Mitigation Framework Leadership Group (MitFLG)
Draft Concept Paper

Draft Interagency Concept for Community Resilience Indicators and National-Level Measures

Published for Stakeholder Comment in June 2016

The information presented in this paper is intended to illustrate potential options for measuring resilience and to engage public comment. The paper is a summary of MitFLG research only - it is not a draft policy, strategy, or other Federal doctrine.

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FOREWORD

In collaboration with the Community Resilience Indicators Subcommittee of the Mitigation Framework Leadership Group (MitFLG), an interagency project team co-led by the Federal Emergency Management Agency and the National Oceanic and Atmospheric Administration, developed this Draft Concept Paper. This paper provides a Federal interagency perspective, outlining one of many possible approaches to measuring community resilience capacity using indicators. The approach represented here is a conceptual framework that extracts federally sourced indicators that can help communities describe their resilience and aligns them with relevant core capabilities under the Mitigation and Recovery Frameworks of the National Preparedness Goal. This alignment promotes consistency with existing national-level and State-level assessment and reporting structures. This conceptual framework presents a potential resource for addressing national-level needs for indicators and metrics for broader consideration by stakeholders.

The indicator approach in this Draft Concept Paper may be broadly useful as a resource to: (1) help build common terms of reference across multiple disciplines; (2) promote collective outcomes from complementary Federal, State, and local capacity-building actions; and (3) characterize local-scale data issues and gaps constraining further development of effective metrics. The project team encourages stakeholders at all levels to review this Draft Concept Paper and to provide comments, feedback, or additional data suggestions that could expand the utility and increase the value of this conceptual framework as a resource for those purposes

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INTRODUCTION

PROBLEM STATEMENT

Defining and quantifying community resilience capacity can be challenging at any level; however, it is especially complicated on a national scale. While most actions to improve community resilience capacity occur at the local level, Federal programs provide numerous resources that support relevant community capacity building across the Nation. It is important to understand how such actions improve local-level resilience capacity. However, Federal agencies also must gauge how their individual and collective efforts affect community resilience capacity nationwide. The availability of locally scaled data for use in understanding and tracking community resilience capacity nationally is very limited. Federal agencies could improve availability significantly by using a consistent framework for community resilience indicators to help guide the development of useful measures, promote the identification and sharing of relevant data, and facilitate the collection of new data needed to fill critical information gaps.

BACKGROUND

The Federal Emergency Management Agency (FEMA) and the National Oceanic and Atmospheric Administration (NOAA) initially undertook this joint project to explore resilience indicators and measures. The project then evolved into a broader interagency partnership under the Mitigation Framework Leadership Group (MitFLG). Leaders representing multiple Federal agencies have expressed interest in common indicators of community resilience to help inform and prioritize resilience policy, capacity-building strategies, and outcomes. Related needs identified by key public- and private-sector stakeholders also served as important drivers for this effort.

One of the recommendations from the 2012 National Research Council report titled *Disaster Resilience: A National Imperative* stated that government entities at Federal, State, and local levels and professional organizations should partner to help develop a framework for communities to adapt to their circumstances and begin to track their progress toward increasing resilience.[1] The project team developed this Draft Concept Paper from a Federal perspective, identifying needs and opportunities using Federal resources to track community resilience capacity building progress at a national scale. To broaden potential

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1 Disaster Resilience: A National Imperative (2012), Committee on Increasing National Resilience to Hazards and Disasters; Committee on Science, Engineering, and Public Policy; Policy and Global Affairs; The National Academies.

applicability, the project team offers the conceptual framework in this paper explicitly for the purpose of soliciting feedback from key public- and private-sector stakeholders and identifying possible connections to related efforts at multiple scales.

COMPONENTS

- **Community Resilience Primer** – This Draft Concept Paper includes key definitions and concepts related to community resilience capacity. The paper helps set the stage for establishing some common, broadly applicable indicators across diverse Federal programs that contribute to community resilience capacity building in many different ways. These Federal capacity-building contributions include supporting intrinsic community functions that are also critical for absorbing, rebounding, and adapting to hazard risks; facilitating hazard-focused community preparedness, risk management and mitigation actions that reduce long-term vulnerabilities; and enabling post-disaster community recovery and redevelopment that integrates community resilience objectives.

- **National Preparedness Goal Alignment** – This Draft Concept Paper provides a structured approach for aligning national-level community resilience indicators and building out a suite of relevant measures that align with the National Preparedness Goal (NPG). The top level of the structure consists of 10 core capabilities associated with the mitigation and recovery mission areas under the NPG. This Draft Concept Paper also describes the indicators and measures using a recently developed taxonomy, designed to provide greater precision to the universe of Federal community resilience resources in the context of the NPG.

- **Community Resilience Indicators** – In this Draft Concept Paper, the term "indicators" refers to general conditions or factors associated with community resilience capacity. A number of community resilience indicators complement the 10 mitigation and recovery mission area core capabilities. Those indicators are grounded in scientific research literature and represented in notable community resilience assessment methodologies and applications. The indicators presented in this paper provide an initial template for possible use in further defining and building out relevant measures for community resilience capacity at multiple scales.

- **Proposed National-Level Measures** – This Draft Concept Paper presents a number of proposed national-level measures associated with various indicators of community resilience capacity. These proposed measures are only a subset of the possible relevant options. They reflect project-driven time and resource limitations, including dependence on readily available Federal geospatial datasets with nationwide coverage at county (preferred) or State (minimum) levels. The main body of this paper provides a summary of the proposed measures; significantly more detail appears in *Appendix B. Assessing Potential National-Level Measures*.

- **Data Access and Availability** – Because the focus of this initial effort was on national-level indicators and measures, the project team generally aggregated community-scale data into State- and national-level summaries for analysis and presentation purposes. The project team recognizes, however, that the greatest potential value for many stakeholders is in the availability of relevant Federal data for assessing community resilience capacity at local levels. To extend project benefits to community stakeholders, this Draft Concept Paper includes links to key publicly available Federal datasets. Descriptions and links to all project data used and created to support this effort appear in *Appendix C. Summary of Datasets Identified for Evaluating Community Resilience Indicators and Measures*.

COMMUNITY RESILIENCE CONCEPTS

Community Resilience, as defined by Presidential Policy Directive (PPD) 8 – National Preparedness and the NPG, is the ability of a community to adapt to changing conditions, withstand disruption, and rapidly recover from emergencies. Community resilience to hazards, including the impacts associated with climate change, is an element of overall national security and resilience and is a priority goal of the Federal Government.

Community can have a variety of meanings, but a unifying Federal definition, also supported by the NPG, is

> *A unified group of people who share goals, values, or purposes. Communities may exist within geographic boundaries or unite geographically dispersed individuals. Communities bring people together in different ways for different reasons, but each provides opportunities for sharing information and promoting collective action.*

Communities generally function under the authority of a specific governance structure, such as a town, city, county, or Tribal entity. *Community* also may refer to State or regional governance structures. Community governance structures generally facilitate decision-making that can substantially affect individual quality of life in capacities including livelihoods, housing, health, physical access, educational and cultural access, and environmental quality. Resilient communities work to build and protect the public and private assets and services that assure sustainability, livability, and equal access for all citizens.

Resilience is a broad concept linked to numerous aspects of individual and community capabilities in response to many different stressors; therefore, no single measurement approach fits all situations. Even when using a common resilience framework, starting and ending points for each community are likely to differ, depending on specific risks, inherent physical, social and economic characteristics, and resources available to address needs. Recognizing that there are valid reasons for multiple tools that can help communities meet specific needs, the effort summarized in this paper does not attempt to duplicate or replace any of them. Instead, it builds on the research and application of many of these existing resources for the explicit purpose of exploring indicators of community resilience capacity that are most relevant across a wide range of Federal capacity-building programs. Federal programs generally help build community resilience capacity through the following approaches:

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- **Intrinsic community functions** – These programs strengthen resilience through support to core community functions, such as economic development, transportation, housing, community infrastructure, natural resources, environmental protection, and public health. Generally, when these systems are functioning adequately to meet steady-state community needs, some inherent capacity is available to help absorb and rebound from hazard impacts.

- **Risk management and mitigation action** – These programs strengthen resilience through support for communities in identifying, managing, and mitigating hazards and risks. Community actions such as integrating improved risk information into decision-making, reducing asset vulnerabilities to hazards, and implementing risk-informed development standards are all examples of building community resilience capacity.

- **Disaster recovery and redevelopment** – These programs include disaster assistance and other types of programs that integrate future resilience objectives into community recovery and redevelopment activities. Community resilience capacity building includes such actions as adopting higher resilience standards for post-disaster redevelopment and allocating disaster assistance funds (where authorized) for high-priority hazard mitigation projects.

NATIONAL PREPAREDNESS GOAL ALIGNMENT

NATIONAL PREPAREDNESS GOAL

The NPG defines what it means for the whole community to be prepared and thus resilient for all types of disasters and emergencies. The goal itself 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.*

These risks include natural hazards, such as hurricanes and pandemic influenza; accidental hazards, such as dam failures and chemical spills; and manmade threats, such as acts of terrorism and cyber-attacks. The NPG is capabilities based and organized into five mission areas:

1. **Prevention** – Avoid, prevent, or stop an imminent, threatened, or actual act of terrorism.

2. **Protection** – Protect our citizens, residents, visitors, assets, systems, and networks against the greatest threats and hazards in a manner that allows our vital interests and way of life to thrive.

3. **Mitigation** – Reduce the loss of life and property by lessening the impact of disasters.

4. **Response** – Respond quickly to save lives, protect property and the environment, and meet basic human needs in the aftermath of an incident.

5. **Recovery** – Assist communities affected by an incident to recover through a focus on the timely restoration, strengthening, and revitalization of infrastructure, housing, and the economy, as well as the health, social, cultural, historic, and environmental fabric of communities affected by an incident.

The NPG describes 32 activities, called core capabilities, which address the greatest risks to the Nation. Core capabilities targets recognize that communities need the flexibility to determine how they apply their resources, based on the threats that are most relevant to them. The core capabilities are grouped into the

five mission areas described above, based on where they most logically fit. Some fall into only one mission area, while some others apply to several mission areas.

The NPG serves as a national-level objective for which everyone at the Federal, State, local, Tribal, Territorial, private and nonprofit, and individual levels can play an important role. Aligning the indicators and measures in this Draft Concept Paper with the NPG ensures consistency with that national-level objective.

ALIGNMENT TO A COMMUNITY RESILIENCE INDICATOR CATEGORIZATION TAXONOMY

Efforts to build community resilience can be complicated. These efforts should be community-driven, with clear goals and priorities for what an individual community considers necessary to become more resilient. One of the inherent complexities with community resilience capacity building is that goals can and should differ greatly among communities because communities must tailor the outcomes to their individual needs. To support a wide range of different capacity-building needs, many Federal departments and agencies publish guidance, standards, materials, and data that they broadly label as "resilience resources." Over time, this general labeling of resilience resources has made it increasingly difficult for State and local practitioners to identify and use the most applicable resilience capacity-building resources.

To address this challenge for federally sponsored resources, an interagency effort was undertaken to better align how these resources are communicated and organized. The effort resulted in a taxonomy to improve how the Federal Government communicates the intended objectives and outcomes from their community resilience indicators, metrics, standards, and related resources. The taxonomy provides greater precision to the universe of Federal community resilience resources in the context of the NPG. The taxonomy does not attempt to establish a mutually exclusive classification scheme. Instead, the taxonomy is a useful tool for aligning Federal resources by degrees of relevance and helping clarify areas of emphasis under the larger resilience umbrella. An overview of the categories included in the taxonomy appears in Figure 1. Information on the full taxonomy, including definitions, is in *Appendix A*.

Figure 1. Resilience Indicator Categorization Taxonomy
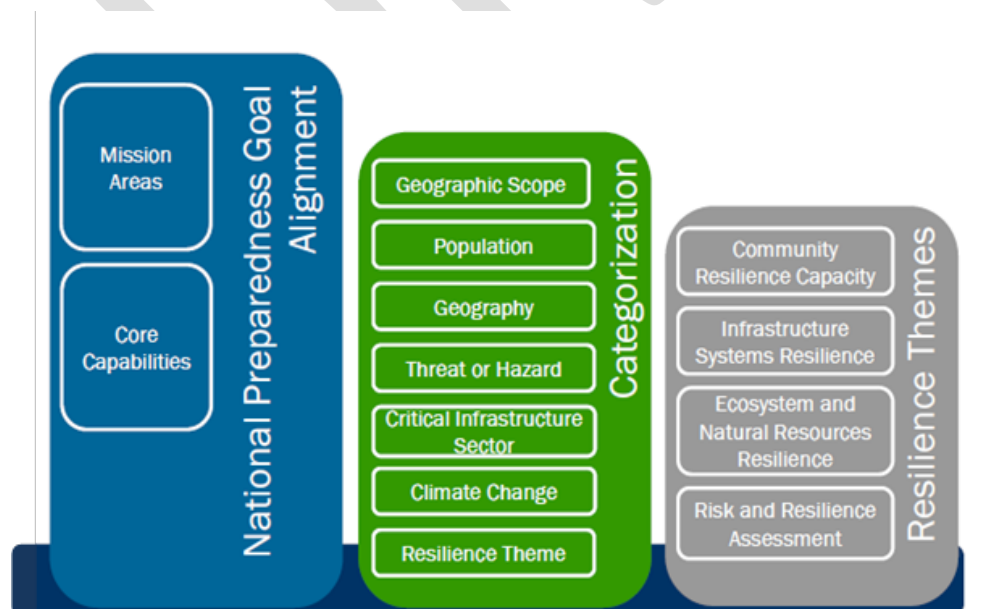
The proposed indicators and measures presented in this Draft Concept Paper are described below using the recently developed taxonomy.

Mission Area and Core Capabilities Framing

The primary objective of the proposed indicators and measures in this Draft Concept Paper is to identify key attributes of community resilience capacity related to the mitigation and recovery mission areas. These attributes align specifically with 10 core capabilities:

1. Housing

2. Health and Social Services

3. Economic Recovery

4. Infrastructure Systems

5. Natural and Cultural Resources

6. Threats and Hazards Identification

7. Risk and Disaster Resilience Assessment

8. Planning

9. Community Resilience

10. Long-Term Vulnerability Reduction

Categorizing the Indicators

- **Geographic Scope** – A desired outcome for this Federal effort is to develop national-level measures that can summarize community resilience capacity information and possibly track relevant trends over time at a national level. While this national-level scope is the primary driver for the proposed measures in this Draft Concept Paper, the indicator framework presented here also may be useful as a template for developing similar measures at regional, State, and local scales.

- **Geography** – The proposed indicators and measures in this Draft Concept Paper reflect a wide range of community resilience factors that cut across different types and sizes of communities. Overall, however, the proposed indicators and measures are likely to be more representative of community resilience attributes in urban and suburban areas than in rural areas. Stakeholders have requested additional indicators and measures for rural communities as a priority for future consideration.

- **Threat or Hazard** – The proposed indicators in this Draft Concept Paper focus primarily on community capacity; therefore, they should apply to all hazards. Overall, however, the current indicators and measures are likely to be more representative of resilience capacity for flood-related hazards than other types of hazards or threats. Stakeholders have requested additional indicators and measures that reflect resilience capacity for a broader range of hazards, including wildfires and earthquakes.

- **Critical Infrastructure Sector** – The proposed indicators in this Draft Concept Paper cut across multiple critical infrastructure sectors as defined in the National Infrastructure Protection Plan. Key sectors represented in the indicators include Dams, Health Care and Public Health, Transportation Systems, and Water and Wastewater Systems.

- **Climate Change** - The proposed indicators in this Draft Concept Paper focus primarily on community capacity; therefore, they should apply to all hazards, including those caused by or exacerbated by climate changes. Stakeholders have requested additional indicators and measures that reflect resilience capacity for a broader range of climate-related hazards, including extreme temperatures, drought, and sea level rise.

Resilience Themes

While these indicators and measures touch on all four themes represented in the taxonomy (i.e., community resilience capacity, infrastructure systems resilience, ecosystem and natural resources resilience, risk and resilience assessment), the primary emphasis is community resilience capacity. From the taxonomy, key attributes of community resilience capacity represented by the proposed indicators and measures in this Draft Concept Paper are:

- Housing Resilience

- Health Resilience

- Economic Resilience

- Access and Functional Needs

- Community Planning

- Social Connectedness

Community Resilience Indicators

The project team conducted an extensive literature review of governmental, business, nonprofit, and academic literature related to community resilience capacity and indicators. This Draft Concept Paper includes the indicators that represent key factors of community resilience and are grounded in scientific research literature and represented in notable assessment methodologies and applications for community resilience.

The team did not attempt to duplicate or replace previous work or ongoing research conducted by the broader professional community engaged in resilience indicators and measurement. Instead, the project team derived these indicators from Federal datasets, emphasizing those with connections to the core capabilities of mitigation and recovery mission areas. The resulting list of indicators, presented in Table 1, is not exclusive but serves as a basis for further defining key elements of community resilience capacity and building out relevant measures.

Table 1. Community Resilience Indicators	
Indicator	Resilience Relevance
Housing Core Capability	
Housing Condition	Families living in housing units that are well maintained and consistent with current building standards are typically more resilient to hazards than families living in poor housing conditions. Substandard housing may be more susceptible to the impacts of hazards, resulting in property damage, injury, or death during an event and extensive repair costs in both time and money after an event. These costs are especially challenging for the typically lower-income families that occupy housing units with severe problems. Communities taking actions to reduce high concentrations of substandard housing are increasing community resilience capacity by improving housing quality and reducing the housing-related disaster vulnerabilities.
Housing Affordability	Households not overburdened by housing costs are able to invest in property enhancements, have financial flexibility for post-disaster uncertainties, and generally have more capacity to absorb and bounce back from unanticipated events. The availability of affordable and accessible housing affects the resilience capacity of vulnerable individuals and households, and is especially critical to effective disaster recovery at the community scale. Understanding and overcoming housing affordability and accessibility challenges improves community resilience capacity at multiple levels.
Health and Social Services Core Capability	
Health Care Availability	Health care organizations play a key role in community resilience. Communities with high concentrations of primary care physicians tend to have higher levels of overall physical and mental health. High levels of baseline community health are important for resilience because communities with healthy residents are better able to absorb the impacts of, and recover from, disasters. Primary care physician accessibility also is important for disaster response and recovery, when many injuries or health-related impacts may result from an event.
Healthy Behaviors	Resilient communities promote individual and community physical, behavioral, and social health to strengthen their communities for both daily and extreme challenges. In general, communities with good baseline mental and physical health are more resilient to disasters than communities with high concentrations of health-related needs are. Individual mental and physical health and resilience is important for community resilience because healthy, socially connected, prepared people make for stronger communities that are better able to withstand, manage, and recover from disasters. Promoting wellness and encouraging healthy behaviors alongside disaster preparedness can help communities face everyday challenges as well as major disruptions or disasters.
Environmental Health	A number of environmental factors, such as air and water quality, can directly affect individual and community health status. Areas with concentrated environmental health risks can increase disaster impacts by increasing underlying vulnerabilities and amplifying the impact on individuals with access and functional needs. Poor air quality contributes to health conditions including cancers, cardiovascular disease, asthma, and other illnesses that can compound disaster vulnerabilities. In addition, many areas with high environmental health hazard risks also face other socioeconomic challenges that can exacerbate disaster impacts. Improving environmental health and reducing the prevalence of related diseases increases community resilience capacity.

	Table 1, continued

Indicator	Resilience Relevance
Economic Recovery Core Capability	
*State and Local Government Revenues	The capacity of a State, Tribal, or local government to sustain critical services to its constituency is an important indicator of the overall resilience of that jurisdiction. Many Federal grant programs derive their need basis from whether States or local government applicants have exhausted their taxing or borrowing capacity, thus necessitating Federal involvement. Additionally, the diversity of revenue sources can demonstrate the resilience of the State or local government and their ability to sustain critical services even following major disruptions or exceptional expenditure needs (like a major disaster).
Employment Opportunity	A community's general economic vitality and employment levels, among several other factors, are related. High employment rates indicate community stability and a general economic ability to absorb disaster impacts and recover quickly. Communities with high unemployment, on the other hand, tend to have more residents who are disproportionately affected by disasters. The factors that lead to unemployment at the local level vary greatly from community to community and can often represent structural or entrenched conditions that may be very difficult to change with local actions. The unemployment rate also does little to tell a story about labor market participation, or the types of industry, work, and working conditions present in a community. As such, employment opportunity should be just one of many variables used when considering a community's economic vitality and resiliency.
Income	Across sociodemographic groups, income builds adaptive capacity and allows individuals to prepare for, respond to, and recover from disasters. Individuals with low incomes are less likely to have access to high-quality housing units, social support networks, or other resources to limit their exposure to hazards. They are also less able to recover and rebuild their quality of life when disaster results in the destruction of their property or adverse impacts to their health. They may be unable to afford housing in a new location, or pay for repairs and disaster-related medical bills. Conversely, higher income individuals tend to live in higher quality, more resilient housing and have the financial capacity to prepare for, respond to, and recover from disasters. Given how closely income and resilience capacity are related, a significant need and opportunity exists to improve local community resilience capacity through economic development initiatives and programs. Additional information, such as income distribution, cost of living ratios, and poverty thresholds, is necessary for a more in-depth perspective on income-related capacity and vulnerabilities.
Infrastructure Systems Core Capability	
Roadway Conditions	A community's transportation infrastructure is the core of its economy and its disaster response and recovery system. In the response phase of a disaster, sufficient transportation infrastructure ensures that residents can evacuate and emergency responders can reach areas in need. After a disaster, functioning transportation infrastructure is critical for economic and physical recovery. Roads and bridges are a critical part of the transportation infrastructure.
Transportation Connectivity	Transportation alternatives provide several resilience-related benefits to communities. Good transportation options and alternatives make places more attractive for economic development and give people more options for walking, bicycling, and other active transportation methods, thereby improving individual health. Redundancies in key transportation systems and the availability of transportation alternatives can also be critical to community recovery. Transportation alternatives rely on the availability of adequate multimodal infrastructure and effective connectivity between different modes. Public transportation terminals that only serve a single mode of transportation are more exposed to impacts from service disruption, while multimodal stations have redundant systems in place.

	Table 1, continued
Indicator	Resilience Relevance
Transit Accessibility	The national transit system is composed of hundreds of local transit providers that operate over 140,000 vehicles, travel over 48 billion annual passenger miles, and collect over $8.5 billion in annual passenger fares. Transit plays many roles in maintaining social, economic, and environmental systems, including providing affordable and less-polluting commute alternatives for workers, as well as access to services for individuals with access and functional needs. The latter is especially important in disaster response and recovery. For disaster response purposes, transit provides an evacuation method for many of the individuals who are most disproportionately affected, including people without access to their own transportation and people with disabilities. For recovery purposes, transit is important for helping individuals who may be disproportionately impacted to access medical and social services, as well as their places of employment. Given the importance of transit for disaster response and recovery for individuals who are disproportionately impacted, particularly individuals with disabilities, transit station accessibility is a critical requirement for resilient communities.
Water Sector Emergency Support	Water and wastewater services are vital for human activity and the Nation's economy, as well as preventing disease and protecting the environment. . If communities cannot ensure water service during emergencies during emergencies, critical services, such as firefighting and health care (hospitals), and other dependent and interdependent sectors, such as energy, transportation, and food and agriculture, would suffer damaging effects. As a result, the recovery time is prolonged. To increase resilience, communities should have plans to ensure continuity of operations, including procedures designed to prevent, detect, respond to, and recover from all hazards.
*Energy Assurance	The U.S. energy infrastructure fuels the economy of the 21st century. Without a stable energy supply, health and welfare are threatened, and the U.S. economy cannot function. The Energy Sector is uniquely critical because it provides an "enabling function" across all other critical infrastructure. During emergencies, power service disruptions can have cascading impacts on other systems that pose additional health and safety risks (e.g. inability to heat or cool homes, provide potable water, treat sewage or stormwater runoff, or communicate with emergency responders). Energy assurance planning to identify supply disruption risks and vulnerabilities and reduce future health, safety and economic impacts improves overall resilience capacity.
*Telecommunications Accessibility	Telecommunications services are integral to the U.S. economy, underlying the operations of all businesses, public safety organizations, and government. Over the last 25 years, communications infrastructure evolved from predominantly a provider of voice services into a diverse, interconnected industry using terrestrial, satellite, and wireless transmission systems. It is critical to ensure that vital voice and data circuits and other telecommunications services are available and accessible when necessary to maintain a state of readiness or respond to and manage an event or crisis.
Dam Safety	As of the 2013 update, the National Inventory of Dams (NID) included information for more than 87,000 dams. As a critical part of our nation's infrastructure, dams provide benefits that all Americans enjoy, such as flood risk reduction, hydropower generation, water supply, and recreation. However, due to the nature of water storage, dams can pose a flooding risk to nearby and downstream communities. Dam hazards can occur in a number of ways. Dam failure, or the destruction of a dam, can occur from a natural hazard event, failure or incorrect operation of a project feature that compromises the structure, or by intentionally destructive human actions. Failures can lead to devastating loss of life and property for downstream areas. Overtopping of a dam can contribute to non-breach inundation risks or lead to possible failure of the structure.

	Table 1, continued
Indicator	**Resilience Relevance**
Integrated Infrastructure Sector Preparedness	The resilience of community infrastructure systems depends not just on the functioning of each individual infrastructure sector, but on how sectors collectively anticipate and address system interdependencies that can have a ripple effect in a hazard event. Community medical services, for example, rely on access to telecommunications services, which in turn depend on the continuity of electric power in an emergency. When one system is impacted, the risk of a cascading effect of loss and damage can be significant, and communities need to assess, plan, and prepare for the continuity of services across sectors in a disaster.
Natural and Cultural Resources Core Capability	
Water Conservation	Water supply is vulnerable to climate variability and national security threats. Water demand will grow as the U.S. population increases; extended dry periods will cause reductions in the quantity of water available, leading to increased challenges in meeting the demands for domestic water use. Water conservation and water efficiency (i.e., changes in technology) can increase community resilience by improving the reliability of existing water supplies, reducing the impacts of drought, and, in some cases, providing conserved water for other necessary uses, such as agricultural or environmental needs.
Wetlands Conservation	Wetlands enhance community resilience to hazards and climate change by serving as natural buffers or protective barriers. Wetlands aid in mitigating the severity of hurricanes and coastal flooding. They accomplish this by decreasing the area of open water available for wind to form waves, increasing the drag on water movement and thereby reducing the amplitude of storm surges, reducing direct wind effects on the water surface, and directly absorbing wave energy. Conserving, protecting, and restoring wetlands can increase community resilience capacity by decreasing flood-related risks and helping reduce the economic and environmental consequences of hazard and climate events. In addition, wetlands act as "carbon sinks," which can mitigate the severity of potential future climate changes.
Forest Conservation	Forest cover enhances community resilience to hazards and climate change by providing natural protection from hazards and serving as a carbon sink. Trees can intercept snow and rainfall, can reduce landslide hazards, and can increase the water-holding capacity of the soil by building up an organic layer. Tree canopies may mitigate adverse climate impacts by reducing radiative transfers both to the ground and into the atmosphere. Forests can also reduce soil erosion and peak flows and affect windspeeds. Protecting forests and restoring managed or degraded forests can be a vital contribution to reducing anthropogenic emissions and aiding societal adaptation to unavoidable climate change.
Habitat Quality	Habitat quality is an indicator of ecosystem health and may be critically linked to community economic and societal well-being. This is especially true in areas with significant reliance on natural resources-based sectors, such as fisheries, forestry, recreation, and tourism. Resilient aquatic habitats are critical to fish and wildlife, water conservation, flood control and people. These habitats provide for recreational, commercial, and subsistence fishing; boating; fish and wildlife viewing; and other uses that support local economies and contribute to economic well-being. Activities that prevent degradation of fish habitats and/or increase the overall health of fish and other aquatic organisms can maintain or improve the ecological resilience of aquatic resources and maintain or improve the resilience capacity of resource-dependent communities.

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	Table 1, continued
Indicator	**Resilience Relevance**
*Cultural Resources Protection	In the same way that biological diversity increases the resilience of natural systems, cultural diversity can increase the resilience of social systems. The maintenance of cultural diversity into the future, and the knowledge, innovations, and outlooks it contains, increase the capacity of human systems to adapt to, and cope with, change. Cultural heritage, as a key component of cultural diversity, is a critical consideration for any strategy to build the resilience of communities. Promoting the protection of cultural heritage is necessary because of its intrinsic historic or artistic value and because it provides the fundamental spiritual and psychosocial support and sense of belonging communities need during the disaster recovery phase; it also contributes to building resilience to disasters and climate change. (See *Heritage and Resilience: Issues and Opportunities for Reducing Disaster Risks*.)
Threats and Hazards Identification Core Capability	
Risk Identification	Risk identification allows decision-makers, responders, and community members to understand potential risks better, which allows for implementation of informed actions to reduce risk and increase resilience. Those who have identified and assessed potential risks are more capable of mitigating, preparing for, responding to, and recovering from disasters. Threat and hazard risks are constantly evolving and connected to multiple variables. Resilient communities understand that risk identification is not a static task; rather, risk identification is an activity that communities must conduct continuously over time. A wide variety of actions, such as conducting formalized risk and threat assessments, conducting scientific risk studies and mapping geologic risk areas, and collecting information about public awareness of risk, may constitute risk identification. Local communities participate in risk identification through a variety of federally sponsored activities, including Risk Mapping, Assessment and Planning (Risk MAP), Threat and Hazard Identification and Risk Assessment (THIRA), and pre-project planning.
Risk and Disaster Resilience Assessment Core Capability	
Risk Data	For communities and the agencies that serve them to better mitigate, prepare for, respond to, and recover from disasters, it is essential to understand the risks from hazards and climate change. Understanding risk involves obtaining accurate data to assess the risk. Scientific and technological advancements now make it possible to improve foundational risk data continuously. The improved risk data become a critical part of the evolution of the risk identification, assessment, understanding, and action continuum.
Risk Awareness	Based on scientific information about risks and vulnerabilities, risk awareness targets desired changes in individual behaviors or perceptions. Assessments of risk perception and awareness can track progress toward targeted outcomes and inform the development and improvement of risk communication strategies and tools. Because different community stakeholders have different responsibilities and desired behaviors, understanding and effectively targeting risk awareness outcomes for different groups is essential. For example, risk awareness goals targeting local officials responsible for land-use regulations or building codes would be different from the risk awareness goals targeting household preparedness for the public. Communities can improve resilience capacity through effective risk awareness strategies.

	Table 1, continued
Indicator	**Resilience Relevance**
Community Preparedness	Community preparedness generally focuses on the pre-event actions that residents, businesses, governments, and emergency responders can take to respond to a disaster effectively. For residents and businesses, this includes basic steps, such as developing household or business emergency plans and securing backup energy, communication, food, and water supplies. For local governments, community preparedness includes having well-planned, organized, trained, and equipped emergency operations. Communities build resilience capacity by ensuring that emergency operations plans are in place across critical service delivery agencies and that contingencies are in place for continued delivery of critical services during disruptions of operations.
Planning Core Capability	
Mitigation Planning	Hazard mitigation planning is a process that State, Territorial, Tribal, and local governments use to identify risks and vulnerabilities associated with natural hazards, and to develop long-term strategies for protecting people and property during future events. Unlike other types of disaster-related planning, mitigation planning focuses specifically on ending the cycle of repeated disaster damage. Local hazard mitigation plans enable communities to identify broad strategies and specific actions they can take to protect lives and property. Examples of mitigation actions that a local hazard mitigation plan might include are projects designed to physically protect assets – such as elevating homes at risk of flooding or retrofitting key critical facilities against seismic or wind hazards – or broader regulatory actions that require community-wide use of disaster-resistant building codes or standards. Developing a local hazard mitigation plan is a critical, foundational step for a community to shape a sound overall disaster resilience strategy.
Planning Integration	Emergency managers or public safety personnel often conduct assessments of and planning for hazards and climate risks. Although these stakeholders are among the most important in the process, integrating safety planning beyond public safety departments is integral to enhancing community resilience. For example, local planning, engineering, maintenance, parks and recreation, or administration departments make many decisions that directly affect public safety and resilience. By integrating public safety and resilience considerations into these decision-making processes, communities can select projects, plans, and long-term visions that achieve their goals, while also maximizing public safety and resilience benefits. By fully integrating hazard considerations into all types of local government planning, communities ensure that their implementation activities are more resilient. Planning integration is essential to long-term community resilience. Well-planned long-term vulnerability reduction is holistic and tied into comprehensive planning and management, linking mitigation goals to other community goals, such as actions and incentives to improve overall residential property values, business continuity, natural resource conservation, school safety, or transit reliability.
Community Resilience Core Capability	
Collaborative Networks	Communities and the agencies that serve them that are able to mitigate, prepare for, respond to, and recover from disasters in a planned, intentional, and collaborative manner tend to be highly resilient. Collaboration can be challenging, as local agencies can operate with a "silo" mentality, only focusing on the specific goals of that agency. Additionally, the diverse range of stakeholders present in most communities can make meaningful collaboration difficult. To withstand and recover, it is essential that whole communities, including those public agencies with interest in the communities, work effectively together to anticipate, mitigate, and respond to risks and disasters.

Table 1, continued	

Indicator	Resilience Relevance
Civic Capacity	Social connectedness is a critically important element of community resilience capacity. Socially isolated individuals are less resilient than socially connected individuals are because they have less access to shared resources and are vulnerable to mental health challenges. At the community level, concentrated levels of isolation are a major factor of community vulnerability. Understanding the level of civic engagement and capacity within communities can help determine the level of social connectedness that exists. People are more empowered to help one another after a major disturbance in communities in which members are regularly involved in each other's lives. Volunteering is one way to enhance social connectedness, both for the people who are volunteering and for the people who benefit from the volunteer work. Volunteering can help make people healthier and less likely to be unemployed for an extended period. Volunteer work can also help ensure that people who may be disproportionately impacted are prepared for and able to respond to hazard events.
Long-Term Vulnerability Reduction Core Capability	
Building Codes	Design and construction play a major role in the ability of a structure to withstand impacts from a hazard. Building codes are legal requirements that set minimum material and design standards for construction. Many communities in the United States have minimum standard building codes. In addition, many, but not all States have adopted statewide building codes that address disaster-resistant standards for most building types. Some States and communities choose to go beyond minimum standards. For example, some building codes focus on higher requirements for energy and water efficiency; others focus on mitigating specific hazards, such as flooding or tornadoes. Building requirements that mitigate the impacts of hazards shift costs to the front end of the project, requiring slightly higher construction costs with the intention of significantly reducing recovery repairs, risk of injury, and loss of life. Accurate identification of hazards and performance levels with the application of appropriate building codes increases resilience.
Higher Standards	Prescriptive requirements, where satisfactory performance means meeting the minimum requirements, form the basis for many development standards. Long-term vulnerability reduction requires looking beyond minimum standards to reliability-based performance criteria that can improve the overall resilience of the built environment across a community. To improve their resilience capacity, communities should adopt codes and standards that encourage and incentivize risk-appropriate actions that exceed minimum requirements when necessary to meet resilience performance targets.
Mitigation Investment	Funding availability is crucial to enabling the implementation of hazard mitigation plans and to building, rebuilding or otherwise sustaining physical community structures or systems to reduce or avoid future losses. Tracking mitigation investment opportunities provides a way to gauge how attuned communities are to the need and opportunities for rebuilding with future hazard protection in mind. Mitigation investment to reduce long-term vulnerabilities can take many forms including hardening structures, building protective or diversionary structures around roads and highway systems or public utilities, or removing structures or facilities from high-risk zones such as Special Flood Hazard Areas shown on National Flood Insurance Program (NFIP) flood maps.

* Note: The project team added the indicators marked with an asterisk late in the project, based on stakeholder input. Because they were not part of the original set of indicators used to explore potential measures, *Appendix B. Assessing Potential National-Level Measures* does not reflect these indicators.

PROPOSED NATIONAL-LEVEL MEASURES

This section of the Draft Concept Paper summarizes progress toward developing national-level measures to support the indicator framework introduced earlier. The proposed measures identified in Table 2 are representative of a subset of the key community resilience factors reflected by the indicators. In most cases, the single proposed measure linked to an individual indicator does not reflect the breadth of the indicator fully or adequately. Accordingly, the proposed measures may be useful in quantifying some aspects of the indicators, but most are not stand-alone proxies for the indicators. The proposed measures, accompanied by the context of the indicators, build an effective narrative about community resilience capacity.

The project team explored numerous Federal programs and agency datasets for potential use in quantifying and tracking key national-level outcomes related to the community resilience indicators. The team limited their identification and development of proposed measures to readily available Federal datasets that met key prioritization and consistency criteria. The list of proposed measures presented in Table 2 does not reflect all of the datasets examined. Table 2 also does not include all measures that the team evaluated or measures recommended for consideration by participating agencies. Additional opportunities exist to explore, develop, and refine measures further by building off the resources collected through this initial effort.

The project team initially explored measurement options for nearly all indicators under the framework, but the "Proposed Measures" below only represent those that were: (1) fully developed for national-level data analysis; (2) successfully coordinated with data providers; and (3) approved by contributing agencies for use in this context. *Appendix B. Assessing Potential National-Level Measures*, along with the associated web mapping application developed by the team, provides additional details about the proposed measures listed in Table 2, including those listed below. Appendix B also includes narratives about measures that the team considered for the project, but did not develop fully for various reasons.

- Detailed descriptions of the proposed measures;

- Access to the source data used to develop the proposed measures;

- Access to the "transformed" State-level or community-level data developed for use in an initial baseline analysis; and

- Baseline analysis results and national-level summaries.

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Indicator	Measure	National-Level Baseline Summary
Table 2. Proposed National-Level Measures		
Housing Core Capability		
Housing Condition	Proposed Measure: Percentage of households living with at least one of four severe housing problems (5-year average)	Percentage of total households living with at least one of four severe housing problems (nationally and for each State) In the U.S., approximately 42.7 million of 116.4 million households (37 percent) have one of the four severe housing problems.
Housing Affordability	Proposed Measure: Percentage of households that are cost burdened (monthly housing costs, including utilities, exceed 30 percent of monthly income)	Percentage of households living in counties with monthly housing costs exceeding 30 percent of monthly income (nationally and for each State) For the period of 2008-2012, the 5-year average national cost-burdened housing rate was approximately 32 percent.
Health and Social Services Core Capability		
Health Care Availability	Proposed Measure: Number of primary care physicians per 100,000 residents	Number of primary care physicians per 100,000 residents, for the (nationally and for each State) The U.S. has approximately 78 primary care physicians per 100,000 residents.
Healthy Behaviors	Proposed Measure: Percentage of adult population not participating in leisure time physical activity	Percentage of adults who do not participate in leisure time physical exercise (nationally and for each State) Nationwide, approximately 26.3 percent of Americans do not participate in leisure time physical exercise.
Environmental Health	TBD – Various options explored using available data; further investigation needed for developing proposed measure	No baseline
Economic Recovery Core Capability		
State and Local Government Revenues	TBD – Future consideration needed for developing proposed measure	No baseline
Employment Opportunity	Proposed Measure: 3-year average unemployment rate	3-year average unemployment rate (nationally and for each State) From 2012 through 2014, the 3-year average national unemployment rate was 7.25 percent.
Income	Proposed Measure: Per capita income	Per capita income (nationally and for each State) In 2013, the national per capita income was $46,049.

Table 2, continued		
Indicator	**Measure**	**National-Level Baseline Summary**
Infrastructure Systems Core Capability		
Roadway Conditions	TBD – Various options explored using available data; further investigation needed for developing proposed measure	No baseline
Transportation Connectivity	Proposed Measure: Percentage of public transportation passenger terminals with intermodal connectivity	Percentage of public transportation passenger terminals with intermodal connectivity (nationally and for each State) Nationwide, 56 percent of public transportation passenger terminals have intermodal connectivity.
Transit Accessibility	Proposed Measure: Percentage of transit system stations in compliance with Americans with Disabilities Act (ADA) accessibility requirements	Percentage of transit system stations in compliance with ADA accessibility requirements (nationally and for each State) In 2013, approximately 78 percent of transit stations in the Federal Transit Administration National Transit Database were ADA compliant and, therefore, accessible to people with disabilities.
Water Sector Emergency Support	Proposed Measure: Number of States with Mutual Aid and Assistance Agreements in place through Water/Wastewater Agency Response Network (WARN)	Number of States with WARN agreements in place in 2015 (49 total)
Energy Assurance	TBD – Future consideration needed for developing proposed measure	No baseline
Telecommunications Accessibility	TBD – Future consideration needed for developing proposed measure	No baseline
Dam Safety	TBD – Various options explored using available data; further investigation needed for developing proposed measure	No baseline
Integrated Infrastructure Sector Preparedness	TBD – Various options explored using available data; further investigation needed for developing proposed measure	No baseline
Natural and Cultural Resources Core Capability		
Water Conservation	Proposed Measure: Per capita water use for all domestic uses	Per capita water use for all domestic uses, (nationally and for each State) In 2010, national per capita water use was approximately 88 gallons per day.
Wetlands Conservation	TBD – Various options explored using available data; further investigation needed for developing proposed measure	No baseline

	Table 2, continued	
Indicator	Measure	National-Level Baseline Summary
Forest Conservation	TBD – Various options explored using available data; further investigation needed for developing proposed measure	No baseline
Habitat Quality	TBD – Various options explored using available data; further investigation needed for developing proposed measure	No baseline
Cultural Resources Protection	TBD – Future consideration needed for developing proposed measure	No baseline
Threats and Hazards Identification Core Capability		
Risk Identification	TBD – Various options explored using available data; further investigation needed for developing proposed measure	No baseline.
Risk and Disaster Resilience Assessment Core Capability		
Risk Data	TBD – Various options explored using available data; further investigation needed for development of proposed measures	No baseline
Risk Awareness	TBD – Various options explored using available data; further investigation needed for developing proposed measure	No baseline
Community Preparedness	<u>Proposed Measure:</u> Number of sites designated as StormReady® and/or TsunamiReady® *[Note: This measure is specific to a single community preparedness program. Additional exploration of measures required for a more complete representation of the indicator.]*	Number of designated StormReady® and/or TsunamiReady® sites (nationally and for each State) As of February 2016, 2,402 StormReady® and TsunamiReady® sites exist nationwide.
Planning Core Capability		
Mitigation Planning	<u>Proposed Measure</u>: Percentage of population residing in communities covered by a current local hazard mitigation plan	Percentage of the population residing in communities covered by a current local hazard mitigation plan (nationally and for each State) As of December 31, 2015, over 82 percent of the Nation's population (excluding U.S. Territories) lives in a community with a current local hazard mitigation plan.
Planning Integration	TBD – Various options explored using available data; further investigation needed for developing proposed measure	No baseline

	Table 2, continued	
Indicator	**Measure**	**National-Level Baseline Summary**
Community Resilience Core Capability		
Collaborative Networks	TBD – Various options explored using available data; further investigation needed for developing proposed measure	No baseline
Civic Capacity	<u>Proposed Measure</u>: Percentage of individuals surveyed who performed volunteer activities for or through an organization during the preceding 12-month period *[Note: This measure is specific to a single element of social connectedness. Additional exploration of measures required for a more complete representation of the indicator.]*	Percentage of individuals surveyed who performed volunteer activities for or through an organization during the preceding 12-month period (nationally and for each State) Nationwide in 2014, 25.3 percent of the individuals surveyed volunteered during the previous year.
Long-Term Vulnerability Reduction Core Capability		
Building Codes	<u>Proposed Measure</u>: Percentage of reporting communities that are subject to one or more hazards (seismic, hurricane, or flood) that have adopted building codes with disaster resistance provisions	Percentage of reporting communities that are subject to one or more hazards (seismic, hurricane, or flood) and have adopted building codes with disaster resistance provisions (nationally and for each State) As of 2015, approximately 60 percent of the Nation's jurisdictions that are subject to seismic, hurricane, or flood hazards had adopted a building code with disaster resistance provisions.
Higher Standards	<u>Proposed Measure</u>: Percentage of National Flood Insurance Program (NFIP)-participating communities enrolled in the Community Rating System (CRS) with a CRS rating of Class 5 or better *[Note: This measure is specific to a single "higher standard" program. Additional measures should be explored for more complete representation of the indicator.]*	Percentage of NFIP-participating communities enrolled in the CRS with a CRS rating of Class 5 or better (nationally and for each State) As of the date of this report, 113 of the 22,875 NFIP-participating communities (0.5 percent) enrolled in the CRS have a CRS rating of Class 5 or better.
Mitigation Investment	<u>Proposed Measure</u>: Percentage of total public infrastructure disaster relief funds spent on Section 406 (Stafford Act) Mitigation for disasters in the preceding 5-year period *[Note: This measure is specific to disaster declaration areas and does not reflect nationwide coverage.]*	No baseline Considered: Percentage of total public infrastructure disaster relief funds spent on Section 406 Mitigation for disasters in the preceding 5-year period (nationally and for each State)

	Table 2, continued	
Indicator	**Measure**	**National-Level Baseline Summary**
	<u>Proposed Measure</u>: Percentage of Small Business Administration (SBA) home disaster loan funds spent on mitigation assistance *[Note: This measure is specific to disaster declaration areas and does not reflect nationwide coverage.]*	Percentage of SBA home disaster loan funds spent on mitigation assistance, for each State that provided SBA home disaster loans In 2014, in the 28 States that reported SBA home disaster loans, loan recipients spent an average of 0.5 percent of loan funds on mitigation assistance.

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DATA ACCESS AND AVAILABILITY

Table 3 provides a list of the publicly available Federal community-scale datasets that were either (a) used as source data for the proposed national-level measures listed in Table 3, or (b) identified as potentially relevant data for development of additional national-level measures under the indicator framework. Given the potential relevance of these data to many of the community resilience indicators in this Draft Concept Paper, Table 3 provides links to possible resources in related resilience indicators and assessment activities, for stakeholders to use. *Appendix B. Summary of Indicators and Sources* provides a more comprehensive summary of project data sources.

Table 3. Federal Resources for Relevant Community-Level Data		
Dataset and Access Link	Description	Relationship to Indicators and Proposed Measures
HUD Comprehensive Housing Affordability Strategy (CHAS) Data	The Comprehensive Housing Affordability Strategy (CHAS) data, provided by the U.S. Department of Housing and Urban Development (HUD), offers a wide range of information about housing conditions.	Source data used for proposed measures of Housing Condition Indicator and Housing Affordability Indicator
HHS Area Health Resources Files (AHRF)	U.S. Department of Health and Human Services (HHS) AHRF provides a comprehensive set of data offering a broad range of health resources and information, including the number of primary care physicians and local population.	Source data used for proposed measure of Health Care Availability Indicator

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Table 3, continued		
Dataset and Access Link	**Description**	**Relationship to Indicators and Proposed Measures**
CDC Diabetes County-Level Data	The Centers for Disease Control and Prevention (CDC) collects data and trends of diagnosed diabetes, obesity, and leisure-time physical inactivity at the national, State, and county levels. Information includes (1) State- and county-level data in the U.S., (2) data on how counties compare with each other, and (3) maps and motion charts to examine how changes in diabetes coincide with changes in obesity over time and by location.	Source data used for proposed measure of Healthy Behaviors Indicator
EPA 2011 NATA Assessment Results	The National Air Toxics Assessment (NATA), developed by the U.S. Environmental Protection Agency (EPA), provides modeled estimates of respiratory disease risk as the result of exposure to toxic air contaminants.	Potential data source for future measure of Environmental Health Indicator
EDA Innovation Index	Developed through an Economic Development Administration (EDA)-sponsored effort, the Innovation Index highlights factors that indicate a region is more or less ready to participate in the knowledge economy. The index provides regional-scale data that can help communities understand how they compare to the nation, other regions, and States in terms of innovation capacity and innovation results.	Potential data source for future measure of Economic Health/Sector Strength Indicator
BLS Local Area Unemployment Statistics	U.S. Bureau of Labor Statistics (BLS) provides annual unemployment estimates for each county and State nationwide. Because unemployment data may have wide year-to-year variability, this BLS report provides 3-year unemployment rate averages.	Source data used for proposed measure of Employment Opportunity Indicator
BEA Local Area Personal Income	U.S. Bureau of Economic Analysis (BEA) provides per capita local area personal income, which BEA calculates as the total personal income of the residents of a given area divided by the resident population of the area. BEA measures personal income before the deduction of personal income taxes and other personal taxes and reports it in current dollars.	Source data used for proposed measure of Income Indicator
BTS Intermodal Passenger Connectivity Database	The Intermodal Passenger Connectivity Database (IPCD), managed by the U.S. Bureau of Transportation Statistics (BTS), provides a national quantification of the degree of connectivity in the passenger transportation system.	Source data used for proposed measure of Transportation Connectivity Indicator

Table 3, continued		
Dataset and Access Link	**Description**	**Relationship to Indicators and Proposed Measures**
FTA National Transit Database (NTD): Passenger Stations	The Federal Transit Administration (FTA) provides national transit system data through the National Transit Database (NTD). U.S. Congress established the NTD to be the primary national source for transit system information and statistics. By statute, recipients or beneficiaries of certain grants from the FTA must submit data to the NTD. As part of the data submission, local transit authorities report on the number of total transit stations, as well as the number of transit stations that are ADA-compliant.	Source data used for proposed measure of Transit Accessibility Indicator
Water/Wastewater Agency Response Networks (WARNs) *(Note: Data were provided by EPA partner organization, American Water Works Association)*	EPA encourages States to establish WARNs to provide methods whereby water/wastewater utilities provide and receive emergency aid and assistance necessary due to sustained or anticipated damage from natural or human-caused incidents.	Source data used for proposed measure of Water Sector Emergency Support Indicator
NTIA National Broadband Map	The National Telecommunications and Information Administration (NTIA) created the National Broadband Map (NBM) in collaboration with the Federal Communications Commission, and in partnership with 50 States, five Territories, and the District of Columbia. The NBM provides maps and downloadable data on broadband availability across every neighborhood in the United States. First published in February 2011, NTIA updated the NBM every 6 months through April 2015 with data from the State Broadband Initiative. NTIA currently collects broadband deployment data from service providers every 2 years.	Potential data source for future measure of Telecommunications Accessibility Indicator

	Table 3, continued	
Dataset and Access Link	**Description**	**Relationship to Indicators and Proposed Measures**
USACE National Inventory of Dams	The U.S. Army Corps of Engineers (USACE) maintains the National Inventory of Dams (NID) in close collaboration with FEMA and State regulatory offices. Dams in the NID must meet at least one of the following criteria; (1) High hazard classification - loss of one human life is likely if the dam fails, (2) Significant hazard classification - possible loss of human life and likely significant property or environmental destruction, (3) Equal or exceed 25 feet in height and exceed 15 acre-feet in storage, and (4) Equal or exceed 50 acre-feet storage and exceed 6 feet in height.	Potential data source for future measure of Dam Safety Indicator
USACE National Levee Database	The USACE-maintained National Levee Database (NLD) is a dynamic, searchable inventory of information about levees and a key resource supporting decisions and actions affecting levee safety. The NLD provides information about the location and condition of levees and floodwalls, as well as reports, inspection summaries, and other related records. The NLD includes detailed information about the levees in the National Levee Safety Program, as well as a growing library of available information on levees outside of the USACE program.	Potential data source for future measure of Dam Safety Indicator
USGS Water Use Information for the Nation	The U.S. Geological Survey (USGS) tracks the estimated use of water nationwide, including the public supply deliveries for domestic use. USGS collects the data from counties every 5 years for the national water use report.	Source data used for proposed measure of Water Conservation Indicator
Land Cover for the Conterminous United States - Forests	This EPA EnviroAtlas dataset represents the percentage of land area that is classified as forest land cover, modified forest land cover, and natural land cover in each subwatershed (12-digit Hydrologic Unit Classification, or HUC). (The EPA EnviroAtlas uses the National Land Cover Database (NLCD) for these data.)	Potential data source for future measures of Wetlands Conservation Indicator

	Table 3, continued	
Dataset and Access Link	**Description**	**Relationship to Indicators and Proposed Measures**
USDA USFS Forest Inventory and Analysis Program	The U.S. Forest Service (USFS) Forest Inventory and Analysis (FIA) Program provides the information needed to assess America's forests. The FIA Program reports on status and trends in forest area and location; in the species, size, and health of trees; in total tree growth, mortality, and removals by harvest; in wood production and utilization rates by various products; and in forest land ownership.	Potential data source for future measures of Forest Conservation Indicator
Protected Lands for the Conterminous United States	This EPA EnviroAtlas dataset illustrates the percent of land within a subwatershed (12-digit HUC) that has legally recognized easements for conservation or other protections in place to restrict human use or development. These data include both public and private land. (The EPA EnviroAtlas uses the USGS Protected Areas Database of the United States for these data.)	Potential data source for future measures of Wetlands Conservation Indicator and Forest Conservation Indicator
USGS National Fish Habitat Partnership Data System	In support of the National Fish Habitat Partnership (NFHP), the USGS works with partners and stakeholders to gather data in support of conducting a condition assessment of fluvial water bodies throughout the U.S.). The dataset is available to NFHP participants and other users interested in acquiring consistently organized information characterizing river systems over larger regions.	Potential data source for future measure of Habitat Quality Indicator
Percent Stream Buffer Zone As Natural Land Cover for the Conterminous United States	This EPA EnviroAtlas dataset shows the percentage of land area within a 30-meter buffer zone along the National Hydrography Dataset high-resolution stream network, and along water bodies (such as lakes and ponds) that are connected via flow to the streams, that is classified as forest land cover, modified forest land cover, and natural land cover using the NLCD for each Watershed Boundary Dataset 12-digit HUC in the conterminous U.S.	Potential data source for future measure of Habitat Quality Indicator
NOAA StormReady and TsunamiReady Sites	The National Weather Service provides data about StormReady® and TsunamiReady® sites, ranging in geographic scale from States to counties, to specific commercial and educational sites.	Source data used for proposed measure of Community Preparedness Indicator

Table 3, continued		
Dataset and Access Link	**Description**	**Relationship to Indicators and Proposed Measures**
FEMA Hazard Mitigation Plan Status	FEMA requires State, Tribal, and local governments to develop and adopt hazard mitigation plans as a condition for receiving certain types of non-emergency disaster assistance, including funding for mitigation projects. Jurisdictions must update their hazard mitigation plans and re-submit them for FEMA approval every 5 years to maintain eligibility. The data provided indicate the status of hazard mitigation plans in local jurisdictions across the nation.	Source data used for proposed measure of Hazard Mitigation Planning Indicator
Corporation for National and Community Service (CNCS) Volunteering and Civic Life in America	The CNCS site provides a comprehensive look at volunteering and civic life in the 50 States and 51 cities across the U.S. Data include volunteer rates and rankings, civic engagement trends, and analysis.	Source data used for proposed measure of Civic Capacity Indicator
ISO Building Codes Effectiveness Grading Schedule (BCEGS) *(Note: ISO developed the community- level BCEGS data. The link above is for aggregated State-level data, which were used by permission from ISO. Users may obtain community-specific BCEGS data directly from ISO.)*	The Insurance Services Office (ISO) BCEGS® program assesses the building codes in effect in a particular community and how the community enforces them, with special emphasis on mitigating losses from natural hazards. ISO assigns each municipality a Building Code Effectiveness Classification from 1 (exemplary commitment to building-code enforcement) to 10 for both commercial and residential construction.	Source data used for proposed measure of Building Codes Indicator
FEMA Community Rating System Communities and their Classes	The Community Rating System (CRS) is a voluntary incentive program through which FEMA recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. The data provided are from the most recent Flood Insurance Agent's Manual containing current and historical listings of all CRS communities, their class, and insurance discount.	Source data used for proposed measure of Higher Standards Indicator

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APPENDIX A. RESILIENCE INDICATOR CATEGORIZATION TAXONOMY

An overview of the taxonomy to improve how the Federal Government communicates the intended objectives and outcomes from their community resilience indicators, metrics, standards, and related resources appears in Table A-1.

Table A.1. Community Resilience Taxonomy Structure

NATIONAL PREPAREDNESS GOAL ALIGNMENT

Mission Areas

Prevention	Preventing, avoiding, or stopping a threatened or an actual act of terrorism.
Protection	Protecting our citizens, residents, visitors, assets, systems, and networks against the greatest threats and hazards in a manner that allows our interests, aspirations, and way of life to thrive.
Mitigation	Mitigating the loss of life and property by lessening the impact of future disasters.
Response	Responding quickly to save lives, protect property and the environment, and meet basic human needs in the aftermath of an incident.
Recovery	Recovering through a focus on the timely restoration, strengthening, and revitalization of infrastructure, housing, and the economy, as well as the health, social, cultural, historic, and environmental fabric of communities affected by an incident.

Core Capabilities

Planning - Prevention	Conduct a systematic process engaging the whole community as appropriate in the development of executable strategic, operational, and/or tactical-level approaches to meet defined objectives.
Planning - Protection	Conduct a systematic process engaging the whole community as appropriate in the development of executable strategic, operational, and/or tactical-level approaches to meet defined objectives.
Planning - Mitigation	Conduct a systematic process engaging the whole community as appropriate in the development of executable strategic, operational, and/or tactical-level approaches to meet defined objectives.
Planning - Response	Conduct a systematic process engaging the whole community as appropriate in the development of executable strategic, operational, and/or tactical-level approaches to meet defined objectives.

Table A-1, continued	
Planning - Recovery	Conduct a systematic process engaging the whole community as appropriate in the development of executable strategic, operational, and/or tactical-level approaches to meet defined objectives.
Public Information and Warning - Prevention	Deliver coordinated, prompt, reliable, and actionable information to the whole community through the use of clear, consistent, accessible, and culturally and linguistically appropriate methods to effectively relay information regarding any threat or hazard, as well as the actions being taken and the assistance being made available, as appropriate.
Public Information and Warning - Protection	Deliver coordinated, prompt, reliable, and actionable information to the whole community through the use of clear, consistent, accessible, and culturally and linguistically appropriate methods to effectively relay information regarding any threat or hazard, as well as the actions being taken and the assistance being made available, as appropriate.
Public Information and Warning - Mitigation	Deliver coordinated, prompt, reliable, and actionable information to the whole community through the use of clear, consistent, accessible, and culturally and linguistically appropriate methods to effectively relay information regarding any threat or hazard, as well as the actions being taken and the assistance being made available, as appropriate.
Public Information and Warning - Response	Deliver coordinated, prompt, reliable, and actionable information to the whole community through the use of clear, consistent, accessible, and culturally and linguistically appropriate methods to effectively relay information regarding any threat or hazard, as well as the actions being taken and the assistance being made available, as appropriate.
Public Information and Warning - Recovery	Deliver coordinated, prompt, reliable, and actionable information to the whole community through the use of clear, consistent, accessible, and culturally and linguistically appropriate methods to effectively relay information regarding any threat or hazard, as well as the actions being taken and the assistance being made available, as appropriate.
Operational Coordination - Prevention	Establish and maintain a unified and coordinated operational structure and process that appropriately integrates all critical stakeholders and supports the execution of core capabilities.
Operational Coordination - Protection	Establish and maintain a unified and coordinated operational structure and process that appropriately integrates all critical stakeholders and supports the execution of core capabilities.
Operational Coordination - Mitigation	Establish and maintain a unified and coordinated operational structure and process that appropriately integrates all critical stakeholders and supports the execution of core capabilities.
Operational Coordination - Response	Establish and maintain a unified and coordinated operational structure and process that appropriately integrates all critical stakeholders and supports the execution of core capabilities.
Operational Coordination - Recovery	Establish and maintain a unified and coordinated operational structure and process that appropriately integrates all critical stakeholders and supports the execution of core capabilities.
Prevention	
Forensics and Attribution	Conduct forensic analysis and attribute terrorist acts (including the means and methods of terrorism) to their source, to include forensic analysis as well as attribution for an attack and for the preparation for an attack in an effort to prevent initial or follow-on acts and/or swiftly develop counter-options.
Intelligence and Information Sharing - Prevention	Provide timely, accurate, and actionable information resulting from the planning, direction, collection, exploitation, processing, analysis, production, dissemination, evaluation, and feedback of available information concerning physical and cyber threats to the United States, its people, property, or interests; the development, proliferation, or use of WMDs; or any other matter bearing on U.S. national or homeland security by local, state, tribal, territorial, Federal, and other stakeholders. Information sharing is the ability to exchange intelligence, information, data, or knowledge among government or private sector entities, as appropriate.

Table A-1, continued	
Interdiction and Disruption - Prevention	Delay, divert, intercept, halt, apprehend, or secure threats and/or hazards.
Screening, Search, and Detection - Prevention	Identify, discover, or locate threats and/or hazards through active and passive surveillance and search procedures. This may include the use of systematic examinations and assessments, biosurveillance, sensor technologies, or physical investigation and intelligence.
Protection	
Intelligence and Information Sharing - Protection	Provide timely, accurate, and actionable information resulting from the planning, direction, collection, exploitation, processing, analysis, production, dissemination, evaluation, and feedback of available information concerning physical and cyber threats to the United States, its people, property, or interests; the development, proliferation, or use of Weapons of Mass Destruction; or any other matter bearing on U.S. national or homeland security by local, State, Tribal, Territorial, Federal, and other stakeholders. Information sharing is the ability to exchange intelligence, information, data, or knowledge among government or private sector entities, as appropriate.
Interdiction and Disruption - Protection	Delay, divert, intercept, halt, apprehend, or secure threats and/or hazards.
Screening, Search, and Detection - Protection	Identify, discover, or locate threats and/or hazards through active and passive surveillance and search procedures. This may include the use of systematic examinations and assessments, biosurveillance, sensor technologies, or physical investigation and intelligence.
Access Control and Identity Verification	Apply and support necessary physical, technological, and cyber measures to control admittance to critical locations and systems.
Cybersecurity	Protect against damage to, the unauthorized use of, and/or the exploitation of (and, if needed, the restoration of) electronic communications systems and services (and the information contained therein).
Physical Protective Measures	Implement and maintain risk-informed countermeasures and policies protecting people, borders, structures, materials, products, and systems associated with key operational activities and critical infrastructure sectors.
Risk Management for Protection Programs and Activities	Identify, assess, and prioritize risks to inform Protection activities, countermeasures, and investments.
Supply Chain Integrity and Security	Strengthen the security and resilience of the supply chain.
Mitigation	
Community Resilience	Enable the recognition, understanding, communication of, and planning for risk and empower individuals and communities to make informed risk management decisions necessary to adapt to, withstand, and quickly recover from future incidents.
Long-term Vulnerability Reduction	Build and sustain resilient systems, communities, and critical infrastructure and key resources lifelines to reduce their vulnerability to natural, technological, and human-caused threats and hazards by lessening the likelihood, severity, and duration of the adverse consequences.
Risk and Disaster Resilience Assessment	Assess risk and disaster resilience so that decision makers, responders, and community members can take informed action to reduce their entity's risk and increase their resilience.

Table A-1, continued	
Threats and Hazard Identification	Identify the threats and hazards that occur in the geographic area; determine the frequency and magnitude; and incorporate this into analysis and planning processes to clearly understand the needs of a community or entity.
Response	
Critical Transportation	Provide transportation (including infrastructure access and accessible transportation services) for response priority objectives, including the evacuation of people and animals, and the delivery of vital response personnel, equipment, and services into the affected areas.
Environmental Response/Health and Safety	Conduct appropriate measures to ensure the protection of the health and safety of the public and workers, as well as the environment, from all-hazards in support of responder operations and the affected communities.
Fatality Management Services	Provide fatality management services, including decedent remains recovery and victim identification, working with local, state, tribal, territorial, insular area, and Federal authorities to provide mortuary processes, temporary storage or permanent internment solutions, sharing information with mass care services for the purpose of reunifying family members and caregivers with missing persons/remains, and providing counseling to the bereaved.
Fire Management and Suppression	Provide structural, wildland, and specialized firefighting capabilities to manage and suppress fires of all types, kinds, and complexities while protecting the lives, property, and the environment in the affected area.
Infrastructure Systems - Response	Stabilize critical infrastructure functions, minimize health and safety threats, and efficiently restore and revitalize systems and services to support a viable, resilient community.
Mass Care Services	Deliver essential commodities, equipment, and services in support of impacted communities and survivors, to include emergency power and fuel support, as well as the coordination of access to community staples. Synchronize logistics capabilities and enable the restoration of impacted supply chains.
Mass Search and Rescue Operations	Provide life-sustaining and human services to the affected population, to include hydration, feeding, sheltering, temporary housing, evacuee support, reunification, and distribution of emergency supplies.
On-scene Security, Protection, and Law Enforcement	Deliver traditional and atypical search and rescue capabilities, including personnel, services, animals, and assets to survivors in need, with the goal of saving the greatest number of endangered lives in the shortest time possible.
Operational Communications	Ensure a safe and secure environment through law enforcement and related security and protection operations for people and communities located within affected areas and also for response personnel engaged in lifesaving and life-sustaining operations.
Logistics and Supply Chain Management	Ensure the capacity for timely communications in support of security, situational awareness, and operations by any and all means available, among and between affected communities in the impact area and all response forces.
Public Health, Healthcare, and Emergency Medical Services	Provide lifesaving medical treatment via Emergency Medical Services and related operations and avoid additional disease and injury by providing targeted public health, medical, and behavioral health support, and products to all affected populations.
Situational Assessment	Provide all decision-makers with decision-relevant information regarding the nature and extent of the hazard, any cascading effects, and the status of the response.
Recovery	
Infrastructure Systems - Recovery	Stabilize critical infrastructure functions, minimize health and safety threats, and efficiently restore and revitalize systems and services to support a viable, resilient community.

Table A-1, continued	
Economic Recovery	Return economic and business activities (including food and agriculture) to a healthy state and develop new business and employment opportunities that result in an economically viable community.
Health and Social Services	Restore and improve health and social services capabilities and networks to promote the resilience, independence, health (including behavioral health), and well-being of the whole community.
Housing	Implement housing solutions that effectively support the needs of the whole community and contribute to its sustainability and resilience.
Natural and Cultural Resources	Protect natural and cultural resources and historic properties through appropriate planning, mitigation, response, and recovery actions to preserve, conserve, rehabilitate, and restore them consistent with post-disaster community priorities and best practices and in compliance with applicable environmental and historic preservation laws and executive orders.

CATEGORIZATION

Geographic Scope (Includes National; Regional (multi-State); State; Local Community)

Regions

Urban	Includes areas that are urban.
Suburban	Includes areas that are suburban (less densely populated, but urbanized).
Exurban	Includes areas that are suburban (less densely populated and outside the typical commuting radius).
Rural	Includes areas that are rural.
Coastal	Includes areas on the coast of a large body of water (e.g., oceans and Great Lakes).
Interior: Riverine	Includes areas not near a coast, but near a major river.
Interior: Nonriverine	Includes areas not near a coast or a major river.

All Hazards (Resource is generally applicable to all hazards)

Natural Threat / Hazards	As defined in existing statute and/or regulation.
Technological Threat / Hazard	As defined in existing statute and/or regulation.
Human-caused Threat / Hazard	As defined in existing statute and/or regulation.
Critical Infrastructure Sector	As defined in Presidential Policy Directive (PPD)-21 and the National Infrastructure Protection Plan (NIPP).

Climate Change

Climate Change Adaptation	Resource intended to support community adaptation to climate change impacts.
Climate Change Mitigation	Resource intended to support community efforts to mitigate climate changes.
Changing weather patterns	Includes threats and hazards caused by or exacerbated by climate changes.
Severe weather	Includes threats and hazards caused by or exacerbated by climate changes.

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Table A-1, continued	
Extreme temperatures	Includes threats and hazards caused by or exacerbated by climate changes.
Drought	Includes threats and hazards caused by or exacerbated by climate changes.
Flood	Includes threats and hazards caused by or exacerbated by climate changes.
Salt water intrusion	Includes threats and hazards caused by or exacerbated by climate changes.
Sea-level rise	Includes threats and hazards caused by or exacerbated by climate changes.
Storm surges	Includes threats and hazards caused by or exacerbated by climate changes.
Increased atmospheric water retention	Includes threats and hazards caused by or exacerbated by climate changes.
Warming oceans	Includes threats and hazards caused by or exacerbated by climate changes.
Debris flows	Includes threats and hazards caused by or exacerbated by climate changes.
Upward shift of natural snow-reliability line	Includes threats and hazards caused by or exacerbated by climate changes.
Polar ice melt	Includes threats and hazards caused by or exacerbated by climate changes.
Glacier melt	Includes threats and hazards caused by or exacerbated by climate changes.
Permafrost melt	Includes threats and hazards caused by or exacerbated by climate changes.
Change in ice cover	Includes threats and hazards caused by or exacerbated by climate changes.
Other	Includes threats and hazards caused by or exacerbated by climate changes.
Other Description	Includes threats and hazards caused by or exacerbated by climate changes.
Resilience Themes	
Community Resilience Capacity	
Access and Functional Needs	Includes the capacity of the community to consider, include, and integrate the needs of populations with access and functional needs.
Economic Resilience	Includes the capacity of the community adapt to and recover from incidents that impact the local or regional economy.
Health Resilience	Includes the capacity of the community to adapt to and recover from incidents that impact the public health of the population and public health infrastructure.
Housing Resilience	Includes the capacity of the community to adapt to and recover from incidents that impact the housing stock, the affordability of housing, and the accessibility of housing.
Sustainability	Includes the capacity of the community to integrate concepts of sustainable building, energy use, commodity consumption, and other related activities.
Community Planning	Includes the capacity of the community to plan regarding community resilience-building issues.
Social Connectedness	Includes the capacity of the community to engage and employ formal and informal social networks to build the overall resilience of the community as a whole, vulnerable populations, and areas affected by incidents.

Table A-1, continued	
Infrastructure Systems Resilience	
Facility Guidance	Includes guidance for building resilience into existing facilities for achieving higher levels of performance, survivability, or other related criteria.
Construction	Includes guidance for constructing facilities to achieve higher levels of performance, survivability, or other related criteria.
Assessment	Includes guidance for assessing the performance of existing facilities in meeting resilience-driven targets.
Water Infrastructure	Includes guidance for assessing, evaluating, or building water and wastewater systems to meet resilience-driven targets.
Critical Infrastructures	Includes guidance that applies broadly to critical infrastructures in meeting resilience-driven targets.
Ecosystem and Natural Resource Resilience	
Water	Includes the capacity of hydrological systems to be resilient to threats and hazards.
Fisheries	Includes the capacity of fisheries to be resilient to threats and hazards.
Agriculture	Includes the capacity for agriculture (production agriculture and livestock) to be resilient to threats and hazards.
Wildlife	Includes the capacity of wildlife ecologies to be resilient to threats and hazards.
Cultural Resources	Includes the capacity of cultural assets and resources to be resilient to threats and hazards.
Risk and Resilience Assessment	
Threat and Hazard Identification	Includes the capacity to identify, evaluate, and measure threats and hazards to communities and infrastructure.
Risk Analysis	Includes the capacity to conduct analysis of known risks, evaluating probability, impact, and consequences to a community.
Resiliency Assessment	Includes the capacity to conduct aggregate analyses of multiple variables that can suggest the degree to which a community is able to reach its resilience targets.

APPENDIX B. ASSESSING POTENTIAL NATIONAL-LEVEL MEASURES

PURPOSE

The information included in this appendix comprehensively summarizes and presents the initial work of the project team in exploring national-level measures for use in tracking trends and progress across a wide range of community resilience indicators or factors. Data availability was a limiting factor for identifying and developing highly effective measures across the entire conceptual indicator framework. The team encountered challenges in identifying and accessing relevant Federal data sources with national coverage at consistent scales. Because of data challenges and gaps, this Concept Paper only includes fully developed proposed measures for some of the indicators. Many of the remaining indicators include descriptions of measures that were considered or evaluated by the team, but could not be more fully developed for various reasons.

CAVEATS AND LIMITATIONS OF PROPOSED MEASURES

Scoring: The project team did not select the proposed measures based on their value or utility for composite indexing, community comparison, or scoring. The proposed measures consider possible uses of Federal program-based information in identifying relevant national-level trends in community resilience capacity-building activities and outcomes. The team did not develop the proposed measures to support comparative assessment of resilience capacity among States or communities.

Data Aggregation: Baseline assessments for the proposed measures include results aggregated into State-level and national-level summaries, even when the underlying data are at a community scale. The team summarized and presented aggregated results because the primary goal driving the development of these measures was to demonstrate how they might be used nationally for tracking community resilience capacity-building trends over time. The team also recognized that further examination of the community-level project data for indicator-related uses at different scales was possible; however, it was beyond the scope of the current effort.

Indicator Representation: Some key issues and concerns raised by stakeholders thus far about the limited nature of the proposed measures for indicator representation include:

- Current proposed measures generally have either a flood-related or a broad multihazard resilience-related emphasis. They do not fully represent a wide range of hazard and climate risks and vulnerabilities.

- Current proposed measures do not fully represent relevant infrastructure sectors. Contributors noted concerns over the absence of measures related to key utility sectors, such as energy and telecommunications. Private parties own and operate the vast majority of the nation's energy infrastructure; due to its complexity, scope, and interconnected nature, the Federal Government does not provide a systematic assessment of resilience within the energy sector at the community level.

- Current proposed measures generally emphasize urban issues and priorities. Contributors noted that they do not adequately account for rural considerations.

- Current proposed measures do not adequately cover U.S. Territory interests.

- Current proposed measures do not reflect Tribal communities as separate from States or counties.

SUMMARY OF ACCOMPANYING WEB MAPPING APPLICATION

A Geographic Information System (GIS) web mapping application that provides a visual representation of the data distribution for the proposed measures supplements this appendix. The GIS web mapping application also provides access to the State-level or county-level findings, as well as to the original agency datasets used to develop the measures. The GIS web mapping application is available at http://arcg.is/1RPElqB.

GIS Web Mapping Application Contents

The GIS web mapping application contains two primary components: (1) indicator dataset navigation bar, and (2) map body.

The navigation bar provides access for each indicator with a proposed measure, as well as the ability to toggle between specific indicators to investigate the proposed measures geographically. The dataset navigation bar also includes a legend and a link to a downloadable zip file containing a local version of the hosted dataset, the original source data (where they are publicly available), and the data disclaimer.

The map body visually displays the aggregated data for the selected measure. A muted dark gray canvas serves as the base map, and users have the ability to pan around and zoom in or zoom out, allowing them to investigate areas of interest further. Additionally, a user's selection of a State or county enables a popup functionality that allows the user to view several key attributes and download data if desired.

Figure B-1is a screenshot from the GIS web mapping application. Readers are encouraged to use the web mapping application to directly view and interact with data for proposed measures.

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Figure B-1. Web Mapping Application Screen Shot
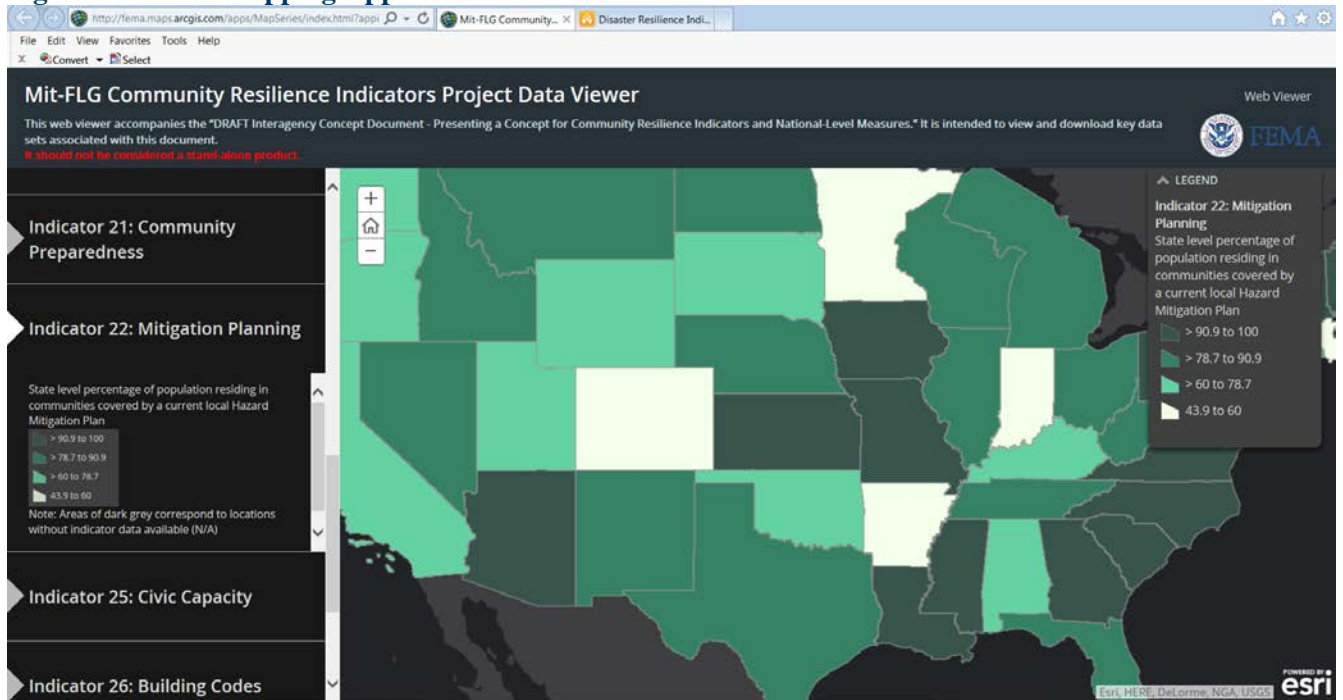
Web Mapping Application Format

The web mapping application is a static product. A future operational goal could be to configure the application to allow Federal agencies to update their data contributions regularly, especially for tracking the progress of certain measures over time. For this to be successful, Federal agencies will need to publish datasets as industry-standard web services – that is, Representational State Transfer (REST) or Web Map Service (WMS) – that permit open access and download of the associated data. The long-term strategy is to encourage Federal agencies to publish data that are relevant to resilience assessment in easily accessible and usable formats that lend themselves to both statistical and geospatial analysis, thus making the data publicly available for use by communities, academics, and other agencies as a data.gov initiative.

ORGANIZATION

The remaining sections of this appendix are organized and presented by indicator and aligned with the indicator descriptions in Table 2 in the main body of this Draft Concept Paper. For ease of presentation and reference, the team numbered the indicators represented in this appendix, as shown in Figure B-2.

This appendix does not include all of the indicators introduced in the main body of this Draft Concept Paper. MitFLG representatives recommended several additions during the interagency review process. Additional effort would be required to explore and develop proposed measures for new indicators.

Figure B-2. Organization of Indicators to Relevant Core Capabilities

Core Capability	Indicators
Core Capability: Housing	• Indicator 1: Housing Condition • Indicator 2: Housing Affordability
Core Capability: Health	• Indicator 3: Health Care Availability • Indicator 4: Healthy Behaviors • Indicator 5: Environmental Health
Core Capability: Economic Recovery	• Indicator 6: Employment Opportunity • Indicator 7: Income
Core Capability: Infrastructure Systems	• Indicator 8: Roadway Conditions • Indicator 9: Transportation Connectivity • Indicator 10: Transit Accessibility • Indicator 11: Water Sector Emergency Support • Indicator 12: Dam Safety • Indicator 13: Integrated Infrastructure Sector Preparedness
Core Capability: Natural and Cultural Resources	• Indicator 14: Water Conservation • Indicator 15: Wetlands Conservation • Indicator 16: Forest Conservation • Indicator 17: Habitat Quality
Core Capability: Threats and Hazards Identification	• Indicator 18: Risk Identification
Core Capability: Risk and Disaster Resilience Assessment	• Indicator 19: Risk Data • Indicator 20: Risk Awareness • Indicator 21: Community Preparedness
Core Capability: Planning	• Indicator 22: Mitigation Planning • Indicator 23: Planning Integration
Core Capability: Community Resilience	• Indicator 24: Collaborative Networks • Indicator 25: Civic Capacity
Core Capability: Long-Term Vulnerability Reduction	• Indicator 26: Building Codes • Indicator 27: Higher Standards • Indicator 28: Mitigation Investment

Summary of Proposed Measures

Table B-1 presents information on proposed national-level measures and baselines associated with various indicators of community resilience capacity. The proposed measures are only a subset of possible relevant options. As mentioned in the main body of this Draft Concept Paper, they reflect project-driven time and resource limitations, including dependence on readily available Federal geospatial datasets with nationwide coverage at county (preferred) or State (minimum) levels. The sections of this appendix that follow Table B-1 provide additional information on each of the proposed measures considered by the project team.

Table B-1. Proposed Indicator Framework with Illustrative Measures

Core Capability	Indicator	Proposed Measure	Baseline	Tracking National Progress
Housing	Indicator 1: Housing Condition	Percentage of households living with at least one of four severe housing problems (5-year average) [HUD Comprehensive Housing Affordability Strategy Housing Conditions Data]	Percentage of total households living with at least one of four severe housing problems, (nationally and for each State) Nationwide, approximately 42.7 million of 116.4 million households (37 percent) have one of the four severe housing problems.	Decreases in these percentages over time generally indicate improving housing conditions. Reductions in State-level percentages (especially those higher than the national average) could indicate significant progress in related capacity building at community levels.
Housing	Indicator 2: Housing Affordability	Percentage of households that are cost burdened (monthly housing costs, including utilities, exceed 30 percent of monthly income) [HUD Comprehensive Housing Affordability Strategy]	Percentage of households living in counties with monthly housing costs exceeding 30 percent of monthly income (nationally and for each State) From 2008 through 2012, the 5-year average national cost-burdened housing rate was approximately 32 percent.	Decreases in these percentages generally indicate improved housing affordability relative to average income. Reductions in State-level percentages over time could indicate progress in related capacity-building efforts at community levels.
Health and Social Services	Indicator 3: Health Care Availability	Number of primary care physicians per 100,000 residents [HHS Area Health Resources Files]	Number of primary care physicians per 100,000 residents (nationally and for each State). The U.S. has approximately 78 primary care physicians per 100,000 residents.	Increases in this number generally indicate improved health care related capacity. Increases in State-level averages, especially for those States below the national average, could represent significant progress in capacity-building efforts at community levels.

		Table B-1, continued		
Core Capability	Indicator	Proposed Measure	Baseline	Tracking National Progress
Health and Social Services	Indicator 4: Healthy Behaviors	Percentage of adult population not participating in leisure time physical activity [CDC Diabetes County Level Data]	Percentage of adults not participating in leisure time physical activity (nationally and for each State). Nationwide, approximately 26.3 percent of Americans are not participating in leisure time physical activity.	Decreases in these percentages reflect healthier lifestyle behaviors. Reductions in State-level percentages could indicate progress in related capacity-building efforts at community levels.
Health and Social Services	Indicator 5: Environmental Health	No measure at this time*	No baseline*	No measure at this time*
Economic Recovery	Indicator 6: Employment Opportunity	3-year average unemployment rate [U.S. Bureau of Labor Statistics Local Area Unemployment Statistics]	3-year average unemployment rate (nationally and for each State) From 2012 through 2014, the 3-year average national unemployment rate was 7.25 percent.	Decreases in these rates generally reflect improvement in employment conditions. Reductions in State-level rates over time (especially in States with rates exceeding the national average) could indicate progress in related capacity-building efforts at community levels.
Economic Recovery	Indicator 7: Income	Per capita income [U.S. Bureau of Economic Analysis Local Area Personal Income]	Per capita income (nationally and for each State) In 2013, the national per capita income was $46,049.	Increases in per capita income generally reflect improvements in economic conditions. Increases in State-level per capita income over time (especially in States below the national average) could indicate progress in related capacity-building efforts at community levels.
Infrastructure Systems	Indicator 8: Roadway Conditions	No measure at this time*	No baseline*	No measure at this time*

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		Table B-1, continued		
Core Capability	Indicator	Proposed Measure	Baseline	Tracking National Progress
Infrastructure Systems	Indicator 9: Transportation Connectivity	Percentage of public transportation passenger terminals with intermodal connectivity [U.S. Bureau of Transportation Statistics Intermodal Passenger Connectivity Database]	Percentage of public transportation passenger terminals with intermodal connectivity (nationally and for each State) Nationwide, 56 percent of public transportation passenger terminals have intermodal connectivity.	Increasing percentages of intermodal connectivity for public transportation passenger terminals generally reflect increased transportation choices/options. Increases in State-level percentages over time could indicate progress in related capacity-building efforts at community levels.
Infrastructure Systems	Indicator 10: Transit Accessibility	Percentage of transit system stations in compliance with American with Disabilities Act of 1990 (ADA) accessibility requirements [Federal Transit Administration National Transit Database (NTD): Transit Stations]	Percentage of transit system stations in compliance with ADA accessibility requirements (nationally and for each State) In 2013, approximately 78 percent of transit stations in the NTD were ADA compliant and, therefore, accessible to people with disabilities.	This is a regulatory requirement, so 100 percent compliance reflects desired outcomes. In the few instances where State-level percentages are relatively low in comparison to the national percentage, increases could indicate substantial progress in related capacity-building efforts at community levels. In States where current percentages are relatively high (nearing 100 percent), related capacity-building efforts could focus on improvements that go beyond the minimum regulatory requirements.
Infrastructure Systems	Indicator 11: Water Sector Emergency Support	Number of States with Mutual Aid and Assistance Agreements in place through Water/Wastewater Agency Response Networks (WARN) [American Water Works Association WARN]	Number of States with WARN agreements in place in 2015 (49 total)	Establishing and maintaining WARN coverage in all 50 States reflects a basic level of water sector emergency support capacity. Additional State and local capacity-building efforts could focus on maintaining State participation and expanding the number of communities with WARN agreements.

		Table B-1, continued		
Core Capability	Indicator	Proposed Measure	Baseline	Tracking National Progress
Infrastructure Systems	Indicator 12: Dam Safety	No measure at this time* Considered: Percentage of high hazard potential dams with an updated Emergency Action Plan (EAP) [FEMA and USACE EAP inventory]	No baseline*	No measure at this time* Considered: Percentage of dams covered by updated EAPs is a potential measure of community resilience to flooding. While EAPs are essential to dam safety, EAPs alone do not sufficiently capture resilience to dam-related flood hazard. Exploring other measures is appropriate.
Infrastructure Systems	Indicator 13: Integrated Infrastructure Sector Preparedness	No measure at this time* Considered: Number of communities participating in DHS Regional Resilience Assessment Program (RRAP) assessments, as a measure of community-level infrastructure sector involvement in cross-sector dependency planning. [DHS RRAP].	No baseline*	No measure at this time* Considered: Increased community participation in RRAP was explored as a measure of infrastructure preparedness capacity at community levels. A weakness was the high level of variability between RRAP projects in terms of the ratio of community participants to Federal, State, and private owners and operators of critical infrastructure.
Natural and Cultural Resources	Indicator 14: Water Conservation	Per capita water use for all domestic uses [USGS National Water Use Report]	Per capita water use for all domestic uses (nationally and for each State) In 2010, the average national per capita water use for all domestic uses was approximately 88 gallons per day.	Decreasing per capita water use generally reflects improved water conservation. Decreases in State-level per capita water use over time (especially where they exceed national and regional averages) could indicate significant progress in related community capacity-building efforts.

Table B-1, continued				
Core Capability	Indicator	Proposed Measure	Baseline	Tracking National Progress
Natural and Cultural Resources	Indicator 15: Wetlands Conservation	No measure at this time* Considered: Extent (in square miles) of wetlands land cover change in coastal watershed counties [NOAA Coastal Change Analysis Program]	No baseline*	No measure at this time* Considered: Decreasing coastal wetlands loss generally reflects improved wetlands conservation. State-level decreases in wetlands losses over time (especially in States with losses above the national average) could indicate significant progress in related community capacity-building efforts.
Natural and Cultural Resources	Indicator 16: Forest Conservation	No measure at this time* Considered: Extent (in square miles) of forest land cover change in coastal watershed counties [NOAA Coastal Change Analysis Program]	No baseline*	No measure at this time* Considered: Decreasing forest loss generally reflects improved forest conservation outcomes. State-level decreases in forest losses over time (especially in States with losses above the national average) could indicate significant progress in related community capacity-building efforts.
Natural and Cultural Resources	Indicator 17: Habitat Quality	No measure at this time* Considered: Kilometers of scored stream reaches with Cumulative Habitat Condition Index scores (reflecting degradation risk) of high or very high [USGS National Fish Habitat Partnership Data]	No baseline*	No measure at this time* Considered: Decreasing habitat degradation risks generally reflects improved habitat quality. Decreases over time in State-level percentages of land area at a high or very high risk for degraded habitat could indicate progress in related community capacity-building efforts.

Table B-1, continued				
Core Capability	Indicator	Proposed Measure	Baseline	Tracking National Progress
Threats and Hazards Identification	Indicator 18: Risk Identification	No measure at this time* Considered: Percentage of the population enabled with new or improved flood risk products and tools [FEMA Risk Mapping, Assessment, and Planning Program Deployment Metric]	No baseline*	No measure at this time* Considered: Through the Risk MAP deployment metric, FEMA tracks the percentage of the U.S. population living in areas covered by recently initiated flood hazard mapping activities. Strengths of the measure include national coverage and the use of quality standards. Weaknesses include significant variability in both community involvement and the timeframes for starting and completing studies. Additional or alternative metrics should be explored.
Risk and Disaster Resilience Assessment	Indicator 19: Risk Data	No measure at this time* Considered: Percentage of square miles with elevation data that meets the USGS 3-Dimension Elevation Program (3DEP) initiative base-level specifications [USGS 3DEP]	No baseline*	No measure at this time* Considered: Increasing 3DEP coverage reflects improved availability of high-resolution data for use in numerous risk-related mapping, modeling, and assessment efforts and is consistent with desired 3DEP program outcomes. Improvements in the State percentages over time could indicate progress in related community capacity-building efforts.

	Table B-1, continued			
Core Capability	Indicator	Proposed Measure	Baseline	Tracking National Progress
Risk and Disaster Resilience Assessment	Indicator 20: Risk Awareness	No measure at this time* Considered: Percentage of community leaders surveyed who are aware of community flood risks [FEMA Community Leadership Survey]	No baseline*	No measure at this time* Considered: Increases in the percentage of community leaders over time could indicate progress in related community capacity-building efforts. A weakness of the measure is the survey relies heavily on feedback from local floodplain management officials; therefore, it may over-represent local community leaders' risk awareness.
Risk and Disaster Resilience Assessment	Indicator 21: Community Preparedness	Number of sites designated as StormReady® and/or TsunamiReady® [NWS StormReady® and TsunamiReady®]	Number of sites designated as StormReady® and/or TsunamiReady® (nationally and for each State) As of February 2016, 2,402 StormReady® and TsunamiReady® sites exist nationwide.	Increasing this number reflects improvements consistent with desired StormReady® and TsunamiReady® program outcomes. Increases in the State numbers over time could indicate progress in related community capacity-building efforts.
Planning	Indicator 22: Mitigation Planning	Percentage of population residing in communities covered by a current local hazard mitigation plan [FEMA National Mitigation Planning Program]	Percentage of the population residing in communities covered by a current local hazard mitigation plan (nationally and for each State) As of December 31, 2015, over 82 percent of the Nation's population (excluding U.S. Territories) lives in a community with a current local hazard mitigation plan.	Increasing the percentage of population covered by a current hazard mitigation plan reflects improvements consistent with desired National Hazard Mitigation Planning Program outcomes. Increases in the State percentages over time could indicate progress in related community capacity-building efforts.

		Table B-1, continued		
Core Capability	Indicator	Proposed Measure	Baseline	Tracking National Progress
Planning	Indicator 23: Planning Integration	No measure at this time* Considered: Percentage of coastal population benefiting from the integration of hazard management into coastal planning [NOAA National Coastal Zone Management Program]	No baseline*	No measure at this time* Considered: A high percentage generally reflects desired coastal management program outcomes. In most coastal States, capacity-building efforts are expressly included; future reporting efforts will focus on capturing local capacity-building outcomes.
Community Resilience	Indicator 24: Collaborative Networks	No measure at this time* Considered and included for illustrative and discussion purposes: States with State-led interagency collaboration supporting disaster risk reduction efforts, as illustrated by USACE Silver Jackets program State Team measure.	No baseline*	No measure at this time* Considered: One facet of community resilience is the capacity to engage intergovernmental collaboration (Federal, State, local, Tribal) around flood risk management as well as other disaster risk management. Silver Jackets team and project data provide a potential measure of this capacity. Exploring other potential measures in combination with, or as an alternative to, Silver Jackets is appropriate.
Community Resilience	Indicator 25: Civic Capacity	Percentage of individuals surveyed who performed volunteer activities for or through an organization during the preceding 12-month period [Corporation for National and Community Service, Current Population Survey]	Percentage of individuals surveyed who performed volunteer activities for or through an organization during the preceding 12-month period (nationally and for each State). Nationwide in 2014, 25.3 percent of the individuals surveyed had performed volunteer activities during the previous year.	Increasing percentages generally reflect increases in the overall resilience capacity of communities. Increases in State-level percentages over time could indicate substantial progress in related capacity-building efforts at community levels.

			Table B-1, continued	
Core Capability	Indicator	Proposed Measure	Baseline	Tracking National Progress
Long-Term Vulnerability Reduction	Indicator 26: Building Codes	Percentage of reporting communities that are subject to one or more hazards (seismic, hurricane or floods) that have adopted building codes with disaster resistance provisions [Insurance Services Office/FEMA Building Code Effectiveness Grading Schedule State by State Summary of Community Adoptions]	Percentage of reporting communities that are subject to one or more hazards (seismic, hurricane, or flood) and that have adopted building codes with disaster resistance provisions (nationally and for each State). As of 2015, approximately 60 percent of the Nation's jurisdictions that are subject to seismic, hurricane, or flood hazards had adopted a building code with disaster-specific provisions.	Increasing code adoptions by at-risk communities should reflect an increase in the overall resilience of the built environment. Increasing State-level percentages over time could indicate substantial progress in related capacity-building efforts at community levels.
Long-Term Vulnerability Reduction	Indicator 27: Higher Standards	Percentage of National Flood Insurance Program (NFIP)-participating communities enrolled in the Community Rating System (CRS with a CRS rating of Class 5 or better [FEMA CRS Communities and their Classes]	Percentage of NFIP-participating communities enrolled in the CRS with a CRS rating of Class 5 or better (nationally and for each State) As of the date of this report, 113 of the 22,875 NFIP-participating communities (0.5 percent) enrolled in the CRS have a CRS rating of Class 5 or better.	Increasing percentages represent voluntary actions taken by communities to apply standards that exceed minimum NFIP requirements. Many of these capacity-building actions relate to other indicators. Increasing this percentage reflects improvements consistent with desired CRS outcomes. Increases in State-level percentages over time could indicate substantial progress in related capacity-building efforts at community levels.

Table B-1, continued

Core Capability	Indicator	Proposed Measure	Baseline	Tracking National Progress
Long-Term Vulnerability Reduction	Indicator 28: Mitigation Investment	No measure at this time* Considered: Percentage of total public infrastructure disaster relief funds spent on Section 406 (Stafford Act) Mitigation for disasters in the preceding 5-year period [FEMA Enterprise Data Warehouse EMMIE Public Assistance Data]	No baseline* Considered: Percentage of total public infrastructure disaster relief funds spent on Section 406 Mitigation for disasters in the preceding 5-year period (nationally and for each State)	No measure at this time* Considered: Increasing Section 406 Mitigation spending could indicate a corresponding increase in State and community capacity to reduce long-term risk to public infrastructure. Because Section 406 Mitigation represents only a portion of overall mitigation assistance available to communities (other sources of funding include FEMA Hazard Mitigation Assistance programs and HUD Community Development Block Grant disaster grants), other measures should be considered.
Long-Term Vulnerability Reduction	Indicator 28: Mitigation Investment	Percentage of SBA home disaster loan funds spent on mitigation assistance [SBA Disaster Loans]	Percentage of SBA home disaster loan funds spent on mitigation assistance (nationally and for each State that report SBA home disaster loans) In 2014, in the 28 States that reported SBA home disaster loans, loan recipients spent an average of 0.5 percent of loan funds on mitigation assistance.	Increasing the SBA loan- based mitigation investment over time could indicate substantial progress in related capacity-building efforts at community levels.

*For those indicators with no baseline or no measure at this time, further discussion and investigation into the potential programs to support the desired indicator are necessary and ongoing.

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Indicator 1: Housing Condition

INDICATOR RESILIENCE RELEVANCE

Families living in housing units that are well maintained and consistent with current building standards are typically more resilient to hazards than families that are living in poor housing conditions. Substandard housing may be more susceptible to the impacts of hazards, resulting in property damage, injury, or death during an event and extensive repair costs in both time and money after an event. These costs are especially challenging for the typically lower-income families that occupy housing units with severe problems. Communities taking actions to reduce high concentrations of substandard housing are increasing community resilience capacity by improving housing quality and reducing the housing-related disaster vulnerabilities.

Indicator 1: Housing Condition	
Proposed Measure:	*Percentage of households living with at least one of four severe housing problems (5- year average)*
Data Source:	*Comprehensive Housing Affordability Strategy (CHAS) Housing Conditions Data*
Data Publisher:	*HUD* *Year:* *2008-2012 (5-Year Average)*
Data Download:	*http://www.huduser.gov/portal/datasets/cp/CHAS/data_download_chas.html*

PROPOSED MEASURE

Proposed Measure: **Percentage of households living with at least one of four severe housing problems (5-year average)**

Comprehensive Housing Affordability Strategy (CHAS) data, provided by the U.S. Department of Housing and Urban Development (HUD), offer a wide range of information about housing conditions. The CHAS data used for this report are the percentage of households living with one of four severe housing problems (5-year average). The four housing problems are (1) incomplete kitchen facilities, (2) incomplete plumbing facilities, (3) more than one person per room, and (4) rental or mortgage costs that are greater than 50 percent of household income. CHAS data are the best available data for this topic; the four housing problems serve as a proxy for overall housing condition.

For Indicator 1: Housing Condition, the GIS web mapping application, available at http://arcg.is/1RPElqB, presents the percentage of occupied households living with at least one of the four severe housing problems mentioned above.

BASELINE ANALYSIS AND SUMMARY

Nationwide, approximately 42.7 million of 116.4 million (37 percent) households have one of the four severe housing problems. At the State level, the percentage of total housing units with one of four housing problems ranges from 22 to 49 percent. Table B-2 presents the percentage of occupied housing units with severe housing problems for all 50 States, Washington DC, and Puerto Rico. At the county level, the range of housing units with severe problems is 3 to 76 percent.

Lower rates of housing problems reflect higher housing-related community resilience capacity. Decreases in the percentage of housing units with these severe housing problems would demonstrate capacity-building progress over time.

Table B-2. Number and Percentage of Housing Units with One of Four Severe Housing Problems by State							
State	**Percentage**	**State**	**Percentage**	**State**	**Percentage**	**State**	**Percentage**
U.S.	**37**	IL	37	NE	27	SD	25
AL	30	IN	29	NV	43	TN	31
AK	37	IA	25	NH	37	TX	34
AZ	38	KS	28	NJ	44	UT	33
AR	29	KY	29	NM	33	VT	37
CA	49	LA	30	NY	42	VA	34
CO	36	ME	34	NC	33	WA	38
CT	40	MD	37	ND	22	WV	23
DE	34	MA	38	OH	32	WI	33
DC	40	MI	34	OK	28	WY	25
FL	43	MN	32	OR	40	PR	46
GA	36	MS	32	PA	32	Note: Values shown are for 2008-2012	
HI	48	MO	30	RI	40		
ID	33	MT	31	SC	32		

This section provides a State-level aggregation of community- or county-level data. See the map viewer for detailed local datasets.

Indicator 2: Housing Affordability

RESILIENCE INDICATOR RELEVANCE

Households not overburdened by housing costs are able to invest in property enhancements, have financial flexibility for post-disaster uncertainties, and generally have more capacity to absorb and bounce back from unanticipated events. The availability of affordable and accessible housing affects the resilience capacity of vulnerable individuals and households, and is especially critical to effective disaster recovery at the community scale. Understanding and overcoming housing affordability and accessibility challenges improves community resilience capacity at multiple levels.

Indicator 2: Housing Affordability

Proposed Measure:	*Percentage of households that are cost burdened (monthly housing costs, including utilities, exceed 30 percent of monthly income)*
Indicator Data:	*Comprehensive Housing Affordability Strategy (CHAS)*
Data Publisher:	*HUD* *Year:* *2008-2012 (5-Year Average)*
Data Download:	*http://www.huduser.gov/portal/datasets/cp/CHAS/data_download_chas.html*

PROPOSED MEASURE

Proposed Measure: **Percentage of households that are cost burdened (monthly housing costs, including utilities, exceed 30 percent of monthly income).**

CHAS data, provided by HUD, offer a wide range of information about housing conditions. The CHAS data used for this measure provide the percentage of households spending more than 30 percent of their income on housing costs, including utilities.[2]

For Indicator 2: Housing Affordability, the GIS web mapping application, available at http://arcg.is/1RPElqB, presents the 5-year average (2008-2012) percentage of cost-burdened (overpaying) households at the county level.

BASELINE ANALYSIS AND SUMMARY

For the period of 2008-2012, the 5-year average national cost-burdened housing rate was approximately 32 percent. In other words, roughly one in three households in the U.S. were spending more than 30 percent of their income on housing and utilities. At the county level, the rate of overpayment ranges from approximately 5 percent to nearly 50 percent. Counties with high cost-burdened housing rates have more housing affordability and accessibility challenges and less community resilience capacity. A reduction in

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2 The 30-percent threshold is a payment standard used by HUD and the USDA and ensures that households do not have excessive rent burdens and do have income available for non-housing living expenses.

the overpayment rate over time reflects improved housing affordability and accessibility and indicates progress in building housing-related community resilience capacity. Table B-3 presents the 5-year average overpayment rates by State.

Table B-3. Percentage of Cost-Burdened and Severely Cost-Burdened Households by State (2008-2012 5-Year Averages)

State	Percent	State	Percent	State	Percent	State	Percent
U.S.	**32**	IL	33	NE	24	SD	22
AL	27	IN	26	NV	38	TN	28
AK	27	IA	23	NH	35	TX	28
AZ	33	KS	25	NJ	40	UT	29
AR	25	KY	26	NM	28	VT	34
CA	40	LA	27	NY	37	VA	31
CO	33	ME	31	NC	30	WA	34
CT	37	MD	34	ND	20	WV	21
DE	31	MA	36	OH	29	WI	30
DC	36	MI	32	OK	25	WY	22
FL	39	MN	29	OR	35	Source: HUD 2008-2012 CHAS 5-Year Averages	
GA	32	MS	28	PA	30		
HI	37	MO	27	RI	37		
ID	29	MT	28	SC	29		

This section provides a State-level aggregation of community- or county-level data. See the map viewer for detailed local datasets.

Indicator 3: Health Care Availability

INDICATOR RESILIENCE RELEVANCE

As noted in the U.S. Climate Resilience Toolkit, health care organizations play a key role in community resilience.[3] Communities with high concentrations of primary care physicians tend to have higher levels of overall physical and mental health.[4] High levels of baseline community health are important for resilience because communities with healthy residents are better able to absorb the impacts of, and recover from, disasters. Primary care physician accessibility also is important for disaster response and recovery, when many injuries or health-related impacts may result from an event.

Indicator 3: Health Care Availability			
Proposed Measure:	*Number of primary care physicians per 100,000 residents*		
Data Source:	*Area Health Resources Files*		
Data Publisher:	*U.S. Department of Health and Human Service*	*Year:*	*2013*
Data Download:	*http://ahrf.hrsa.gov/download.htm*		

PROPOSED MEASURE

Proposed Measure: **Number of primary care physicians per 100,000 residents**

The U.S. Department of Health and Human Service (HHS) Area Health Resources Files (AHRF) provides a comprehensive set of data offering a broad range of health resources and information, including the number of primary care physicians among local populations. A greater concentration of primary care physicians implies that health care options are more accessible.

For Indicator 3: Health Care Availability, the GIS web mapping application, available at http://arcg.is/1RPElqB, presents the number of primary care physicians per 100,000 residents for each county in the U.S.

BASELINE ANALYSIS AND SUMMARY

In the U.S., approximately 78 primary care physicians are available per 100,000 residents. At the county level, the number of primary care physicians per 100,000 residents ranges from 0 to over 400, with the average being around 50. Generally, communities with lower rates of primary care physician availability have more challenges with health-related resilience capacity. Although the relationship between the number of primary care physicians and the populations they serve is complicated, an increase in primary care

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3 https://toolkit.climate.gov/topics/human-health/building-climate-resilience-health-sector
4 Cutter, Susan, Kevin Ash, and Christopher Emrich. 2014. "The Geographies of Community Disaster Resilience." Global Environmental Change: 29. Page 65-77.

physicians per 100,000 residents would generally reflect capacity-building progress. Table B-4 presents primary care physician concentrations for each State and the District of Columbia.

Table B-4. Primary Care Physicians per 100,000 Residents, by State (2013)							
State	Primary Care Physicians per 100,000 Residents	State	Primary Care Physicians per 100,000 Residents	State	Primary Care Physicians per 100,000 Residents	State	Primary Care Physicians per 100,000 Residents
U.S.	78	ID	65	MO	71	PA	83
AL	64	IL	81	MT	78	RI	95
AK	87	IN	68	NE	76	SC	69
AZ	69	IA	75	NV	59	SD	79
AR	66	KS	76	NH	94	TN	74
CA	81	KY	68	NJ	87	TX	63
CO	85	LA	66	NM	77	UT	60
CT	86	ME	110	NY	85	VT	114
DE	75	MD	92	NC	73	VA	78
DC	124	MA	108	ND	85	WA	87
FL	75	MI	81	OH	77	WV	78
GA	67	MN	93	OK	66	WI	83
HI	89	MS	54	OR	96	WY	69

This section provides a State-level aggregation of community- or county-level data. See the map viewer for detailed local datasets.

Indicator 4: Healthy Behaviors

INDICATOR RESILIENCE RELEVANCE

Resilient communities promote individual and community physical, behavioral, and social health to strengthen their communities for daily, as well as extreme, challenges. In general, communities with good baseline mental and physical health are more resilient to disasters than communities with high concentrations of health-related needs are. Individual mental and physical health and resilience is important for community resilience because healthy, socially connected, prepared people make for stronger communities that are better able to withstand, manage, and recover from disasters. Promoting wellness and encouraging healthy behaviors alongside disaster preparedness can help communities face everyday challenges as well as major disruptions or disasters.

Indicator 4: Healthy Behaviors		
Proposed Measure:	*Percentage of adult population that does not participate in any leisure-time physical activity*	
Data Source:	*Diabetes County Level Data*	
Data Publisher:	*CDC*	*Year:* 2013
Data Download:	*http://www.cdc.gov/diabetes/data/county.html*	

PROPOSED MEASURE

Proposed Measure: **Percentage of adult population that does not participate in any leisure-time physical activity**

Leisure time physical activity is critical to overall health, both physical and mental. As noted by the Centers for Disease Control and Prevention (CDC), regular physical activity helps improve overall health and fitness and reduces personal risk for many chronic diseases. Communities with high concentrations of physical inactivity tend to have poorer health, including higher rates of diabetes. The CDC collects data on physical activity at the county and State level. As part of its data collection process, the CDC asks survey respondents:

> *During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?*

Respondents who answer "no" indicate that they do not participate in any leisure time physical activity. A higher percentage of inactive residents implies poorer physical and mental health.

For Indicator 4, the GIS web mapping application, available at http://arcg.is/1RPElqB, presents the age-adjusted percentage of the population that does not participate in any leisure time activity, for each county in the U.S.

BASELINE ANALYSIS AND SUMMARY

Nationwide, approximately 26.3 percent of Americans are not physically active outside of their workplace. Inactivity at the county level ranges from 9.3 percent to 40.6 percent. A reduction in these inactivity rates over time, especially in communities with higher than average rates, would indicate improvements in health-related resilience capacity. Table B-5 presents physical inactivity concentrations for each State and the District of Columbia.[5]

Table B-5. Percentage of Adults Who Engage in No Leisure-Time Physical Activity (2013)					
State	Percentage	State	Percentage	State	Percentage
U.S.	**26.3**	KY	30.2	OH	28.5
AL	31.5	LA	32.2	OK	33.0
AK	22.3	ME	23.3	OR	18.5
AZ	25.2	MD	25.3	PA	26.3
AR	34.4	MA	23.5	RI	26.9
CA	21.4	MI	24.4	SC	26.9
CO	17.9	MN	23.5	SD	23.8
CT	24.9	MS	38.1	TN	37.2
DE	27.8	MO	28.3	TX	30.1
DC	19.5	MT	22.5	UT	20.6
FL	27.7	NE	25.3	VT	20.5
GA	27.2	NV	23.7	VA	25.5
HI	22.1	NH	22.4	WA	20.0
ID	23.7	NJ	26.8	WV	31.4
IL	25.1	NM	24.3	WI	23.8
IN	31.0	NY	26.7	WY	25.1
KS	26.5	ND	27.6		

This section provides a State-level aggregation of community- or county-level data. See the map viewer for detailed local datasets.

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5 County-level data are for 2012 and come from the CDC diabetes data website (http://www.cdc.gov/diabetes/data/county.html). State data are not publicly available for this resource; State and national estimates were obtained from the same method and author (CDC) but were published for 2013. The State-level data are available at http://www.cdc.gov/nccdphp/DNPAO/index.html.

Indicator 5: Environmental Health

INDICATOR RESILIENCE RELEVANCE

A number of environmental factors, such as air and water quality, can directly affect individual and community health status. Areas with concentrated environmental health risks can increase disaster impacts by increasing underlying vulnerabilities and amplifying the impact on individuals with access and functional needs. Poor air quality contributes to health conditions including cancers, cardiovascular disease, asthma, and other illnesses that can compound disaster vulnerabilities. In addition, many areas with high environmental health hazard risks also face other socioeconomic challenges that can exacerbate disaster impacts. Improving environmental health and reducing the prevalence of related diseases increases community resilience capacity.

PROPOSED MEASURE

Although the project team explored a number of options related to air and water quality, the team did not identify an appropriate Federal dataset that met minimum project criteria for this indicator.

Indicator 6: Employment Opportunity

INDICATOR RESILIENCE RELEVANCE

A community's general economic vitality and employment levels, among several other factors[6] are related. High employment rates indicate community stability and a general economic ability to absorb disaster impacts and recover quickly. Communities with high unemployment, on the other hand, tend to have more residents who are disproportionately impacted in disasters. The factors that lead to unemployment at the local level vary greatly from community to community and can often represent structural or entrenched conditions that may be very difficult to change with local actions. The unemployment rate also does little to tell a story about labor market participation, or the types of industry, work, and working conditions present in a community. For instance, if unemployment rates are low but one or two employers are primarily responsible for employment in the community, the community may be more vulnerable than indicated by the unemployment rate alone. As such, employment opportunity should be just one of many variables used when considering a community's economic vitality and resiliency.

Indicator 6 – Employment Opportunity

Proposed Measure:	3-year average unemployment rate
Data Source:	Local Area Unemployment Statistics
Data Publisher:	U.S. Bureau of Labor Statistics (BLS) Year: 2012-2014
Data Download:	http://www.bls.gov/lau/tables.htm

PROPOSED MEASURE

Proposed Measure: 3-year average unemployment rate

The U.S. Bureau of Labor Statistics provides annual unemployment estimates for each county and State in the U.S. Unemployment data may have wide year-to-year variability; therefore, this report provides 3-year unemployment rate averages.

For Indicator 6: Employment Opportunity, the GIS web mapping application, available at http://arcg.is/1RPElqB, presents the 3-year average (2012-2014) unemployment rate by county.

BASELINE ANALYSIS AND SUMMARY

From 2012 through 2014, the 3-year average national unemployment rate was 7.25 percent. The 3-year average unemployment rate at the county level ranged from 1.2 percent to 25.7 percent. Counties with lower

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6 Cutter, Susan, Kevin Ash, and Christopher Emrich. 2014. "The Geographies of Community Disaster Resilience." Global Environmental Change: 29. Page 65-77.

unemployment levels would be more likely to have economic stability and vitality. A reduction in the unemployment rate would generally indicate progress in building community resilience capacity. Table B-6 shows the 3-year average unemployment rates for each State and the District of Columbia.

Table B-6. Unemployment Rate by State (3-Year Average, 2012-2014)					
State	Unemployment Rate	State	Unemployment Rate	State	Unemployment Rate
U.S.	7.25	KY	7.57	OH	6.87
AL	7.33	LA	6.73	OK	5.03
AK	6.93	ME	6.60	OR	7.87
AZ	7.70	MD	6.47	PA	7.03
AR	7.03	MA	6.40	RI	9.13
CA	8.93	MI	8.43	SC	7.73
CO	6.53	MN	4.87	SD	3.83
CT	7.53	MS	8.50	TN	7.43
DE	6.53	MO	6.60	TX	6.00
DC	8.43	MT	5.37	UT	4.63
FL	7.37	NE	3.70	VT	4.50
GA	8.20	NV	9.50	VA	5.63
HI	5.07	NH	4.97	WA	7.10
ID	6.03	NJ	8.03	WV	6.90
IL	8.40	NM	6.83	WI	6.43
IN	7.33	NY	7.50	WY	4.77
IA	4.73	NC	7.73		
KS	5.20	ND	2.93		

This section provides a State-level aggregation of community- or county-level data. See the map viewer for detailed local datasets.

Indicator 7: Income

INDICATOR RESILIENCE RELEVANCE

Across sociodemographic groups, income builds adaptive capacity and allows individuals to prepare for, respond to, and recover from disasters. Individuals with low incomes are less likely to have access to high-quality housing units, social support networks, or other resources to limit their exposure to hazards. They are also less able to recover and rebuild their quality of life when disaster results in the destruction of their property or adverse impacts to their health. They may be unable to afford housing in a new location, or pay for repairs and disaster-related medical bills. Conversely, higher income individuals tend to live in higher quality, more resilient housing and have the financial capacity to prepare for, respond to, and recover from disasters. Given how closely income and resilience capacity are related, a significant need and opportunity exists to improve local community resilience capacity through economic development initiatives and programs. Additional information, such as income distribution, cost of living ratios, and poverty thresholds, is necessary for a more in-depth perspective on income-related capacity and vulnerabilities.

Indicator 7: Income		
Proposed Measure:	*Per capita income*	
Data Source:	*Local Area Personal Income*	
Data Publisher:	*BEA*	*Year:* *2015*
Data Download:	*http://www.bea.gov/newsreleases/regional/lapi/lapi_newsrelease.htm*	

PROPOSED MEASURE

Proposed Measure: **Per capita income**

The U.S. Bureau of Economic Analysis (BEA) provides per capita local area personal income, which BEA calculates as the total personal income of the residents of a given area divided by the resident population of the area. BEA uses the U.S. Census Bureau annual mid-year population estimates to determine the resident population at the county level. Local area personal income includes the following: (1) sum of wages and salaries; (2) supplements to wages and salaries; (3) proprietors' income with inventory valuation and capital consumption adjustments; (4) rental income of persons with capital consumption adjustment; (5) personal dividend income; (6) personal interest income; and (7) personal current transfer receipts, less contributions for government social insurance, plus the adjustment for residence. BEA measures personal income before the deduction of personal income taxes and other personal taxes reports it in current dollars.

For Indicator 7: Income, the GIS web mapping application, available at http://arcg.is/1RPElqB, presents per capita income ranges by county.

BASELINE ANALYSIS AND SUMMARY

In 2013, the national per capita income was $46,049. Per capita income at the county level ranged from $17,536 to $121,632. In general, those communities with higher per capita income have higher economic resilience capacity. An increase in per capita income over time, especially for communities below national or regional averages, would generally indicate resilience capacity-building progress. Table B-7 presents the per capita income for each State and the District of Columbia.

Table B-7. Per Capita Income by State* (2013)					
State	**Per Capita Income**	**State**	**Per Capita Income**	**State**	**Per Capita Income**
U.S.	**$46,049**	KY	$36,214	OH	$41,049
AL	$36,481	LA	$41,204	OK	$41,861
AK	$50,150	ME	$40,924	OR	$39,848
AZ	$36,983	MD	$53,826	PA	$46,202
AR	$36,698	MA	$57,248	RI	$46,989
CA	$48,434	MI	$39,055	SC	$35,831
CO	$46,897	MN	$47,500	SD	$46,039
CT	$60,658	MS	$33,913	TN	$39,558
DE	$44,815	MO	$40,663	TX	$43,862
DC	$75,329	MT	$39,366	UT	$36,640
FL	$41,497	NE	$47,157	VT	$45,483
GA	$37,845	NV	$39,235	VA	$48,838
HI	$45,204	NH	$51,013	WA	$47,717
ID	$36,146	NJ	$55,386	WV	$35,533
IL	$46,980	NM	$35,965	WI	$43,244
IN	$38,622	NY	$54,462	WY	$52,826
IA	$44,763	NC	$38,683		
KS	$44,417	ND	$53,182		

This section provides a State-level aggregation of community- or county-level data. See the map viewer for detailed local datasets.

Indicator 8: Roadway Conditions

INDICATOR RESILIENCE RELEVANCE

A community's transportation system is the core of its economy and its disaster response and recovery system. In the response phase of a disaster, sufficient transportation infrastructure ensures that residents can evacuate and emergency responders can reach areas in need. After a disaster, functioning transportation infrastructure is critical for economic and physical recovery. Roads and bridges are a critical part of the transportation network.

Bridges traverse significant geological features, including canyons, rivers, and water bodies, that interrupt the roadway path. Bridge loss during a disaster can dramatically increase the time for emergency responders to reach a disaster area or reduce the ability for individuals to evacuate. Poor physical conditions may have a negative impact on a bridge's ability to maintain its intended function to convey highway traffic during and after a disaster, as well as affect its performance.

PROPOSED MEASURE

Although the project team explored a number of measurement options related to road and bridge function, the team did not identify an appropriate Federal dataset that met minimum project criteria for this indicator.

Indicator 9: Transportation Connectivity

INDICATOR RESILIENCE RELEVANCE

Transportation alternatives provide several resilience-related benefits. Good transportation options and alternatives make places more attractive for economic development and give people more options for walking, bicycling, and other active transportation methods, thereby improving individual health. Redundancies in key transportation systems and the availability of transportation alternatives can also be critical to community recovery. Transportation alternatives rely on the availability of adequate multimodal infrastructure and effective connectivity between different modes. Public transportation terminals that only serve a single mode of transportation are more exposed to impacts from service disruption, while multimodal stations have redundant systems in place. For example, if an earthquake buckles train rails, a multimodal station that has the capacity to provide bus, airplane, or ferry service allows evacuations to occur under a different transportation mode.

The emergency response efforts undertaken for Hurricane Sandy and Hurricane Katrina illustrate the importance of public transportation options during an emergency event. During certain events, access to buses, airplanes, trains, and ferries is critical for mass evacuation. Public transportation terminals are often strategically important during evacuation as the public knows where they are, they are generally in areas accessible to the public, and they provide easy staging areas for evacuation vehicles.

Indicator 9: Transportation Connectivity		
Proposed Measure:	*Percentage of public transportation passenger terminals with intermodal connectivity*	
Data Source:	*Intermodal Passenger Connectivity Database (IPCD)*	
Data Publisher:	*Bureau of Transportation Statistics* *Year:* *August 2013*	
Data Download:	*http://www.transtats.bts.gov/IPCD.aspx?DB_ID=640andLink=0*	

PROPOSED MEASURE

Proposed Measure: **Percentage of public transportation passenger terminals with intermodal connectivity**

The Intermodal Passenger Connectivity Database (IPCD), managed by the U.S. Bureau of Transportation Statistics (BTS), provides a national quantification of the degree of connectivity in the passenger transportation system.[7] BTS collects the data on an ongoing basis. As the passenger transportation system

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7 The IPCD does not include on-demand transportation (i.e., hotel shuttles, taxis, private transportation services, paratransit). The IPCD only includes the scheduled passenger transportation modes such as intercity, commuter and transit rail; scheduled air service; intercity and transit bus; and intercity and transit ferry services.

changes daily, data updates for specific facilities may lag behind actual change dates; however, it is valid to use the data to present an overall picture and analyze long-term progress toward increased connectivity.[8]

For Indicator 9: Transportation Connectivity, the GIS web mapping application, available at http://arcg.is/1RPElqB, presents the percentage of public transportation terminals with intermodal connectivity, by State.

BASELINE ANALYSIS AND SUMMARY

Nationwide, 56 percent of public transportation terminals have intermodal connectivity. Table B-8 presents the percentage of public transportation terminals with intermodal connectivity for each State and the District of Columbia. An increase over time in the percentage of public transportation passenger terminals with intermodal connectivity would indicate improved resilience capacity.

Table B-8. Percentage of Intermodal Public Transportation Facilities by State (2013)					
State	**Percentage Intermodal**	**State**	**Percentage Intermodal**	**State**	**Percentage Intermodal**
U.S.	**56.0**	KY	36.0	OH	44.5
AL	27.3	LA	50.9	OK	17.9
AK	10.4	ME	35.1	OR	53.9
AZ	57.9	MD	78.7	PA	49.8
AR	30.8	MA	67.1	RI	56.0
CA	77.1	MI	30.4	SC	26.8
CO	40.7	MN	43.3	SD	10.7
CT	67.1	MS	14.3	TN	45.5
DE	100.0	MO	40.0	TX	50.5
DC	95.9	MT	13.6	UT	65.8
FL	73.9	NE	3.3	VT	50.0
GA	52.7	NV	64.0	VA	71.8
HI	14.3	NH	43.6	WA	66.9
ID	16.3	NJ	63.4	WV	32.1
IL	77.4	NM	29.5	WI	41.6
IN	39.0	NY	63.4	WY	17.1
IA	38.6	NC	50.5		
KS	25.0	ND	16.2		

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8 Data summaries presented here are from the IPCD on August 2013.

Indicator 10: Transit Accessibility

INDICATOR RESILIENCE RELEVANCE

The national transit system is composed of hundreds of local transit providers that operate over 140,000 vehicles, travel over 48 billion annual passenger miles, and collect over $8.5 billion in annual passenger fares.[9] Transit plays many roles in maintaining social, economic, and environmental systems, including providing affordable and less polluting commute alternatives for workers, as well as access to services for individuals with access and functional needs. The latter is especially important in disaster response and recovery. For disaster response purposes, transit provides an evacuation method for many of the individuals who are most disproportionately impacted, including people without access to their own transportation and people with disabilities. For recovery purposes, transit is important for helping individuals who may be disproportionately impacted to access medical and social services, as well as their places of employment. Given the importance of transit for disaster response and recovery for individuals who are disproportionately impacted, particularly individuals with disabilities, transit station accessibility is a critical requirement for resilient communities.

Indicator 10: Transit Accessibility	
Proposed Measure:	*Percentage of transit system stations in compliance with ADA accessibility requirements*
Data Source:	*National Transit Database (NTD): Transit Stations*
Data Publisher:	*Federal Transit Administration Year: 2013*
Data Download:	*http://www.ntdprogram.gov/ntdprogram/datbase/2013_database/ 201320Transit20Station.xls*

PROPOSED MEASURE

Proposed Measure: **Percentage of transit system stations in compliance with ADA accessibility requirements**

The Federal Transit Administration (FTA) provides national transit system data through the National Transit Database (NTD). The U.S. Congress established the NTD to be the Nation's primary source for transit system information and statistics. By statute, recipients or beneficiaries of certain grants from the FTA must submit data to the NTD.[10] As part of this data submission, local transit authorities report on both the total number of transit stations and the number of transit stations that are compliant with the requirements of the Americans with Disabilities Act of 1990 (ADA). These data generally reflect urban accessibility conditions; future efforts should include pursuing additional data to better reflect rural accessibility conditions.

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9 http://www.ntdprogram.gov/ntdprogram/ntd.htm
10 http://www.ntdprogram.gov/ntdprogram/ntd.htm

For Indicator 10: Transit Accessibility, the GIS web mapping application, available at http://arcg.is/1RPElqB, presents information on the States with less than 100 percent of transit system stations in compliance with ADA accessibility requirements.

BASELINE ANALYSIS AND SUMMARY

In 2013, approximately 78 percent of the transit stations in the NTD were ADA compliant and therefore accessible to people with disabilities. At the State level, the percentage of stations that are ADA compliant ranges from 40 to 100 percent. Table B-9 presents information on the percentage of ADA-compliant transit stations in the 50 States, the District of Columbia, and Puerto Rico. ADA requirements are mandatory; therefore, national and State totals should be moving toward 100 percent compliance over time.

Table B-9. ADA-Compliant Transit Stations in the NTD by State (2013)							
State	ADA-Compliant Stations	Total Stations	Percent ADA-Compliant Stations	State	ADA-Compliant Stations	Total Stations	Percent ADA-Compliant Stations
U.S.	4,103	5,262	78	MT	19	19	100
AK	14	14	100	NC	48	48	100
AL	12	12	100	ND	4	4	100
AR	3	3	100	NE	2	2	100
AZ	43	43	100	NH	10	10	100
CA	701	707	99	NJ	205	312	66
CO	66	66	100	NM	18	18	100
CT	13	14	93	NV	16	16	100
DC	86	86	100	NY	316	795	40
DE	9	9	100	OH	73	100	73
FL	123	123	100	OK	10	10	100
GA	67	67	100	OR	77	78	99
HI	4	4	100	PA	300	600	50
IA	10	10	100	PR	78	78	100
ID	2	2	100	RI	1	1	100
IL	315	431	73	SC	10	10	100
IN	29	36	81	SD	2	2	100
KS	3	3	100	TN	30	30	100
KY	6	6	100	TX	369	369	100
LA	28	28	100	UT	102	102	100
MA	284	363	78	VA	59	60	98
MD	82	100	82	VT	2	2	100
ME	4	4	100	WA	178	182	98
MI	31	32	97	WI	19	21	90
MN	117	119	98	WV	18	18	100
MO	77	85	91	WY	0	4	0
MS	8	8	100				

Indicator 11: Water Sector Emergency Support

INDICATOR RESILIENCE RELEVANCE

Water and wastewater services are vital for human activity and the Nation's economy, as well as preventing disease and protecting the environment. If communities cannot ensure water service during emergencies, critical services, such as firefighting and health care (hospitals), as well as other dependent and interdependent sectors, such as energy, transportation, and food and agriculture, would suffer damaging effects. As a result, the recovery time is prolonged. To increase resilience, communities should have plans to ensure continuity of operations, including procedures designed to prevent, detect, respond to, and recover from all hazards.

Indicator 11: Water Sector Emergency Support	
Proposed Measure:	*States with Mutual Aid and Assistance Agreements in place through WARN*
Data Source:	*Water/Wastewater Agency Response Networks (WARN)*
Data Publisher:	*American Water Works Association (AWWA) Year:* *2015*
Data Download:	*http://www.NationalWARN.org*

PROPOSED MEASURE

Proposed Measure: **Number of States with Mutual Aid and Assistance Agreements in place through WARN**

EPA, per Presidential Policy Directive 21, is the Federal lead for strengthening the security and resilience of the Nation's water and wastewater infrastructure. As the Federal lead, EPA has encouraged the establishment of Water/Wastewater Agency Response Networks (WARNs), which are networks or utilities-helping-utilities governed by a common mutual aid and assistance agreement, in each State. WARNs provide a means whereby water and wastewater utilities provide and receive emergency aid and assistance necessary due to sustained or anticipated damages from natural or human-caused incidents. Intrastate emergency aid and assistance may include personnel, equipment, materials, and other associated services to restore critical operations impacted during an emergency.

For Indicator 11: Water Sector Emergency Support, the GIS web mapping application, available at http://arcg.is/1RPElqB, presents information on the States with established WARNs.

BASELINE ANALYSIS AND SUMMARY

The National Capital Region and 49 States have established WARNs. While Mississippi does not have an official WARN, it does have a mutual aid program through EPA. Statewide WARNs provide a single agreement to access water resources through the State. Communities located in States with established WARNs are more resilient because communities and States can use the WARNs to respond quickly to incidents of any size, from minor well malfunctions to complete service disruptions, with or without a government emergency declaration.

Tracking whether States have mutual aid and assistance programs in place through WARNs is the most basic level of water mutual aid resilience measurement. The level of resilience increases with the number of utilities that are members of the WARNs and the percentage of the State's population served by those WARNs. Future collection and tracking of local agreements could provide a more robust measure of resilience.

States also can increase resilience by integrating WARNs with interstate mutual aid and assistance agreements, such as the National Emergency Management Agency Emergency Management Assistance Compact.

Homeland Security

Mitigation Framework Leadership Group (MitFLG)

Indicator 12: Dam Safety

INDICATOR RESILIENCE RELEVANCE

As of the 2013 update, the National Inventory of Dams (NID) including information for more than 87,000 dams. As a critical part of our nation's infrastructure, dams provide benefits that all Americans enjoy, such as flood risk reduction, hydropower generation, water supply, and recreation. However, due to the nature of water storage, dams can pose a flooding risk to nearby and downstream communities. Dam hazards can occur in a number of ways. Dam failure, or the destruction of a dam, can occur from a natural hazard event, failure or incorrect operation of a project feature that compromises the structure, or by intentionally destructive human actions. Failures can lead to devastating loss of life and property for downstream areas. Overtopping of a dam can contribute to non-breach inundation risks or lead to possible failure of the structure.

The U.S. Army Corps of Engineers (USACE) compiles the NID from 68 sources, including 18 Federal agencies, 49 States, and Puerto Rico. The information collected includes a classification of the dam's hazard potential. The FEMA Federal Guidelines for Dam Safety classifies high hazard potential to a structure "where failure or mis-operation will probably cause loss of human life"; significant hazard potential to a structure "where failure or mis-operation results in no probable loss of human life but can cause economic loss, environmental damage, disruption to lifeline facilities, or can impact other concerns"; and low hazard potential to a structure "where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses."

The NID also collects related data, such as owner information, geometry, and Emergency Action Plan status. The NID does not include every dam in the U.S. Dams not meeting the minimum criteria for inclusion in the pose no threat to human life, very little economic damage (limited to dam owner), and are small in height and storage.

PROPOSED MEASURE

The project team has not fully developed a proposed measure for this indicator.

Considered Measure: Percentage of high hazard potential dams with an updated Emergency Action Plan (EAP)

The project team considered using the percentage of high hazard potential dams with an updated EAP by State as a measure to support Indicator 12: Dam Safety. However, this measure is insufficient on its own to quantify dam safety. Additional indicators, such as an emergency evacuation plan, a hazard mitigation plan, and action to mitigate dam infrastructure-specific risks, are also important.

FEMA provides guidelines for developing EAPs for dams. An EAP is a formal document that identifies potential emergency conditions at a dam and specifies actions that dam owners/operators must follow to minimize loss of life and property damage. EAPs should include the following: [11]

1. Actions the dam owner will take to moderate or alleviate a problem at the dam;

2. Actions the dam owner will take, and in coordination with emergency management, authorities, to respond to incidents or emergencies related to the dam;

3. Procedures dam owners will follow to issue early warning and notification messages to responsible downstream emergency management authorities;

4. Inundation maps to help dam owners and emergency management authorities identify critical infrastructure and population-at-risk sites that may require protective measures, warning, and evacuation planning; and

5. Delineation of the responsibilities of all those involved in managing an incident or emergency and how the responsibilities should be coordinated.

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[11] http://www.fema.gov/media-library-data/5b20db599c212f77fd5e85d256f471a3/EAP%20Federal%20Guidelines_FEMA%20P-64.pdf

Indicator 13: Integrated Infrastructure Sector Preparedness

INDICATOR RESILIENCE RELEVANCE

The resilience of community infrastructure systems depends not just on the functioning of each individual infrastructure sector, but on how sectors collectively anticipate and address system interdependencies that can have a ripple effect in a hazard event. Community medical services, for example, rely on access to telecommunications services, which in turn depend on the continuity of electric power in an emergency. When one system is impacted, the risk of a cascading effect of loss and damage can be significant, and communities need to assess, plan, and prepare for the continuity of services across sectors in a disaster.

PROPOSED MEASURES

The project team has not fully developed a proposed measure for this indicator.

One Federal program with potentially relevant data for consideration is the Regional Resiliency Assessment Program (RRAP). The RRAP is a U.S. Department of Homeland Security (DHS)-led cooperative assessment of specific critical infrastructure within a designated geographic area and a regional analysis of the surrounding infrastructure. The RRAP addresses a range of hazards that could have regionally and nationally significant consequences. Each RRAP project will typically include yearlong data collection and analysis, followed by continued technical assistance in support of resilience.

Each year, DHS selects voluntary, non-regulatory RRAP projects with input and guidance from Federal and State partners. The range of critical infrastructure facilities, systems, and services covered by RRAP include chemical and nuclear, commercial, communications and information, manufacturing, dams, national defense, emergency services, energy, financial, food and agriculture, government, transportation, water and wastewater. The program's goal is to mitigate the Nation's risk of loss of life and physical and economic damage from natural and manmade hazards by:

- Assessing critical infrastructure on a regional level, focusing on threats, vulnerabilities, and consequences from an all-hazards perspective;

- Identifying critical infrastructure dependencies, interdependencies, cascading effects, and resilience characteristics and gaps;

- Assessing the integrated preparedness and protection capabilities of critical infrastructure owners and operators and emergency planning and response organizations; and

- Coordinating protection and response planning efforts to enhance resilience and address security gaps within the geographic region.

The culmination of RRAP activities, research, and analysis is a Resiliency Assessment. A Resiliency Assessment documents project results and findings, including key regional resilience gaps and options for addressing these shortfalls. Facility owners and operators, regional organizations, and government agencies

can use the results to help guide strategic investments in equipment, planning, training, and resources to enhance the resilience and security of facilities, surrounding communities, and entire regions.

RRAP data reflect the involvement of local communities in RRAP assessments, which may vary based on project scope. RRAP also involves numerous other participants, such as Federal and State agencies and private owners and operators of critical infrastructure not reflected in the dataset, who may or may not be located within the community in question. More importantly, RRAPs vary from region to region depending on existing infrastructure and community buy-in. When combined with other Federal programs, RRAPs could be a useful community resilience metric. Using the RRAP as a community resilience indicator presents the following challenges:

- RRAP data used in the reports reflects local community participation and may not include Federal, State, and/or private sector data, or all key members of a community.

- RRAPs vary from region to region depending on the existing infrastructure and the assessment scope producing variation in data. In some cases, RRAPs will consider sub-elements of a community. In others, they will consider infrastructure issues that span multiple States.

- The number of RRAPs executed each year expands or contracts based on appropriated funding levels.

- For community-level tracking, RRAP data would need to be desegregated. When data are desegregated, the result is that there is absent participant data – Federal, State, and private owners and operators are absent — and thus the data may not accurately reflect the program and meet the indicator criteria.

Indicator 14: Water Conservation

INDICATOR RESILIENCE RELEVANCE

Water supply is vulnerable to climate variability. Water demand will grow as the U.S. population increases; extended dry periods may cause a reduction in the quantity of water available, leading to increased challenges to meeting the demands for domestic water use. Water conservation and water efficiency (i.e., changes in technology) can increase community resilience by improving the reliability of existing water supplies, reducing the impacts of drought, and, in some cases, providing conserved water for other necessary uses, such as agricultural or environmental needs.

Indicator 14: Water Conservation		
Proposed Measure:	*Per capita water use for all domestic uses*	
Data Source:	*USGS National Water Use Report*	
Data Publisher:	*USGS*	*Year:* *2010*
Data Download:	*http://water.usgs.gov/watuse/data/2010/index.html*	

PROPOSED MEASURE

Proposed Measure: **Per capita water use for all domestic uses**

USGS tracks the estimated use of water in the U.S., including total domestic use. Domestic water use includes indoor and outdoor uses at residences, such as drinking, food preparation, bathing, washing clothes and dishes, flushing toilets, watering lawns and gardens, and maintaining pools. Domestic water use also includes potable and non-potable water provided to households by a public water supplier (domestic deliveries) and self-supplied water use. Users typically draw self-supplied domestic water from a private source, such as a well. Per capita water use for domestic uses as a metric to represent water conservation is valuable, but is also limited because water use does not account for available water supply. This limitation is important to consider when reviewing the supporting data. The USGS collects data every 5 years for the national water use report.

For Indicator 14: Water Conservation, the GIS web mapping application, available at http://arcg.is/1RPElqB, presents the domestic, publicly supplied per capita water use at the State level in 2010.

BASELINE ANALYSIS AND SUMMARY

In 2010, national per capita water use was approximate 88 gallons per day. The lowest recorded per capita domestic water use for a State was 51 gallons per day, and the highest was 168 gallons per day. Table B-10 presents information on domestic, publicly supplied per capita water use for the 50 States, the District of

Columbia, Puerto Rico, and the U.S. Virgin Islands (USVI). For the relationship between resilience and domestic water use, areas with lower per capita domestic water use represent higher resilience capacity related to water conservation. Reduced per capita rates of water use over time would be an indicator or community resilience capacity-building progress represented by.

Table B-10. Domestic, Publicly Supplied Per Capita Water Use by State* (2010)								
State	Per Capita Use (gallons/day)		State	Per Capita Use (gallons/day)		State	Per Capita Use (gallons/day)	
U.S.	88		KY	67		OH	66	
AL	76		LA	104		OK	85	
AK	90		ME	55		OR	113	
AZ	147		MD	103		PA	59	
AR	106		MA	65		PR	62	
CA	108		MI	79		RI	72	
CO	111		MN	62		SC	100	
CT	75		MS	100		SD	93	
DE	80		MO	88		TN	80	
DC	125		MT	107		TX	92	
FL	87		NE	95		USVI	60	
GA	79		NV	134		UT	167	
HI	144		NH	70		VT	64	
ID	168		NJ	80		VA	75	
IL	80		NM	90		WA	111	
IN	76		NY	79		WV	80	
IA	65		NC	70		WI	51	
KS	73		ND	80		WY	144	

Indicator 15: Wetlands Conservation

INDICATOR RESILIENCE RELEVANCE

Wetlands enhance community resilience to hazards and climate change by serving as natural buffers or protective barriers. Wetlands aid in mitigating the severity of hurricanes and resulting flooding. They accomplish this by decreasing the area of open water available for wind to form waves, increasing the drag on water movement and thereby reducing the amplitude of storm surges, reducing direct wind effects on the water surface, and directly absorbing wave energy. Conserving, protecting, and restoring wetlands can increase community resilience capacity by decreasing flood-related risks and helping reduce the economic and environmental consequences of hazard and climate events. In addition, wetlands act as "carbon sinks," which can mitigate the severity of potential future climate changes.

PROPOSED MEASURE

The project team has not fully developed a proposed measure for this indicator.

Considered Measure: **Extent (in square miles) of wetlands land cover change in coastal watershed counties (5 years)**

The Coastal Change Analysis Program (C-CAP), run by the NOAA Office for Coastal Management (OCM), measures regional land cover and change for the coastal regions of the U.S.[12,13] OCM updates the data every 5 years.

The team considered using extent (in square miles) of wetlands land cover change in coastal watershed counties over 5 years as a measure to support Indicator 15: Wetlands Conservation. However, this dataset covers the coastal areas of the Nation, not the entire U.S. OCM and others should investigate developing a national-level dataset reporting on wetlands conservation for future inclusion in this project.

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12 The mapped areas include coastal intertidal areas, wetlands, and adjacent uplands. The mapped land cover classes have been identified as features that can be accurately and consistently derived primarily through remote sensing and have been targeted as important indicators of coastal ecosystems.
13 The National Wetlands Inventory, managed by the U.S. Fish and Wildlife Service, may be another data source to be considered in the future for this measure.

Indicator 16: Forest Conservation

INDICATOR RESILIENCE RELEVANCE

Forest cover enhances community resilience to hazards and climate change by providing natural protection from hazards and serving as a carbon sink. Trees can intercept snow and rainfall, can reduce landslide hazards, and can increase the water-holding capacity of the soil by building up an organic layer. Tree canopies may mitigate adverse climate impacts by reducing radiative transfers both to the ground and into the atmosphere. Forests can also reduce soil erosion and peak flows and affect windspeeds. Protecting forests and restoring managed or degraded forests can be a vital contribution to reducing anthropogenic emissions and aiding societal adaptation to unavoidable climate change.

PROPOSED MEASURE

The project team has not fully developed a proposed measure for this indicator.

Considered Measure: Extent (in square miles) of forest land cover change in coastal watershed counties (5 years)

Through the C-CAP, OCM measures regional land cover and change for the coastal regions of the U.S. As mentioned earlier, OCM updates the data every 5 years.

The team considered using the extent (in square miles) of forest land cover change in coastal watershed counties over 5 years as a measure to support Indicator 16: Forest Conservation. However, this dataset covers the coastal areas of the Nation, not the entire U.S. OCM and others should investigate developing a national-level dataset reporting on forest conservation for future inclusion in this project.

Indicator 17: Habitat Quality

INDICATOR RESILIENCE RELEVANCE

Habitat quality is an indicator of ecosystem health and may be critically linked to community economic and societal well-being. This is especially true in areas with significant reliance on natural resources-based sectors, such as fisheries, forestry, recreation, and tourism. Resilient aquatic habitats are critical to fish and wildlife, water conservation, flood control, and people. These habitats provide for recreational, commercial, and subsistence fishing; boating; fish and wildlife viewing; and other uses that support local economies and contribute to economic well-being. Activities that prevent degradation of fish habitats and/or increase the overall health of fish and other aquatic organisms can maintain or improve the ecological resilience of aquatic resources and maintain or improve the resilience capacity of resource-dependent communities.

PROPOSED MEASURE

The project team has not fully developed a proposed measure for this indicator.

Considered Measure: **Kilometers of scored stream reaches with CHCI scores (reflecting degradation risk) of high or very high**

The National Fish Habitat Partnership (NFHP) collects, assesses, and produces the stream habitat condition index for streams throughout the contiguous U.S., including the District of Columbia. The index reports the risk of current habitat degradation. The assessment uses risk of habitat degradation instead of known habitat degradation because no agency has measured habitat condition objectively or consistently for a majority of aquatic habitats in the U.S. As a result, the index focuses on anthropogenic or human disturbance factors that are responsible for degrading habitat, rather than using direct measurements of habitat condition.

The team considered using the kilometers of scored stream reaches with cumulative habitat condition index (CHCI) scores reflecting degradation risk of high or very high as a measure to support Indicator 17: Habitat Quality; however, the CHCI dataset is specific to assessing watershed health and aquatic habitats. Indicator 17 includes various types of habitats; it is not exclusively aquatic. The team should consider measures of habitat conditions other than aquatic habitats in the future.

Indicator 18: Risk Identification

RESILIENCE ACTION RELEVANCE

Risk identification allows decision makers, responders, and community members to understand potential risks better, which allows for implementation of informed actions to reduce risk and increase resilience. Those who have identified and assessed potential risks are more capable of mitigating, preparing for, responding to, and recovering from disasters. Threat and hazard risks are constantly evolving and connected to multiple variables. Resilient communities understand that risk identification is not a static task; rather, risk identification is an activity that communities must conduct continuously over time. A wide variety of actions, such as conducting formalized risk and threat assessments, conducting scientific risk studies and mapping geologic risk areas, and collecting information about public awareness of risk, may constitute risk identification. Local communities participate in risk identification through a variety of federally sponsored activities, including Risk Mapping, Assessment and Planning (Risk MAP), Threat and Hazard Identification and Risk Assessment (THIRA), and pre-project planning.

PROPOSED MEASURE

The project team has not fully developed a proposed measure for this indicator.

Considered Measure: Percentage of the population enabled with new or improved flood risk products and tools

Systematically available public data on community-level risk identification was not easily accessible. Although the team considered using a number of possible measures of community risk identification action, none was selected for this project.

One consideration was measuring the deployment of the FEMA Risk MAP program, a flood-focused effort. Through the Risk MAP program, FEMA works with Federal, State, Tribal, and local partners across the United States to identify flood risk and help reduce that risk. Through the program, FEMA provides high-quality flood hazard maps and information, tools to better assess the risk from flooding, and planning and outreach support to communities to help them take action to reduce (or mitigate) flood risk. Risk MAP projects are tailored to the needs of communities and may involve different products and services. For more information about the Risk MAP program, see http://www.fema.gov/risk-mapping-assessment-and-planning-risk-map.

To monitor its success in meeting the Risk MAP program vision, FEMA must understand the extent of Risk MAP product delivery and how to measure increases in both community flood risk awareness and the scope of actions communities are taking to reduce flood risk. Therefore, FEMA uses several metrics to measure the success of the Risk MAP program. One such metric is Risk MAP deployment. Risk MAP deployment must ensure an understanding of the difference between "risk" and "hazard" and create a dialogue on how flood risk data should find its way into day-to-day decisions as well as mitigation and other comprehensive plans. Risk MAP deployment is measured as the percentage of population where the local Risk MAP dialogue and study process has been initiated and is calculated by dividing the total population within the appropriate Risk MAP project footprint by the total national population, based on 2010 Census data. The Risk MAP coverage metric considers whether the Risk MAP project has funded watershed-based Discovery

projects as well as certain Risk MAP Flood Risk Products, including the Flood Risk Map, Flood Risk Report, and Flood Risk Database, which includes various Flood Risk Datasets. There are additional special considerations for Risk MAP projects involving coastal and levee analyses. Through Fiscal Year 2015, Risk MAP deployment covered roughly 60 percent of the U.S. population. Strengths of the Risk MAP deployment measure include that it is available nationally and the risk identification process meets data quality standards that FEMA has established for the Nation.

Apparent drawbacks to the measure also exist. While communities covered by Risk MAP deployment are likely to be more resilient to flooding-related events, due to the availability of studies, maps, and plans to support flood risk mitigation, the availability of flood risk products following deployment in each geographic area varies widely. The extent of community involvement in deployment-related actions is also highly variable across geographic areas, and communities may have limited control over deployment activities. Therefore, the team should consider additional or alternative metrics to Risk MAP deployment.

Indicator 19: Risk Data

INDICATOR RESILIENCE RELEVANCE

For communities and the agencies that serve them to better mitigate, prepare for, respond to, and recover from disasters, it is essential to understand the risks from hazards and climate change. Understanding risk involves obtaining accurate data to assess the risk. Scientific and technological advancements now make it possible to improve foundational risk data continuously. The improved risk data become a critical part of the evolution of the risk identification, assessment, understanding, and action continuum.

One example of these recent technological advances is the ability to obtain three-dimensional (3D) elevation data. Such 3D elevation data are essential for flood mitigation, conservation management, infrastructure development, national security, and many other applications. Having accurate, current elevation data greatly assists in efforts to recognize, understand, communicate, plan, and address risks from disaster and climate change. FEMA expects that a national 3D elevation data program could allow for more efficient updating of its flood maps. These 3D data could provide significant benefits to the communities and citizens that are customers of the National Flood Insurance Program (NFIP), making updated information available to affected communities and homeowners more quickly.

PROPOSED MEASURE

The project team has not fully developed a proposed measure for this indicator.

Considered Measure: Percentage of the area (in square miles) with elevation data that meet 3DEP base-level specifications

USGS is implementing the 3D Elevation Program (3DEP) initiative in response to the need for high-quality topographic data and a wide range of other 3D representations of the natural and constructed features in the U.S. The 3DEP initiative supports the acquisition of high-quality light detection and ranging (lidar) data and interferometric synthetic aperture radar (ifsar) data, which are just a portion of the elevation datasets collected nationally. The team considered using the percentage of the area (in square miles) with elevation data that meet 3DEP base-level specifications as a measure to support Indicator 19: Risk Data; however, this dataset does not comprehensively represent risk data for the Nation. The team and others should consider measures of risk data collection other than through the 3DEP initiative in the future.

Indicator 20: Risk Awareness

INDICATOR RESILIENCE RELEVANCE

Based on scientific information about risks and vulnerabilities, risk awareness targets desired changes in individual behaviors or perceptions. Assessments of risk perception and awareness can track progress toward targeted outcomes and inform the development and improvement of risk communication strategies and tools. Because different community stakeholders have different responsibilities and desired behaviors, understanding and effectively targeting risk awareness outcomes for different groups is essential. Risk awareness goals targeting local officials responsible for land-use regulations or building codes would be different from the risk awareness goals targeting household preparedness for the public. Communities can improve resilience capacity through effective risk awareness strategies.

PROPOSED MEASURE

The project team has not fully developed a proposed measure for this indicator.

Considered Measure: **Percentage of community leaders surveyed who are aware of community flood risks**

FEMA conducts an annual online survey of community leaders affiliated with the NFIP. As part of this survey, FEMA measures the percentage of local officials who are "aware" of their community's flood risk. In the 2015 survey, FEMA asked community leaders whether the following statement was true or false for their community:

> *Your community's flood risk can change over time due to new weather patterns, development, and other factors.*

The team considered using community leaders' responses to the above statement as a measure to support Indicator 20: Risk Awareness; however, the team determined that a survey of community leaders where the survey population is predominantly associated with the NFIP might not sufficiently represent the local leadership population in the U.S. The team and others should explore other surveys specific to flood risk awareness and surveys that may address broader hazard risk awareness. The team should determine whether other risk awareness data, such as information in the USACE Levee Screening Tool, would be useful in developing a better metric in the future.

Indicator 21: Community Preparedness

INDICATOR RESILIENCE RELEVANCE

Community preparedness generally focuses on the pre-event actions that residents, businesses, governments, and emergency responders can take to respond to a disaster effectively. For residents and businesses, this includes basic risk-appropriate steps, such as developing household or business emergency plans and securing backup energy, communication, food, and water supplies. For local governments, community preparedness includes having well-planned, organized, trained, and equipped emergency operations. Communities build resilience capacity by ensuring that emergency operations plans are in place across critical service delivery agencies and that contingencies are in place for continued delivery of critical services during disruption of operations.

On average annually, Americans cope with 100,000 thunderstorms; 26,000 severe thunderstorms; 5,000 floods; 1,300 tornadoes; and 2 deadly hurricanes that make landfall. Approximately 98 percent of all presidentially declared disasters are weather related, leading to 650 deaths per year and about $15 billion in damage.[14] The ability of government, residential, and commercial entities to prepare for weather-related impacts with risk-appropriate actions contributes greatly to a community's resilience to these disasters.

Indicator 21: Community Preparedness		
Proposed Measure:	*Number of sites designated as StormReady® and/or TsunamiReady®*	
Data Source:	*StormReady® and TsunamiReady®*	
Data Publisher:	*National Weather Service (NWS)*	*Year:* *2015*
Data Download:	*http://www.stormready.noaa.gov/communities.shtml*	

PROPOSED MEASURE

Proposed Measure: **Number of sites designated as StormReady® and/or TsunamiReady®**

The National Weather Service (NWS) administers the StormReady® and TsunamiReady® programs, nationwide community preparedness initiatives that use a grassroots approach to help communities develop plans to handle all types of weather hazards. The programs encourage communities to improve local hazardous weather operations by providing emergency managers with clear-cut guidelines on how to do so.

A community must meet the following criteria to receive an official StormReady® designation:

- Establish a 24-hour warning point and emergency operations center;

- Have more than one way to receive weather hazard warnings and forecasts and to alert the public;

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14 http://www.stormready.noaa.gov/

- Create a system that monitors weather conditions locally;

- Promote the importance of public readiness through community seminars; and

- Develop a formal hazardous weather plan, which includes training weather hazard spotters and holding emergency exercises.

The NWS provides data about StormReady®-participating communities and sites ranging in geographic scale from States to counties to specific commercial and educational sites.

The NWS also administers the TsunamiReady® program. TsunamiReady® is a voluntary community recognition program that promotes tsunami hazard preparedness as an active collaboration among Federal, State/Territorial, and local emergency management agencies, community leaders, and the public. The main goal of the program is to improve public safety before, during, and after tsunami emergencies. The program aims to do this by establishing guidelines for a standard level of capability to mitigate, prepare for, and respond to a tsunami and by working with communities to help them meet the program guidelines and ultimately receive the TsunamiReady® designation.

For Indicator 21: Community Preparedness, the GIS web mapping application, available at http://arcg.is/1RPElqB, presents the range of StormReady® and/or TsunamiReady® designated sites by State.

BASELINE ANALYSIS AND SUMMARY

As of February 2016, 2,402 StormReady® and TsunamiReady® sites exist nationwide. Table B-11 provides the number of StormReady® and/or TsunamiReady® sites, by State. State site totals range from 5 to 177. An increase in the number of StormReady® or TsunamiReady® designated sites over time would be a good indicator of progress.

Table B-11. Number of Sites Designated as StormReady® or TsunamiReady® by State (2015)							
State	**StormReady® and/or TsunamiReady® Sites**	**State**	**StormReady® and/or TsunamiReady® Sites**	**State**	**StormReady® and/or TsunamiReady® Sites**
U.S.	**2,402**	KY	57	ND	46
AL	58	LA	26	OH	32
AK	21	ME	11	OK	101
AZ	19	MD	16	OR	34
AR	34	MA	21	PA	82
CA	103	MI	52	RI	7
CO	37	MN	32	SC	59
CT	9	MS	60	SD	29
DE	5	MO	81	TN	77
FL	126	MT	53	TX	166
GA	111	NE	29	UT	21
HI	11	NV	20	VT	2
ID	177	NH	0	VA	54
IL	120	NJ	23	WA	59
IN	50	NM	23	WV	11
IA	36	NY	40	WI	20
KS	45	NC	81	WY	15

Indicator 22: Mitigation Planning

INDICATOR RESILIENCE RELEVANCE

Hazard mitigation planning is a process that State, Territorial, Tribal, and local governments use to identify risks and vulnerabilities associated with natural hazards, and to develop long-term strategies for protecting people and property during future events. Unlike other types of disaster-related planning, mitigation planning focuses specifically on ending the cycle of repeated disaster damage. Local hazard mitigation plans enable communities to identify broad strategies and specific actions they can take to protect lives and property. Examples of mitigation actions that a local hazard mitigation plan might include are projects designed to physically protect assets – such as elevating homes at risk of flooding or retrofitting key critical facilities against seismic or wind hazards – or broader regulatory actions that require community-wide use of disaster-resistant building codes or standards. Developing a local hazard mitigation plan is a critical, foundational step for a community to shape a sound overall disaster resilience strategy.

Jurisdictions need to develop and adopt FEMA-approved hazard mitigation plans as a condition for receiving project grants under the FEMA Hazard Mitigation Assistance (HMA) grant programs. FEMA, therefore, provides guidance and tools regarding hazard mitigation plan development. In partnership with States, FEMA reviews and approves local hazard mitigation plans.

Indicator 22: Mitigation Planning		
Proposed Measure:	*Percentage of population residing in communities covered by a current local hazard mitigation plan*	
Data Source:	*National Mitigation Planning Program*	
Data Publisher:	*FEMA*	*Year:* *2015*
Data Download:	*https://hazards.fema.gov/gis/nfhl/rest/services/MPP/MPP_GIS/MapServer (a map service accessible via Geographic Information System software)*	

PROPOSED MEASURE

Proposed Measure: **Percentage of population residing in communities covered by a current local hazard mitigation plan**

FEMA reports the "*Percent of the U.S. population (excluding territories) covered by planned mitigation strategies*" as a national performance measure. Specifically, this measure tracks the percentage of the U.S. population (not counting the populations of U.S. Territories) living in communities with current local hazard mitigation plans, and therefore benefiting from the plans' value to their communities in terms of capacity building, mitigation strategy, and eligibility for FEMA grants.

To calculate the measure, FEMA sums the population of each community with a local hazard mitigation plan approved by FEMA (or designated approvable pending the local government's official adoption of the plan) to determine an overall percentage of the national population. National population coverage and how

that coverage varies geographically provides information about the level of community interest in and capacity for hazard mitigation, as well as about eligibility for FEMA HMA project grants. FEMA maintains a database tracking the status of State, Territoryl, Tribal, and local jurisdictions with hazard mitigation plans. FEMA updates the database at least quarterly, and members of the public can interact with geographic data from the system via a GIS service.

For Indicator 22: Mitigation Planning, the GIS web mapping application, available at http://arcg.is/1RPElqB, presents the percentage of the population residing in communities covered by a current local hazard mitigation plan.

BASELINE ANALYSIS AND SUMMARY

As of December 31, 2015, FEMA has designated the local hazard mitigation plans for 22,706 communities as "approved" or "approvable-pending-adoption." Over 82 percent of the U.S. population (excluding U.S. Territories) lives in a community with an approved or approvable-pending-adoption hazard mitigation plan.

Table B-12 provides a breakdown of the data by State, indicating the percentage of each State population living in communities with current local hazard mitigation plans. Among the States, the percentage of the population covered by current hazard mitigation plans ranges from 44 to 100 percent. Together with other factors, population coverage by local hazard mitigation plans may contribute to greater community-level resilience in the States.

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Table B-12. Percentage of Population Covered by Current Local Hazard Mitigation Plans, by State (as of Fiscal Year 2016, Quarter 1)							
State	2010 Census Population	Population Covered by Current Plans	Per-cent	State	2010 Census Population	Population Covered by Current Plans	Per-cent
U.S.*	308,745,538	254,902,333	82.6	MT	989,415	892,061	90.2
AL	4,779,736	3,130,325	65.5	NE	1,826,341	1,661,927	91.0
AK	710,231	611,076	86.0	NV**	2,700,551	2,254,831	83.5
AZ	6,392,017	6,113,732	95.6	NH	1,316,470	1,232,478	93.6
AR	2,915,918	1,280,148	43.9	NJ	8,791,894	8,148,953	92.7
CA**	37,253,956	23,937,915	64.3	NM	2,059,179	1,663,536	80.8
CO	5,029,196	2,608,486	51.9	NY	19,378,102	16,878,366	87.1
CT	3,574,097	3,477,642	97.3	NC**	9,535,483	9,338,212	97.9
DE	897,934	706,568	78.7	ND	672,591	563,198	83.7
DC	601,723	601,723	100.0	OH**	11,536,504	10,188,349	88.3
FL**++	18,801,310	16,944,424	90.1	OK	3,751,351	2,714,214	72.4
GA**	9,687,653	9,287,039	95.9	OR**	3,831,074	2,993,435	78.1
HI	1,360,301	1,360,211	100.0	PA	12,702,379	12,518,977	98.6
ID	1,567,582	1,253,103	79.9	RI	1,052,567	725,282	68.9
IL	12,830,632	11,186,021	87.2	SC	4,625,364	4,250,350	91.9
IN	6,483,802	3,040,382	46.9	SD	814,180	541,509	66.5
IA**++	3,046,355	3,020,195	99.1	TN	6,346,105	5,532,949	87.2
KS	2,853,118	2,844,626	99.7	TX	25,145,561	21,005,768	83.5
KY**	4,339,367	3,028,360	69.8	UT	2,763,885	2,155,472	78.0
LA	4,533,372	4,499,176	99.2	VT	625,741	451,208	72.1
ME	1,328,361	1,321,888	99.5	VA	8,001,024	7,998,407	100.0
MD	5,773,552	5,672,444	98.2	WA**	6,724,540	5,002,610	74.4
MA	6,547,629	3,681,149	56.2	WV	1,852,994	1,638,734	88.4
MI	9,883,640	8,009,275	81.0	WI**++	5,686,986	4,647,557	81.7
MN	5,303,925	3,183,003	60.0	WY	563,626	443,803	78.7
MS	2,967,297	2,751,218	92.7				
MO**++	5,988,927	5,910,018	98.7				

* Excluding U.S. Territories
** States with enhanced State hazard mitigation plans, reflecting comprehensive State mitigation programs with strong grants management capabilities. Enhanced status confers eligibility for increased funds under the FEMA Hazard Mitigation Grant Program following a disaster declaration.
++ States granted Program Administration by States authority by FEMA, which includes delegated review authority for local hazard mitigation plans.

Indicator 23: Planning Integration

INDICATOR RESILIENCE RELEVANCE

Emergency managers or public safety personnel often conduct assessments of and planning for hazards and climate risks. Although these stakeholders are among the most important in the process, integrating safety planning beyond public safety departments is integral to enhancing community resilience. For example, local planning, engineering, maintenance, parks and recreation, or administration departments make many decisions that directly affect public safety and resilience. By integrating public safety and resilience considerations into these decision-making processes, communities can select projects, plans, and long-term visions that achieve their goals, while also maximizing public safety and resilience benefits. By fully integrating hazard considerations into all types of local government planning, communities ensure that their implementation activities are more resilient. Planning integration is essential to long-term community resilience. Well-planned long-term vulnerability reduction is holistic and tied into comprehensive planning and management, linking mitigation goals to other community goals, such as actions and incentives to improve overall residential property values, business continuity, natural resource conservation, school safety, or transit reliability.

PROPOSED MEASURE

The project team has not fully developed a proposed measure for this indicator.

Considered Measure: Percentage of coastal population benefiting from the integration of hazard management into coastal planning

U.S. coastal communities are home to more than 160 million people and generate more than one-half of the U.S. economic output. Coastal areas are susceptible to a number of natural hazards, including coastal storms, flooding, coastal erosion, tsunami, and sea level rise, which climate change will exacerbate. These hazards threaten lives, property, infrastructure, the natural environment, and, ultimately, economies. Each year, coastal hazards result in hundreds of millions (sometimes billions) of dollars in damage and associated costs.

The U.S. Congress passed the Coastal Zone Management Act (CZMA) in 1972 to address the challenge of continued growth in the coastal zone. This Act provides for the management of the nation's coastal resources, including the Great Lakes. The goal is to "preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone." The National Coastal Zone Management Program, administered by NOAA, and State coastal management programs implement the CZMA. The integration of hazards into the comprehensive planning process is critical for community resilience, particularly in the coastal zone, where nearly all development is subject to potential hazards.

The Coastal Zone Enhancement Program, which is part of the National Coastal Zone Management Program, provides incentives to States to enhance their State programs within nine key areas:

- Wetlands;
- Coastal hazards;
- Public access;
- Marine debris;
- Cumulative and secondary impacts;
- Special area management planning;
- Ocean and Great Lakes resources;
- Energy and government facility siting; and
- Aquaculture.

Examples of coastal hazard enhancements include improved risk assessment procedures, multihazard planning, education, sea-level rise assessment, coastal climate change adaptation, interjurisdictional hazard mitigation coordination, post-disaster recovery planning, land use management, and NFIP and CRS integration with coastal planning. NOAA collects data on State coastal management programs to track the inclusion of these key areas in program updates.

The NOAA Coastal Zone Enhancement Program captures planning integration for coastal States, but does not reflect community-level data for the entire U.S. Other agencies, including EPA, HUD, and FEMA, also have grants or programs related to integrated planning; however, at this time, those agencies were unable to provide adequate datasets for this project. The project team and others should investigate community-level planning integration data for the entire Nation further for inclusion in this project.

Indicator 24: Collaborative Networks

INDICATOR RESILIENCE RELEVANCE

Communities and the agencies that serve them that are able to mitigate, prepare for, respond to, and recover from disasters in a planned, intentional, and collaborative manner tend to be highly resilient. Collaboration can be challenging, as local agencies can operate with a "silo" mentality, only focusing on the specific goals of that agency. Additionally, the diverse range of stakeholders present in most communities can make meaningful capacity difficult. To withstand and recover, it is essential that whole communities, including those public agencies with interest in the communities, work together to anticipate, mitigate, and respond to risks and disasters.

PROPOSED MEASURE

The project team has not fully developed a proposed measure for this indicator.

While the team explored a number of options related to collaborative networks, the team was unable to identify an appropriate Federal dataset that met minimum project criteria for this indicator. The team explored one optional measure for illustrative purposes--the percentage of States with State-led interagency collaborations supporting disaster risk-reduction efforts (USACE Silver Jackets Program).

The USACE Silver Jackets Program aims to create or supplement continuous mechanisms to achieve collaborative solutions for State-prioritized community flood risk issues and implement those solutions. The Silver Jackets Program leverages and optimizes resources from multiple State, Federal, Tribal, and local agencies to reduce flood and natural disaster risk and enhance response and recovery efforts when disasters occur. Silver Jackets Teams are developed and led at the State level with Federal support. Individual programs of the participating agencies provide the resources for activities led by the Silver Jackets Teams within the constraints of their available budgets. At a minimum, each Silver Jackets Team includes the State Hazard Mitigation Officer, the State NFIP Coordinator, a FEMA representative, and a USACE representative. As the team lead, the State may invite additional participation from both governmental and nongovernmental representatives.

As of 2015, 86 percent of the States and the District of Columbia have Silver Jacket Teams that have initiated projects entailing USACE technical or planning assistance. Communities located within States with Silver Jacket Teams are likely to be more resilient to disasters due to the teams' ability to leverage multiagency program resources, collaboratively solve issues, present a unified interagency message, and facilitate integrated post-disaster recovery solutions. However, the amount of community-level benefit from collaboration occurring within each State with a Silver Jackets team varies significantly. The level of Silver Jackets project activity identifies differences to some extent, but the Silver Jackets project data are only a partial capture of overall collaborative activity.

While Silver Jackets remains an important program with strong relevance to the level of collaboration, the team and others should consider additional measures. For example, Citizen Corps Whole Community Councils, a FEMA-supported activity, bring government and community leaders together to involve the whole community in all phases of emergency management and community preparedness to strengthen local

resilience. As of December 31, 2014, 1,887 local Councils were registered. These Councils provide "a platform" for whole community collaboration. Citizen Corps Councils are inclusive of non-governmental resources as well.

Indicator 25: Civic Capacity

INDICATOR RESILIENCE RELEVANCE

Social connectedness is a critically important element of community resilience capacity. Socially isolated individuals are less resilient than socially connected individuals are because they have less access to shared resources and are vulnerable to mental health challenges. At the community level, concentrated levels of isolation are a major factor of community vulnerability. Understanding the level of civic engagement and capacity within communities can help determine the level of social connectedness that exists. People are more empowered to help one another after a major disturbance in communities in which members are regularly involved in each other's lives. Volunteering is one way to enhance social connectedness, both for the people who are volunteering and for the people who benefit from the volunteer work. Volunteering can help make people healthier and less likely to be unemployed for an extended period.[15,16] Volunteer work can also help ensure that people who may be disproportionately impacted are prepared for, and able to respond to, hazard events.

Indicator 25: Civic Capacity		
Proposed Measure:	*Percentage of individuals surveyed who performed volunteer activities for or through an organization during the preceding 12-month period*	
Data Source:	*Current Population Survey*	
Data Publisher:	*Corporation for National and Community Service* *Year:* *2014*	
Data Download:	*http://www.volunteeringinamerica.gov/rankings.cfm*	

PROPOSED MEASURE

Proposed Measure: **Percentage of individuals surveyed who performed volunteer activities for or through an organization during the preceding 12-month period**

The Current Population Survey (CPS), conducted monthly by the U.S. Census Bureau, includes two supplements: the Volunteer Supplement and the Civic Supplement. The Corporation for National and Community Service (CNCS) compiles information from these two supplements and, as part of administering the Volunteering and Civic Life in America website, makes the data publicly available. Among the data made available are the volunteer rates per State.[17]

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15 http://www.nationalservice.gov/pdf/07_0506_hbr.pdf
16 http://www.ncoc.net/index.php?download=114kcfl1427
17 The volunteer rate is the percentage of individuals who responded on the CPS Volunteer Supplement that they had performed unpaid volunteer activities at any point during the 12-month period that preceded the survey for or through an organization.

For Indicator 25: Civic Capacity, the GIS web mapping application, available at http://arcg.is/1RPElqB, presents the percentage of individuals surveyed, by State, who performed volunteer activities for or through an organization during the 12-month period preceding the 2014 CPS.

BASELINE ANALYSIS AND SUMMARY

Across the Nation, 25.3 percent of individuals surveyed have volunteered during the previous year. Table B-13 lists the percentage of individuals in each State and the District of Columbia who volunteered for or through an organization during the 12-month period preceding the 2014 CPS. The individual percentages range from 17.4 percent to 46.0 percent. Increasing the percentage of individuals surveyed who performed volunteer activities for or through an organization during the preceding 12-month period would indicate improved resilience.

Table B-13. Percentage of Individuals Volunteering by State (2014)							
State	Percentage	State	Percentage	State	Percentage	State	Percentage
AL	24.1	IL	25.9	MT	30.4	RI	23.8
AK	34.3	IN	27.5	NE	34.6	SC	23.1
AZ	23.3	IA	33.0	NV	19.4	SD	34.1
AR	20.5	KS	35.1	NH	27.8	TN	25.0
CA	24.6	KY	23.8	NJ	22.5	TX	23.2
CO	30.9	LA	17.4	NM	25.5	UT	46.0
CT	28.9	ME	31.9	NY	19.2	VT	34.7
DE	26.1	MD	28.2	NC	26.3	VA	30.1
DC	31.3	MA	25.2	ND	29.7	WA	32.9
FL	20.1	MI	27.4	OH	26.6	WV	20.8
GA	23.3	MN	35.3	OK	25.8	WI	35.4
HI	23.4	MS	24.7	OR	32.7	WY	28.8
ID	35.8	MO	30.2	PA	27.0		

Indicator 26: Building Codes

INDICATOR RESILIENCE RELEVANCE

Design and construction play a major role in the ability of a structure to withstand impacts from a hazard. Building codes are legal requirements that set minimum material and design standards for construction. Many communities in the United States have minimum standard building codes. Additionally, many but not all States have adopted statewide building codes that address disaster-resistant standards for most building types. Some States and communities choose to go beyond minimum standards. For example, some building codes focus on higher requirements for energy and water efficiency; others focus on mitigating specific hazards, such as flooding or tornadoes. Building requirements that mitigate the impacts of hazards shift costs to the front end of the project, requiring slightly higher construction costs with the intention of significantly reducing recovery repairs, risk of injury, and loss of life. Accurate identification of hazards and performance levels with the application of appropriate building codes increases resilience.

Indicator 26: Building Codes	
Proposed Measure:	*Percentage of reporting communities that are subject to one or more hazards (seismic, hurricane, or flood) that have adopted building codes with disaster resistance provisions*
Data Source:	*Building Code Effectiveness Grading Schedule State by State Summary of Community Adoptions*
Data Publisher:	*Insurance Services Office/FEMA Year: 2015*

PROPOSED MEASURE

Proposed Measure: **Percentage of reporting communities that are subject to one or more hazards (seismic, hurricane, or flood) that have adopted building codes with disaster resistance provisions**

The Insurance Services Office (ISO) tracks building code effectiveness through the Building Code Effectiveness Grading Schedule (BCEGS). The BCEGS State by State Summary of Community Adoptions dataset identifies the number of jurisdictions by State and the number of jurisdictions subject to one or more hazards (seismic, hurricane, or flood) that have adopted building codes with disaster provisions.[18]

For Indicator 26: Building Codes, the GIS web mapping application, available at http://arcg.is/1RPElqB, presents the percentage of reporting communities, by State, that are subject to one or more hazards and have adopted building codes with disaster resistance provisions.

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18 Total number of reporting jurisdictions for each State is based on jurisdictions who participated in the BCEGS survey performed by ISO or were provided by Building Code Adoption Tracking Research. Jurisdictions include, but are not limited to, cities, towns, townships, boroughs, villages, counties, and parishes.

BASELINE ANALYSIS AND SUMMARY

As of 2015, approximately 60 percent of the Nation's jurisdictions that are subject to seismic, hurricane, or flood hazard had adopted a building code with disaster provisions. Table B-14 provides the percentage of jurisdictions subject to one or more hazards that have adopted building codes with disaster provisions for each State and the District of Columbia. Hazard-based building code coverage ranges from 0 percent at the low end to 97 percent at the high end. Communities that have building codes with disaster provisions are likely to have more resilient structures; therefore, those communities would be more resilient over time. An increase in the percentage of jurisdictions with disaster provision building codes would generally indicate progress.

Table B-14. Jurisdictions Subject to One or More Hazards (Seismic, Flood, Wind) That Have Adopted Building Codes with Disaster Provisions, by State (2015)					
State	Total Jurisdictions	Percentage of Jurisdictions Subject to One or More Hazards That Have Adopted Building Codes with Disaster Provisions	State	Total Jurisdictions	Percentage of Jurisdictions Subject to One or More Hazards That Have Adopted Building Codes with Disaster Provisions
U.S.	23,569	60	MT	46	41
AL	246	62	NE	103	76
AK	15	53	NV	78	91
AZ	77	53	NH	116	89
AR	94	91	NJ	1,349	47
CA	761	82	NM	35	97
CO	203	33	NY	1,282	89
CT	181	2	NC	702	73
DE	151	30	ND	75	51
FL	935	95	OH	2,784	82
GA	532	76	OK	120	88
HI	4	0	OR	188	92
ID	11	73	PA	3,755	82
IL	400	52	RI	41	27
IN	516	66	SC	280	84
IA	168	72	SD	33	63
KS	97	2	TN	188	56
KY	446	77	TX	465	65
LA	74	86	UT	229	56
ME	112	79	VT	6	0
MD	695	68	VA	814	77
MA	348	23	WA	26	92
MI	1,506	26	WV	169	45
MN	794	57	WI	1,666	0
MS	336	3	WY	42	63
MO	275	73			

Indicator 27: Higher Standards

INDICATOR RESILIENCE RELEVANCE

Prescriptive requirements, where satisfactory performance means meeting the minimum requirements, form the basis for many development standards. Long-term vulnerability reduction requires looking beyond minimum standards to reliability-based performance criteria that can improve the overall resilience of the built environment across a community. To improve their resilience capacity, communities should adopt codes and standards that encourage and incentivize risk-appropriate actions that exceed minimum requirements when necessary to meet resilience performance targets.

Flooding is the highest-impact single hazard in the Nation. The U.S. Treasury reports that, between 1980 and 2013, floods caused an estimated $260 billion in damage. Devastation from flooding can affect every aspect of a community, resulting in loss of life and long-term impairment to livelihoods, property values, and the environment.

The NFIP is a federally backed insurance program that provides communities with products and incentives to reduce their risk from flooding and more quickly recover from flooding events. The NFIP covers more than $1.23 trillion in assets against flood damage and affords opportunities for managing climate-related risks.

When communities agree to participate in the NFIP, they are agreeing to follow certain practices that reduce flood risk. By encouraging land-use practices that limit and reduce the number of structures in identified flood hazard areas, communities participating in the NFIP will have fewer losses from a given flood event compared to losses experienced during previous flood events. In addition to meeting the minimum requirements of the NFIP, communities that want to take extra steps to reduce their flood risk can participate in the CRS.

Indicator 27: Higher Standards	
Proposed Measure:	*Percentage of NFIP-participating communities enrolled in the CRS with a CRS rating of Class 5 or better*
Data Source:	*Community Rating System Communities and their Classes*
Data Publisher:	*FEMA* *Year: 2015*
Data Download:	*https://www.fema.gov/media-library/assets/documents/15846*

PROPOSED MEASURE

Proposed Measure: **Percentage of NFIP-participating communities enrolled in CRS with a CRS rating of Class 5 or better**

CRS is a voluntary program that recognizes and rewards communities for taking additional steps to reduce their risk of flooding. Some of the resilience values associated with higher floodplain management standards, especially in high-risk areas, include increased community livability, livelihood stability, environmental stewardship, higher property values, and health and recreation. By participating, communities earn credit points that determine classifications. There are 10 CRS Classes: Class 1 requires the most credit points and provides the largest flood insurance premium reduction (45 percent), while Class 10 means the community does not participate in the CRS or has not earned the minimum required credit points, and residents receive no premium reduction. The CRS Classes are based on completion of 19 creditable activities organized into four categories: (1) Public Information; (2) Mapping and Regulations; (3) Flood Damage Reduction; and (4) Warning and Response

Creditable actions equating to higher scores include those listed below.

- Public Information
    - Maintain FEMA Elevation Certificates for new construction in the floodplain.
    - Send information about local flood hazards, flood insurance, flood protection structures, and/or natural and beneficial functions of floodplains to community residents.
    - Maintain flood insurance and flood protection information and resources in the community public library or on a community website.

- Mapping and Regulations
    - Guarantee that currently vacant floodplain parcels will not be developed.
    - Require soil tests or engineered foundations.
    - Require compensatory storage.
    - Regulate new construction to minimize erosion and protect or improve water quality.

- Flood Damage Reduction
    - Prepare, adopt, implement, and maintain/update a comprehensive hazard mitigation plan.
    - Acquire and/or relocate floodprone structures to remove them from high-risk areas[19].
    - Conduct periodic inspections of all channels and retention basins and remove all debris.

- Warning and Response
    - Provide early flood warnings to the public, and have a detailed flood response plan keyed to flood crest predictions.
    - Maintain existing levees not otherwise credited in the flood insurance rating system that provide some flood protection.

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19 High-risk areas typically are labeled on flood maps as the V zone or A zone.

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For Indicator 27: Higher Standards, the GIS web mapping application, available at http://arcg.is/1RPElqB, presents the range of insured flood risk communities that are also CRS communities with a Class 5 or better rating at the State level.

BASELINE ANALYSIS AND SUMMARY

As of the date of this report, 1,368 of 22,875 NFIP-participating communities (5.9 percent) participate in the CRS. Rating classifications vary by community and State. The City of Roseville, California, is the only CRS Class 1 community, meaning reduction in premiums for flood insurance policyholders in high-risk areas (also referred to as Special Flood Hazard Areas) of at least 45 percent. More than 100 communities have a CRS ranking of at least Class 5, indicating substantial community investments in risk reduction and substantial reductions (at least 25 percent) for flood insurance policyholders in high-risk areas. State participation ranges from 0 percent to nearly 6 percent.

States and communities with higher rates of CRS participation should respond to and recover from disasters more effectively than other communities recover; therefore, those States and communities should be more resilient. Table B-15 provides NFIP and CRS community participation information for all States and Puerto Rico.

For the purpose of this report, the project team considered communities with a CRS rating of Class 5 through Class 1 the most resilient. However, all levels of CRS and NFIP participation are important for reducing local risk and protecting lives and property. FEMA continues to encourage NFIP-participating communities to enroll in the CRS and encourages CRS communities to consider expanding their portfolio of activities.

Table B-15. NFIP and CRS Participation by State (2015)				
State	Total Number of CRS Communities	Number of Communities in CRS Classes 1-5	Number of Communities in CRS Classes 6-9	Total Number of NFIP Participating Communities	Percentage of NFIP Communities in CRS Classes 1-5
U.S.	1,368	113	1,255	22,875	0.5
AL	14	0	14	450	0.0
AK	6	0	6	32	0.0
AZ	26	3	23	108	2.8
AR	16	0	16	428	0.0
CA	90	7	83	526	1.3
CO	46	4	42	260	1.5
CT	7	0	7	177	0.0
DE	11	0	11	49	0.0
FL	219	26	193	472	5.5
GA	50	3	47	578	0.5
HI	2	0	2	4	0.0
ID	20	0	20	176	0.0
IL	60	11	49	970	1.1
IN	33	0	33	452	0.0
IA	6	1	5	690	0.1
KS	31	0	31	459	0.0
KY	27	1	26	353	0.3

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	Table B-15, continued				
State	Total Number of CRS Communities	Number of Communities in CRS Classes 1-5	Number of Communities in CRS Classes 6-9	Total Number of NFIP Participating Communities	Percentage of NFIP Communities in CRS Classes 1-5
LA	42	0	42	318	0.0
ME	17	0	17	985	0.0
MD	13	1	12	145	0.7
MA	15	0	15	341	0.0
MI	22	1	21	1,015	0.1
MN	7	2	5	630	0.3
MS	32	2	30	346	0.6
MO	7	1	6	688	0.1
MT	12	0	12	136	0.0
NE	6	1	5	416	0.2
NV	10	2	8	34	5.9
NH	4	0	4	217	0.0
NJ	73	12	61	552	2.2
NM	11	0	11	108	0.0
NY	32	0	32	1,511	0.0
NC	86	2	82	616	0.64
ND	2	1	1	334	0.3
OH	14	0	14	805	0.0
OK	12	4	8	427	0.9
OR	27	1	26	271	0.4
PA	25	0	25	2,465	0.0
PR	1	0	1	5	0.0
RI	8	0	8	40	0.0
SC	43	3	40	250	1.2
SD	5	0	5	234	0.0
TN	14	0	14	418	0.0
TX	62	5	57	1,371	0.4
UT	11	0	11	214	0.0
VT	3	0	3	248	0.0
VA	23	0	23	296	0.0
WA	36	15	21	294	5.1
WV	7	0	7	283	0.0
WI	17	2	15	593	0.3
WY	5	0	5	85	0.0

More information on the CRS and CRS participating communities is accessible through the FEMA website at http://www.fema.gov/national-flood-insurance-program-community-rating-system.

The NFIP Community Status Book, which is accessible through http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-status-book, provides a complete listing of NFIP-participating communities.

Indicator 28: Mitigation Investment

INDICATOR RESILIENCE RELEVANCE

Funding availability is crucial to enabling the implementation of hazard mitigation plans and to building, rebuilding, or otherwise sustaining physical community structures or systems to reduce or avoid future losses. Tracking mitigation investment opportunities provides a way to gauge how attuned communities are to the need and opportunities for rebuilding with future hazard protection in mind. Mitigation investment to reduce long-term vulnerabilities can take many forms, including hardening structures; building protective or diversionary structures around roads and highway systems or public utilities; or removing structures or facilities from high-risk zones, such as Special Flood Hazard Areas shown on NFIP maps.

Indicator 28: Mitigation Investment

Public Infrastructure Disaster Relief Funds

Proposed Measure:	*Percentage of total public infrastructure disaster relief funds spent on Section 406 Mitigation for disasters in the preceding 5-year period (considered but data provides rough estimates of actual spending at this stage only)*
Data Source:	*Enterprise Data Warehouse (EDW) EMMIE Public Assistance Data*
Data Publisher:	*FEMA* *Year:* *2011 –2016*

Voluntary Hazard Mitigation Loans

Proposed Measure:	*Percentage of SBA home disaster loan funds spent on mitigation assistance*
Data Source:	*SBA Disaster Loans*
Data Publisher:	*SBA* *Year:* *2014*

PUBLIC INFRASTRUCTURE DISASTER RELIEF FUNDS

Proposed Measure

The project team has not fully developed a proposed measure for this indicator.

Considered Measure: **Percentage of total public infrastructure disaster relief funds spent on Section 406 Mitigation for disasters in the preceding 5-year period**

A major portion of Federal disaster assistance to State, Territory, Tribal, and local governments is devoted to the repair and restoration of damaged public infrastructure and facilities. Public infrastructure is a broad classification that encompasses the physical structures and systems supporting community health and social services, transportation, financial institutions, fire and police, power, communications, water and wastewater, and cultural and natural resources. FEMA distributes disaster recovery assistance for public infrastructure through its Public Assistance Program. Disaster events can cause damage to public structures;

when this happens, States and communities should take advantage of opportunities to restore them in a way that reduces the risk of repeated disaster losses in the future.

Section 406 Mitigation is the portion of Federal public assistance that allows damaged public infrastructure to be restored using loss-reduction measures that go beyond current applicable construction standards. The measures applied must be cost-effective in preventing repetitive future damages. By promoting measures that reduce future losses to life and property, Section 406 Mitigation funds help to build and maintain disaster-resilient communities.

Many communities take advantage of the availability of Section 406 Mitigation funds, while others lack a basic awareness of their availability and the resilience benefits they create. Communities can use Section 406 Mitigation funds in coordination with other Federal mitigation assistance. In some cases, communities can combine Section 406 Mitigation funds with other Federal mitigation assistance for the same projects and facilities to cover the total costs of necessary improvements. FEMA is working proactively to enhance the capacity to use Section 406 Mitigation funds by creating new procedures and pilot programs that help to target mitigation opportunities early in a disaster. Local community awareness in creating the demand for mitigation is essential.

Section 406 Mitigation funds provide some sense of the amount of post-disaster spending devoted to reducing future disaster losses. However, this measure is limited because not all public assistance funding that reduces the risk of damage in future disasters is Section 406 Mitigation funding. Communities may not use Public Assistance funds for hazard mitigation in cases such as the following:

- For improvements to facilities that were not damaged in the declared disaster. While communities can use other Federal mitigation assistance, such as the Hazard Mitigation Grant Program, to improve undamaged public structures, communities may only apply Section 406 Mitigation funds may to damaged structures.

- For improvements that are required by building codes. For example, when a local, State, tribal, territorial, or insular area government already requires the use of the most current disaster-resistant codes and standards, this is not considered Section 406 Mitigation because restoration to applicable building requirements is already funded.

While Section 406 Hazard Mitigation spending is compelling as a potential indicator of resilience, the interagency team did not include Section 406 data as a proposed measure in this appendix; however, it may be included in the future. Section 406 spending is a nationwide dataset capable of capturing broad trends in long-term risk reduction decision-making after a disaster. However, current Section 406 spending may be incomplete for some applications and areas of the U.S. Reporting system improvements are underway. Additionally, Section 406 spending provides only one stream of activity that indicates overall community-level mitigation spending.

Section 406 spending and other indicators of mitigation spending covered in this appendix, such as SBA Mitigation Loans, are worthy of consideration. Additionally, the FEMA HMA grant programs and the HUD Community Development Block Grant (CDBG) disaster grants provide national mitigation assistance to communities. The project team and others should consider the use of measures associated with the FEMA HMA grant programs and the HUD CDBG disaster grants program for Indicator 28: Mitigation Investment.

VOLUNTARY HAZARD MITIGATION LOANS

Proposed Measure

Proposed Measure: **Percentage of SBA home disaster loan funds spent on mitigation assistance**

In addition to grants for disaster assistance, businesses, private nonprofit organizations, homeowners, and renters may qualify for SBA home disaster loans to help them recover from disasters. While most SBA home loans are devoted to restoring buildings and facilities to existing codes and standards, qualifying property owners may also be eligible for additional funds to cover the cost of improvements that will protect the property against future damage. Property owners may use these mitigation loans to cover "above code" activities such as additional freeboard to elevate a qualifying home or business, or the addition of retaining walls. SBA provides mitigation loan money in addition to the amount of the approved overall disaster loan, up to an additional 20 percent over the total amount of disaster damage to real estate and/or leasehold improvements, to a maximum of $200,000 for home loans and total loan amount of $2 million for business loans.

SBA home disaster mitigation loans provide a measure of voluntary mitigation, meaning the improvements provided by the mitigation portion of the loan are not required, but the loan recipient has been educated about the value of hazard mitigation and has elected to request the additional amount to protect against future losses and damage. The SBA tracks the amount of voluntary mitigation and works in collaboration with other Federal agencies to promote voluntary mitigation.

SBA tracks home and business loan voluntary mitigation. As the SBA and other Federal agencies work to improve community-level understanding of the value of voluntary mitigation, more individuals may take advantage of the additional 20-percent allowance. However, these data may not necessarily result in an upward trend, because governments at all levels continue to work to improve and encourage local disaster resistance code requirements.

For Indicator 28: Mitigation Investment, the GIS web mapping application, available at http://arcg.is/1RPElqB, presents the percentage of SBA home disaster loan funds spent on mitigation assistance.

Baseline Analysis and Summary

Nationwide, in 2014, property owners spent an average of 0.5 percent of SBA home disaster loan funding on mitigation assistance in the 28 States that reported SBA home disaster loans.

Table B-16 lists the State-level percentages for those States that reported SBA home disaster loans. An increase in the percentage of SBA home disaster loan funds spent on mitigation assistance would indicate that communities and property owners are taking steps toward improving resilience.

Table B-16. Percentage of SBA Home Disaster Loan Funds Spent on Mitigation Assistance (2014)

State	Average Percent	State	Average Percent	State	Average Percent	State	Average Percent
AL	0.21	IN	0.00	NC	0.37	TX	0.35
AR	0.00	KS	0.00	NE	0.00	UT	0.00
AZ	0.28	MA	0.00	NY	0.13	WA	0.00
CA	0.00	MD	1.03	OH	1.32	WI	0.00
CT	0.00	MI	4.14	OK	0.00		
FL	0.59	MN	0.00	PA	0.00		
IA	1.52	MO	0.00	SD	0.19		
IL	0.00	MS	0.00	TN	0.11		

Note: Only States that reported SBA home disaster loans are included here.

This section provides a State-level aggregation of community- or county-level data. See the map viewer for detailed local datasets.

List of Citations

Articles and resources used in support of the report narrative are listed below.

Centers for Disease Control and Prevention, Diabetes Data, www.cdc.gov/diabetes/data/county.html

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NIST (National Institute of Standards and Technology). 2015. *Community Resilience Planning Guide for Buildings and Infrastructure Systems Volume I.* www.nist.gov/el/resilience/upload/NIST_Guide_Volume_1_042515_For-Web-2.pdf

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NTD (National Transit Database). 2015. "What is the National Transit Database?" http://www.ntdprogram.gov/ntdprogram/ntd.htm

NWS (National Weather Service). 2016. "National Weather Service: StormReady!" www.stormready.noaa.gov/

APPENDIX C.
SUMMARY OF INDICATORS AND SOURCES

The project team considered a number of Federal datasets and data sources during the assessment of community resilience indicators summarized in this Draft Concept Paper. Table C-1 summarizes the datasets and data sources that the team identified for use in this paper by core capability and resilience indicator.

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			Where to Get It	
Indicator	Dataset Name	Description of Dataset	Map Service	Authoritative Source
Table C-1. Summary of Datasets Identified for Evaluating Community Resilience Indicators				
Core Capability – Housing				
Indicator 1: Housing Conditions	Comprehensive Housing Affordability Strategy (CHAS) Housing Conditions Data	The CHAS data, provided by the U.S. Department of Housing and Urban Development (HUD), offers a wide range of information about housing conditions. The CHAS data used for this dataset is the percentage of households living with one of four severe housing problems (5-year average). The four housing problems are (1) incomplete kitchen facilities, (2) incomplete plumbing facilities, (3) more than 1 person per room, and (4) rental or mortgage costs that are greater than 50 percent of household income.	County-level percentage of households living with at least one of four severe housing problems	HUD CHAS Data Download Page
Indicator 2: Housing Affordability	Comprehensive Housing Affordability Strategy (CHAS)	The CHAS data, provided by HUD, offers a wide range of information about housing conditions. The CHAS data used for this dataset is the percent of households spending more than 30 percent of their income on housing costs including utilities.	County-level percentage of households that are cost burdened	HUD CHAS Data Download Page
Core Capability – Health and Social Services				
Indicator 3: Health Care Availability	Area Health Resources Files (AHRF)	The U.S. Department of Health and Human Services AHRF provides a comprehensive set of data offering a broad range of health resources and information, including the number of primary care physicians and local population.	County-level primary care physicians per 100,000 population	Area Health Resources Files (AHRF)

| | | | Where to Get It | |
| | | | Map Service | Authoritative Source |
Indicator	Dataset Name	Description of Dataset		
Table C-1, continued				
Indicator 4: Healthy Behaviors	Diabetes County Level Data	The Centers for Disease Control and Prevention (CDC) collects data on physical activity at the county and State level. As part of its data collection process, the CDC asks survey respondents, "During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?" Respondents who answer "no" indicate that they do not participate in any leisure time physical activity.	County-level percentage of adult population not participating in leisure time physical activities	CDC Diabetes County-Level Data
Core Capability – Economic Recovery				
Indicator 6: Employment Opportunity	Local Area Unemployment Statistics	The U.S. Bureau of Labor Statistics provides annual unemployment estimates for each county and State in the U.S. Because unemployment data may have wide year-to-year variability, this report provides 3-year unemployment rate averages.	County-level 3-year average unemployment rate	Local Area Unemployment Statistics
Indicator 7: Income	Local Area Personal Income	The U.S. Bureau of Economic Analysis provides per capita local area personal income, which is calculated as the total personal income of the residents of a given area divided by the resident population of the area. Personal income is measured before the deduction of personal income taxes and other personal taxes and is reported in current dollars.	County-level per capita income	Local Area Personal Income, 2014
Core Capability – Infrastructure Systems				
Indicator 9: Transportation Connectivity	Intermodal Passenger Connectivity Database (IPCD)	The IPCD, managed by the U.S. Bureau of Transportation Statistics, provides a national quantification of the degree of connectivity in the passenger transportation system.	State-level percentage of public transportation passenger terminals with intermodal connectivity	Intermodal Passenger Connectivity Database (IPCD)

| | | | Where to Get It | |
Indicator	Dataset Name	Description of Dataset	Map Service	Authoritative Source
Table C-1, continued				
Indicator 10: Transit Accessibility	National Transit Database (NTD): Transit Stations	The Federal Transit Administration (FTA) provides national transit system data through NTD. U.S. Congress established the NTD to be the primary national source for transit system information and statistics. By statute, recipients or beneficiaries of certain grants from the FTA must submit data to the NTD. As part of the data submission, local transit authorities report on the number of total transit stations, as well as the number of transit stations that are compliant with accessibility requirements of the Americans with Disabilities Act of 1990.	States with <100% percent of transit system stations in compliance with accessibility requirements of Americans with Disabilities Act of 1990	NTD 2013 Transit Stations
Indicator 11: Water Sector Emergency Support	Water/Wastewater Agency Response Networks (WARNs)	The U.S. Environmental Protection Agency encourages States to establish WARNs to provide methods whereby water/wastewater utilities provide and receive emergency aid and assistance necessary due to sustained or anticipated damages from natural or human-caused incidents.	States with Mutual Aid and Assistance Agreements in place through the Water/Wastewater Agency Response Network	Water/Wastewater Agency Response Network
Core Capability – Natural and Cultural Resources				
Indicator 14: Water Conservation	USGS National Water Use Report	The U.S. Geological Survey (USGS) tracks the estimated use of water in the U.S., including the public supply deliveries for domestic use. USGS collects the data from counties every 5 years for the national water use report.	State-level per capita water use for all domestic uses	Estimated Use of Water in the U.S. County-Level Data for 2010

			Where to Get It	
Indicator	**Dataset Name**	**Description of Dataset**	**Map Service**	**Authoritative Source**
Core Capability – Risk and Disaster Resilience Assessment				
Indicator 21: Community Preparedness	StormReady® and TsunamiReady	The National Weather Service provides data about StormReady® and TsunamiReady® sites ranging in geographic scale from States, to counties, to specific commercial and educational sites.	State-level number of StormReady® and/or TsunamiReady® designated sites	National Weather Service - StormReady® Communities
Core Capability – Planning				
Indicator 22: Mitigation Planning	National Mitigation Planning Program	The Federal Emergency Management Agency (FEMA) is responsible for approving local hazard mitigation plans. FEMA maintains a database of communities with "approved" and "approvable-pending-adoption" local hazard mitigation plans, along with their populations. FEMA updates the database at least quarterly.	State-level percentage of population residing in communities covered by a current local hazard mitigation plan	A map service accessible via Geographic Information System software
Core Capability – Community Resilience				
Indicator 25: Civic Capacity	Current Population Survey (CPS)	The CPS, conducted monthly by the U.S. Census Bureau, includes two supplements: the Volunteer Supplement and the Civic Supplement. The Corporation for National and Community Service compiles information from these two supplements and, as part of administering the Volunteering and Civic Life in America website, makes the data publicly available. Part of the data made available is the volunteer rates per State.	State-level percentage of individuals surveyed who performed volunteer activities for or through an organization during the preceding 12- month period	Volunteering and Civic Life in America

Table C-1, continued

APPENDIX C: SUMMARY OF INDICATORS AND SOURCES

			Where to Get It	
Indicator	**Dataset Name**	**Description of Dataset**	**Map Service**	**Authoritative Source**
Table C-1, continued				
Core Capability – Long-Term Vulnerability Reduction				
Indicator 26: Building Codes	Building Code Effectiveness Grading Schedule (BCEGS)	The Insurance Services Office (ISO) tracks building code effectiveness through the BCEGS. The dataset identifies the number of jurisdictions by State and the number of jurisdictions subject to one or more hazards (seismic, hurricane, or flood) that have adopted building codes with disaster-specific provisions	State-level percentage of reporting communities that are subject to one or more hazards (seismic, hurricane or floods) that have adopted building codes with disaster resistance provisions	ISO
Indicator 27: Higher Standards	Community Rating System (CRS) Communities and their Classes	FEMA tracks National Flood Insurance Program (NFIP) enrollment and CRS classification for all jurisdictions in the U.S. The data identifies the number of NFIP-participating jurisdictions by State, the number of CRS jurisdictions by State, and the CRS class rating for each CRS participant.	State-level percentage of insured flood risk communities enrolled in the Community Rating System (CRS) with a significant number of CRS activities	CRS Communities and their Classes; NFIP Community Status Book
Indicator 28: Mitigation Investment	Public Infrastructure Disaster Relief Funds	FEMA tracks Public Infrastructure recovery funding spent on hazard mitigation for each State.	County level percentage of total Public Infrastructure disaster relief funds spent on 406 Mitigation for disasters in the preceding 5-year period	FEMA
Indicator 28: Mitigation Investment	Voluntary Hazard Mitigation Loans (SBA)	The Small Business Administration (SBA) has disaster loans available to businesses, private nonprofit organizations, homeowners, and renters.	Percentage of SBA home disaster loan funds spent on mitigation assistance	SBA

APPENDIX D.
LIST OF ACRONYMS AND ABBREVIATIONS

Acronyms and abbreviations that appear in this Draft Concept Paper are:

3DEP   Three-Dimension Elevation Program

ADA   Americans with Disabilities Act of 1990

AHRF   Area Health Resources Files

AWWA   American Water Works Association

BCEGS   Building Code Effectiveness Grading Schedule

BEA   U.S. Bureau of Economic Analysis

BLS   U.S. Bureau of Labor Statistics

BTS   U.S. Bureau of Transportation Statistics

C-CAP   Coastal Change Analysis Program

CDBG   Community Development Block Grant (Program)

CDC   Centers for Disease Control and Prevention

CHAS   Comprehensive Housing Affordability Strategy

CHCI   Cumulative Habitat Condition Index

CNCS   Corporation for National and Community Service

CPS   Current Population Survey

CRS   Community Rating System

CZMA   Coastal Zone Management Act

DHS   U.S. Department of Homeland Security

DOC   U.S. Department of Commerce

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DOI	U.S. Department of the Interior
EAP	Emergency Action Plan
EDA	U.S. Economic Development Administration
EDW	Enterprise Data Warehouse
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIA	Forest Inventory and Analysis (Program
FTA	Federal Transit Administration
GIS	Geographic Information System
HHS	U.S. Department of Health and Human Services
HMA	Hazard Mitigation Assistance Program
HUC	Hydrologic Unit Classification
HUD	U.S. Department of Housing and Urban Development
ifsar	Interferometric Synthetic Aperture Radar
IPCD	Intermodal Passenger Connectivity Database
ISO	Insurance Services Office
lidar	Light Detection and Ranging
MitFLG	Mitigation Framework Leadership Group
NATA	National Air Toxics Assessment
NBM	National Broadband Map
NFHP	National Fish Habitat Partnership
NFIP	National Flood Insurance Program
NID	National Inventory of Dams
NIST	National Institute of Standards and Technology
NLCD	National Land Cover Dataset
NLD	National Levee Database
NOAA	National Oceanic and Atmospheric Administration
NPG	National Performance Goal
NRCS	Natural Resources Conservation Service

NTD	National Transit Database
NTIA	National Telecommunications and Information Administration
NWS	National Weather Service
OCM	Office for Coastal Management
pdf	Portable Document Format
PPD	Presidential Policy Directive
REST	Representational State Transfer
Risk MAP	Risk Mapping, Assessment, and Planning (program)
RRAP	Regional Resiliency Assessment Program
SBA	Small Business Administration
THIRA	Threat and Hazard Identification and Risk Assessment
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WARN	Water/Wastewater Agency Response Network
WMS	Web Map Service

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