



*United States
Geological Survey*

Golden, CO

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NIST Community Resilience Program

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What is the Problem?

- Natural and man-made disasters cause an estimated \$57B in average annual costs.
- Superstorm Sandy caused over \$65B in losses.
- Large single events can cause losses exceeding \$100B.
- Current approach of response and rebuilding is impractical and inefficient for dealing with natural disasters.
- Planning does not generally account for interconnected nature of buildings and infrastructure, nor needs of social institutions.
- Changing nature of hazards is not always considered.



What is Disaster Resilience?

- The term "resilience" means the ability to *prepare for* and *adapt to* changing conditions and *withstand* and *recover rapidly* from disruptions*
- In the context of community resilience, the emphasis is not solely on mitigating risk, but implementing measures to ensure that the community recovers to normal, or near normal *function*, in a reasonable timeframe.

*As defined in Presidential Policy Directive 21.



Community Needs Drive Functional Requirements for Buildings and Infrastructure



Community Resilience for the Built Environment



- Natural hazards
- Manmade hazards
- Degradation
- Climate change

- Performance Goals
- Mitigation
- Response
- Recovery



Overview of NIST Community Resilience Research

- Strategic goal on Disaster-Resilient Structures and Communities, including:
 - Community Resilience,
 - NEHRP,
 - Wind Research (NWIRP),
 - Fire Research,
 - Structures Research, and
 - Disaster and Failure Studies (NCST).
- Seek to provide the critical knowledge, metrics, and tools to enable the emergence of performance-based standards and codes.
- Perform technical studies in the aftermath of disaster and failure events to derive lessons learned and to recommend needed changes to codes, standards, and practices that will improve the safety and performance of buildings and infrastructure.
- NIST staff participate actively in standards and codes development (e.g., ASCE, ASTM, ACI, AISC, ICC, NFPA) to implement research results.



Disaster Resilience Framework

NIST is:

- **Convening** the highly diverse stakeholder interests to:
 - Develop the first version of a comprehensive **Disaster Resilience Framework** for achieving community resilience that considers the interdependence of the community's physical and human assets, operations, and policies/regulations
 - Establish a **Disaster Resilience Standards Panel** to further develop the **Disaster Resilience Framework (version 2.0)** and,
 - Develop **Model Resilience Guidelines** for critical buildings and infrastructure systems essential to community resilience based on model standards, codes, and best practices
- It is envisioned that the Disaster Resilience Standards Panel will update the framework and guidance on a regular basis and recommend improvements that enhance resilience to standards and codes.



Stakeholder Engagement is Critical

Stakeholders include, but are not limited to:

- Codes and standards organizations
- State, local, and regional officials
- Insurance/re-insurance industry
- Architects
- Engineers
- Utility operators
- Urban planners
- Industry
- Emergency managers
- Relief organizations
- Regulators
- Academia



Federal Stakeholders

- Federal stakeholders include, but are not limited to:
 - Executive Office of the President (National Security Staff, OSTP, NSTC)
 - Department of Homeland Security
 - Department of Commerce
 - Department of Defense
 - Environmental Protection Agency
 - U.S. Army Corps of Engineers
 - Department of Energy
 - Department of Health and Human Services
 - Department of Housing and Urban Development
 - Department of Transportation
 - U.S. Geological Survey
 - National Science Foundation



What is a “Framework”?

- Conceptual structure
- Educational tool
- Identifies mature standards
- Recommends best practices



Disaster Resilience Framework 1.0

- The Disaster Resilience Framework focuses on the role that buildings and infrastructure systems play in ensuring community resilience.
- The Framework will:
 - Establish types of performance goals and ways to express them
 - Identify existing standards, codes, and best practices that address resilience
 - Identify gaps that must be addressed to achieve resilience
 - Capture regional differences in perspectives on resilience
- The Disaster Resilience Framework will be informed through a series of stakeholder workshops.



Draft Resilience Framework

Ch. 1: The Community

Ch. 2: Community Disaster Resilience for the Built Environment

Ch. 3: Examples of Community Disaster Resilience

Ch. 4: Sectors, Interdependencies and Cascading Effects

Ch. 5: Building Sector

Ch. 6: Transportation Sector

Ch. 7: Energy Sector

Ch. 8: Communication and Information Sector

Ch. 9: Water and Wastewater Sector

Ch. 10: Tools and Metrics for Evaluating Disaster Resilience

Ch. 11: Recommendations and Next Steps

Note: Underlined text denotes breakout sessions at July 30 workshop



Framework Development Process

Participation in the workshops is open to all interested stakeholders

Community Resilience Framework Version 1.0

July 2014 Workshop

- 25% Draft
- Hoboken, NJ
- http://www.nist.gov/el/building_materials/resilience/2nd-disaster-resilience-workshop.cfm

October 2014 Workshop

- 50% Draft
- Norman, OK

January 2015 Workshop

- 75% Draft
- Western US

April 2015 Workshop

- Release Draft for Public Comment
- Southeast US



Disaster Resilience Standards Panel (DRSP)

- The DRSP will represent the broad interests of the stakeholder community.
- The DRSP will be:
 - open to all interested participants
 - a self-governing entity
- The DRSP will lead development of:
 - Disaster Resilience Framework 2.0
 - Model Resilience Guidelines



Disaster Resilience Framework – How to Participate

- Attend working sessions at workshops
- Chapters will be announced for each workshop when registration opens
- Review working drafts of the framework posted one week prior to each workshop
- Share your knowledge and experience
- Make others aware of the Framework, DRSP, and Workshops



NIST Disaster and Failure Studies

Objectives

- Probable technical cause
- Lessons learned: successes and failures
- Improvements to standards, codes, practices, technologies
- Future research priorities

NIST Authorities & Roles:

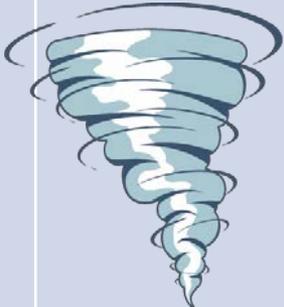
- **NCST Act (2002):** building failures, evacuation and emergency response procedures
- **NIST Act (1950, as amended):** structural investigations; fire-resistive building materials; materials, mechanisms, structures, components, and systems)
- **Fire Prevention and Control Act (1974):** fire investigations
- **NEHRP Reauthorization Act (2004):** earthquakes
- **National Windstorm Impact Reduction Act (2004):** wind, storms and floods
- **National Response Framework:** structural and fire safety; disaster operations and situation assessment; urban and industrial hazard analysis; recovery



NIST Disaster and Failure Studies



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Earthquakes	Hurricanes	Construction/ Building	Tornadoes	Fires
<p>San Fernando, CA (1971)</p> <p>Mexico City, Mexico (1985)</p> <p>Loma Prieta, CA (1989)</p> <p>Northridge, CA (1994)</p> <p>Kobe, Japan (1995)</p> <p>Kocaeli, Turkey (1999)</p> <p>Maule, Chile (2010)*</p> <p>Christchurch, NZ (2011)*</p>	<p>Camille, MS/LA (1969)</p> <p>Alicia, Galveston, TX (1983)</p> <p>Hugo, SC (1989)</p> <p>Andrew, FL (1992)</p> <p>Hurricanes Mitch and Georges, LAC (1998)</p> <p>Hurricanes Katrina and Rita (2005)</p>	<p>Skyline Plaza Apartments, Bailey's Crossroads, VA (1973)</p> <p>Willow Island Cooling Tower, WV (1978)</p> <p>Kansas City Hyatt Regency, Kansas City, MO (1981)</p> <p>Riley Road Interchange, East Chicago, IN (1982)</p> <p>Harbor Cay Condominium, Cocoa Beach, FL (1981)</p> <p>L'Ambiance Plaza, Hartford, CT (1987)</p> <p>Ashland Oil Tank Collapse, Floreffe, PA (1988)</p> <p>U.S. Embassy, Moscow, USSR (1987)</p> <p>Murrah Federal Building, Oklahoma City, OK (1995)</p> <p>World Trade Center Disaster, New York, NY (2001)</p> <p>Dallas Cowboys Indoor Practice Facility, May 2009</p>	<p>Jarrell, TX (1997)</p> <p>Spencer, SD (1998)</p> <p>Oklahoma City, OK (1999)</p> <p>Joplin, MO (2011)*</p> <p>© 2011 Shutterstock/Diagon. Used with permission</p>  	<p>DuPont Plaza Hotel, San Juan, PR (1986)</p> <p>First Interstate Bank Building, Los Angeles, CA (1988)</p> <p>Loma Prieta Earthquake, CA (1989)</p> <p>Hillhaven Nursing Home (1989)</p> <p>Pulaski Building, Washington, DC (1990)</p> <p>Happyland Social Club, Bronx, NY (1990)</p> <p>Oakland Hills, CA (1991)</p> <p>Hokkaido, Japan (1993)</p> <p>Watts St, New York City (1994)</p> <p>Northridge Earthquake, CA (1994)</p> <p>Kobe, Japan (1995)</p> <p>Vandalia St, New York City (1998)</p> <p>Cherry Road, Washington, DC (1999)</p> <p>Keokuk, IA (1999)</p> <p>Houston, TX (2000)</p> <p>Phoenix, AZ (2001)</p> <p>Cook County Administration Building Fire (2003)</p> <p>The Station Nightclub, RI (2003)</p> <p>Charleston, SC, Sofa Super Store Fire (2007)</p> <p>Witch Creek & Guejito, CA, WUI Fire (2007)</p> <p>Amarillo, TX, WUI Fire (2011)</p>



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* Ongoing



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Impacts of NIST Disaster and Failure Studies

- World Trade Center (2001)
 - U.S. model building code changes adopted for fireproofing strength, installation, and inspection; fire-resistance rating; structural integrity
 - U.S. model building code changes adopted for occupant evacuation; fire service access; active fire protection systems; emergency responder communications
- The Station Nightclub Fire (2003)
 - Sprinklers, restricted festival seating, crowd manager, and egress inspection recordkeeping requirements for new and existing facilities adopted in NFPA 101 (Life Safety Code)
- Jarrell, TX, Tornado (1997)
 - Enhanced Fujita (EF) Tornado Intensity Scale adopted by NOAA's National Weather Service



Community Resilience Center of Excellence

- COE Focus:
 - Computational Modeling
 - Data Management Tools
 - Resilience Field Studies
- Funding: \$4 million per year for five years, with possibility for an additional five year award.
- Closes: Sept. 12, 2014

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Community Resilience COE

Federal Funding Opportunity (closes September 12, 2014)

Subscribe to COE Program Announcements (e-mail)

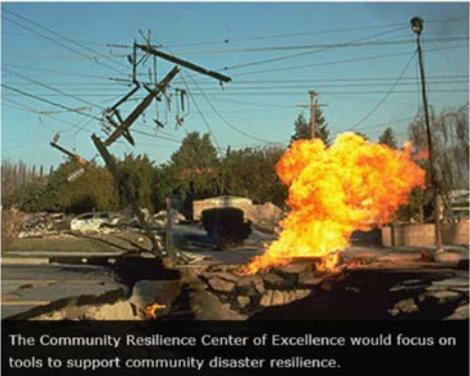
News

NIST Announces Competition for Community Resilience Center of Excellence

NIST to Establish New Centers of Excellence for Work in Forensics, Disaster Resilience

Events

Community Resilience Center of Excellence Webinar, 08/05/14



The Community Resilience Center of Excellence would focus on tools to support community disaster resilience.

Overview

The Community Resilience Center of Excellence would focus on tools to support community disaster resilience. The center would work on developing integrated, systems-based computational models to assess community infrastructure resilience and guide community-level resilience investment decisions. The proposed center also would develop a data management infrastructure, or

Resources

Community Resilience Center of Excellence Frequently Asked Questions

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