



Approaching the Challenge of Disaster Risk Reduction

NIST Community Resilience Guide

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NHMA

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DISASTER
RISK REDUCTION
Ambassador Curriculum

Welcome!

Steve Cauffman, NIST





NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

Source: Community Resilience Planning Guide for Buildings and Infrastructure, NIST

Learning Objectives

1. Define resilience in the context of an entire community
2. Identify the six planning steps described in the NIST *Community Resilience Planning Guide for Buildings and Infrastructure Systems*
3. State the purpose of the NIST *Community Resilience Economic Decision Guide for Buildings and Infrastructure Systems*

Disaster Risk Reduction (DRR)

- A **systematic approach** to identifying, assessing, and reducing the risks of disaster
- Aims to **reduce vulnerabilities** to disaster, utilizing knowledge and experience developed by the natural hazard community of professionals and practitioners
- DRR initiatives are in every sector of emergency management, planning and development, and humanitarian work

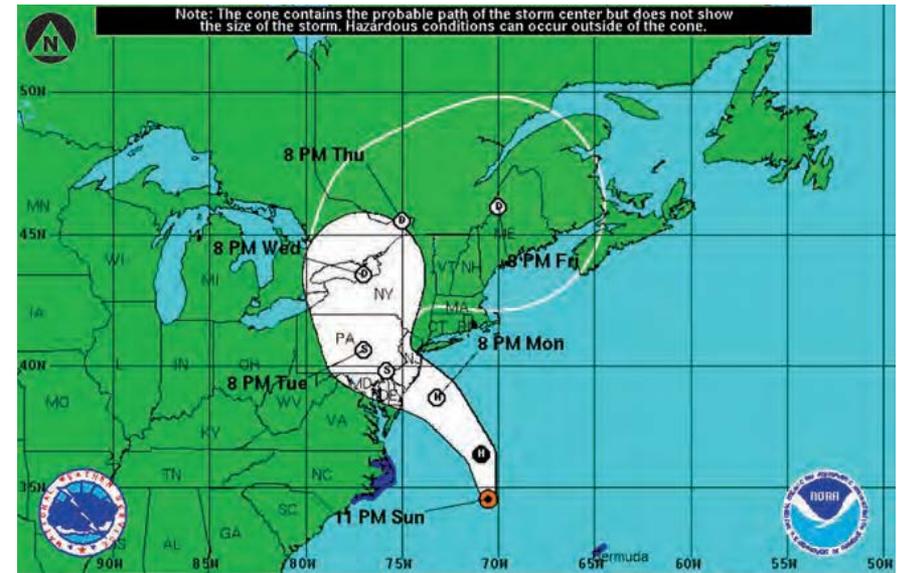
**Disaster Risk Reduction is a foundation
of Community Resilience**

Why Community Resilience?

- 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**

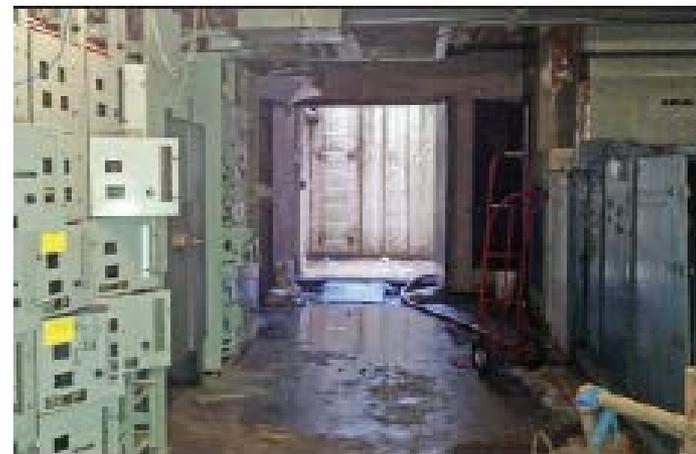
Why Community Resilience? (cont.)

- 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



Why Community Resilience? (cont.)

- 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
 - 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)

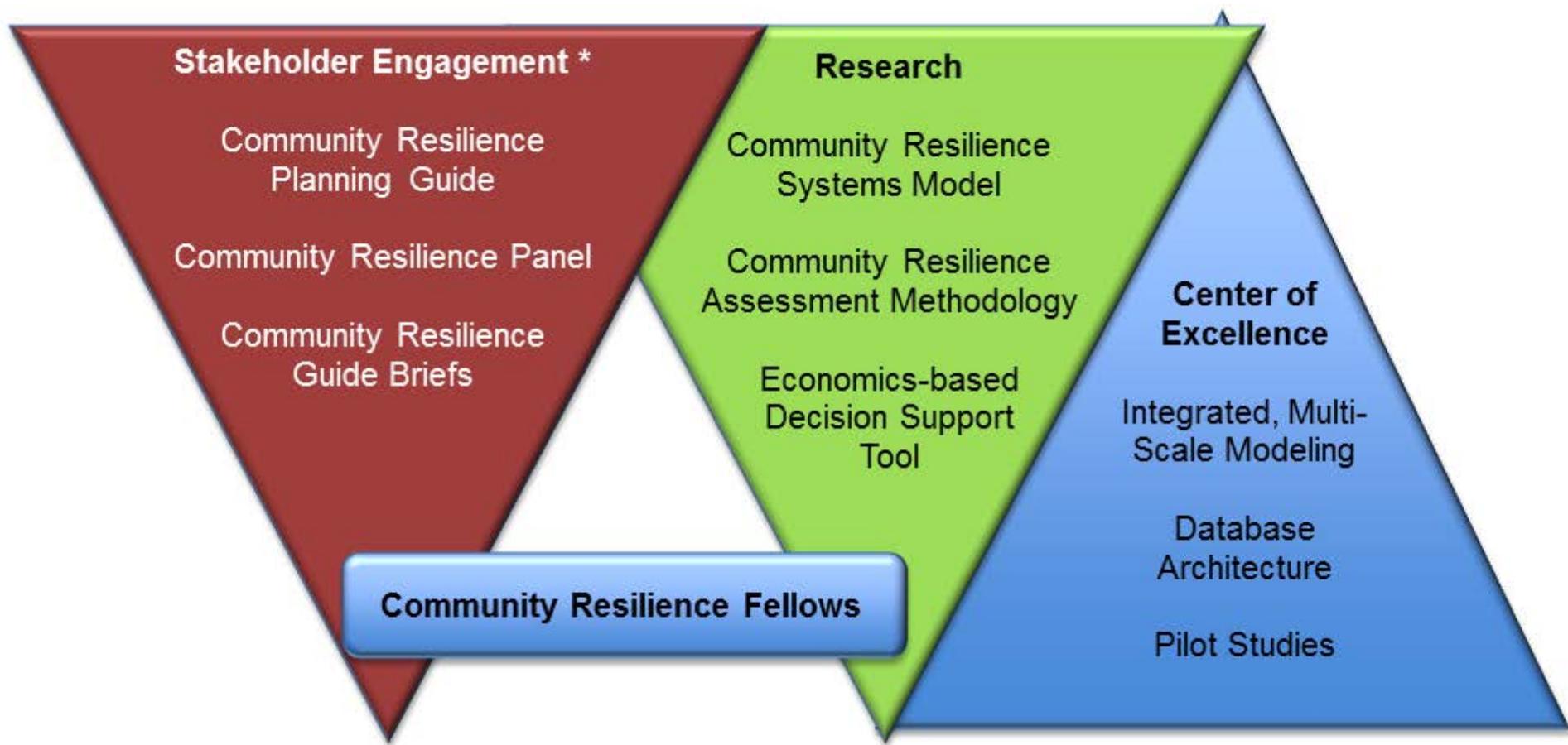
“... the ability to prepare for and adapt to changing conditions and to withstand and recover rapidly from disruptions.

Resilience includes the ability to withstand and recover from deliberate attacks, accidents, or naturally occurring threats or incidents.” (PPD 21)

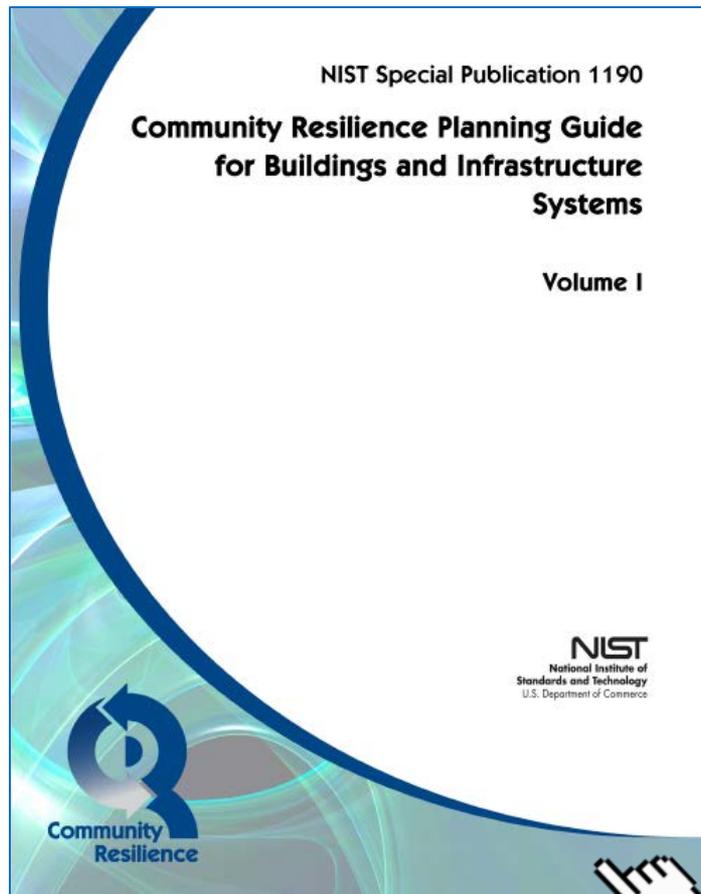
What is Resilience? (cont.)

- **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

NIST Community Resilience Program



Planning Guide Outline



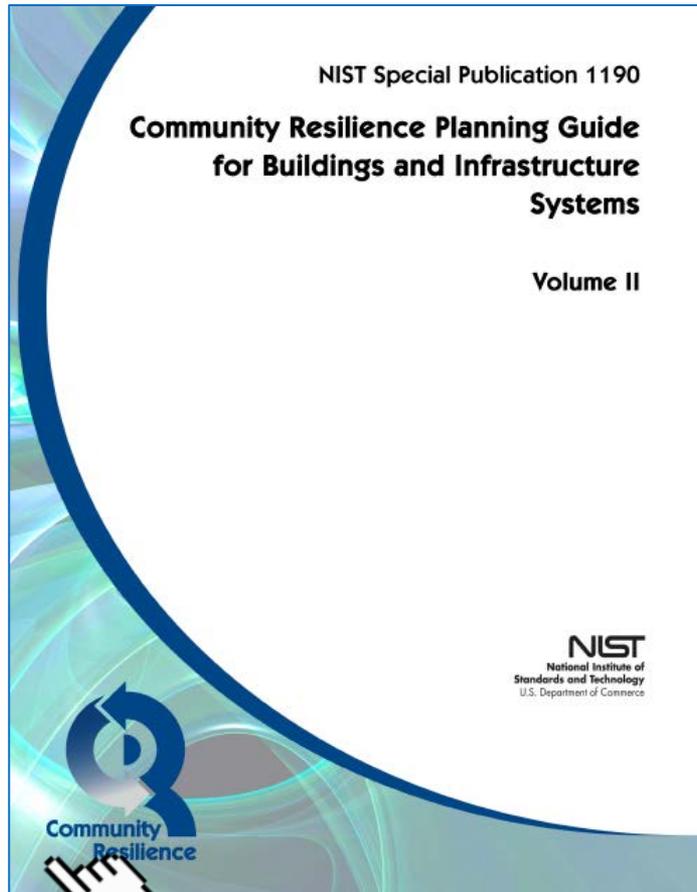
Volume I – Methodology

Executive Summary

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

[click to view Guide]

Planning Guide Outline (cont.)



[click to view Guide]

Volume II – 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

1. FORM A COLLABORATIVE PLANNING TEAM

- Identify leader
- Identify team members
- Identify key stakeholders



2. UNDERSTAND THE SITUATION



Social Dimensions

- Characterize social functions & dependencies
- Identify support by built environment
- Identify key contacts

Built Environment

- Identify and characterize built environment
- Identify key contacts
- Identify existing community plans

Link Social Functions & Built Environment

- Define clusters



3. DETERMINE GOALS & OBJECTIVES

- Establish long-term community goals
- Establish performance goals
- Define community hazards
- Determine anticipated performance
- Summarize results



4. PLAN DEVELOPMENT



- Evaluate gaps
- Identify solutions
- Develop implementation strategy

5. PLAN PREPARATION, REVIEW, AND APPROVAL

- Document plan and strategy
- Obtain feedback and approval
- Finalize and approve plan

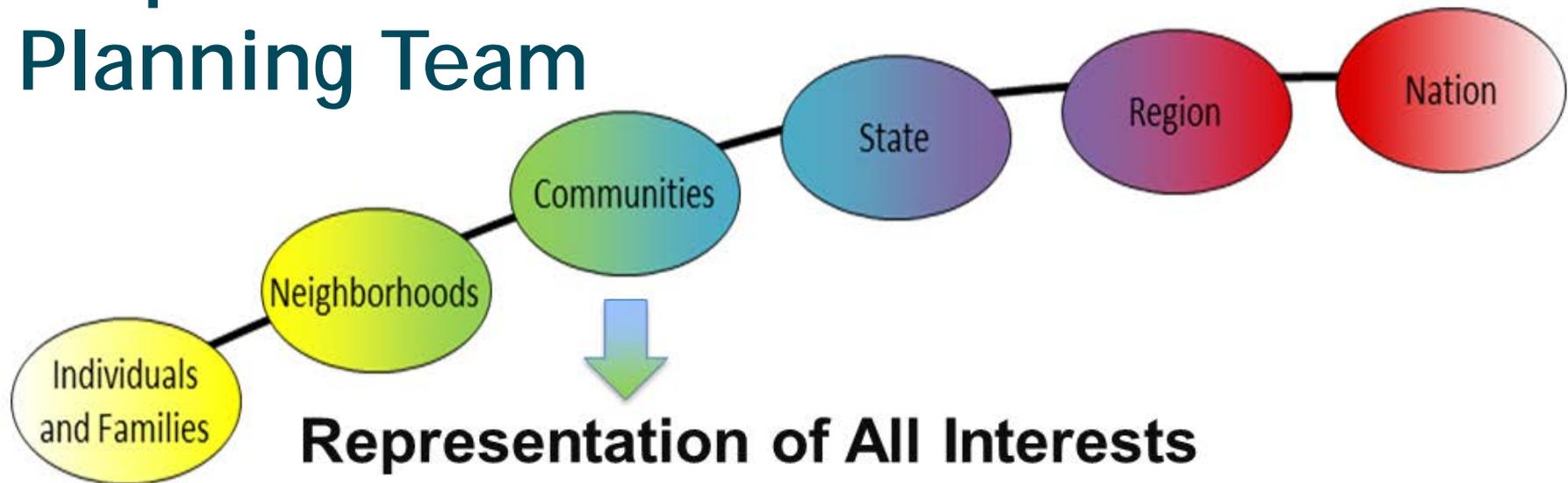


6. PLAN IMPLEMENTATION AND MAINTENANCE

- Execute approved solutions
- Evaluate and update
- Modify strategy as needed



Step 1. Form a Collaborative Planning Team



Representation of All Interests

Public

- Elected Officials
- Local Government
- Community Members

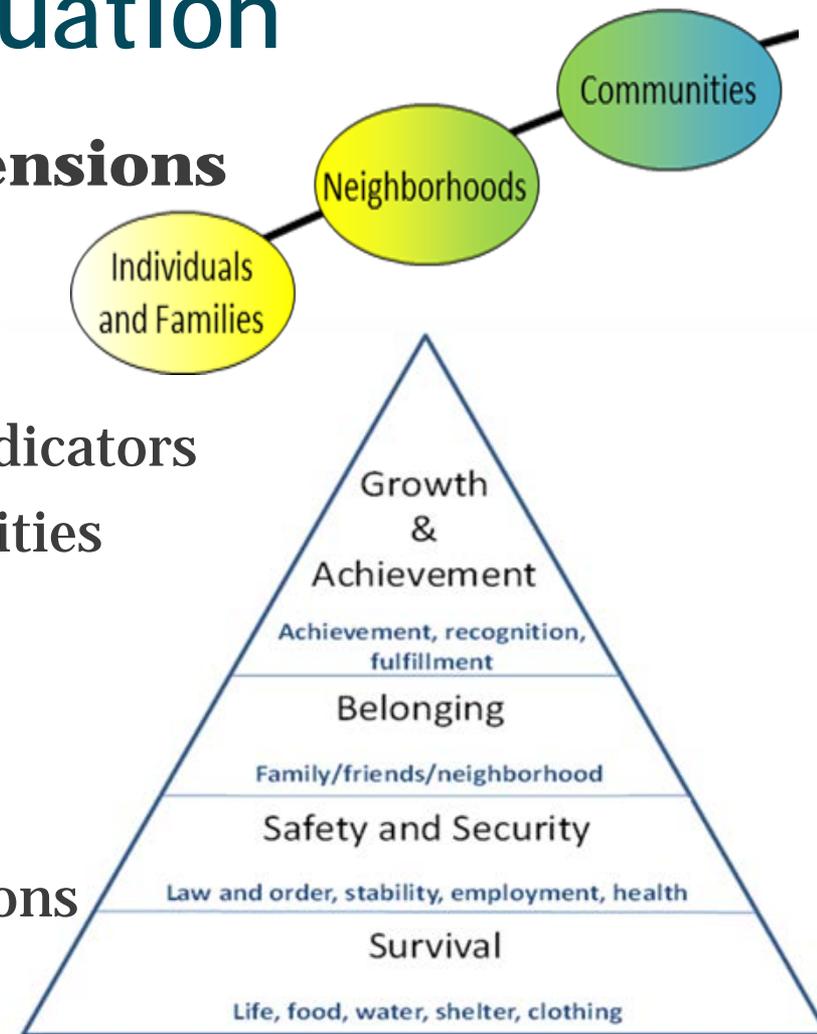
Private

- Business and Services
 - Banking, Health care
 - Utilities
 - Media
- Organizations
 - NGOs (VOAD, Relief)

2. Understand the Situation

Characterize the Social Dimensions

- Community members
 - Present and future needs
 - Demographics and economic indicators
 - Social Capital/Social Vulnerabilities
- Social institutions
 - Social functions
 - Gaps in capacity
 - Dependencies on other institutions
- Community metrics



2. Understand the Situation (cont.)

Characterize the Built Environment

- **Buildings** - Individual structures, including equipment and contents that house people and support social institutions
- **Building Clusters** - A set of buildings that serve a common function such as housing, healthcare, retail, etc.



2. Understand the Situation (cont.)

Characterize the Built Environment (cont.)

- **Infrastructure Systems** - Physical networks and structures that support social institutions, including transportation, energy, communications, water and waste water systems
- **Dependencies** - Internal and External, Time, Space, Source
- **Characterize** - Location, number, construction, demands and use, etc.



2. Understand the Situation (cont.)

Some rely more on the built environment



Emergency Rooms



Industrial Plants

Some functions change

Schools → Shelters



Link Social Dimensions and Built Environment

Identify how services are supported:

- Services provided to meet needs
- Dependency on other services and systems
- Dependency on built environment
- Consequences of loss

3. Determine Goals and Objectives

Establish Long Term Community Goals

- Long term goals to improve the community can guide the prioritization and implementation process
 - Improve reliability of infrastructure systems
 - Enhance community functions
 - Reduce travel time impacts to residents and businesses
 - Revitalize an existing blighted area

3. Determine Goals and Objectives (cont.)

Establish Long Term Community Goals (cont.)

- Community resilience is achieved over time
 - Resilience can be achieved with resources for current maintenance and capital improvements

3. Determine Goals and Objectives (cont.)

Establish Desired Performance Goals for the Built Environment

- Performance goals are independent of hazard events
 - Community functions are needed during recovery, such as acute health care, 911 call centers, emergency response
 - Consider role of a facility or system that impacts others outside the community

3. Determine Goals and Objectives (cont.)

Establish Desired Performance Goals for the Built Environment (cont.)

- Define goals in terms of '*time needed to restore functionality*'
- Use goals to help prioritize repair and reconstruction efforts
- Goals may suggest criteria for new construction and retrofit of existing construction

3. Determine Goals and Objectives (cont.)

Determine and Characterize Hazards

- Identify prevalent hazards
 - Wind, Earthquake, Inundation
 - Fire, Snow, Rain, Earthquake, Inundation
 - Human-caused or Technological
- Evaluate hazards for 3 levels

| | |
|----------------|---|
| Routine | Level expected to occur frequently • <i>Should have minimal disruption</i> |
| Design | Level used to design buildings • <i>Anchor for community planning</i> |
| Extreme | Maximum considered possible • <i>Plan for critical services</i> |

3. Determine Goals and Objectives (cont.)

Anticipated Performance of Existing Built Environment

Anticipated performance (restoration of function) during recovery depends on:

- Damage level - Condition and capacity of structural and nonstructural systems
- Recovery time - Materials, equipment, and labor needed for restoration
- Dependencies on other systems that may be damaged



Hurricane Irene



Hurricane Katrina

Example Matrix: Building Performance Goals

| Building Clusters | Support Needed ⁴ | Design Hazard Performance | | | | | | | | |
|---|-----------------------------|-------------------------------|-----|-----|-------------------------|-----|------|----------------------|------|-----|
| | | Phase 1 Short-Term | | | Phase 2 Intermediate | | | Phase 3 Long-Term | | |
| | | Days | | | Weeks | | | Months | | |
| | | 0 | 1 | 1-3 | 1-4 | 4-8 | 8-12 | 4 | 4-24 | 24+ |
| | | Building Performance Category | | | | | | | | |
| A | | | B | | | C | | | D | |
| Critical Facilities | | | | | | | | | | |
| Emergency Operation Centers | R, S, MS | 90% | | | | | | | X | |
| First Responder Facilities | R, S, MS | 90% | | | | | | | X | |
| Memorial Hospital | R, S, MS | 90% | | | | | | | X | |
| Non-ambulatory Occupants (prisons, nursing homes, etc.) | R, S, MS | 90% | | | | | | | X | |
| National Aircraft Parts Factory (NAP) | R, S, C | 90% | | | | | | | X | |
| Emergency Housing | | | | | | | | | | |
| Temporary Emergency Shelters | R, S | 30% | 90% | | | | | | | X |
| Single and Multi-family Housing (Shelter in place) | R, S | 60% | | | 90% | | | | | X |
| Housing/Neighborhood | | | | | | | | | | |
| Critical Retail | R, S, C | | 30% | 60% | 90% | | | | | X |
| Religious and Spiritual Centers | R, S | | | 30% | 60% | 90% | | | | X |
| Single and Multi-family Housing (Full Function) | R, S | | | 30% | | 60% | | 90% | | X |
| Schools | R, S | | | 30% | 60% | 90% | | | | X |
| Hotels & Motels | R, S, C | | | 30% | | 60% | 90% | | | X |
| Community Recovery | | | | | | | | | | |
| Businesses – Manufacturing (except NAP) | R, S, C | | | | 30% | 60% | 90% | | | X |
| Businesses - Commodity Services | R, S, C | | | | 30% | 60% | | 90% | | X |
| Businesses - Service Professions | R, S, C | | | | 30% | | 60% | | 90% | X |
| Conference & Event Venues | R, S, C | | | | 30% | | 60% | | 90% | X |

Example Matrix: Transportation Infrastructure

| Transportation Infrastructure | Support Needed ⁴ | Design Hazard Performance | | | | | | | | |
|--|-----------------------------|---------------------------|-----|-----|-------------------------|-----|------|----------------------|------|-----|
| | | Phase 1 Short-Term | | | Phase 2 Intermediate | | | Phase 3 Long-Term | | |
| | | Days | | | Weeks | | | Months | | |
| | | 0 | 1 | 1-3 | 1-4 | 4-8 | 8-12 | 4 | 4-24 | 24+ |
| Ingress (goods, services, disaster relief) | | | | | | | | | | |
| Local Roads | R, S | 60% | 90% | X | | | | | | |
| State Highways and Bridge | R, S | 60% | 90% | | X | | | | | |
| Regional Airport | R, S | | 30% | 60% | 90% | | X | | | |
| Egress (emergency egress, evacuation, etc.) | | | | | | | | | | |
| Local Roads | R, S | 60% | 90% | X | | | | | | |
| State Highways and Bridge | R, S | 60% | 90% | | X | | | | | |
| Regional Airport | R, S | | 30% | 60% | 90% | | X | | | |
| Community resilience | | | | | | | | | | |
| Critical Facilities | | | | | | | | | | |
| Hospitals | R, S | 60% | 90% | X | | | | | | |
| Police and Fire Stations | R, S | 60% | 90% | X | | | | | | |
| Emergency Operational Centers | R, S | 60% | 90% | X | | | | | | |
| Emergency Housing | | | | | | | | | | |
| Residences | R, S | 30% | 60% | 90% | X | | | | | |
| Emergency Responder Housing | R, S | 30% | 60% | 90% | X | | | | | |
| Public Shelters | R, S | 90% | | X | | | | | | |
| Housing/Neighborhoods | | | | | | | | | | |
| Essential City Service Facilities | R, S | 30% | 60% | 90% | X | | | | | |
| Schools | R, S | 30% | 60% | 90% | X | | | | | |
| Medical Provider Offices | R, S | 30% | 60% | 90% | X | | | | | |
| Retail | R, S | 30% | 60% | 90% | X | | | | | |
| Community Recovery | | | | | | | | | | |
| Residences | R, S | 30% | 60% | 90% | X | | | | | |
| Neighborhood retail | R, S | 30% | 60% | 90% | X | | | | | |
| Offices and work places | R, S | 30% | 60% | 90% | X | | | | | |
| Non-emergency City Services | R, S | 30% | 60% | 90% | X | | | | | |
| All businesses | R, S | | 30% | 60% | 90% | X | | | | |

Example Matrix: Energy Infrastructure

| Energy Infrastructure | Support Needed ⁴ | Design Hazard Performance | | | | | | | | |
|---|-----------------------------|---------------------------|-----|-----|-------------------------|-----|------|----------------------|------|-----|
| | | Phase 1 Short-Term | | | Phase 2 Intermediate | | | Phase 3 Long-Term | | |
| | | Days | | | Weeks | | | Months | | |
| | | 0 | 1 | 1-3 | 1-4 | 4-8 | 8-12 | 4 | 4-24 | 24+ |
| Power - Electric Utilities | | | | | | | | | | |
| Community Owner or Operated Bulk Generation | | | | | | | | | | |
| In Place Fueled Generation (Hydro, solar, wind, wave, compressed air) | R/C | 90% | X | | | | | | | |
| Transmission and Distribution (including Substations) | | | | | | | | | | |
| Critical Response Facilities and Support Systems | | | | | | | | | | |
| Hospitals, Police and Fire Stations / Emergency Operations Centers | R, C | 60% | 90% | X | | | | | | |
| Disaster debris / recycling centers/ related lifeline systems | R, C | 60% | 90% | X | | | | | | |
| Emergency Housing and Support Systems | | | | | | | | | | |
| Public Shelters / Nursing Homes / Food Distribution Centers | R, C | | 60% | 90% | X | | | | | |
| Emergency shelter for response / recovery workforce/ Key Commercial and Finance | R, C | | 60% | 90% | X | | | | | |
| Housing and Neighborhood infrastructure | | | | | | | | | | |
| Essential city services / schools / Medical offices | R, C | | 60% | 90% | X | | | | | |
| Houses of worship/meditation/ exercise | C | | 60% | 90% | X | | | | | |
| Buildings/space for social services (e.g., child services) and prosecution activities | C | | 60% | 90% | X | | | | | |
| Community Recovery Infrastructure | | | | | | | | | | |
| Commercial and industrial businesses / Non-emergency city services | C | | | 90% | X | | | | | |
| Residential housing restoration | R, S, MS, C | | | 90% | X | | | | | |

Example Matrix: Water Infrastructure

| Water Infrastructure | Support Needed ⁴ | Design Hazard Performance | | | | | | | | |
|---|-----------------------------|---------------------------|-----|-----|-------------------------|-----|------|----------------------|------|-----|
| | | Phase 1 Short-Term | | | Phase 2 Intermediate | | | Phase 3 Long-Term | | |
| | | Days | | | Weeks | | | Months | | |
| | | 0 | 1 | 1-3 | 1-4 | 4-8 | 8-12 | 4 | 4-24 | 24+ |
| Source | | | | | | | | | | |
| Raw or source water and terminal reservoirs | R, S | | | 90% | | | | | | |
| Raw water conveyance (pump stations, piping to WTP) | R, S | | | | 90% | | | | X | |
| Potable water at supply (WTP, wells, impoundment) | R, S | 30% | | 60% | 90% | | | X | | |
| Water for fire suppression at key supply points (to promote redundancy) | R, S | 90% | | | X | | | | | |
| Transmission (including Booster Stations) | | | | | | | | | | |
| Backbone transmission facilities (pipelines, pump stations, and tanks) | R, S | 90% | | | | | X | | | |
| Control Systems | | | | | | | | | | |
| SCADA or other control systems | R, S | 30% | | 60% | 90% | | X | | | |
| Distribution | | | | | | | | | | |
| Critical Facilities | | | | | | | | | | |
| Wholesale Users (other communities, rural water districts) | R, S | | 60% | 90% | | | X | | | |
| Hospitals, EOC, Police Station, Fire Stations | R, S | | 60% | 90% | | | X | | | |
| Emergency Housing | | | | | | | | | | |
| Emergency Shelters | R, S | | 60% | 90% | | | X | | | |
| Housing/Neighborhoods | | | | | | | | | | |
| Drinking water available at community distribution centers | R, S | | | 60% | 90% | | | | | |
| Water for fire suppression at fire hydrants | R, S | | | | 90% | | | | X | |
| Community Recovery Infrastructure | | | | | | | | | | |
| All other clusters | R, S | | | 30% | 90% | | | | X | |

Example Summary Resilience Matrix

| 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 | 90% | | | | | | | X | |
| Transportation | | 90% | X | | | | | | |
| Energy | | 90% | X | | | | | | |
| Water | | | 90% | | X | | | | |
| Wastewater | | | | 90% | | | | X | |
| Communication | | 90% | | X | | | | | |
| Emergency Housing | | | | | | | | | |
| Buildings | | | | | | | | | |
| Transportation | | | | | | | | | |
| Energy | | | | | | | | | |
| Water | | | | | X | | | | |
| Waste Water | | | | | | | | | |
| Communication | | | | 90% | X | | | | |
| Housing/Neighborhoods | | | | | | | | | |
| Buildings | | | | | | 90% | | | X |
| Transportation | | | 90% | X | | | | | |
| Energy | | | 90% | X | | | | | |
| Water | | | | 90% | | | | X | |
| Waste Water | | | | | 90% | | | X | |
| Communication | | | | 90% | | | X | | |
| Community Recovery | | | | | | | | | |
| Buildings | | | | | | | | 90% | X |
| Transportation | | | | 90% | X | | | | |
| Energy | | | 90% | X | | | | | |
| Water | | | | 90% | | | | X | |
| Waste Water | | | | | | | 90% | X | |
| Communication | | | | 90% | | | X | | |

Desired Performance

Anticipated Performance



Superstorm Sandy

4. Plan Development

Evaluate Gaps and Evaluate Incentives

- Prioritize gaps
 - Long-term community goals
 - Social needs during recovery
- Identify alternative solutions
 - Multiple stages
 - Temporary and permanent
 - Administrative
 - Construction

- **Floodplain management**
 - Reduce threat: relocate, elevate
- **Wind and seismic preparedness**
 - Strengthen: retrofit, redundancy
- **Recovery Plans**
 - Mutual aid agreements
 - Improvement plans

| 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 | [Redacted] | | | | | | | | | |
| Buildings | [Redacted] | | | | | | | | | |
| Transportation | 90% | [Redacted] | | | | | | | | |
| Energy | 90% | [Redacted] | | | | | | | | |
| Water | [Redacted] | | | | | | | | | |
| Wastewater | [Redacted] | | | | | | | | | |
| Communication | 90% | [Redacted] | | | | | | | | |

4. Plan Development (cont.)

Prioritize Solutions and Develop Implementation Strategy

- Select solutions for prioritized performance gaps
 - Determine how alternative solutions can be combined to meet community goals
 - Consider collaborative projects



2013 Mandatory Soft Story Retrofit program for all older, wood-framed, multi-family buildings ensures the safety and resilience of San Francisco

4. Plan Development (cont.)

Prioritize Solutions and Develop Implementation Strategy (cont.)

- Develop implementation strategies
 - Quantify benefits of impact on public safety and social needs
 - Evaluate economic impacts on community - costs and savings
 - Consider short- and long-term benefits versus costs
- Determine preferred implementation strategy



North Texas 2050 plan integrates land use, natural resources, transportation, housing, water and wastewater infrastructure, parks and open spaces

5. Plan Preparation, Review, and Approval

Plan Approval

- Document proposed implementation strategy and supporting assessments and solutions
- Share with all stakeholders and community members
 - Public Meetings, review and comment period
- Finalize and approve community plan



6. Plan Implementation and Maintenance

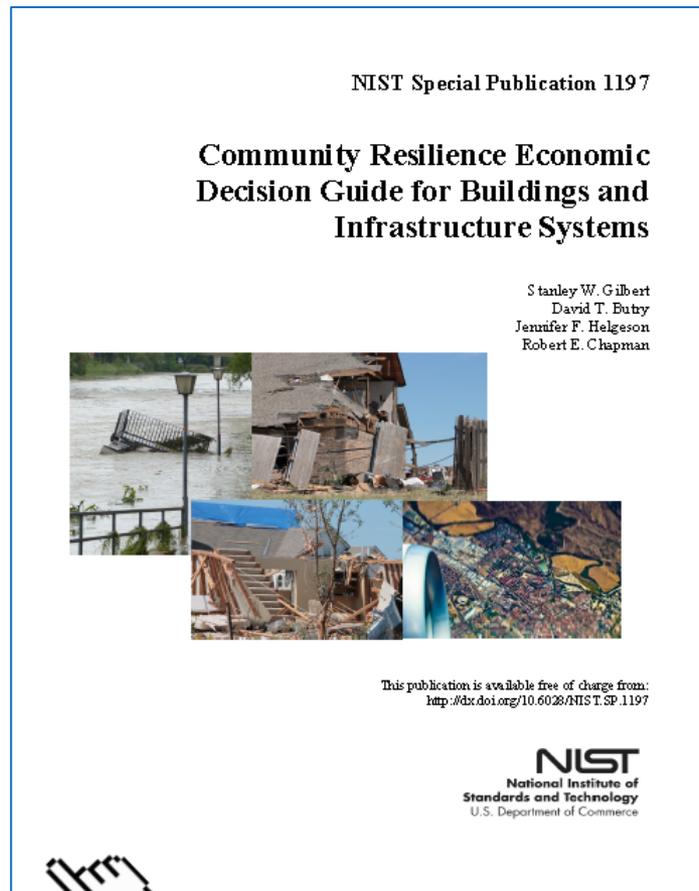
- ***Implementation***

- Formally adopt community plan to guide local government and agencies
- Identify and obtain resources to implement solutions
- Track and *communicate progress* to stakeholders

- ***Plan Maintenance***

- Review strategy and solutions on a regular basis
- Modify or update as needed

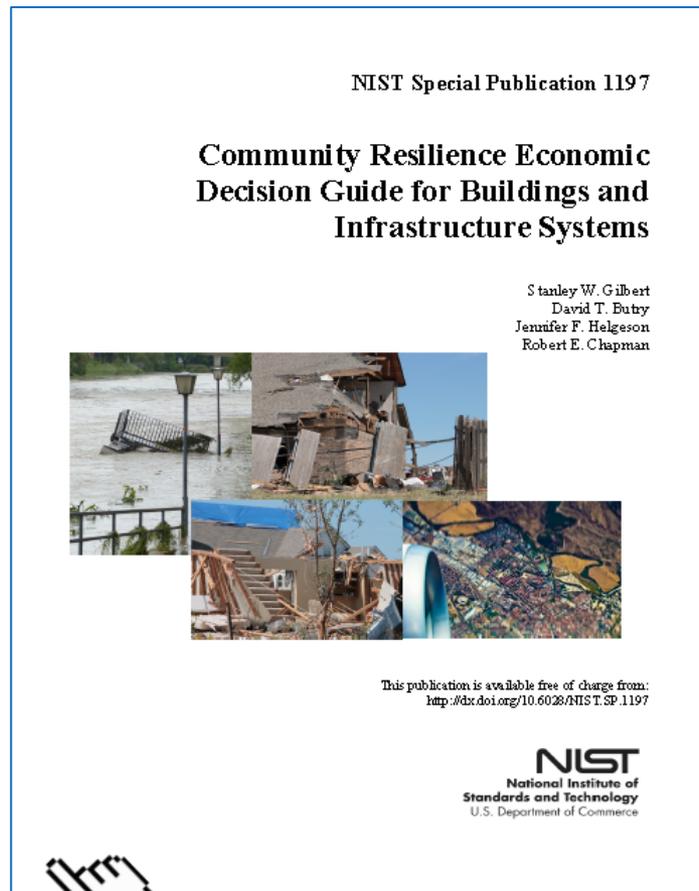
Economic Decision Guide (EDG)



[click to view Guide]

- Provides a standard methodology for evaluating investment decisions aimed at improving the resilience of communities
- Specifically designed for use with NIST's *Community Resilience Planning Guide for Buildings and Infrastructure Systems*
 - Provides a mechanism to evaluate the efficiency of resilience actions and to prioritize them

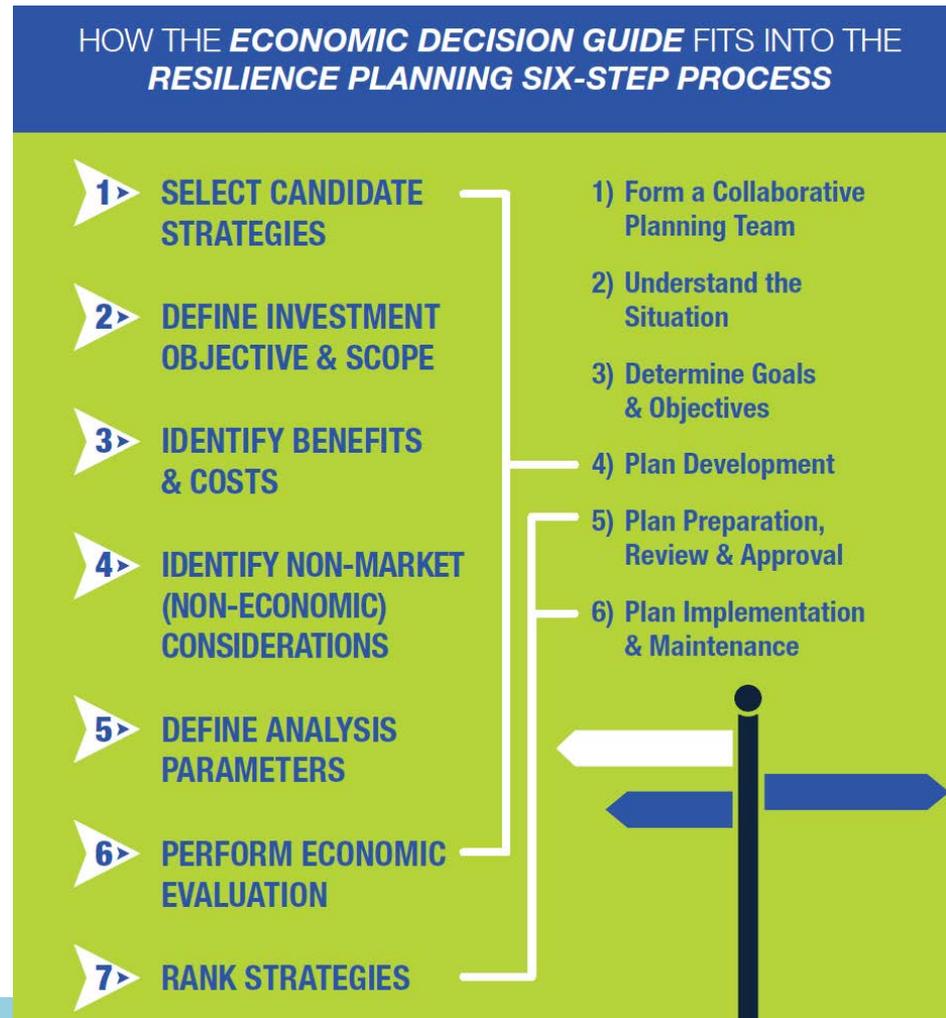
Economic Decision Guide (cont.)



[click to view Guide]

- Frames the economic decision process
 - Identifies and compares resilience-related benefits & costs
 - Across competing alternatives
 - Versus the status quo (do-nothing)

Process Overview



Economic Decision Process Overview

Community Resilience Panel

- Engage and connect community and cross-discipline stakeholders
- Identify policy and standards-related gaps and impediments to community resilience
- Develop and maintain a Resilience Knowledge Base



Community Resilience Panel (cont.)

- Panel meets twice per year at locations around the country
- Standing committees and Panel Coordinating Committee meet monthly by phone
- Membership is open to all interested parties
- There are approximately 390 members currently including:
 - State, local, and federal government representatives
 - Utility owners and operators
 - Insurance/re-insurance
 - Engineers and Architects
 - Economists
 - Social scientists



[click to visit website]

Implementation of the Guide

- Encourage use of the Guide for community resilience plans
- Collect data on implementation of resilience planning to inform future versions of the Guide and other products



NIST Contact

Website: <http://www.nist.gov/el/resilience/>

Guide: <http://www.nist.gov/el/resilience/guide.cfm>

Or google “NIST Resilience Planning Guide”

General E-mail: resilience@nist.gov



Thank You!



DISASTER
RISK REDUCTION
Ambassador Curriculum

- **Questions and/or comments**
- **Contact information**

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