



BENCHMARKS FOR IMPROVING COMMUNITY RESILIENCE

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Abstract

Resilience is the ability to positively adapt to changes. To date, most resilience efforts have focused on individual community functions, systems and disciplines or are highly tailored, limiting their widespread use. However, communities rely on multiple functions to support daily life and resilience. Communities need methods to determine their current resilience looking across these functions and identify a roadmap to improvement.

Using the concepts within the Sendai Framework, the Alliance for National & Community Resilience (ANCR) has engaged subject matter experts including representatives from governments, business, academia, practitioners, finance, and insurance to develop benchmarks for 19 community functions cutting across social, organizational and infrastructural aspects of communities. Benchmarks provide a practical method for assessing cross-function resilience within a community by identifying its strengths and weaknesses and the interdependencies of multiple critical systems. A roadmap for improving resilience identifies standards, ratings, certifications and best practices useful in achieving a community's identified goals.

Recognizing that the safety, sustainability and resilience of a community's building stock has a direct correlation to the community's overall resilience, ANCR's first Benchmark, the Buildings Benchmark, focuses on codes, standards and other practices that facilitate resilient buildings. The second Benchmark, the Housing Benchmark, focuses on the affordability and availability of housing and the provision of adequate shelter following an event.

This paper walks through the development of the Benchmarks and how communities can use them to assess and improve their resilience from a whole community perspective rather than optimizing individual systems.

Keywords: benchmark; community resilience; (max. one line) separated by semicolon; Maximum 5

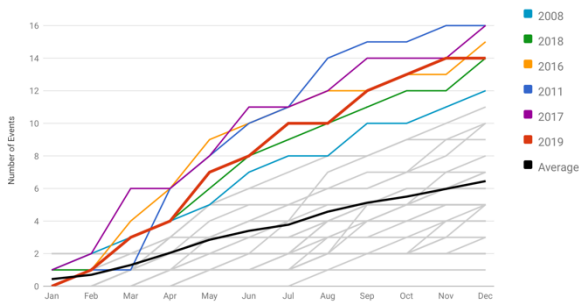


1. Introduction

Across America and internationally, communities are facing unprecedented environmental, social, and economic challenges. Environmental changes are making cities more vulnerable to heat waves, rising sea levels, dangerous flooding, prolonged droughts, and other extreme weather events. Social unrest in the nation’s urban centers is creating friction between residents, businesses, and government institutions. The precarious economic recovery is also complicating these challenges, as real wages fail to keep pace with rising costs, unemployment remains high, and the income gap widens.

The extent and impact of hazard events is growing to a level where reliance on governments to support recovery is being overwhelmed. In the United States, 2017 tied 2005 for the most weather and climatic events causing \$1 billion in damage and far exceeded any prior year in the costs associated with such disasters—totaling over \$300 billion. [1] See Figure 1. Earthquake-related events are not included in these figures, but add an additional level of risk and concern to an already overburdened recovery infrastructure. This situation is not limited to the U.S. The global reinsurer SwissRe has been tracking global hazard events and identified a similar upward trend. [2] See Figure 2.

1980-2019 Year-to-Date United States Billion-Dollar Disaster Event Frequency (CPI-Adjusted)
Event statistics are added according to the date on which they ended.



1980-2019 Year-to-Date United States Billion-Dollar Disaster Event Cost (CPI-Adjusted)
Event statistics are added according to the date on which they ended.

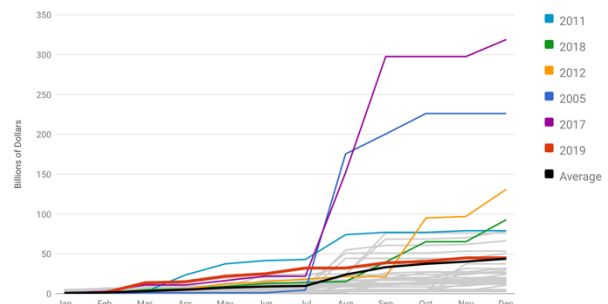


Fig. 1 - Number (left) and cost (right) of U.S weather and climate events causing \$1 billion damage or more [1]

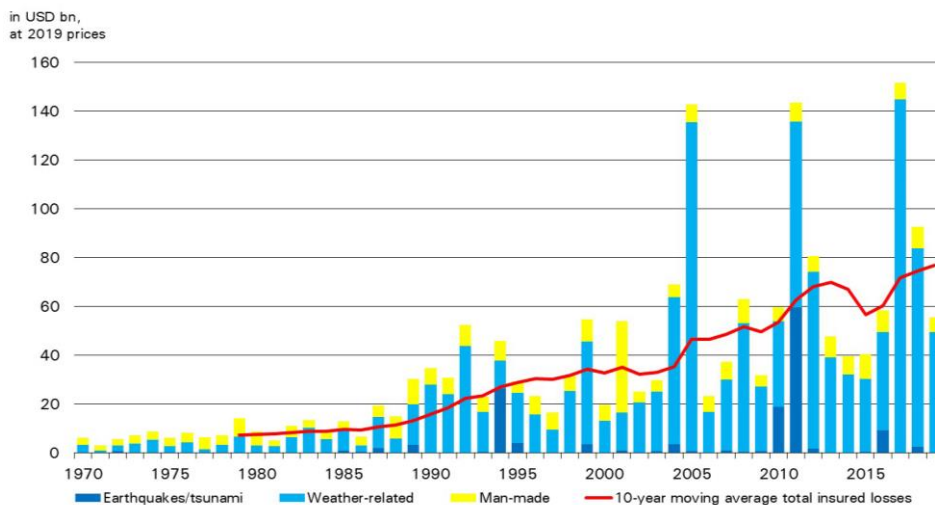


Fig. 2 – Global catastrophe-related insures losses (1970-2019) [2]



The concept of resilience has been identified as an approach to address these growing challenges. Resilience is the ability to respond to and positively adapt to change. This means anticipating the future and acting to mitigate potential harm while preparing to seize the opportunities inherent in turbulence and change. To date, many efforts to enhance resilience have focused on individual systems or disciplines. However, communities function as a system of systems, relying on the continued viability and service across social, organizational and infrastructural aspects of communities.

When disaster strikes, all of the gears of the local system must continue to function. A city with the lights on cannot effectively operate if the streets are impassable. A business that has survived hurricane winds cannot thrive if the banking networks have crashed. A household with running water cannot be sustained if the grocery store shelves are bare. Communities are complex, interconnected systems that urgently need a way to comprehend what it means to be resilient, and their need to become more resilient could not be greater or more pervasive.

This recognition of the need for a holistic approach to resilience and that communities need the tools to navigate this complex landscape led to the creation of the Alliance for National & Community Resilience (ANCR) and the development of the Community Resilience Benchmarks (CRBs) system.

2. Developing a Whole-Community Resilience Benchmark System

There currently is no practical, easily understandable way for communities to know their strengths or weaknesses—particularly across the entirety of departments and services—and therefore no way for them to gauge their true resilience. With no understanding of their resilience position, communities have little impetus to undertake the vital but difficult challenge of taking action to reduce risk. They are unable to see that they can achieve clear short-term benefits through better access to capital, lower interest rates, and a more accommodating insurance market by taking actions to make the whole community more resilient in the longer-term.

Achieving community resilience requires the engagement and buy-in of multiple community stakeholders. There are over 89,000 communities across the U.S.—cities, towns, and counties ranging in size, population, demographics, economic priorities, environmental challenges, investment opportunities, and financial constraints. Governments can lead, encourage, facilitate, assist, and even hinder communities as they seek to become more resilient, but communities cannot expect government alone to make the investments necessary to be truly resilient. Governments, organizations, businesses, the faith-based community, individuals, and families must all contribute to this effort – and all have the potential to lead.

Cities, businesses, and households need support to be able to effectively adapt to increasing environmental, health, economic, and social hazards. Every day, communities and businesses depend upon the ability to use roads, access hospitals, get to work and school, receive mail, and communicate with friends, family, colleagues, customers, and clients. None can ultimately succeed unless all succeed. While some tools exist to help cities and communities become more resilient, no systemic resiliency toolkit or benchmarking system exists to help localities understand where they may be vulnerable.

ANCR identified 19 community functions that represent the social, organizational and infrastructural systems that make communities what they are and influence how they function. [3] See Figure 3. For each of these community functions, ANCR is developing a set of benchmarks that allow a community to evaluate the resilience of each individual function and understand the resilience of the community as a whole.

The Benchmarks will reflect the strengths and weaknesses of the community, its trajectory, and its ability to positively respond to and rapidly recover from disruptive events. Because communities are highly interconnected, a community's ability to rapidly recover from a natural disaster depends as strongly on its social and economic attributes as on the resilience of its infrastructure.



Fig. 3 – Community Functions

Through the evaluation process, benchmarking would:

- Motivate communities to take a “Whole Community approach” that considers all parts of the community. Every U.S. community is highly interconnected in a way that means that the recovery of its economy depends as much on social capital as on financial resources.
- Enable significant incentives to be provided to improve the community’s resilience position – largely financial through expanded individual, business, and government access to credit and insurance – but also social with greater civic pride, and the increased ability to attract jobs and people to a safer, more vital community.
- Provide investors – whether bond financiers, business lenders, banks, or insurance companies – with the ability to more accurately assess and price risk.

2.1 The Basis for the Community Resilience Benchmarks System

While considerable effort and resources can be spent on developing the Benchmarks, ANCR identified several guiding principles to inform development:

1. **A community’s resilience depends on every segment of the community; each segment has its own resilience.** This principle embeds the Whole Community concept in the CRBs. It requires a consistent framework for parsing a community into its component parts. It also requires that the CRBs provide a measure of the resilience of each of those parts.
2. **A community’s resilience only has meaning in terms of its risk profile, which should include all of the significant risks the community faces.** Experience on the Gulf Coast has shown that a community’s resilience to one type of risk (e.g., Hurricane Katrina) is not necessarily the same as its resilience to other risks (e.g., the Great Recession or the BP oil spill). Further, every community has its own distinctive risk profile – some communities are threatened by natural disasters; others face the threat of terrorism. All face the risks of economic disruption, or social unrest, or a health crisis. Some communities face all of these. Thus, the CRBs must consider the comprehensive risk profile of the community – the hazards it faces, their potential impacts, and their likelihood of occurrence.
3. **The Benchmarks should be useful for any American community.** While this may seem like a given, it has significant practical implications. While small rural communities may be functionally similar to mega-cities (perform the same functions for their residents), the scale of these functions may make for



practical differences in application. In general, there is less data available to assess the resilience of rural communities; conversely, the complexity of most mega-cities can make it difficult to assess the resilience of each of their parts.

4. **The Benchmarks should be useful to both the community itself and to those outside the community.** In general, those inside the community will be most interested in shoring up weaknesses and developing greater strengths, i.e., they will be most interested in a detailed breakdown of the community – its trajectory, its capacity and its resources. Conversely, those considering investing in a community will be more interested in the overall risk to and opportunities for their investment.

In addition to the guiding principles, the ANCR development team looked to additional sources to develop an initial strawman. These sources included:

1. The United Nations International Strategy for Disaster Reduction (UNISDR) assessment tools (10 Essentials) developed to support the Sendai framework. These provide a consistent and defensible basis for the strawman. They help to resolve the tension between the public's focus on service and continuity, and service providers' focus on asset protection.
2. *The practical experience of the Community and Regional Resilience Institute (CARRI). CARRI found that resilience is a manifestation of the strengths of a community; thus, the Benchmarks need to focus on determining the community's strengths and weaknesses.* Both CARRI's experience and that of others who have worked with communities demonstrate that performance-based, outcome-oriented approaches tend to be most useful to communities looking to become more resilient.
3. *Existing standards. In many cases, existing standards*—especially those used for accreditation—include one or more of the essential elements of resilience. For example, a health care facility meeting the standards of the Joint Commission will have demonstrated risk awareness, essential capacity, and competence to deal with crises.

2.2 Developing the Benchmarks

The initial strawman was developed through the work of a resilience expert, John Plodenic, a principal in early resilience work at CARRI. For each community function, a committee of subject matter experts is brought together to review the strawman content, offer improvements, identify acceptable evidence and develop consensus on the content of the Benchmark. See Figure 4.

The benchmarks for each functional area are structured around requirements (actions, plans, policies, etc.) identified as crucial to resilience within the functional area. The requirements associated with any given aspect of the functional area are organized across three tiers: Essential, Enhanced, and Exceptional. Each “higher” tier demands a greater level of community commitment, investment, and/or engagement to achieve and presumably will have greater impact on enhancing community resilience. Within each Benchmark requirement, to meet the Enhanced or Exceptional benchmark all the requirements of the Essential, or Essential and Enhanced benchmarks, respectively, must also be demonstrated as well.

The benchmarks are intended to provide communities with a mechanism to evaluate their current state of resilience and to identify potential actions they can take to improve resilience. As a system, the CRBs process is intended to be managed under the direction of a community leader with the functional area benchmarks evaluated by personnel with day-to-day responsibility in each functional area.

Acceptable Evidence and Commentary are provided for each of the Benchmark requirements to assist the user in understanding the overall purpose of the requirement and some of the means for demonstrating achievement. In some cases, the community may have identified or implemented strategies that meet the intent of the requirement but may not fit with the identified acceptable evidence. The community should document this alternative approach or evidence.



ANCR Community Resilience Benchmark Development Process



Fig. 4 – ANCR Benchmark Development Process

3. The Buildings Benchmark

The first benchmark in the portfolio is the Buildings Benchmark. [4] Buildings perform a key function in communities. Many of the other community functions rely on buildings to support the services they provide-- police and fire stations support emergency response, hospitals support public health, schools support education, factories and office buildings support businesses and the economy, and houses support employees and citizens. The safety, sustainability and resilience of a community's building stock has a direct correlation to the community's overall resilience.

The Buildings Benchmark covers all occupiable structures in a community including new and existing buildings and both residential and non-residential/commercial buildings. The Buildings Benchmark focuses on the regulatory aspects of assuring the safety and resilience of the physical structures and not the policies associated with the provision of housing and the associated socio-economic factors--this topic is covered in the Housing Benchmark. Considered another way, the Buildings Benchmark is primarily focused on the activities of a code department or building department whereas the Housing Benchmark is focused on the functions associated with a housing authority or housing department.

The Buildings Benchmark breaks into nine categories to determine the resiliency of buildings within a community. The categories are:

- Adoption of Building Codes
- Administration and Enforcement of Building Codes
- Licensure and Continuing Education or Testing for Contractors
- Mitigation of Highly Vulnerable Buildings
- Mitigation and Design of Critical Facilities
- Resilient Design
- Disaster Response / Continuity of Operations Plans (COOP)
- Standards for Emergency Shelters
- Financial Resources for Post-Event Recovery



Each category is expanded to essential, enhanced and exceptional levels of resilience. Within the categories are descriptions of requirements to meet essential, enhanced or exception resilience. As an example, the content and acceptable evidence of the Administration and Enforcement of Building Codes requirement are provided in Figure 5.

2) Administration and Enforcement of Building Codes	
Essential Requirements	Acceptable Evidence
a) The community allocates adequate human and financial resources to administer and enforce adopted building codes.	<ul style="list-style-type: none"> • A gap analysis has been done to determine if building code administration and enforcement resources are adequate. This includes adequate inspection personnel and time. • A schedule and training requirements are in place for code officials, designers and builders in the community. • Evidence of IAS accreditation of building officials or the department.
Enhanced Requirements	Acceptable Evidence
b) The community ensures that all newly constructed buildings, existing buildings, and occupancies are compliant with adopted codes, and that existing buildings and occupancies are compliant with fire codes.	<ul style="list-style-type: none"> • A code compliance study is performed every 3 years and demonstrates a compliance level of at least 50%. A copy of the most recent study is provided. • Demonstrate that a plan has been developed and implemented to fill the gaps identified in the administration and enforcement gap analysis.
Exceptional Requirements	Acceptable Evidence
c) The community ensures that all newly constructed buildings, existing buildings, and occupancies are compliant with adopted codes, and that existing buildings and occupancies are compliant with fire codes.	<ul style="list-style-type: none"> • A code compliance study is performed every 3 years and demonstrates a compliance level of at least 75%. A copy of the most recent study is provided.

Fig. 5 – Buildings Benchmark Administration and Enforcement of Building Codes Requirements and Acceptable Evidence [4]

Building codes are the primary mechanism communities can use to regulate the design and construction of new buildings and the renovation of existing buildings. Codes reflect a community's minimum accepted requirements for the protection of life-safety of building occupants and people in proximity to buildings. Most communities rely on model building codes as the basis for their locally adopted code. Model building codes are developed through a national consensus process to efficiently leverage national experts, respond to the latest research findings, identify and incorporate new technology and processes, and support economies of scale. The latest edition of the model codes reflects the current national consensus on the minimum requirements necessary to avoid and reduce potential losses of life and property in the face of hazards. Communities that adopt codes in a timely manner assure that any changes to its building stock meet current consensus levels. A community's commitment to the ongoing adoption of codes, and thus the resilience of the covered buildings, is reflected in the Benchmark requirements.

Enforcement of building codes is necessary to assure that the anticipated results from adoption of codes are actually achieved. To achieve widespread compliance with the code, communities must commit to providing the human, technical and financial resources necessary to support permitting, plan review and inspections. These resources include training for both enforcement personnel and the industry stakeholders subject to provisions of the code. In addition to community resilience, the level of investment in code administration and enforcement can contribute to community goals around customer-centric service and economic development. Realistic timelines for permitting, plan review, and inspections can help facilitate positive relationships between the code department and developers, designers, builders and contractors and contribute to compliance.

4. The Housing Benchmark

Housing is often the largest part of rebuilding after an emergency or disaster. Having a resilient housing community and plans in place before something happens can ensure the quick and timely recovery of the community as a whole and the individuals at its core. Housing also is a key determinant of the social resilience of a community. Many of the other community functions rely on safe, affordable and resilient housing to



support a workforce, provide a tax base, facilitate commerce, and reduce stresses on health care and educational systems. Safe housing enables communities to maintain economic continuity and a stable workforce throughout and after a natural hazard event. The safety, sustainability, resilience and affordability of a community's housing stock has a direct correlation to the community's overall resilience and the ability of a community to prepare for current and future risks.

The Housing Benchmark covers all residential structures in a community, including single family and multi-family structures. [5] Additionally, the Benchmark addresses the differing housing needs of diverse groups, including residents with supportive housing needs, older residents, families, and congregant living facilities. The Housing Benchmark focuses on the availability of affordable housing, the quality of housing provided, the availability of shelter and transitional housing, and the continuity planning in place to ensure housing is available and maintained during a disaster. The performance of physical structures and the policies, practices, codes and standards that support them are covered in the Buildings Benchmark. Considered another way, the Housing Benchmark is focused on the functions associated with a housing authority or housing department and related agencies (including planning and community development), whereas the Buildings Benchmark is primarily focused on the activities of a code department or building department.

The Housing Benchmark includes nine requirements:

- Housing affordability and availability
- Housing affordability: policies
- Disaster preparedness: communication and outreach
- Disaster preparedness: emergency and temporary shelter
- Transitional and post-disaster housing
- Total cost of home ownership/rental
- Insurance coverage
- Disaster response/continuity of operations plans (COOP)
- Equitable long-term recovery from disasters

Like the Buildings Benchmark, the Housing Benchmark requirements feature three levels of requirements: essential, exception and enhanced. The requirements and acceptable evidence for Housing Affordability and Availability are provided in Figure 6.

1. Housing Affordability and Availability	
Essential Requirements	Acceptable Evidence
a) The community has a plan with numerical targets in place to show how it will make progress towards sufficient availability of affordable housing for its residents. The plan shows how affordable housing will be increasingly integrated into the broader community in a way that does not isolate households by race/ethnicity or income by making affordable housing available solely in limited locations.	<ul style="list-style-type: none"> • Community has adopted a plan with quantitative targets for making housing available and affordable to extremely-low-income, very-low-income, and low-income households such that a decreasing share of such households will be cost-burdened over a 5 to 10 year time horizon, based on a credible assessment of local housing needs, including projected changes in population and households. • Plan demonstrates how production of affordable housing will not be isolated only in certain neighborhoods.
Enhanced Requirements	Acceptable Evidence
b) The community is showing progress in increasing availability of affordable housing for its residents in a broad range of locations.	<ul style="list-style-type: none"> • Community has achieved targets over the past 5 to 10 years for making housing more affordable to extremely-low-income, very-low-income, and low-income households based on a prior credible assessment of local housing needs. • Housing availability has been increased throughout the community and is not isolated only in certain neighborhoods.
Exceptional Requirements	Acceptable Evidence
c) The community is showing significant progress in increasing availability of affordable housing for its residents beyond an essential baseline in a broad range of locations.	<ul style="list-style-type: none"> • Community has not only shown progress but also created mechanisms for community groups and landowners to enforce progress towards targets prospectively, e.g. allowing homes that already have been identified as addressing affordability targets to receive development approvals without having to go through additional rounds of applications.

Fig. 6 – Housing Benchmark Housing Affordability and Availability Requirements [5]



5. Conclusion

ANCR is currently undertaking development of the Water Benchmark to include domestic water, wastewater and stormwater management. Additional benchmarks will be developed to complete the suite of 19. Through the coordinated development of the Benchmarks, the ANCR system will support communities in understanding their vulnerabilities and developing coordinated and holistic plans to address them in an efficient manner.

6. Acknowledgements

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7. References

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