# 1. Framework Introduction

## 1.1. Overview

Communities are places where people live, work, play, and build their futures. Each community has its own identity based on its location, history, leadership, available resources, and the people who live and work there. Successful communities provide their members with the means to meet essential needs as well as pursue their interests and aspirations.

All communities are subject to disruptive events. Across the nation, communities experience disruptions from weather events, infrastructure failures, cyber-attacks, technological accidents, sea level rise, or other disruptive events. Buildings and infrastructure systems are vital to community prosperity and health. If these systems fail or are damaged, essential services are interrupted. Depending on the magnitude and duration of the disruptive event, communities may experience anything from temporary interruptions in services to a permanent loss of businesses and relocation of residents.

Community resilience is the ability of a community to prepare for anticipated hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions. Communities are looking for ways to become more resilient to disasters. This framework focuses on community resilience planning for the built environment, where the performance goals for the physical infrastructure systems are informed by the needs of the residents and social institutions. The built environment includes buildings and infrastructure systems, including power, communication, water and wastewater, and transportation systems.

Communities are increasingly aware of the need to become proactive and take steps to improve their resiliency, by preparing for anticipated hazards, adapting to changing conditions, and withstanding and recovering rapidly from disruptions. Changing conditions include the effects of aging infrastructure systems and climate change, such as sea level rise in coastal areas. In a resilient community, a hazard event at the design level should cause only local disruptions that the community can tolerate without long-term detrimental effects. If an unanticipated or extreme event occurs, the resilience planning and preparation should reduce the extent of disruption and recovery time. Additionally, communities that have a well-developed resilience plan are prepared to recover in a way that improves sustainability and resilience.

The Disaster Resilience Framework provides communities with a methodology to plan for resilience by prioritizing improvements to buildings and infrastructure systems based on their importance in supporting social institutions and economic functions in the community. Communities should implement resilience plans as a part of their long-term community planning process. Integrated long-term planning and implementation of measures to improve resilience can benefit community goals, such as providing an attractive, vibrant place to live for residents and a reliable environment for businesses to locate. A resilient community also provides day-to-day benefits to communities by reducing daily disruptions if improved design and construction practices are adopted. Even if it is many years before a significant hazard occurs, the community's resilience plan will continue to improve the performance of buildings and infrastructure systems to other hazards, including interdependencies and cascading effects of system failures.

This community resilience methodology has a set of core activities for developing a community resilience plan, presented in Chapters 2 to 9:

- Characterize Social Dimensions of the Community
- Characterize Built Environment and Hazards
- Plan for Community Resilience
- Develop Strategies for Existing Built Environment

- Develop Strategies for New Built Environment

Community resilience planning for the built environment requires input from all stakeholders, including local government, owners and operators of buildings and infrastructure systems, and residents with equal representation from the community's social institutions and economic functions. When all interests and needs are addressed in a comprehensive evaluation at the community level, communities develop a transparent, supportable path forward that is embraced and supported by everyone. Additionally, precious resources can be allocated based on a community-wide evaluation that prioritizes needed improvements.

## 1.2. Defining Communities

Communities are highly variable and diverse, with geographic areas and populations ranging from small, rural communities to large, urban, dense communities. Communities also differ by their histories, cultures, social make-up, businesses, industries, and access to and availability of resources.

The Community Capitals Framework, depicted in Figure 1-1, describes community assets and resources in terms of various forms of capital: natural, built (physical), financial (economic), human, social, political, and cultural. Each of the community capitals are interrelated and interact with each other, and can be considered the collective set of assets available within a given community.

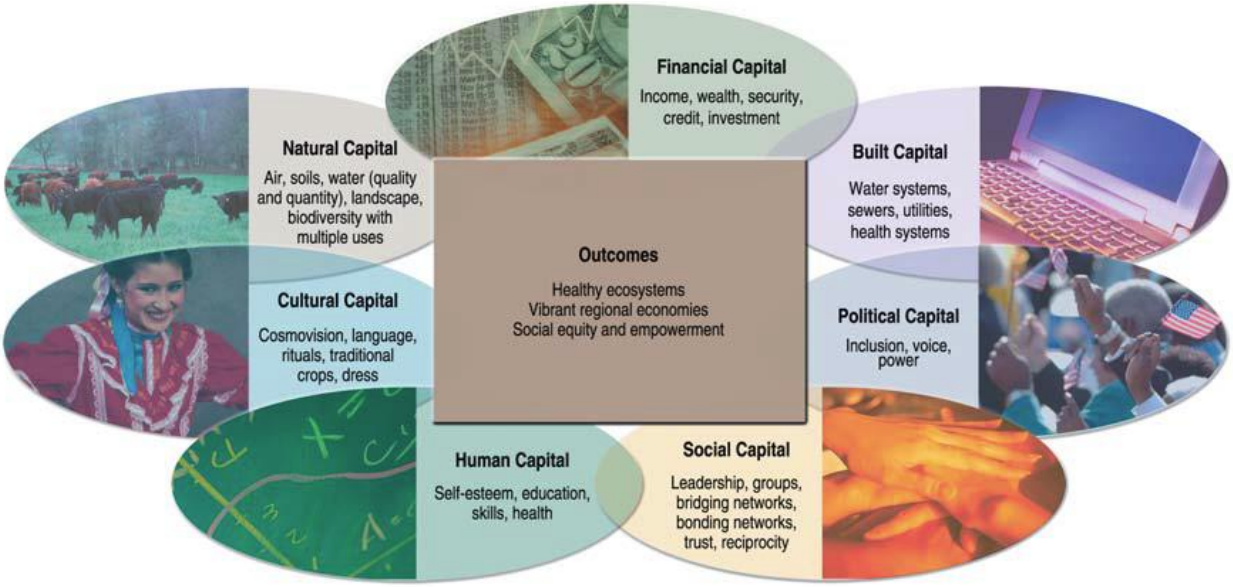


***Figure 1-1: The Community Capitals Framework (Flora et al, 2008).***

Community capitals are described as:[1]

- ***Natural*** – resources such as air, land, water, minerals, oil, and the overall stability of ecosystems
- ***Built*** – buildings and infrastructure systems within a community
- ***Financial*** – financial savings, income, investments, and available credit at the community-level
- ***Human*** – the knowledge, skills, health and physical ability of community members
- ***Social*** – social networks, associations, and the trust generated by them among groups and individuals within the community
- ***Political*** – having access to resources and the ability/power to influence their distribution; also, the ability to engage external entities in efforts to achieve goals

[1] Ritchie, Liesel A. and D.A. Gill, "Considering Community Capitals in Disaster Recovery and Resilience." http://www.riskinstitute.org/peri/component/option,com_deeppockets/task,catContShow/cat,86/id,1086/Itemid,84/.

- ***Cultural –*** language, symbols, mannerisms, attitudes, competencies, and orientations of local community members/groups.

Knowledge about each type of capital in a community provides stakeholders with valuable information, as it contributes to understanding about the community's well-being, sustainable development, and resilience. Awareness of community capitals helps identify short-term and long-term benefits, whether or not a hazard event occurs, and provides input to mitigation, preparedness, response, and recovery plans and investments.

While all the types of capitals are important to each community, this report focuses primarily on built capital (buildings and infrastructure systems), with consideration of how built capital supports other capitals within a community. The needs of citizens and social institutions, government, industry, and business should help define functional requirements for a community's buildings and infrastructure systems, as illustrated in Figure 1-2. For instance, after a significant hazard event, will residents be able to remain in their homes? Can governments communicate with residents to inform them and support recovery efforts? Will businesses and industries be able to resume operations within a reasonable period? These types of social needs determine the performance expected from a community's buildings and infrastructure systems. However, functional requirements at the community level are often not explicitly established.


***Figure 1-2: Social activities, such as individual citizens and social institutions, business and government define the functional requirements of the community buildings and infrastructure systems.***

A resilience plan offers a community answers and available alternative options. There may be multiple solutions or multiple stages to meet a requirement, including alternative or temporary solutions to meet the immediate need, as well as restoring a building or infrastructure system.

Functional buildings and infrastructure systems are necessary for communities to prosper. When buildings and infrastructure systems are damaged by hazard events, social services are interrupted, economic losses soar, and precious resources must be re-allocated to repair and rebuild. When the damage is extensive, the recovery process can be a significant drain on local residents and their resources and can be drawn out over years.

## 1.3. Community Resilience

The term "resilience" is used in many ways. The definition for the framework is contained in Presidential Policy Directive 21 (PPD-21).[2] The definition states, "The term 'resilience' means the ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions." Under this broad definition, resilience includes activities already conducted by some communities, such as disaster preparedness, hazard mitigation, code adoption and enforcement, and emergency response.

[2] Presidential Policy Directive 21, http://www.whitehouse.gov/the-press-office/2013/02/12/presidential-policy-directive-critical-infrastructure-security-and-resil.

In the context of this framework, the phrase "prepare for and adapt to changing conditions" refers to preparing for conditions that are likely to occur within the lifetime of a facility or infrastructure system, such as a hazard event, and hazard intensities or physical conditions that may change over time. Depending on location, this may include effects of climate change, such as sea level rise in coastal areas or a change in understanding of a hazard such as tornadoes. Changing conditions also include changes in our use of infrastructure systems. For example, increasing the use of communication and information devices leads to evolving levels of dependencies on information and power systems. Changing conditions may also include aging effects on infrastructure systems. If buildings and infrastructure systems are designed, maintained and operated properly, disruption to community functions should reduce over time, as more of the built environment will be performing at levels compatible with community resilience goals.

The second part of the definition, "withstand and recover quickly from disruptions," must be examined for the anticipated range of possible hazard events. In a resilient community, a hazard event at the design level may cause local disruptions tolerated by the community without long-term detrimental effects (e.g., permanent relocation of residents or business). If an unanticipated or extreme event occurs, the resilience planning and preparation will likely reduce the extent of disruption and recovery time. Additionally, communities that have a well-developed resilience plan are prepared for the recovery process.

## 1.4. Community Resilience of the Built Environment

### 1.4.1. Resilience Concept

Figure 1-3 illustrates the concept of resilience for an element of the built environment in terms of 'functionality' versus 'recovery time.' Functionality is a measure of how well a building or infrastructure system is able to operate and perform at its intended purpose. Recovery time provides a measure of how long a building or system function is unavailable or is operating at a reduced capacity. Recovery time also provides an indirect measure of the pre-event condition of the system, the performance of the system during the event, and the level of damage sustained.

Planning for resilience can minimize or even eliminate loss of functionality for a range of hazard event intensities, depending on the available solutions, resources, and priorities. For hazard events, loss of functionality occurs suddenly – on the order of minutes to days – due to physical damage to one or more systems, whereas recovery of functionality may take anywhere from hours to years. Typically, a lesser degree of lost functionality corresponds to a reduced time to full recovery. However, this simple example does not account for dependencies on other systems.

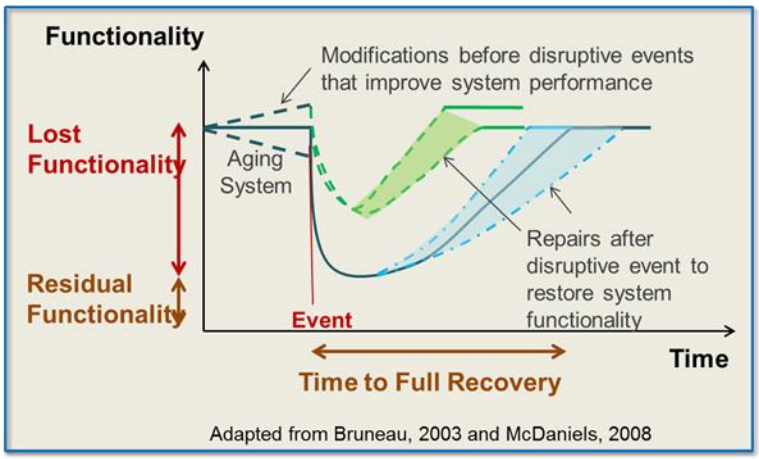


***Figure 1-3: Resilience can be expressed simply, in terms of system functionality and the time to recover functionality following a disruptive hazard event.***

## 1.5. Why Is Community Resilience Needed?

Hazard events can disrupt community functions so extensively that they result in permanent changes. Hurricane Katrina, in 2005, and Superstorm Sandy, in 2012, both caused extensive damage across many communities that are still recovering. However, even for lesser storm events, communities across our country experience significant damage each year. There were between 45 and 81 Presidential disaster declarations each year, from January 2000 to January 2011, for floods, hurricanes, tornadoes, earthquakes, fire events, and severe storms (FEMA 2011). Many of the disaster declarations were for hazard events with loads less than current design levels. Communities need to be proactive in staying resilient and minimizing and mitigating disruptions.

Communities currently reduce threats and vulnerabilities through activities that include adoption and enforcement of codes, standards, and regulations, as well as preparedness, mitigation, codes and standards-based design, and emergency management. These activities are necessary and prudent, but they are not enough to make a community resilient. Community resilience also requires that the built environment maintains acceptable levels of functionality during and after events. More specifically, communities should develop plans that recover the built environment to full functionality within a specified period. The recovery times are based on the role and importance of each facility or system within the community and the extent of disruption that can be tolerated while remaining functional.

However, across the nation, communities continue to experience significant damage and losses, despite robust adoption and enforcement of best practices, regulations, and codes and standards. This is partly because each one is developed independently for buildings and each infrastructure system and they do not address interdependencies between systems, nor community-level performance goals. As a result, integrated performance and dependencies between buildings and infrastructure systems cannot currently be addressed solely through the universal adoption of codes and regulations.

Additionally, communities are primarily composed of existing construction. Buildings and infrastructure systems are built to different standards based on the understanding of the hazards at the time. Many of the nation's infrastructure systems are reaching the end of their useful service life or operating in a degraded state. The American Society of Civil Engineers (ASCE) is committed to protecting the health, safety, and welfare of the public. As such, ASCE is equally committed to improving the nation's infrastructure systems. To document the national needs, a Report Card is issued to evaluate the condition and performance in 16 categories for infrastructure systems, assigning letter grades that are based on physical condition and needed investments for improvement. In 2013 (ASCE 2013), the overall Grade was a D+ with estimated investment of $3.6 trillion needed by 2020. Further, not all of these systems are operated and maintained as intended, some operate beyond design lifetimes, and the replacement rate for the built infrastructure is slow. While this deteriorated state is a cause for significant concern, it is also an opportunity to develop and implement a new paradigm – community resilience – when planning for and envisioning the future of each community.

### 1.5.1. Developing a Plan for Community Resilience

***Resilience Activities.*** For a community to have a resilient built environment, additional activities are needed beyond code adoption and enforcement. Figure 1-4 depicts how community resilience can be addressed at the community level. Disruptive events, including all anticipated hazards and effects of changing conditions are countered by a community resilience plan that includes performance goals for the built environment, and supporting strategies that include mitigation, response, and recovery activities. Other aspects of a resilient community – security, protection, emergency response, business continuity, and other issues related to human health, safety, and general welfare – may also inform the performance goals for the built environment. Plans to improve community resilience may also include land use policy, temporary measures, and other non-structural approaches.

***Mitigation through Land Use Planning.*** Land use planning is an important part of community planning and mitigation measures. Building and infrastructure design and construction are just one part of a comprehensive community development process that involves both new and renewed development. For communities that are built out, or are concerned about areas already constructed, there are two resilience options: (a) implement land use planning and redevelopment strategies to reduce the potential damage and disruption before a hazard event if there is political will and resources to do so and (b) develop plans for alternate land use/redevelopment strategies as part of the recovery process (return of functions and repairs/rebuilding). These options are part of hazards-based community development processes, particularly in geologic and flood-prone hazard areas.


***Figure 1-4. Community resilience can be achieved over time by developing performance goals and implementing methods to mitigate, resist, or recover from damage imposed by hazards, degradation, and climate change effects.***

***Hazards.*** Many older systems are difficult to improve through mitigation or design improvements. Therefore, it is helpful for communities to understand how their built environment (buildings and supporting infrastructure systems) will respond to a range of hazard levels or intensities. A hazard that occurs several times during the life of the system, such as every 10 to 20 years, is not expected to cause significant damage, and is referred to as a *Routine Hazard* event in this framework. *Expected Hazard* events, or design-level hazard events, may occur over the service life of a system. At a minimum, buildings are anticipated to remain stable during a hazard event, so that occupants can evacuate safely. However, the building may need to be repaired or replaced, depending on the hazard event and the extent and type of damage. Occasionally, *Extreme Hazard* events occur with a greater level or intensity than the Design Hazard. A system's capacity may be exceeded and cause widespread, cascading damage to other systems. These varying levels of hazard should all be considered with appropriate levels of emergency response and recovery plans.

***Performance Goals.*** Inclusion of desired performance goals versus anticipated performance of the built environment to hazard events, *and* expected recovery sequences, time, and costs provides a complete basis for communities to allocate resources and prioritize improvements. Ideally, community resilience planning should integrate with long-term plans for economic development to achieve improved social and economic well-being in the long term. San Francisco and the state of Oregon are developing and implementing this approach for resilience planning (SPUR 2009, Yu, Wilson, and Wang 2014).

***Implementation.*** Community resilience is achieved over time through implementation of prioritized improvements occurring as funds and opportunities are available. Resilience planning at the individual system level, without a comprehensive understanding of the social and economic drivers present and the role of building or infrastructure systems in the community, may be incomplete and less effective.

With a resilience plan, answers and alternative options for the restoration of the built environment will be available and understood by the community. There may be multiple solutions or multiple stages to meet a requirement, including temporary or short-term solutions to meet immediate needs as well as long-term, permanent solutions that restore buildings or infrastructure systems.

***Core Activities.*** Table 1-1 lists core activities for developing a community resilience plan. The social dimensions of the community identify what functions are important to a community, and when they need to be available during or after an event.

***Table 1-1: Core Activities for Community Resilience***

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|---|---|
| Establish Core Resilience Team | • Identify Chief Resilience Officer or other resilience leader<br>• Establish Resilience Office within community government<br>• Engage key stakeholders |
| Characterize Social Dimensions of the Community | • Identify and assess actual and desired functions of social institutions, including business, industry, and financial systems, based on individual/social needs met by these institutions and social vulnerabilities.<br>• Identify key stakeholders and representatives for decision making. |
| Characterize Built Environment and Hazards of the Community | • Identify and assess building and infrastructure systems, including condition, location, and vulnerabilities, and the ways in which the built environment support social functions.<br>• Identify hazard types and range of levels or intensities and changing conditions that the community anticipates.<br>• Identify key stakeholders and representatives for decision making. |
| Develop Plan for Community Resilience | • Establish desired and expected performance goals for the built environment during and after a hazard event that meet needed social functions after a hazard event with input from all key stakeholders<br>• Identify and prioritize gaps in the desired performance of the built environment that need to be addressed to improve community resilience |
| Implement Strategies for Existing Built Environment | • Identify methods that may include mitigation, retrofit, or relocation options<br>• Prioritize strategies based on gaps in the desired performance goals |
| Implement Strategies for New Built Environment | • Adopt provisions to improve the integrated performance of the built environment, such as land use, zoning, codes and standards, and local ordinances for buildings and infrastructure systems |

Chapter 2 discusses considerations for the needs of individuals and how a community meets these needs through social institutions, including government, business, industry, health care, and education institutions. Buildings and infrastructure systems that support the identified social functions are grouped, or clustered, as a subsystem. Additionally, anticipated hazards and the effects of changing conditions are identified. The desired and expected performance (i.e., recovery of function) of the clustered subsystems after a hazard event is evaluated. Significant gaps between these two performance levels are prioritized into strategies for improvement. Last, strategies are developed to address prioritized needs in the built environment. Chapter 3 offers guidance related to this process at the community level, and the basis for three hazard levels and intensities for each hazard. Chapters 5 to 9 provide a more detailed overview of buildings and infrastructure systems' performance in hazard events of all sizes, how they may affect community resilience, primary codes, standards, and regulations, and strategies for setting performance goals and determining prioritization and improvement of mitigation efforts.

***Resilience Guidance, Metrics and Tools.*** Chapter 10 summarizes available guidance, metrics, and tools for assessing community resilience. The chapter presents three types of community resilience metrics: recovery times for restoring function in building and infrastructure systems; economic metrics that

represent business, tax base, income, local services and amenities; and sustained growth, and social metrics that represent survival, safety and security, sense of belonging, and growth and achievement. The chapter further reviews examples of existing community resilience assessment tools and identifies the primary metrics used in each method.

## 1.6. Other Federal Activities Supporting Resilience

### 1.6.1. The National Preparedness Frameworks

For the last several years, the Federal Government worked to improve the resilience of the nation to disruptive events such as natural and human-caused hazards. This effort resulted in a number of guidance documents and tools for use to assess threats, hazards, and vulnerabilities in buildings and infrastructure systems and to develop approaches to reduce or eliminate those vulnerabilities. In particular, the Federal Emergency Management Agency (FEMA) was tasked through Presidential Policy Directive 8 on National Preparedness to produce a series of frameworks to address the spectrum of prevention, protection, mitigation, response, and recovery. This section provides a brief overview of the Presidential Policy Directive 8 frameworks and the relationship of the NIST Disaster Resilience framework to those documents.

On March 30, 2011, the President issued Presidential Policy Directive 8 (PPD-8), on National Preparedness.[3] PPD-8 directed the Secretary of Homeland Security to develop a National Preparedness Goal, establish a National Preparedness System, build and sustain preparedness, and submit a National Preparedness report annually.

The National Preparedness Goal, developed in response to PPD-8 is:

> *"A secure and resilient nation with the capabilities required across the whole community to prevent, protect against, mitigate, respond to, and recover from the threats and hazards that pose the greatest risk."*[4]

The National Preparedness Goal further established 31 core capabilities necessary to achieve the goal.[5] These core capabilities are organized into five mission areas: Prevention, Protection, Mitigation, Response, and Recovery. Each mission area has a framework document that describes the roles and responsibilities of the whole community.

- Individuals, families, and households
- Communities
- Non-governmental organizations (NGOs)
- Private sector entities
- Local governments
- State, tribal, territorial, and insular area governments
- Federal Government

With the exception of the National Prevention Framework, which specifically addresses, "the capabilities necessary to avoid, prevent, or stop a threatened or actual act of terrorism,"[6] the remaining framework documents address protection, mitigation, and response to all hazards – natural and human-caused. The National Response Framework, while structured somewhat differently to address the roles that state, tribal and, especially, the federal government play in supporting recovery following a major event. The

[3] Presidential Policy Directive, PPD-8 – National Preparedness, http://www.dhs.gov/presidential-policy-directive-8-national-preparedness.
[4] National Preparedness Goal, https://www.fema.gov/national-preparedness-goal.
[5] National Preparedness Goal, Core Capabilities, https://www.fema.gov/core-capabilities.
[6] National Prevention Framework, http://www.fema.gov/media-library-data/20130726-1913-25045-6071/final_national_prevention_framework_20130501.pdf, page 1.

documents also emphasize the role of community and local government in recovery and especially in pre-event planning for the recovery.

The PPD-8 framework documents distinguish between community and local government. The PPD-8 documents consider communities as "unified groups that share goals, values, or purposes, and may operate independently of geographic boundaries or jurisdictions."[7] When NIST refers to "community" in the Disaster Resilience Framework, it refers to an entity defined by a clear geographical boundary and a governance structure capable of making or influencing decisions that affect resilience. The NIST Disaster Resilience Framework recognizes the importance of these organizations to community resilience, but relies on the local government to coordinate closely with these organizations when establishing plans and priorities for the built environment, so that these organizations are able to carry out their roles in support of response and recovery when disruptive events occur.

The NIST Disaster Resilience Framework complements the PPD-8 framework documents by providing a methodology and specific guidance for developing a prioritization plan, at the local level, to reestablish the function of buildings and infrastructure following a disruptive event, so as to meet the societal goals of the community. The Disaster Resilience Framework allows communities to consider interdependencies among buildings, infrastructure and the social and economic systems present in the community. The Disaster Resilience Framework also considers potential downstream cascading effects that occur from disruptions in these systems. The Disaster Resilience Framework provides a critical to identify and address opportunities to enhance resilience.

### 1.6.2. Disaster Mitigation Assessment

Nearly 24,000 communities, representing 80% of the people in the United States, have developed mitigation plans in accordance with FEMA Disaster Mitigation Assessment guidance[8], based on the Disaster Mitigation Act of 2000[9]. As mitigation is a component of resilience, these communities are taking substantive steps toward planning for resilience. A planning process that includes a detailed consideration of the built environment as outlined in the Disaster Resilience Framework and incorporates ongoing mitigation planning provides a comprehensive understanding of community resilience.

With the existing community mitigation planning structures, expanding the scope to resilience is the next logical step. Those already involved in mitigation activities have similar types of roles and responsibilities needed for resilience. The mitigation planning process emphasizes public participation in vetting mitigation strategies with targets, actions and priorities. Community resilience plans can be built around existing mitigation plans using the framework techniques related to the built environment.

## 1.7. Disaster Resilience Framework and Supporting Activities

### 1.7.1. Disaster Resilience Framework

The framework addresses resilience at the community scale, and provides an adaptable process for communities of varying size and complexity. Communities have a governance structure that can lead development, manage resources, and enforce codes, standards, regulations and other policies. In implementing mitigation and recovery planning, community resilience planning aims to engage the whole community to transform their interdependencies into opportunities for progressive investments in their future that have tangible, everyday benefits with big payoffs.

Resilience of the built environment can be assessed at local, regional, or national scales, depending on the infrastructure systems under consideration and the entity conducting the assessment. For instance, many electric power systems provide service to a region with a number of communities. A resilience assessment

[7] National Protection Framework, http://www.fema.gov/media-library-data/1406717583765-996837bf788e20e977eb5079f4174240/FINAL_National_Protection_Framework_20140729.pdf, page 6.
[8] https://www.fema.gov/multi-hazard-mitigation-plan-status
[9] https://www.fema.gov/media-library/assets/documents/4596

by the power company of its system would likely be at a regional scale. However, a community receiving service from the power company would assess the resilience of its infrastructure systems within the community boundaries, based on individually established needs and performance goals. Part of the community resilience plan should include coordination with and input from the power company to inform the community performance goals. While a community will not own all the infrastructure systems operating within its boundaries, their plans should include input from building and infrastructure system owners.

The framework provides guidance on how to identify a community's social functions and establish supporting performance goals for recovery of function for the built environment. Achieving a resilient built environment requires the participation of many parties, from decision makers to system operators and users of the systems. Thus, this framework is intended for several audiences: community-level decision makers, owners and operators of buildings and infrastructure systems, and planners and designers of the built environment.

The executive summary provides an overview of why community resilience should be incorporated into community development plans, community resilience activities, and how other ongoing plans, such as mitigation plans, can be incorporated into community resilience plans. Chapters 2 to 4 provide community level guidance for resilience planning and describe the process for setting performance goals, identifying hazards and vulnerabilities, and planning for recovery after a hazard event. These chapters should inform those tasked with developing community level plans and coordinating with owners and operators of infrastructure systems and organizations. Chapters 5 to 9 offer specific resilience guidance for buildings and infrastructure systems and Chapter 10 provides guidance on available resilience tools and metrics.

Chapter 2 supplies guidance on the types of social functions and vulnerabilities that a community may need to address following a disaster event, including education, health care, economic and government functions, and on how social needs can help define the performance goals for the built environment.

Chapter 3 presents guidance on developing integrated performance goals for recovery of the community, independent of hazards. In other words, the community needs to envision how it wants to function during, and recover after, an event. It is strongly recommended that communities define performance goals for several levels of a hazard: routine hazards, expected hazards, and extreme hazards. When the performance goals are evaluated for each hazard level, different vulnerabilities may be identified.

Chapter 4 addresses known interdependencies between infrastructure systems, and identifies the types of cascading events that may occur given the failure of an individual infrastructure system. Knowledge of possible dependencies will improve recovery planning.

Chapters 5 to 9 describe the process in more detail for buildings, building clusters and infrastructure systems (i.e., transportation, power, communication, and water and wastewater systems), with a focus on owners and operators. The guidance includes considerations for determining desired and expected performance goals for recovery of function, based on the guidance provided in Chapter 3. These chapters also describe the types of systems that should be considered and the regulatory environment under which they are designed. Primary codes, standards, tools, and best practices are also identified.

Chapter 10 provides an annotated listing of available metrics and tools to support resilience planning and implementation.

Due to the significant breadth of stakeholders and knowledge required to develop this report, NIST consulted experts in each of the infrastructure domains, held a series of workshops to engage a number of stakeholders across the country, and solicited public comments during the framework development.

### 1.7.2. Disaster Resilience Standards Panel

A Disaster Resilience Standards Panel (DRSP), representing the broad spectrum of the stakeholder community, will support the further framework development and refinement. The DRSP will operate as an independent organization for the broad range of stakeholders to address community resilience issues. Stakeholder interests include community planning, disaster recovery, emergency management, business continuity, insurance/re-insurance, state and local government, design, construction, and maintenance of buildings and infrastructure systems (water and wastewater, energy, communications, transportation), and standards and code development. The DRSP will also develop Model Resilience Guidelines for communities to enhance their disaster resilience.

### 1.7.3. Model Resilience Guidelines

The Model Resilience Guidelines will promote best practices and help communities develop their own disaster resilience plan. Expected topics include:

- Disaster-Resilient Performance Goals for Buildings and Infrastructure Systems
- Evaluating Community Disaster Resilience
- Procedures for Achieving Resilience Performance Goals
- Prioritizing Risk Reduction Activities at the Community Level

## 1.8. References

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