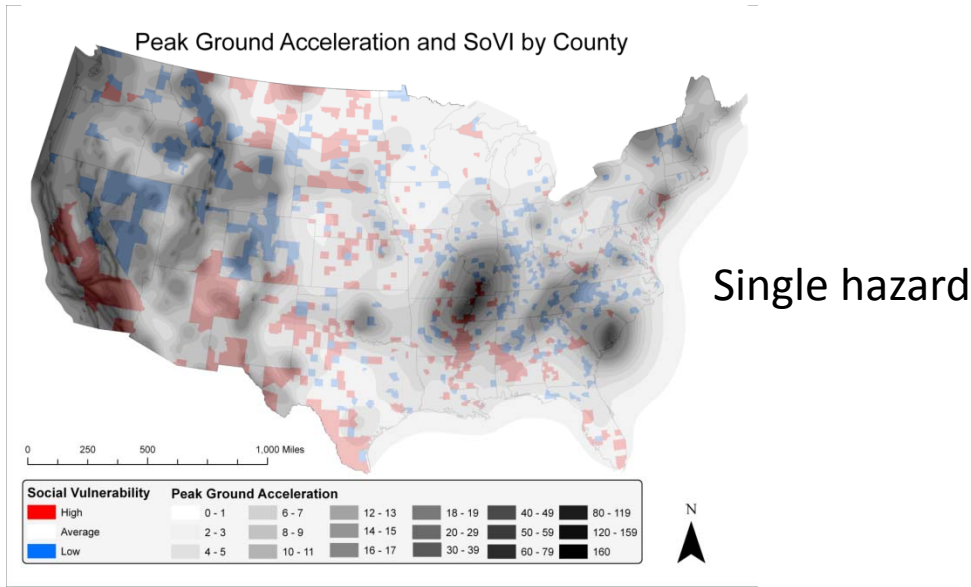
- Conceptual clarification
- Monitoring
- Modeling, evaluation
- Data sharing/dissemination
- Post-event research



Consistent and comparable locally-based hazard vulnerability assessments

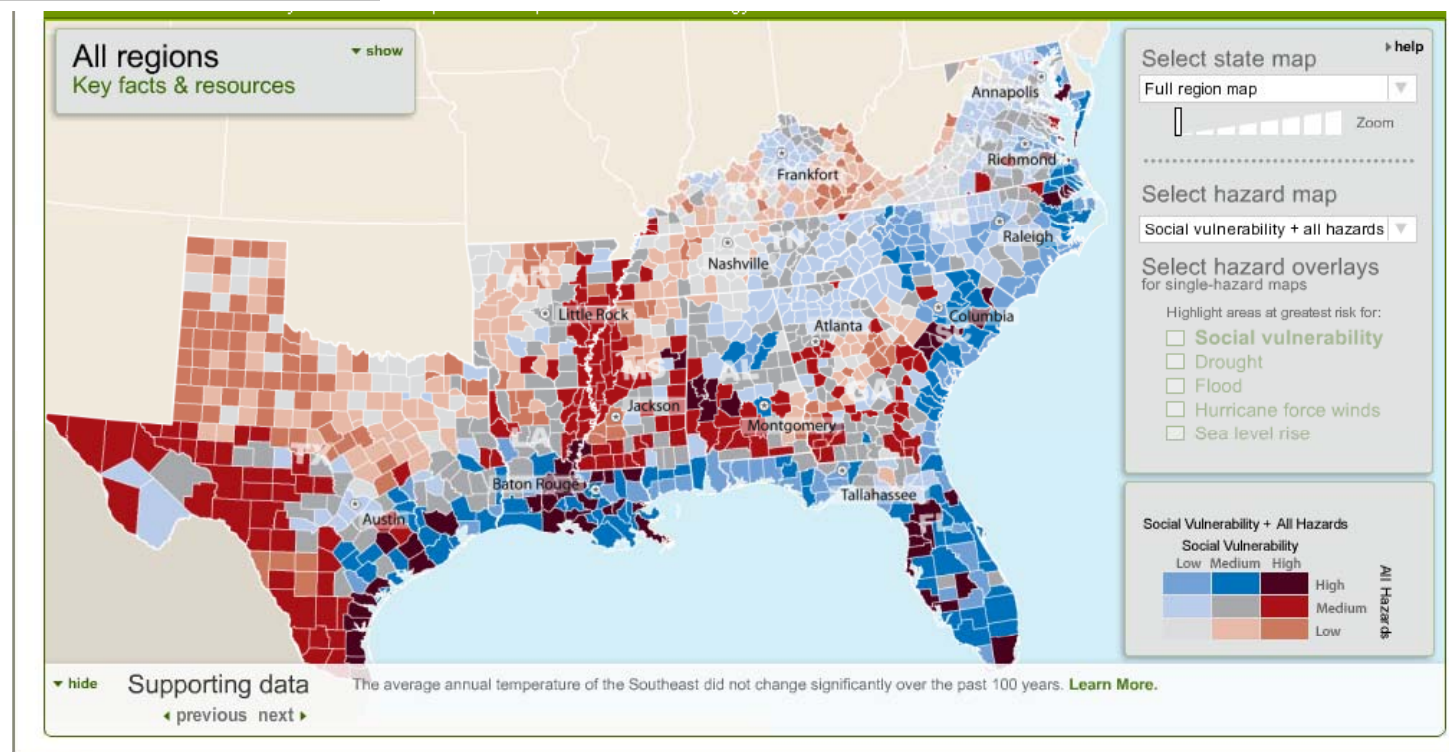
Measuring and mapping social vulnerability



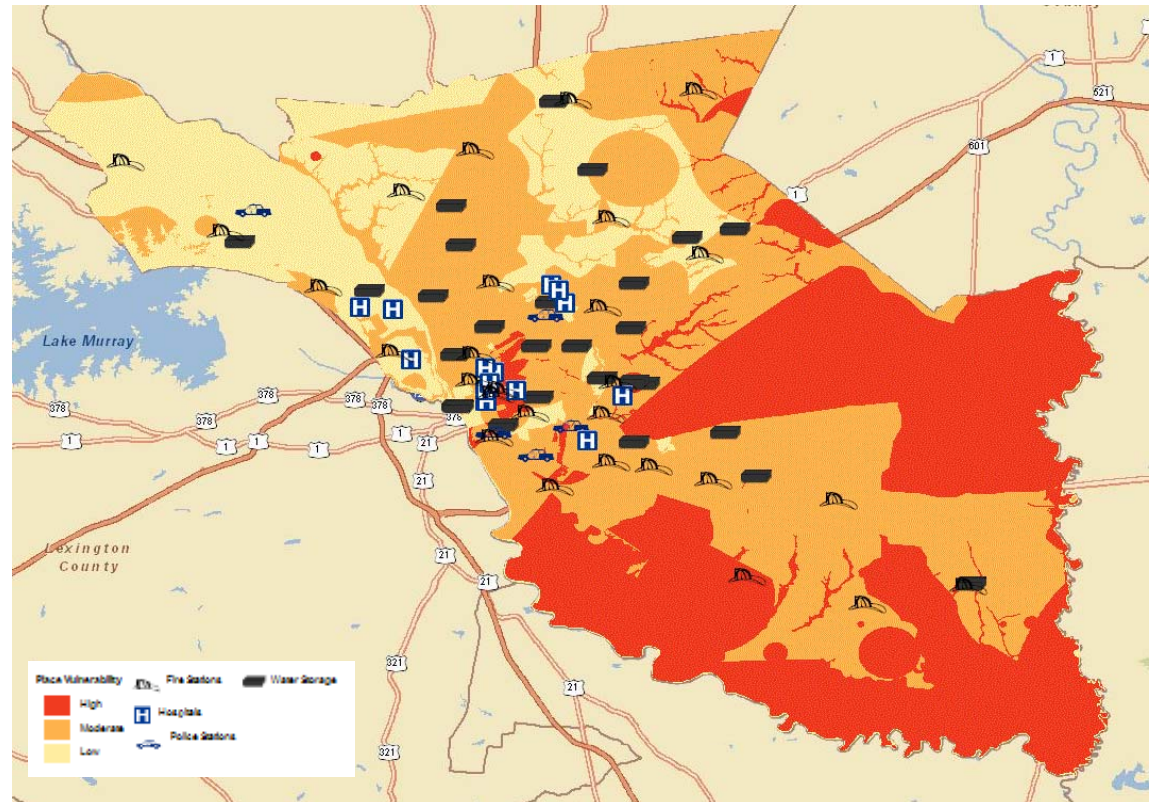
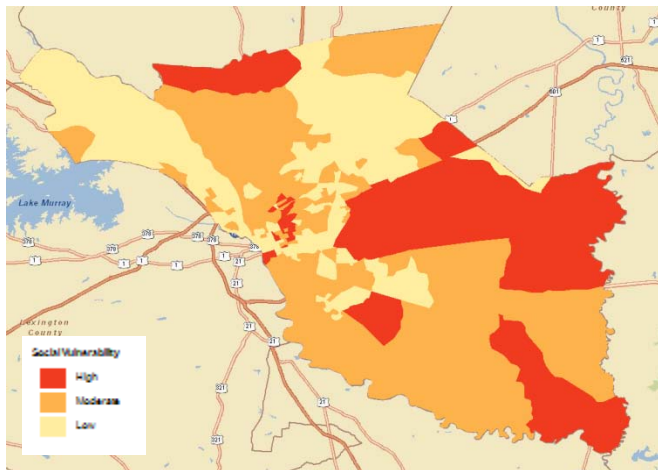
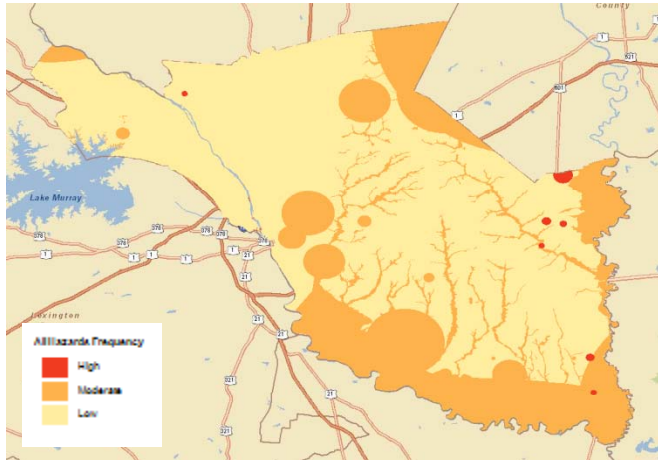


Integrating social vulnerability with hazard exposure

Multi-hazard



Downscaling to sub-county scales



<http://mapra.cas.sc.edu/ihat/index.html>

Tate, E., S. L. Cutter, and M. Berry, 2010. "Integrated multi-hazard mapping," *Environment and Planning B: Planning and Design* 37 (4): 646-663.

South Carolina Integrated Hazards Assessment Tool

Home Mapping Hazard Frequency Losses HVRI

Select average annual SHELUDS losses (1960-2009) by:

County Richland
 Hazard Avalanche

Export to Excel

Hazard	Property Damage	Crop Damage	Fatalities	Injuries
Coastal	\$118	\$12	0.000	0.000
Drought	\$165,909	\$115,259	0.010	0.000
Flooding	\$15,483	\$13,622	0.000	0.020
Hail	\$5,990	\$4,510	0.000	0.032
Heat	\$161,564	\$64,214	0.130	0.000
Hurricane/Tropical Storm	\$192,611	\$173,733	0.020	0.600
Landslide	\$0	\$0	0.140	0.000
Lightning	\$88,737	\$2,765	0.080	0.975
Severe Storm/Thunder Storm	\$126,709	\$14,795	0.070	0.226
Tornado	\$322,739	\$34	0.020	0.340
Wildfire	\$1,852	\$4,783	0.000	0.001
Wind	\$118,464	\$3,782	0.021	0.291
Winter Weather	\$36,629	\$268,977	0.125	0.024

Additional information regarding SHELUDS data is available from the [metadata](#).

Last updated: November 16, 2010

Associated Losses

Downscaling to sub-county scales

Frequency of Events

South Carolina Integrated Hazards Assessment Tool

Home Mapping Hazard Frequency Losses HVRI

Select hazard frequency profile by:

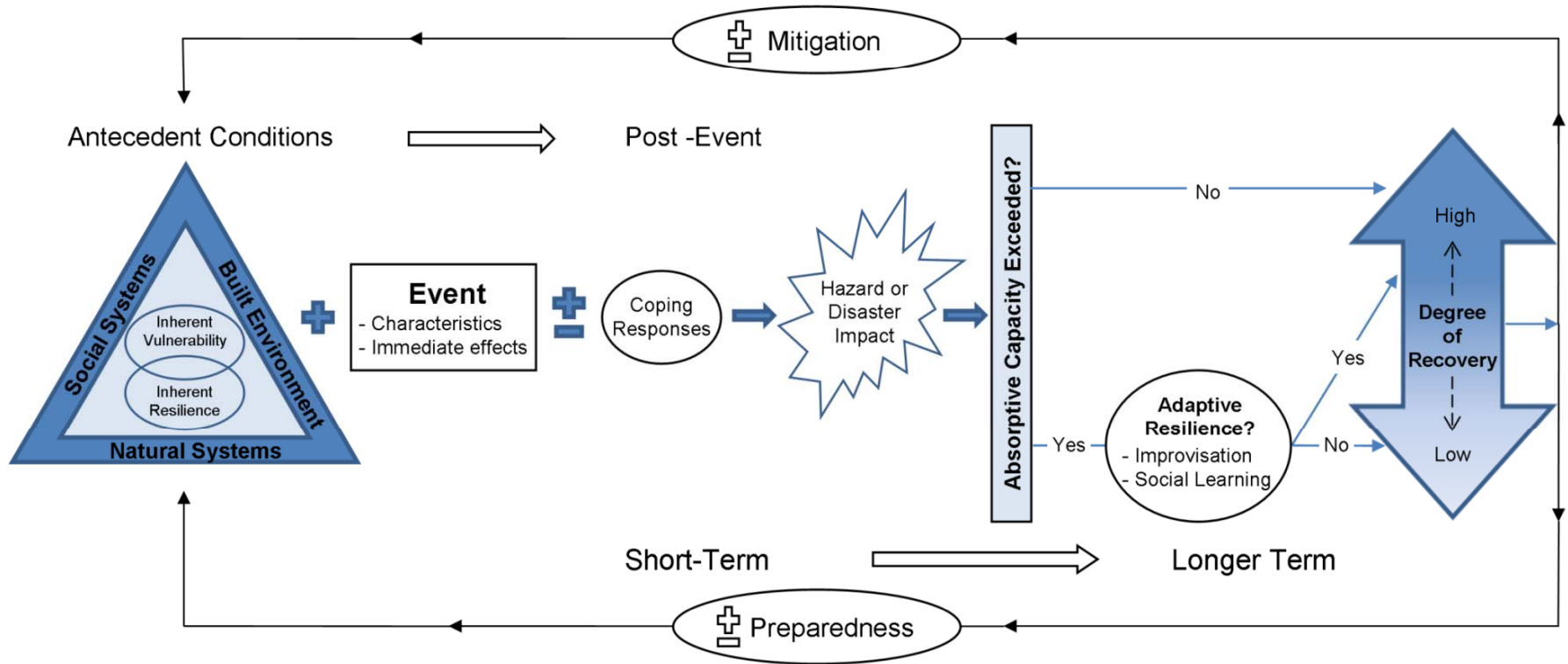
County Richland
 Hazard Avalanche

Export to Excel

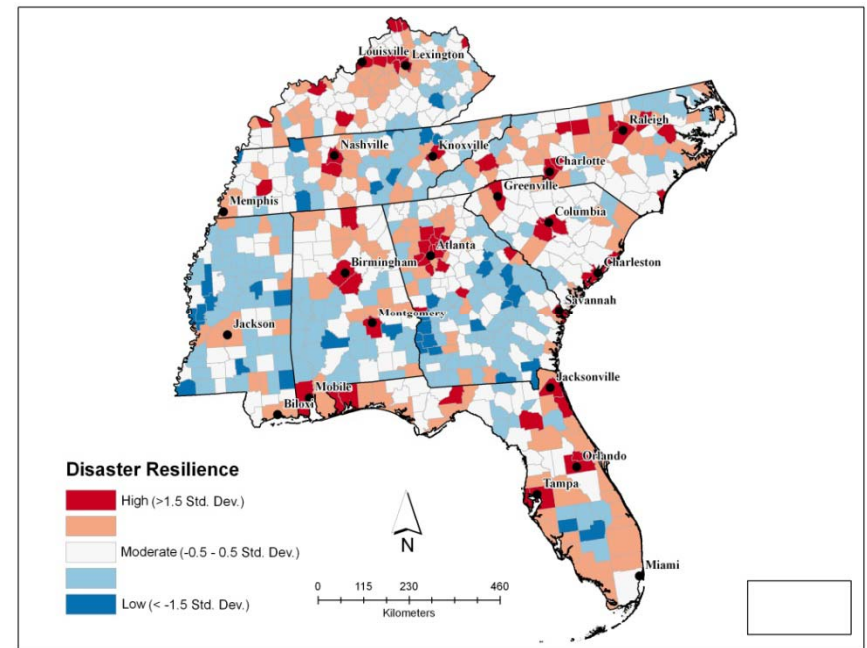
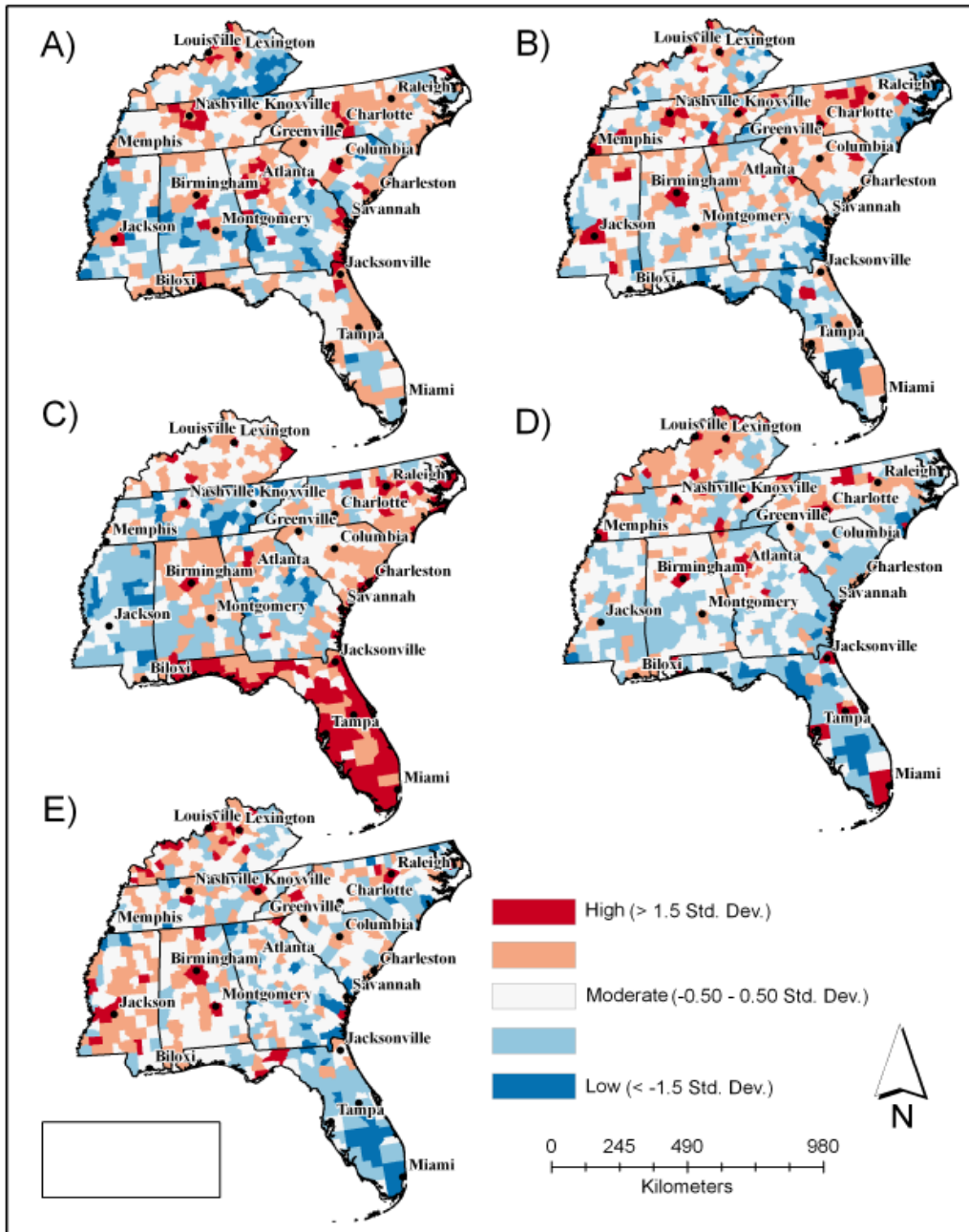
Hazard	Events	Years In Record	ReturnPeriod	Annual % Chance
Avalanche	0	49		
Civil Disorder				
Dam Failure				
Drought	1	59	59.00	1.69
Earthquake	18	310	17.22	5.80
Fire - wildfire hazard only	1693	21	0.01	8061.90
Flood	23	59	2.56	38.98
Fog	0	12		
Funnel Cloud	2	16	8.00	12.50
Hail	147	59	0.40	249.15
Hazardous materials (Hazmat)--fixed facility and transportation	328	22	0.06	1490.90
Hurricane/Tropical Storm	17	158	9.29	10.75
Landslide	1	49	49.00	2.04
Lightning	10	16	1.60	62.50
Nuclear Power Plants	0	16		
Ocean & Lake Surf	1	16	16.00	6.25
Precipitation	1	15	15.00	6.66
Severe Winter Storm	7	59	8.42	11.86
Temperature Extremes	1	16	16.00	6.25
Terrorism	0	29		
Thunderstorm & High Winds	269	59	0.21	455.93
Tornado	34	59	1.73	57.62
Transportation - motor vehicle	94120	10	0.00	941200.00

Last updated: November 16, 2010

Evidence-based indicators to measure progress toward DRR and resilience



Cutter, S. L., L. Barnes, M. Berry, C. Burton, E. Evans, E. Tate, and J. Webb. 2008. A place-based model for understanding community resilience to natural disasters. *Global Environmental Change* 18 (4): 598-606.



Cutter, S. L., C. G. Burton, and C. T. Emrich, 2010.
 "Disaster resilience indicators for benchmarking
 baseline conditions," *Journal of Homeland Security
 and Emergency Management* 7(1): Article 51.



2. Develop a science action plan consistent with international efforts

Integrated Research on Disaster Risk



Key components—focus on risk and disaster risk reduction; need an integrated approach across hazards, disciplines, scales; recognize importance of data and information



Broad research objectives:

1. Characterization of hazards, vulnerability, and risk
2. Understanding decision making in complex and changing risk contexts
3. Reducing risks and curbing losses through knowledge-based actions
4. Cross cutting themes—case studies; assessment, data management and monitoring; capacity building



Partners: National and international science institutions; national and international development assistance agencies; National IRDR Committees

Some Specifics

National IRDR Committees

Establish US National Committee for IRDR
consistent with other countries

Members:

SDR (US Federal Agencies)

Disasters Roundtable

Major Multidisciplinary Disaster Research
Centers :

Natural Hazards Center, Boulder

Disaster Research Center, Delaware

Hazards & Vulnerability Research

Institute, South Carolina

Hazard Reduction & Recovery Center,
Texas A&M

Others.....

IRDR Initial Projects

FORIN—IRDR forensic
investigations

RIA—Risk interpretation and
action

DATA—long-term databases

GAIRDR—Global assessment
of integrated research on
disaster risk



3. Awareness of Upcoming Reports

IPCC Special Report (SREX)



Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation

Timeline:

April 2011 Government and expert review comments (2nd draft)

May 2011 Final drafts prepared

Oct 2011 SREX Final Government Distribution

Nov 2011 Joint WG1/WG2 session to approve SREX Summary for Policy Makers
and underlying report

SREX Contents

Chapter 1:

Climate change: new dimensions in disaster risk, exposure, vulnerability, and resilience

Chapter 2:

Determinants of risks: exposure and vulnerability

Chapter 3:

Changes in climate extremes and their impacts on the natural physical environment

Chapter 4:

Changes in impacts of climate extremes: human systems and ecosystems

Chapter 5:

Managing the risks from climate extremes at the local level

Chapter 6:

Managing the risks from climate extremes at the national level

Chapter 7:

Managing the risks: international level and integration across scales

Chapter 8:

Toward a sustainable and resilient future

Chapter 9:

Case studies

<http://www.ipcc-wg2.gov/AR5/extremes-sr/index.html>

The National Academies, Committee on Science, Engineering, and Public Policy (COSEPUP)

Increasing National Resilience to Hazards and Disasters

Study statement of task

An ad hoc committee overseen through collaborative oversight of the Disasters Roundtable (DR) and the Committee on Science, Engineering, and Public Policy (COSEPUP) will conduct a study and issue a consensus report that integrates information from the natural, physical, technical, economic, and social sciences to identify ways in which to increase national resilience to hazards and disasters in the United States. In this context, “national resilience” includes resilience at federal, state and local community levels.

The ad-hoc committee will:

- ❑ Define “national resilience” and frame the primary issues related to increasing national resilience to hazards and disasters in the United States;
- ❑ Provide goals, baseline conditions, or performance metrics for resilience at the U.S. national level;
- ❑ Describe the state of knowledge about resilience to hazards and disasters in the United States;
- ❑ Outline additional information or data and gaps and obstacles to action that need to be addressed in order to increase resilience to hazards and disasters in the United States;
- ❑ Present conclusions and recommendations about what approaches are needed to elevate national resilience to hazards and disasters in the United States.

Study Sponsors (as of September 2010)

Department of Agriculture/Forest Service
Department of Energy
Department of Homeland Security
DHS/Federal Emergency Management
Agency
Department of the Interior/U.S.
Geological Survey
National Aeronautics and Space
Administration
National Oceanic and Atmospheric
Administration
U.S. Army Corps of Engineers
Community and Regional Resilience
Institute (CARRI)

Members

Susan L. Cutter, *chair, University of South Carolina, Columbia, SC*
Joseph A. “Bud” Ahearn, *CH2M Hill Ltd, Denver, CO*
Bernard Amadei, *University of Colorado at Boulder, CO*
Patrick Crawford, *Feeding America, Chicago, IL*
Gerald E. Galloway, *University of Maryland, College Park, MD*
Michael F. Goodchild, *University of California, Santa Barbara, CA*
Howard C. Kunreuther, *University of Pennsylvania, Philadelphia, PA*
Meredith Li-Vollmer, *Public Health Seattle & King County, Washington*
Monica Schoch-Spana, *University of Pittsburgh Medical Center, Baltimore, MD*
Susan Scrimshaw, *The Sage Colleges, Troy, NY*
Ellis M. Stanley, Sr., *Dewberry, Los Angeles, CA*
Gene Whitney, *Congressional Research Service, Washington, DC*
Mary Lou Zoback, *Risk Management Solutions, Newark, CA*

General Study Timeline

- ❑ January – May 2011: 2-3 committee meetings offsite
 - ❑ New Orleans-Biloxi (January)
 - ❑ Cedar Rapids-Iowa City (March)
 - ❑ Irvine (May)
- ❑ May – June 2011: Mid-term commissioned report to sponsors and public (written by rapporteur to capture content from one or more committee meetings)
- ❑ August – September 2011: Final committee meeting (final writing meeting)
- ❑ October 2011 – January 2012: Committee report to review and response to review
- ❑ February 2012: Delivery of pre-publication report to sponsors and public release
- ❑ February 2012 and beyond: Report dissemination, derivative products

To provide **actionable** recommendations and guidance on the best approaches to take to reduce human losses from hazards and disasters by increasing national resilience at the local community, state, and federal levels.

Questions???

scutter@sc.edu

HVRI HAZARDS & VULNERABILITY RESEARCH INSTITUTE *Carolina*

Home Quick Links Staff Research Products Publications Education General Info

Hurricane Katrina: Then and Now

NOW

For the past 5 years, HVRI researchers have been visiting the Mississippi Gulf Coast to assess the state of recovery from Hurricane Katrina.

For more information about these efforts, [click here](#).

Mission

To conduct basic research on hazard vulnerability and resilience; train the next generation of hazard scientists and practitioners; and through its outreach efforts, assist in the improvement of emergency preparedness, planning, response, and recovery at local, state, national, and international scales.

Recent Publications

[Disaster Resilience Indicators for Benchmarking Baseline Conditions.](#)

[Modeled earthquake losses and social vulnerability in Charleston, South Carolina.](#)

[Integrated Multihazard Mapping.](#)

Data

Natural Hazards Losses 1980-2005 (SHIELDS™)

Social Vulnerability Index (SoVI™)

SCEMD Online Hazards Mapping

Year in Disaster: 2005, 2007, 2008

News

HVRI New integrated hazards assessment tool

HVRI SHIELDS 3.0 database release (1980-2005)

USC research spotlights recovery disparities

This Month in Disaster History

Blizzard of 1996: January 5-8

Spreading from the southern Appalachians to Maine, the powerful nor'easter buried the eastern seaboard under 1 to 3 feet of snow between January 5-8, 1996. Unseasonably warm weather followed on January 9-10, producing a major thaw. Resulting river levels reached 20 feet above flood stage in parts of Delaware, Pennsylvania, and Virginia. All told, the storm resulted in 157 deaths and an estimated \$2 billion in damage.

More information is available from the [Science Blog](#) at Penn State University.

FEMA NASA HVRI NSF NOAA

<http://webra.cas.sc.edu/hvri/>