



Advisory Committee on
Earthquake Hazards
Reduction
March 4, 2016

NIST Community Resilience Program

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Why Community Resilience?

- All communities face potential disruption from natural, technological, and human-caused hazards.
- Disasters take a high toll in lives, livelihoods, and quality of life that can be reduced by better managing disaster risks.
- Communities are socio-technical systems. Buildings and infrastructure enable social and economic function. Therefore, social and economic needs and functions should drive the goals for performance of buildings and physical infrastructure.
- Planning and implementing *prioritized* measures can strengthen resilience and improve a community's ability to continue or restore vital services in a more timely way – and to build back *better*.
- New tools and guidance are needed to measure resilience and plan and implement measures to enhance resilience.



What is Resilience?

- *“the ability to adapt to changing conditions and withstand and rapidly recover from disruption due to emergencies”.* (Presidential Policy Directive (PPD) 8)
- *“the ability to prepare for and adapt to changing conditions and to withstand and recover rapidly from disruptions. Resilience includes the ability to withstand and recover from deliberate attacks, accidents, or naturally occurring threats or incidents.”* (PPD 21)
- Resilience addresses all activities through recovery:
 - Prevention, Protection, Mitigation, Response, and Recovery
 - Risk assessments address the potential consequences of hazard’s impact on existing construction and identify vulnerabilities
 - Emergency management addresses immediate response, with a focus on life safety



Guide Development Process

**Community
Resilience
Planning
Guide
Version 1.0
October 2015**

**April 2015
Workshop
Houston, TX**

- Release Draft
- Public Comments until June 26

**February 2015
Workshop
San Diego, CA**

- 75% Draft

**October 2014
Workshop
Norman, OK**

- 50% Draft

**July 2014
Workshop
Hoboken, NJ**

Hoboken, NJ

• 25% Draft

**April 2014
Workshop
NIST**



Planning Guide Outline

Volume 1 - Methodology

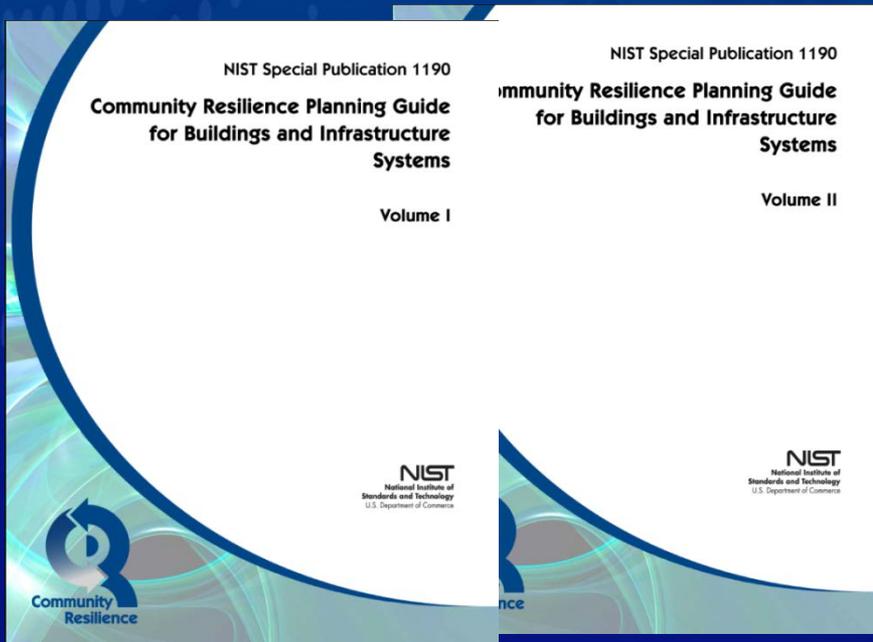
Executive Summary

- Introduction
- 6 Step Methodology
- Planning Example – Riverbend
- Glossary and Acronyms

Volume 2 - Reference

Executive Summary

- **Social** Community
- Dependencies and Cascading Effects
- **Buildings**
- **Transportation** Systems
- **Energy** Systems
- **Communications** Systems
- **Water & Wastewater** Systems
- Community Resilience Metrics



Planning Steps for Community Resilience

SIX-STEP GUIDE TO PLANNING FOR COMMUNITY RESILIENCE



NIST Community Resilience Panel

- **Mission:**

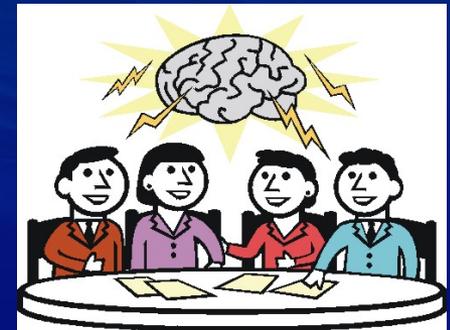
Reduce barriers to achieving community resilience by promoting collaboration among stakeholders to strengthen the resilience of buildings, infrastructure, and social systems upon which communities rely.

- Consider the adequacy of standards, guidelines, best practices and other tools and recommend, develop, and work with others to make improvements in community resilience.

- **Goals:**

- Engage and connect community and cross-sector stakeholders by creating a process to encourage and support community resilience that focuses on buildings and infrastructure.
- Identify policy and standards-related gaps and impediments to community resilience.
- Raise awareness of sector dependencies and cascading effects of disasters.
- Identify or develop consistent definitions and metrics relating to resilience for use across sectors.
- Contribute to current and future community resilience guidance documents.
- Reduce barriers to achieving community resilience.
- Develop and maintain a Resilience Knowledge Base (RKB).

Federal Co-Sponsors



Disaster Resilience Fellows

- Community disaster resilience requires diverse and comprehensive consideration of the systems (physical and social) present in a community. Expertise in all areas was not represented on the NIST Team.
- The Disaster Resilience Fellows Program will augment expertise currently existing on the NIST team in the following areas:
 - State and local governance
 - Urban planning
 - Lifeline sectors (electric power, water/wastewater, transportation, communications)
 - Emergency planning and response
 - Sociology of disasters
 - Business continuity



Next Steps ...

Use of the Guide

- Encourage use of the Guide for community resilience plans.
- Develop training tools and user forum to support implementation
- Collect data on implementation of resilience planning to inform future versions of the Guide and other products.





Community Resilience CoE

- NIST is initiating research to develop a systems-based modeling environment for evaluating the impacts of loss of function in the built environment and the consequential effects on community response and recovery.
- The long-term objective is to provide decision-makers and professionals with methods and tools to support cost-effective infrastructure designs and investments that make our communities more resilient.

Infrastructure	Recovery Time								
	Days 0	Days 1	Days 1-3	Wks 1-4	Wks 4-8	Wks 8-12	Mos 4	Mos 4-24	Mos 24+
Critical Facilities									
Buildings	[Red bar from Day 0 to Day 1]								
Transportation	[Red bar from Day 1 to Day 1-3]								
Energy	[Red bar from Day 1 to Day 1-3]								
Water	[Red bar from Day 1-3 to Wks 1-4]								
Wastewater	[Red bar from Wks 1-4 to Wks 8-12]								
Communication	[Red bar from Day 1 to Day 1-3]								



Community Resilience Center of Excellence

- Awarded February 2015
- \$4M/year cooperative agreement
for 5 years - renewable up to 10 years



2013 Mandatory Soft Story Retrofit program for San Francisco.

- Objectives
 - Thrust 1. Develop an integrated, multi-scale, computational modeling environment (NIST-CORE) for community systems to support standards and tools for assessment and decision making
 - Thrust 2. Foster the development of data architectures and data management tools to enable disaster resilience planning
 - Thrust 3. Conduct studies to validate resilience data architectures, data management tools, and models



Community Resilience Center of Excellence

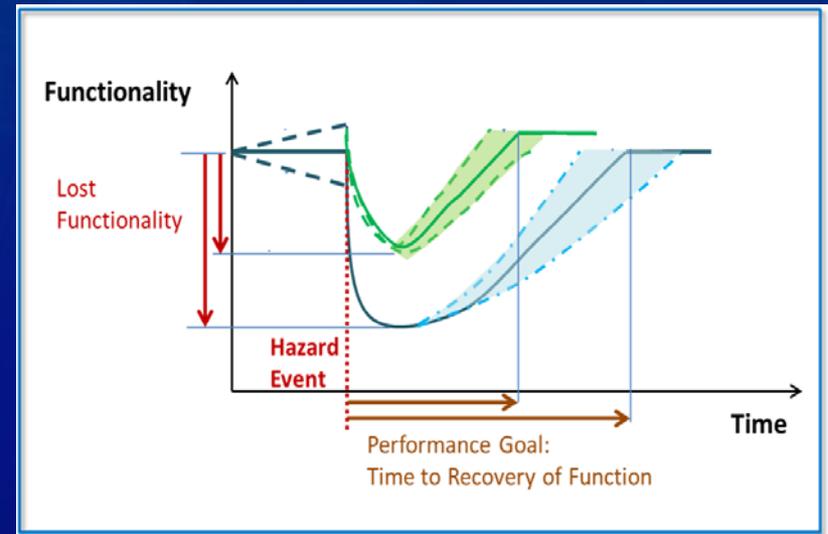
- NIST and Center researchers are collaborating to develop the science basis for integrated systems modeling and that integrates
 - Physics-based models of buildings and other infrastructure, including dependencies and cascading effects
 - Networks for transportation, energy, water, and communication
 - A spectrum of hazards and hazard intensities
 - Models of social and economic systems
 - Resilience-based performance criteria and metrics



Thrust 1 - NIST-CORE

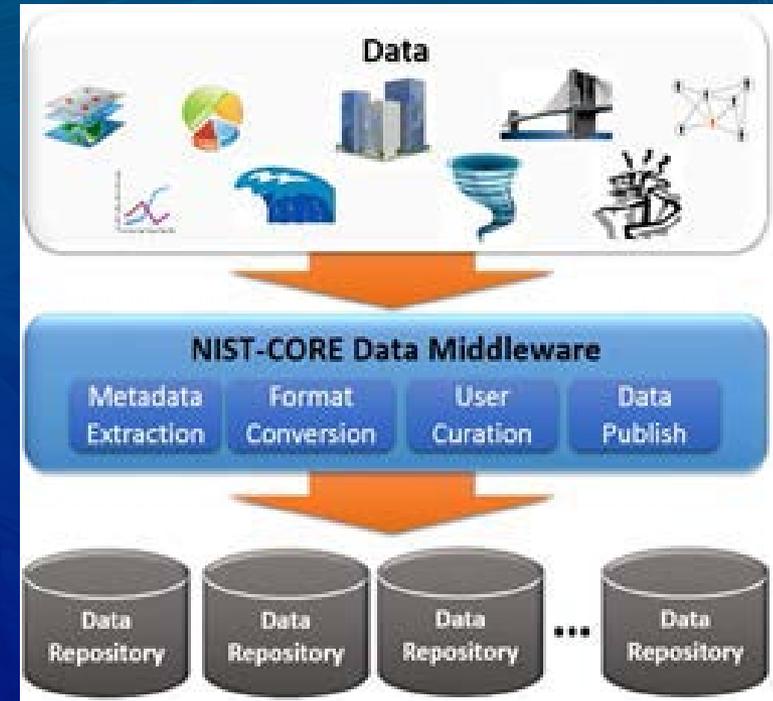
NIST-Community Resilience Modeling Environment

- Multidisciplinary computational environment
 - Open-source platform, computer model, software, and databases
 - Risk-informed approach to decision-making
 - Quantitative comparisons of alternative resilience strategies
 - Integrated social systems vital to the functioning and recovery of communities - *financial, social and political support, healthcare delivery, education, public administration*
 - Inter-dependent physical systems and cascading effects



Thrust 2. Data Architecture & Management Tools

- Standardized data architecture and data management tools
- Ability to use databases from domains of engineering and social sciences seamlessly in the decision process.
- Effectively help users ingest, manage, query, visualize and share data.

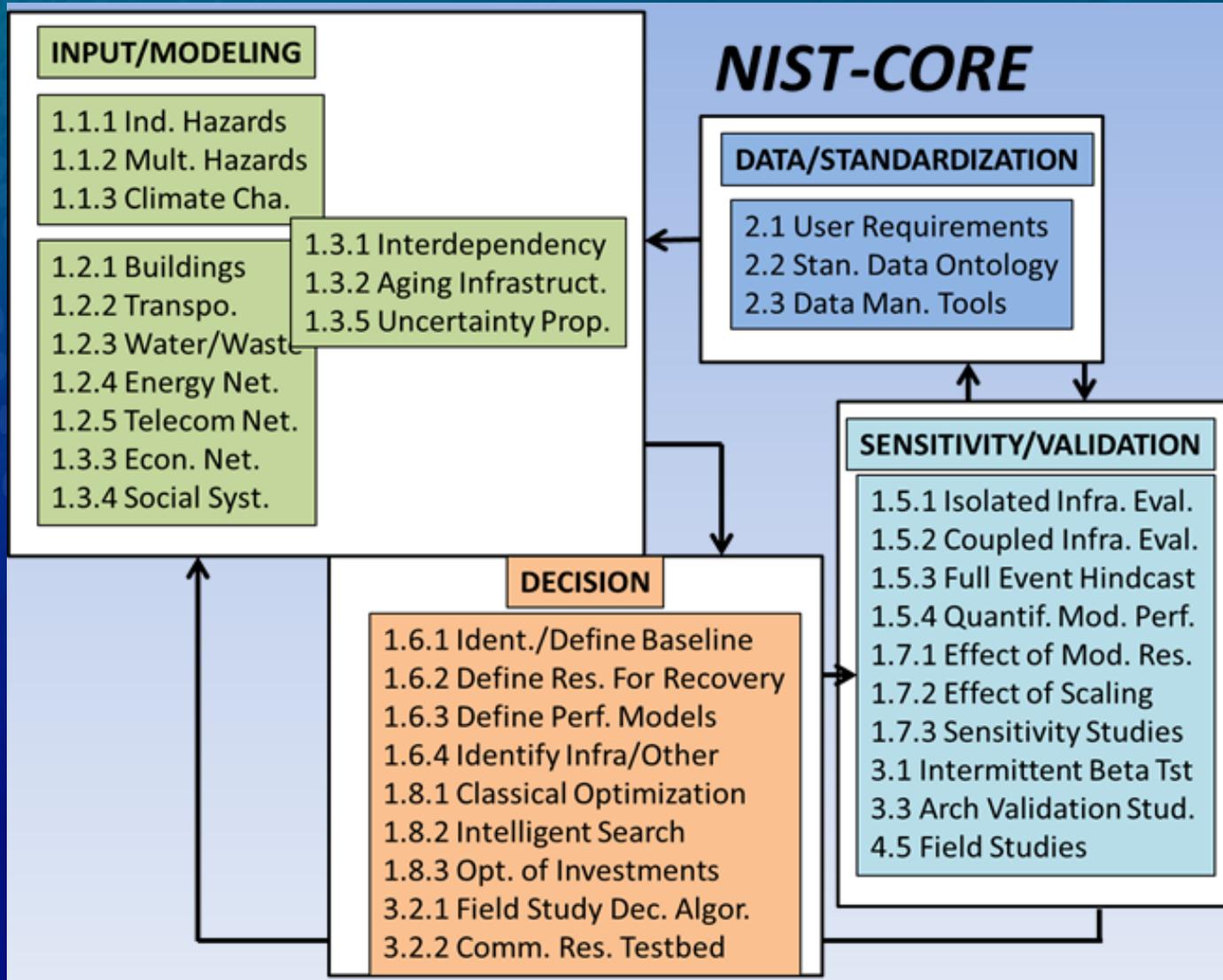


Thrust 3. Validation Studies

- Participate in field studies and other investigations to validate and improve the computational environment and its supporting databases.
- Validate the resilience data architecture through a series of testbeds.
- Test the process of data collection, its integration NIST-Core, and decision support-based intelligent search and decision algorithms.



NIST-CORE Tasks



Questions and Discussion

