Improving Local Resilience through Community Planning

National Association of Counties

August 4, 2016

Stronger Counties. Stronger America.

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Today's Speakers

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Improving Local Resilience through Community Planning

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National Institute of Standards and Technology

Joel Max, Emergency Management Coordinator,
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Outline

- Approach

- Community Resilience Planning Guide for Buildings and Infrastructure Systems

- Community Resilience Economic Decision Guide for Buildings and Infrastructure Systems

- Current Activities

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.

- 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.

- 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.
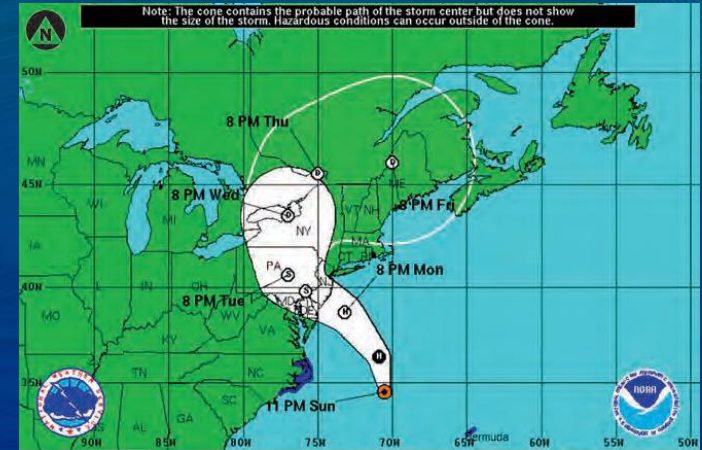
What is Resilience?

- *"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 <u>through recovery</u>:
  - 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

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

NIST Special Publication 1190

Community Resilience Planning Guide for Buildings and Infrastructure Systems

Volume I

NIST
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U.S. Department of Commerce

Community Resilience

ommunity Resilience Planning Guide for Buildings and Infrastructure Systems

Volume II

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Planning Steps for Community Resilience

SIX-STEP GUIDE TO PLANNING FOR COMMUNITY RESILIENCE
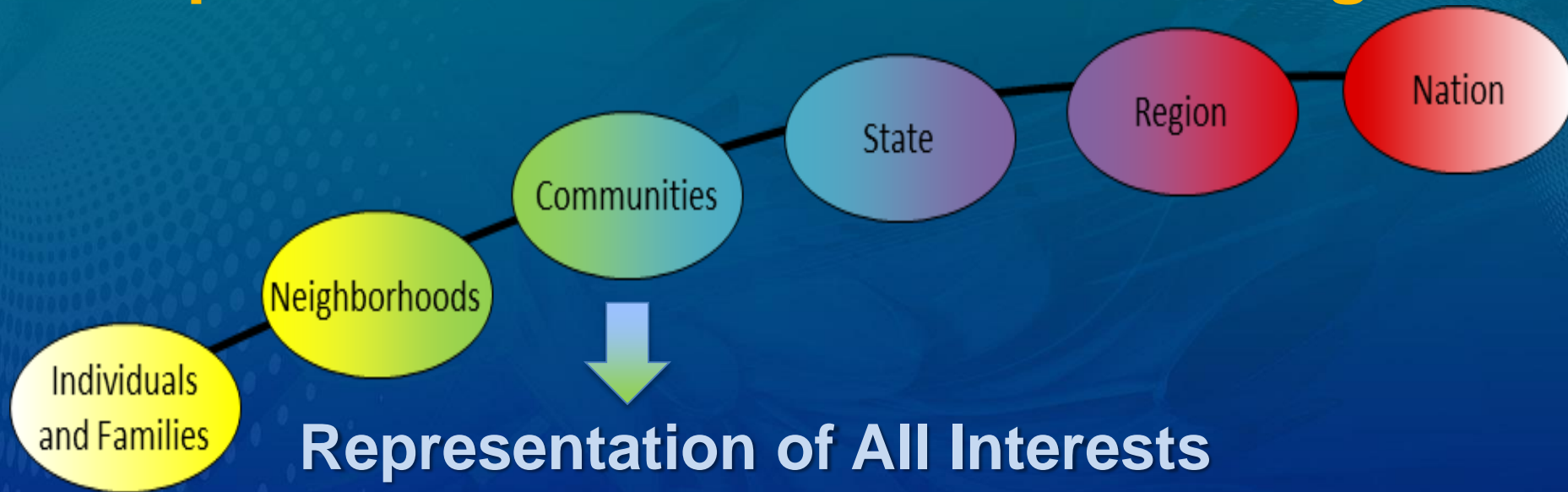
1. FORM A COLLABORATIVE PLANNING TEAM
- Identify leader
- Identify team members
- Identify key stakeholders

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

Community Resilience

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Step 1. Form a Collaborative Planning Team

Individuals and Families — Neighborhoods — Communities — State — Region — Nation

Representation of All Interests

Public

- Elected Officials
- Local Government
- Community Members

Private

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

Step 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
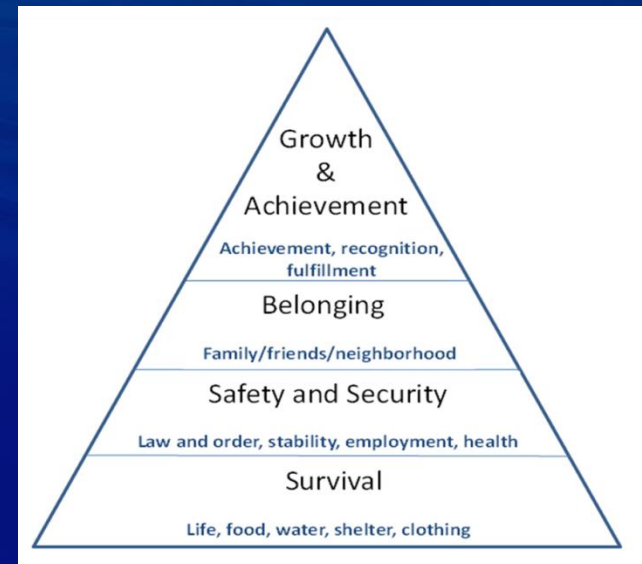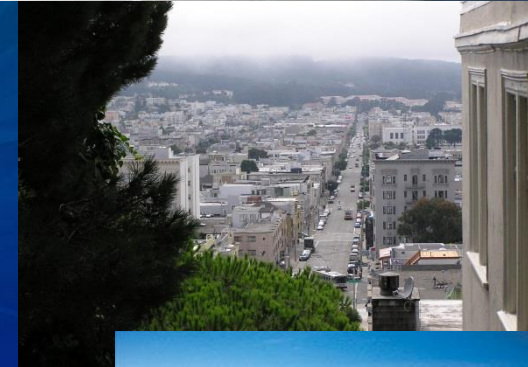
Characterize the Built Environment

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.

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.

Link Social Dimensions and Built Environment

Some rely more on the built environment

Emergency Rooms

Industrial Plants

Some functions change

Schools → **Shelters**

Identify how services are supported

- Services provided to meet needs

- Dependency on other services and systems

- Dependency on built environment

- Consequences of loss

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

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

Determine and Characterize Hazards

- Identify prevalent hazards
  - Wind, Earthquake, Inundation
  - Fire, Snow, Rain
  - Human-caused or Technological

- Evaluate hazards for 3 levels
  - Routine   Level expected to occur frequently
    - *Should have minimal disruption*
  - Design   Level used to design buildings
    - *Anchor for community planning*
  - Extreme   Maximum considered possible
    - *Plan for critical services*

Anticipated Performance of Existing Built Environment

- Anticipated performance (restoration of function) during recovery depends

  - 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				90%					
Transportation				X					
Energy				X					
Water					X				
Waste Water				90%					
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

Step 4. Plan Development
Evaluate Gaps and Identify Solutions

- Prioritize gaps
  - Long-term community goals
  - Social needs during recovery

- Identify alternative solutions
  - Multiple stages
  - Temporary and permanent
  - Administrative
  - Construction

- Flood plain 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									
Buildings	90%								
Transportation		90%							
Energy		90%							
Water			90%						
Wastewater				90%					
Communication		90%							

Prioritize Solutions and Develop Implementation Strategy

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

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

- 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.

Step 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.

APPROVED

Final Community Plan: Implementation Strategy

Step 6. Plan Implementation and Maintenance

Implementation

- Formally adopt community plan to guide local government and agencies

- Identify and obtain resources to implement solutions

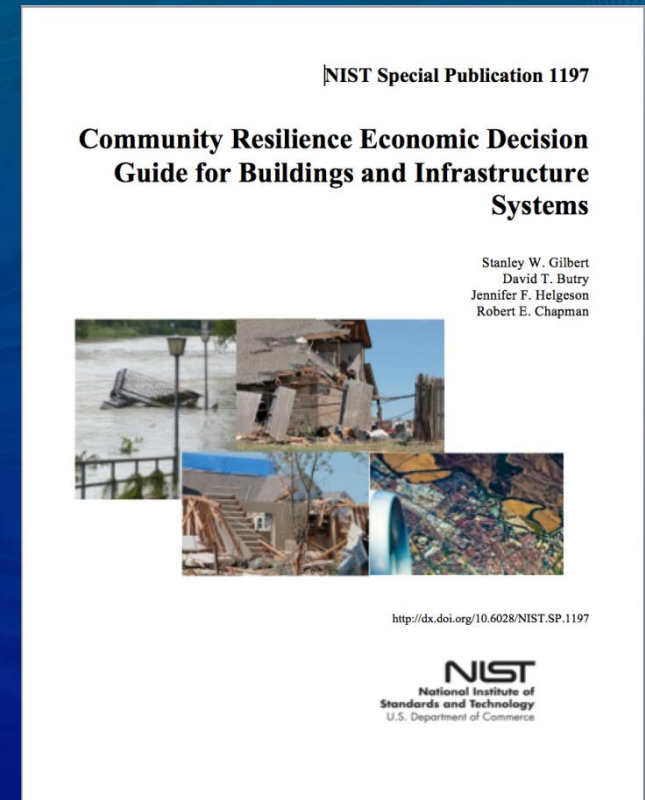- Track and *communicate progress* to stakeholders

Plan Maintenance

- Review strategy and solutions on a regular basis

- Modify or update as needed

Economic Decision Guide (EDG)

- 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 <u>efficiency</u> of resilience actions and to <u>prioritize</u> them

- Frames the economic decision process

  - Identifies and compares resilience-related benefits & costs

    - Across competing alternatives

    - Versus the status quo (do-nothing)

NIST Special Publication 1197

Community Resilience Economic Decision Guide for Buildings and Infrastructure Systems

Stanley W. Gilbert
David T. Butry
Jennifer F. Helgeson
Robert E. Chapman

http://dx.doi.org/10.6028/NIST.SP.1197

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# Next Steps …

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.

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.
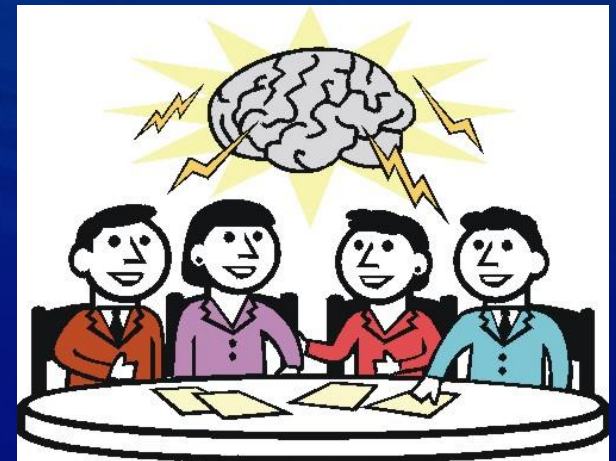
The Larimer County/Fort Collins Experience with the NIST Guide

Fort Collins Overview

- Pop approx. 149,600

- History of weather events, resilience

- Collaboration: City of Fort Collins and Larimer County

- Good relationship with state and federal government

- Why NIST Guide?

Progress to Date

- Over 20 stakeholder meetings across 8 Social Function Groups and 4 Utility Groups

- Contact with over 100 stakeholders

Progress to Date (cont…)

- Bridging Social Function Groups and utility companies to build resilience

- Year 1 nearly completed

- Years 2 and 3 to begin

- Transitioning from outreach and research to implementation phase over the next 2 years

Lessons Learned

- Lay the groundwork early

- Form an engaged Collaborative Planning Team

- Identify right champions for each Social Function Group

Lessons Learned (cont…)

- Be flexible with resilience language and outreach approach

- Stress the value added for each stakeholder group

- Move from "what" to "how"

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

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Question & Answer session

- Type your question into the "Questions" box and the moderator will read the question on your behalf.

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THANK YOU!

Additional questions or feedback?

Contact Jenna Moran at jmoran@naco.org