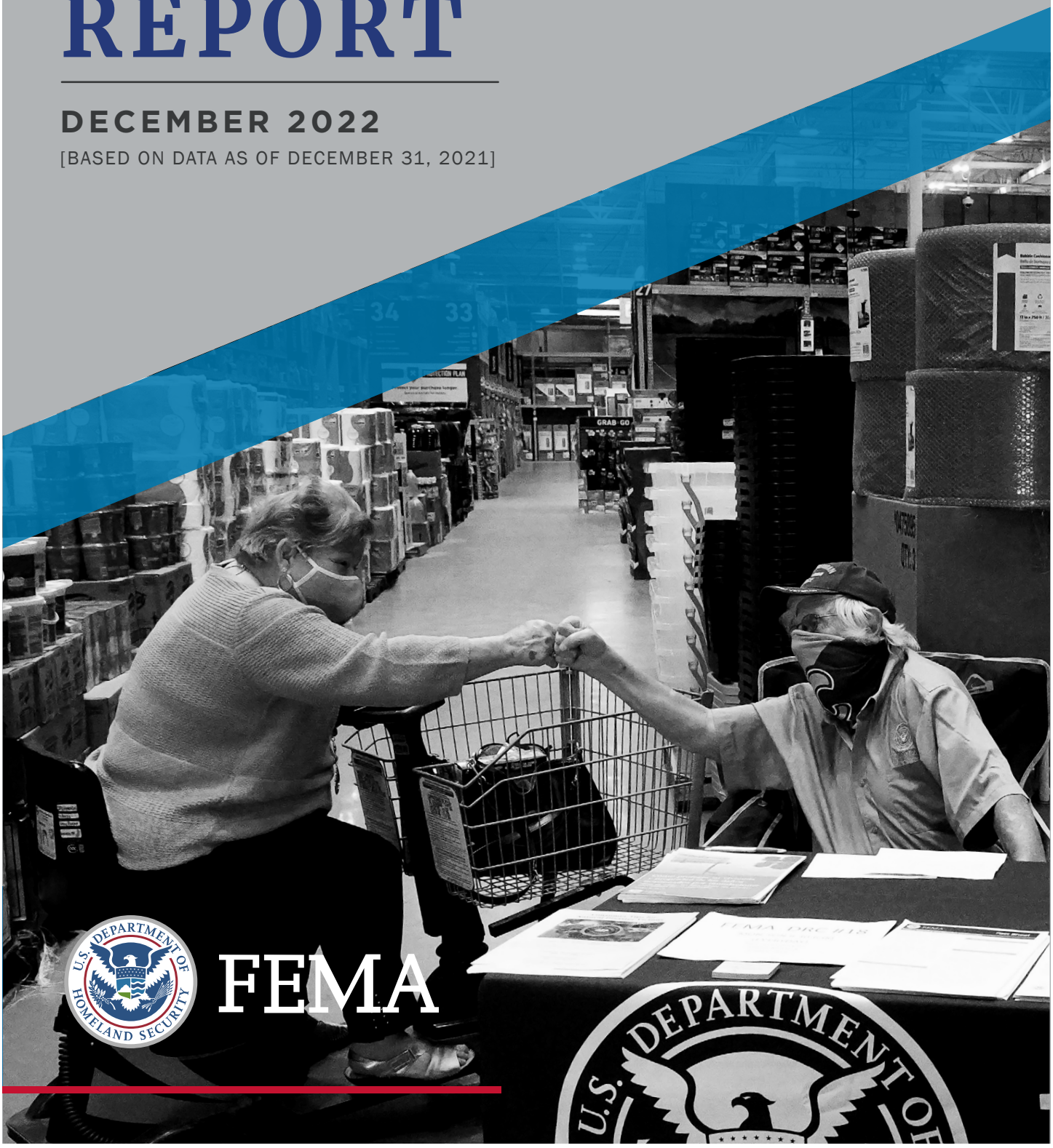
NATIONAL PREPAREDNESS REPORT

DECEMBER 2022

[BASED ON DATA AS OF DECEMBER 31, 2021]



FEMA

FOREWORD

I am pleased to announce the release of the 2022 National Preparedness Report (NPR). This report was developed during a pivotal time in emergency management. The range and complexity of the disasters our nation faces continue to rapidly evolve, and with this comes changing expectations of the emergency management community. The NPR remains a critical marker of national preparedness, by highlighting our areas of strength and those areas in which we can improve as a whole community in becoming a more resilient nation.

Emergency management cannot be reactionary in today's environment. Climate change directly impacts the frequency and intensity of natural disasters and our ability to ensure the safety of our communities. Building community-wide resilience to climate change through targeted mitigation investments and leveraging future risk data needs to be a primary focus for all levels of government and partners. Though this entails higher costs for everyone, the consequences of inaction are far more severe. States, local governments, tribes, and territories can leverage federal funding—including $1.2 trillion through the Infrastructure Investment and Jobs Act and $1.16 billion through FEMA's Building Resilient Infrastructure and Communities, and Flood Mitigation Assistance programs—to build climate change resilience at the local level.

While government can help fund and guide mitigation efforts, the private sector owns much of the nation's critical infrastructure and provides essential services for the public sector, individuals and families, and whole communities. Private-public partnerships and increased information-sharing between these sectors remains pivotal to reducing risk to aging infrastructure systems and building resilience to all hazards, including cyberattacks.

Resilience cannot be achieved without equitable consideration for, and participation of, all community members. Ensuring equitable disaster risk reduction for all socially vulnerable populations remains a high priority for emergency managers nationwide. This report presents data on the factors that expose socially vulnerable populations to higher risk. My hope is that emergency managers across the whole community will leverage this information to best ensure everyone receives the help they need before, during, and after disasters.

As we look forward, FEMA will continue to evaluate disaster preparedness in future NPRs through a data-centric and academically rigorous research approach to identify opportunities for growth, remove barriers, and increase our national resilience.

Deanne Criswell
FEMA Administrator

EXECUTIVE SUMMARY

The 2022 National Preparedness Report (NPR) summarizes the progress made towards building and sustaining the capabilities needed to prevent, protect against, mitigate, respond to, and recover from the threats and hazards that pose the greatest risk to the nation and describes the major gaps in emergency management preparedness. This annual report offers practical insights into preparedness to support decisions about program priorities, resource allocations, and actions for increasing whole community resilience. The NPR pulls from open-source data, community[i] Threat and Hazard Identification and Risk Assessment (THIRA) and Stakeholder Preparedness Review (SPR) data, and a federal interagency data call with submissions from 53 agencies, divisions, and sub-components throughout the federal government.

The 2022 NPR covers calendar year 2021 and builds on content from previous NPRs. The report contains the following key sections.

An **Introduction** that summarizes some of the major disasters that occurred in 2021 and outlines the contents of the report including: risk areas, capability areas, management opportunities, and the research approach for the report.

A **Risks** section that examines prevalent national risks, including those which present as sudden onset incidents, like cyberattacks, and more chronic stressors including climate change. The section also includes an overview of the growing threat of inequity and vulnerability as determinant factors of incident severity.

A **Capabilities** section that includes a review of capability trends across THIRA and SPR reporting communities and an overview of the inaugural National Stakeholder Preparedness Review methodology.

A **Management Opportunities** section that includes resources whole community partners can utilize in developing strategies to bolster their emergency management capabilities and disaster resilience to reduce risk. The report details three management opportunities for consideration: 1) Building Community-Wide Resilience to Climate Change Impacts, 2) Reducing Physical and Technological Risks to Critical Infrastructure, and 3) Increasing Equity in Individual and Community Preparedness. These management opportunities detail best practices and solutions for addressing risks and capability gaps identified in earlier sections of the report.

A **Conclusion** that summarizes the content of the report's analysis.

i For this document, the term "community" generally refers to the states, urban areas, tribes, and territories that complete THIRA and SPRs.

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INTRODUCTION

Calendar year 2021 highlighted the role emergency management plays across the whole community and all mission areas. The ongoing coronavirus disease 2019 (COVID-19) pandemic has highlighted and underscored the importance of emergency management and emergency managers across the country. Individuals and communities, the private and nonprofit sectors, faith-based organizations, tribes, and all levels of government must continue to work together to achieve the National Preparedness Goal of: **"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."**[1,2] Although the COVID-19 pandemic remained a central hazard in 2021, the nation also experienced numerous other incidents including but not limited to floods, droughts, hurricanes, blizzards, tornadoes, wildfires, and cyberattacks. **In 2021 there were 20 weather-related disasters with losses exceeding $1 billion each.**[3,4] As a comparison, from 1980–2021 the average number of billion-dollar disasters was 7.4 incidents per year.[4]

Through the National Preparedness Report (NPR), the Federal Emergency Management Agency (FEMA) assesses the nation's emergency management posture and identifies remaining challenges and opportunities for improvement. FEMA has developed the NPR for the past ten years as an annual requirement of Presidential Policy Directive 8, and in alignment with Title VI of the Post-Katrina Emergency Management Reform Act (PKEMRA).[5,6,7] This report provides partners across the nation with insights into risks and associated capabilities to anticipate and support the development of risk management decisions regarding program priorities, resource allocations, and community actions.

The 2022 NPR is the culmination of 15 months of rigorous open-source research, analysis, and input from partners at the federal, state, local, tribal, and territorial (FSLTT) levels. FEMA conducted open-source research utilizing academic, public sector, private sector, and media sources to identify existing and emerging risks, national preparedness policy developments, and innovative programs implemented at all levels of government. FEMA also engaged with 53 offices within federal departments and agencies to better understand both the threats and hazards that challenge the nation and actions taken to strengthen national preparedness. Finally, FEMA conducted a quantitative and qualitative analysis of preparedness assessment data to better understand capability strengths and gaps nationwide (**Figure 1**). While the scope of this report is domestic, FEMA recognizes the importance of engaging with international partners and organizations to share expertise, experiences, and best practices. Such engagement ensures preparedness of our nation and allies, and resilience of the globally interconnected systems relied upon to maintain steady-state operations.

Through the 2022 NPR, FEMA examines preparedness across all five mission areas and the whole community. This year's report follows the risk and capabilities approach FEMA first introduced in 2020 to assess the incidents of 2021 and draws high-level conclusions about national risk and capabilities. Last year's report introduced Management Opportunities—potential paths forward for closing gaps. The 2022 report continues this discussion with a deeper focus on climate change, physical and technological risks, and equity. Places where these themes are present in the report are marked with an associated icon (**Figure 2**).

The report includes an **Introduction**, and then a discussion of the three main elements of **Risk**—threat or hazard likelihood, vulnerability, and consequence(s)—and how particular risks will challenge the nation's capabilities. The **Capabilities** section provides a high-level overview of the nation's current emergency management posture and discusses how capabilities are used. The **Management Opportunities** section offers suggestions for building capabilities to address risk trends. The **Conclusion** summarizes the contents of the report.

Next year, the 2023 NPR will include additional trend analyses of risks across communities, leveraging Threat and Hazard Identification and Risk Assessment (THIRA) data to better understand communities' most challenging threats and hazards over time, and FEMA's National Risk Index (NRI) data to examine anticipated disaster-related annual losses. The 2023 report will also leverage data from the National Household Survey (NHS) to show trends in individual and community preparedness and resilience efforts.

Figure 1: 2022 NPR data sources.

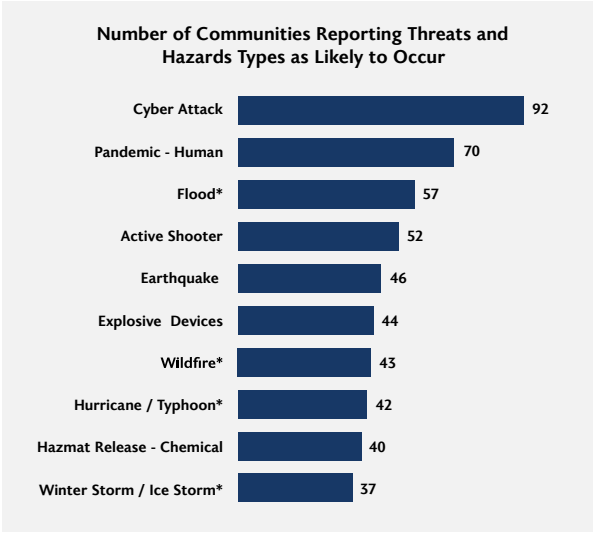
Figure 2: Symbols used throughout the 2022 NPR to denote sections associated with the report's three main topic focus areas.

RISKS

CURRENT RISK LANDSCAPE

Every three years, communities use the THIRA to identify the threat and hazard types that are most likely to occur and that are most likely to stress their capabilities. These communities then evaluate how close they are to reaching their goals through their annual Stakeholder Preparedness Reviews (SPR). **In 2021, most communities identified cyberattacks, pandemics, and flooding as the threat and hazard types of most concern (Figure 3).** For more information on risk constructs, refer to Appendix D: Risk and Emergency Management.

In their 2021 THIRA/SPR submissions, **95% of communities reported natural hazards[ii] as likely to occur and 92% of communities reported hazards which can be exacerbated by climate change as most stressful to their emergency management capabilities**. Climate change significantly shifts risk



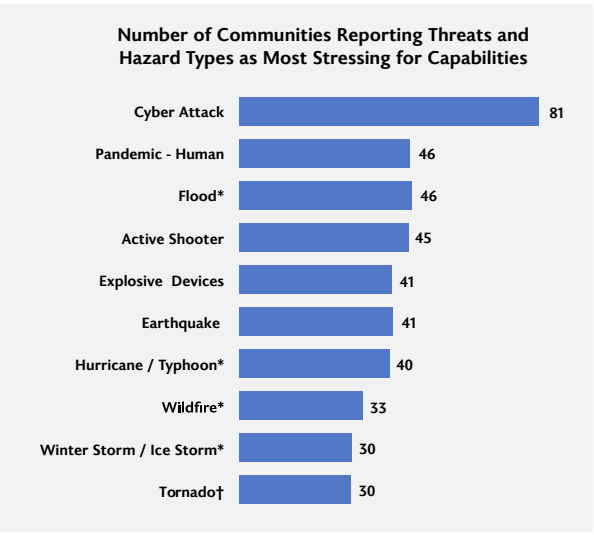


Figure 3: Number of communities identifying specific threats and hazards as likely to occur (left) and number of communities identifying their most stressful threats and hazards (right) through the THIRA/SPR process; communities can select more than one threat or hazard. To select "most stressful" threats or hazards, communities determine which of their identified threat/hazards would most challenge their ability to achieve the capability target that they set for each of the targets. Threats with asterisks (*) are likely to be exacerbated by climate change. Threats with a cross (†) cannot be directly attributed to climate change as existing research has yet to conclusively identify this correlation. A total of 131 communities reported this data through THIRA/SPR in 2021.[iii]

ii For this statistic, "natural hazards" refers to those in the THIRA/SPR including floods, hurricanes/typhoons, wildfires, winter/ice storms, severe storms/high winds, earthquakes, droughts, tsunamis, sinkholes/landslides/expansive soil, and extreme temperatures.

iii Refer to Appendix C: National Risk and Capability Assessment and Methodology for a full list of threat/hazard types users can select within the THIRA/SPR Unified Reporting Tool.

likelihood and hazard impacts. It will dramatically change communities' risk outlooks in the coming decades.[9] For example, extreme heat is now one of the deadliest types of weather incidents in the United States (U.S.), causing more fatalities than hurricanes, tornadoes, or flooding, individually.[10,11,12] Heat fatalities have outpaced hurricane fatalities by a significant margin in recent decades. The 30-year average indicates heat was responsible for just over three times the number of fatalities caused by hurricanes.[13] **The 10-year and 2021 averages for heat-related fatalities are eight times more than hurricanes.**[13] Socially vulnerable populations are disproportionately affected by extreme heat, particularly those who live with disabilities, communities of color, low-income individuals, individuals lacking a high school diploma, and populations 65 or older.[14] These groups often live in areas with increasing childhood asthma diagnoses from climate-driven changes, higher labor hour losses from extreme heat exposure, and growing climate-driven mortality rates.[14] According to the National Oceanic and Atmospheric Administration (NOAA), much of the U.S. will see a six-to-eight-degree Fahrenheit increase in maximum temperatures in the next 15–45 years.[15]

The U.S. could also experience a rise in sea levels of up to seven feet by the year 2100 as a result of climate change.[16] Sea level along the U.S. coastline is projected to rise, on average, 10-12 inches between 2020 and 2050.[16] By 2050, major flooding disasters are expected to occur five times more frequently than in 2021.[16] Many conventional natural hazards, such as flooding, can become catastrophic as community vulnerabilities and frequencies of incident occurrence change due to climate change. Flooding is the most common natural hazard to affect communities. Since 1996, 99% of all counties in the U.S. have experienced a flood incident.[17,18,1] Flooding caused over $155 billion in property damage over the last decade.[19]

Governments, companies, and individuals increasingly turn to the digital sphere for work, play, and connection. **70% of communities identified that a cyberattack would challenge their capabilities, and 62% identified a cyberattack as their most stressing threat or hazard type, making this single threat the most frequently identified and most stressing of 2021.**[iv] In 2021, the Federal Bureau of Investigation (FBI) reported the total financial losses from personal and corporate data breaches were over $600 million.[20] Additionally, 35% of communities cited that a pandemic would

DEFINITIONS RELATING TO RISK[8]

Risk: Potential for an unwanted outcome as determined by its likelihood and the consequences.

Threat: Indication of potential harm to life, information, operations, the environment, and/or property.

Hazard: A source or cause of harm or difficulty. A hazard also differs from a threat in that a threat is directed at an entity, asset, system, network, or geographic area. A hazard is not directed.

Likelihood: The chance of something happening, whether defined, measured, or estimated objectively or subjectively, or in terms of general descriptors (e.g., rare, unlikely, likely, almost certain), frequencies, or probabilities.

Vulnerability: Physical feature or operational attribute that renders an entity open to exploitation or susceptible to a given hazard or threat.

Consequence: Effect of an event, incident, or occurrence.

iv The high number of responses associated with the cyber-attack statistic may in part, result from the cybersecurity target being required for communities completing the THIRA/SPR in 2021. Figure 7 shows a list of all 2021 required targets.

challenge their capabilities. Throughout 2021, the COVID-19 pandemic continued to evolve as new variants emerged and strained healthcare, social, and economic systems.[1]

CLIMATE CHANGE AND WEATHER-RELATED HAZARDS

Climate change may be the most significant contributor to change in risk for weather-related natural hazards, including floods, drought, and wildfires. The number of costly flooding incidents has increased over time; this trend is likely to continue.[21] Flooding risk to infrastructure will increase significantly between 2021 and 2051, with 10% more residential properties and 6% more critical infrastructure facilities at risk of increased exposure to more severe flooding.[22] This increase stems from changing environmental conditions resulting from climate change, erosion, and land subsidence.[1] Rising sea levels will also expand communities' risk exposure. From 1970 to 2010, the population in high-density coastal areas increased by 34.8 million, a 39% increase.[23] As of 2014, almost 40% of the U.S. population lived in coastal communities; these communities are at greater risk of experiencing flooding, erosion, and the effects of rising sea levels.[24]

Climate change also increases the frequency and severity of windstorms, including hurricanes and winter storms. In early 2021, intense winter storms left most built infrastructure intact. Still, they caused significant damage to electrical grids and water distribution in the Southern U.S.[25] In addition, of the 21 named tropical storms in 2021—the third-highest number on record after 2020 and 2005—seven reached hurricane strength, and four of these became major hurricanes.[26,27,1] **Over the last 40 years, windstorms caused over $1 trillion in economic damages, making them the most costliest loss-producing natural hazard the U.S. has faced**.[28,4] As they become more severe, the costs of windstorms and associated flooding will also likely expand. Already, insured hurricane losses are 11% higher than they would be in a world without climate change, and they are likely to increase further—by as much as 19% by 2050.[27]

Climate-driven drought and higher temperatures have intensified wildfires across the Western U.S.[32,1,33] Between 1979 and 2020, **human-driven climate change was the main driver of fire weather in this region, causing twice as many fires beyond regularly observed variability**.[34,1] In California, ten of the costliest wildfires in loss of life and property occurred after 2015, mirroring the rise in global temperatures and severe droughts.[35,1] Similarly, the Marshall Fire, which burned nearly 1,600 acres of Colorado in December 2021 and prompted over 30,000 people to evacuate, was among the most destructive in the state's history, destroying more than 1,000 homes and 30 commercial structures.[36,37] Severe wildfires damaged several California reservoirs and municipal

COMMUNICATING HAZARD LIKELIHOOD

Hazard likelihood conveys recurrence intervals (i.e., a storm with a 1% chance of occurring in any year can describe a 100-year storm). Over the last 50–70 years, however, low-likelihood incidents have become more common in much of the U.S. For example, **floods that had a 5% and 2% chance of occurring in the 1970s now have a 12.5% and a 4.8% chance of occurring annually, respectively.**[29] Evidence also suggests that the storms with a 1% chance of occurrence in the 1950s are more common due to climate change.[30,1] These likelihoods do not mean that if an incident happens, a similar impact will not happen again during the same interval. If a 1% chance incident occurs this year, multiple incidents of comparable magnitude could occur again within the 100-year interval, potentially even within the same year and in the same area.[31]

water infrastructure in recent years, including water meters and plastic pipes. Such damage can impact water safety or suspend service for long periods.[35] Although the economic effects of wildfires are not fully quantifiable, academic reports suggest California's 2018 wildfire season caused $148.5 billion in damages, roughly 1.5% of the state's annual GDP.[38] Challenges to human health, economies, and utility preparedness will deepen as climate change continues to drive more prolonged and more severe wildfire seasons. **The increased severity, duration, and occurrence rate of climate-related disasters puts immense strain on emergency responders. It continues to cause delays in recovery efforts, which can take weeks, months, or even decades.**[39]

Climate Change-Related Risks to Critical Infrastructure

Climate change continues to drive systemic risk. Systemic risks propagate across boundaries of situational awareness or operational control, potentially amplifying damage across systems.[55] Climate change can undermine emergency management efforts, destabilize financial institutions, and exacerbate vulnerabilities.[56,57] In 2021, the U.S. experienced 20 billion-dollar climate and weather disasters (**Figure 4**), resulting in 688 fatalities and costing $145 billion.[4,1,58] After 2005 and 2017, 2021 was the third costliest year for extreme weather.[4] **Over the last five years, extreme weather—often fueled by climate change—has cost the nation $600 billion in economic and physical damages.**[57,1]

The severe winter storm that affected Texas in February 2021 exemplified the systemic risks of climate change. Unusually cold weather and snow froze elements of gas and oil power plants, causing power plants to stop producing energy. At the same time, demand for energy increased as people tried to heat their homes to keep warm, leading to large-scale power outages.[1,4,59] Between February 8th and 20th, 1,045 individual generators experienced 4,124 outages, 75% of which were caused by inoperability from freezing temperatures or fuel issues.[59] The cold weather and power loss also interrupted the state's water supply. The storm resulted in 49% of Texans losing running water, with disruption times averaging 52 hours.[60] Over 200 people died because of this disaster and its cascading impacts.[60] The winter storm caused an estimated $80–$130 billion dollars in damages across Texas.[61] Such incidents may become increasingly prevalent as climate change drives extreme weather.

Extreme weather often causes utility interruptions.[62] **Between the 2000s and the 2010s, the U.S. saw a 67% increase in significant power outages due to weather-related incidents.**[63,64] In 2020, U.S. electricity consumers experienced over eight

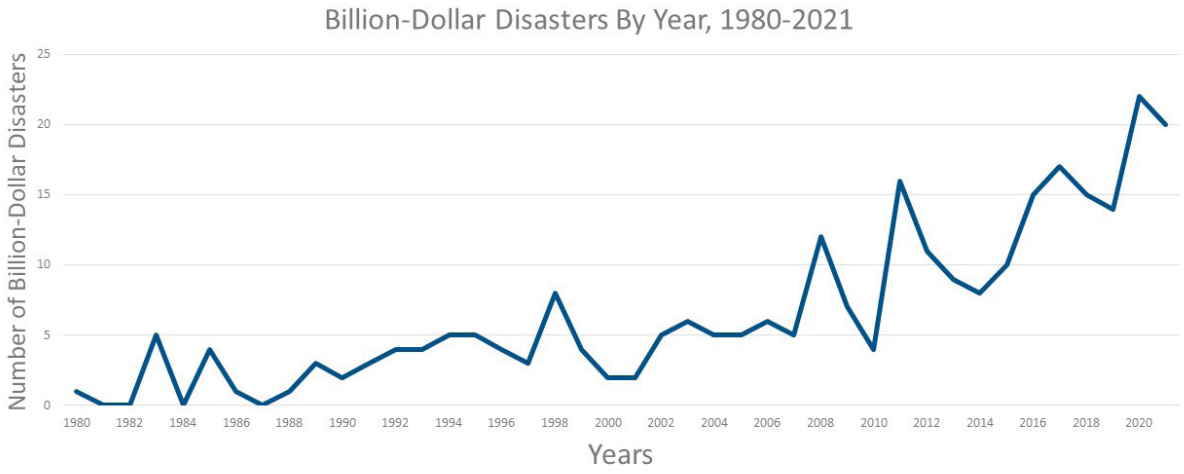


Figure 4: This graph illustrates the number of billion-dollar weather-related disasters (adjusted by the consumer price index) in the U.S. from 1980–2021. 20 billion-dollar disasters occurred in 2021, the second-highest number on record.[4]

hours of power interruptions on average, the longest interruption time since the U.S. Energy Information Administration began collecting data in 2013.[65] Most of this outage time was due to the impacts of major storms and hurricanes; outside of these extreme incidents and their increasingly severe consequences on electric grids, outage time was similar to previous years. The National Interagency Fire Center has documented an average of 70,000 wildfires per year since 1983.[32] The number of acres burned per year, however, has grown over the same period.[32] **Figure 5** depicts each state's annual burned acreage alteration from 1984–2001 to 2002–2018.[32,40] Over that time, Western states saw

AVERAGE CHANGE IN BURNED ACREAGE COMPARING THE PERIODS OF 1984-2001 AND 2002-2018

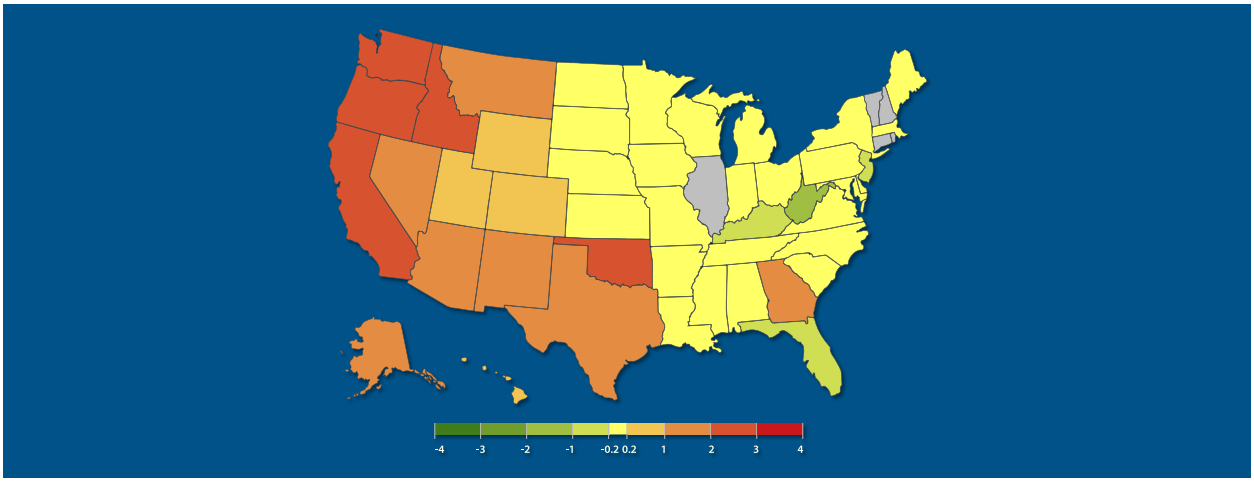


Figure 5: Percentage change in annual burned acreage of state's total land area from 1984–2001 to 2002–2018.

TORNADOES: SHIFTING VULNERABILITY

Changes to the three main elements of risk—hazard likelihood, vulnerability, and consequence—challenge the nation and alter local risk profiles. Rising global temperatures have created more favorable conditions for tornado formation in the Southeast.[41] From December 10–11, 2021, dozens of devastating tornadoes swept six states. One of these tornadoes touched down and remained on the ground for more than 165 miles through Northwestern Tennessee and Western Kentucky—significantly above the average tornado path length of fewer than four miles.[42,17] In all, 88 people were killed, including 77 in Kentucky.[43] This storm is part of a trend in which tornadic activity has decreased in Tornado Alley (i.e., regions in Texas, Oklahoma, and Kansas that historically experience heightened tornado activity) and increased in Southeastern states like Kentucky, Tennessee, Alabama, Mississippi, and Missouri, which have historically seen fewer tornadoes.[44]

Today, Tornado Alley communities face lower tornado risk than communities in the Southeast.[45]

Physical and socio-economic conditions in the Southeast can make communities vulnerable to tornadoes. More people and infrastructure are at risk in the Southeast due to higher population density than in Tornado Alley.[46] Based on the Bureau of Economic Analysis population assessments, over 85 million individuals live in the Southeast, nearly 26% of the U.S. population.[47] The Southeast also has high concentrations of mobile homes and homes without basements, increasing tornado fatality rates.[45,48,49] 10.8 percent of the populations across Southeastern states (Mississippi, Tennessee, Kentucky, and Alabama) live in mobile homes, according to 2021 American Community Survey Census data.[50] This region experiences a high percentage of nighttime and long-track tornados (tornadoes with paths longer than 100 miles), with visibility of these weather hazards often being low because of a large portion (13.5 million acres) of forested land across 13 Southeastern states.[51,52,53] Consequently, tornado-related fatalities rose by 83% in the Southeast in 2020.[54] As communities' risk profiles shift, emergency managers, residents, and whole community partners across the Southeast and broader nation will need to continually examine their preparedness posture against such hazards.

the most significant percentage increase in areas burned.[32,1] Additionally, the peak of wildfire season occurs earlier in the year.[32] From 1984 to 2000, burned areas peaked in August. In recent years, the peak of burned areas has occurred in July.[32,65]

RISKS TO CRITICAL INFRASTRUCTURE AND CYBERSECURITY

In the 2021 Report Card for America's Infrastructure, the American Society for Civil Engineers recommends the United States "increase long-term, consistent investment" to achieve an infrastructure system "fit for the future."[66,1] Several previous NPRs have described the health, safety, and commercial risks associated with aging, vulnerable infrastructure. Underinvestment in the security of digital networks that enable flexible, modern utilities is another known risk for aging, vulnerable infrastructure. FSLTT governments, and the private sector, will experience an array of cyber-enabled threats designed to access sensitive information, steal money, and force ransom payments.[67,1] Exploitation of cyber vulnerabilities for deliberate, physical sabotage continues to present an emerging threat to communities.[68,69,1]

Cybersecurity Risks

In early 2021, an unknown malicious actor attempted to poison the water supply in the city of Oldsmar, Florida, by increasing the levels of sodium hydroxide (lye).[70] Fortunately, an employee quickly detected the intrusion, reversed the changes, and reported the incident to law enforcement.[70] The plant also had backup alarms that would have triggered if the lye level rose. Other small or decentralized water treatment facilities can be vulnerable, with the utility sector's nationwide patchwork of thousands of small services often lacking the resources to implement robust cybersecurity protections.[71,1] In May 2021, a ransomware attack on the Colonial Pipeline led the Colonial Pipeline Company to shut down its operations out of precaution, which disrupted fuel supplies across the East coast.[72,1] The Colonial Pipeline Company paid a ransom of over $4 million in Bitcoin to restore its

RISKS OF RANSOMWARE

Ransomware poses an ongoing threat to all levels of the government and private sector.[74,1] In a ransomware attack, malicious actors use software to encrypt files and render systems unusable, then demand a ransom payment in exchange for restoring access.[1] Ransomware evolves and becomes more sophisticated over time, requiring organizations to constantly maintain and update their cybersecurity posture and partner with law enforcement to hold malicious actors accountable.[74,1] The cost of ransomware attacks also continues to increase, with organizations experiencing revenue losses and ransoms for restoring systems and data. **Paying a ransom to recover information does not guarantee success for companies; only 8% of respondents to a 2021 survey recovered all their data after paying a ransom.**[75] In 2021, the Cybersecurity and Infrastructure Security Agency (CISA) reported an increase in sophisticated, high-impact ransomware impacts on critical infrastructure organizations, affecting 14 of the 16 U.S. critical infrastructure sectors.[76] The National Cyber Investigative Joint Task Force urges companies to report ransomware incidents to appropriate law enforcement entities. Additionally, CISA, the National Security Agency, and the FBI strongly discourage victims of ransomware attacks pay a ransom, as this does not guarantee data restoration.[1,77]

networks.[73] The company also reported the incident to law enforcement, which ultimately recovered most of the ransom payment.[73] These examples illustrate why mitigation of cybersecurity threats against critical infrastructure system operations continues to be a top priority in the U.S. and abroad.

As climate change causes natural disasters to increase in frequency, the likelihood that a cyberattack will coincide with another disaster grows, becoming a major area of concern for communities across the nation.[78] Such a cyberattack during or immediately after a natural disaster or terrorism-related incident could create a "domino effect," leading to losses of electrical power, water, telecommunications, and other infrastructure that could hamper response efforts and imperil survivors depending on the nature of the disaster.

EQUITY, SOCIAL VULNERABILITY, AND RISK EXPOSURE

Communities and individuals are impacted differently by disasters, which often magnify existing social and economic trends that drive inequities in recovery. As the frequency of natural disasters continues to increase, so does the disproportionate risk exposure to, and consequences for, individuals and communities who are likely to be rendered most vulnerable. Several factors, including poverty, lack of access to transportation, and crowded housing may weaken an individual's and community's ability to prevent financial loss, injury, and fatalities in a disaster.

For example, social vulnerability can impact the ability of individuals, households, and communities to access aid after an incident.[81] Language barriers, limited technological access, and requirements for documentation can prevent people from accessing federal aid.[81,1] Well-resourced communities can more readily generate the necessary funding for disaster response and recovery than small or rural communities.[81] Additionally, federal grants and loans can have differing requirements for eligibility.[81,1] For instance, eligibility for the Disaster Supplemental Nutrition Assistance Program (D-SNAP) is contingent upon a state receiving an Individual Assistance Declaration from the President.[116] D-SNAP provides temporary food assistance for households affected by a natural disaster. The program provides one month of benefits to eligible disaster survivors and can facilitate the issuance of additional Supplemental Nutrition Assistance Program benefits for eligible households.[116] D-SNAP begins after the restoration of commercial food distribution channels, and families can purchase and prepare food at home.[116] States must request and receive approval from United States Department of Agriculture's (USDA)s Food and Nutrition Service to operate a D-SNAP. These issues demonstrate the continued importance of equity across federal programs and disaster aid.

FEMA and the federal disaster management community are working to address social vulnerability and to advance government resource

EQUITY AND SOCIAL VULNERABILITY

Equity: The consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment, such as Black, Latino, and Indigenous and Native American persons, Asian Americans and Pacific Islanders and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality.[117]

Social vulnerability: Refers to the resilience of communities (i.e., the ability to survive and thrive) when confronted with external stressors to human health, stressors such as natural or human-caused disasters, or disease outbreaks. Reducing social vulnerability can decrease both human suffering and economic loss.[84,85,120]

utilization by underserved individuals and communities.[1] "Underserved communities" refers to "populations sharing a particular characteristic, as well as geographic communities, that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life."[117,1] This includes individuals listed in the definition of 'equity' from Executive Order 13985. FSLTT governments provide resources such as housing and other aid assistance that are intended for all disaster survivors, but these resources are not always made readily accessible to individuals who belong to underserved communities.[1]

Figure 6 displays the variation in social vulnerability factors across counties through a tool developed by the Centers for Disease Control and Prevention (CDC)/Agency for Toxic Substances and Disease Registry (ATSDR) Social Vulnerability Index (SVI).[87] Although such indices are essential and useful for their concise reporting of multiple metrics as a single vulnerability score, they risk making individual variables easier to overlook and mask relationships between variables.[88] For instance, income may be considered at the county level, but each household may have varying levels of income security.[88] A single-parent household, for example, could be more economically vulnerable than a two-parent household, even at the same income level.[88] Awareness of these possibilities will help decision-makers to interpret information about social vulnerability in their region more appropriately.

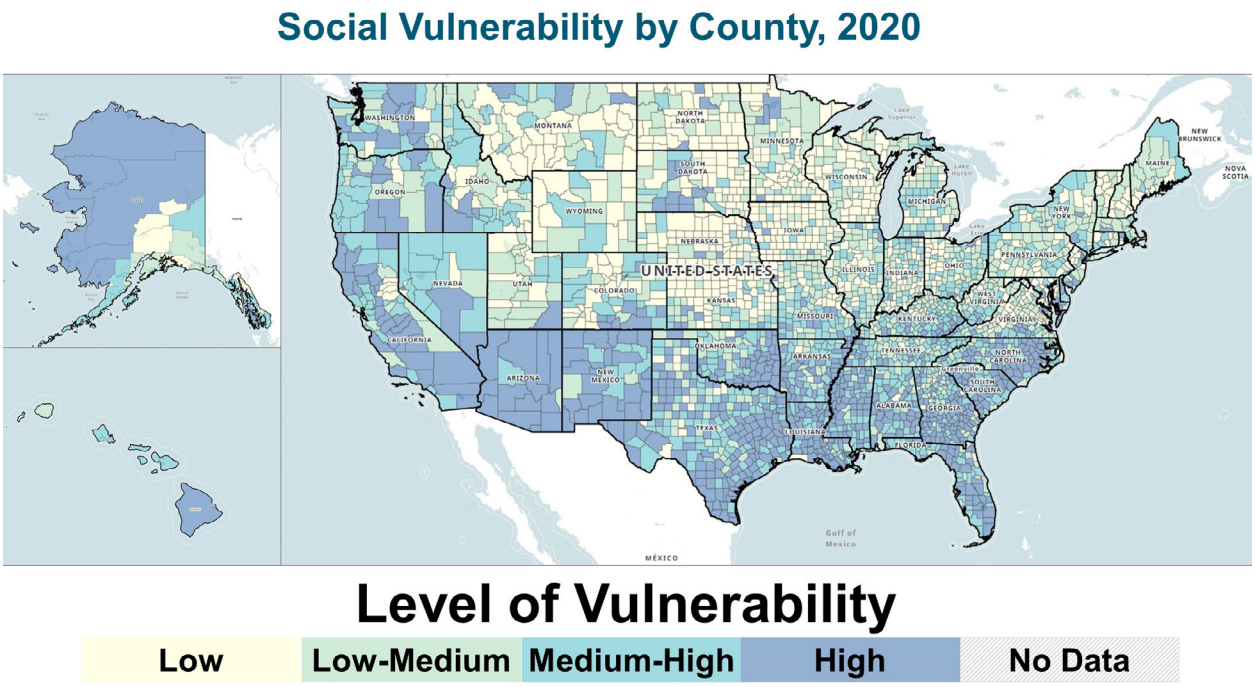
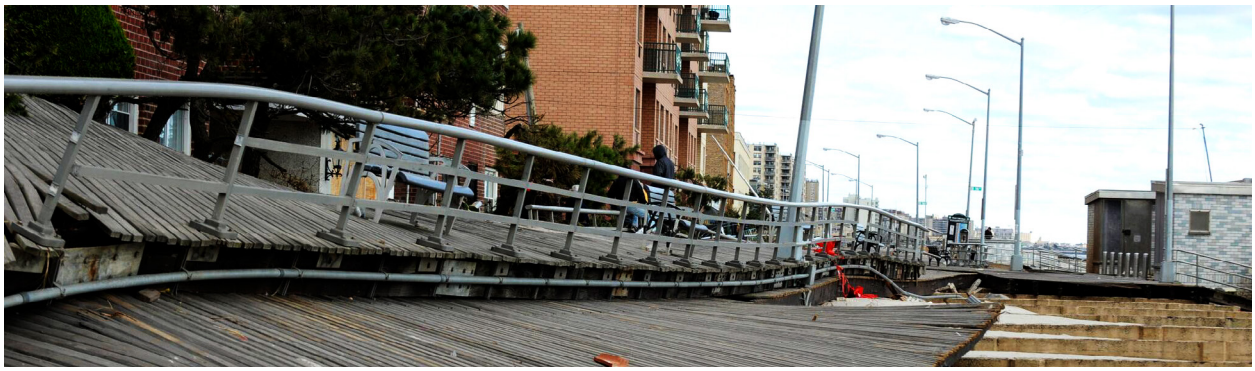


Figure 6: This graph displays social vulnerability across the U.S. by county as calculated in 2020, the most recent year for which data is available. Darker colors, which correspond to higher percentiles, indicate increased vulnerability.



CAPABILITIES

A prepared nation continually works to develop the capabilities required to successfully mitigate risks and respond to disasters, both expected and unforeseen. Identifying and evaluating the threats and hazards that pose the greatest risk to the nation allows for effective sustainment, prioritization, bolstering, and delivery of the 32 Core Capabilities, as outlined within the National Preparedness System.[89]

To assess the nation's preparedness posture, identify gaps in national capability, and develop strategies to address these gaps, FEMA developed the National Risk and Capability Assessment (NRCA).[90] The NRCA is a suite of preparedness assessments that FEMA uses to measure risk and capability across the nation in a standardized and coordinated way. The NRCA encompasses the National THIRA, which details tiered, capability-specific performance objectives (i.e., the National Capability Targets described in the National Stakeholder Preparedness Review [National SPR] Efforts section of this report).[90] Through the National SPR—the next step in the NRCA—FEMA assesses national readiness for catastrophic disasters against the National Capability Targets, and identifies national-level emergency management capability gaps and planning assumptions for all hazards.[90] For more information on the NRCA, refer to Appendix C: National Risk and Capability Assessment and Methodology. This section:

- Presents an overview of the nation's emergency management capability in 2021;
- Discusses implementation of the National Incident Management System (NIMS) and National Qualification System (NQS);
- Outlines preparedness indicators and local capability trends to help assess national and community capabilities; and
- Highlights outcomes from the inaugural National SPR.

FEMA monitors the use of NQS guidelines across authorities having jurisdiction through outreach and tools such as OneResponder. This enables FEMA to better assess the qualification of emergency personnel and the nation's disaster cadre readiness. Registered NQS jurisdictions are currently at 9% of the NQS goal for 2025; this percentage remains low—as 2021 was the first year of reporting for this measure—but is projected to increase in coming years.

NATIONAL INCIDENT MANAGEMENT SYSTEM IMPLEMENTATION

NIMS guides all levels of government, nongovernmental organizations (NGO), and the private sector to work together to prevent, protect against, mitigate, respond to, and recover from incidents and is adaptable to any situation, including planned special events.[91] As part of NIMS, the NQS establishes guidance and tools to assist stakeholders in developing processes for qualifying, certifying, and credentialing deployable emergency personnel. NIMS and NQS are vital tools that provide guidance for indicating and assessing emergency management capabilities and promote resource-sharing between state and federal agencies. Many agencies and jurisdictions have exercised NIMS as their incident management system and use the guidance for developing and implementing deliberate operational procedures.[91] For instance, the U.S. Nuclear Regulatory Commission (NRC) has used NIMS to establish its operational plans, procedures, and regulations to respond to nuclear and radiological incidents caused by natural disasters, acts of terrorism, and other human-driven disasters.[92] To ensure a coordinated,

THE SURFSIDE, FLORIDA, CONDOMINIUM COLLAPSE

Multiple federal agencies supported response and recovery efforts after the Surfside, Florida condominium collapse. Whereas FEMA assisted survivors, the National Institute of Standards and Technology (NIST) dispatched experts to assess the technical cause of the collapse.

FEMA's National Urban Search and Rescue (US&R) Response System (the System) is a unique partnership between federal and local resources that provides lifesaving assistance during major disasters.[93] Often viewed as FEMA's "Swiss Army Knife" for disaster response, the System offers necessary US&R capacities to execute disaster missions successfully.[39] This was on display during the partial collapse of the Champlain Towers South building in Surfside, Florida, on June 24, 2021. FEMA deployed numerous System resources specializing in structural collapse at the request of local and state responders to assist with the response.[94] FEMA sent 5 NIMS Type 1 US&R task forces from several states, each comprised of 70–80 members, to work alongside in-state operational US&R resources.[94] These US&R resources included the Blue Incident Support Team and deployed task forces, including Indiana Task Force One, Ohio Task Force One, New Jersey Task Force One, Pennsylvania Task Force One, and Virginia Task Force Two.[94] The task forces worked 12-hour shift operations utilizing NIMS for object and work assignments onsite, which were vital for recovery and response efforts in this disaster.[94] Though the System encompasses valuable federal resources that local jurisdictions can use, states still have difficulties funding non-federal US&R resources effectively throughout the year, which affects their capabilities.[39]

The National Construction Safety Team (NCST) Act, signed into law on Oct. 1, 2002, by President Bush, authorizes NIST to establish teams to investigate building failures. These authorities follow guidelines established by the National Transportation Safety Board for investigating transportation accidents. The NCST Act gives NIST the authority to dispatch teams of experts, where appropriate and practical, within 48 hours after major building disasters. Under the law, the NIST Director, in consultation with the U.S. Fire Administration and other appropriate federal agencies, maintains a standing advisory committee of as many as 12 persons to advise him or her on carrying out the Act, and to review procedures and reports issued. On June 30, 2021, NIST launched a full technical investigation into the partial collapse of the Champlain Towers South. This work is being conducted under the authority of the NCST Act. The goal of the NIST investigation is to determine the technical cause of the collapse and, if needed, to recommend changes to building codes, standards and practices, or other appropriate actions to improve the structural safety of buildings.

whole community response to emergencies, the NRC regularly participates in nuclear power plant emergency exercises with state and local partners to ensure recovery planning and operational coordination.[92] To maintain and practice incident response, the NRC requires each of the 58 operating nuclear power plants to conduct drills annually and requires FEMA-evaluated Radiological Emergency Preparedness full-scale exercises with offsite officials every two years.[92] Federal partners—including the Department of State, Department of Energy, Department of Health and Human Services (HHS), the FBI, the NOAA National Weather Service, and other federal entities—have participated in these exercises to ensure a coordinated interagency response.[92]

PREPAREDNESS INDICATORS

Federal measurements and indicators for grants and other preparedness measures are vital in emergency management as they support the development of state, local, tribal, and territorial government (SLTT) capabilities. Each year, FEMA and other federal agencies collect data from communities on a wide range of metrics, or preparedness indicators, related to capability building. These preparedness indicators allow the federal government to assess annual changes in capability and gain insight into areas for continued improvement to close capability gaps. This section outlines:

- National Capability Target achievement
- Community capability target achievement
- Communities' most challenging threats and hazards
- Community capability target priority rankings
- Non-disaster preparedness grant allocations and expenditure alignment to community capability gaps and National Priority Areas (NPA)

Along with the indicators outlined in this section, readers should refer to FEMA's 2021 NHS results for data regarding preparedness actions, attitudes, and motivations of the U.S. public.

FEMA continues to mature these preparedness indicators, the reporting of which are likely to similarly evolve across future NPRs.

National Capability Target Achievement

Figure 7 presents the required state, territory, and Urban Area Security Initiative (UASI) THIRA targets for 2021, the data from which supports the determination of communities' highest and lowest capabilities as reported in community SPRs. FEMA receives the data that informs this section through community THIRA/SPR submissions.[v]

Mission Area	Core Capability	Target Name
Cross-Cutting	Public Information & Warning	Information Delivery
	Operational Coordination	Unified Operations
Prevention/ Protection	Intelligence and Information Sharing	Intelligence Cycle Auditing/Execution
Protection	Access Control and Identity Verification	Credential Acceptance
	Cybersecurity	Cyber Plan Updates
	Interdiction and Disruption	Interdiction/Disruption Activities
	Physical Protective Measures	Critical Infrastructure Security Plan Updates
	Risk Management for Protection Programs and Activities	Critical Infrastructure Risk Assessment
	Screening, Search, and Detection	Conduct Screening Operations
	Supply Chain Integrity and Security	Supply Chain Risk Preparedness
Mitigation	Risk and Disaster Resilience Assessment	Threat and Hazard Modeling
Response	Fatality Management Services	Body Recovery/Storage
	Public Health, Healthcare, and Emergency Medical Services	Medical Care
Recovery	Economic Recovery	Reopen Businesses
	Health and Social Services	Reestablish Services

Figure 7: Required state, territory, and UASI targets for 2021 THIRA reporting.

v For more information on the NRCA and a list of limitations of the national-level analysis, refer to Appendix C: National Risk and Capability Assessment and Methodology.

Community Capability Target Achievement

In 2021, communities overall reported being relatively close to achieving their target goals. Target achievement indicates the percentage of capability that a community has attained relative to their specific target statement. For 13 of the required 15 targets, more than half of all reporting communities reported 70% to 100% of target achievement. Target achievement percentages are grouped into three categories: 0-29% target achievement, 30-69% target achievement, and 70-100% target achievement.

In addition to assessing current capabilities in the 2021 THIRA/SPR process, communities also identified priority rankings for reaching or maintaining each capability target. The priority rankings include low, medium, and high priority. Communities placed the highest priority on Cyber Plan Updates, Information Delivery, and Medical Care. Conversely, they identified Credential Acceptance, Critical Infrastructure Risk Assessment, and Threat and Hazard Modeling as low priority most frequently over other capability targets.

Figure 8 presents target achievement reported by communities for the 2021 required THIRA/SPR targets and the percentage of communities that rated the target as "High Priority." The horizontal axis of the graph indicates the proportion of state, territory, and UASI communities that report achieving the capability ranges specified by each color. The percentages along the right side of the graph indicate how many communities rated that target as a "High Priority."

Of the 15 required targets, the top five targets where communities reported being closest to their goals (as determined by the 70-100% data) were, from highest to lowest achievement: Intelligence Cycle Auditing/Execution, Unified Operations, Threat and Hazard Modeling, Supply Chain Risk Preparedness, and Information Delivery. In the 2021 NPR, communities also identified four of these five

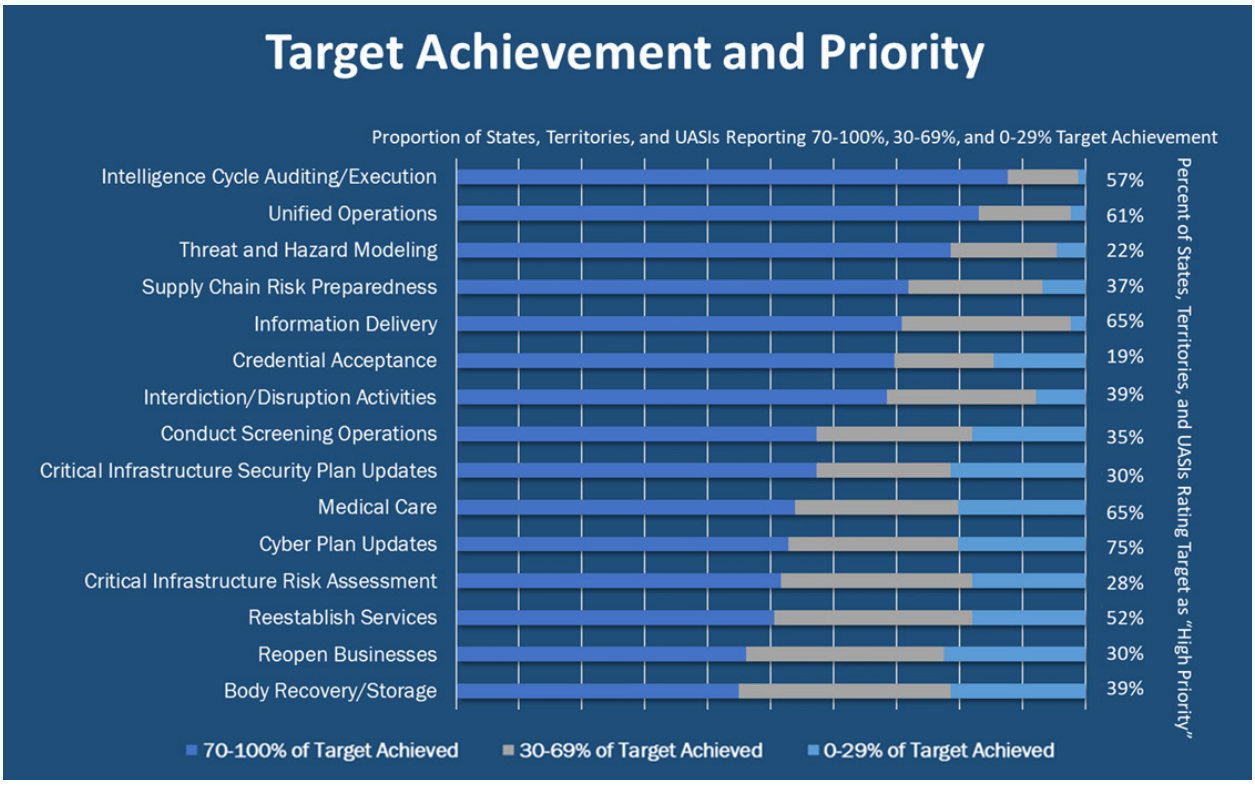


Figure 8: This graph displays 1) the proportion of states, territories, and UASIs that have achieved capability within the color-coded target achievement ranges (70-100%, 30-69%, and 0-29% respectively) for each required target (horizontal axis) and 2) the percent of states, territories, and UASIs who rate each required target as a high priority (right side). Targets are organized by the 70-100% achievement range from greatest achievement to least achievement.

targets as closest to their goals. The Interdiction/Disruption Activities target fell within this category in 2021 but has been replaced by the Supply Chain Risk Preparedness target for 2022.

The bottom five targets where communities reported being furthest from their goals (as determined by the 0-29% data) were, from highest to lowest achievement: Reopen Businesses, Critical Infrastructure Security Plan Updates, Body Recovery/Storage, Medical Care, and Cyber Plan Updates. Most communities categorized Medical Care as high priority. Communities ranked the other four lower achieving targets as medium priority more often than high priority. Communities were further from their goals for the targets of Reopen Businesses, Critical Infrastructure Security Plan Updates, and Medical Care in both 2020 and 2021. In 2021, communities were also furthest from their own goals for their targets of Body Recovery/Storage and Cyber Plan Updates.

FEMA assesses national level measures of capability by aggregating capability for all states directly affected by plausible concurrent operations (PCO) for each standardized impact. The aggregated community capability value is then divided by the National Capability Target to determine the percentage of capability achieved for each impact. An impact with achievement under 30% counts as having "far less combined community capability than the national goal." For additional information on targets and impacts, refer to the THIRA/SPR Comprehensive Preparedness Guide 201. More information on why these targets may have less achievement can be found below in the discussion on communities achievements of their own goals.

Community SPR Insights

Qualitative data from the SPR provides insight into how communities built capability towards their target goals in 2021. The following examples demonstrate how communities across the nation built and lost capabilities for the targets communities identified as being closest to and furthest from their goals:

Highest Performing Capabilities

Intelligence Cycle Auditing/Execution:

- Added new personnel to their intelligence teams
- Continued to develop statewide suspicious activity reporting repositories

Information Delivery:

- Implemented state notification systems
- Increased the number of people who can receive reliable and actionable information including those with limited English proficiency

Unified Operations:

- Improved the common operating picture
- Procured project management software for steady-state and disaster use

Threat and Hazard Modeling:

- Enhanced watch center briefings
- Established a community outreach unit
- Utilized a food security task force to identify needs across the state

Supply Chain Risk Preparedness:

- Made long-term capacity improvements
- Increased resiliency in local food supply chain stakeholders
- Analyzed supply chain dependencies

Lowest Performing Capabilities

Reopen Businesses:

- Strains on inventories
- Supply chain issues due to COVID-19 impacts

Critical Infrastructure Security Plan Updates:

- UASIs reported staff attrition and aging equipment leading to decreased capability

Body Recovery/Storage:

- Staffing and budget shortages
- Workload increases
- Reduced storage space

Medical Care:

- Lost capability due to a declining number of graduates from emergency medical services programs

Cyber Plan Updates:

- Limited staff and staff turnover
- Trainings and exercises postponed or canceled due to COVID-19

Communities Most Challenging Threats and Hazards

As part of the THIRA process, communities estimate which threats or hazards would most challenge their ability to achieve each standardized target. For the targets where communities are closest to achieving their capability goals (**Figure 9**), they most frequently identified earthquakes and hurricanes/typhoons as the most challenging threats and hazards. For the targets where communities are furthest from achieving their capability goals (**Figure 10**), they most frequently identified active shooter incidents, cyberattacks, and explosive devices as the most challenging threats and hazards.

Threats and Hazards Identified as Most Challenging
(For Targets Closer to Community Goals)

Target	*Most Challenging*	*Second Most Challenging*	*Third Most Challenging*
Intelligence Cycle Auditing/Execution	Explosive Devices	Active Shooter Other Human Caused Cyber Attack	Complex Coordinated Terrorist Attack
Unified Operations	Earthquake	Hurricane / Typhoon	Active Shooter
Threat and Hazard Modeling	Hurricane / Typhoon	Earthquake	Cyber Attack
Supply Chain Risk Preparedness	Pandemic Human	Hurricane / Typhoon	Earthquake
Information Delivery	Earthquake	Hurricane / Typhoon	Cyber Attack

Key

-- Natural

-- Human-Caused /Technological

Figure 9: Communities' most challenging threats and hazards for capabilities closest to their target goals.

Threats and Hazards Identified as Most Challenging

(For Targets Furthest from Community Goals)

Target	*Most Challenging*	*Second Most Challenging*	*Third Most Challenging*
Critical Infrastructure Security Plan Updates	Cyber Attack	Active Shooter	Explosive Devices
			Hurricane / Typhoon
			Other - Human Caused
Reopen Businesses	Earthquake	Hurricane / Typhoon	Flood
Body Recovery/Storage	Explosive Devices	Active Shooter	Earthquake
			Pandemic - Human
Cyber Plan Updates	Cyber Attack	Utility Interruption	Tornado
			Other – Technological
			Other – Natural
			Hazmat Release
			Earthquake
Medical Care	Earthquake	Pandemic – Human	Explosive Devices
		Active Shooter	

Key

-- Natural

-- Human-Caused/Technological

Figure 10: Communities' most challenging threats and hazards for capabilities furthest from their target goals.

Non-Disaster Grant Distribution and Alignment

Figure 11 depicts community grant allocations for non-disaster grants. Non-disaster grants include the Homeland Security Grant Program (HSGP). Projects paid for by HSGP funds must relate directly to preventing, protecting against, mitigating, responding to, and recovering from acts of terrorism. The HSGP cannot be used to build capabilities related to natural hazards unless a capability has cross-benefits related to both terrorism threats and natural hazards. In fiscal year (FY) 2021, communities allocated the most HSGP grant dollars to cross-cutting core capabilities that apply to all mission areas. More than 38% of funding went to those core capabilities, with the majority going to Planning and Operational Coordination. Communities dedicated between 16% and 21% of funding to each of the Response, Protection, and Prevention mission areas. Communities allocated approximately 6% of funding to the Mitigation mission area and less than 1% to the Recovery Mission Area.

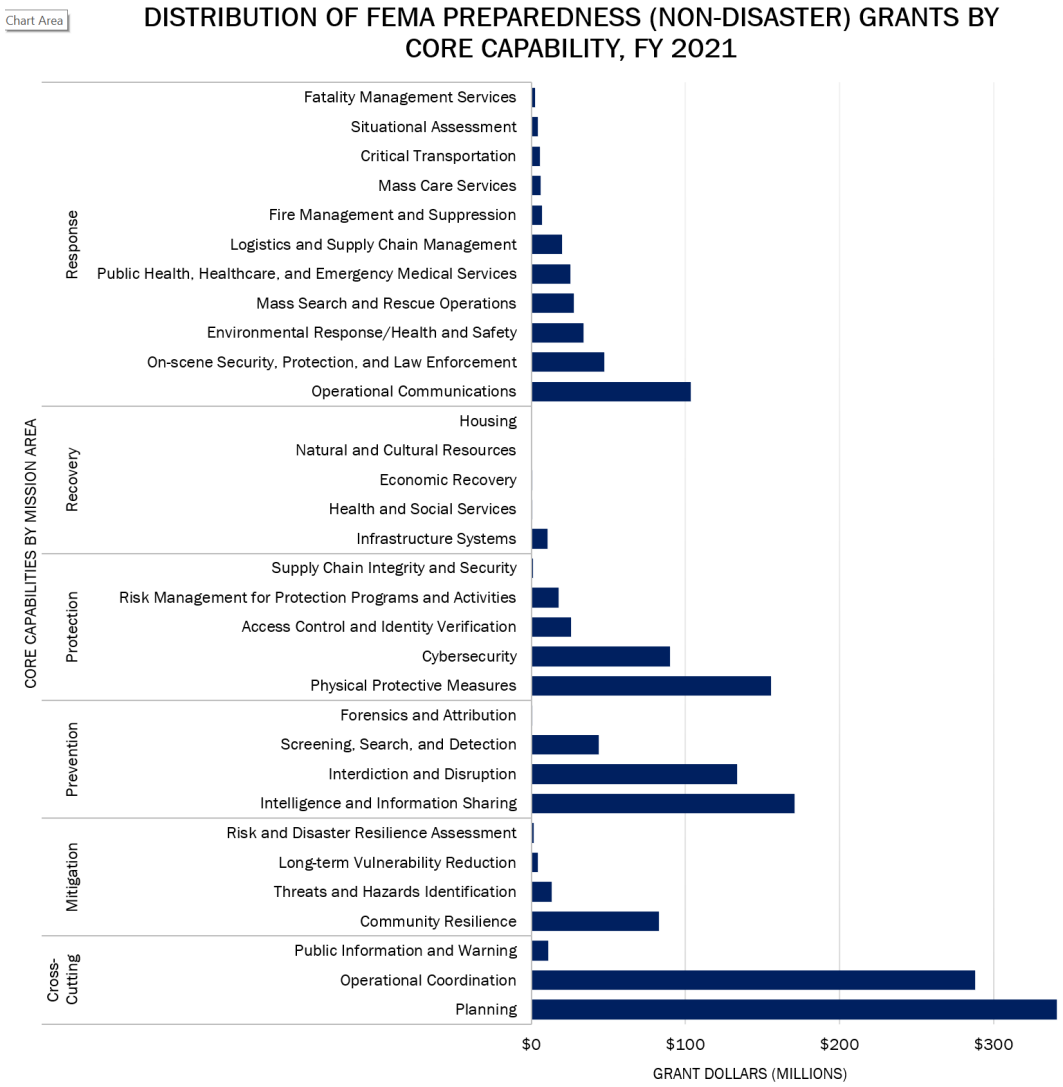


Figure 11: Non-Disaster Grant investments for FY 2021 as reported in the Biannual Strategy Implementation Report. Grants include the State Homeland Security Program, Urban Area Security Initiative, Operation Stonegarden, Nonprofit Security Grant Program, Emergency Management Performance Grant, Tribal Homeland Security Grant Program, and the Emergency Management Performance Grant - American Rescue Plan Act.[95]

National SPR Efforts

As addressed in Section 1242 of the 2018 Disaster Recovery and Reform Act,[255] FEMA must develop a national-level capability assessment that:

- Identifies the greatest risks to the nation
- Sets targets for capability needed to meet the requirements of those threats and hazards
- Analyzes national capability to meet those targets

In 2019, FEMA published the *National THIRA: Overview and Methodology*, the first assessment developed under the NRCA.[225] The National THIRA uses a data-driven and federally agreed upon approach to identify nine regionally and nationally catastrophic scenarios of most significant concern to the nation.[225] The National THIRA includes an assessment of the likely impacts of those threats and hazards and sets 28 National Capability Targets for the response and recovery mission area capabilities, which align to the scenarios that would most stress each. In 2021, FEMA began conducting an extensive literature review, analyzing community-level capability data, and consulting subject-matter experts (**Figure 12**) to assess national capability and build the foundation of the first-ever National SPR. The National SPR methodology is similar to the methodology communities follow when completing their assessments to identify capability and gaps in planning, organization, equipment, training, and exercises. Through the National SPR, FEMA has drawn qualitative conclusions about the nation's likely ability to manage catastrophic disasters and their impacts. FEMA will leverage findings from the National SPR to inform its upcoming Investment Strategy for National Preparedness, which was first introduced in the 2021 NPR. For more information on the National SPR, refer to the National Stakeholder Preparedness Review Methodology section of Appendix C.

Figure 12: Depiction of different aspects of the National SPR development process.

MANAGEMENT OPPORTUNITIES

This section focuses on opportunities FSLTT governments, NGOs, and the private sector can leverage to manage risk, build capability, and address capacity gaps to increase their overall resilience. Strategies and applications for implementing these management opportunities will differ across sectors and levels of government. These management opportunities are not prescriptive mandates but are meant to highlight existing resources for utilization, spark ideas, and inform interested parties of potential paths forward.

The 2021 NPR included three Management Opportunities that FSLTT governments and organizations can pursue when developing strategies to enhance their capability: 1) developing a preparedness investment strategy; 2) addressing steady-state inequities, vulnerabilities, and a dynamic risk landscape; and 3) strengthening processes within and better connecting the areas of the National Preparedness System. The 2022 NPR Management Opportunities build on some of last year's strategies through the lens of three main risk topic areas: climate change, physical and technological risks, and equity.

BUILD COMMUNITY-WIDE RESILIENCE TO CLIMATE CHANGE IMPACTS

Communities across the nation face a complex set of threats and hazards. These threats and hazards are measured based on different levels of risk that vary depending on their vulnerabilities and levels of exposure. Systemic risks are one of the most common types of risk communities face. Systemic risks are challenging to mitigate because they involve interconnected systems and structures, which may experience unknown or unpredictable cascading impacts after an incident. Communities with greater systemic risk exposure are more vulnerable to the physical impacts of climate change, which can wreak havoc on interconnected infrastructure systems like water, internet, transportation systems, power, fuel, communications, and supply chains.[97]

Targeted investments—particularly those that harden critical infrastructure and create redundancies—are one of the best ways communities can mitigate the impact of future disasters and adapt to the effects of a changing climate. Over the past several years, the federal government has made significant progress in allocating funds for mitigation to build resilience to all-hazards and harden critical infrastructure.[92] For example, SLTT governments have taken advantage of federal initiatives like FEMA's Building Resilient Infrastructure and Communities (BRIC) program, which had $1 billion in available funds in 2021. **Figure 13** highlights the number of BRIC applications and the amount of requested funding for hazard mitigation in the U.S.[98]

This section examines the present need for mitigation investments and provides more detail on the grants and information resources available to SLTT governments interested in advancing local adaptation and mitigation efforts. In addition, this section provides an overview of how to leverage data to improve climate resilience along with examples of data collection initiatives and tools at the local level that help foster greater community resilience to the impacts of climate change.

Increase resilience to climate change impacts through targeted mitigation investments

Large mitigation projects, both old and new, demonstrate the enormous cost the nation faces in building resilience.[1] Limiting critical infrastructure disruptions helps ensure the continuity of essential government functions. After Hurricane Katrina, the U.S. Army Corps of Engineers (USACE) designed and constructed the Hurricane and Storm Damage and Risk Reduction System for southeastern Louisiana.[100,101] The project totaled $14.45 billion, with a $12.8 billion federal share and $1.5 billion non-federal share (to be repaid over 30 years).[100,102] In 2021, New York City invested $125 million through the Raised Shoreline Citywide program to combat rising sea levels and tidal flooding by raising shorelines.[103,104]

Although various mitigation projects are planned or already underway, funding for these projects is finite. **Not all projects can be funded at once, so investing in projects early and strategically based on their requirements for time and resources can allow the nation to build resilience sustainably.** For example, "gray" mitigation infrastructure projects (e.g., sea walls or barriers) may help a community adapt to climate change's long-term effects but have the added benefit of lessening the severity of storm surges and flooding in the present.[1]

Natural or "green" infrastructure[vi] projects—such as restoring wetlands or coastal sand dunes to act as barriers against rising sea levels and storm surges—also help communities achieve long-term climate adaptation goals.[105] Green infrastructure can also provide critical habitat for wildlife and reduce greenhouse gas levels in the atmosphere by capturing carbon for photosynthesis.[106,1] Both projects build resilience at different rates, require diverse resources and levels of funding, and provide various benefits (**Figure 14**).

To promote communities' continued investment in mitigation projects, the federal government passed the Infrastructure Investment and Jobs Act (IIJA) on

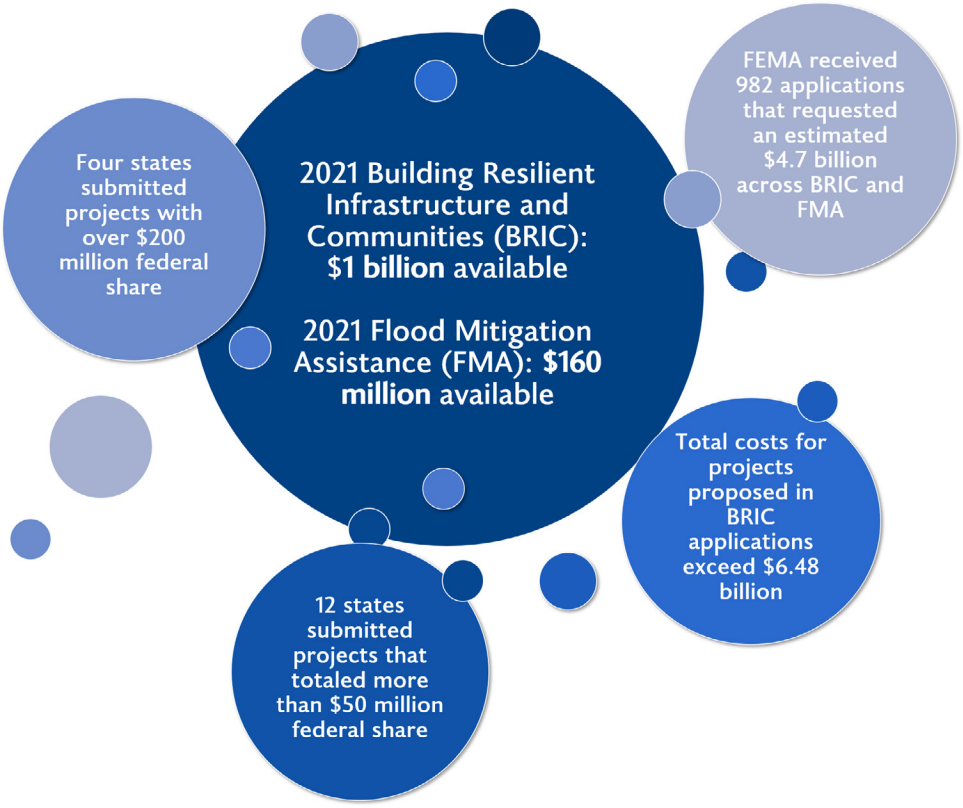


Figure 13: Overview of 2021 BRIC and Flood Mitigation Assistance (FMA) funding.[98]

vi Natural, or "green," infrastructure projects rely on services produced by ecosystems, often utilizing natural landscapes to minimize flood damages, purify and store water, and reduce urban stormwater runoff. Natural infrastructure is now also defined in 23 U.S.C. 101. Source: Resources for the Future, "Natural Infrastructure." Accessed 2/24/2022. https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities/after-apply/fy-2021-subapplication-status

November 15, 2021 (also referred to as the Bipartisan Infrastructure Law).[80] The bill designates $47 billion for climate resilience over five years starting in FY 2022 to diversify resilience and mitigation programs. It complements preexisting FEMA award programs to make the nation more resilient, including $3.46 billion for SLTT government mitigation projects, $1.16 billion to the Disaster Relief Fund under the BRIC Program, and $3.5 billion to the National Flood Insurance Fund for FMA.[107,108] The FMA provisions will allow FEMA to more than triple grant awards typically made to help mitigate the risk of repetitive flood damage to homes and businesses insured by the National Flood Insurance Program (NFIP).[109] IIJA also designated $7.3 billion in funding to states for transportation resilience planning and improvements through the Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Formula Program, and designated an additional $1.4 billion for the

A COMMON LEXICON: THE IMPORTANCE OF SHARED TERMINOLOGY

Risks and disasters frequently require the attention of experts spanning multiple fields. Establishing common terminology facilitates cross-field conversations and helps to minimize confusion. For example, the emergency management community uses the term "mitigation" to describe risk reduction. The environmental community uses the same term and others with slightly different meanings:

Mitigation: Reducing and stabilizing the levels of heat-trapping greenhouse gases in the atmosphere.[99]

Adaptation: Adapting to life in a changing climate—this involves adjusting to actual or expected future climate.[99]

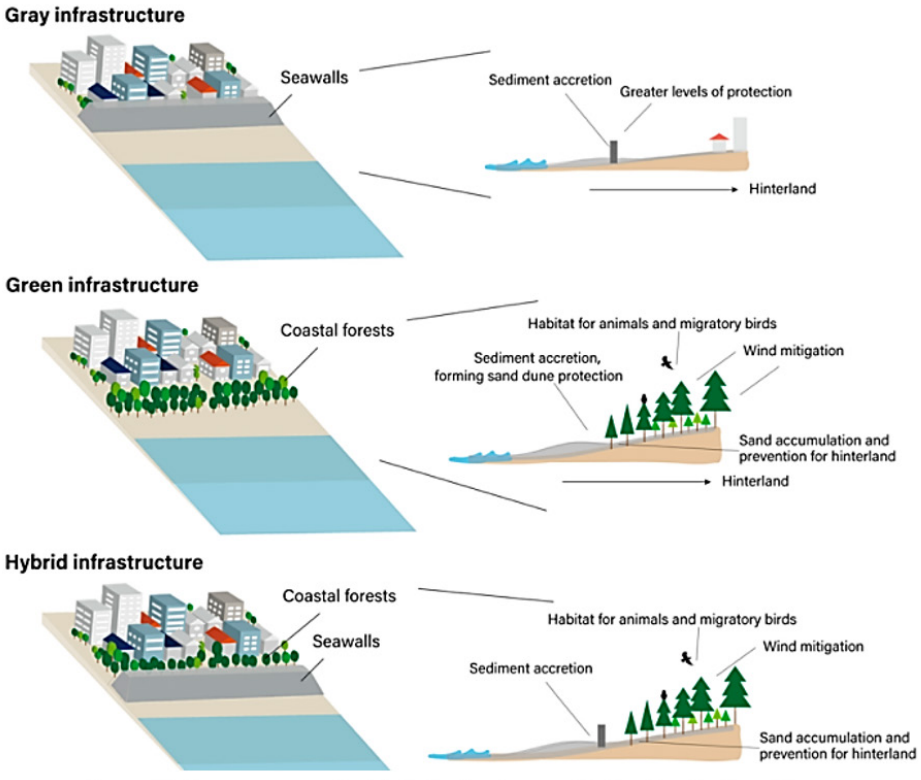


Figure 14: Gray, green, and hybrid infrastructure and their mitigation benefits.[105]

PROTECT discretionary grant program to provide grants to eligible entities.[110] **Eligible state entities can use PROTECT funding for strengthening and protecting evacuation routes, resilience planning, and other climate and natural hazard resilience improvements.**[110] The legislation also improves the affordability of FMA grants by increasing the federal grant share for qualifying socially vulnerable and lower-income communities and individuals. **Communities can use the FMA grants for projects that reduce or eliminate the long-term risk of flood damage to buildings insured under the NFIP, including structure elevation, localized flood reduction projects, structural retrofitting of existing buildings, and acquisition, demolition, or relocation of structures.**[111]

The IIJA designated funding for the Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Act provides $500 million in federal assistance to states or eligible tribal governments to utilize low-interest loans for pre-disaster mitigation activities.[114] These loans can fund infrastructure, water, wastewater, community, and small business development projects. Examples of these projects include upgrades to address extreme flooding with stormwater drainage systems and barriers, breakers, and seawalls to fortify coastlines against rising water levels. **The 2021 IIJA provisions for mitigation funding constitute the most significant single national investment to date in building community resilience.**[115] **To access the funds available through the IIJA and STORM Act, communities should use available tools and resources to identify their priorities for mitigation and building long-term all-hazards resilience projects.** The U.S. Climate Resilience Toolkit highlights a multitude of government entities and private foundations that offer financial and technical resources for building resilience to climate change impacts.[116]

Many other information resources are available to communities interested in advancing local adaptation and mitigation efforts. The White House published a *Compendium of Federal Nature-Based Resources and Guidance for Coastal Communities, States, Tribes, and Territories* to highlight coastal resiliency best practices.[131] Non-federal resources, such as the Environmental and Energy Study Institute's *Federal Resources for Nature-Based Solutions to Climate Change* fact sheet, provide insight into federal funding and technical assistance available to help SLTT governments, NGO, universities, and individuals.[132] In addition, the *Toolkit for Engaging the Private Sector in National Adaptation Plans* provides strategies to engage private sector actors in adaptation planning, implementation, monitoring, and evaluation.[133]

HAZARD MITIGATION: BUILDING CODES

Hazard-resistant building codes are a low-cost, high-impact solution that can help break disaster damage and reconstruction cycles. However, 65% of communities across the country have not adopted the latest building codes.[112] This increases the risk for the people that live in these communities. A 2020 National Institute of Building Sciences study found that adopting the latest building codes saves thirteen dollars for every dollar invested.[113]

The BRIC grant provides incentives for SLTT governments to adopt and enforce modern building codes to harden critical infrastructure. When applying for grants, SLTT governments may use financial savings calculation and local community building code adoption rates data in risk assessments to understand the benefits of updating their codes.

Leverage Data to Improve Communities' Climate Resilience

Data is an incredibly valuable tool for emergency managers. **Communities can leverage data from historical and real-time incidents to help anticipate and prepare for future climate change impacts.** Reliable, localized data is crucial for understanding the long-term impacts of climate change when planning for local climate adaptation projects. For instance, seawalls only last 30–50 years, protecting against both sea-level rise and storm surge—a degradation period engineers and city planners should account for, along with projected sea level rise, when designing oceanfront infrastructure and seawalls.[134]

Some SLTT governments have integrated sea-level rise and geographical data into their coastal resiliency planning. In 2021, Virginia was the third state to develop a Coastal Resilience Master Plan behind Texas and Louisiana. The Coastal Resilience Master Plan is a data-driven, whole-of-government, and equitable approach designed to address the impacts of rising sea levels.[135] Virginia's Coastal Resilience Master Plan utilizes the intermediate-high sea-level rising scenarios and geographic data from NOAA and USACE in correlation with sea-level rise viewing data tools collected by the Hampton Roads Planning District Commission.[135,1] As coastal flooding increases across the nation, so too do federal funding opportunities to increase resiliency efforts that focus on data-driven initiatives. In 2022, USACE anticipates leveraging $2.3

U.S. CLIMATE RESILIENCE TOOLKIT[116]

The U.S. Climate Resilience Toolkit is a comprehensive resource for communities seeking to build resilience through adaptation and mitigation to address climate change impacts. The toolkit contains a wealth of information on planning, threats and hazards, risk assessments, climate data and science, training resources, and funding streams for mitigation projects. The following list represents some, but not all, of the information available through the toolkit.

- **NOAA** Environmental Literacy Program[117]
- **NOAA** Climate Adaptation Partnerships FY 2022[118]
- **NOAA** Climate.gov[119]
- Tribal Climate Resilience Liaisons at the U.S.Geological Survey National and Regional Climate Adaptation Science Centers[120]
- **FEMA** BRIC[107]
- **Wildlife Conservation Society's** Climate Adaptation Fund[121]
- **Drought.gov** Competitive Funding Opportunities[122]
- **U.S. Environmental Protection Agency (EPA)** Smart Growth Grants and Other Funding[123]
- **USDA Forest Service** Climate Change Resource Center[124]
- **USDA** Climate Hubs[125]
- **EPA** Climate Change Adaptation Resource Center[126]
- **NIST** Community Resilience Assessment Methodology Products[127]
- Kresge Environment Program[128]
- **Open Space Institute** Resilient Landscape Initiative[129]
- **Georgetown University** Adaptation Clearinghouse[130]

billion to reduce coastal flooding through 15 projects and inland flood risks through another 15 projects.[136] Utilizing localized data empowers communities to minimize flooding risks through pre-disaster hazard mitigation efforts and strengthen interagency collaboration on resiliency projects.

The National Aeronautics and Space Administration (NASA) is developing the Earth System Observatory to create a three-dimensional view of Earth, from the bedrock to the atmosphere.[140] The Observatory will focus on determining how aerosols affect the global energy balance, refining projections and models of climate change, predicting severe weather, forecasting droughts, and understanding how climate change affects agriculture, among other goals.[140] NASA, through a partnership with NOAA and universities, also runs the Short-Term Prediction Research and Transition (SPoRT) project.[141] SPoRT utilizes expertise in remote sensing, modeling and data assimilation, total lightning, and impact imagery for disasters to transform research into operations to improve short-term weather forecasts on both regional and local scales.[142]

The federal government and SLTT governments play a critical role in building community-wide resilience to climate change impacts through targeted investments and data sharing. They can also promote significant community funding for mitigation and critical infrastructure hardening projects. In addition, the public sector collects, analyzes, and shares data that communities can use for everything from improving building codes to estimating coastal flooding impacts. However, whole community efforts to build resilience will only be possible with the collaboration of the private sector. Both government agencies and the private sector benefit from information-sharing agreements and working partnerships that can support steady-state and emergency operations. One example of such a partnership is between NIST and its collaboration with industries and other stakeholders to develop an innovative framework focused on enhancing the security and integrity of technology supply chains.[143]

LEVERAGING DATA: CITIZEN SCIENCE

Data can inform programs and projects examining the present-day impacts of climate change. One such impact is exceptionally high tides around the globe due to rising sea levels. Also known as "king tides," these occur during new or full moons, when the moon is at its perigee (when it is closest to earth), or during specific seasons. To better understand how climate change impacts tidal patterns and causes flooding in coastal regions, communities around the U.S. are using citizen scientists—volunteers that usually need no prior science experience—to track, measure, and analyze king tides. These efforts provide actionable data alone or with other sources, such as modeling. Below are some examples of king tide citizen science activities around the nation. While these examples list project "owners," they are all multi-partnered efforts:

- **The University of Hawai'i Sea Grant College Program's Hawai'i and Pacific Islands King Tides Project:** Citizen scientists can submit photos of king tides through the project's platform.[137]
- **Virginia Institute of Marine Science Catch the King:** Leverages citizen scientists to aid in GPS flood data collection throughout coastal Virginia.[138]
- **Florida International University's Sea Level Solutions Center Citizen Science:** Citizen scientists participate through "Sea Level Solutions Days," taking water samples and measuring depths to create a database of urban flooding in Miami. This database predicts the areas of the city most vulnerable to sea level rise.[139]

REDUCE PHYSICAL AND TECHNOLOGICAL RISKS TO CRITICAL INFRASTRUCTURE

The public sector, individuals and families, and whole communities rely on the private sector as a provider of essential services and a partner in Recovery Support Functions and EmergencySupport Functions (ESF). The private sector plays a key role in providing resources, capabilities, and solutions to stabilize and restore community lifelines and maintain the performance of essential national functions when responding to large-scale incidents. The private sector also owns most of the nation's critical infrastructure, such as banking and financial institutions, telecommunications networks, and energy production and transmission facilities.[144,1]

Along with mitigation projects targeting climate change impacts, communities can invest in mitigation measures to reduce the risk exposure of the nation's critical infrastructure to physical and technological threats and hazards, including earthquakes, solar weather, power grid disruptions, and cyber threats. Threats to the nation's critical infrastructure continue to evolve, as evident from the 2021 cyberattacks mentioned previously on the Colonial Pipeline and the Oldsmar Water Treatment Facility in Florida.[70,73] These incidents highlighted significant vulnerabilities in our infrastructure, rated a "C-" by the American Society of Civil Engineers in 2021.[145] **Communities can reduce their vulnerability by improving the resilience of these interconnected systems and structures and can leverage existing funding sources available through federal grants to achieve this goal.** For instance, the IIJA includes over $1 billion in federal assistance for SLTTs to address cybersecurity and critical infrastructure improvements.[80] As climate change impacts and disasters increase in frequency and severity, the following topics will be important considerations for members of the public and private sectors to build community-wide resilience:

- Information sharing between the public and private sector, and resilience policies
- Physical risk reduction

This section examines each topic in greater detail. It highlights successful initiatives that the private and public sectors have undertaken to facilitate greater resilience to the impacts of all threats and hazards. This management opportunity also emphasizes the private sector's role in addressing specific systemic risks to privately-held infrastructure and assets, which, when impacted by a disaster, can have far-reaching implications for all levels of government, nonprofit organizations, and individuals.

Build Relationships Between the Public, Academic, and Private Sectors to Increase Information Sharing and Cross-Sector Resilience

CISA actively collaborates with the critical infrastructure community to develop and implement lifecycle plans to address the systemic risk to National Critical Functions (NCF).[146,1] NCFs are the functions of government and the private sector so vital to the U.S. that their disruption, corruption, or dysfunction would have a debilitating effect on security, national economic security, national public health or safety, or any combination thereof. Working with federal interagency partners through the Federal Risk Management Working Group, a body chartered under the Federal Senior Leadership Council, CISA has supported the development of an NCF Risk Register. The NCF Risk Register aids partners in identifying, communicating, and prioritizing risks to the nation's critical infrastructure.[1] The NCF Risk Register applies a national-level focus to critical infrastructure risk management, extending beyond CISA to key stakeholder groups across the government and the private sector. Additionally, CISA has used the NCFs to monitor and report on the implications of the COVID-19 pandemic on critical infrastructure sectors.[147]

In July 2021, FEMA published the *Building Private-Public Partnerships* guide for jurisdictions. **Organizations**

can establish Private-Public Partnerships (P3) to develop and complete physical projects and for information sharing and planning before, during, and after disasters. P3s benefit the academic, private, and public sectors by identifying and addressing challenges, establishing mutual priorities, engaging both sectors in dialogue, and identifying scalable capabilities.[149,1] For example, P3s may assist with keeping supply chains operational or assessing the economic impacts of a disaster on the local economy, workforce, and infrastructure to help business activity resume post-disaster.[149,1] Private-sector entities may be concerned about sharing proprietary information with public-sector entities. **To better protect information, the private and public sectors can utilize memorandums of understanding or non-disclosure agreements to facilitate information sharing.** The *Building Private-Public Partnerships* guide includes a maturity model (**Figure 15**) that can help P3s establish goals and metrics for assessing their organization.

Several communities have established successful P3s that have increased resilience and provided mutual benefits among partners. The City of Houston, Harris County, Texas, established a Supply Chain Group before 2017 that included power, water, building supplies, telecommunications, and transportation representatives.[149] After Hurricane Harvey in August 2017, the city brought the grocery sector into the P3 and expanded the group to include neighboring cities and counties.[149] During the COVID-19 pandemic, the City of Houston P3 was instrumental in identifying areas of need for vulnerable residents.[149]

P3s can also help address specific areas of concern and promote community resilience to various threats and hazards. For example, the American Institute for Conservation's Alliance for Response initiative aims to create networks of cultural heritage and emergency management professionals across the country to prepare for emergencies to help avert or minimize damage

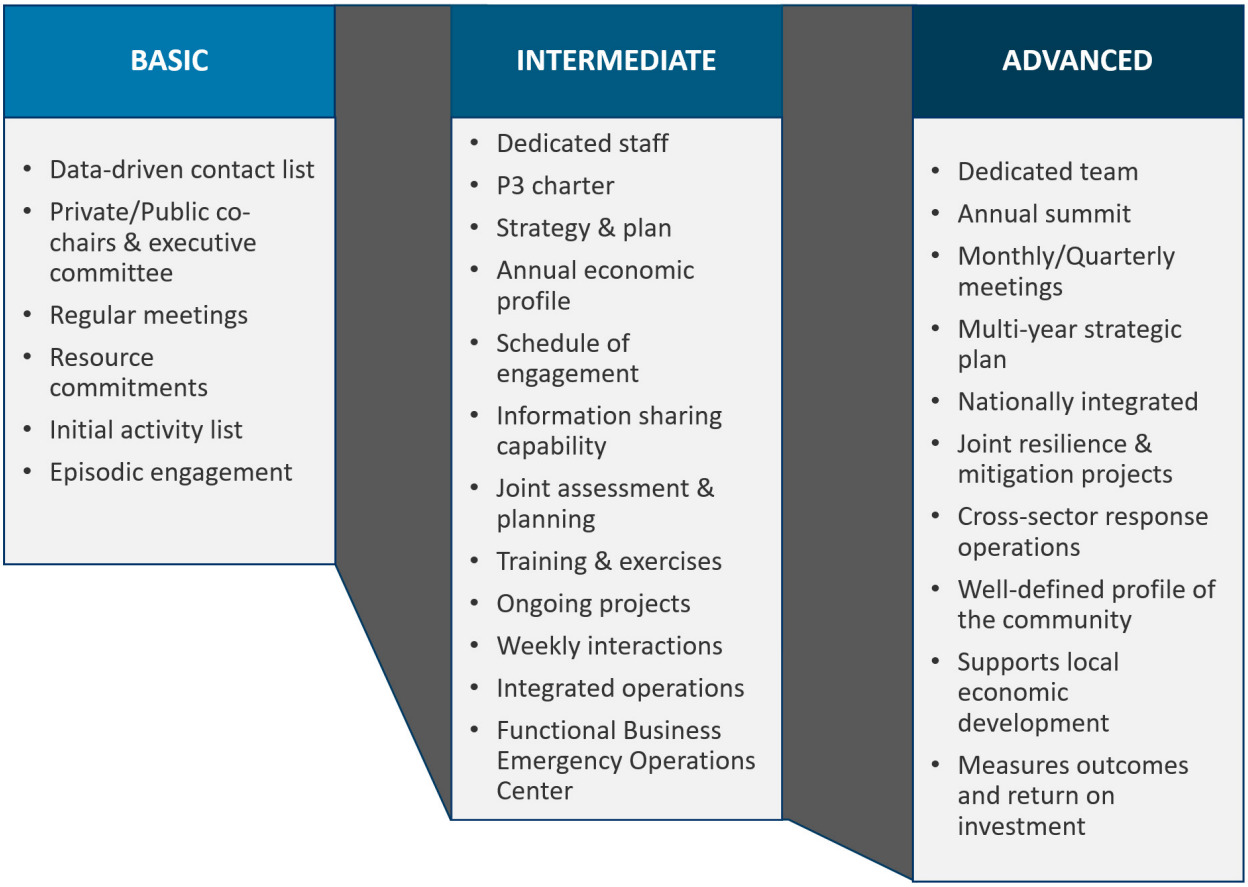


Figure 15: P3 maturity model to help establish goals and metrics.[149]

to cultural resources. The South Florida network focuses on preventing damage or losses to art and cultural resources before and after disasters so communities can recover more quickly.[149] Members of this P3 include artists, museums, archives, libraries, galleries, cultural institutions, first responders, and emergency management from Broward, Miami-Dade, and Monroe Counties.[149] Miami-Dade County has incorporated the Alliance into its business ESF.[149]

Like emergency operations plans, continuity plans are essential for preparedness because they provide decision-making guidance on responding to threats and hazards. Private sector businesses that adopt continuity plans build redundancies within their organizations to decrease the likelihood of adverse impacts, such as disruption to normal operations, stemming from a variety of threats and hazards, both physical and intangible (e.g., threats to public image). Conversely, companies without continuity plans are more likely to face financial or physical damages not covered by insurance during emergencies.[153] This can lead customers to divert their business to other companies that weathered emergency situations more effectively.[153]

Public and private preparedness policies are beneficial to building whole community resilience. The COVID-19 pandemic demonstrated the

CISA INFRASTRUCTURE RESILIENCE PLANNING FRAMEWORK

CISA developed the Infrastructure Resilience Planning Framework (IRPF) to provide an approach for localities, regions, and the private sector to work together to plan for the security and resilience of critical infrastructure services while facing multiple threats and changes.[148] The framework focuses on five implementation steps, including laying the foundation, critical infrastructure identification, risk assessment, development of actions, and implementation and evaluation.[148] The IRPF can be used for all 16 critical infrastructure sectors identified by Presidential Policy Directive 21.[148] The IRPF also includes comprehensive, step-by-step planning guidance, templates, and other resources designed to inform long-term planning and investment decisions.[148]

NATIONAL EMERGENCY COMMUNICATIONS PLAN

Many types of disasters affect communications systems. CISA, in collaboration with whole community partners, developed and periodically updated the National Emergency Communications Plan (NECP), the nation's roadmap to ensuring emergency communications interoperability at all levels of government.[150]

The NECP Implementation for the Rural Emergency Medical Communications Demonstration Project (REMCDP) highlights this shared vision. In line with the goals and objectives of the NECP, the University of Mississippi Medical Center (UMMC) used REMCDP funding to develop multiple training programs—including the First Hands Program—to strengthen the preparedness of medical and emergency communications across the state. The First Hands Program combined medical and land mobile radio communications education with hands-on exercises to empower first responders providing medical aid in rural communities. The exercises—such as properly using and securing radio channels during a medical emergency, accurately accessing the statewide communications system, and using a bleeding control kit until medical assistance arrives—highlight some of the program's successes, which led to at least eight lives saved since its inception.

UMMC was awarded additional REMCDP funding in FY 2018 and FY 2020 to offer refresher First Hands Program courses, develop the First Voice Program, which expanded the efforts to all Mississippi public safety communication personnel and dispatchers, and develop just-in-time training for rapid deployment during an emergency like those during recent COVID-19 pandemic response efforts.[151] The new training programs have remained in high demand throughout the state and led to thousands of trained participants who can help bridge the gap between public safety personnel and medical professionals.[152]

importance of continuity plans and mitigation efforts to limit impacts on healthcare personnel and facilities for public health emergencies. Medical facilities and providers with plans are more equipped to sustain their missions, core essential functions, and services for patients already receiving care, and reduce exposure for staff by following established guidelines. Continuity plans may help overcome preparedness challenges, such as addressing potential patient surges when faced with space, staffing (including leadership), and equipment/supply constraints.[154] Continuity plans are also important for business continuity and can help organizations mitigate climate change impacts on the global economy. Climate change affects a broad spectrum of businesses and all aspects of supply chains, including producers and manufacturers, suppliers, distributors, retailers, and consumers (**Figure 16**).[155,156]

Recognizing the significant impact climate change will have on the global economy, many private sector businesses have activated or developed continuity plans and other preparedness policies to build business resilience. For example, an increasing number of global Fortune 500 companies have adopted climate targets for their operations to reduce their environmental impacts and increase their climate resiliency.[157] As of October 2020, 32.6% of global Fortune 500 companies adopted at least one climate target.[158] Additionally, most S&P 500 companies now publish sustainability reports, rising from just 20% of that group in 2011 to over 90% in 2019.[158] Although these statistics are encouraging, on a global scale, many businesses need to adopt preparedness policies to support continuity and business resilience. Without these policies in place, businesses may have heightened risk exposure to the impacts of climate change and may experience more significant financial impacts.

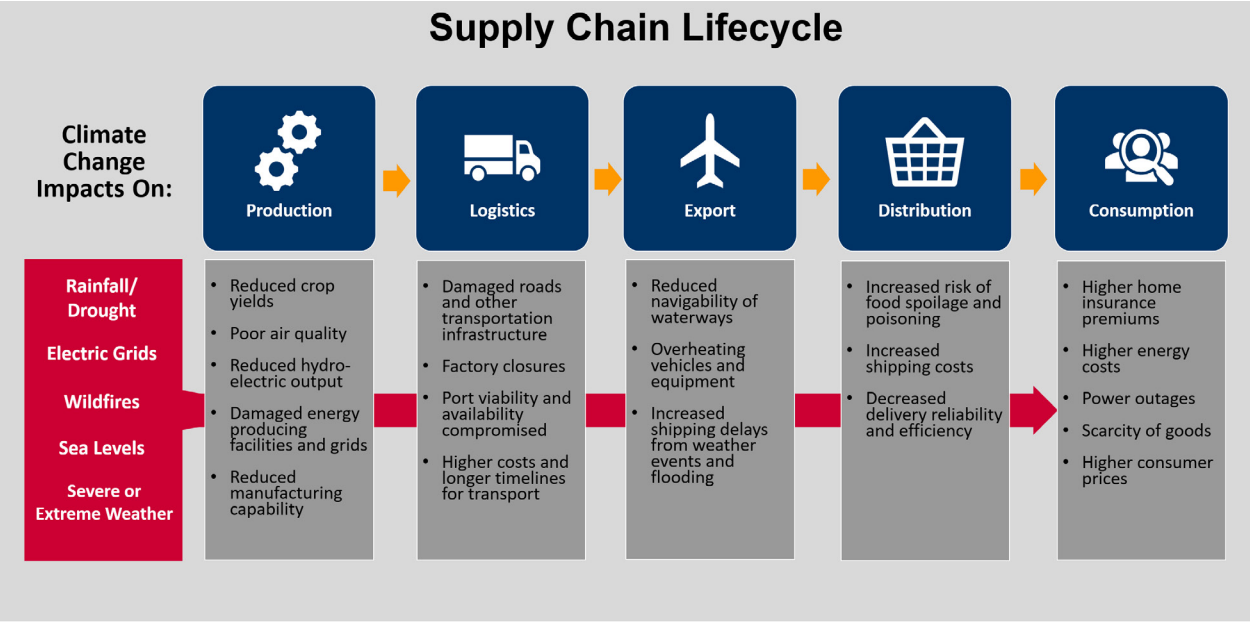


Figure 16: Examples of climate change impacts to each step of the supply chain.[155,156]

Reduce Risk Exposure of Privately-Held Infrastructure and Other Assets

In May 2021, President Biden issued Executive Order (EO) 14030: Climate Related Financial Risk. This Executive Order notes how the intensifying impacts of climate change present physical risks to the financial sector, including assets, publicly traded securities (i.e., stocks), private investments, and companies.[159] EO 14030 seeks to increase private sector disclosure of physical risks such as supply chain disruptions and transition risks associated with the global shift away from carbon-intensive energy resources.[159] Although primarily directed at federal entities, the order highlights the association of private and federal financial programs, assets, and liabilities. The EO underscores that hazard mitigation, climate mitigation, and climate adaptation efforts are not just for the public sector; the private sector must also take steps to reduce its risk of exposure to the impacts of climate change. The EO highlights this through climate finance. Climate finance is "local, national, or transnational financing—drawn from public, private, and alternative sources of financing—that seeks to support mitigation and adaption actions that will address climate change."[157]

In response to EO 14030, the Financial Stability Oversight Council released a Report on Climate-Related Financial Risk in October 2021 with four overarching recommendations to strengthen the financial system, decrease its vulnerabilities, and increase its resilience to climate shocks:[159,160]

1. Build capacity and expand efforts to address climate-related financial risks
2. Fill climate-related data and methodological gaps
3. Enhance public climate-related disclosures
4. Assess and mitigate climate-related risks that could threaten the stability of the financial system

Since 2017, private sector climate investments have increased by 13% from approximately $274 billion in 2017/18 to $310 billion in 2019/2020.[161] Corporations account for the largest source of private financial flows in 2019/2020, culminating at around 40%.[161] While corporations accounted for the largest share of private climate finance, commercial financial institutions made the biggest stride in growth, increasing their share from 18% in 2017/2018 to 39% in 2019/2020 ($122 billion).[161] In 2019/2020 direct climate finance from institutional investors and funds was around $3.2 billion and $5.3 billion, respectively, mostly within the renewable energy sector.[161] Nevertheless, this amount still falls short of the amount of investment required to avoid the worst impacts of climate change on the nation's communities.[vii] As demonstrated in **Figure 17**, to achieve the transition to sustainable net zero emissions and a resilient world, climate finance flows must increase dramatically at the global level—by at least 590%—by 2030.[161]

Private capital is vital for boosting investments in risk mitigation measures such as sustainable energy transitions and critical infrastructure updates.[162] While developing new and innovative resiliency-building strategies, the private sector can focus on digitalization, decarbonization, and diversification.[162]

Understanding the supply chain is also critical to private and public sectors. Supply chain risks include the limited availability or lack of raw goods to finish products or maintain the safety of products, as well as the potential for malware to infect supply chain systems. Increased understanding and visibility of the supply chain helps ensure security, resilience, and quality. In May 2022, NIST published *Cybersecurity Supply Chain Risk Management Practices for Systems and Organizations*, which guides organizations on identifying, assessing, and mitigating cybersecurity risks throughout the supply chain at all levels of their organizations.[164] The guidance resulted from a multi-year effort with drafts published in 2020 and 2021.[164] The public and private sectors can use this guide to inform supply chain studies to understand supply chain risks better.[164] Similarly, in 2021 CISA's Information and Communications Technology (ICT) Supply Chain Risk Management Task Force—a private-public partnership founded by the Department of Homeland Security (DHS) in 2018—produced several resources to help the private and public sectors identify challenges and develop actionable solutions to enhance global ICT supply chain resilience.[165,166,167,168]

vii At the 2015 UN Climate Change Conference (COP21) in Paris, France, world leaders agreed to try and limit global warming to 1.5°C above pre-industrial levels. If planetary warming surpasses the 1.5°C threshold, the anticipated risks to health, livelihoods, food security, water supply, human security, and economic growth will increase. The severity of impacts from climate-related disasters (e.g., hurricanes, coastal flooding, droughts, wildfires) will also increase exponentially relative to the amount of warming. Source: IPCC, 2018: Summary for Policymakers. https://www.ipcc.ch/sr15/chapter/spm/

INCREASE EQUITY IN INDIVIDUAL AND COMMUNITY PREPAREDNESS

Several societal factors play a role in determining how severely a disaster may impact a community, including but not limited to, household composition, number of persons with daily access and functional needs, access to technology, minority populations, language barriers, housing types, and income level.[169] Socially vulnerable populations often experience social exclusion, which may lead to inaccurate representation of these groups in emergency management planning and preparedness efforts.[170,171,172,173] Without an accurate picture of socially vulnerable populations, resources may not reach those most likely to face structural and procedural barriers to assistance.[172] All these factors may hinder communities' preparedness for and recovery from disasters.

Effective disaster response and recovery depend on individual and community preparedness, particularly in the first 72 hours of an incident. However, maintaining individual-level preparedness may be difficult for socially vulnerable populations who lack the resources, time, or ability to sufficiently prepare for disasters.[1] If many community members are socially vulnerable and inadequately resourced, the collective risk for adverse outcomes in a disaster increases.

The nation has progressed in addressing the social vulnerabilities that exacerbate the risks posed by disasters. At the federal level, FEMA has engaged in equity discussions directly with SLTT governments to reduce unnecessary barriers to program participation and improve program effectiveness, better serve all communities, increase equity in its programs and services, and promote preparedness.[174] There remains a strong need to increase access to resources for individuals most likely to face barriers so they may better prepare for and build resilience to disasters. This section highlights how increasing community preparedness through federal resources begins, informed by 1) data-driven analysis and understanding of communities with vulnerable populations who face the greatest disaster risks; and 2) both current and emerging collaborative dialogue and cooperation between all levels of government, sectors, and populations. Joint efforts from the White House's Domestic Policy Council, National Security Council, and Office of Management and Budget began by

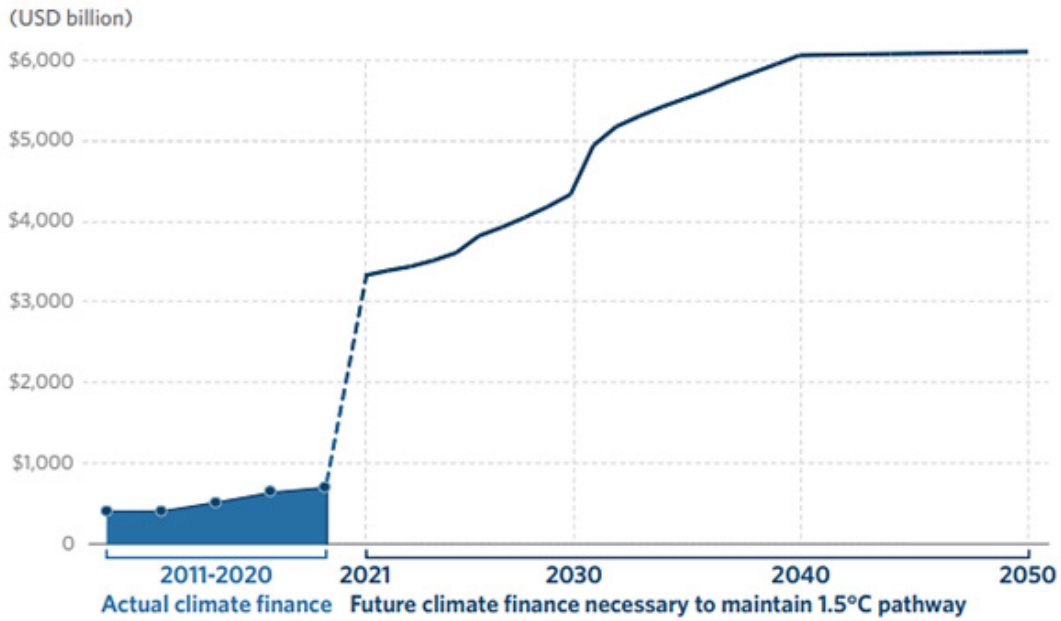


Figure 17: Global tracked climate finance flows and the average estimated annual climate investment needed through 2050 to maintain 1.5°C pathway.[161]

assessing how traditionally underserved populations can access federal disaster recovery assistance programs equally compared to other communities. Relying heavily on support from agencies across the emergency management spectrum, federal agencies identified a series of programs to improve the equitable delivery of services within one year. While significant progress occurred in 2022, considerable progress needs to continue.

Leverage Data to Understand the Factors Increasing Risk to Socially Vulnerable Populations

To address equity in individual preparedness, all levels of government and nongovernmental stakeholders—such as community-based organizations—should attempt to leverage and analyze data to understand better what factors expose socially vulnerable populations to higher risk. **At the local level, emergency managers should consider the individual social vulnerability characteristics within their communities when designing or updating community plans and engaging in other preparedness activities.**[1]

The federal government has developed several tools and resources that emergency managers can use to address equity in individual and community preparedness. Ready.gov has resources for individuals with access and functional needs, including people who achieve independence through assistive aids and service, to prepare for emergencies and disasters. FEMA's NRI data-driven online mapping application models use community risk to 18 natural hazards alongside social vulnerability and community resilience at the county level; providing a holistic view of the relationship between risk and vulnerability.[186] The NRI's social vulnerability filter is based on data from the University of South Carolina's SVI for the United States. It includes data on 29 socioeconomic variables that contribute to social vulnerability. **Eight of these variables explain nearly 80% of the national variations in social vulnerability: wealth, race and social status, age, ethnicity and lack of health insurance, persons with access and functional needs, service sector employment, race, and gender.**[187,188,84] Communities can use the NRI's powerful functions to understand their unique risk profiles and take actions to promote greater preparedness for disasters (e.g., risk communication and engagement, education for homeowners and renters, and community-level planning efforts).[186]

The CDC maintains the CDC/ATSDR SVI database.[86] The CDC/ATSDR SVI database helps emergency managers and public health professionals identify, map, and plan support for communities that most likely need support before, during, and after a public health emergency.[86] The first version of the CDC/ATSDR SVI database was published in 2011. The tool is continually evolving with technological advancements

STATE COORDINATION FOR FOREST MANAGEMENT

Wildfires do not recognize distinctions between public and privately owned land. The California Forest Improvement Program (CFIP) is the state's primary landowner assistance program.[163] This forestry cost-share program provides funds to non-industrial private forest landowners with ownerships of less than 5,000 acres of timberland for a variety of practices, including management plans, supervision, site preparation, planting, thinning, pruning, release, land conservation, improvement of fish and wildlife habitat, and fuels reduction.[163] CFIP encourages private and public investments in forest lands and resources. These investments within the state ensure adequate future high-quality timber supplies, related employment, and other economic benefits and work to protect, maintain, and enhance the forest resource for the benefit of present and future generations.[163] Since the program's establishment, CFIP has helped landowners with forest improvement activities on over 1,000,000 acres.[163] In 2020, the California Department of Forestry and Fire Protection developed the Wildfire Resilience Block Grant program to provide financial and technical forestry assistance to non-industrial forest landowners.[163] The grantee organization serves as the project lead and provides forest management technical and financial assistance to landowners.[163] This grant opportunity maintains the flexibility to meet the emerging needs of private forestland landowners.[163]

and community needs.[86] **Examples such as the current SVI tools could be expanded upon by the emergency management community to create equity and data analysis tools specific to emergency management.**

Another useful tool is the Housing and Urban Development (HUD) *Planning Guide for Local Jurisdictions*. This tool outlines an inclusive community planning process that brings together organizations and individuals who can address the needs of the homeless and other vulnerable populations in disasters. Homeless populations are marginalized in planning processes but lack access to resources after disasters. The guide provides guidance on steps communities can take to account for people experiencing homelessness in disaster plans.[189] HUD also created the *Disaster Recovery Homeless Toolkit*, which local stakeholders can use to enhance disaster response for vulnerable populations.[190] Communities can use these resources to assist in building their local resiliency.

In partnership with several FEMA regions, FEMA's Individual and Community Preparedness Division developed a variety of publicly available webinars and training courses that address how individuals and communities can increase equity in preparedness.[191,192] The training and webinars address how to create:

- Individual emergency preparedness plans to ready oneself and one's family
- Culturally inclusive programs to prepare and train non-English-speaking community members in disaster preparedness
- "Communities of strength" to prepare older individuals and senior serving organizations for disasters
- Community response plans that address preparedness and response considerations for LGBTQ+ people
- Community planning programs that integrate the needs of children during emergencies
- Preparedness actions, trends, and perceptions of individuals in historically underserved communities, including primarily non-English-speaking households, senior people, those living in rural areas, people who function with the use of assistive aids and services, socioeconomically disadvantaged people, and individual races and ethnicities

Increase Equitable Access to Disaster Risk Reduction Resources for Individuals, Communities, and SLTT Governments Across the Nation

Many FEMA programs, including those for mitigation and recovery, are directed at individuals who own property. Tribal communities, lower-income households, individuals who experience homelessness, and renters sometimes face challenges when trying to participate in federal programs simply because they have minimal incorporation in the program process. Recent efforts to mitigate this disparity by FEMA include removing barriers to disaster assistance, increasing outreach, and monitoring the uptake of government resources by communities to facilitate more equitable outcomes.[1] For example, in 2021, **FEMA requested authority to collect demographic data from disaster relief applicants to determine if discrimination exists in the agency's aid distribution.** FEMA will use this information and data collected through these efforts, including anecdotal and qualitative data, to formulate recovery and mitigation plans, make changes to address gaps in services and barriers, and to ensure that plans do not disproportionately exclude or negatively affect populations in violation of federal civil rights laws.

Small and mid-sized business owners are another group that often experience challenges in recouping losses after a disaster, often because of a lack of preparedness and awareness of aid programs. Minority-owned businesses are especially vulnerable in the aftermath of disasters and may incur higher losses. Data from the 2021 Small Business Credit Survey indicates that **declines in revenue and employment were most severe for firms owned by people of color between 2019 and 2020.**[199] Despite experiencing greater losses, minority-owned firms were less likely to apply for Small Business

Administration (SBA)-administered loans such as the Paycheck Protection Program (PPP) (**Figure 18**).[199] By not applying for these loans, minority business owners may experience compounding effects that further inhibit recovery after disasters.[viii]

Local governments have taken the initiative to help business owners prepare for and recover from disasters. The City of Austin, Texas, Small Business Division has developed an English-Spanish disaster preparedness and disaster recovery resource site to aid businesses affected by economic and natural disasters.[200] The site encourages Austin's small businesses to create preparedness and communications plans, assess risks, and review bank and insurance policies to protect businesses and employees.

Besides small and minority-owned businesses, certain individuals struggle to build resilience and may have difficulty accessing risk reduction resources. Older populations and individuals disempowered by lack of access to routine assistive aids such as wheelchair ramps and services such as American Sign Language are likely to be more vulnerable to disasters. These populations may achieve independence through the use of assistive aids and services.[201] This higher level of vulnerability may stem from these populations'

SOCIAL VULNERABILITY IN LOCAL COMMUNITIES

Poverty is one of the primary drivers of social vulnerability. In 2021, the national poverty rate rose from a 60-year low to 11.4%, or approximately 37.2 million people, as the COVID-19 pandemic upended the U.S. economy.[175] In March 2021, more than a third of households, including half of Latino and African American households, had difficulties paying for life-sustaining necessities.[176] Within this group, some individuals experienced poverty more than others. For instance, the poverty rate among Black persons was the highest, at 19.5%. Nearly 25% of people without a high school diploma were in poverty (compared to less than 4% of people with a bachelor's degree or higher). Women are still more likely to live in poverty, partly because of the pay gap between men and women and job prospects.[175] In 2020, women earned annually, on average, 83.1.% of male earnings for median hourly earnings of both full- and part-time workers.[177,178] The COVID-19 pandemic hindered women's advancement in closing the pay gap, as layoffs in the workforce and limited childcare affected women in nearly every sector.[179] In January 2021, women's participation rate in the labor workforce was at 55.7%, the same percentage in October 1986.[179] These factors make it challenging for vulnerable groups to save and build wealth and to allocate some of their already limited income for disaster preparedness.[1] For context, whereas the median U.S. household income was $67,521 in 2020, the income of a family of four living in poverty was just $26,246.[175]

Other indicators of social vulnerability are harder to quantify but are nonetheless important considerations when calculating risk on an individual and community level. For example, due to systemic discriminatory practices in land use and development during the mid-20th century—a practice also known as "redlining"—some individuals today are more likely than others to live in areas at high risk of disaster impacts and are less equipped to absorb the financial impact of disasters. Redlining has historically impacted Black persons and other persons of color. For decades, federally backed mortgages and additional credit were declined for people in redlined areas, fueling a cycle of disinvestment in those communities.[180] Today these communities—which have more industry, paved surfaces, and consistently fewer trees and green spaces such as parks—are exposed to summer temperatures that are as much as 20 degrees Fahrenheit higher than wealthier, majority-white communities in the same locality.[180] However, these communities do not have the resources to prepare for and cope with hazards like heat waves exacerbated by climate change.[181,182]

The investigations of the 2016 flooding incident in Lumberton, NC, conducted by NIST and the NIST Center of Excellence for Risk-Based Community Resilience Planning, resulted in a combined engineering and social science field study protocol that provides a quantitative linkage between flood damage and socio-economics. The initial findings showed displacement to be higher for black and Native American households than for white households. These findings were primarily because households of color were much more likely to be residing in housing located in flood zones.[183] Subsequent reports found connections between populations and their rate of recovery, namely that social vulnerabilities related to race, ethnicity, income, tenancy status, and education levels had the largest impact on recovery rates.[184,185]

viii SBA will be building out additional content on SBA.gov to provide an additional resource where small businesses can obtain information and resources for business owners to better build resilience before a disaster and tools to facilitate their recovery after a disaster.

reliance on hearing, learning, mobility, or seeing services that may be disrupted for extended periods of time during a disaster. Individuals with access and functional needs are also at increased risk of experiencing severe effects from diseases, as observed throughout the COVID-19 pandemic. In January 2022, **patients with disabilities were 36% more likely to have longer hospital stays and faced 77% more readmissions after contracting COVID-19 than those without disabilities**.[202] Individuals with disabilities have been impacted harshly in other disasters, especially by wildfires in western states in recent years. During the 2018 California wildfire season, of those displaced or affected, 7.2% required assistive aids to hear, 11.8% required ambulatory aids, 11.4% required assistance with cognition, and 10.2% relied on the aid and attendance of another person.[201] More recently, communities in the path of the 2021 Dixie Fire in Northern California struggled to protect their disabled and older residents.[203] The impacted area is home to a significant population of people with disabilities—the percentage in the area is roughly twice the state average—who live in largely rural areas that lack the critical infrastructure and resources needed to support them during disasters.[203] Many people with disabilities can access resources and tools once provided the services necessary to help build resilience. The federal government has taken these concerns into account and has responded with actionable initiatives, such as FEMA's Individuals with Disabilities page referenced above.[204]

COVID-19 VACCINE ROLLOUT

The COVID-19 pandemic posed an enormous national challenge in 2021 and continues to stress capabilities across the country. A critical success of the response against the COVID-19 pandemic was the rapid development of the Food and Drug Administration (FDA) approved Pfizer-BioNTech and Moderna vaccines, and FDA-authorized Johnson & Johnson vaccine to protect against virus transmission and reduce the severity of symptoms if transmitted. This rapid vaccine development enabled an overall successful vaccine distribution with 243,527,564 million having received at least one dose of the COVID-19 Vaccine in the U.S. as of December 30, 2021.[193]

Another success of the response to the COVID-19 pandemic was ensuring equity in the vaccine rollout.[1] In 2021, the federal government established several programs to support the equitable distribution of COVID-19 vaccines aimed at higher-risk communities, high transmission areas, or those areas with high vulnerability ratings based on the CDC's Social Vulnerability Index.[194] For instance, the Health Resources and Services Administration (HRSA) established 18 Federal Pilot Community Vaccination Centers to distribute vaccinations in high-risk areas. HRSA and the CDC established the Health Center COVID-19 Vaccine Program, which continues to allocate vaccine doses to health centers nationwide. Over 91% of the eligible health centers' patients fall at or below 200% of the Federal Poverty Guidelines.[194] In 2021, an anthropological study conducted by FEMA found that cultural brokers—individuals in the local community who help connect emergency managers to under-resourced communities—are key to understanding community hesitancies and identifying opportunities to build confidence in the vaccines and share accurate information throughout many types of disasters.[195] Engaging with cultural brokers can support operations in unfamiliar, historically underserved, or more vulnerable areas, and lead to reducing communication breakdowns and facilitating cross-cultural communication pathways.[196,1]

COVID-19 COMPARATIVE ANALYSIS

FEMA Region 1, in coordination with the HHS Office of Assistant Secretary for Preparedness and Response and the USACE Engineer Research and Development Center scientists, developed several predictive analytics products to support public health decision-making and emergency response. One such product, the COVID-19 Comparative Analysis: Policy Decision Tool, visualizes information from various data sources to derive narratives regarding disrupted and vulnerable populations, the extent of disruptions, and how they change over time. Using metrics from across federal agencies, the tool further evaluates how COVID-19 outbreaks and policy changes impact disenfranchised communities and indicates where assistance might be needed, given shifting trends. Specifically, this tool provides insight into public health impacts against the backdrop of state policy changes.

In testimony before the Congressional Committee on Homeland Security, the Government Accountability Office (GAO) noted in its preliminary analysis of recovery outcomes and participation in federal disaster recovery programs, that better-resourced communities—that is, communities with more staff, funding, time, government revenue, capital outlay, or budgets for emergency management—participated more actively in select federal programs.[205] In addition, GAO noted that **not all tribal nations have sufficient funding to develop emergency management departments, which in and of itself can be a barrier to accessing federal resources**.[205] FEMA and some SLTTs have recognized that disparities exist in accessing tools and resources to build individual and community resilience and have taken steps to address these gaps. **However, FEMA and SLTT governments must continue working together to ensure that all communities—especially those that are disadvantaged—are aware of the many resources available to them and receive the support they need to effectively leverage these resources and build greater resiliency at the individual and community level.**

EQUITABLE POLICY IN ACTION

In September 2021, FEMA implemented three significant alterations to its federal Individual Assistance Policy.[198] These steps advanced the equitable treatment of more individuals/survivors impacted by disasters.[ix] FEMA broadened the range of homeownership and occupation documentation while simultaneously expanding housing assistance and financial aid forms provided to survivors.[198]

The **first step** FEMA implemented was allowing new forms of documentation to prove home ownership/occupancy.[x] Now, FEMA accepts motor vehicle registration, court documents, letters from social service organizations, federal/state benefit providers, and local schools.[198] This practice reduces the administrative burden on the hardest-hit survivors of disasters.

The **second step** is providing FEMA-sponsored Other Needs Assistance grants for homeowners affected by disaster-caused property damages without rendering the home uninhabitable.[198] Creating new forms of housing assistance supports renters and homeowners otherwise ineligible for other FEMA aid while protecting individuals from potential health and safety concerns posed by partially damaged homes.

The **third step** revolves around financial assistance for disaster-caused disabilities.[198] FEMA amended its policy to provide financial aid for individuals with disaster-caused disabilities and require special components for their homes such as ramps or grab bars, to make one's home safe.

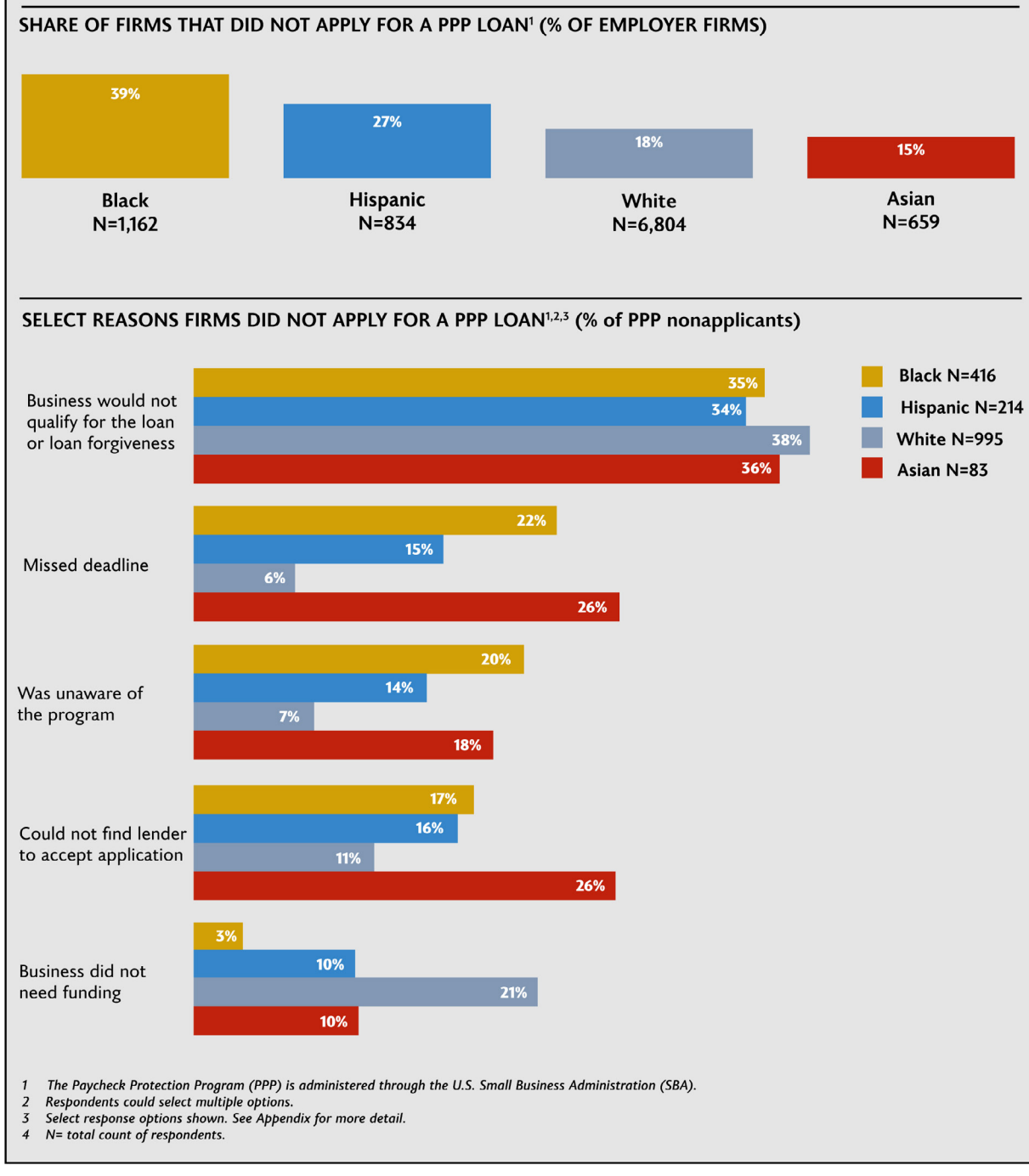
FEMA implemented these equitable steps in the Individual Assistance Program and Policy Guide 1.1 and across the entire agency in 2021.

ix Due to the recent implementation of this policy, limited data is available on the effectiveness of the program.

x For more information, please refer to Verifying Home Ownership or Occupancy.

EMERGENCY FUNDING
PPP Nonapplicants

Black- and Hispanic-owned firms were less likely to apply for a PPP loan. Firms owned by people of color were more likely than white-owned firms to report that they missed the deadline or were unaware of the program.



1 *The Paycheck Protection Program (PPP) is administered through the U.S. Small Business Administration (SBA).*
2 *Respondents could select multiple options.*
3 *Select response options shown. See Appendix for more detail.*
4 *N= total count of respondents.*

Figure 18: Nonapplicants for SBA PPP loans, and reasons for not applying.[199]

CONCLUSION

The 2022 NPR provides an overview of the nation's current risk landscape. While the 2020 and 2021 NPRs contained risk discussions centered on risk types, FEMA considered risks holistically for the 2022 NPR. In particular, the 2022 NPR contains a deeper dive into long-term, persistent vulnerabilities and risks that can impact preparedness for other hazards. These include climate change, physical and technological risks, and equity and social vulnerability.

This report also includes an evaluation of national capabilities that helps clarify the nation's preparedness and resilience against all threats and hazards, and management opportunities for closing capability gaps to prepare for them. By building and sustaining the capabilities needed to prevent, protect against, mitigate, respond to, and recover from threats and hazards across the whole community, the nation becomes more resilient in the face of emergencies and disasters.

Like prior years' NPRs, the 2022 NPR includes a review of capability data submitted by SLTTs through the THIRA/SPR. Reporting of THIRA/SPR data by communities allows FEMA and the federal government to understand capability needs and informs federal planning and preparedness efforts, including federal grants focused on building and sustaining community capabilities.

The 2022 NPR also identifies potential management opportunities that the federal government, NGOs, community-based organizations, research institutions/universities, SLTTs, and the private sector can use to build capability and address capacity gaps. Building community-wide resilience to climate change helps form the foundation for successful response and recovery efforts. Ensuring effective community resilience also requires all government levels to involve and work with the private sector. Finally, all levels of government should work to maximize equity in individual and community preparedness to ensure equitable responses and outcomes to disasters across the whole community.

APPENDIX A: ACRONYMS

ATSDR: Agency for Toxic Substances and Disease Registry

BRIC: Building Resilient Infrastructure and Communities

CDC: Centers for Disease Control and Prevention

CFIP: California Forest Improvement Program

CISA: Cybersecurity and Infrastructure Security Agency

COVID-19: Coronavirus Disease 2019

D-SNAP: Disaster Supplemental Nutrition Assistance Program

EPA: Environmental Protection Agency

ESF: Emergency Support Functions

FBI: Federal Bureau of Investigation

FDA: Food and Drug Administration

FEMA: Federal Emergency Management Agency

FMA: Flood Mitigation Assistance

FSLTT: Federal, State, Local, Tribal, and Territorial

FY: Fiscal year

GAO: Government Accountability Office

HHS: Department of Health and Human Services

HRSA: Health Resources and Services Administration

HSGP: Homeland Security Grant Program

HUD: Department of Housing and Urban Development

ICT: Information and Communications Technology

IIJA: Infrastructure Investment and Jobs Act

IRPF: Infrastructure Resilience Planning Framework

LGBTQ+: Lesbian, Gay, Bisexual, Transgender, and Queer Persons

APPENDIX A: ACRONYMS

NASA: National Aeronautics and Space Administration

NCF: National Critical Functions

NCST: National Construction Safety Team

NFIP: National Flood Insurance Program

NGO: Non-Governmental Organization

NHS: National Household Survey

NIMS: National Incident Management System

NIST: National Institute of Standards and Technology

NOAA: National Oceanic and Atmospheric Administration

NPR: National Preparedness Report

NQS: National Qualification System

NRC: Nuclear Regulatory Commission

NRCA: National Risk and Capability Assessment

NRI: National Risk Index

National SPR: National Stakeholder Preparedness Review

PCO: Plausible Concurrent Operations

PKEMRA: Post-Katrina Emergency Management Reform Act

PPD: Presidential Policy Directive

PPP: Paycheck Protection Plan

PROTECT: Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation

P3: Private-Public Partnership

REMCDP: Rural Emergency Medical Communications Demonstration Project

SBA: Small Business Administration

SLTT: State, Local, Tribal, and Territorial

SPoRT: Short-Term Prediction Research and Transition project

SPR: Stakeholder Preparedness Review

STORM Act: Safeguarding Tomorrow through Ongoing Risk Mitigation Act

SVI: Social Vulnerability Index

THIRA: Threat and Hazard Identification and Risk Assessment

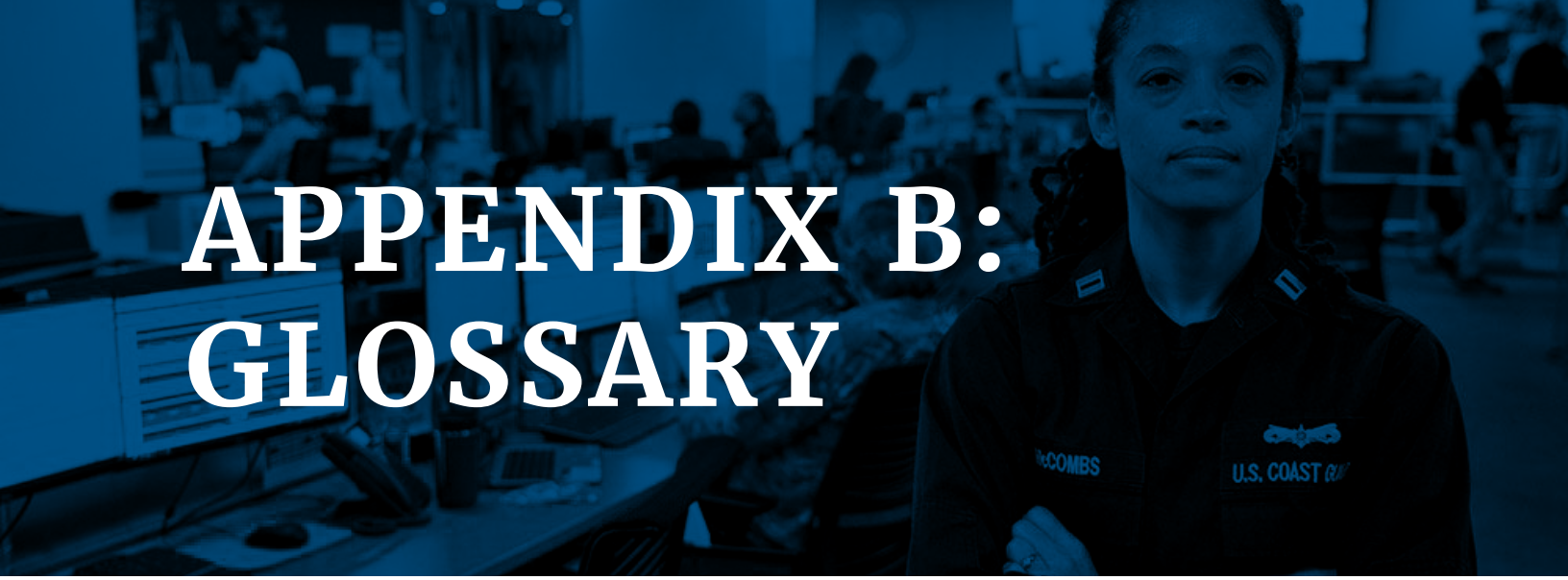
UASI: Urban Area Security Initiative

UMMC: University of Mississippi Medical Center

USACE: United States Army Corp of Engineers

USDA: United States Department of Agriculture

US&R: Urban Search and Rescue



APPENDIX B: GLOSSARY

Access and functional needs: Individuals having access and functional (AFN) needs may include, but are not limited to, individuals with disabilities or individuals who may be regarded as disabled, older adults, and individuals with limited English proficiency, limited access to transportation, and/or limited access to financial resources to prepare for, respond to, and recover from an emergency.[8]

Building Private-Public Partnerships: This guiding document provides best practices for jurisdictions to establish and maintain a private-public partnership (P3) to help coordinate mitigation, response, and recovery planning and preparedness, and increase community resilience.[149]

Building Resilient Infrastructure and Communities: Supports state, local, tribal, and territorial (SLTT) governments as they undertake hazard mitigation projects, limiting risks faced from disasters and natural hazards. The program's guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency.[98]

California Forest Improvement Program: California's primary landowner assistance program.[163]

Capability assessment: The process of identifying how a community's capabilities have changed over the last year and how those changes affect the community's current capability.[90]

Capability gap: The difference between the capability target a community sets in the Threat and Hazard Identification and Risk Assessment (THIRA) Step 3 and the current capability the community determines in the Stakeholder Preparedness Review (SPR) Step 1.[206]

Capability goal: The amount of capability a community aims to achieve.[206]

Capability target: The specific and measurable metrics that describe the capabilities a community needs to manage potential catastrophic incidents.[223]

Cascading impacts: A "domino effect" risk phenomenon related to increasingly interconnected systems, in which a disruption or failure of one system causes impacts that lead to additional disruptions or failures in other, dependent systems.[207]

Catastrophic incident: A natural disaster or act of terrorism, or other man-made disaster that results in extraordinary levels of casualties or damage or disruption severely affecting the population (including mass evacuations), infrastructure, environment, economy, national morale, or government functions in an area.[8,207]

APPENDIX B: GLOSSARY

Catastrophic risks: Catastrophic risks are distinguished by the scale of their impacts. These risks can result from natural, human-caused, or technological incidents. Some examples of catastrophic impacts are widespread damage to buildings and infrastructure, mass casualties or injuries, severe impacts to the environment, or significant disruptions to basic life-sustaining services or government functions.[207]

Coastal Resilience Master Plan: An ongoing, state-led coastal planning effort coordinated by the states of Texas, New Jersey, Virginia, and Louisiana, that seeks to restore, enhance, and protect the coastlines.[135,208,209,210]

Community: A group of people living in the same locality and under the same government, or a political subdivision of a state or other authority that has zoning and building code jurisdiction over a particular area."[211]

Community Lifelines: The community lifeline construct is a model that documents the status of indispensable services that enable the continuous operation of essential business and government functions and is critical to human health and safety and/or national economic security. Community Lifelines are a common lens which all responders can use to assess whether critical lifesaving and life-sustaining services are disrupted and, if so, which Core Capabilities are required to provide and restore those services.[212]

Community THIRA and SPR: Threat and Hazard Identification and Risk Assessment (THIRA) and Stakeholder Preparedness Review (SPR) completed by States, Urban Areas, Tribes, and Territories.

Consequence: Effect of an event, incident, or occurrence.[8]

Continuity plans: Continuity plans enable communities and organizations to continue essential functions and provide critical services across a broad spectrum of emergencies when normal operations are disrupted.[153]

Core Capability: Thirty-two distinct critical elements necessary to achieve the National Preparedness Goal.[89]

Coronavirus Disease 2019 Comparative Analysis: Policy Decision Tool: This tool was developed by Federal Emergency Management Agency (FEMA) Region 1, in coordination with the United States Department of Health and Human Services (HHS) Office of Assistant Secretary for Preparedness and Response (ASPR) and the United States Army Corps of Engineers (USACE) Engineer Research and Development Center scientists. It is designed as a predictive analytics product to support public health decision-making and emergency response. The tool further enables evaluation of how disenfranchised communities are impacted by coronavirus disease 2019 (COVID-19) outbreaks and policy changes through visualization methods.[213]

Critical infrastructure: Systems and assets, whether physical or virtual, so vital that the incapacity or destruction of such may have a debilitating impact on the security, economy, public health or safety, environment, or any combination of those matters, across any federal, state, regional, territorial, or local jurisdiction.[8]

Disaster Recovery Reform Act: Provides a number of tools for FEMA and other federal and state actors to better respond to natural disasters, and specifically provides a dedicated funding stream for proactive disaster mitigation.[96]

Disaster Relief Fund: Federal legislation that provides an appropriation against which FEMA can direct, coordinate, manage, and fund eligible response and recovery efforts associated with domestic major disasters and emergencies that overwhelm state resources pursuant to the Robert T. Stafford Disaster Relief and Emergency Assistance Act.[214]

Disaster Supplemental Nutrition Assistance Program: Offers short-term food assistance that benefits families recovering from disasters. It also helps people returning to their homes and who have access to electricity and grocery stores.[82]

Emergency Operations Plan: A document that assigns responsibility to organizations and individuals for carrying out specific actions at projected times and places in an emergency that exceeds the capability or routine responsibility of any one agency.[215]

APPENDIX B: GLOSSARY

Emergency Support Functions: A way to group functions that provide federal support to states and federal-to-federal support after an incident. Emergency support functions (ESF) provide the structure for organizing, planning, and deploying interagency support for a Federal response to Stafford Act declared disasters and emergencies and for non-Stafford Act incidents. The nation's 15 ESFs include: transportation; communications; public works and engineering; firefighting; information and planning; mass care, emergency assistance, temporary housing, and human services; logistics; public health and medical services; search and rescue; oil and hazardous materials response; agriculture and natural resources; energy; public safety and security; cross-sector business and infrastructure; and external affairs.[216]

Emerging risks: Emerging risks are either new risks or familiar risks that evolved due to new or unfamiliar conditions; and therefore, often lack the historic data traditionally used to assess risk. Emerging risks can appear suddenly and often arise from advancements in technology or changes in the threat environment.[207]

Event: Planned, non-emergency activity occurring in a particular place during a particular interval of time.[8]

Equity: The consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment, such as Black, Latino, and Indigenous and Native American persons, Asian Americans and Pacific Islanders and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality.[83]

Executive Order 13985: This Executive Order (Advancing Racial Equity and Support for Underserved Communities Through the Federal Government), is focused on promoting and strengthening the federal workforce by promoting diversity, equity, inclusion, and accessibility. [83]

Executive Order 14030: An Executive Order on Climate-Related Financial Risk, noting how the intensifying impacts of climate change present physical risks to the financial sector, including to assets, publicly traded securities, private investments, and companies.[159]

Function: A service, process, capability, or operation performed by an asset, system, network, or organization.[8]

Hazard: A source or cause of harm or difficulty. A hazard also differs from a threat in that a threat is directed at an entity, asset, system, network, or geographic area. A hazard is not directed.[8]

Homeland Security Grant Program: A federal program with three components—the State Homeland Security Program (SHSP), Urban Area Security Initiative (UASI), and Operation Stonegarden (OPSG)—that supports enhancing the ability of state, local, tribal, and territorial governments, and nonprofits, to prevent, protect against, respond to, and recover from terrorist attacks.[217]

Impact: The measure of effect or influence of an action, person, or thing on another; may occur as either direct or indirect results of an action.[8]

Incident: A natural, technological, or human-caused occurrence that may cause harm and that may require action.[8]

Individual Assistance Policy: DHS announced three immediate steps FEMA is taking to reduce barriers to access experienced by underserved populations through programs that provide individual assistance to disaster survivors. FEMA will now accept a broader range of homeownership and occupancy documentation and expand the forms of assistance offered to survivors. These changes to FEMA's Individual Assistance (IA) program were made to ensure equal access is available to all survivors through FEMA programs.[198]

APPENDIX B: GLOSSARY

Infrastructure Investment and Jobs Act: Authorizes $1.2 trillion for transportation and infrastructure spending. Some of this funding is directed at tackling the climate crisis and strengthening the nation's resilience, including in underserved communities that are most vulnerable. The Act provides $6.8 billion that FEMA will invest in communitywide mitigation to reduce disaster suffering and avoid future disaster costs in the face of more frequent and severe events arising from wildfires, droughts, hurricanes, tornados, floods, and other natural hazards.[80]

Likelihood: The chance of something happening, whether defined, measured, or estimated objectively or subjectively, or in terms of general descriptors (e.g., rare, unlikely, likely, almost certain), frequencies, or probabilities.[8]

Mission area: The basis for all operational activities. Mission areas define the full spectrum of operations, including Prevention, Protection, Mitigation, Response, and Recovery.[8]

Mitigation: Ongoing and sustained action that eliminates or reduces the potential effects of hazards.[8]

Mutual aid: Agreements that establish the terms under which one party provides resources—personnel, teams, facilities, equipment, and supplies—to another party.[218]

National Critical Functions: The functions of government and the private sector so vital to the United States that their disruption, corruption, or dysfunction would have a debilitating effect on security, national economic security, national public health or safety, or any combination thereof.[146]

National Emergency Communications Plan: Created to strengthen and enhance emergency communication capabilities.[150]

National Flood Insurance Program: A federal program that aims to reduce the impact of flooding on private and public structures by providing affordable insurance to property owners, renters, and businesses and by encouraging communities to adopt and enforce floodplain management regulations.[219]

National Incident Management System: Guides all levels of government, NGOs, and private sectors to work together to prevent, protect against, mitigate, respond to, and recover from incidents.[91]

National Preparedness Goal: Defines what it means for the whole community to be prepared 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."[2]

National Preparedness System: The instrument the nation employs to build, sustain, and deliver Core Capabilities to achieve the goal of a secure and resilient nation.[220]

National Qualification System: FEMA establishes and promotes baseline qualifications for a national incident workforce consisting of incident management, incident support, and emergency management personnel through the National Qualification System (NQS).[92]

National Response Framework: A guide on how the nation responds to all types of disasters and emergencies. It describes specific authorities and best practices for managing incidents that range from the serious but purely local to large-scale terrorist attacks or catastrophic natural disasters.[79]

National Risk and Capability Assessment: A suite of assessment products that measures risk and capability across the nation in a standardized and coordinated process. When analyzed together, these products measure national risks, capabilities, and gaps. The National Risk and Capability Assessment (NRCA) includes the following components: THIRA, SPR, National THIRA, National SPR, and, the Investment Strategy for National Preparedness.[221]

APPENDIX B: GLOSSARY

National Risk Index: A FEMA tool that uses data-driven online mapping application models for community risk for 18 natural hazards alongside social vulnerability and community resilience at the county level, which better provides a holistic view of the relationship between risk and vulnerability.[187]

Planning Guide for Local Jurisdictions: A tool developed by HUD outlining an inclusive community planning process that highlights organizations and individuals that can address the needs of homeless and other vulnerable populations in disasters.[222]

Plausible concurrent operations: A representative sample of ongoing response and recovery operations the nation could be supporting when other catastrophic incidents occur.[223]

Post-Katrina Emergency Management Reform Act: A 2006 law that enhances FEMA's responsibilities and autonomies within DHS to lead and support the nation in a comprehensive and risk-based emergency management system of preparedness, protection, recovery, response, and mitigation.[6]

Presidential Policy Directive 8: National Preparedness: Aims to strengthen the security and resilience of the United States through systematic preparation for the threats and hazards that pose the greatest risk to the nation.[5]

Private-Public Partnerships: Establishing support and maintaining mutually beneficial arrangements and jurisdictions between the public sector and private sector, nongovernmental organizations (NGO), and other stakeholders.[226]

Ransomware: In a ransomware attack, malicious actors use software to encrypt files and render systems unusable, then demand a ransom payment in exchange for restoring access.[227]

Ready.Gov: A national public service campaign designed to educate and empower individuals for response and mitigation efforts. The site also provides preparedness resources for emergencies and disasters.[228]

Resilience: The ability to adapt to changing conditions and withstand and rapidly recover from disruption.[8]

Risk: Potential for an unwanted outcome as determined by its likelihood and the consequences.[8]

Risk assessment: A product or process evaluating information based on a set of criteria that assigns values to risks for informing priorities, developing or comparing courses of action, and informing decision-making.[8]

Risk management: A process of identifying, analyzing, and communicating risk and accepting, avoiding, transferring, or controlling it to an acceptable level considering associated costs and benefits of any actions taken.[8]

Rural Emergency Medical Communications Demonstration Project: Fulfills the authorizing legislation's requirement to leverage existing technologies and engage non-medical professionals to help establish or sustain statewide medical communications systems and use existing infrastructure to improve the delivery of rural medical care.[151]

Safeguarding Tomorrow through Ongoing Risk Mitigation Act: This bill is designed to "amend the Robert T. Stafford Disaster Relief and Emergency Assistance Act to allow the Administrator of FEMA to provide capitalization grants to states to establish revolving funds to provide hazard mitigation assistance to reduce risks from disasters and natural hazards, and other related environmental harm."[48]

Short-Term Prediction Research and Transition: Utilizes expertise in remote sensing, modeling and data assimilation, total lightning, and impact imagery for disasters to transform research into operations to improve short-term weather forecasts on both regional and local scales.[230]

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Social vulnerability: The resilience of communities (the ability to survive and thrive) when confronted by external stresses on human health, stresses such as natural or human-caused disasters, or disease outbreaks.[86]

Social Vulnerability Index: CDC/ATSDR created the SVI which identifies high vulnerability levels within a given region of the U.S. It uses 16 U.S. census variables to help local officials identify communities that may need support before, during, or after disasters.[86]

Stakeholder Preparedness Review: A self-assessment of a jurisdiction's current capability levels against the targets identified in the THIRA.[221]

Standardized impact: Metrics used by the emergency management community with quantifiable consequences associated with major threats and hazards.[223]

Systemic risks: Systemic risks are distinguished by their interconnectedness. Systemic risk propagates or emerges in interconnected systems across boundaries of situational awareness or operational control, resulting in unwanted effects that cascade with amplifying harm. This type of risk begins as a distributed vulnerable state that increases with the complexity of our social, technological, and environmental systems. Once a triggering incident takes place, systemic risk can destabilize entire systems' critical functions by affecting multiple sectors and producing cascading effects that may amplify the original incident's impact. These risks are especially concerning when they appear in critical infrastructure sectors (e.g., electric, financial).[207]

Threat: Indication of potential harm to life, information, operations, the environment and/or property.[8]

THIRA/SPR Comprehensive Preparedness Guide 201: FEMA document that guides communities and organizations through the methodological process of the THIRA and SPR.[224]

Threat and Hazard Identification and Risk Assessment: A three-step risk assessment process that helps the whole community—including persons, businesses, faith-based organizations, non-profit groups, schools and academia, and all levels of government—understand its risks and estimate capability requirements.[8]

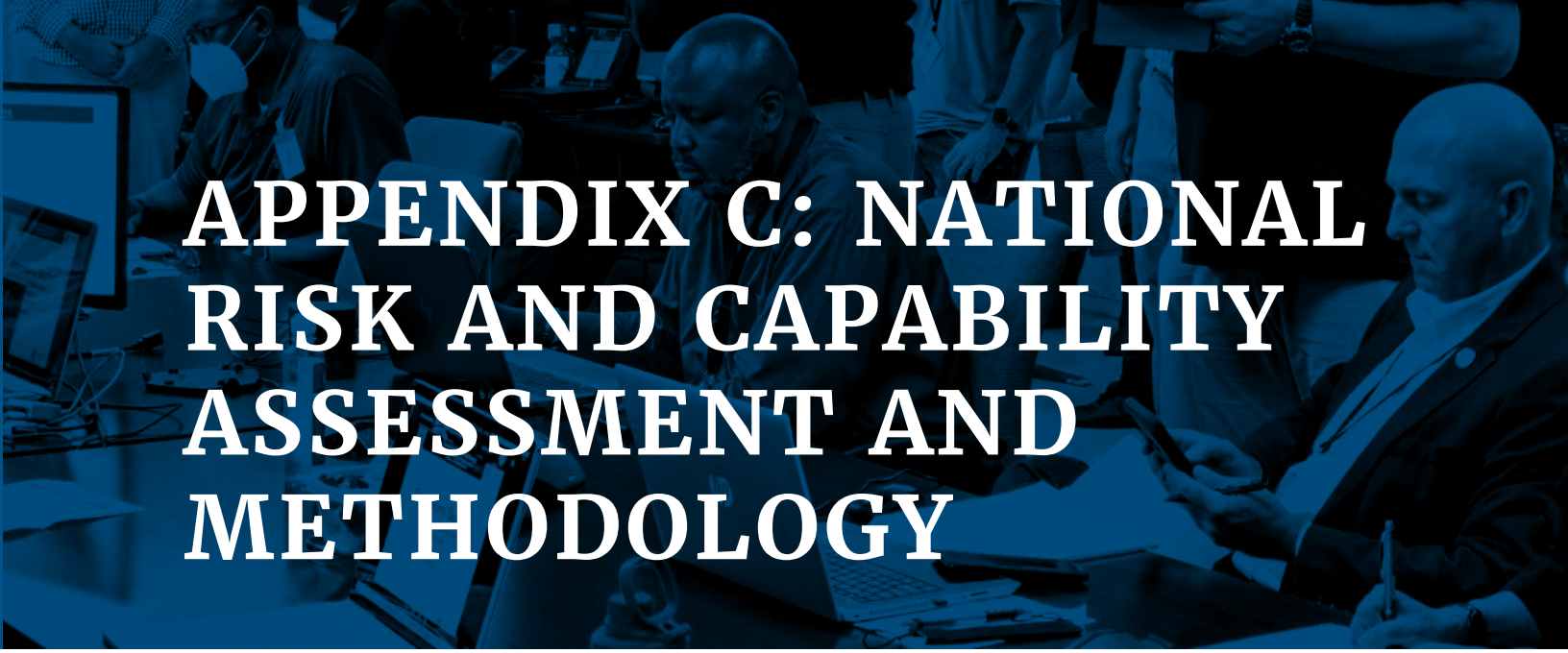
Urban Search & Rescue: The National Urban Search & Rescue (US&R) Response System (the System), established under the authority of FEMA in 1989, is a framework for organizing federal, state and local partner emergency response teams as integrated federal disaster response task forces. The System's 28 US&R task forces can be deployed by FEMA to a disaster area to provide assistance in structural collapse rescue, or they may be pre-positioned when a major disaster threatens a community.[93]

U.S. Climate Resilience Toolkit: A comprehensive resource guide for communities seeking information on building resilience to mitigate climate change impacts.[116]

Vulnerability: Physical feature or operational attribute that renders an entity open to exploitation or susceptible to a given hazard or threat.[8]

Vulnerable populations: Populations that are less likely to be able to prepare for hazards; less likely to receive or be able to respond to warnings; more likely to die, suffer injuries, and have disproportionately higher material losses; have more psychological trauma; and face more obstacles during phases of response and recovery.[231]

Whole community: A process to "involve people in the development of national preparedness documents… [and] ensure that their roles and responsibilities are reflected in the content of the materials." Whole community includes individuals and families, businesses, faith-based and community organizations, nonprofit groups, schools and academia, media outlets, and all levels of federal, state, local, tribal, and territorial (FSLTT) partners.[232]



APPENDIX C: NATIONAL RISK AND CAPABILITY ASSESSMENT AND METHODOLOGY

COMMUNITY AND NATIONAL CAPABILITY TARGETS

Community and National Capability Targets facilitate capabilities-based planning, which emergency managers use to determine the nation's capability requirements to manage its risk. Since 2012, states, territories, urban areas, and tribes have used the community Threat and Hazard Identification and Risk Assessment (THIRA) to set capability goals. Communities then use the Stakeholder Preparedness Review (SPR) to report their current level of preparedness. To help facilitate consistency and standardization across communities and the nation, the Federal Emergency Management Agency (FEMA) developed a methodology by which communities report their goals and current capability using standardized capability targets. FEMA uses the THIRA/SPR in partnership with communities to help understand their gaps and progress in preparedness. Through the THIRA, communities assess their risks and set targets for the capabilities needed to address those risks. Through the SPR, communities evaluate how close they are to meeting their targets, identify their gaps, and develop approaches for closing those gaps. FEMA uses these assessments to inform national-level capability and gap assessments and assess national preparedness.

Each standardized capability target has three components (**Figure 19**).[1] Critical tasks apply to a wide range of threats and hazards—not only those identified in the THIRA—that emergency managers nationwide routinely plan for. Each standardized target also incorporates impacts and timeframe metrics. Standardized impacts are key metrics used by the emergency management community with quantifiable consequences associated with major threats and hazards.[1] Timeframe metrics describe the amount of time or level of effort needed to

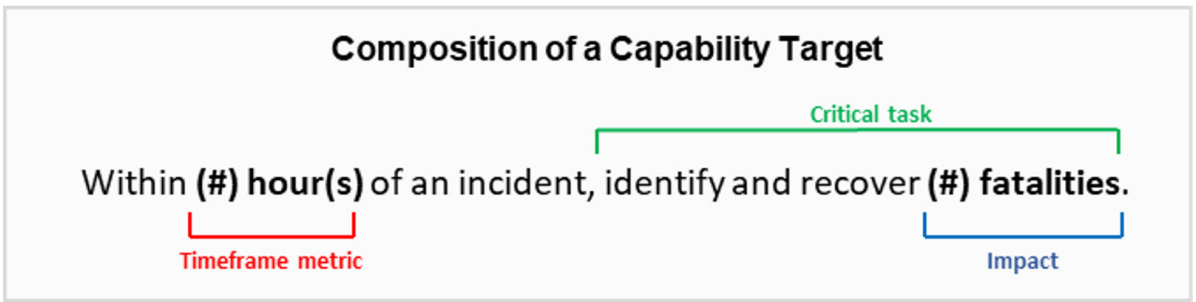


Figure 19: Example of standardized target language, including timeframe, critical task, and impact.

APPENDIX C: NATIONAL RISK AND CAPABILITY ASSESSMENT AND METHODOLOGY

successfully manage the impact, and consider how quickly communities can activate and then sustain a given capability. Capability targets help define success for one or more aspects of a Core Capability.

NATIONAL RISK AND CAPABILITY ASSESSMENT

Section 1242 of the 2018 Disaster Recovery Reform Act[96] sets the requirement that FEMA develop "tiered, capability-specific performance objectives" to assess national preparedness and identify gaps in national capability. To meet this requirement, FEMA developed the National Risk and Capability Assessment (NRCA), a suite of preparedness assessments that measure risk and capability across the nation in a standardized and coordinated way (**Figure 20**).[90]

The NRCA builds upon annual community capability assessments (i.e., THIRA/SPR submissions from states, territories, urban areas, and tribal nations). Through these assessments, all 56 states and territories (including the District of Columbia) and many major urban areas and tribes measure catastrophic risks to their communities, the impacts of those risks, and their capability to manage them. The federal government then uses the same common language to assess the nation's catastrophic risks and capabilities to support communities. The *2022 National Preparedness Report* (NPR) uses NRCA data as an indicator to understand the nation's preparedness posture and where significant capability gaps remain.

In 2020, for the first time, FEMA established national response and recovery capability targets. These targets represent estimates of the capabilities required to manage the nation's realistic worst-case scenarios, using standardized language. With the completion of the National Threat and Hazard Identification and Risk Assessment (National THIRA), all levels of government, including the federal government, now use this same standardized target language to assess these requirements. In 2021, 56 states and territories (including the District of Columbia), 39 tribes, and 33 urban areas completed SPRs.

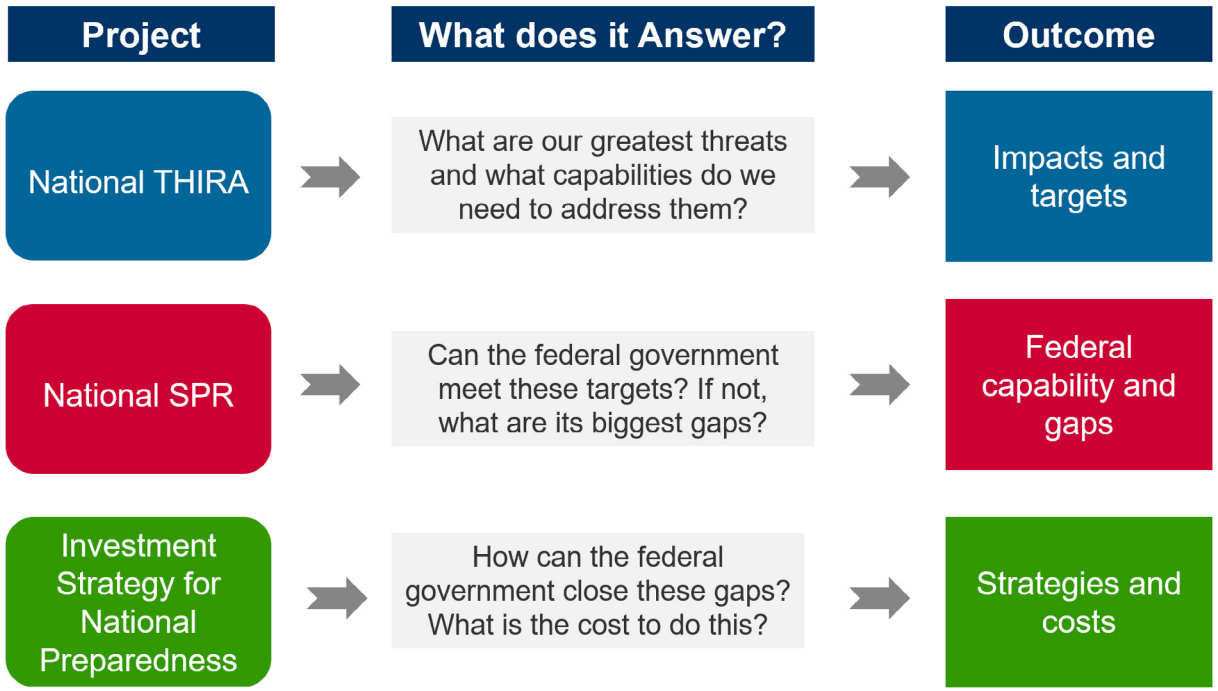


Figure 20: Elements of the NRCA, the questions each answer, and the outcomes of each element. The NRCA helps identify national-level capability gaps and needs for meeting the requirements of catastrophic disasters.

APPENDIX C: NATIONAL RISK AND CAPABILITY ASSESSMENT AND METHODOLOGY

Through the NRCA, FEMA compares the level of capability that communities collectively intend to build and sustain to the estimated level of capability that the nation will need to manage a catastrophic disaster. By identifying and understanding resulting gaps in capability, the nation can strategize how best to close these gaps using data-driven decision-making.

At a national level, disasters rarely occur in isolation. Because of this, the National Capability Targets also account for the likely engagement of FEMA and other partners in ongoing disaster operations at the same time as a catastrophic incident, thereby increasing the total impact that the nation would need to address. For this reason, in FEMA's analysis, the agency included Plausible Concurrent Operations (PCO) based on historical impact data for hurricanes, floods, and wildfires. Using these PCOs alongside the National THIRA scenarios, FEMA worked with partner agencies and subject-matter experts to determine the estimated impacts and timeframes within which those impacts should be addressed. FEMA and the federal interagency continue to assess national capability gaps through analysis included in this report and the National SPR.

National Stakeholder Preparedness Review Methodology

The goals of the National SPR are to gauge the nation's readiness for catastrophic disasters, to identify national-level emergency management capability gaps and planning assumptions for all hazards, and to use these findings to inform preparedness efforts. The National SPR was developed through an extensive literature review, analysis of community-reported capability data, and working groups with subject-matter experts. The qualitative and quantitative analysis included in the National SPR informs several areas including planning and exercises, continuous improvement, and preparedness investments.

For the National SPR analysis of national capability, FEMA conducted a review of after-action reports and open-source information, and state, local, tribal, and territorial (SLTT) capability data submitted to FEMA through the annual community SPR. FEMA then conducted a series of working groups with subject-matter experts from across the federal government to validate the research findings and identify additional gaps in capability. These gaps were then validated through the federal review process.

COMPARISON OF COMMUNITY RISK AND CAPABILITY ASSESSMENT TO THE NRCA

1. Risks and Associated Impacts: All levels of government use the THIRA process to identify and assess threats and hazards of concern.

2. Capability Goals: The community THIRA process uses capability targets to convert the likely impacts of incidents into community capability goals, while the National THIRA establishes capability targets for the nation to meet collectively.

3. Current Capabilities: The community SPR enables communities to measure their current capabilities, while the National SPR works to assess the nation's ability to provide support beyond existing community capabilities.

4. Gaps: The SPR process helps all levels of government identify the current gaps preventing achievement of their capability goals. The forthcoming Investment Strategy for National Preparedness will identify strategies to close these gaps.

APPENDIX C: NATIONAL RISK AND CAPABILITY ASSESSMENT AND METHODOLOGY

Reporting

The NPR provides an annual assessment of national preparedness across all five mission areas and the whole community and builds on the other components of the NRCA. The development of the NPR involves a rigorous, analytical process that combines open-source research with information provided by FSLTT partners. The foundational data for the 2022 report comes from community THIRA/SPR submissions. Community THIRA/SPRs provide FEMA with data on capabilities, gaps, priorities, and trends. Federal partners also provide direct information early in the report's development through an interagency data call, and later review the report to provide feedback and ensure the report's accuracy before publication.

DATA LIMITATIONS

As with any research and analysis, limitations exist. Readers should consider the following while reviewing the content presented in this report:

- Communities assess their own capabilities based on the targets they set and the scenarios they choose to assess against. Community estimates of capability, reported through the SPR, are considered steady-state estimates of community capability at the time of reporting. This differs from National Capability Targets, which are set capability goals based on the likely impacts of nationally catastrophic incidents. Reported community capability represents the level of capability communities believe they can provide in response to a specific incident and are assumed not to account for any anticipated loss of capability resulting from a hazard impact. Actual capability may differ due to a range of factors, including but not limited to 1) the timing and location of an incident; 2) a hazard's direct or indirect impacts on capability (e.g., destruction or inaccessibility of a capability); 3) concurrent response or recovery efforts that require capability elsewhere; and 4) limited shareability and deployability of capability.
- The data used in the National SPR, along with the National Capability Targets, do not currently include nongovernmental, or private-sector capability outside of the capability communities may report in their SPR submissions.[xi,xii]
- Communities may use different strategies to assess their capabilities within the THIRA/SPR methodology.
- Since the THIRA/SPR process began in 2012, the methodology has been updated and improved. For instance, Urban Area Security Initiative (UASI) recipients were not required to complete the SPR until 2018. Additionally, in 2020, FEMA modified the THIRA/SPR reporting requirements due to an unprecedented strain on communities from the coronavirus disease 2019 (COVID-19) pandemic, which reduced the number of targets communities had to assess and instead focused on pandemic-related capabilities and those measuring progress in meeting the Secretary of Homeland Security's priorities. These reporting requirements remained for the 2021 THIRA/SPR assessments. Of the 29 targets communities were required to assess in 2019, only six were required in 2020 and 2021. These modifications to methodology and reporting requirements make it difficult to conduct year-over-year SPR data trends, due to a lack of consistent data over the last three years.

xi Analysis of federal capability is forthcoming through the National SPR, and high-level results may be provided in future NPR reports, including the 2023 NPR.

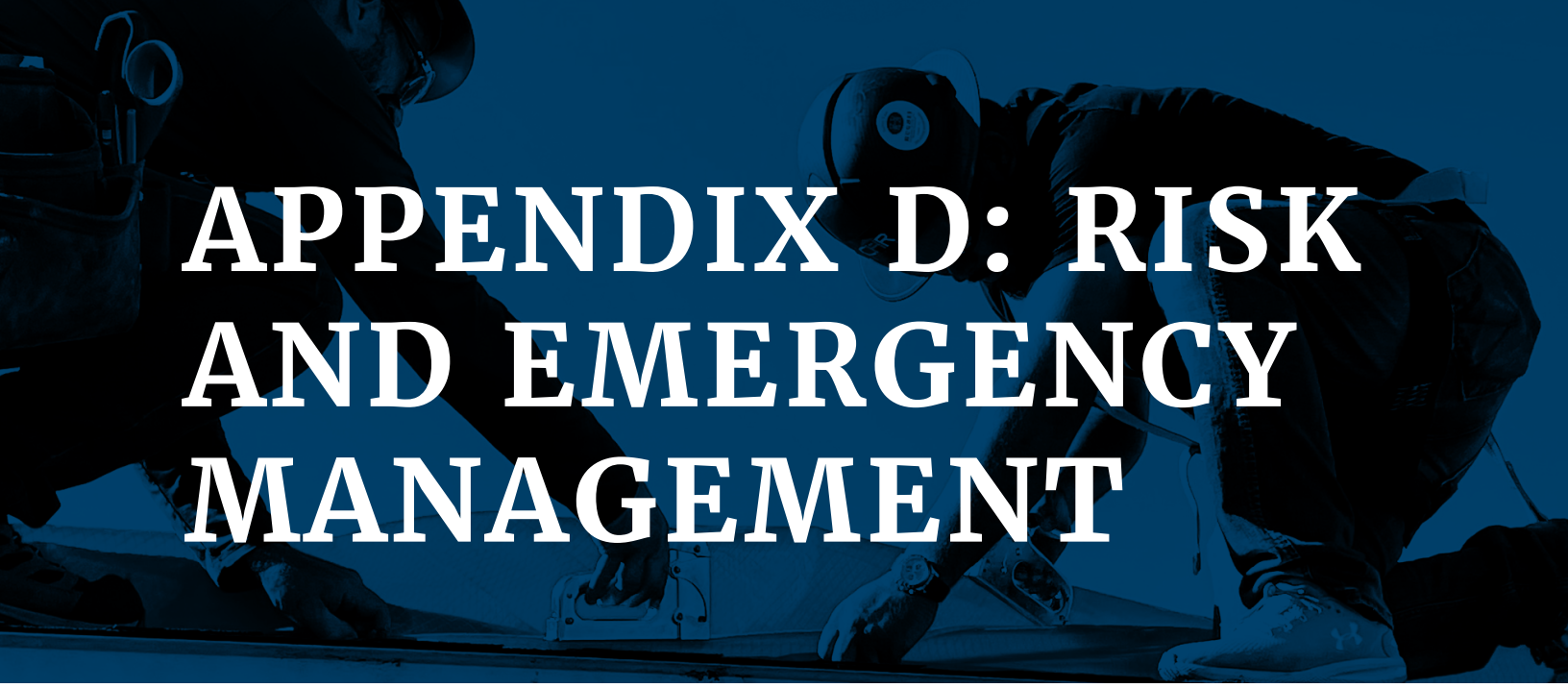
xii Communities are instructed that the capabilities assessed in SPR Step 1.1 should be those that exist within the boundaries of the community, whether owned by sub-jurisdictions, or private and nonprofit organizations. The capabilities should not be from the federal government or achieved through interstate mutual aid. The capability targets are goals for building internal capability, therefore communities complete the capability assessment considering only internal capabilities.

APPENDIX C: NATIONAL RISK AND CAPABILITY ASSESSMENT AND METHODOLOGY

THIRA/SPR THREATS AND HAZARDS

Below is the list of threat/hazard types users can select within the THIRA/SPR Unified Reporting Tool.

Threat/Hazard Types	Threat/Hazard Category
Active Shooter	Human Caused
Aircraft as a Weapon	
Arson	
Biological Attack	
Chemical Attack	
Civil Disturbance	
Complex Coordinated Terrorist Attack	
Cyber Attack	
Explosive Devices	
Food/Water Contamination	
Improvised Nuclear Attack	
Mass Migration	
Metal Theft	
Radiological Attack	
Animal Disease	Natural
Avalanche	
Drought	
Earthquake	
Extreme Temperatures	
Flood	
Hurricane/Typhoon	
Invasive Species	
Pandemic-Human	
Severe Storm/High Winds	
Sinkhole/Landslide/Expansive Soils	
Space Weather	
Tornado	
Tsunami	
Volcanic Eruption	
Wildfire	
Winter Storm/Ice Storm	
Dam Failure	Technological
Fuel Shortage	
Hazmat Release - Chemical	
Hazmat Release - Radiological	
Mine Accident	
Mine/Underground Fire	
Pipeline Explosion	
Transportation Accident	
Urban Conflagration	
Utility Interruption	
Water Contamination	
Other (Describe below)	Included in all Three Categories



APPENDIX D: RISK AND EMERGENCY MANAGEMENT

Characteristics of risk—likelihood, vulnerability, and consequence—can change over time, requiring emergency managers and the whole community to understand the current and future consequences of risks in order to withstand, adapt, and recover from them. Consequences, for example, evolve as systems become more interconnected and interdependent; risk likelihood must be reassessed as climate change advances, and changing population distribution may make communities more or less vulnerable to certain threats and hazards.

Vulnerability can shape communities' risk profiles and their need for emergency management capabilities. Communities can address these risks by bolstering insufficient capabilities, while simultaneously reducing overall vulnerability. Reducing vulnerability requires addressing root issues, such as climate change and socioeconomic inequality.

DEFINITIONS RELATING TO RISK[8]

Risk: Potential for an unwanted outcome assessed as a function of hazard/threats, assets and their vulnerabilities, and consequences.

Threat: Indication of potential harm to life, information, operations, the environment and/or property.

Hazard: A source or cause of harm or difficulty. A hazard also differs from a threat in that a threat is directed at an entity, asset, system, network, or geographic area. A hazard is not directed.

Likelihood: The chance of something happening, whether defined, measured, or estimated objectively or subjectively, or in terms of general descriptors (e.g., rare, unlikely, likely, almost certain), frequencies, or probabilities.

Vulnerability: Physical feature or operational attribute that renders an entity open to exploitation or susceptible to a given hazard or threat.

Consequence: Effect of an event, incident, or occurrence.

CATEGORIES OF RISK [207]

Catastrophic risks are distinguished by their magnitude.

Systemic risks are distinguished by their interconnectedness.

Emerging risks are distinguished by their novelty or evolution due to new or unfamiliar conditions.

APPENDIX D: RISK AND EMERGENCY MANAGEMENT

Risk management and emergency preparedness are the responsibilities of the whole community—including individuals and households, the private sector, nongovernmental organizations and all levels of government.[232] All community members have a role in developing risk awareness and a collective understanding of the community's vulnerabilities and capabilities; such shared and inclusive knowledge enables local execution, state management, and federal support of emergency management efforts.[232]

HIGH-SEVERITY HAZARDS: CATASTROPHIC RISK

A catastrophic incident is "a natural disaster, act of terrorism, or other man-made disaster that results in extraordinary levels of casualties, or damage or disruption severely affecting the population (including mass evacuations), infrastructure, environment, economy, national morale, or government functions in an area."[8] Locally or regionally catastrophic incidents can overwhelm municipal or state capabilities, prompting requests for and provision of federal aid.[79]

Catastrophic incidents severely disrupt one or more of the National Critical Functions. These seven functions describe foundational responsibilities of the federal government—such as providing national leadership and stabilizing the nation's economy—that establish and enable its leadership before, during, and after disasters.[233]

The Federal Emergency Management Agency (FEMA) used the 2019 National Threat and Hazard Identification and Risk Assessment (National THIRA) to identify the most severe threats and hazards facing the nation and to define the hazards—such as earthquakes, hurricanes, pandemics, and space weather—that could lead to a nationally catastrophic scenario.[223] The diversity of these incidents, and of the incidents that communities across the nation regularly experience, reinforces the importance of all-hazard preparedness.[223] An all-hazards posture ensures that communities maintain readiness for all threat and hazard types to which they are exposed.[2]

CASCADING IMPACTS: SYSTEMIC RISK

The seven community lifelines—energy; communications; safety and security; food, water, shelter; health and medical; hazardous material; and transportation—represent the foundational operations of maintaining government continuity and human health and security.[212] In contrast to a catastrophic incident, which may directly interrupt multiple lifelines, a systemic incident directly impacts a limited number of lifelines and, through cascading effects, indirectly impacts one or more additional lifelines.

This type of risk begins as a distributed vulnerable state that increases with the complexity and interconnectedness of our social, technological, and environmental systems. Once a triggering incident takes place, cascading impacts are significant due to the dependencies between sectors. For example, an incident that disrupts global positioning systems or communication services can impact supply chain and transportation services that usually fill community needs and further economic activity.[146,79]

NOVEL CHALLENGES: EMERGING RISK

Emerging risks are either new risks or familiar risks that evolved due to new or unfamiliar conditions. They can appear suddenly and often arise from advancements in technology or changes in the threat and hazard environment. Due to a lack of historic data, which is generally used to assess risk, emerging risks can be difficult to prepare for or respond to.

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