2022
Annual Report

TMAC
TECHNICAL MAPPING ADVISORY COUNCIL

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Deanne Criswell   April 11, 2023
Administrator
Federal Emergency Management Agency
500 C Street SW
Washington, DC 20472

Administrator Criswell,

As Chair of the Technical Mapping Advisory Council (TMAC), I am pleased to forward to you the TMAC 2022 *Annual Report* for your consideration. This Annual Report includes four recommendations and several actions for FEMA to consider.

The focus of this year's report was to assess ways in which FEMA might improve program delivery to disadvantaged communities. While the members of the TMAC have a strong collective knowledge of the National Flood Mapping Program, including its legal foundations, federal regulations, policy, technical processes for carrying out the program and how it impacts a broad group of stakeholders, none of the members are experts in working with or supporting disadvantaged communities. Nonetheless, the TMAC rose to the challenge by performing literature reviews, engaging and conducting listening sessions with renowned experts in fields related to social justice and equity, and by conducting a survey of other industry practitioners. In executing our responsibilities, the TMAC conducted 3 public meetings (one virtual and two in a hybrid fashion) between October 23, 2022, and March 2, 2023.

To conduct our assessment and develop recommendations the TMAC formed three subcommittees each focused on various parts of the challenge. Subcommittee 1 focused on identifying program access barriers and improving stakeholder engagement with disadvantaged communities. Subcommittee 2 focused on identifying unintended consequences and analyzing how data analytics might help inform program execution and Subcommittee 3 coordinated and facilitated listening sessions to elicit information from social justice and equity experts and oversaw the development and deployment of the survey to solicit perceptions from floodplain management and flood risk management practitioners to further inform the recommendations developed.

In summary, the TMAC suggests establishing program performance measures around improving service to disadvantaged communities, increasing investments in disadvantaged community support services, working with Congress to address the unintended consequences associated with the convergence of legal mandates and scientific facts, and to not shy away from preparing and making readily available flood hazard and risk data for these communities. Importantly, the TMAC found that the drivers and degree to which communities are disadvantaged vary widely, and there is not a distinct line between disadvantaged and non-disadvantaged communities. Successes learned through applying TMAC's recommendations to address barriers to understanding risk and taking action or mitigating unintended consequences of the flood mapping program for disadvantaged communities can potentially be broadly applied to address issues that create disadvantages.

The TMAC is excited to continue providing thoughtful recommendations to you and is working with FEMA staff to shape our 2023 efforts.

Respectfully,

Doug Bellomo, P.E., PMP
Chair
Technical Mapping Advisory Council

Acknowledgments

TMAC would like to acknowledge the extraordinary efforts of several subject matter experts and support staff, without whom this report would not have been possible. Each of the following people selflessly dedicated their time and expertise:

00 EXECUTIVE SUMMARY

Flood damages in the United States continue to mount. Calendar year 2022 was notable with 18 weather- and climate-related events causing $1 billion dollars or more each in damages and totaling over $165 billion. Many of these events, including Hurricanes Fiona, Ian, and Nicole and severe flooding in Kentucky and Missouri, caused significant flood damage.

Studies on flood risk management make it clear that "the poor and disadvantaged usually suffer the most from flood risk" (Jha et al. 2012). Indeed, this was the case in the Kentucky and Missouri floods. This disproportionate suffering, combined with a renewed emphasis on improving the way the federal government responds to the climate crisis and better serves disadvantaged communities, has informed FEMA's establishment of several strategic priorities. In fact, FEMAs Goal 1 in its 2022–2026 Strategic Plan focuses on instilling equity as a foundation of emergency management and includes objectives to remove barriers to programs FEMA stewards and achieve equitable outcomes for those FEMA serves (FEMA 2023). In fact, in its Justice 40 Initiative, the Biden Administration identified the Risk Mapping Assessment and Planning (Risk MAP) Program as one of the first programs to demonstrate how it is improving service to disadvantaged communities (OMB 2021).

FEMA has not had a specific focus on improving Risk MAP program delivery for disadvantaged communities and reached out to the Technical Mapping Advisory Council (TMAC) to help identify ways in which it could remove program access barriers, better understand unintended consequences associated with the realities of converging legal mandates and scientific facts, recommend how to improve stakeholder engagement, and analyze how datasets on disadvantaged communities could be used to inform how FEMA executes limited program resources.

Although the members of the TMAC have a strong collective knowledge of the National Flood Mapping Program, including its legal foundations, federal regulations, policy, technical processes for carrying out the program and how it impacts a broad group of stakeholders, none of the members are experts in working with or supporting disadvantaged communities. Consequently, the TMAC relied heavily on past reports and studies as well as expert advice and insights to develop this report.

Rising to the challenge, the TMAC broke into three subcommittees each of which focused on a different aspect of the effort. Subcommittee 1 focused on identifying program access barriers and improving stakeholder engagement with disadvantaged communities. Subcommittee 2 focused on identifying unintended consequences and analyzing how data analytics might help inform program execution. Because none of the TMAC members were experts in working with or supporting disadvantaged communities, a third subcommittee oversaw the process of finding experts who could provide insights and creating an online survey to solicit perceptions from floodplain management and flood risk management practitioners.

The TMAC's efforts culminated in four overarching recommendations and several actions for FEMA's consideration, including establishing program performance measures to improve service to disadvantaged communities, increasing investments in disadvantaged community support services, working with Congress to address the unintended consequences associated with the National Flood Mapping Program products, and continuing to provide reliable flood hazard and risk data to disadvantaged communities by maintaining and updating existing data and developing new data. Importantly, the TMAC found that the drivers and degree to which communities are disadvantaged vary widely, and there is not always a distinct line between disadvantaged and non-disadvantaged. Therefore, it is important for FEMA to consider addressing the issues that are impediments to understanding flood risk and taking actions regardless of the unintended consequences to a disadvantaged or non-disadvantaged community. The lessons learned from successes can be applied to any issues that create disadvantages.

The challenges facing disadvantaged communities are unique and demand deliberate attention to find solutions. Slowing down data delivery or modifying the mapping process to avoid the legal insurance purchase and floodplain management mandates will only lead to new inequities and exacerbate those that already exist. Although the recommendations in this report will prove useful, ultimately success will be measured by those served, and FEMA will need to meet disadvantaged communities exposed to flooding where they are, listen intently to their challenges, and act within the bounds of its authorities and budget to help move them forward.

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ACRONYMS

ACS	American Community Survey
ADFO	alternate designated federal officer
AECOM	AECOM Technical Services, Inc.
ASFPM	Association of State Floodplain Managers
ATSDR	Agency for Toxic Substances and Disease Registry
BCR	Benefit-Cost Ratio
BLE	base-level engineering
BRIC	Baseline Resilience Indicators for Communities
BRIC	Building Resilient Infrastructure and Communities
BW	Biggert-Waters Flood Insurance Reform Act of 2012
CAP	Community Assistance Program
CB	Capacity Building
CDC	Centers for Disease Control and Prevention
CEJST	Climate and Economic Justice Screening Tool
CNMS	coordinated needs management strategy
COVID	Corona Virus 19
CRE	Community Resilience Estimates
CRS	Community Rating System
CTP	Cooperating Technical Partners
CX	Customer Experience
DFO	designated federal officer
DHS	Department of Homeland Security
DTA	Direct Technical Assistance
EDRC	Economically Disadvantaged Rural Communities
EO	Executive Order
ESL	English as a second Language
FEMA	Federal Emergency Management Agency
FFRD	Future of Flood Risk Data
FIMA	Federal Insurance and Mitigation Administration
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance
FRM	flood risk management
GA	Georgia
GAO	General Accounting Office
GIS	Geographic Information Specialist

HH	households
HMA	Hazard Mitigation Assistance
IPR	Income-to-Poverty Ratio
IT	information technology
LGBTQ	lesbian, gay, bisexual, transgender, and queer
LIDAR	Light Detection and Ranging
LUST	leaking underground storage tank
MAP	Mapping, Assessment, and Planning
MPTA	Mitigation Planning Technical Assistance
NFHL	National Flood Hazard Layer
NFIP	National Flood Insurance Program
NFWF	National Fish and Wildlife Foundation
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NRI	National Risk Index
NVUE	New, Validated, or Updated Engineering
OMB	Office of Management and Budget
PE	Professional Engineer
RMD	Risk Management Directorate
RMP	Proximity to Risk Management Plan
SAFE-D	Safety through Disruption
SCO	State Coordinating Office
SFHA	Special Flood Hazard Area
SLTT	state, local, tribal, and territorial
SLTTGCC	State, Local, Tribal, and Territorial Government Coordinating Council
SME	subject matter expert
SoVI	Social Vulnerability Index (developed at the University of South Carolina)
SSSE	State Support Services Element
STARR	Strategic Alliance for Risk Reduction
SVI	Social Vulnerability Index (developed by the Centers for Disease Control and Prevention)
THIRA	Threat and Hazard Identification and Risk Assessment
TMAC	Technical Mapping Advisory Council
USACE	US Army Corps of Engineers
U.S.C.	United States Code
UST	underground storage tank

01 INTRODUCTION

Helping Americans before, during, and after disasters is the Federal Emergency Management Agency's (FEMA's) mission. Through the mapping arm of the National Flood Insurance Program (NFIP) and the Risk Mapping, Assessment, and Planning Program (Risk MAP) (collectively referred to as the National Flood Mapping Program), FEMA aims to provide comprehensive flood hazard and risk data to inform flood insurance pricing and flood risk mitigation activities, including floodplain management. The data produced and provided through these two authorities is key to helping guide decisions that impact current and future flood risks at all levels of government (federal, state, local, tribal, and territorial) as well as businesses and individuals. The Technical Mapping Advisory Council (TMAC), a federal advisory committee, supports FEMA in its flood hazard identification and risk assessment efforts by reviewing and making recommendations to improve how FEMA carries out its National Flood Mapping Program authorities as directed by the Biggert-Waters Flood Insurance Reform Act of 2012 (42 United States Code [U.S.C.] Sections 4001–4130) (BW-12) and the Homeowner Flood Insurance Affordability Act of 2014.

1.1   TMAC BACKGROUND

NATIONAL FLOOD INSURANCE PROGRAM

FEMA administers the NFIP through the Federal Insurance and Mitigation Administration (FIMA). Created with the passage of the National Flood Insurance Act of 1968, the NFIP is an insurance, mapping, and floodplain management program that makes federally backed flood insurance available to home and business owners and renters in communities that participate in the program. By participating in the NFIP, communities agree to adopt ordinances and enforce minimum building requirements that reduce the risk of flooding.

Since being established in 2013, the TMAC has continued to successfully implement its mandate as outlined in BW-12. Figure 1-1 presents a timeline of the 13 reports that TMAC has published since 2015, not including this 2022 annual report. In addition to six annual reports, the TMAC has produced two interim reports, two summary reports, and three other reports. These reports include a combined total of 135 formal recommendations and implementation actions to FEMA. Formal recommendations from the TMAC are those that FEMA should strongly consider and implement to extent possible within the authorities of their program. Implementation actions provide suggestions on how to implement the formal recommendations but are not recommendations.

The TMAC's reports were provided under the authorities and responsibilities described in the subsections that follow.

1.1.1   TMAC AUTHORIZATION

BW-12 mandated that FEMA establish a federal advisory committee to provide advice and recommendations to improve the preparation of Flood Insurance Rate Maps (FIRMs) created under the NFIP and on future risks from climate change, rising

TMAC Final Reports

2015*
- TMAC 2015 Future Conditions Risk Assessment and Modeling Report
- TMAC 2015 Annual Report
- TMAC 2015 Annual Report Summary

2016
- TMAC 2016 National Flood Mapping Program Review
- TMAC 2016 Annual Report

2017
- TMAC 2017 Annual Report

2018
- TMAC 2018 Annual Report
- TMAC 2018 Annual Report Summary

2019
- TMAC 2019 Annual Report (Memorandum)

2020
- TMAC 2020 Annual Report

2021
- TMAC 2021 Annual Report

* Other Reports
- TMAC 2015 Annual Report – Interim
- TMAC 2015 Future Conditions Risk Assessment and Modeling Report – Interim

Figure 1-1: Timeline of past TMAC reports
Source: FEMA n.d.a

sea levels, and FIRM development. Pursuant to BW-12, FEMA filed the charter with Congress on July 29, 2013, that formally established the TMAC (FEMA 2013a).

The TMAC views components of today's NFIP as significant to a new, much stronger foundation for the improved national flood risk management (FRM) framework that recognizes the complex nature of flood risk and the diverse ways in which it is managed.

1.1.2   TMAC RESPONSIBILITIES

The TMAC's Charter outlines the principles and functions of the TMAC, including the objectives and scope of TMAC activities, description of duties, member composition, frequency of meetings, and other pertinent items related to the TMAC's establishment and operation (FEMA 2013b). The TMAC's bylaws establish and describe rules of conduct, regulations, and procedures regarding its membership and operation (FEMA 2013a).

According to the TMAC Charter, one of the TMAC's primary responsibilities is the submittal of an annual report to the FEMA Administrator. The report must include a description of the TMAC's activities, its evaluation of the "status and performance of FIRMs and mapping activities to revise and update FIRMs," and its recommendations to ensure the FIRMs reflect the best available science and are based on the best available methodologies for considering the impact of future development on flood risk. Past efforts since the TMAC's establishment are summarized in Figure 1-1 Previous annual reports are available on FEMA's TMAC website at https://www.fema.gov/flood-maps/guidance-reports/technical-mapping-advisory-council/reports.

1.2   2022 TMAC

The 2022 TMAC convened in May 2022 with the members shown in Table 1-1. Through a Memorandum, dated May 25, 2022 (FEMA Memo), FEMA requested the TMAC focus its effort on some current challenges the Agency faces, as described in this chapter. The TMAC held three public-facing meetings and seven administrative meetings, as noted in Table 1-3, as well as numerous internal working meetings throughout 2022 to develop this TMAC 2022 Annual Report. It also shared a draft outline of the report for review and comment by the public, conducted an informal survey to gain insight into the perceptions of various groups regarding the topics investigated this year, and shared a draft report for public comment prior to finalizing.

1.2.1   TMAC MEMBERS AND DESIGNATED FEDERAL OFFICERS

The 2022 TMAC members and subcommittee members are listed in Table 1-1 and designated federal officers (DFOs) are listed in Table 1-2.

Members of the TMAC include designated members and additional members appointed by the FEMA Administrator, as set forth in the bylaws. The designated members of the Council are:
- The FEMA Administrator or the designee thereof;
- The Secretary of the Interior or the designee thereof;
- The Secretary of Agriculture or the designee thereof; and

- The Under Secretary of Commerce for Oceans and Atmosphere or the designee thereof.

The FEMA Administrator or designee appoints the 16 additional members of the Council. These members are appointed based on their demonstrated knowledge and competence regarding surveying, cartography, remote sensing, geographic information systems (GISs), or the technical aspects of preparing and using FIRMs.

To the maximum extent practicable, the Council membership will have a balance of federal, state, local, tribal, and private members, and include geographic diversity consisting of representation from states with a coastline or other area(s) identified by the FEMA Administrator as at high risk for flooding or as Special Flood Hazard Areas (SFHAs).

Table 1-1: TMAC Member List

Name	BW-12 Membership Title	Job Title, Company/Agency	Subcommittee 1	Subcommittee 2	Subcommittee 3
Doug Bellomo (TMAC Chair)	Engineering Member	Vice President Water Resources, Flood Risk Management, AECOM	✓	✓	✓
Vincent DiCamillo (TMAC Vice Chair)	Mapping Member	Senior Principal, Stantec Consulting	✓	✓	✓
Maria Cox Lamm (Subcommittee 1 Chair)	NFIP Coordination Offices Representative	State NFIP Coordinator, South Carolina Department of Natural Resources	✓		
Jeff Sparrow (Subcommittee 2 Chair)	Floodplain Management Member	Vice President, Moffatt & Nichol		✓	
Scott Giberson (Subcommittee 3 Chair)	Flood Hazards Determination Firm Member	Compliance Principal, CoreLogic Flood Services			✓
Stephen Aichele	USGS Representative	Geographer, USGS			✓
Stacey Archfield	Department of the Interior Designee	Research Hydrologist, US Geological Survey Water Mission Area		✓	
Edward Clark	NOAA/Commerce for Oceans and Atmosphere Designee	Deputy Director, Office for Water Prediction, National Oceanic and Atmospheric Administration (NOAA)	✓		
Josh Davies	State Hazard Mitigation Officer	State Mitigation Officer, Texas Division of Emergency Management		✓	
Ataul Hannan (new member)	Local Cooperating Technical Partner Representative	Planning Division Director, Harris County Flood Control District			
Ronald Jacobson	Surveying Member	Survey Manager, Coleman Engineering		✓	

Table 1-1: TMAC Member List (continued)

Name	BW-12 Membership Title	Job Title, Company/Agency	Subcommittee 1	Subcommittee 2	Subcommittee 3
Carey Johnson	State Cooperating Technical Partner Representative	Environmental Scientist Consultant, Director's Office, Kentucky Division of Water	✓		
William Lehman	USACE Representative	Sr. Flood Risk Analyst, US Army Corps of Engineers (USACE)			✓
Jonathan Paoli	State Geographic Information System Representative	Communications & Technology Bureau Chief, Iowa Homeland Security & Emergency Management		✓	
Jaime Reinke (new member)	State Cooperating Technical Partner Representative	Professional Engineer, Nebraska Department of Natural Resources			
Luis Rodriguez	FEMA Designee	Director, Engineering and Modeling Division, Federal Insurance and Mitigation Administration (FIMA), Federal Emergency Management Agency (FEMA)	✓		
Brooke Seymour (new member)	Regional Flood and Storm Water Management Organization Member	Planning and Floodplain Management Director, Mile High Flood District			
Jonathan Smith	US Department of Agriculture Designee	Director, Resource Inventory Division, Natural Resources Conservation Service		✓	
Liang Xu	Local Cooperating Technical Partner Representative	Engineering Manager, Santa Clara Valley Water District			✓

Table 1-2: Designated Federal Officers

Name	FEMA Title	Designated Federal Officer (DFO) / Alternate DFO (ADFO)
Brian Koper	Emergency Management Specialist, Federal Insurance and Mitigation Administration (FIMA)	DFO
John Ebersole	Attorney, FIMA Legal Division	TMAC Legal Counsel/ADFO
David Rosa	Emergency Management Specialist, FIMA	ADFO

1.2.2   **2022 TMAC FOCUS**

Each year, FEMA asks the TMAC to focus its efforts in specific areas to complement efforts FEMA is already undertaking to adapt and improve delivery of the National Flood Mapping Program. FEMA's memorandum, dated May 25, 2022, from Michael Grimm, Assistant Administrator for Risk Management, requested that the TMAC consider addressing the following topic areas (a copy of the FEMA Memo is presented in Appendix A):

1. Evaluate the barriers that disadvantaged communities face in understanding their risk and acting to reduce their risk. Recommend ways for the program to overcome these obstacles and better meet the needs of these communities.

2. Evaluate and recommend ways for the National Flood Mapping Program to identify and limit the potential negative impact and unintended consequences that might result from National Flood Mapping Program products and program delivery, such as:
    – Increasing the cost of living (flood insurance, rent, cost of goods and services) for low-income populations;
    – Increasing the amount of unsafe and poor-quality housing;
    – Decreasing access to vital community programs dependent on tax revenue;
    – Creating job losses; and
    – Increasing the probability of foreclosure in these communities.

3. Evaluate and recommend ways for the National Flood Mapping Program to improve stakeholder engagements with disadvantaged/underserved communities.

4. Evaluate ways the agency could use statistical data and analysis regarding social vulnerability and underserved populations and provide recommendations on how that data and analysis should inform future annual investment decisions for the National Flood Mapping Program.

OVERVIEW OF 2022 TMAC ACTIVITIES AND REPORT

The TMAC began its 2022 efforts with an administrative meeting on May 27, 2022, in which FEMA provided additional context around their 2022 Memo. Shortly thereafter, the TMAC organized itself into three subcommittees:

Subcommittee 1. Focused on topic areas 1 and 3
    – Barriers to Understanding Risk and Taking Action – Evaluation of the barriers that disadvantaged communities face in understanding their risk and actions to reduce their risk.
    – Improved Stakeholder Engagement. Evaluation and recommendations for the National Flood Mapping Program to improve stakeholder engagements with disadvantaged/underserved communities.

Subcommittee 2. Focused on topic areas 2 and 4

– Unintended Consequences of the National Flood Mapping Program – Evaluation and recommendations of ways for the National Flood Mapping Program to identify and limit the potential negative impact and unintended consequences that National Flood Mapping Program products and program delivery may create.

– Data and Analysis to Inform Investment Decisions – Evaluation of ways the agency could use statistical data and analysis regarding social vulnerability and underserved populations and provide recommendations on how that data and analysis should inform future annual investment decisions for the National Flood Mapping Program.

Subcommittee 3. Focused on outreach to subject matter experts and practitioners

– A third subcommittee was formed to coordinate listening sessions from subject matter experts (SMEs) and practitioners in the fields of social justice, social vulnerability, and disadvantaged and underserved communities. Gaining insights from these experts and practitioners was vital in the development of this report.

> TMAC members are not experts in the fields of equity, social vulnerability, or disadvantaged and underserved communities; therefore, the TMAC coordinated listening sessions and sought input and advice from relevant SMEs in these fields.

Throughout the period of assessment and report development, the TMAC held three public-facing meetings, which included time for public input to be provided, and seven administrative meetings as summarized in Table 1-3. On October 11, 2022, the TMAC shared an annotated outline for public review and comment, and on December 23, 2022, provided a first draft report for additional comments. Additionally, on November 24, 2022, the TMAC released an informal survey to gain insight into the perceptions of various groups regarding the topics investigated this year.

1.3   TERMS USED IN THIS REPORT

In the spirit of promoting understanding and recognition of the sensitivity of language, the TMAC is providing a list of terms and definitions for this report. The intent is not to promote one definition above another but rather to have a common vernacular as we discuss the TMAC topic areas.

1.3.1   BACKGROUND

Some of the terms used in this report have a specific definition in the National Flood Mapping Program context. For example, the mapping arm of the NFIP, has

Table 1-3: TMAC Meetings and Activities

Date	Activity	Purpose
May 27, 2022	Administrative Meeting	Introduction of 2022 TMAC members and introduction of FEMA 2022 TMAC request
June 27, 2022	Administrative Meeting	TMAC organizes subcommittees to address tasks being undertaken in 2022
June 29, 2022	Administrative Meeting	TMAC reviews and reports out on activities and progress of the TMAC subcommittees
July 25, 2022	Administrative Meeting	TMAC reviews and reports out on activities and progress of the TMAC subcommittees
August 24, 2022	Administrative Activity	TMAC reviews and reports out on activities and progress of the TMAC subcommittees
September 26, 2022	Administrative Meeting	TMAC reviews and reports out on activities and progress of the TMAC subcommittees
October 11, 2022	Public Activity	TMAC shares annotated outline with public and requests public comment
October 23/24, 2022	Public Meeting	TMAC reviews and reports out on activities and progress of the TMAC subcommittees, and requests public comment
November 21, 2022	Administrative Meeting	TMAC reviews and reports out on activities and progress of the TMAC subcommittees
November 24, 2022	Public Activity	TMAC requests input through release of an informal survey
December 23, 2022	Public Activity	TMAC releases second draft report for public review
Jan 23/24, 2023	Public Meeting	TMAC discusses second draft report and requests public comment
March 1/2, 2023	Public Meeting	TMAC votes to finalized and publish report
March/April	Public Activity	Final Report Published (tentative)

a specific definition of "community" that is aligned to a local jurisdictions (i.e., city, town, village, county) whereas in the July 20, 2021, *Interim Implementation Guidance for the Justice40 Initiative* (Justice40 Interim Guidance) (see Executive Order 14008 text box) issued by the Executive Office of the President Office of Management and Budget (OMB), "community" is not limited to political jurisdiction but rather is defined more broadly. The Justice40 Interim Guidance "provides the initial recommendations pursuant to section 223 of Executive Order 14008 and supports the Administration's comprehensive approach to advancing equity for all in line with Executive Order 13985." Executive Order 14008 states that "40 percent of the overall benefits" of federal investments from covered programs should flow to disadvantaged communities (see Executive Order 14008 text box). For the purposes of this report, we use the definition of "community" referenced in the Justice40 Interim Guidance, which documents a set of actions required of agencies that manage covered Justice40 programs. Note also that FEMA administers the NFIP through states and the local jurisdictions, not directly with disadvantaged communities.

In addition, the FEMA Memo used several terms seemingly interchangeably:

- Disadvantaged communities
- Disadvantaged/underserved communities
- Underserved populations

EXECUTIVE ORDER 14008, TACKLING THE CLIMATE CRISIS AT HOME AND ABROAD (EO 14008)

President Biden's January 2021 executive order to take aggressive action to tackle climate change directed his Administration to:

- Center the climate crisis in U.S. foreign policy and national security considerations.
- Take a whole-of-government approach to the climate crisis.
- Leverage the federal government's footprint and buying power to lead by example.
- Rebuild our infrastructure for a sustainable economy.
- Advance conservation, agriculture, and reforestation.
- Revitalize energy communities.
- Secure environmental justice, spur economic opportunity and establish the Justice40 Initiative. The Justice40 Initiative is a government effort to deliver at least 40 percent of the overall benefits from certain federal investments to disadvantaged communities.

To reduce potential confusion about who the TMAC is referring to when using these terms, the TMAC uses one term, "disadvantaged communities," when discussing findings and recommendations to improve outcomes in areas of equity for the group specified in the FEMA Memo. Use of the term "disadvantaged communities," is consistent with the Justice40 Interim Guidance and Executive Order 14008.

Understanding the interrelationships between local jurisdictions, socially vulnerable populations, disadvantaged communities, and areas of flood risk is important in addressing the tasks undertaken by the TMAC. As shown in Figure 1-2, a local jurisdiction may include socially vulnerable populations and disadvantaged communities. In some cases, the entire local jurisdiction may comprise socially vulnerable populations and disadvantaged communities. Socially vulnerable populations and disadvantages communities may or may not be geographically defined.

As represented in Figure 1-3, most local jurisdictions are subjected to varying degrees of flood risk exposure ranging from low to high flood risk exposure.

As shown in Figure 1-4, the TMAC's focus is on the intersection of disadvantaged communities and areas of moderate and high flood risk The TMAC's evaluations, findings, and recommendations are focused on this intersection. The TMAC recognizes that disadvantaged communities are typically exposed to a greater degree of moderate and high flood risk than the general population.

1.3.2   TERMS AND DEFINITIONS

The following key terms and definitions used in this report may have a variety of meanings depending on the perspective and experience of the reader. The TMAC chose to include terms that are encountered in the May 25, 2022, FEMA Memorandum and in materials reviewed to support recommendations.
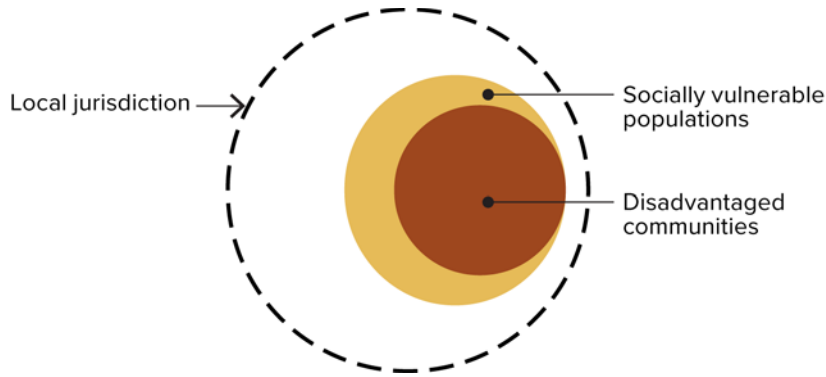
Figure 1-2: Interrelationships between a local jurisdiction, socially vulnerable populations, and disadvantaged communities
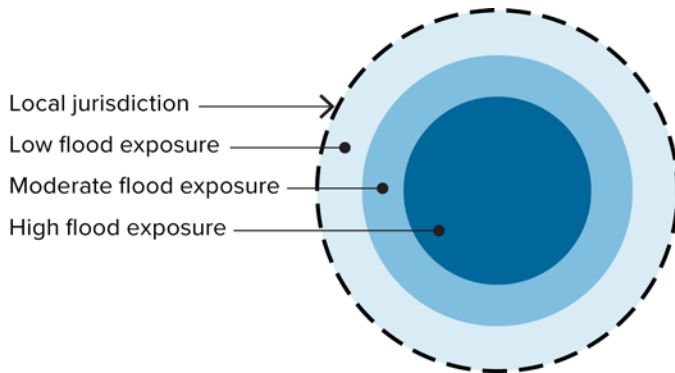
Figure 1-3: Interrelationships between local jurisdiction and flood exposure
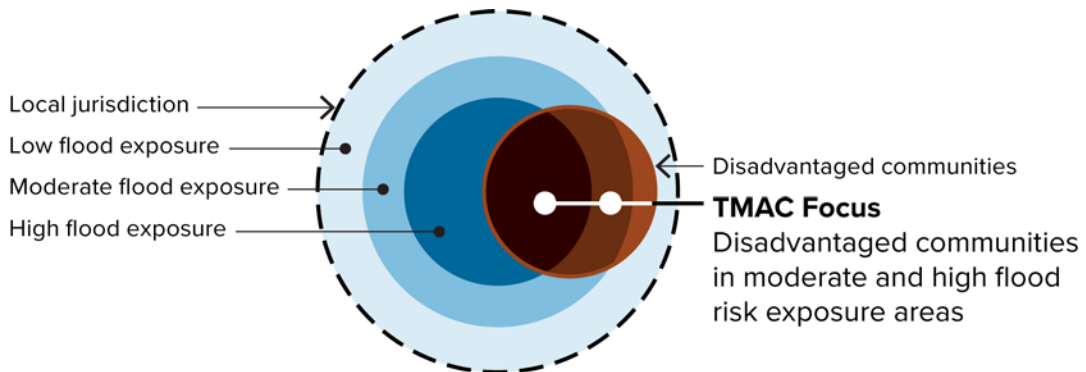
Figure 1-4: Interrelationships between socially vulnerable populations, disadvantaged communities, local jurisdictions, and flood risk areas

Disadvantaged Community. In this term, *Community* is defined as "either a group of individuals living in geographic proximity to one another, or a geographically dispersed set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions" (OMB 2021). The term *Disadvantaged* is defined based on a combination of variables that may include, but is not limited to, any of the following:

- Low income, high and/or persistent poverty
- High unemployment and underemployment
- Racial and ethnic residential segregation, particularly where the segregation stems from discrimination by government entities
- Linguistic isolation
- High housing cost burden and substandard housing
- Distressed neighborhoods

- High transportation cost burden and/or low transportation access
- Disproportionate environmental stressor burden and high cumulative impacts
- Limited water and sanitation access and affordability
- Disproportionate impacts from climate change
- High-energy cost burden and low-energy access
- Jobs lost through the energy transition
- Access to healthcare

In determining which variables to consider, agencies should consider the statutory authority for covered programs. In addition to the above definition of disadvantaged communities, geographic areas within tribal jurisdictions should be included (OMB 2021).

Equity. Equity is 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 (The White House 2021).

Redlining. The term refers to the practice of mortgage lenders of drawing red lines around portions of a map to indicate areas or neighborhoods in which they do not want to make loans. Redlining on a racial basis has been found by the courts to be an illegal practice.

Social vulnerability. Social vulnerability broadly refers to the resilience of a social group (the ability to survive and thrive) when confronted by external stresses on human health and livelihood, stresses such as natural or human-caused disasters, or disease outbreaks. Socially vulnerable populations have increased negative impacts from natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Socially vulnerable communities are not necessarily disadvantaged communities. Reducing social vulnerability can decrease both human suffering and economic loss (ATSDR 2022; FEMA n.d.b).
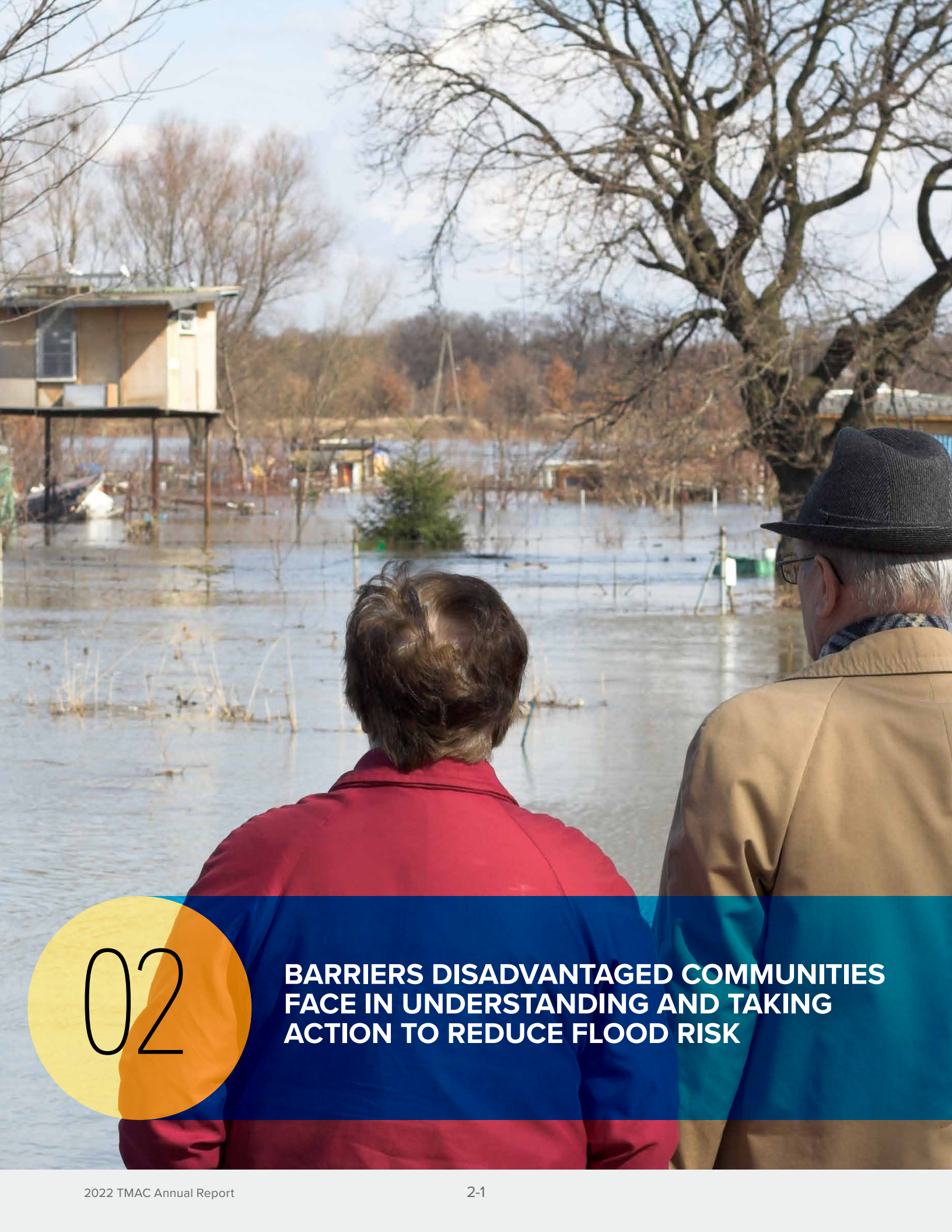
02 BARRIERS DISADVANTAGED COMMUNITIES FACE IN UNDERSTANDING AND TAKING ACTION TO REDUCE FLOOD RISK

The TMAC identified seven barriers that prevent disadvantaged communities from leveraging National Flood Mapping Program data, products, and services or acting upon critical flood risk information. The TMAC suggests actions or pathways that can be taken to mitigate the barriers. At least one pathway to better meet the needs of disadvantaged communities is suggested for each barrier.

The list of barriers identified is not exhaustive. It includes those that are believed to have a particular impact on disadvantaged communities and are also within the National Flood Mapping Program authorities granted to FEMA. In some cases, historical practice and policy led to some of the barriers that are inadvertently perpetuated today.

EXCERPT FROM FEMA MEMO

Evaluate the barriers that disadvantaged communities face in understanding their risk and acting to reduce their risk. Recommend ways for the program to overcome these obstacles and better meet the needs of these communities.

2.1   BARRIERS AND PATHWAYS

"Understanding human systems and interpreting natural systems are both very important. But overall, we spend much less time thinking about human systems compared to the built environment and the physical dimensions of flooding—which I think is a problem."

—Dr. Eric Tate
Associate Professor
University of Iowa
Department of Geographical
and Sustainability Sciences

Seven barriers that may affect flood risk understanding and taking action are described below. They are grouped into four general categories as shown below:

- Information Delivery
  - Unequal access to information
  - Language barriers to information primarily distributed in English
  - Logistical components of the National Flood Mapping Program
- Jurisdictional Capacity and/or FEMA Data Gaps
  - No or unreliable flood hazard data
  - Difficulty translating highly technical data into action
- Financial Resources
  - Lack of financial resources
- Other
  - Lack of trust

The TMAC considered activities that FEMA could facilitate to provide pathways that remove or reduce these barriers for disadvantaged communities. These pathways include:

- Enhanced, inclusive, accessible, and equitable communications
- Tailored products
- Technical assistance
- Additional analysis to support program/policy revisions

- Leveraging partnerships

For the purposes of this report, TMAC uses the Justice40 Interim Guidance definition of disadvantaged communities as described in Chapter 1.

2.1.1   INFORMATION DELIVERY

"Social vulnerability to floods is the result of chronic issues in our social and economic systems. It is about who gets access to resources and who gets to participate in decisions. As a result, some population groups have seen persistently higher impacts from flooding."

—Dr. Eric Tate
Associate Professor
University of Iowa
Department of Geographical and
Sustainability Sciences

Barriers related to information delivery include unequal access to information and logistical components of the National Flood Mapping Program process.

Barrier: Unequal access to information

In 2003, FEMA began a Map Modernization effort converting flood hazard maps from paper to digital. Paper maps were previously available in limited supply at government offices and through the Government Printing Office. Converting to digital maps provided undisputed maintenance, update, and access improvements. Maps and data are now available online from the National Flood Hazard Layer (NFHL), a geospatial database that contains flood hazard data covering over 90 percent of the U.S. population (FEMA 2021a).

Providing data digitally and discontinuing and greatly reducing the availability of paper maps, may have inadvertently created accessibility challenges for those who do not have reliable access to broadband internet and cannot benefit from the increased functionality of digital flood hazard data.

"Equity is achieved not only when everyone is provided full access to information and assistance – but when interventions are taken to ensure that all are provided with the resources necessary to meaningfully participate, make progress, and benefit from hazard mitigation."

—Dr. Alessandra Jerolleman
Associate Professor
Jacksonville State University
Emergency Management
Department

Using data from the Census Bureau's 2018 American Community Survey (ACS), the Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services, found (HHS 2020):

- Individuals in low-income households have less access to internet services.
- More than one in six people in poverty have no internet access.
- People living in nonmetropolitan areas have less access to the internet than those in metropolitan areas.
- Internet access is less common among older people in poverty.
- Access to the internet among people in poverty varies across states.

Also, the *2020 Broadband Deployment Report* released by the Federal Communications Commission (FCC) found, "Tribal lands continue to face significant obstacles to broadband deployment" (2020). The report indicates other areas of the nation, including territories and non-tribal rural areas, also lag behind in broadband access.

In addition, many people prefer to see paper, read paper, and get hard copy mail. In some cases, even when there is access to broadband internet, it may still be easier for some to understand information if it is in a hard copy format.

Potential Pathway: Tailored products to improve access

Understanding the distinct challenges, recognizing the need for different solutions, and tailoring National Flood Mapping Program efforts for different populations is important. Stakeholders engaged in a 2020 FEMA listening session for the Hazard Mitigation Assistance (HMA) program highlighted the importance of a tailored programmatic approach and underscored that deep and sustained jurisdiction engagement was often lacking. Benefits highlighted included jurisdiction buy-in and maximizing jurisdictional benefits while minimizing unintended consequences, all of which supports one of the National Flood Mapping Program goals of equipping communities with accessible and implementable solutions to meet their needs.

Although FEMA's Risk Management Directorate (RMD) does not have the authority or resources to influence the roll out of broadband internet, FEMA has invested considerably in creating digital flood hazard products. Understanding where a lack of access to digital data exists, FEMA can then provide planning and funding for the development of an appropriate media for flood risk products in disadvantaged communities, thereby improving program delivery to disadvantaged communities.

Barrier: Language barriers to information primarily distributed in English

In a predominantly English-speaking culture, non-native English speakers and non-English speakers face barriers to accessing flood risk information. Language barriers can be present because of the highly technical nature of flood risk terminology and also because of limited English proficiency. Flood Ready Vermont, a state readiness program, appropriately states, "For persons with limited English proficiency, many educational resources that are available to the general public to teach about flooding and minimizing flood risk may be inaccessible due to language barriers" (2023). Further, the average reading level for adults in the U.S. is at or around an eighth grade reading level, making it potentially difficult for many to understand the technical language used in flood risk discussions.

Potential Pathway: Enhanced, inclusive, accessible, equitable communications and tailored products

Developing flood risk data requires advanced engineering and spatial modeling expertise. However, flood risk communication products must be created in plain language that is clear and concise and avoids jargon, excessive acronyms, and complicated language. Plain language is also important for flood risk activities

that involve public meetings and public input. These occasions present potential opportunities for using translators or interpreters.

Customization of engagements and the creation of verbal and written material that meets plain language guidelines or is in a language other than English will improve delivery of the National Flood Mapping Program to disadvantaged communities. The need for tailored communication products for linguistically isolated populations should be investigated for each project. Such evaluations may require additional planning, funding, and assessment of effectiveness.

Barrier: Logistical components of the National Flood Mapping Program Process

Before the COVID-19 pandemic, the majority of opportunities to provide input or increase awareness of the mapping data were at in-person public meetings. These meetings were often planned without consideration for transportation needs and a variety of work schedules. Attendance was often low, reducing the effectiveness of information sharing. A number of logistical factors may hinder the effectiveness of the National Flood Mapping Program public meeting process.

- Individual Factors
    - Meetings are not well advertised
    - Purpose of the meeting is unclear or not considered relevant
    - Need for childcare to attend
    - Belief that the individual has no power in the outcome
    - Meetings not at a convenient time / inability to take time of off work to attend
    - Meeting locations not in close proximity to public transit prevent participation from those without access to a personal vehicle
    - Fear of the government (e.g., immigration status)

- Jurisdictional Factors
    - The flood mapping process occurs over many years and jurisdictional staff turnover results in gaps in understanding of what has been completed or agreed to
    - The process, especially the due-process component, can be perceived as convoluted, complex, and difficult to navigate
    - Higher jurisdictional priorities, such as food insecurity or community health, limit capacity to support the flood mapping process
    - Inability to supplement the federal meeting notices: the current FEMA-funded requirement is for limited newspaper publication and *Federal Register* notice

Potential Pathway: Enhanced, inclusive, accessible, and equitable communications; tailored products; partnerships

Tailoring the engagement processes to better meet the needs of the stakeholders will improve delivery of the National Flood Mapping Program to disadvantaged communities. Tailoring engagement may include:

- Assessing disadvantaged community challenges related to engaging in the National Flood Mapping Program process, including those associated with attending public meetings

- Partnering with other organizations to align National Flood Mapping Program engagements with other well-attended events already planned within the jurisdiction

- Funding additional engagement beyond the required newspaper, *Federal Register* notices, and public open houses that focus specifically on reaching disadvantaged communities

2.1.2   JURISDICTIONAL CAPACITY AND/OR DATA GAPS

Barriers related to jurisdictional capacity and/or data gaps include lack of reliable flood hazard data and difficulty translating highly technical data into action.

"The FEMA flood mapping program establishes the floor. For under-resourced communities that is the floor of data. We see the floor … is too low from a risk communication standpoint, so at scale we need to move up the floor on the socially vulnerable community's behalf because they're never going to look in their budget and say, "you know what, we ought to update our flood maps" versus "we ought to make sure that we're doing job development" or whatever might be more socially relevant in those communities."

—Jack Krolikowski
Deputy Manager Hazard Mitigation
Georgia Office of Homeland Security and Emergency Management

Barrier: No or unreliable flood hazard data

FIRMs are used for many purposes related to flood insurance, land development, regulations, and planning. According to the ASFPM 2020 *Flood Mapping for the Nation* report, over 6,500 jurisdictions in the U.S. do not have FEMA flood maps, roughly 3,300 communities have maps over 15 years old, and several communities have paper maps over 30 years old that are based on obsolete mapping methods. As ASFPM states in the same report, "It is nearly impossible to take action and reduce risk from flood hazards that haven't been identified" (ASFPM 2020).

Historically, the highest risk areas were prioritized (typically these were areas with higher population densities) to receive new and reliable maps, even over less

populated areas with considerable flood hazards. Thus, lower population jurisdictions may be less aware of flood risk because the foundational flood data does not exist or is no longer believed to be reliable. Consequently, people living in rural areas, small towns, and/or on tribal lands are less likely to have access to flood hazard information. The TMAC 2000 report states, "unmapped flood hazard areas present a serious threat to people who may choose to buy or build within them" (TMAC 2000).

Furthermore, not all areas of the country have detailed technical analysis that provides accurate and actionable flood hazard information. Some have regulatory SFHA data (supported by detailed analysis or Zone A data that are less detailed), and others may have other flood risk products that are very useful in relaying risk.

Also, FIRMs do not typically portray urban flooding. Marginalized populations suffer from the disruption and damage of urban flooding, more so than riverine or hurricane flooding. This gap in flood hazard information prevents understanding risk and taking action. It is also a barrier in obtaining funding to address it because some areas might not show up as flood-prone on a FIRM.

Potential Pathway: Additional analysis

An analysis of the age of data and the coverage in disadvantaged communities compared to that of non-disadvantaged communities will help in understanding whether disadvantaged communities have less access to detailed, current, or reliable flood hazard information. The results could be used to inform future National Flood Mapping Program investments and meet elements of the Justice40 Initiative. While FEMA has carried out analytics of this nature and has shared preliminary results with the TMAC, their work to date used the Centers for Disease Control and Prevention (CDC) Social Vulnerability Index (SVI) index rather than the Climate and Economic Justice Screening Tool (CEJST), which is available at https://screeningtool.geoplatform. gov/en/#3/33.47/-97.5 (CEJST 1.0, Nov 2022). See Chapter 5 for a more complete assessment of the data and tools available to identify disadvantaged communities.

Barrier: Difficulty translating highly technical data into action

Making the flood risk data available or accessible does not necessarily make it understandable or actionable. In a high capacity, well-resourced jurisdiction, FEMA may be able to deliver the digital data and be confident that the jurisdiction has the infrastructure and staff to use the data to assist in lowering or maintaining flood risk at a level acceptable to them. However, many jurisdictions may have difficulty translating data into actions that help them better manage flood risks, especially if they lack engineering, GIS, and local floodplain management expertise. Lack of staff capacity, insufficient tailored risk information, and varying jurisdictional interests and needs all may contribute to inaction. Low-resourced jurisdictions and disadvantaged

communities may not have the skillsets to translate flood hazard data into an understanding of flood risk or how to use it for mitigation, such as developing resilience grant applications. Disadvantaged communities will most likely need technical support to apply for and implement any mitigation efforts.

Potential Pathway: Technical assistance

Technical assistance can support disadvantaged communities that have data but do not have the time, infrastructure, or staff to use it.

Mitigation Planning Technical Assistance (MPTA), which allows assistance to jurisdictions to bridge the gap between understanding and action through activities such as outreach, mitigation grant application support, technical analysis, capacity building, and training, is embedded in the NFIP process. In its 2018 *Guidance for Flood Risk Analysis and Mapping,* FEMA states "Under [the National Flood Mapping Program], mitigation planning technical assistance is envisioned to be a component of every flood risk project" (FEMA 2018a). Equipping the FEMA regions with additional guidance, examples, and training on how to provide technical assistance to disadvantaged communities during the flood mapping process project lifecycle may increase this support. Actions that may result in greater use of MPTA include:

- Encouraging jurisdictions to take advantage of technical assistance during the flood risk study process

- Making it easier for jurisdictions to navigate and participate in FEMA's and other federal programs' technical assistance options, including leveraging or expanding the use of FEMA's Direct Technical Assistance component of the Building Resilient Infrastructure and Communities (BRIC) Program

- Clarifying technical assistance activities and processes that may work particularly well for lower capacity and disadvantaged communities

- Integrating technical assistance across the National Flood Mapping Program

- Creating technical assistance metrics and measures

- Providing additional support to disadvantaged communities interested in bringing flood risk to acceptable levels, such as providing practical actions that can be taken to reduce risk.

Also, FEMA's Future of Flood Risk Data (FFRD) initiative is exploring the use of probabilistic modeling to develop more detailed, comprehensive, and flexible flood hazard and risk datasets, primarily for non-regulatory purposes. Dissemination of these data will expand the availability of high-quality flood hazard and risk information previously unavailable to resource-constrained jurisdictions as well as enable more tailored data visualization, communication, and analysis approaches to meet the needs

of users who have less experience and knowledge with FEMA flood hazard products. Considering the needs of disadvantaged communities in the design and dissemination of this new generation of risk products, graduated datasets, and maps is critical to prevent confusion and adding burdens to lower-capacity jurisdictions that may then further exacerbate inequities. An equitable roll-out of FFRD products will need to include tailored engagement, data formats, and tools that provide equal access to disadvantaged communities.

"One of the benefits [of FFRD] is that the data you are creating is flexible enough to support future regulatory environments and can support risk-based resilience decisions and eventually future conditions."

—Christina Lindemer
Coastal Engineer and Emergency Management Specialist, FEMA

2.1.3   FINANCIAL RESOURCES

Another barrier to understanding risk and taking action is financial considerations.

Barrier: Financial barriers

Redlining refers to the historical practice by mortgage lenders of drawing red lines around areas or neighborhoods in which they intend to deny loans. See complete definition in Terms and Definitions (Chapter 1).

Having fewer personal financial resources may affect individual homeowners from taking actions to reduce their flood risk in historically minority communities. According to a Redfin analysis of flood risk in 38 U.S. metropolitan areas, formerly redlined areas have $107 billion worth of homes facing high flood risk—25% more than non-redlined areas (Redfin Real Estate News 2021). Authors noted, "In redlined neighborhoods, it was nearly impossible to get a loan, resulting in decades of diminished home equity and economic inequality for Black Americans." Because of decades of disinvestment, formerly redlined neighborhoods aren't as financially able to act to reduce their flood risk.

Also, access to banking and financial services is less available to disadvantaged communities. Years of financial exclusion perpetuates preexisting disparities and may limit the effectiveness of efforts to address inequality. For example, lack of value in area homes can impact the ability to obtain loans for mitigation, thereby impeding flood risk reduction efforts. Further, disadvantaged communities may lack the resources to maintain the standards required for participation in the NFIP and the lack of jurisdictional participation in the NFIP reduces access to financial support such as insurance, loans, and federal assistance, which exacerbates the financial barrier to reduce flood risk.

Low-income areas have a smaller tax base and, therefore, less funding to reduce flood risk on a larger scale. Despite awareness of flood risk, some local officials may be

reluctant to prohibit construction in some areas because of concerns about further limiting the tax base. This may be especially true in areas that have fewer alternate options for generating revenue.

Even with the benefit of flood risk awareness, communities with no or poor financial resources may not have the means to take action or may face consequences from spending on mitigation that outweigh the potential risk of flooding.

"… people at the margins and the most vulnerable … are the ones who understand their risk because they live it. They see it every single day. They are living a fragile existence. … yes, [part of our task] … is about improving risk perception and education. Part of our task, yes, is about trying to get people to take recommended protective actions such as to buy flood insurance, to elevate their home, [to relocate]. But then we know that really the last and the hardest mile … is, how do we support people to take the actions that they're being told to take? … they may not have the resources, the capacity, the time, or the ability to move."

—Dr. Lori Peek
Professor of Sociology and Director of the Natural Hazards Center
University of Colorado Boulder

Potential Pathways: Technical assistance, tailored products, partnerships, and program revisions

Leveraging partnership resources may reduce financial barriers. For example, FEMA can support more jurisdictions when it leverages partners to conduct training or provide technical assistance. Technical assistance, which was identified as a pathway to help translate technical data into action, can also provide surge support when financial barriers prevent understanding and acting to reduce flood risk.

FEMA's guidance document, *Incorporating Mitigation Planning Technical Assistance into National Flood Mapping Program Projects* (2018b), explains how the program can help jurisdictions use National Flood Mapping Program data to take mitigation action. This program support as described in the guidance document can supplement the efforts of jurisdictions with disadvantaged communities that have limited discretionary funding of their own to increase flood risk awareness and reductions efforts. Examples of mitigation support that can be provided through the program include using data to assess relative risks and vulnerability; modeling mitigation scenarios for possible projects; quantifying the long-term social, economic, and environmental benefits of proposed infrastructure investments; and utilizing the Flood Risk Assessment dataset to identify areas where mitigation activities may produce the greatest return on investment.

FEMA may be able to learn from National Fish and Wildlife Foundation (NFWF) and other grant makers that offer smaller equity-centered grants and training opportunities to build capacity within under-resourced jurisdictions. This approach could make

it easier for communities to better navigate the FEMA grant programs application process and financial barriers.

Finally, a review of current grant programs to determine whether they allow equitable access for low-capacity jurisdictions with disadvantaged communities could reveal where changes to policy may reduce this barrier. Closing the competitive gap between low- and high-capacity communities is essential to ensuring FEMA grant programs are truly equitable.

2.1.4   TRUST

Another barrier to understanding risk and taking action is a lack of trust.

Barrier: Lack of trust

According to the by the Pew Research Center's *Americans' Trust in Government, Each Other, Leaders* report, "two-thirds of adults think other Americans have little or no confidence in the federal government." The report goes on to indicate that "Levels of personal trust are associated with race and ethnicity, age, education and household income...Those with less income and education are markedly more likely to be low trusters" (Pew Research Center 2019). Low levels of income and education can be linked to the following categories of disadvantaged communities: low income, high and/or persistent poverty, and high unemployment and underemployment. Therefore, disadvantaged communities are more likely to distrust the government than the general public.

Tribal entities, in particular, are impacted by a lack of trust in the federal government. A 2011 article published in the Journal of Community Psychology noted that:

> *During the past 500 years, many American Indian and Alaska Native peoples have learned to distrust the people who came to their land as colonizers and the institutions they created...Distrust has also been earned by European-American service providers, educators, and researchers who have intentionally or inadvertently imposed their values, beliefs, and systems of care upon individuals, families, and communities for whom these services or practices may be ineffective and/or harmful (NIH 2011).*

Throughout American history, Native Americans have been displaced from their ancestral lands and resettled in various locations across the United States, many of which experience the impacts of sea-level rise and other climatic changes. Being relocated from their lands has led to cultural and socio-emotional sensitivities and a distrust in government that may contribute to not taking action to reduce flood risk.

Because FEMA, a federal agency, leads the creation of flood hazard maps and the communication of flood risk is largely directed by federal, state, and other partners, any lack of trust in these institutions inhibits mitigation action. If a disadvantaged community does not believe the agency issuing the information is trustworthy, it is unlikely to believe the information is credible and take action based on that information. Also, as stated in various subject matter expert (SME) presentations, disadvantaged communities are reluctant to take support from others outside their circle of trust.

Potential Pathway: Partnerships

FEMA has embraced partnerships as essential across its programs as evidenced in the RMD goals to be a trusted source of hazard and risk information and to invest in strategic partnership networks that expand our reach to increase the nation's resiliency (FEMA 2019). The FEMA Strategic Plan also notes "FEMA must transform how the agency delivers support so that partners can increase their capacity" (FEMA 2023).

Partnerships help to foster trust of information and program uptake, in part, because partners can more effectively identify barriers and opportunities to tailor programs and policies. This partnership role will be increasingly important as the National Flood Mapping Program develops more non-regulatory products that are tailored to community interests and needs.

Positioning FEMA as the convener and co-producer of flood risk information may increase trust in flood risk products. Additionally, partnering with entities that have greater cultural competency within the stakeholders' groups they hope to influence will lead to better outcomes. FEMAs Cooperating Technical Partner (CTP) program is an example of how this can work effectively. Enhancing and expanding partnerships through this program may result in the delivery of flood data that are more readily accepted by disadvantaged communities.

Other FEMA-led partnership programs and initiatives have potential to move disadvantaged communities further along the resilience continuum. These could include the Department of Homeland Security (DHS) Center for Faith-Based and Neighborhood Partnerships, the Resilient Nation Partnership Network, and others. Exploring where the use of partnerships may be most fruitful, including trust-building, may help position disadvantaged communities to better understand and act to reduce flood risk. FEMA could also seek out, identify, and resource "champions" within disadvantaged communities who could support FEMA, state, and local jurisdiction messaging about flood risk. Providing technical support to these communities may require a liaison that the community is familiar with and trusts.

Potential Pathway: Evaluation of 2022 Guidance Related to Tribal Nations

Implementation of 2022 Guidance Related to Tribal Nations may also help reduce trust barriers in tribal nations. In November 2022, the Biden Administration shared actions that demonstrate prioritized relationships with tribal nations. These actions may improve their trust in government, thereby increasing trust in flood hazard products. Some of these actions include:

- Releasing new tribal consultation policies and a best practice report for integrating tribal treaty and reserved rights into agency decision-making,

- Increasing tribal participation in the management and stewardship of federal lands and waters of significance to tribal communities,

- Distributing of a first-of-its-kind government-wide guidance for federal agencies to recognize and include Indigenous Knowledge in federal research, policy, and decision making,

- Announcing a new "access to capital" initiative with the goal of increasing awareness, access, and utilization of financing opportunities for tribal nations; and

- Issuing new regulations to consider tribal benefits in water resources development projects.

A more complete list of actions can be found at https://www.whitehouse.gov/briefing-room/statements-releases/2022/11/30/fact-sheet-biden-harris-administration-announces-new-actions-to-support-indian-country-and-native-communities-ahead-of-the-administrations-second-tribal-nations-summit/ (The White House 2022).

An evaluation of how each of these actions intersect with the National Flood Mapping Program is suggested.

2.2   SUMMARY OF FINDINGS

Based on TMAC's assessment, we believe that the barriers that prevent disadvantaged communities from understanding and acting to mitigate their flood risk are varied and broad. Some barriers are the result of long-term systemic or programmatic actions experienced by these communities. Others, such as language, are the result of unique characteristics of these communities. The root causes of these barriers are often complex and not easily addressed. This chapter discussed suggested improvements or enhancements to processes and programs as potential pathways to remove or reduce barriers. These pathways may improve information delivery, increase disadvantaged community capacity, address financial constraints, and create trust. The pathways

include the use of enhanced communications, tailored products, technical assistance, additional analysis to support program/policy revisions, and leveraging partnerships. Specifically, the TMAC suggests that FEMA consider the following actions to help address barriers encountered by disadvantaged communities:

- Enhance communications by providing additional planning and funding for supplemental, alternate, or enhanced communications in flood risk project areas that include disadvantaged communities. Enhanced communications do not simply mean more communications, rather it means communications that address inclusivity, accessibility, and equity in delivery.

- Co-create flood hazard/risk products, with disadvantaged communities, that are tailored to demonstrate how the things they value are impacted by flooding with an aim to identify practical actions that can be taken to bring risks into a range acceptable to them.

- Explore how to make it easier for disadvantaged communities to navigate and participate in FEMA's technical assistance options, clarify technical assistance activities and processes that may work particularly well for disadvantaged communities, integrate technical assistance across all FEMA mapping and mitigation programs, and create technical assistance metrics and measures.

- Assess and enhance the use of partnerships to help overcome the lack of trust and financial resources and reduce logistical barriers to participation in the National Flood Mapping Program for disadvantaged communities.

These suggested actions are included within specific recommendations in Chapter 7.

03

UNINTENDED CONSEQUENCES AND BENEFITS OF THE NATIONAL FLOOD MAPPING PROGRAM FOR DISADVANTAGED COMMUNITIES

Although the National Flood Mapping Program is intended to raise awareness of hazards to help communities increase their resilience to floods, its products and services can lead to unintended consequences for disadvantaged communities. This chapter discusses the unintended consequences and benefits of National Flood Mapping Program products and services as well as the unintended consequences of not having data or having unreliable data. The benefits of reliable data are also addressed later in the chapter. This chapter expands on the barriers and benefits described in Chapter 2.

EXCERPT FROM FEMA MEMO

Evaluate and recommend ways for [National Flood Mapping Program] to identify and limit the potential negative impact and unintended consequences that might result from [National Flood Mapping Program] products and program delivery...

3.1   NEGATIVE OR UNINTENDED CONSEQUENCES OF UNRELIABLE FLOOD DATA OR LACK OF FLOOD DATA

As of February 2020, 3,300 communities (out of 22,500) had maps that were more than 15 years old (Federal Reserve Bank of New York 2022). Studies reviewed by the TMAC also show that changes in land use are impacting flooding conditions, making available flood hazard data outdated or unreliable (Rice University, Kinder Institute for Urban Research 2021). Disadvantaged communities are especially susceptible to the impacts of unreliable data, which often does not account for the urban flooding that can be substantial in urbanized disadvantaged communities. These disadvantaged communities often lack the resources to prepare for or recover from disasters and having unreliable data can exacerbate their circumstances. Unreliable data can affect preparation for disasters, understanding of risk, and the ability to recover from disasters. Although reliable data may not eliminate all risk impacts, it can lessen negative impacts. While unreliable data does affect those outside of disadvantaged communities, the disadvantaged communities face greater difficulties as a result of unreliable or no flood data.

EXAMPLE: New Jersey communities were heavily damaged when the remnants of Hurricane Ida caused flooding that exceeded the 1% annual chance data that was used to prepare for the storm.

This section addresses five potential negative impacts and unintended consequences identified in the FEMA Memo (refer to Chapter 1) as well as several others identified by the TMAC.

3.1.1   **INABILITY TO PLAN EMERGENCY RESPONSE**

Many disadvantaged communities are located in areas susceptible to flooding. These communities have infrastructure that was constructed prior to the development of flood data that might have assisted in mitigating flood risks. With upstream development increasing runoff from major storms and climate change affecting the severity and frequency of flooding, these areas are susceptible to increased risks, including life safety risks associated with evacuations prior to a flood's arrival and emergency response activities as the event unfolds. For example, during a 2016 flood event in Northern Wisconsin and the Western Upper Peninsula of Michigan that affected disadvantaged communities and jurisdictions, flood hazard data provided through the National Flood Mapping Program suggested access to the communities would not likely be an issue; however, access to the community was disrupted by the flood, and local emergency management personnel felt that their assumption about the reliability of the data negatively impacted their response objectives.

"Urbanization may lead to more flooding in cities because of decreases in wetland presence and increases in impervious surfaces."

—University of Michigan Center for Social Solutions Report titled "Case Study: Floods and Socioeconomic Inequality" (2020)

Poor evacuation and response planning, which can often be attributed to unreliable data or a lack of data, has greater consequences for low-mobility communities. A 2006 paper concludes "people with disabilities were disproportionately affected by the Hurricanes [Katrina and Rita] because their needs were often overlooked or completely disregarded" (National Council on Disability 2006). Another post-Katrina notes, "A major failure of the plans for evacuating the low-mobility population was the lack of communication" (National Academy of Engineering 2006). In addition to negatively impacting the capability of local jurisdictions to plan for flood emergencies, unreliable data or a lack of data can also make it more difficult to justify the need for resources to improve emergency response activities. The result of these data issues in low-mobility populations is a persistent increased risk of life loss. The solution is to find ways to provide reliable flood data in areas with low-mobility populations so response capabilities can be improved, and the resilience of low-mobility communities can be increased (as shown in Figure 3-1).
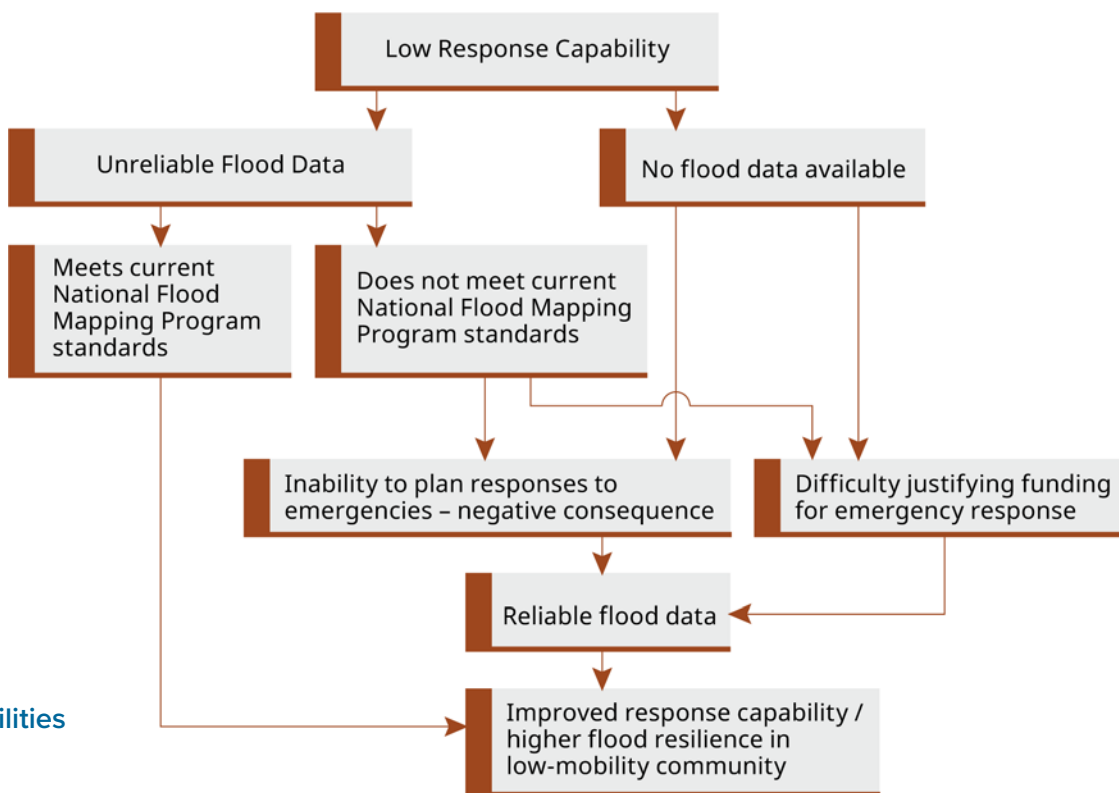
**Figure 3-1:
Path to improve
response capabilities
in low-mobility
communities**

3.1.2   POOR LAND USE AND BUILDING CODE ADOPTION CAPABILITY

A 2020 Kinder Institute for Urban Research article suggests FEMA flood data tend to underestimate flood hazards, which leads to general questions about the reliability of the data. The article states that outside the FEMA mapped flood hazard areas, Black and Hispanic residents experienced a disproportionate amount of damage during Hurricane Harvey. The author suggests that this result stems from FEMA not capturing changes in land use quickly enough, not showing flood hazards beyond the 100-year flood, and not recognizing the impacts climate change is having on flooding conditions (Rice University 2020). The TMAC suggested action provided is similar to those in past reports (2017 and 2021 reports).

FEMA should move away from a binary view of flooding, largely focused on mapping the 1% annual exceedance flood probability flood hazard, and toward a more graduated and complete view of flood hazards while also assessing flood risk to individual buildings. Figure 3-2 shows how a more comprehensive set of flood data can improve land use and building code adoption capabilities.

"Looking at the impacts of Hurricane Harvey, what we can attribute to climate change and who is feeling those climate impacts and the kinds of communities that were flooded because of climate change were particularly those that were outside of federal floodplains, particularly low income people and particularly those in in Latino and Latina neighborhoods. … [This can be attributed to] mapping programs, whether it's in the United States, the UK, Europe, anywhere globally that rely on building up a mosaic of local scale studies do miss the risk and there's always going to be bias to where is modeled … [W]hat we're seeing in the United States is a lot of the places that don't have models but are at risk are particularly disadvantaged communities. I would argue that large scale modeling techniques can resolve a lot of these issues."

—Dr. Oliver Wing
Chief Research Officer, Fathom
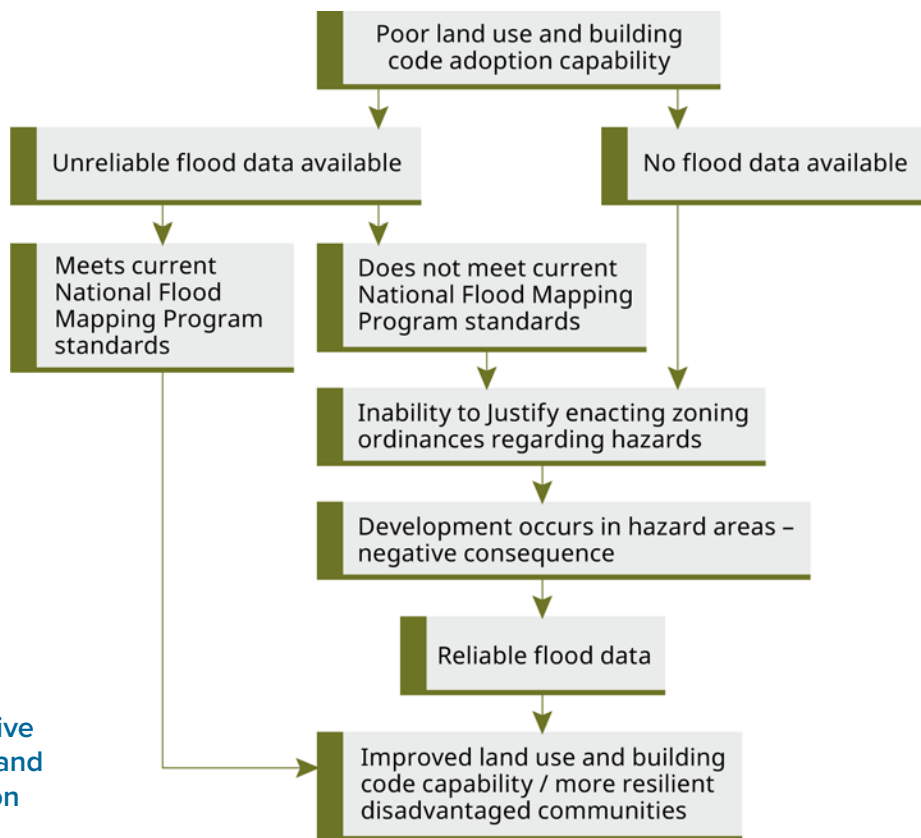
Figure 3-2: Comprehensive flood data can improve land use and building adoption capabilities

3.1.3   INABILITY TO MITIGATE HAZARDS

In many instances, a lack of flood data in disadvantaged communities makes it difficult to mitigate hazards and manage flood risks. One case study found that federal

EXAMPLE: In Essex County, NJ, unreliable data prevented the community from qualifying for Increased Cost of Compliance (ICC) or mitigation funding.

programs often overlook disadvantaged communities because reducing flood risks in wealthier areas has greater economic returns. Moreover, the study suggests that both public and governmental support is necessary to move mitigation projects forward (University of Michigan 2020). The need for federal help to move mitigation projects forward, a focus on economic returns, and a general lack of public support all keep disadvantaged communities from improving their resilience to flood risks (as shown in Figure 3-3).

Figure 3-3: Reliable flood risk data is needed to justify mitigation funding

3.1.4   INCREASED FINANCIAL BURDEN

All else being equal, disadvantaged communities exposed to moderate to high flood hazards will likely experience a faster increase in the cost of living over time. Housing values deflate and the ability to provide goods and services increase in flood-prone areas. The factors impacting the rise are two-fold: a lack of flood risk reduction capability and investment and continued or rising rates of flood damage (Marsh McLennan 2021). This results in a damage-rebuild-damage cycle with no means of escape. The solutions, as outlined in Chapter 2 of this report, include providing technical assistance to improve flood risk management capabilities (including applying

for federal grants or other aid), tailored engagement strategies and partnerships to improve local buy-in to solutions, and investments in reliable flood data to justify the need for improved emergency management capabilities and other investments.

3.1.5   INSUFFICIENT TAX OR OTHER REVENUE FOR ACCESS TO STATE OR FEDERAL PROGRAMS

Jurisdictions with a high proportion of disadvantaged communities generally have a lower local tax base, and available funds are primarily (if not exclusively) used to meet basic community needs. As such, these jurisdictions rely on state and federal aid and struggle to meet funding match requirements. Not only is meeting cost share requirements nearly impossible, but the upfront costs also associated with applying—such as studies or justification reports—can be equally challenging. The lack of funding to meet basic application and execution requirements discourages these jurisdictions from participating. This was the case for the floods in Northern Wisconsin and the Western Upper Peninsula of Michigan. Also, during our Subject Matter Expert presentation, Bobby Howard confirmed this issue. Tribal jurisdictions often have neither the expertise nor funding to address mitigation projects. When disadvantaged communities rebuild following a disaster, they are not able to access various community programs that would improve the situation. At the time, the communities in Northern Wisconsin and the Western Upper Peninsula of Michigan indicated they would just build back to the pre-event condition because they had no other options. The solutions, as outlined in Chapter 2 of this report include providing technical assistance to improve flood risk management capabilities (including applying for federal grants or other aid), tailored engagement strategies and partnerships to improve local buy-in to solutions, and investments in reliable flood data to facilitate the justification for improved emergency management capabilities and other investments.

"There are barriers built in that prevent the tribal nations from even attempting grant opportunities because of the way that they're written … The only people that can apply for the [grants] are the Big 5 [tribal nations]. Because no one else meets the eligibility requirements. There are 39 tribes in the state of Oklahoma, and five can apply for the grant … The bigger issue is there are 574 federally recognized tribal nations that all compete against each other for all these set asides and the money in the set aside that is 32 times less than what the normal grant that the 50 states get to apply for. The boundaries of the Muscogee Nation is the size of Rhode Island [but] Rhode Island is able to compete for a pot of money that is 32 times larger than what I can compete for."

—Bobby Howard
Emergency Manager, Muscogee (Creek) Nation
Member of the State, Local, Tribal, and Territorial Government Coordinating Council (SLTTGCC)

3.2   UNINTENDED CONSEQUENCES OF RELIABLE FLOOD DATA

Providing reliable flood data can lead to many benefits for disadvantaged communities and jurisdictions. However, some unintended negative consequences can occur. This section addresses negative impacts and unintended consequences identified in the FEMA Memo (refer to Chapter 1) as well as several other potential unintended consequences identified by the TMAC, such as a perception that areas located outside the SFHA do not have a flood risk.

3.2.1   REMAPPED AS SPECIAL FLOOD HAZARD AREA

When FEMA updates its regulatory flood mapping under the National Flood Mapping Program, and the area mapped as being within the SFHA increases, any federally backed loan on a home within the revised SFHA is subject to the flood insurance mandatory purchase requirement. In disadvantaged communities, this increases the financial burden on those who may only marginally be able to meet financial commitments. For example, renters could be burdened with a rent increase when landlords pass on the increased costs related to being mapped in the SHFA. Additionally, some banks are reluctant to provide loans to properties in an SFHA (Federal Reserve Bank of New York 2022).

The solution to these challenges cannot be solved through FEMA's National Flood Mapping Program. In fact, any attempts to solve bank lending practices or insurance affordability issues by withholding or slowing down the dissemination of flood data would only worsen the problems. The most rational solution to these challenges is to reduce the risk to levels acceptable to those taking them; however, that is not so easy to accomplish given the other barriers. FEMA has proposed some other ideas in its *Affordability Framework* report (Department of Homeland Security 2018). Regardless, any solutions to address these challenges can be complemented by the other recommendations in this report, including providing technical assistance to disadvantaged communities to improve their flood risk management capabilities (including applying for federal grants or other aid), tailoring engagement strategies and partnerships to improve local buy-in to solutions, and investments in reliable flood data to facilitate the justification for improve emergency management capabilities and other investments.

3.2.2   POTENTIAL FOR INCREASED HOMELESSNESS

The TMAC reviewed a number of documents regarding links between flooding and homelessness and some studies that suggest homelessness rises in disadvantaged communities after a flood disaster, nothing indicates flood mapping itself increases homelessness.

3.2.3   SUMMARY OF UNINTENDED CONSEQUENCES

Table 3-1 summarizes the types of flood risk data that may exist in the Risk MAP program along with the potential consequences, negative or positive, and an overall assessment of how it translates to disadvantaged communities. The TMAC believes that the benefits of providing reliable flood risk data to disadvantaged communities far outweigh any negative consequences.

Table 3-1: Summary of Potential Consequences

Data Type	Potential Negative Consequences	Potential Positive Consequences	Overall Assessment for Disadvantaged Communities
No Flood Data	Fails to demonstrate hazards exist, unknowingly increasing risk to lives and property. Inability to mitigate hazard and creating social inequity.	None	Provide comprehensive flood data to all citizens and remove access barriers for disadvantaged communities.
Regulatory Data	• Requires mitigation for new or substantially damaged buildings, may be unaffordable for some • Requires insurance for federally backed loans, may be unaffordable for some, communicates hazards exist, could reduce property values, could force business to relocate causing job losses	• Requires mitigation for new or substantially damaged buildings – reduces risk • Requires insurance for federally backed loans – provides a financial backing • Communicates hazards exist - informs people making investments	Continuing to maintain regulatory data is critical. Expanding regulatory data into disadvantaged communities makes sense; however, affordability issues must be addressed effectively to mitigate the potential negative consequences for those who cannot afford to move out of harm's way, to lower risks through mitigation or to transfer risks through insurance.
Informational Data	• Does not require mitigation • Does not require insurance • Could reduce property values	• Offers information to aid in analyzing mitigation options • Offers information to aid in insurance purchase decisions • May help buyers avoid buying into an unacceptable level of risk	Without requirements to mitigate or avoid risks, informational data may not have the impacts regulatory data has; however, providing the data helps disadvantaged communities build cases for mitigation investments, seeking assistance to address insurance affordability challenges. Potential decreases in property values are negative from the view of a seller's eyes, but positive from the view of a buyer's eyes so TMAC views this as a neutral consequence.
Unreliable Data	• Could lead to inequitable floodplain management requirements • Could lead to inequitable insurance purchase requirements • Could lead to over/under investing in mitigation	None	Unreliable data leads to inequities that are difficult to remedy because they can be hidden thus to avoid these inequities it is important to invest in ensuring data is properly maintained in total – including in disadvantaged communities (e.g., don't neglect or forget to maintain data in disadvantaged communities).

3.3   BENEFITS OF RELIABLE NATIONAL FLOOD MAPPING PROGRAM PRODUCTS FOR DISADVANTAGED COMMUNITIES

This section addresses how having either regulatory or nonregulatory reliable flood data can benefit disadvantaged communities (such as improving community lifelines and being able to assess the risk).

3.3.1   ABILITY TO PROVIDE MITIGATION

Reliable flood data gives disadvantaged communities the flood risk information they need to plan and apply for funding of mitigation strategies that could reduce damages from a flooding disaster. FEMA has programs available for funding flood mitigation activities, which can lead to a reduction in flood insurance premiums. Some researchers suggest that mitigation based on reliable flood data would benefit disadvantaged communities by allowing for the construction of structures that can withstand floods with minimal damage resulting in fewer at-risk structures (University of Michigan 2020; SAMHSA 2017).

Although there is the possibility that reliable flood data could limit access to financial support (as discussed in Chapter 3), the ability to justify mitigation practices, as noted in the studies cited above, will help reduce flood risk and outweigh any negative consequence. These articles, along with presentations from SMEs, have indicated that although mitigation efforts reduce flood risks, reliable data is needed to justify the financial support needed for mitigation projects.

3.3.2   ABILITY FOR PERSONAL FINANCE OF IMPROVEMENTS

Having reliable flood data allows financial institutions to match loans with qualified individuals. Loans for property in flood hazard areas are denied at higher rates than those outside flood hazard areas (Federal Reserve Bank of New York 2022; Federal Reserve Bank of San Francisco 2019). This could mean disadvantaged communities (particularly those with lower incomes) in areas with high to moderate flood risk would be less able to qualify for loans, which in turn may result in gentrification in these areas. The ability to execute mitigation practices, comply with jurisdictional building requirements, and obtain flood insurance would make financial institutions more comfortable extending loans in these areas given lower risks (Federal Reserve Bank of San Francisco 2019). Achieving the benefits associated with reliable data facilitating improved flood risk management capabilities requires that steps be put in place to offset the risks of potentially gentrifying flood hazard areas. The solution is not to withhold flood data but to address more directly the flood risks and affordability issues facing disadvantaged communities.

3.3.3   ABILITY TO CREATE QUALITY HOUSING BY AVOIDING FLOODPLAIN

Housing in disadvantaged communities have a disproportionate amount of flood risk and thus they suffer more when disasters strike (SAMHSA 2017). The Federal Reserve Bank of San Francisco suggests improving building codes and zoning ordinances to lower flood exposure (Federal Reserve Bank of San Francisco 2019). The article also indicates that building practices should take into consideration flooding, similarly those for hurricane wind loads and earthquake loads. With reliable flood data, local jurisdictions and states can work collaboratively to improve the quality of existing and future housing to make it more flood resilient.

3.4   SUMMARY OF FINDINGS

Based on the assessment conducted by the TMAC, having unreliable or no data can negatively affect disadvantaged communities by lowering their capability to effectively manage flood risks. While having reliable data generally increases an advantaged jurisdictions' ability to manage flood risks, will need to take additional steps to assist disadvantaged communities in using reliable flood data. The TMAC believes that if insurance rates were to be reduced it should be through an affordability program not by changing the methods of delivering reliable data or not providing reliable data.

However, having reliable flood data alone will not likely reduce flood risk or flood insurance premiums in disadvantaged communities. To reap the benefits of reliable data in those areas, additional tools and solutions must be deployed to avoid any potentially negative consequences. The TMAC suggests that FEMA consider the following actions to reduce the unintended consequences to disadvantaged communities:

Provide Reliable Flood Data. Disadvantaged communities are more likely to have unreliable or no flood data. This leaves them more vulnerable to flooding disasters and makes recovery more difficult should disaster strike. To help disadvantaged communities better plan for and mitigate flooding risks.

Provide Mitigation Resources to Disadvantaged Communities. Disadvantaged communities often do not have the resources or expertise to navigate or understand mitigation opportunities that are available to them. As part of its National Flood Mapping Program, FEMA should provide assistance to help disadvantaged communities interpret the data and generate solutions to their biggest flood risk issues. These solutions might include helping them identify potential mitigation projects that match their values, gain access to funding, or help them execute actions that reduce flood risks.

Establish a Professional Liaison Network. One of the difficulties disadvantaged communities and jurisdictions face is the lack of connection and trust when working with outside groups. FEMA should establish and properly resource a disadvantaged community liaison network of qualified professionals who can help assist disadvantaged communities and jurisdictions with the activities outlined in the previous action. Although such a network is typically outside the normal role FEMA plays, it would help disadvantaged communities with understanding the processes to reduce flood risk. This network could be made up of local floodplain managers, or other community leadership that understand both the flood risks the disadvantaged communities and jurisdictions face and the values the communities or jurisdictions' hold, along with the unique situations they face.

Based on the assessment conducted by TMAC, the TMAC believes that FEMA Risk MAP products and data do create unintended negative consequences to disadvantaged communities, however the TMAC also believes that providing reliable flood risk data offsets the unintended or negative consequences. Unreliable data or a lack of data can negatively affect disadvantaged communities by lowering their capability to understand their flood risk exposure, effectively manage flood risks, and take advantage of mitigation opportunities. In Table 3-2 below TMAC describes suggested activities FEMA should take to provide communities with reliable flood risk data and services. For each suggested activity TMAC has described the potential risks and benefits, and an overall assessment of how it translates to disadvantaged communities. These suggested actions are included within specific recommendations provided in Chapter 7.

Table 3-2: Suggested Activities for Reliable Flood Risk Data and Services in Disadvantaged Communities

Activity	Potential Risk of Activity	Potential Benefits of Activity	Overall Assessment for Disadvantaged Communities
Regulatory Provide reliable regulatory flood data to disadvantaged communities	• Required flood insurance may be unaffordable • Increased housing costs (Mitigation)	• Provide reliable emergency response • Allow for justification of mitigation funding and implementation • Provides comfort for lending by financial institutions • Provides ability to plan for quality affordable housing • Allows for understanding risk • Provides basis to gage insurance costs	• Based on the studies and articles cited in this Chapter, providing reliable regulatory flood data provides disadvantaged communities the benefits to plan for events with minimal risks. • Based on the potential risks and benefits of this activity, the findings of the TMAC find that the potential benefits to disadvantaged communities outweigh the potential risk
Non-regulatory Provide reliable non-regulatory flood data to disadvantaged communities	• Disadvantaged communities may not be aware of the risk of flooding. • May not have insurance to cover damages in case of a flood event.	• Flood insurance, which may be unaffordable, will not be required. • Could still have justification for mitigation funding. • Jurisdiction could use the data for floodplain management.	Providing non-regulatory flood data would provide the same benefits that regulatory data has but removes some of the unaffordability risk associated with regulatory flood data. However, those at risk of flooding may not have insurance to assist with recovery after a flood.
Provide technical assistance to disadvantaged communities	• Disadvantaged communities may lack knowledge or resources to address providing reliable flood data or mitigation • Disadvantaged communities may not know where to look for assistance	• Provides disadvantaged communities the ability to determine the funding available • Provides disadvantaged communities a way to understand and navigate the process of obtaining funding • Provides disadvantaged communities a resource to successfully implement projects, including mitigation	The studies cited in this Chapter indicate that disadvantaged communities lack the knowledge or resources to successfully reduce flood risk. By providing technical assistance, these communities would have a better chance of improving their risk as it relates to floods.
Provide liaison to build trust with disadvantaged communities	• Disadvantaged communities often do not trust outside entities to give assistance • Disadvantaged communities may have a difficult time taking advice from entities they do not have a relationship with	• Having a liaison would build trust with the communities • The liaison would help the communities understand all the benefits of mitigation by being able to talk to their specific situation. The liaison would be able to act as an intermediator between FEMA and the community. This would allow both entities to gain trust with each other	Disadvantaged communities often lack trust with outside entities. Having a liaison (not necessarily a FEMA employee) would help bring the trust factor to the community. By increasing this trust, the community would be more willing to look at opportunities to improve its flood risk.
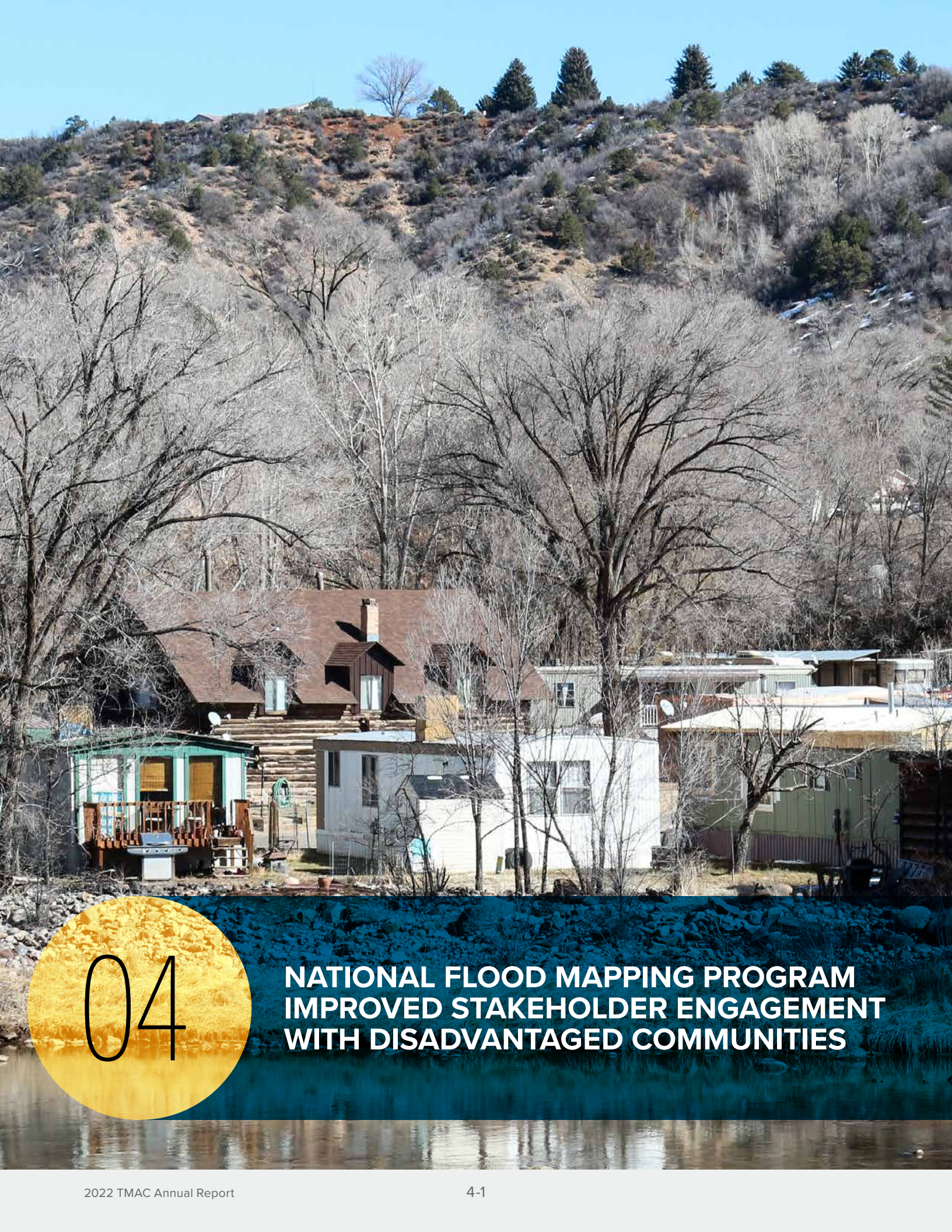
04 NATIONAL FLOOD MAPPING PROGRAM IMPROVED STAKEHOLDER ENGAGEMENT WITH DISADVANTAGED COMMUNITIES

Over the years, FEMA has transformed its traditional flood hazard identification and mapping efforts into a more integrated process of identifying, assessing, communicating, planning, and mitigating flood-related risks through the National Flood Mapping Program. Stakeholder engagement and working with federal, state, tribal, and local partners throughout the project timeline is central to the National Flood Mapping Program process.

Stakeholder engagement is the way an organization involves people who may be affected by its decisions or who can influence the way its decisions are carried out. The National Flood Mapping Program recognizes stakeholder engagement as a critical part of any flood risk project. FEMA's current Stakeholder Engagement Guidance can be found in four documents available at https://www.fema.gov/flood-maps/guidance-reports/guidelines-standards/guidance-femas-risk-mapping-assessment-and-planning.

As the National Flood Mapping Program continues to evolve to deliver probabilistic flood hazard and graduated flood risk information and achieve equitable outcomes, forming partnerships with trusted and diverse community organizations will help FEMA and its partners more effectively achieve key program outcomes. As proposed in a 2022 National Academies of Sciences, Engineering, and Medicine report, and supported by FEMA's Resilient Nation Partnership Network's forums and resources, building alliances among partners helps drive action at the national, state, local, tribal, and territorial (SLTT) levels. These collaborations work across the board but are particularly effective in improving equity and resilience in disadvantaged communities (National Academies of Sciences, Engineering, and Medicine 2022).

Taking an equitable approach to stakeholder engagement is supported by FEMA's Strategic Plan.* Goal 1 of the Strategic Plan acknowledges that a community's geographic, demographic, political, historical, and cultural characteristics create the unique contexts that require tailored solutions to meet the community's unique needs:

The nation needs all communities to be resilient. Proactively prioritizing actions that advance equity for communities and identifying groups that have historically been underserved or disproportionately affected by disasters is critical for their resilience.

FEMA should use an informed and intentional approach to proactively engage trusted and diverse community leaders and organizations to help identify and prioritize practical actions that reflect the diversity of values and goals across all NFIP-

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* The 2022–2026 FEMA Strategic Plan outlines a vision and three goals designed to address key challenges the agency faces during a pivotal moment in the field of emergency management.

participating jurisdictions. Communities are much more likely to reduce their flood risk when they understand how flooding poses risks to the outcomes they want to achieve, are involved in identifying those risks and outcomes, and have the tools and resources to adapt as new information and experiences warrant change. Taking a tailored approach to remove barriers for groups that have historically been underserved means making it easier for disadvantaged communities to engage in the process through equal access, making the benefits of the National Flood Mapping Program available to all.

4.1   EVALUATION OF CURRENT STAKEHOLDER ENGAGEMENT PROCESS

The National Flood Mapping Program is managed nationally but delivered regionally, through Risk MAP and NFIP mapping projects. FEMA Regional Offices work in consultation with their states and in coordination with mapping partners. Mapping partners may include contractors, CTPs, and other federal agencies. Although each Region may have a unique approach to delivering the program, National Flood Mapping Program activities generally follow a standard engagement timeline.

An evaluation of the current flood mapping engagement process found that the process leans heavily on pre-determined required touchpoints, born mostly from meeting minimum statutory and regulatory notification requirements. This can lead to a "check the box" approach to accomplishing the engagement tasks. Flexibility is afforded in how the engagement is delivered, but additional engagement outside of the pre-determined required touchpoints is not always available.

GOALS OF THE RISK MAP PROGRAM

GOAL 1: Address gaps in flood hazard data to form a solid foundation for flood risk assessments, floodplain management, and the actuarial soundness of the NFIP.

GOAL 2: Ensure that a measurable increase of the public's awareness and understanding of risk management results in a measurable reduction of current and future vulnerability to flooding.

GOAL 3: Lead and support states, communities, and tribes to effectively engage in risk-based mitigation planning that results in sustainable actions that reduce or eliminate risks to life and property from natural hazards.

GOAL 4: Provide an enhanced digital platform that improves management of National Flood Mapping Program resources, stewards information produced by National Flood Mapping Program, and improves communication and sharing of risk data and related products with all levels of government and the public.

GOAL 5: Align risk analysis programs and develop synergies to enhance decision-making capabilities through effective risk communication and management.

Being more equity-centered is not just a social requirement; it is a necessity to meet the changing needs of the U.S. population. To empower Whole Communities, especially disadvantaged communities, to reduce their risk, it is important to identify and understand the unique needs and diversity of those communities. This understanding requires discovering each community's key characteristics, social factors, culture, history, and more. Exploring and understanding these factors will help FEMA tie program delivery to community values and objectives. These community insights can be identified using tools such as the CEJST and the SVI and by engaging with the people who actually live in the community.

Disadvantaged communities present unique engagement challenges. The challenges the local jurisdiction face impact the ability of the disadvantaged element within the community to interpret and apply the information conveyed during the flood mapping process. Jurisdictions with disadvantaged communities face challenges ranging from a lack of resources, including funding for staff, technology, and outreach, to cultural challenges, such as language barriers and distrust of outsiders. (Refer to Chapter 2 for additional barriers.) The limited staff in these jurisdictions often perform multiple duties. The staff's knowledge can be hampered by the limited funding to provide training. However, if given the resources, staff can perform their jobs in a comparable manner to their non-disadvantaged counterparts.

4.1.1   CUSTOMIZATION OF CURRENT ENGAGEMENT PROCESS

The flood mapping process can be customized. FEMA partners with CTPs and contractors to deploy National Flood Mapping Program projects in its 10 Regions. The National Flood Mapping Program has engagement requirements and implementation of these requirements is flexible, allowing for customization. The engagement process usually includes individualized outreach based on community insights, personal experience, and an assessment of the specific needs of the communities. This directly benefits disadvantaged communities as the engagement needs to overcome the barriers they face, which are greater than their non-disadvantaged community counterparts.

"It is necessary that we bring people together with expertise in built, natural, and social environments because it is at the interface of those environments where natural hazards become human disasters. In order to respond to [hazards] effectively, I absolutely believe that we must work together. …No technical fix is going to work in isolation because disasters are fundamentally social events. For that reason, we need both social fixes as well as technical fixes to work together in concert."

—Dr. Lori Peek
Professor of Sociology and Director of the Natural Hazards Center
University of Colorado Boulder

Customization of the engagement process is vital for assisting disadvantaged communities as it modifies the process to overcome the barriers they face.

The CTP program can be formulated to a partner's strengths and level of interest in the process. Some CTPs choose to be fully vested in the entire flood mapping process and run point for an entire flood map update project from start to finish. Other CTPs choose to be involved in specific aspects of the flood mapping process. FEMA funds the partnership through a cooperative agreement based on the partners' levels of involvement as outlined in Mapping Activity Statements and the Scope of Work.

CTPs are uniquely suited to support jurisdictions with disadvantaged communities throughout the flood mapping process because they have developed and can leverage the relationships they have built. These relationships result in a greater level of trust, which assists in implementation of the National Flood Mapping program and the reception of risk information.

Barriers and potentially negative or unintended consequences facing disadvantaged communities have been outlined in previous chapters along with potential pathways and suggested actions for how to overcome them.

4.1.2   STATE RESOURCES

Every state has a designated state coordinating agency that houses the State NFIP Coordinating Office. State Coordinating Office (SCO) staff conduct outreach to all participating and non-participating jurisdictions in their state. SCOs, by design, build relationships with all jurisdictions within their states as they are the SMEs regarding floodplain management. Using the SCO to assist in engagement with disadvantaged communities can be a huge benefit to the National Flood Mapping Program as many of the responsibilities of the SCO directly complement the National Flood Mapping Program. The SCO is in touch with the needs and unique characteristics of disadvantaged communities and is uniquely positioned to assist the National Flood Mapping Program to the benefit of those disadvantaged communities. NFIP participating jurisdiction floodplain management programs are one of the end users for flood hazard and risk products. If that jurisdiction is exposed to flooding and is disadvantaged, it is imperative that the relationship between FEMA and the SCO staff be strong. Ensuring a strong relationship provides a force multiplier opportunity whereby both the state and federal agency improve engagements with disadvantaged communities, including in areas beyond the scope of the NFIP. In many cases, the SCO is a trusted partner to a disadvantaged community or participating jurisdiction.

Because SCO responsibilities complement the National Flood Mapping Programs goals and objectives, SCOs play a vital role in the dissemination of information to disadvantaged communities, including increasing flood risk awareness at the local level. They also have an active role in most engagement activities, such as explaining

the regulatory requirements of map adoption for continued participation in the NFIP. The products, regulatory and flood risk, are integral to protecting life and property through floodplain management. The understanding of the information provided under the National Flood Mapping Program by the local government officials correlates with the flood risk awareness of the community as well as the citizens. Access to this information is vital for disadvantaged communities. Without access to the SCO, disadvantaged communities have little chance of staying on par with non-disadvantaged community counterparts when it comes to effective flood risk management.

In some states, SCOs have facilitated the development of regional, watershed, or multi-jurisdictional programs to provide floodplain management services to multiple jurisdictions. These types of multi-jurisdictional floodplain management programs function under memoranda of agreement or memoranda of understanding. Such programs could aid jurisdictions with disadvantaged communities as the cost of building and maintaining a strong floodplain management program is spread over multiple jurisdictions.

One of the responsibilities of the SCO is to provide training to local floodplain managers. The barriers that disadvantaged communities encounter directly impact access to training on the use of flood and risk products. SCOs need to be adequately resourced to meet the needs of disadvantaged communities. The challenges facing disadvantaged communities require SCOs to be creative in how they provide training to overcome those challenges. Gaps exist under the current National Flood Mapping Program regarding the use of flood and risk products. The National Flood Mapping Program delivers the products but does not automatically provide training on how to use the products. Many SCOs have used Community Assistance Program-State Support Services Element (CAP-SSSE) funding along with leveraging state funds to develop and provide training on flood and risk products to floodplain managers.

The Code of Federal Regulations indicates that the FEMA Administrator shall consider state recommendations prior to implementing Program activities affecting state communities for states that show a commitment to floodplain management. Because SCOs and CTPs have knowledge of what disadvantaged communities face in their specific states, states could share recommendations with FEMA to improve engagement with disadvantaged communities.

FEMA could establish a method to engage with states directly regarding improved engagement opportunities with disadvantaged communities and establish a formal system for information to be submitted for evaluation.

4.2   SUMMARY OF FINDINGS

Based on TMAC's assessment of the National Flood Mapping Program engagement process, it is clear that engagement participation is hard to gage and control. Even addressing all the factors that a disadvantaged community faces does not guarantee the desired result of helping people move toward a level of flood risk that is acceptable to them. However, engagement with disadvantaged communities is vital to the success of National Flood Mapping Program projects, including continued engagement after the project is completed. Follow-up is vital to ensure desired outcomes are met. Because there is not always a distinct line between disadvantaged and non-disadvantaged communities, many of the approaches suggested in this chapter could be applied to all communities.

Customization of the engagement process is critical when supporting disadvantaged communities. The unique nature of the challenges of disadvantaged communities means there is no one way to accomplish the end goal of assisting these communities. Therefore, the options for customization in the engagement process need to be expanded. While the National Flood Mapping Program cannot address all challenges faced by disadvantaged communities, being open and transparent about what is and is not possible is essential for successful engagement. Specifically, the TMAC suggests that FEMA take the following actions to increase and enhance engagement with disadvantaged communities:

- Support expansion of funding to support disadvantaged communities understanding of the National Flood Mapping Program and associated flood and risk products.

- Support expansion of engagement opportunities with disadvantaged communities. Figure 4-1 identifies some potential expansion opportunities.

- Support increased funding for customization of engagement with disadvantaged communities.

These suggested actions are included within specific recommendations in Chapter 7.

As shown in Figure 4-1, FEMA could expand the current engagement process for disadvantaged communities.

YEAR 1

1 DISCOVERY
FEMA gathers information about local flood hazards and their risk in close coordination with the community to prioritize future mapping, risk assessment, or mitigation planning assistance.

Watershed/County Community Identification

Research

Hazard Mitigation Plan Review

Partner Identification

Community Outreach

Discovery Meeting

Discovery Report

Determination of available data and scoping for projects that will move forward with Risk MAP study.

Expand outreach in areas of the local jurisdiction that are disadvantaged

Identify partners trusted by disadvantaged communities

YEAR 2-4

2 ENGINEERING & MODELING
FEMA analyzes the information gathered during Discovery and develops the first draft of the maps, called "work maps."

3 FLOOD RISK REVIEW (if needed)
Community officials review and provide initial feedback on the work maps and engineering decisions. FEMA uses the feedback to modify the maps and develop the preliminary Flood Insurance Rate Map (FIRM). Using this information, officials begin to identify and advance mitigation action in their community.

FLOOD RISK

4 PRELIMINARY MAP RELEASE
- **Community Coordination and Outreach Meeting**
  Community officials learn the implications of the updated map and the steps and timeline to adopt the updated map.
- **Open House**
  Citizens learn about their local flood risks, and what resources are available from the State, FEMA, and other partners to reduce risk.

Expand options

5 90-DAY APPEAL AND COMMENT PERIOD
Following two public notices, community members can submit technical data to support a request to revise the FIRM though the 90-day appeal process. All appeals and comments, including all supporting documentation, must be submitted through the appropriate community official.

PUBLIC NOTICE   PUBLIC NOTICE

YEAR 3-5

7 ADOPTION & COMPLIANCE
Communities participating in the NFIP must adopt a compliant floodplain management ordinance by the map effective date to remain in good standing as an NFIP participant.

6 LETTER OF FINAL DETERMINATION
After all appeals are resolved, FEMA sends a Letter of Final Determination, kicking off a six-month period for communities to adopt the new flood maps.

8 RESILIENCE MEETING
FEMA, State and local officials, and partners work to identify and review resilience strategies, planning options, and potential actions to reduce risk.

9 EFFECTIVE MAPS
Once effective, new maps and products are available through FEMA's Flood Map Service Center. The new data will inform flood insurance decisions and local building regulations. Community members can submit data to amend or revise the FIRM as part of a Letter of Map Change (LOMC) process.

Figure 4-1: Current National Flood Mapping Process highlighting where FEMA could expand the current engagement process

05

USE OF DATA AND ANALYSES TO INFORM THE NATIONAL FLOOD MAPPING PROGRAM INVESTMENT DECISIONS

This chapter provides a summary of the FEMA priority areas that are used to make investment decisions and achieve the current goals set forth in the National Flood Mapping Program. The chapter also identifies potential sources of data and analysis methods for disadvantaged communities and suggests how these data and analysis methods might inform future annual investment decisions for the National Flood Mapping Program.

EXCERPT FROM FEMA MEMO

Evaluate ways the agency could use statistical data and analysis regarding social vulnerability and underserved populations and provide recommendations on how that data and analysis should inform future annual investment decisions for the National Flood Mapping Program.

5.1   FEMA NATIONAL FLOOD MAPPING PROGRAM PROJECT PRIORITIES

Figure 4 1 in Chapter 4 provides an overview of the current FEMA flood mapping process, going through the nine steps from Discovery (Step 1) through to the development of Effective Maps (Step 9). Data and analysis on disadvantaged communities can be included in several steps of the process:

- Data and analysis germane to the flood mapping process are primarily incorporated into Steps 1 through 3 (Discovery, Engineering and Modeling, and Flood Risk Review). These steps might be an appropriate place in the flood mapping process to include data and analysis pertaining to disadvantaged communities.

- Data on disadvantaged communities could also be included in Step 5 (Appeal and Comment Period) as part of the assessments of revision requests. This is because Step 5 plays a significant role in changing the boundaries of the designated floodplain.

BENEFIT

For the purposes of this chapter, the term "benefit" is meant in the context of the Justice40 Interim Guidance. The TMAC sought information on how FEMA RMD is currently defining benefits and provides suggestions on potential broader benefit consideration. Benefits outside the context of Justice40 compliance are discussed in Chapters 3 and 4.

Before a National Flood Mapping Program project can begin FEMA must make investment decisions regarding which projects to initiate. The investment process starts with the creation of the federal budget and the performance targets that can be achieved based on the established budget. The current approach to assessing costs and benefits further marginalizes already marginalized communities for simply being poor and having less capital investment. Increasingly, stakeholders have called for benefit-cost analyses to include social benefits and avoided cultural and economic losses. Such developments would more accurately reflect the impacts of activities in and with disadvantaged communities, reducing the apparent costs of assistance to those communities. Assessing the costs of technical assistance to disadvantaged communities via such an

improved cost-benefit approach is a critical potential lever that would allow FEMA to meet its Justice40 requirements. Currently, the main performance target for investment decisions is the New, Validated, or Updated Engineering (NVUE) metric of 80 percent. Based on this NVUE metric, FEMA Headquarters works with the Regions and the Regions work with the states and other partners to identify National Flood Mapping Program projects based on the following five priority areas:

1. **Maintain 80 Percent NVUE.** The NVUE metric identifies the miles of FIRM studies that adequately identify the level of flood risk, as supported by technical data, and do not warrant updating. FEMA has achieved this milestone and now must maintain the existing inventory of 1.1 million stream miles such that flood hazard information meets current program standards.

2. **Advance Ongoing National Flood Mapping Program Projects.** FEMA currently has approximately 1,100 projects initiated prior to the close of fiscal year 2021 that remain ongoing. FEMA has prioritized completing these projects.

3. **Address Remaining Statute Requirements.** FEMA is required by Section 216 of the Biggert-Waters Act of 2012 to map areas of population growth, identify areas with residual risk and areas of inundation behind levees and downstream of dams, and quantify future conditions.

4. **Modernize National Flood Mapping Program Information Technology (IT) Infrastructure.** FEMA must remain current and handle future program requirements while complying with federal security and privacy requirements.

5. **Advance the Future of Flood Risk Data (FFRD) Initiative.** FEMA will continue its exploration efforts through the FFRD initiative in support of a risk-informed NFIP.

In the past, FEMA has not considered whether a community is disadvantaged in making its investment decisions. However, FEMA is now contemplating how to comply with the Justice40 initiative. One option would be to make flood hazard information (non-regulatory products) available without consideration of whether a community is disadvantaged. Then, as part of the flood mapping process, decide whether regulatory products should be made available for a disadvantaged community. As discussed elsewhere in this report, providing regulatory products to disadvantaged communities offers benefits but can also come with unintended consequences.

The increased level of technical assistance, and thus increased cost, to better support disadvantaged communities is another consideration for FEMA when funding projects in those communities. Increased technical assistance can include educating disadvantaged communities on how to use the regulatory and/or non-regulatory products for floodplain management, mitigation, and emergency management. If budgets remain unchanged, this increased support may mean fewer projects can be funded, or there may need to be tradeoffs with other priorities.

FEMA should also consider the increased level of support that disadvantaged communities may require outside of a National Flood Mapping Program project. Support may be needed for day-to-day floodplain management compliance, applying for mitigation grants, and overseeing the execution of mitigation projects. FEMA could utilize the BRIC Direct Technical Assistance program to assist disadvantaged communities with these functions. FEMA could also consider funding or otherwise incentivizing non-disadvantaged CTPs to assist the disadvantaged communities with these activities.

As FEMA examines its priorities for funding decisions, the impact of the National Flood Mapping Program on disadvantaged communities needs to become a priority. Providing regulatory and/or non-regulatory products to disadvantaged communities without proper support and technical assistance will likely lead to frustration for all. However, not providing flood hazard information to disadvantaged communities is also a disservice to them.

5.2   DATA AND ANALYSES THAT CONSIDER DISADVANTAGED COMMUNITIES

The current flood mapping process and priority areas do not explicitly consider data and analysis that utilize information on disadvantaged communities. Possible databases and resources to change this are described below.

5.2.1   SOCIAL VULNERABILITY DATASETS

"With respect to social vulnerability datasets and indicators, to what extent is each one—(1) statistically reliable, (2) externally valid, (3) tailored to flood hazards, (4) tailored to flood exposure, (5) aligned with vulnerability processes and marginalized populations, and (6) used appropriately?"

—Dr. Eric Tate
Associate Professor, University of Iowa Department of Geographical and Sustainability Sciences

Several publicly available resources that provide community-based indices that could be considered for inclusion in investment decision processes; these are summarized in Table 5-1. These indicators combine different metrics of publicly available social vulnerability datasets at the county or census-tract level to visually identify communities that lack resilience or have increased vulnerability to hazards. The resources provided below have been selected because they are: (1) currently used in tools or other decision processes by the federal community to identify socially vulnerable communities, (2) have a demonstrated legacy and investment for sustained support and updating, and/or (3) have been discussed and compared in the peer-reviewed literature. Recently, FEMA conducted its own literature review (FEMA 2022a) to update a 2018 review of commonly used resilience and

vulnerability assessment methodologies and associated indicators. The community-based indicators are summarized below.

Baseline Resilience Indicators for Communities (Cutter et al. 2014). The Baseline Resilience Indicators for Communities (BRIC) index uses a capitals (or categories) approach to provide a scaled, averaged score that is intended to communicate a baseline assessment for monitoring existing attributes of resilience to natural hazards. The BRIC index uses 49 input variables that are largely derived from open-source federal government sources with each sub-index scaled from 0 to 1, with 1 meaning increasing resilience. The values of the variables are then averaged to create an overall BRIC score. Because the index is scaled, BRIC can compare values from one county to another, understand the specific drivers of resilience for individual counties, and monitor improvements in resilience over time.

Community Resilience Estimates (United States Census Bureau 2021). The Community Resilience Estimates (CRE) utilize detailed census data to provide one summary metric for the risk each neighborhood in the United States faces with respect to the impacts of disasters. The number of risk factors are determined by examining demographic, socioeconomic, and housing characteristics in the American Community Survey (ACS) microdata. These include such factors as education, household caregiver status, household communication barriers, vehicle access, and household broadband internet access.

Community Resilience Index (FEMA 2022a). The Community Resilience Index (CRI) utilizes 22 commonly used social vulnerability metrics. These metrics are derived from a review of 14 peer-reviewed assessment methodologies on social vulnerability and community resilience methodologies published between 2003 and 2021. The characteristics include three population characteristics, four household characteristics, two housing characteristics, three healthcare characteristics, six economic characteristics, and four characteristics that capture the connection of the population to the community.

"We're trying to find that balance between how we measure [equity] in a consistent nationwide way but acknowledge that no nationwide index is going to be really perfect. For every situation that there is, there is local knowledge on the ground that we need to account for. There are unique specific community needs that we really need to make sure that we take into the way we think about equity and the way we define it, because those distributional effects will be different depending on the way that we try and measure it."

—Charles Carson
Economist (BRIC), FEMA HQ

Environmental Justice Screening Tool (Environmental Protection Agency 2019). The Environmental Justice Screening Tool (EJScreen) was created by the Environmental Protection Agency to provide a nationally consistent dataset and approach for combining environmental and demographic socioeconomic indicators. EJScreen includes 12 environmental indicators, 7 socioeconomic indicators, and 12 environmental justice indices, as well as supplemental indices. The EJScreen indicators are publicly available data.

Social Vulnerability Index developed by the Centers for Disease Control and Prevention (Centers for Disease Control and Prevention 2020). The SVI database was created by the CDC to help emergency response planners and public health officials identify and map communities that will most likely need support before, during, and after a hazardous event. The CDC SVI ranks each U.S. Census data tract on 15 social factors, including poverty, lack of vehicle access, and crowded housing, and groups them into four related themes to determine the social vulnerability of every census tract.

Social Vulnerability Index developed at the University of South Carolina (Cutter et al. 2003). The Social Vulnerability Index developed at the University of South Carolina (SoVI) is a comparative metric that measures the social vulnerability of U.S. counties to environmental hazards. Using 29 socioeconomic variables, it is intended to show locations where there is an uneven capacity for preparedness and response, where resources might be used most effectively to reduce the pre-existing vulnerability, and for determining the differential recovery from disasters using empirically based information. Data sources are primarily derived from the United States Census Bureau.

Climate and Economic Justice Screening Tool (White House Council on Environmental Quality 2022). The CEJST 1.0 uses publicly available, nationally consistent datasets to identify disadvantaged communities at the census-track scale. The CEJST 1.0 tool considers environmental, climate, or other burdens, and associated socioeconomic burdens in its indicator quantification. The CEJST 1.0 features a user-friendly, searchable map of all 50 states, the District of Columbia, and the U.S. territories; however, measures of social vulnerability use different datasets for the continental U.S. versus the U.S. territories in some cases. The CEJST tool combines data from other tools in this list, namely EJScreen and CRE. The CEJST 1.0 website also has data files, such as spreadsheets and shapefiles, available for download. Of note, CEJST 1.0 provides information on projected climate risks, including risks related to flooding.

5.2.2   DISCUSSION AND LIMITATIONS OF SOCIAL VULNERABILITY DATASETS

This section discusses synthesis reports and toolkits pertaining to the use of social vulnerability data in investment or resilience decisions. For example, the Georgetown

Climate Center Adaptation Clearinghouse (https://www.adaptationclearinghouse.org/) offers a principal clearinghouse for many of these quantitative data resources as well as a discussion of their applications. The section also discusses the limitations of existing datasets.

The scientific consensus on social vulnerability indices is still evolving and remains elusive, as there are different perspectives of social vulnerability and inconsistency in coverage of social vulnerability determinants (Drakes and Tate 2022). The underlying demographics overlap because they rely on the same census-based datasets. Note that CEJST 1.0 encompasses factors included in EJScreen and SVI. However, only recently have some of these indices and metrics been tested in limited settings for flood hazard, recovery, and resilience (Dr. Eric Tate, SME Briefing). For example, Derakhshan et al. (2022) compared the overlap of BRIC and SoVI indices to assess social vulnerability for two different timeframes and two different U.S. counties, finding that neither index fully explains the other and that both contain unique information regarding the utility to identify socially vulnerable communities. Wing et al. (2022) took demographic data from the 2019 ACS and examined which factors related best to flood risk in the United States; the resulting factors were only a few of those included in the social vulnerability indices shown in Table 5-1. Rufat et al. (2015) provide a valuable analysis of important indicators for social vulnerability to floods. While not a metric itself, their analysis provides a potential way forward toward understanding what factors are important when considering social vulnerability to floods.

In addition, there are limitations with many—if not all—of the social vulnerability indices currently in use, particularly in terms of the timing of their last update and their spatial coverage not including some portions of the United States and territories (Dr. Lori Peek, SME Briefing). Differences in social vulnerability, or lack thereof, that may exist within a census block or county (for example, between households or neighborhoods) cannot be quantified because of the resolutions at which these indices are spatially aggregated. There are also gaps in what data is collected in the census—notably homeless populations—and limits in operational knowledge, including how to use climate change metrics with social vulnerability datasets (Hope Morgan and Tammie Tucker, SME Briefing). However, CEJST 1.0 has begun to tackle the gap with respect to climate change metrics by providing projected climate risks. There is also a critical need to understand uncertainty in the ACS data underlying these indices. Spielman et al. (2020) have published work addressing the error estimates of the ACS and their impact on evaluating social vulnerability.

The recent passage of the Community Disaster Resilience Zones Act of 2022 (Public Law No. 117-255) places increasing importance on the National Risk Index (NRI; FEMA 2021b), a tool used to assess the vulnerability of communities to natural hazards. The law requires FEMA to use NRI data to identify census tracts with the highest

vulnerability ratings for natural disasters and designate those areas as community disaster resilience zones. The NRI includes social vulnerability metrics as well as a framework for measuring resilience and risk.

The datasets discussed previously in this chapter use composite indices from which the output is a single comparative metric per analysis unit. While this is useful for resource allocation decisions, these indices frequently lack the context to easily identify important combinations of vulnerability-increasing/resilience-reducing factors unique to individual communities. In effect, these indices show where attention is needed, but if used as standalone measures, these indices would be difficult to use as a means to identify interventions.

For the reasons noted above, the TMAC notes that a comprehensive approach to the investment decision process is advised; one that relies on the available social vulnerability datasets, qualitative data, and other factors to properly tailor engagement and to prioritize projects and funding.

FEMA has begun to apply social vulnerability indicators in limited regional settings to determine National Flood Mapping Program benefits (Greenspan-Johnston, SME briefing). In one such case study, inputs equaled monetary investments and outputs equaled product coverage and quality, as measured in mapped versus unmapped miles, coordinated needs management strategy (CNMS) tiers, and a two-dimensional base-level engineering (2D BLE) coverage map. The intermediate outcomes were quantified using products to drive risk mitigating actions, as measured in HMA Grant awards, the presence of higher standards, and NFIP participation. This pilot analysis found that the presence of communities with higher social vulnerability and lower population density correlates with lower data coverage, a lower number of awarded funds, and lower product use.

5.3   SUMMARY OF FINDINGS

Data and analyses to identify and consider disadvantaged communities in the investment decision process, and hazards in general, is still an emerging and evolving discipline. The appropriate use of a social vulnerability index or indices remains elusive because of the different perspectives of social vulnerability and inconsistency in coverage of social vulnerability determinants. The TMAC's suggested actions reflect the current limitations of knowledge on social vulnerability indices as they apply to flooding. For use in the investment decision process, this report provides information on the currently available social vulnerability datasets and indices as well as a comparison of the individual metrics used to compute each composite index and their spatial resolution. The TMAC supports the continued advancement and validation of social vulnerability data and analyses, particularly with respect to flooding and other

Table 5-1: Summary of Available Indices That Could Be Considered for Inclusion in Investment Decision Processes

Index Name	Source	Factors (Communication, Demographics, Economy, Education, Environmental, Health, Housing, Infrastructure, Transportation)									Spatial Resolution and Coverage	Last Update	Notes
Baseline Resilience Indicators for Communities (BRIC)	Cutter et al., 2014	Communication	Demographics	Economy	Education	Environmental	Health		Infrastructure	Transportation	County level	2015	Available for continental US, Alaska, and Hawaii; also available for 2010
The Community Resilience Estimates (CRE)	United States Census Bureau, 2021	Communication	Demographics	Economy			Health	Housing	Infrastructure	Transportation	Census tract	2018/2019	Available for the U.S., Alaska, Hawaii, and Puerto Rico
Community Resilience Index (CRI)	Federal Emergency Management Agency, 2022	Communication	Demographics	Economy	Education		Health	Housing		Transportation	Census tract available for all indicators, (county and tribal level available for some)	2022	
Environmental Justice Screening Tool v2.0 (EJScreen)	Environmental Protection Agency, 2019	Communication	Demographics	Economy	Education	Environmental					County level	2016-2022; however, each indicator within the tool has different dates at which the indicator has been updated	
Social Vulnerability Index developed by the Centers for Disease Control and Prevention (SVI)	Centers for Disease Control and Prevention, 2020	Communication	Demographics	Economy	Education		Health	Housing		Transportation	Census tract	Composite from 2016 to 2020	Also available for 2014, 2016, 2018, and 2020
Social Vulnerability Index (SoVI) developed at the University of South Carolina	Original methods published in Cutter et al., 2003	Communication	Demographics	Economy	Education	Environmental	Health	Housing	Infrastructure	Transportation	Census tract presented at the county level	Composite from 2010 to 2014	
Climate and Economic Justice Screening Tool (CEJST)	White House Council on Environmental Quality, 2022			Economy		Environmental	Health	Housing	Infrastructure	Transportation	Census tract	2014-2022; however, each indicator within the tool has different dates at which the indicator has been updated	Some indicators are not available for Puerto Rico and U.S. territories.

Category Factor Legend:

Communication   Demographics   Economy   Education   Environmental   Health   Housing   Infrastructure   Transportation

hazards. FEMA is encouraged to consider the indirect and non-monetary benefits of vulnerability reduction and resilience improvement in its benefit-cost assessments of National Flood Mapping Program activities. Furthermore, FEMA could consider integrating the analysis of disadvantaged communities into the Flood Risk Review and Appeal and Comment Period phases of the flood mapping process. Specifically, the TMAC suggests that FEMA take the following actions when considering social vulnerability indices for investment decisions:

- Evaluate the social vulnerability index or combination of indices used in the investment decision process at regular intervals to ensure the current state-of-science, best available, and most representative data are being used in the investment decision process.

- Clearly document and transparently communicate known limitations and gaps of the selected social vulnerability index or combination of indices used in the investment decision process.

- Evaluate the social vulnerability index or combination of indices used in the investment decision process with respect to its efficacy in identifying disadvantaged communities, specifically in the context of flooding.

- Be motivated to choose the best index or indices that identify disadvantaged communities in the context of flooding rather than be limited to using a social vulnerability index or combination of indices that has already been adopted by other areas of FEMA or by other agencies.

- Consider using an equity impact assessment to overcome the gaps and limitations in the applied social vulnerability index or combination of indices. An equity impact assessment can provide real-time validation of the applied social vulnerability index or combination of indices as well as a process check to determine whether the intended effect of the program or design decisions was actualized.

- Recognize that there is not aways a distinct line between disadvantaged and non-disadvantaged communities when making investment decisions and tailoring approaches to address issues that pertain to disadvantaged communities.

- These suggested actions are included within specific recommendations in Chapter 7.

06 2022 TMAC STAKEHOLDER ENGAGEMENT

I n the 2022 FEMA Memo, FEMA requested that the TMAC examine specific areas of the National Flood Mapping Program and its products to "deliver [the program] more equitably, both in the context of the current program and as the program evolves to deliver probabilistic flood hazard and graduated flood risk information." This focus on equity is in line with FEMA's (2022–2026) agency-wide strategic plan and the FIMA's

"There is a moral reason to focus on the most vulnerable populations. Ultimately it is the right thing to do."
—Dr. Eric Tate
Associate Professor
University of Iowa
Department of Geographical and
Sustainability Sciences

2021–2023 strategy and highlights recent guidance in Executive Order 14008. Issued by President Biden in January 2021, Executive Order 14008 sets forth the Justice40 Initiative, of which the National Flood Mapping Program is classified as a "covered program." The Justice40 Interim Guidance asks covered programs to report on benefits that flow to disadvantaged communities through monetary and non-monetary terms and for agencies with covered programs to begin transforming those programs to deliver products more equitably.

Justice40-covered programs are required to engage in meaningful stakeholder consultation and to ensure that community stakeholders are meaningfully involved in determining program benefits and barriers. As such, the TMAC engaged relevant stakeholders, including floodplain managers, state NFIP coordinators, state and local emergency managers, tribal entities, and academics, to understand the broad array of opportunities, challenges, and barriers when delivering the National Flood Mapping Program.

The 2022 FEMA Memo specifically requested that the TMAC help them deliver the National Flood Mapping Program in a way that serves the entire nation more effectively and equitably. While TMAC members have deep knowledge of many aspects of the National Flood Mapping Program, none are experts in helping disadvantaged or underserved communities. Thus, the TMAC solicited advice from experts and launched an informal survey to gain additional insights. A summary of those activities is provided in this chapter.

6.1   SUBJECT MATTER ENGAGEMENT

The importance of engagement during the writing process of the annual TMAC report is paramount. Identifying and engaging stakeholders to meet the intent of the 2022 FEMA Memo ensures that the TMAC addresses outlined requests thoroughly. In addition, fostering robust stakeholder engagement during report compilation allows the TMAC to develop informed written materials that use data, academic research, and technical information from case study examples that may not be easily accessible by other means.

As presented in this chapter, engagement was instituted during the writing process by soliciting the advice of SMEs with direct experience of the topics identified in the

2022 FEMA Memo to provide guidance, formal or informal presentations, listening sessions, and briefings. A survey was developed and distributed to a wide network of stakeholders to gain additional insights into National Flood Mapping Program products and processes, possible barriers, and perceived equity. A summary of the distributed survey and a breakdown of results is provided in this chapter.

6.1.1   APPROACH TO SEEKING SMES, STANDING SMES, AND ENGAGEMENT

The engagement process to meet the intent of the 2022 FEMA Memo required a targeted strategy to holistically evaluate identified areas of focus. Each request in the memo was examined to distinguish all relevant stakeholders and to guide the types of SMEs needed to help inform the TMAC's writing of its annual report to Congress and to provide insight into equity and disadvantaged communities regarding flooding and flood risk. Accordingly, the TMAC developed an SME contact list for all identified stakeholders to track communication and scheduling presentations, listening sessions, and potential standing SME meetings.

Targeted outreach methods were employed in the form of email communication, phone calls, and professional referrals from SMEs. SMEs referred individuals with expertise in the spheres of real estate, geographic information system (GIS) mapping data, risk data and tools, and flood and hazard mitigation, as well as authorities with an equity and social justice focus to their work. Federal partners were also employed during the engagement process to provide an encompassing view of current programs and processes and how they are delivered to communities. FEMA representatives from multiple disciplines were available during internal and external meetings to answer questions and provide guidance as necessary.

6.1.2   SUBJECT MATTER EXPERT PRESENTATIONS

Presentations by SMEs were primarily scheduled at the presenter's availability but most often corresponded with standing TMAC meetings to foster as much attendance as possible. All SME presentations were recorded at the permission of the presenter and were available to TMAC members to reference at any time during preparation of this 2022 TMAC report. In addition, the TMAC engagement team provided PowerPoints and relevant notes to members who could not attend scheduled presentations.

Members of the TMAC engagement team attended all standing meetings to identify any SME needs that may have developed during the writing process. Efforts to attain additional SMEs were made at every request, and if a pertinent SME was available, a presentation or listening session was scheduled and provided to the TMAC. Attempts to engage as many SMEs as possible during the timeframe for report creation were made to fully inform the TMAC on the subject of equity identified in the 2022 FEMA

Memo. Table 6-1 shows the SME speaker presentations to the TMAC. Additional details for each presentation are provided in Appendix B.

Table 6-1: TMAC Subject Matter Expert Presentations 2022

Speaker Name	Speaker Affiliation	Focus of Presentation
Charles Carson	FEMA BRIC Economist	Focus of the session was distributional equity. Refer to Appendix B for a summary of the presentation.
Sunny Ng	FEMA Flood Mitigation Assistance (FMA) Program Analyst	
H. Camille Crain	BRIC Section Chief at FEMA Headquarters.	Focus of the session was procedural equity.
Brandon Sweezea	Section Chief for the Flood Mitigation Assistance (FMA) Program at FEMA	
Christine Gaynes	Civil Engineer with FEMA Region 8 within the Mitigation Division	Focus of the session was Equity Review of Resource Allocation in National Flood Mapping Program in FEMA Region 8.
Johanna Greenspan-Johnston	Senior Resilience Planner with Dewberry, a member of FEMA's STARR II Production and Technical Services team.	
Michael Godesky, P.E.	FEMA	Focus of the session was the results of a literature review and four data studies to determine a National Flood Mapping Program Justice40 Baseline for OMB.
Peter Herrick, Jr.	FEMA, Communications Strategy Branch	Risk Management Directorate	
Peter Herrick, Jr.	FEMA Communications Strategy	Focus of the session was Resilience, Equity and Engagement.
Kathleen Boyer	Branch	Risk Management Directorate, FEMA	
Bobby Howard	Emergency Manager with the Muscogee (Creek) Nation and member of the State, Local, Tribal, and Territorial Government Coordinating Council (SLTTGCC)	Focus of the session was an informal Question and Answer presentation to the TMAC regarding the tribal perspective and experience on NFIP participation and barriers to accessibility of federal programs.
Dr. Alessandra Jerolleman	Associate Professor in Jacksonville State University's Emergency Management Department	Focus of the session was a presentation entitled "A Conversation About Equity and Floodplain Management."
Jack Krolikowski	Deputy Manager for Hazard Mitigation in the State of Georgia's Office of Homeland Security and Emergency Management	Focus of the session was a presentation entitled "Flood Hazard Information Case Study from Northwest GA."

Table 6-1: TMAC Subject Matter Expert Presentations 2022 (continued)

Speaker Name	Speaker Affiliation	Focus of Presentation
Christina Lindemer	FEMA coastal engineer and emergency management specialist	Focus of the session was the Future of Flood Risk Data (FFRD).
Hope Morgan, NCPLS, GISP, CFM	AECOM, GIS Specialist / Project Manager	Focus of the session was a data review of social and environmental vulnerability indexes and tools.
Tammie Tucker, PE, PMP, PMI-ACP, CFM	AECOM, Project Manager	
Dr. Lori Peek	Professor of Sociology at University of Colorado at Boulder; current Director of the Natural Hazards Center and principal investigator of the CONVERGE facility.	Focus of the session was a discussion around a core problem: we don't need to tell people that something is going on with our environment, but we need to know how to support people to take the actions they know they need to take but for which they lack the capacity, resources, time, or ability to take those actions.
Luis Rodriguez	Director, Engineering and Modeling Division at FEMA	Focus of the session was how FEMA makes investment decisions for the National Flood Mapping Program.
Laura Algeo	National Cooperating Technical Partners Program Coordinator	
Dr. Eric Tate	Associate Professor at the University of Iowa, in the Department of Geographical and Sustainability Sciences	Focus of the session was a presentation entitled "Modeling Social Vulnerability to Flood Exposure: Gaps and Needs."
Dr. Oliver Wing	Chief Research Officer at Fathom, where he leads the organization's academic strategy. His role centers on the preservation of Fathom's close ties with academia, ensuring their modeling techniques are research-led, transparent, and peer reviewed.	Focus of the session was on the need for sufficiently accurate risk information across the nation, which is also critical to the continued risk management of the nation. Resolving the need for local accuracy with the need for national coverage is a complex problem that deserves attention.

6.2   STAKEHOLDER SURVEY

Surveys of emergency management professionals have proven valuable in past TMAC efforts. Given the wide range of situations that might lead to a community being disadvantaged or underserved, the TMAC developed a survey to gather experiences and insights from professionals across the field of floodplain and emergency management. The online survey was deployed using a Microsoft Forms interface with a shareable link. The link was provided to over 400 individuals who had expressed

The approach used had both advantages and disadvantages:

ADVANTAGES

Targeting the survey toward professionals allowed the survey to be developed and deployed rapidly. Surveys of professionals are also more likely to result in readily interpretable results because emergency management professionals are already versed in the language of mitigation and response. Professionals also can provide valuable aggregation of the experiences of the jurisdictions they serve.

DISADVANTAGES

The key disadvantages all stem from an inability, given the time and resources available, to gather information from the disadvantaged populations directly. While an emergency manager may have the perspective of an entire jurisdiction, part of the issue the TMAC is investigating this year is the experience of disadvantaged and underserved communities, but the professionals surveyed may not be familiar with this sector. In addition, understanding the barriers to a community may not speak to the obstacles of particular individuals or households within that community. Finally, in many cases, barriers are compounded in that lesser or seemingly unrelated challenges may result in a more significant lack of engagement.

Significant caution should be used to avoid interpreting the results of the survey as anything more than a sampling of what willing professional respondents believe about disadvantaged communities.

A copy of the survey questions is presented in Appendix C.

6.3   SUMMARY OF SURVEY FINDINGS

The online survey gathered 105 responses from November 21, 2022, to January 6, 2023. Most states had 1 to 3 responses. North Carolina, Virginia, Washington, and Wisconsin had 11, 8, 8, and 12 responses, respectively. No responses were received from Arizona, Delaware, Hawaii, Kansas, Kentucky, Montana, New Hampshire, Ohio, Oklahoma, Rhode Island, South Dakota, Tennessee, and Wyoming. The survey responses by state are shown in Figure 6-1.

Of the 105 respondents, 33 self-identified as engineers, 14 as floodplain managers, and 11 as land surveyors. Other respondents included planner, geographer/GIS specialist, risk communicator, hydrologist, and zoning administrator, among others. Nearly all respondents indicated some professional role in hazard response or risk management. Thirty-five respondents reported living or working in a disadvantaged community; 57 reported not living or working in a disadvantaged community. The remaining responses expressed uncertainty or that they work statewide.

Survey respondents (note: 2 respondents did not identify a state)
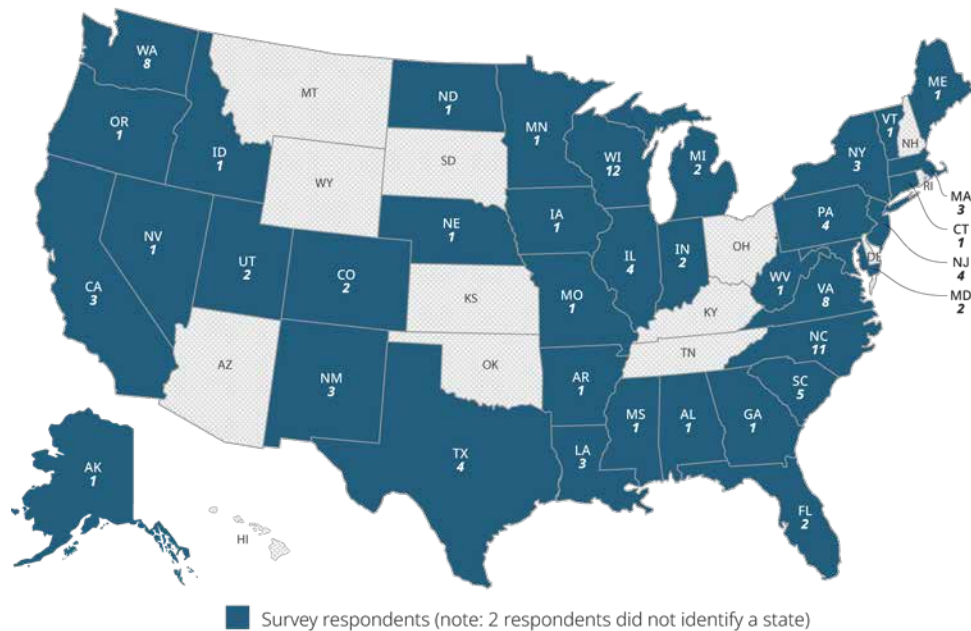
Figure 6-1: Survey responses by state

The overwhelming majority of respondents (86 of 105) stated communities exist on a spectrum from disadvantaged to not disadvantaged. Only 11 respondents selected the statement that communities are either disadvantaged or not (see Figure 6-2). A similar fraction, 88 of 105 respondents, indicated that it was either very important (52) or important (36) for the National Flood Mapping Program to identify disadvantaged communities when developing products and strategies for delivery.

On a range from not disadvantaged to very disadvantaged	86
Disadvantaged or not	11
Other	9
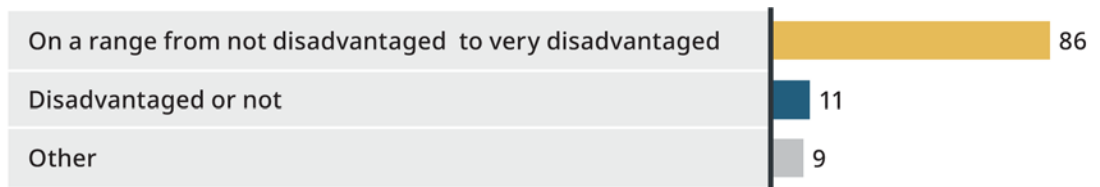
Figure 6-2: More than 4 out of 5 respondents believe communities exist on a spectrum from disadvantaged to not disadvantaged

Respondents were asked to rank the top five factors that indicate people in an area are disadvantaged. Lower-income/persistent poverty was the first response for 52.7 percent of respondents and the second response for 23.6 percent of respondents. Overall, 94.2 percent of respondents listed lower income/persistent poverty as one of their top five indicators of disadvantaged communities. The covarying factor of "high unemployment/underemployment" was the first response of 17 percent of respondents and the second response of 22.6 percent of respondents. Overall, 78.3 percent of respondents listed high unemployment/underemployment as one of their top five

indicators of disadvantaged communities. The other indicators listed based on the percentage of respondents that selected the indicator as their first choice included high housing burden, racial/ethnic residential segregation, and disproportionate environmental stressors. The results are shown graphically in Figure 6-3.

1. Lower income/persistent poverty
2. High unemployment/underemployment
3. High housing burden/substandard housing
4. Racial/ethnic residential segregation
5. Distressed neighborhoods
6. Disproportionate environmental stressors
7. High transportation costs/low access to transportation
8. Limited water and sanitation access and affordability
9. English as a second language (ESL)
10. Disproportionate climate change impacts

First choice   Mid choice   Not chosen

Figure 6-3: Survey results ranking top five indicators of disadvantaged communities

Given the emphasis on economic factors as indicators of disadvantaged communities, a strong plurality of respondents (45 of 105) identified a lack of money as the biggest barrier disadvantaged communities have in managing their flood risk (see Figure 6-4). Other barriers frequently identified included lack of choice (18 responses), lack of support (17 responses), and "other" (14 responses).

Lack of money
People in disadvantaged communities do not have the necessary funds to manage their flood risks. — 45

Lack of choice
Extenuating circumstances cause disadvantaged communities/people to have fewer choices for taking mitigation actions. — 18

Lack of support
People in disadvantaged communities have fewer opportunities to act due to a lack of a support network to help with addressing flood risk challenges. — 17

Other risks are more urgent
Other risks are higher priority than mitigating flood risks. — 14

Other — 11

None
There are no barriers. — 1

Figure 6-4: Survey results for barriers to disadvantaged communities

Similarly, when respondents were asked to identify the top three unintended consequences of National Flood Mapping Program products, increased cost of living was selected most frequently, with 43.4 percent of respondents identifying it as the primary unintended consequence and 91.5 percent identifying it within the top three (see Figure 6-5). The related unintended consequences of increased cost for new housing and gentrification were the next two most frequently selected.

1.	**Increased cost of living** Disproportionate burden on low-income households for cost of living.
2.	**Increased cost for new housing** New developments required to comply with minimum floodplain management requirements will be more expensive.
3.	**Gentrification** In the future, if the cost of living near water is prohibitively high, only those who can afford the risks will be able to live and work there.
4.	**Foreclosure** Increased rates of foreclosure.
5.	**Redlining** Deliberate targeting of select populations in areas exposed to flood risk.
6.	**Reduced job opportunities** Businesses moving operations to safer areas.

First choice   Mid choice   Not chosen

Figure 6-5: Survey results for top three unintended consequences of the National Flood Mapping Program

Respondents were asked to select up to three practical approaches to limit the potential negative unintended consequences associated with increasing flood insurance costs or mandatory purchase requirements in disadvantaged communities (see Figure 6-6). Of the 105 respondents, 72 selected community level insurance, 71 selected subsidies for flood insurance in instances where it is demonstrated an individual cannot afford flood insurance, and 58 identified market approaches such as lowering upfront costs for developers when designs include flood risk mitigation elements.

Community level insurance
The ability for a community to purchase insurance and manage the distribution of funds within the community (parametric insurance)
72

Subsidies
In instances where it is demonstrated an individual cannot afford mandated insurance minimums or the increased cost of insurance, offer a subsidy to reduce the cost.
71

Create a Market
Find ways to leverage market forces by commoditizing flood risk reduction. For example, lower upfront costs for developers when subdivisions and homes are designed with flood risk reduction elements, or provide low interest mitigation loans when the primary purpose of a home upgrade is to reduce flood losses.
58

Post storm/event driven
Defer mandatory purchase and flood insurance cost increase until an existing building is substantially improved or damaged.
43

Other
33

Grace Period
Rather than immediately requiring insurance or increasing insurance costs, defer mandatory purchase and insurance price increases for a given grace period.
27

Transfer risk to general taxpayer
In instances where it is demonstrated an individual cannot afford all or part of a mandated insurance minimum or the increased cost of insurance, quantify the risk and mark all or part of it as held by the general taxpayer.
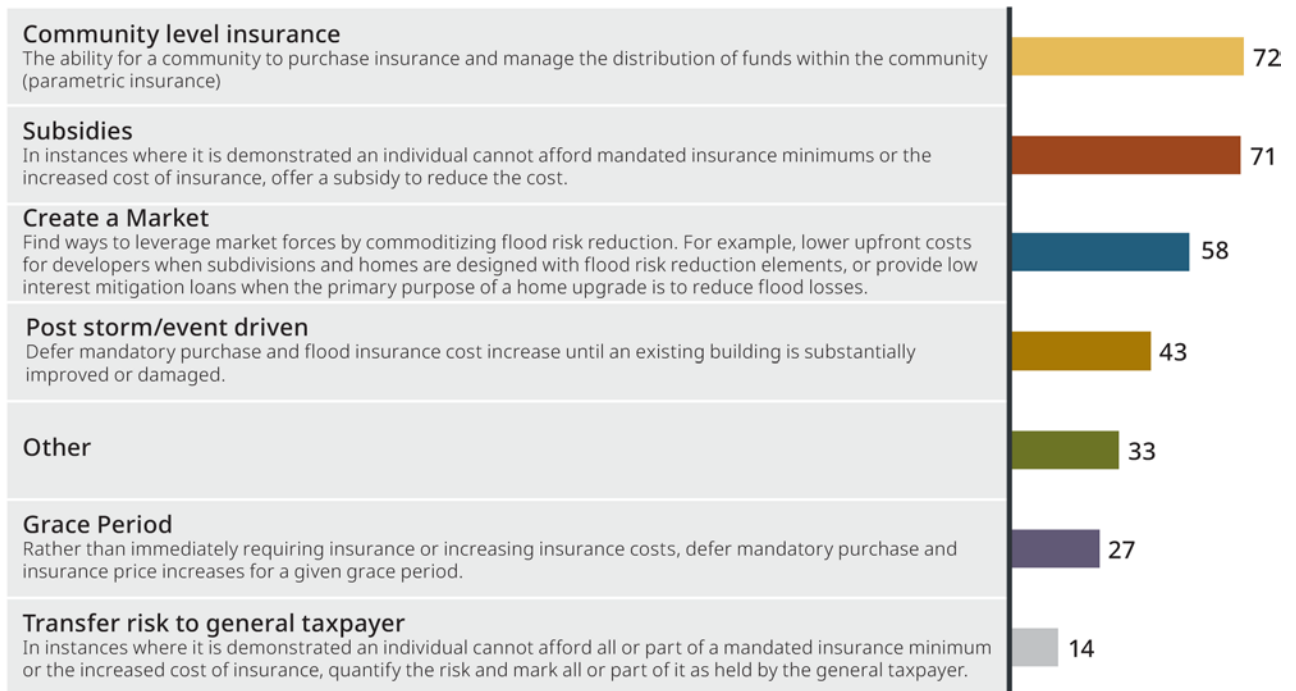14

Figure 6-6: Survey results for approaches to limiting the potential negative unintended consequences of the National Flood Mapping Program in disadvantaged communities

Respondents were asked to rank five approaches the National Flood Mapping Program might use to better support disadvantaged communities through stakeholder engagement to encourage more mitigation actions (see Figure 6-7). "Engage early and listen first" was identified as the first- or second-most preferred approach by more than half of the respondents. Three additional approaches—engage leaders, show respect, and targeted outreach—gathered similar levels of support. Adapting a National Flood Mapping Program product was by far the least preferred approach among respondents, with 43.4 percent identifying it as their last choice.
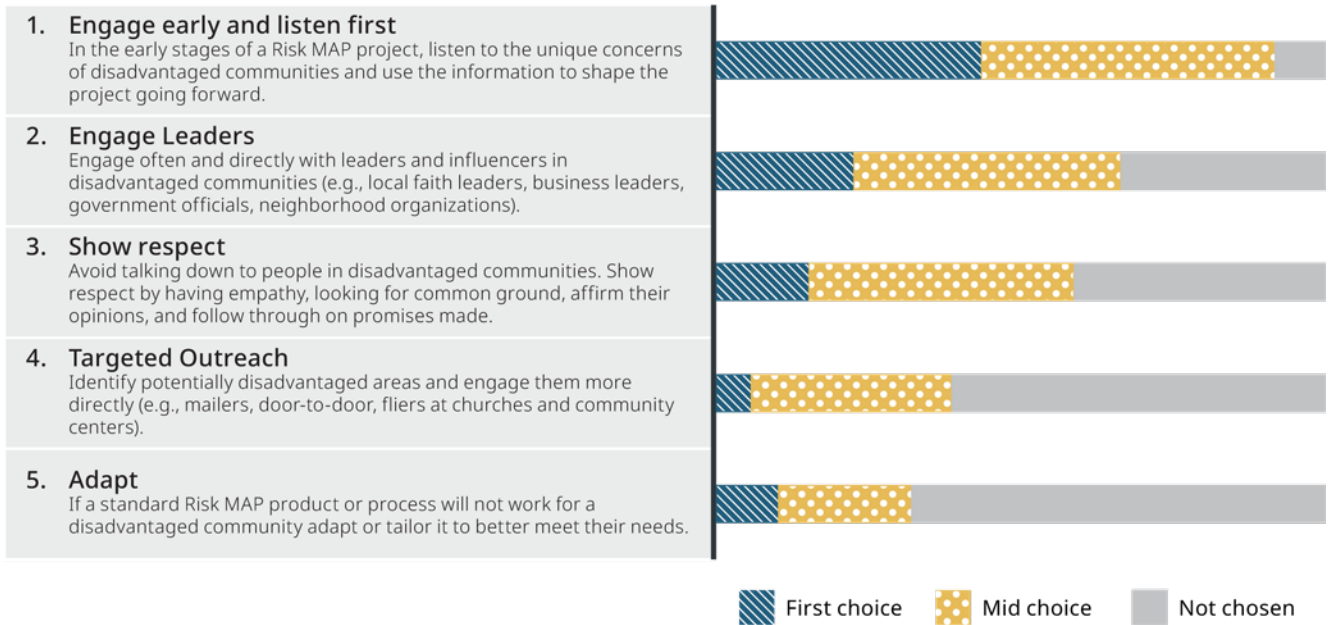
1. **Engage early and listen first**
   In the early stages of a Risk MAP project, listen to the unique concerns of disadvantaged communities and use the information to shape the project going forward.

2. **Engage Leaders**
   Engage often and directly with leaders and influencers in disadvantaged communities (e.g., local faith leaders, business leaders, government officials, neighborhood organizations).

3. **Show respect**
   Avoid talking down to people in disadvantaged communities. Show respect by having empathy, looking for common ground, affirm their opinions, and follow through on promises made.

4. **Targeted Outreach**
   Identify potentially disadvantaged areas and engage them more directly (e.g., mailers, door-to-door, fliers at churches and community centers).

5. **Adapt**
   If a standard Risk MAP product or process will not work for a disadvantaged community adapt or tailor it to better meet their needs.

First choice | Mid choice | Not chosen

Figure 6-7: Survey results for approaches to encourage more mitigation actions

Respondents were asked to identify (not rank) from a list of six choices—plus "other" and "I'm not familiar enough" options— their top three most helpful publicly available datasets for identifying areas where disadvantaged communities might be present (see Figure 6-8). Census tract information was identified by 73 of 105 respondents, but 62 respondents selected the "not familiar enough" option. None of the other options received more than 50 percent support, although "other" did gather 46 votes. Overall, this suggests there is an opportunity for FEMA to educate National Flood Mapping Program participants in methods to identify disadvantaged communities.
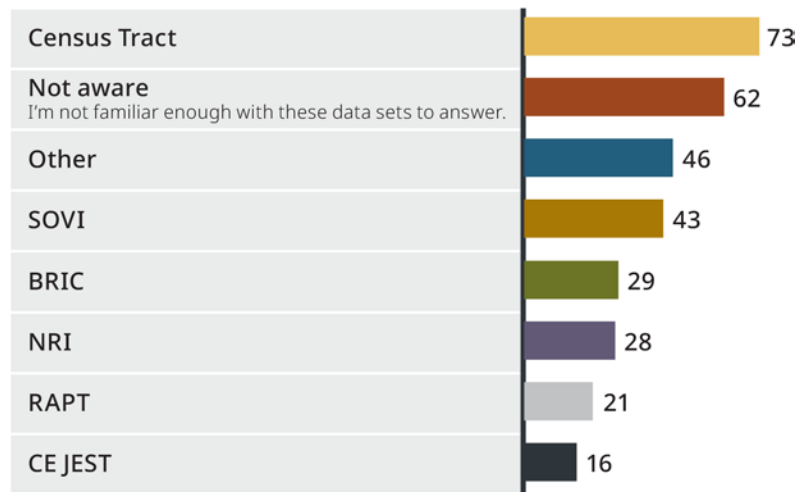

Dataset	Votes
Census Tract	73
Not aware (I'm not familiar enough with these data sets to answer.)	62
Other	46
SOVI	43
BRIC	29
NRI	28
RAPT	21
CE JEST	16

Figure 6-8: Survey results for most helpful publicly available datasets for identifying areas where disadvantaged communities might be present

6.3.1   KEY SURVEY FINDING HIGHLIGHT: DISADVANTAGED COMMUNITIES EXIST ON A SPECTRUM

Based on the results of the survey, those responding overwhelmingly believe disadvantaged communities exist on a spectrum from more disadvantaged to not disadvantaged, as opposed to a crisp binary condition. However, we frequently tend to form policy and mitigation strategies as though disadvantaged status is categorical, and will apply a strategy that worked, or did not work, in one disadvantaged community more generally. Realizing that communities may be disadvantaged for different reasons and to different degrees should inform the approaches used to engage disadvantaged communities, as well as the metrics used to report on that engagement.

6.3.2   KEY SURVEY FINDING HIGHLIGHT: LOW INCOME, PERSISTENT POVERTY, AND HIGH HOUSING BURDENS

Economic factors—low income, persistent poverty, and high housing burdens—are perceived by survey respondents to be more significant indicators of disadvantaged communities than other factors, such as disproportionate climate change impacts, language barriers, or limited water and sanitation availability. Of course, many of these indicators covary; lower-income communities frequently disproportionately suffer the effects of climate change, for example. The identification of economic factors as the most obvious indicators of disadvantaged communities should not be interpreted to mean the other conditions are not issues, but rather that those other conditions, language barriers, for example, are less apparent to the population of survey respondents, who tended to be risk management professionals with relatively little direct experience with disadvantaged communities.

6.3.3   OTHER KEY SURVEY FINDINGS

The survey of 105 respondents included 11 respondents who answered that "Communities Are: Disadvantaged or Not," which is not entirely consistent with the SME briefings on social vulnerability. From those briefs we learned that there are many factors that relate to how disadvantaged a community is, and those factors are related to the hazard in question. Of the 11 (10.4 percent) who answered this way, 5 (4.7 percent) were involved in zoning or land surveying, which typically deals with a binary choice or a very detailed specification of a boundary. That leaves 6 (5.7 percent) of the respondents that believe communities are either disadvantaged or not from the broad population, indicating that the vast majority of respondents find it difficult to identify a community as simply disadvantaged or not.

When responding to the question "How important is it for Risk MAP [National Flood Mapping Program] to identify disadvantaged communities when developing the products and strategies for delivery?" 7 (6.6 percent) respondents said that it is not

important. Of these 7, 4 (3.8 percent) were land surveyors who identified communities as being either disadvantaged or not. Here again we see the theme that the intent and usage of the information impacts the individual's perception of what should go into the development of the products. Since land surveyors do not need the information about a community's state of social vulnerability, they do not see it as useful information to consider in the process of developing products. Of those 7, 5 of the respondents agreed that communities are disadvantaged or not. The correlation between viewing communities as disadvantaged or not is high, with the perspective that identifying disadvantaged communities is not helpful when evaluating strategies for delivery for National Flood Mapping Program products.

The survey results do highlight an opportunity for improvement. While most survey respondents—again, typically risk management professionals—realize there are degrees of disadvantaged communities, and that communities may be disadvantaged for a variety of reasons, there was little awareness within this professional group as to tools that could be used to identify or characterize disadvantaged communities. A structured training effort, perhaps implemented through a certification process, highlighting some of the tools and indices available would be an immediate and relatively inexpensive step to help risk management professionals identify and engage disadvantaged communities more successfully.

6.4   FUTURE TMAC STAKEHOLDER ENGAGEMENT EFFORTS: LESSONS LEARNED

In evaluating the results of this survey, it is important to remember that it is a "survey of the willing" and, as such, represents a collection of anecdotes and opinions, which are still useful for the purposes stated but are not statistically meaningful or necessarily applicable to a broader context. This approach was dictated by the time and resources available.

As a follow-on activity, FEMA is encouraged to develop and deploy a more robust survey of individuals and households in underserved communities. This robust survey would provide insights and opinions directly from those FEMA wishes to better serve. To improve response rates, FEMA may consider distributing the survey through a willing source trusted by the disadvantaged community such as a church or community center. While likely beyond the scope of the TMAC, this engagement is likely to be extremely valuable.

07 CONCLUSIONS AND RECOMMENDATIONS

FEMA's Memorandum, dated May 25, 2022, identified areas for the TMAC to consider as it develops its 2022 annual report aimed at assisting FEMA in the delivery of the National Flood Mapping Program in disadvantaged communities. Chapters 2 through 6 of this report provide the results of the TMAC's assessment in the following four areas in the context of disadvantaged communities facing moderate to high flood risks:

1. **Barriers to Understanding Risk and Taking Action,**

2. **Unintended Consequences of the National Flood Mapping Program,**

3. **Improved Stakeholder Engagement for the National Flood Mapping Program, and**

4. **Data and Analysis to Inform Investment Decisions.**

Based on the assessments of these four areas, the TMAC identified suggested actions FEMA could take to improve overall National Flood Mapping Program delivery for disadvantaged communities. The TMAC then used the outcomes of the assessment and the suggested actions to formulate four recommendations for FEMA as described later in this chapter.

As indicated in Chapter 1 of this report, FEMA administers the National Flood Mapping Program through states and participating local political or tribal jurisdictions and generally not directly with disadvantaged communities as defined in this report. This means that actions taken by FEMA to increase or change engagement with disadvantaged communities need to be conducted through SLTT jurisdictions. The TMAC has considered this distinction in developing recommendations.

The following are important takeaways from the TMAC's assessment of the four topic areas listed above. These takeaways are reflected in the recommendations provided in this chapter:

1. BARRIERS TO UNDERSTANDING RISK AND TAKING ACTION

The TMAC identified seven barriers that influence the understanding and taking of actions to reduce a disadvantaged community's flood risk. These barriers can be jurisdictional or individual. Barriers that prevent disadvantaged communities from understanding and acting to mitigate their flood risk are varied and broad, and TMAC's list is not exhaustive. As described in Chapter 2, for each barrier, the TMAC assessed pathways to better meet the needs of disadvantaged communities. These pathways may improve information delivery, increase disadvantaged community capacity, address financial constraints, and create trust. To facilitate adoption of the pathways, the TMAC included suggested FEMA actions in Recommendations AR-41, AR-42, and AR-43.

2. UNINTENDED CONSEQUENCES OF THE NATIONAL FLOOD MAPPING PROGRAM

The National Flood Mapping program can present unintended negative consequences for disadvantaged communities that are similar to those in non-disadvantaged communities. However, those consequences, such as the need to meet minimum floodplain management requirements, the mandatory purchase requirement, and potential decreases in property value, are felt much more acutely by disadvantaged communities (see Chapter 3 for a more complete listing of potential negative consequences). The TMAC believes that the benefits of providing reliable flood risk data in disadvantaged communities offsets the potential negative consequences associated with the intended purposes of the National Flood Mapping program. In fact, the TMAC feels that withholding information, slowing down public release of data, or otherwise modifying the mapping process in disadvantaged communities could arguably be considered an injustice resulting in longer-term harm. Reliable flood data give disadvantaged communities the information they need to better understand their flood risk and prepare for and respond to a flood event, plan and apply for funding of mitigation strategies, and provide financial institutions with trusted flood risk factors they require to match loans with qualified individuals. The suggested actions included in Recommendations AR-42, AR-43, and AR-44 will help increase the availability of reliable flood risk data to offset negative consequences of the National Flood Mapping Program and help improve affordability of flood insurance for disadvantaged communities.

3. IMPROVED STAKEHOLDER ENGAGEMENT FOR THE NATIONAL FLOOD MAPPING PROGRAM

Results of the National Flood Mapping Program engagement process make clear that participation is hard to gauge and control. The TMAC believes customization of the engagement process in partnership with SLTTs will be critical when working together to provide better support for disadvantaged communities facing moderate to high flood risks. Specific actions that FEMA should consider are included in Recommendation AR-43. However, while necessary, improvements in engagement alone are not sufficient to help disadvantaged communities move toward a level of flood risk acceptable to them.

4. DATA AND ANALYSIS TO INFORM INVESTMENT DECISIONS

Historically, FEMA has not considered whether a community is disadvantaged in making its investment decisions. However, in accordance with Justice40, FEMA must now consider distributing the benefits of the National Flood Mapping Program more equitably. For the purposes of the mapping program, the primary investment

decisions involve the initiation or completion of products and services associated with improved flood risk management. These investments include funding to develop flood risk data and provide community engagement and technical assistance throughout the mapping process and potentially beyond it. The TMAC identified and assessed several publicly available community-based indices that could be used to identify disadvantaged communities for the investment decision-making process (see Chapter 5 for more details). Specific FEMA actions recommended by the TMAC regarding the application of these various indices are included in Recommendation AR-41. The most recent guidance from the Office of the President (Addendum to the Interim Guidance for the Justice40 Initiative dated January 23, 2023) directs federal agencies to use CEJST as the data analytic tool to identify disadvantaged communities, but only for geographically identified disadvantaged communities. FEMA still needs to use additional tools and indices and other sources to identify all disadvantaged communities defined in Justice40 (see Chapter 1 of this report).

The TMAC assessment involved significant literature reviews and direct engagement with subject matter experts in the fields of social vulnerability and disadvantaged communities. This helped the TMAC gain additional insights to support the assessment and development of recommendations. The TMAC's outreach focused on practitioners and not on any specific disadvantaged communities or socially vulnerable populations. As indicated in Recommendation AR-41, the TMAC believes that FEMA would benefit from direct surveys of disadvantaged communities with moderate to high flood risk to gain better insights into the issues and concerns they face (see Chapter 6 for additional details).

The TMAC found that the drivers and degree to which communities are disadvantaged vary widely, and there is not a distinct line between disadvantaged and non-disadvantaged communities. Successes that may be learned through applying TMAC's recommendations to address barriers to understanding risk and taking action or mitigating unintended consequences of the flood mapping program for disadvantaged communities can potentially be broadly applied to address issues that create disadvantages.

As demonstrated in this TMAC assessment report, the topic areas in FEMA's Memorandum of May 25, 2022, are interconnected. Similarly, the four TMAC recommendations that follow are interconnected and intended to work collectively to help FEMA improve delivery of the National Flood Mapping Program in disadvantaged communities. (Also, please note that the recommendation numbering scheme is sequential and a continuation from the recommendation numbering in previous TMAC reports.)

RECOMMENDATION AR-41: Set goals and relevant program performance targets for improving the delivery of the National Flood Mapping Program in disadvantaged communities and evaluate progress to confirm that desired outcomes are being achieved.

To address this recommendation, FEMA should consider the following actions:

1. Leverage the program's flexibility to develop tailored approaches that address specific barriers in disadvantaged communities. Such approaches may include improved communication and engagement opportunities through existing or additional partners, including official participating jurisdictional channels (see Chapter 4 and 6 for additional context).

2. In addition to using CEJST to identify geographically defined disadvantaged communities, evaluate various social vulnerability indices to determine a specific index or combination of indices to apply to all areas of the United States (with a scale from less advantaged to more advantaged). Then overlay that information with CEJST and flood hazard and risk data. This information will help enable FEMA to make more strategic investment decisions based on information that is more nuanced than a simple binary view of communities (e.g., either advantaged or disadvantaged). Regular assessment and updates to these data are likely, so tracking how they change over time will be important, particularly as broader federal outcomes are achieved (moving communities from a state of disadvantaged to advantaged) (see Chapter 5 for additional context).

3. Conduct equity impact assessments and validations to identify gaps and limitations of the application of social vulnerability indices and determine whether the adopted approaches are truly identifying disadvantaged communities (see Chapter 5 for additional context).

4. Confirm that FEMA's investments in disadvantaged communities are leading to the desired outcomes. Approaches could include engaging with and conducting surveys in disadvantaged communities where FEMA has made or is proposing to make investments (i.e., funded a study or provided mitigation grants) to determine whether specific disadvantaged community concerns, issues, and challenges have been identified and addressed where possible (see Chapters 2 and 6 for additional context).

5. Recognize the variability, differences, and distinctions among disadvantaged communities, and in addition to providing full access to flood risk information and technical assistance, confirm that all disadvantaged communities are provided with the resources necessary to meaningfully participate, make progress, and benefit from hazard mitigation (see Chapter 6 for additional context).

RECOMMENDATION AR-42: Continue to provide reliable flood data to disadvantaged communities by maintaining and updating existing data and developing new data where none exists.

To address this recommendation, FEMA should consider the following actions:

1. Assess NVUE compliance and unmapped mile coverage for disadvantaged communities and, where there are statistically significant differences between disadvantaged and non-disadvantaged communities, take action to bring differences in map quality and coverage into better alignment (see Chapter 3 for additional context).

2. Expand the breadth of flood hazard data available within disadvantaged communities to lower the cost burden of securing investments in flood risk reduction. In cases where these data suggest the presence of hazards that warrant creating regulatory floodplains where they do not currently exist, offer additional assistance and provide enhanced communication to disadvantaged communities so they are better prepared to handle the legal impacts associated with these hazards (see Chapter 3 for additional context).

Prioritize the validation and update of existing regulatory floodways, base flood elevations, and flood zones in disadvantaged communities to help ensure disadvantaged communities have confidence that the data used to administer the NFIP are not over- or underestimating 1% annual-chance flood hazards (see Chapter 3 for additional context).

RECOMMENDATION AR-43: Provide additional support to those SLTT governments that need help increasing flood resilience in disadvantaged communities.

To address this recommendation, FEMA should consider that support to include training, funding, guidance documents, and access to professionals with skills in engaging disadvantaged communities, and other "support". It will be important for FEMA to provide this support to disadvantaged communities through SLTTs, rather than directly to disadvantaged communities. The following actions should be considered:

1. Focus on how the data could be used to advance objectives for the mapping program and complement efforts to meet objectives in other FEMA programs (particularly actions to reduce flood risk). The approach could be similar to the approach by many CTPs that advance program objectives beyond flood risk mapping to include floodplain management and mitigation (see Chapter 2 for additional context).

2. Provide tools, training, technical assistance, and funding to assist SLTTs in serving disadvantaged communities where flood risk projects are being conducted (see Chapter 2 for additional context).

3. In cooperation with SLTTs, develop tailored products to support flood risk communication in disadvantaged communities, including mapping products that better portray flood risk and other products aimed at practical actions that can be taken to bring risks to an acceptable level for those communities (see Chapter 2 for additional context).

4. Assess and enhance the use of partnerships to overcome a lack of trust, leverage financial resources, and reduce logistical barriers to participation in the NFIP (see Chapter 2 for additional context).

    Leverage state partnerships (State Hazard Mitigation Officer, NFIP Coordinator, Dam Safety Officer, and Insurance Commissioner) specifically to improve disadvantaged community engagement to include training and possibly additional funding aimed at meeting goals from Recommendation AR-41. (see Chapter 2 and 4 for additional context).

5. Encourage the establishment of disadvantaged community liaison networks made up of qualified professionals (state mitigation officers, local floodplain managers, practitioners, etc.) who can help disadvantaged communities and jurisdictions navigate FEMA's study process and comply with minimum floodplain management requirements of the NFIP. This effort could include identifying and resourcing trusted local leaders within the disadvantaged community to support communications and engagements between federal, state, and jurisdictional representatives and the disadvantaged population (see Chapter 4 for additional context).

6. Consider helping SLTTs identify various programs (including the CRS point system adjustments) that can help them lower flood risk and insurance costs in disadvantaged communities (see Chapter 4 for additional context).

RECOMMENDATION AR-44: Work with Congress to directly and transparently improve equity by addressing the unique challenges faced by disadvantaged communities without slowing down the delivery of flood hazard and risk data.
To address this recommendation, FEMA should consider the following actions:

1. Refer to the ideas outlined in the FEMA affordability framework as a potential starting point (see Chapter 3 for additional context).

2. Work with participating jurisdictions to help identify new approaches to address the unique burden that disadvantaged communities have in complying with floodplain management requirements and addressing non-conforming homes and businesses (see Chapters 3 and 4 for additional context).

3. Consider how attempts to address financial or other challenges indirectly through modifications of mapping standards or procedures could undermine the program mission and create additional inequities within the NFIP (see Chapters 3 and 4 for additional context).

Table 7-1 links each recommendation to the chapter discussions that provide the basis for the recommendation.

Table 7-1: Chapter Discussions Addressing Each Recommendation

Chapter	Recommendation 41	Recommendation 42	Recommendation 43	Recommendation 44
2	✓		✓	
3		✓		✓
4	✓		✓	✓
5	✓			
6	✓			

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APPENDIX A

FEMA MEMO

U.S. Department of Homeland Security
Washington, DC 20472

FEMA

May 25, 2022

Mr. Douglas Bellomo, P.E.
Vice President, AECOM
3101 Wilson Boulevard, Suite 900
Arlington, VA 22201

Dear Mr. Bellomo:

The Biggert-Waters Flood Insurance Reform Act of 2012 established the Technical Mapping Advisory Council (TMAC) to review and make recommendations to the Federal Emergency Management Agency (FEMA) on matters related to the National Flood Mapping Program. Through the Risk Mapping, Assessment, and Planning program (Risk MAP), FEMA continues to deliver quality flood hazard data that increases public awareness and leads to action that reduces risk to life and property, in collaboration with state, local, and tribal governments. As you are aware, future conditions and equity are strategic priorities for FEMA as a whole, as well as for Risk MAP.

Equity is a cross-cutting priority reflected in the Federal Insurance and Mitigation Administration's 2021-2023 strategy. It is also one of three priorities in FEMA's new (2022-2026) agency-wide strategic plan (https://www.fema.gov/about/strategic-plan). FEMA is exploring how to deliver Risk MAP more equitably, both in the context of the current program and as the program evolves to deliver probabilistic flood hazard and graduated flood risk information.

In January 2021, President Biden issued Executive Order 140081, "Tackling the Climate Crisis at Home and Abroad," to announce the Justice40 Initiative. Risk MAP is classified as a "covered program" as outlined in Executive Order 140081. The Justice40 Interim Guidance asks covered programs to report on benefits that flow to disadvantaged communities through both monetary and non-monetary terms.

FEMA requests that the TMAC consider the items in these areas of equity when producing its findings and any recommendations for the 2022 Annual Report. We specifically request the following.

- o   Evaluate the barriers that disadvantaged communities face in understanding their risk and acting to reduce their risk. Recommend ways for the program to overcome these obstacles and better meet the needs of these communities.

- o   Evaluate and recommend ways for Risk MAP to identify and limit the potential negative impact and unintended consequences that might result from Risk MAP products and program delivery such as:

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Douglas Bellomo
May 25, 2022
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- Increasing the cost of living (flood insurance, rent, cost of goods and services) for low-income populations;

- Increasing the amount of unsafe and poor-quality housing;

- Decreasing access to vital community programs dependent on tax revenue;

- Creating job losses; and

- Increasing the probability of foreclosure in these communities.

o Evaluate and recommend ways for Risk MAP to improve stakeholder engagements with disadvantaged/underserved communities.

o Evaluate ways the agency could use statistical data and analysis regarding social vulnerability and underserved populations, and provide recommendations on how that data and analysis should inform future annual investment decisions for Risk MAP.

As in previous years, the TMAC should deliver its findings and any recommendations in an annual report. The insight that the TMAC provides this year will help ensure that FEMA is delivering the Risk MAP program in a way that maximizes investments and serves the entire nation more effectively and equitably. FEMA greatly appreciates the TMAC's continued dedication and expertise.
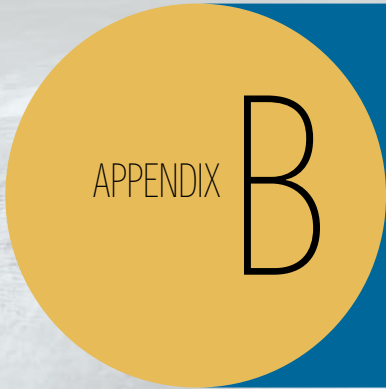
Sincerely,

MICHAEL M GRIMM
Digitally signed by MICHAEL M GRIMM
Date: 2022.05.25 14:25:46 -04'00'

Michael Grimm
Assistant Administrator for Risk Management
Federal Insurance and Mitigation Administration
Federal Emergency Management Agency

Attachments:
Executive Order 140081
Interim Implementation Guidance for the Justice40 Initiative

Speaker/Bio	Presentation Summary
Charles Carson FEMA BRIC Economist **Sunny Ng** FEMA FMA Program Analyst	Distributional equity was the focus of the session. Charles Carson pointed out that distributional specifics lead to some hard questions such as "how do we define vulnerability?" There are various methods used such as the Climate and Economic Justice Screening Tool as well as the Resilience interim equity data standard which established SVI thresholds at 0.6 and 0.8 to determine disadvantaged. Tribal jurisdictions are always considered undeserved as well as Economically Disadvantaged Rural Communities (EDRC). Yet nationwide indices may not fully capture the qualitative benefits or impacts of a project, measure the specific local hazards as accurately as available local data, and may not include unique community needs, history, or context. BRIC Competitive Grants can be measured against different interim standards. Tools will continue to evolve as well as the approach. The Justice40 Initiative is a type of measurement initiative in a sense. There is a commitment to bring 40% of the benefits from federal investments in climate and clean energy to disadvantaged communities. The key in distributive equity is seeing that those benefits are available to communities that historically have not had those benefits available to them. Sunny Ng then continued the session highlighting some challenges as well as what is being measured and the benefits. Potential noted challenges included FMA regulatory limitations in reaching underserved populations due to NFIP Community Participation and Insurance requirements, Privacy Act constraining FEMA's ability to share insured and repetitively flooded properties information to communities for project development, and State and local resource capacity challenges combined with competing priorities may present downstream bandwidth issues. For FY21, 62% of FMA dollars are going towards disadvantaged communities measured using the Climate and Economic Justice Screening Tool (CEJST 1.0) released in November 2022. There is always room for improvement, but the accomplishments are evident in the benefits for Justice40 communities. The properties and families reduce their flood risk. Greenspace and/or green infrastructure is added as well as jobs are being created from flood mitigation investments.

Speaker/Bio	Presentation Summary
H. Camille Crain BRIC Section Chief at FEMA Headquarters. In this role it is her responsibility to design and administer FEMA Hazard Mitigation Assistance's newest grant program, BRIC. She brings over 20 years' experience with FEMAS' Hazard Mitigation Assistance (HMA) grant programs at the university, state, and federal Level. **Brandon Sweezea** Section Chief for the Flood Mitigation Assistance (FMA) Program at FEMA	Camile Crain began the discussion noting the focus would be on procedural equity. BRIC's priorities for FY22 include incentivizing natural hazard risk reduction activities that mitigate risk to public infrastructure and disadvantaged communities. Funding is broken up into three major buckets of the program: State/Territory Allocations, Tribal Set-Aside, and National Competition for Hazard Mitigation Projects. Competition Criteria goes through a 230-point scoring process. Additional changes have been made to the program to increase equitable outcome this year. One has been the ability to have that increase cost share of 90/10 for projects that benefit an economically disadvantaged rural community. Also, applicants can now apply without having a Benefit-Cost Ratio (BCR) in place if they meet certain criteria. A key piece of the program is BRIC Direct Technical Assistance (DTA) which offers a first step to communities that want to get on a road to resilience but don't have the means to put in a grant application. Another thing that they have done to lower the bar of entry is to provide an online request form for BRIC DTA. It's a simpler process to request assistance compared to applying for a grant, which this is not. Next up was Brandon Sweezea who discussed the Flood Mitigation Assistance (FMA) Program. The FMA is different from the other programs in that the applicants must be participating and in good standing with the National Flood Insurance Program (NFIP). Five times the normal funding has been made available starting in FY22. There are three different buckets to which this money is allocated to: Capability and Capacity Building (C&CB) Activities, Localized Flood Risk Reduction Projects, and Individual Mitigation Projects. One of FMA's most competitive features is they can offer high-cost shares. A new offer is that FEMA will pay up to 90% for projects that benefit areas/communities with a CDD (Social Vulnerability Index) SVI greater or equal to .5001. Additional Key changes for promoting equitable outcomes are deprioritizing high-cost projects and implementing Phased Projects where FEMA funds for complex localized flood risk reduction projects. That allows communities to leverage federal funding for projects to be developed and evaluated without a community assuming the risk of not being selected.

Speaker/Bio	Presentation Summary
Christine Gaynes is a Civil Engineer with FEMA Region 8 within the Mitigation Division. She is the National Flood Mapping Program Team Lead, the Regional Cooperating Technical Partners (CTP) Lead, and the Project Manager for National Flood Mapping Program Projects and LOMRs for the State of Colorado. **Johanna Greenspan-Johnston** is a Senior Resilience Planner with Dewberry, a member of FEMA's STARR II Production and Technical Services team. Her areas of expertise include hazard mitigation and resilience planning, vulnerability and risk modeling, stakeholder engagement, and policy analysis. She has also worked extensively with FEMA, including leading the development marketing and outreach campaigns for the National Flood Insurance Program (NFIP), facilitating stakeholder engagement with advanced technical topics and research initiatives under the National Flood Mapping Programing Assessment, and Planning (National Flood Mapping Program) Program, and supporting equity action planning and strategy efforts with HMA.	Ms. Gaynes and Ms. Greenspan-Johnston, representing FEMA Region 8 presented their work on Equity Review of Resource Allocation in National Flood Mapping Program in the region. Their study was motivated by the need for equity in program decision-making and investments. Based on the data collected and analyzed in Region 8, the initial findings are: great equity considerations correlate with both lower coverage and low product use and higher mapping coverage correlates to higher product use. Through the study, they found that the decision support to better serve disadvantaged communities in the context of Justice40 is to identify areas that have lower hazard data quality, higher social vulnerability, and have not received HMA funding. The next steps of the study are to continue research and exploration to develop criteria for identifying which communities are "underserved," drive decision-making and track progress by designing process for setting investment priorities and making product development decision, collaborate with CTPs and SLTT partners by sharing findings and collect input from CTPs and SLTT partners, and share insights and approaches across FEMA.

Speaker/Bio	Presentation Summary
Michael Godesky, P.E. FEMA **Peter Herrick, Jr.** FEMA, Communications Strategy Branch | Risk Management Directorate	FEMA conducted a literature review and four data studies to determine a National Flood Mapping Program Justice40 Baseline for OMB. This work is to tell OMB where FEMA is on Justice40 before OMB and FEMA determine where FEMA needs to go. Some literature suggests that Special Flood Hazard Area increases on Regulatory Maps in Disadvantaged communities or populations has the effect of decreasing resilience. Because of mandatory flood insurance requirement costs increase. Called the Disaster Poverty Trap. This is a key unintended consequence. Main findings: • Data does not show a national selection bias in National Flood Mapping Program projects • Quarter of mapped, miles census tracts, scoped miles are disadvantaged • There are significant regional differences with respect to disadvantaged communities. • Understanding flood risk is an important consideration in project selection. • Evaluating vulnerability, mapping status, and flood risk allows good decisions for Justice40 • The social vulnerability factors are different for each community so HOW we deliver our information is as important as WHERE and WHAT we deliver. • The unique nature of each community makes regional familiarity and coordination with communities critical to project selection.

Speaker/Bio	Presentation Summary
Peter Herrick, Jr. FEMA Communications Strategy Branch	Risk Management Directorate **Kathleen Boyer** FEMA	Resilience, Equity and Engagement FEMA believes the success of its community resilience initiatives relies on its ability to engage intentionally to (i) improve customer experiences, (ii) build trust and empower communities, and (iii) focus on outcomes not outputs. Among the outcomes it seeks with its National Flood Mapping Program are to develop stronger relationships with communities and individuals by increasing trust and satisfaction, to improve access to and understanding of data in order to empower communities to drive action, to broaden engagement across the whole community and improve equitable service delivery, to foster greater community resilience by helping communities consider and plan for future conditions, and to improve engagement by developing a better understanding of customer needs. FEMA is working to adapt to how customers want the flood risk information, how they want to engage, and what their priorities are. FEMA is looking for input on where they can be most impactful, where should they invest more, and where should they disinvest? FEMA is pursuing a new Customer Experience (CX) journey because it is the right thing to do, it's how FEMA delivers effective engagement, and how FEMA can drive to more strategic outcomes. Resilience and equity are two of the key pillars of the CX program. While improving customer experience with an eye towards resilience and equity is a legal requirement, FEMA started this journey before these became legal requirements. Through this FEMA is looking to reduce the disaster gap and to not perpetuate the cycle of the disaster gap. FEMA does not want to do a disservice to a portion of a community or to entire communities. To achieve resilience and equity the deliverables must be tailored to what all communities need and want. FEMA's Questions for the TMAC: FEMA would like the TMAC to help FEMA to better understand what non-traditional factors (factors beyond the census-type demographic factors) should be considered when developing an engagement strategy? What gaps do communities have that FEMA may not be considering? How does FEMA effectively move beyond its current efforts to make progress to deeply understand customer needs and sentiments? How should FEMA approach adding equity demographic data layer around data collection so that FEMA is reasonably sure that who FEMA is hearing from is representative of everyone? How does FEMA enable that access to ensure FEMA is hearing from a diverse customer base who needs the services? What are methods for overcoming technical, language, and other barriers?

Speaker/Bio	Presentation Summary

Bobby Howard
Muscogee (Creek) Nation

Bobby Howard is the Emergency Manager with the Muscogee (Creek) Nation and member of the State, Local, Tribal, and Territorial Government Coordinating Council (SLTTGCC). The Muscogee (Creek) Nation spans across approximately 11 counties in Oklahoma. The tribal entity became a participating member of the NFIP in 2020. As part of the 5 civilized tribes, the Muscogee Nation has an impressive internal framework that allows Bobby to speak on engagement with FEMA programs, access, and the possible barriers to receiving assistance.

Mr. Howard is experienced maneuvering in the federal sphere in regard to the McGirt decision and has assisted the tribe in applying for their own disaster declarations.

Bobby Howard provided an informal Question and Answer presentation to the TMAC regarding the tribal perspective and experience on NFIP participation and barriers to accessibility of federal programs.

Mr. Howard spoke about his engagement with federal partners and his recent time briefing the National Advisory Council and FEMA administrator.

Barriers to accessing federal assistance was discussed in relation to tribal entities. Mr. Howard identified unnecessary requirements as the primary barrier to receiving federal assistance, citing the requirement of a tribe having completed a THIRA assessment as a preliminary qualification for several U.S. Department of Homeland Security funding opportunities. The Threat and Hazard Identification and Risk Assessment (THIRA) is a three-step risk assessment process that helps communities understand their risks and what they need to do to address those risks by identifying what threats and hazards can affect the local community; what impacts would those threats and hazards have on the local community; and what capabilities the local community should have to address those threats. THIRA assessments can be costly and inconsequential when examining a population sometimes as small as 100 and in less than a square mile.

Mr. Howard discussed the nuance of tribal entities and the fact that not all tribes are created equal in regard to access. For instance, tribal set asides for several FEMA Hazard Mitigation Grant funding opportunities are only eligible to the 5 civilized tribes and not all tribal governments. There are "39 tribes in Oklahoma and only 5 can apply for the grant."

At the heart of the discussion with Bobby Howard was the tribe's participation in the NFIP. Spurred by the need to protect its citizens, the Muscogee Creek Nation became a member of the NFIP in 2020. There were tribal citizens located in counties that experience regular flooding and with vast floodplains that did not participate in the NFIP. The tribe's participation extends benefits under the program to citizens in those areas.
- Unrealistic requirements for tribes make accessing assistance difficult and act as systematic barriers.
- Not all tribes are equal in regard to capacity or opportunity.
- 574 federally recognized tribal entities all compete for limited funding allocations.
- Tribal participation in the NFIP extends benefits to citizens even if they are not in participating jurisdictions,

Speaker/Bio	Presentation Summary
Dr. Alessandra Jerolleman Associate Professor, Jacksonville State University Dr. Jerolleman is an Associate Professor in Jacksonville State University's Emergency Management Department. She is a community resilience specialist and applied researcher at the Lowlander Center, as well as a co-founder of Hazard Resilience, a United States based consultancy providing leadership and expertise in disaster recovery, risk reduction, and hazard policy.	Dr. Alessandra Jerolleman provided a formal presentation to the TMAC spanning the course of 60 minutes entitled "A Conversation About Equity and Floodplain Management. Dr. Jerolleman began with the general construct that "Disasters, such as floods, routinely exacerbate existing inequalities." To add to the conversation of this point, a high-level view of the U.S. Commission on Civil Rights 2022 – Hurricanes Maria and Harvey Report was covered. Key findings of the report were highlighted. Emphasis was placed on the finding that individuals with disabilities and non-English speaking individuals had less access overall to technology, were denied assistance, or had stalled assistance. The continuing impacts of historic practices of redlining of Black and Hispanic communities in Houston following the storms was also touched upon. These include impacts on real estate loan approvals and valuations following a disaster event. Several definitions of equity and justice were discussed to provide the TMAC with a holistic view of what it means to be equitable in relation to "underserved communities." During the remaining portion of Dr. Jerolleman's presentation, real world application of equity once inequity is identified was discussed. Additionally, the importance in identifying vulnerability, fostering meaningful engagement to avoid assumptions, and challenges in the process were presented. The challenges of data, trust, and historic inequity were discussed. Also discussed was the importance of other necessary priorities that communities and individuals may have and risk from participation. • Disasters, such as floods, routinely exacerbate existing inequalities. • Flooding takes place in a socio—political and historical context • U.S. Commission on Civil Rights 2022 – Hurricanes Maria and Harvey Report- "People with disabilities, who were non-English speaking, or had less access to technology, were denied assistance, could not access assistance or re-application procedures after initial denial, or had stalled assistance." • There are barriers to access for hazard mitigation, contributing to a real possibility that only those who can afford a resilience premium may remain in place • In many cases, historic inequities impact the existing vulnerability while also lessening the ability of residents to access mitigation dollars • Risk reduction can be used as a tool to pursue pre-event interests in redevelopment or gentrification of certain neighborhoods

Speaker/Bio	Presentation Summary
Jack Krolikowski Deputy Manager for Hazard Mitigation, State of Georgia Office of Homeland Security and Emergency Management. Mr. Krolikowski previously served in the State Environmental Resources Department. In his current capacity, Jack coordinates natural hazard mitigation planning and risk reduction projects across Georgia's 159 counties and for State-owned property, with a particular focus on utilization of best available hazard, vulnerability, and exposure data. He is a graduate with a bachelors and master's degree in Civil Engineering from Georgia Tech.	Jack Krolikowski provided a formal presentation to the TMAC spanning the course of 60 minutes entitled ""Flood Hazard Information Case Study from Northwest GA." Presented in the case study to the TMAC was flooding occurring in northwest Georgia that spanned from early September 2022 and lasted approximately a week. The case study specifically focused on unincorporated Chattooga County and the City of Summerville. Both members participate in communities in the National Flood Insurance Program. Unfortunately, although both jurisdictions participate in the NFIP several areas were still unmapped and the risk wasn't fully assessed. Mandatory purchase requirements have been identified as a barrier to serving the population affected by flooding. • Although jurisdictions participate in the NFIP, lack of resources still leave critical areas unmapped. • Mandatory purchase requirements may act as discouragement to adoption of Flood Insurance Rate Maps with larger Special Flood Hazard Areas.
Christina Lindemer FEMA Christina Lindemer is a coastal engineer and emergency management specialist at the Federal Emergency Management Agency (FEMA) Headquarters supporting the Federal Insurance and Mitigation Administration (FIMA). She is the lead at FEMA for development and integrations of probabilistic methodologies (inland, coastal, etc.) for FFRD.	Christina Lindemer discussed Future Flood Risk Data (FFRD) in the presentation. She pointed out the current depiction of flood hazards is very black and white (or binary) – you're either inside the SFHA or not. The future data produced by FFRD will be graduated. These data will paint a more detailed and comprehensive understanding of how flood hazards vary across the range of potential flooding scenarios (or frequency space). The probabilistic assessments are used to incorporate uncertainty such as the variability of inputs and the natural randomness of hazards, in this case, floods; consider the full spectrum of flooding scenarios, their likelihoods and impacts and provide graduated hazard and risk data. Eventually, The FEMA will develop statistical methods to use the full probabilistic analysis to create a simplified proxy that can be used to create the regulatory products. This will be simplified enough to support the standard review and revision processes we have in the regulatory environment (appeals, LOMRs, etc.) The mapping program must change. The future will be a national 2D, probabilistic modeling framework for both inland and coastal. 2D BLE investments today begin to build towards this future. We can use them today, and we will continue to refine our workflows to make them more efficient in the future.

Speaker/Bio	Presentation Summary
Hope Morgan, NCPLS, GISP, CFM Ms. Morgan is a GIS Specialist/Project Manager at AECOM **Tammie Tucker**, PE, PMP, PMI-ACP, CFM Ms. Tucker is a Civil Engineer and Project Manager at AECOM. Her technical background includes H&H analyses, floodplain management, risk assessment, floodplain mapping, FEMA National Flood Mapping Program products, stream restoration, and construction oversight with the majority of that revolving around open-water channels and flooding.	Ms. Morgan and Ms. Tucker presented a data review of social and environmental vulnerability indexes and tools. The Justice40 Interim Guidance requires agencies that manage covered programs to identify the benefits of the program, determine how the program distributes benefits, and calculate and report on the 40% goal. Hope and Tammie identified 21 pilot programs charged with the initial incorporation of the interim guidance that are at various stages of implementation. Other federal programs not identified as pilot programs are also required to implement the Justice40 guidance on a different timeline. However, many programs are still refining their approach and have not shared their plans to incorporate the Justice40 guidelines. Ms. Morgan and Ms. Tucker presented on nine national level tools and identified state-level tools for ten states. Barriers to understanding risks include funding, culture, language, resources, access to information, and data clarification. To address these risks, Hope and Tammie propose several potential pathways, including basing the response to barriers on local needs, creating barrier plans for meetings based on local needs, using local organizations for public outreach to build trust, and educating the public with a focus on what the information means to them.

Speaker/Bio	Presentation Summary

Dr. Lori Peek
University of Colorado – Boulder

Dr. Lori Peek is a professor of Sociology and director of the Natural Hazards Center at the University of Colorado, Boulder. She is also the principal investigator of the National Science Foundation-funded CONVERGE facility which is dedicated to advancing ethical, problem-focused, and solutions-based multi-disciplinary hazards and disaster research. Her diverse and significant work explores the intersection of society with natural hazards including motivating protective actions for people through early warnings for earthquakes to exploring the significant differences in outcomes among different groups such as children and low-income families in major disasters like Hurricane Katrina. Her nomination by President Biden in 2021 to the Board of the National Institute for Building Sciences and subsequent approval by the U.S. Senate speaks to the significance and quality of her work. As an established author and educator, Dr. Peek is currently advancing the science behind evaluating the phenomenon behind inequitable outcomes in natural hazards and leaving a legacy for years to come through the students and diverse early career researchers with whom she shares her passion and immense knowledge.

For the meeting with Dr. Lori Peek the format was more of a conversation rather than a power point presentation. Dr. Peek quoted Dr. Dennis Mileti, "Conversations unite, PowerPoints divide.", and suggested we engage in conversation rather than receiving a PowerPoint presentation. To facilitate conversation a series of questions were prepared to guide the conversation.

The first question was "How do you define socially vulnerable people, what terms are appropriate or utilized?" Dr. Peek responded that there is no one concept that captures the diversity of this problem or the diversity of people. For example, a range of terms are used such as: socially vulnerable populations, marginalized groups, disadvantaged populations, and populations with access and functional needs. With that in mind, ,the terminology that appears to be most common is social vulnerability and socially vulnerable populations in both the literature and emergency management practice. What social vulnerability and the related concepts share in common that our society has never been completely equitable; there have , always been those that have more or less access to power, economic resources, social capital, and other forms of valued resources. Often those cleavages are along the lines of racial ethnicity, age, gender, sexual orientation, ability, and health status. For example, Dr. Peek and her team have conducted research that has shown that elderly men of color, and especially Black and Indigenous older male adults, are especially vulnerable to death in various natural hazards.

Social vulnerability within the context of natural hazards refers to socio-demographic characteristics of a population and the physical, social, economic, and environmental factors that increase the susceptibility of these groups to adverse disaster outcomes such as death, injury, property loss, familial separation, and so forth. Social vulnerability and effects their capacity to anticipate, cope with, and responds to and recover from disasters. When scholars study social vulnerability, they tend to use data that allows for the analysis of group-based patterns that are influenced by historical forces and current social and economic contexts.

Vulnerability is dynamic and socially determined, and people are not inherently vulnerable. Therefore, researchers are often interested in , understanding how the social context—how and where people live, work, go to school, etc.—that shapes vulnerability and exposure.

Dr. Peek also underscored that social scientists have argued for decades that there is "no such thing as a natural disaster," but instead natural hazard events become human disasters when the natural force collides with a vulnerable built and human environment. At this point, Dr. Peek mentioned the large body of research literature and the resources such as CONVERGE training modules on social vulnerability and research synthesis publications through the Natural Hazards Center.

For example, Dr. Peek questioned how [TMAC] defines the natural hazard of flood? Floods are unique in their physical aspect, but disasters are patterned in their outcomes. As we look across events we can find recurring social patterns—because , of historic processes (e.g., redlining) and contemporary patterns (e.g., disinvestment in in urban infrastructure)—we see people of color flooding more, elderly flooding more. When we can recognize those patterns, we can use that to make changes in the investment decisions to move the needle toward more equitable outcomes.

Speaker/Bio	Presentation Summary
Dr. Lori Peek University of Colorado – Boulder (continued)	Dr. Peek also made the point in terms of group-based patterns that oftentimes Often times those who have the highest risk perception are actually those who might be considered the most socially vulnerable, those living at the margins such as people of color and people living in poverty. Yet our traditional risk communication models just assume that if we give more information that people will take action. But these patterns reveals that often people can't take action, even if they are fully aware of the risk. The issue is that for so long, we have focused on telling people about the risks that they are facing, but a different paradigm would be to inform people about what they can and should do about those risks—and then make sure they have the capacity to perform the recommended protective actions. An equity lens can help us to see who does, and does not, have appropriate capacity and then to question how we can ensure that all people have proper support in the face of ongoing inequities. Said differently, we need to focus on supporting people to take the actions they know they need to take but they do not have the capacity, resources, time, or ability to take those actions. It is also important to consider how natural hazards losses and ongoing inequalities are widening already existing gaps between people. Many of our current policies encourage people to rebuild in place, insurance encourages people to rebuild not relocate—this will only intensify the risks that already vulnerable people face in floods and other hazards. Taking an equity lens can shift our focus from the individual to thinking about the policies and structures in place that encourage or inhibit appropriate adaptive responses to the mounting risks people experience. It is always wroth acknowledging that while there are shortcomings in the currently available social vulnerability tools, but they bring scientists together to help solve difficult problems. We can and should ask, what are the appropriate metrics to determine if actions by FEMA improve outcomes? We have far more data available to us that allow us to measure inequity than we do to evaluate the implemented change to improve equity. There is no shame in that, we cannot make progress in making things equitable until we better understand inequity. But we also need to make sure we are clear on what inequities we are measuring. That is the first step - identify the top 5 inequities, for example, but then don't lose sight of the ethical imperative to also look for solutions to those inequities. The reason we have not seen significant action towards mitigation of social vulnerabilities, is that we have difficulty identifying the impact of our actions on driving equitable outcomes. A big question to address is which part of this complex interwoven fabric is the appropriate thing to address to drive the most effective outcomes? Is it poverty reduction? Reducing segregation along racial and ethnic lines? If we can think about these big questions in our social environment, this can help us to move forward with reducing flood risk.

Speaker/Bio	Presentation Summary
Luis Rodriguez Director, Engineering and Modeling Division at FEMA **Laura Algeo** National Cooperating Technical Partners Program Coordinator	Deciding where to prioritize a mapping study depends upon several variables that are tied directly to the hazard and resulting risk, not necessarily a community's social vulnerability. Among the variables are whether there is LIDAR, results from the National Risk Index, communities identifying they have a flood risk, where there is data that can compare current hazards versus other hazard and risk data that may exist and looking at regional risk factors such as the building density around streams. The ultimate decision to study is one based on where risk and hazard data may not exist or may be out of date and where there is funding to move forward. Social vulnerability and considerations of Justice40 come in later in how we can best deliver the data to those areas so that it is most impactful. In some communities, delivering a regulatory product -- the NFIP FIRM -- can be a disservice to a community that doesn't have the capability to properly implement the NFIP. It leads to other requirements that may cost a community more than it helps. In these cases, alternate delivery of flood hazard data can be very helpful. In these communities, more technical assistance is critical to ensure they understand the data and know what to do with it. Limitations on broadband and internet access is another concern. For some communities, there will be digital maps created, but they may also be provided paper products as needed. Making investment decisions is an annual process working with the Administration and Congress to define the available budget. Budgets change from year to year depending on congressional and administrative priorities. NVUE, with a target of 80% has been the key performance metric for the National Flood Mapping Program. Flood hazard data decays over time, and FEMA has a requirement to evaluate the nation's flood hazard inventory every 5 years. Thus, if we are evaluating 20% each year, we can update streams as needed to maintain 80% NVUE. There is still a lot of work ahead for the National Flood Mapping Program to address unmet legal requirements. For example, addressing areas that are unmapped, areas of residual risk, and future conditions. The program is now in a better position to address these other areas under the existing statute. Justice40 is an additional, new, variable for National Flood Mapping Program to consider. How will FEMA do this? Research indicates that providing disadvantaged communities regulatory products and making them part of the NFIP could put them in a worse place. It makes more sense to make flood hazard information available and work with disadvantaged communities to decide if regulatory products will best support resilience activities. Given that National Flood Mapping Program delivery is designed with flexibility to meet the needs of communities, additional support on roll out of products and communication is key to ensure that socially vulnerable jurisdictions have the resources they need to mitigate their risks. FEMA is developing plans to better define the needs for more technical support - this will most likely be at the regional level.

Speaker/Bio	Presentation Summary

Dr. Eric Tate

Dr. Tate is an Associate Professor at the University of Iowa, in the Department of Geographical and Sustainability Sciences. He teaches and conducts research in the areas of flood hazards, water resources, environmental justice, and social vulnerability, using spatial indicators to explore environment-society interactions. Dr. Tate serves on the Board of Directors for the Anthropocene Alliance, on the Mapping Science Committee of the National Academies of Sciences, as co-chair of the Resilient America Roundtable, and as a co-author of the Adaptation chapter of the Fifth National Climate Assessment. Dr. Tate earned a B.S. in Environmental Engineering from Rice University, an M.S. in Water Resources Engineering from the University of Texas, and a PhD in Geography from the University of South Carolina.

Modeling Social Vulnerability to Flood Exposure: Gaps and Needs

"There are no really generalized opportunities & risks in nature, but instead there are sets of unequal access to opportunities and unequal exposure to risks which are a consequence of the socio-economic system. It is more important to discern how human systems themselves place people in relation to each other and to the environment than it is to interpret natural systems." --Terry Cannon

Dr. Tate posits that there is really no such thing as a natural disaster. Rather disasters are caused when social, physical, and management dimensions come together during or after an event. His research has led him to a basic question: Why aren't we modelling the vulnerability of people instead of spending so much time modelling the vulnerability of things and structures.

"It's not people that are vulnerable, it's societal processes that make people vulnerable. ... We have made them vulnerable."

Another important aspect of his work is looking at the intersections of various characteristics to see how this changes social vulnerability. Home tenure. Dr. Tate proposes that we learn much more through the "intersectionality" of these characteristics, for example, people who are black, of lower income, and renters. Or, people who are white, of lower income, and own their homes. This increased specificity, or tailoring of indices, in models tell us much more about social vulnerability than looking at individual characteristics alone. "A long history of discrimination may mean we look to mitigate but make the problem worse."

"Social vulnerability is multi-dimensional and it is not just income [that drives it.]"

All that said, he believes we have to use the best current tools at our disposal to measure social vulnerability. "We have to make decisions and do the best with the measures we have. Use your judgement. But how you use them [the models] is important."

Speaker/Bio	Presentation Summary
Dr. Oliver Wing	Floodplain management at the local scale is critically important to the continued risk management of the nation. Local scale floodplain management is based on highly resolved models to support local decisions. However, the need for sufficiently accurate risk information across the nation is also critical to the continued risk management of the nation. Resolving the need for local accuracy with the need for national coverage is a complex problem that deserves attention. The cost of developing high resolution local data for multi return periods has broadly been prohibitive, and the ability to make credible decisions on national scale results at a single household level is limited. Finding the right balance in a single model has been largely elusive for the last few decades.
	Regardless of local or national scale the primary components of a flood model are similar, and the common problems are also similar. Lack of data plague both local and national scale models. The problem statement the research group Fathom at the University of Bristol tried to address is "How do you go from small scale models to models that cover a larger scale but still have a local relevance?" The global flood model was built around 2015 and they looked to apply the methods to the US. The University of Bristol has developed a set of model code called LISFLOOD-FP, very similar to HEC-RAS but built in a way where the overly complex terms are dropped so only the things that are relevant are represented in the model to simulate accurate flood depths and extents. The availability of open data from USGS and NOAA allows them to build decent US flood models. Through the development of a regional flood frequency analysis similar to what USGS does with Bulletin 17C the Fathom team developed inputs to drive the assessment of multi frequency hazard maps at the national scale. The last half of the last decade has been spent filling in the gaps with this broad scale model. The early work consisted of model validation. One of the first tests the model was put through was that of comparing it to FEMA data where it does exist and particularly focusing on the AE zones. The metric that was used to test that similarity was the Critical Success Index. Water level areas were looked at rather than flood extent areas. In other studies conducted (Picture1 with red dashed lines), water level errors in the US were as high as 1 meter normally distributed (citation Wing, O. E. J. et al. Simulated historical flood events at the continental scale: observational validation of a large-scale hydrodynamic model. Nat. Hazards Earth Syst. Sci. 21, 559–575 (2021).) The relative error in the modeled output from Fathom's US model in conjunction with the Critical Success Index provides a unique insight into how this model can and should be used. The model is good at describing areas of flooding and is a decent extension of the FEMA flood mapping process allowing for further coverage for the 100-year floodplain and providing reasonable estimates for additional frequencies to paint a fuller picture of the nation's flood risk. However, the errors in water surface elevation limit the usage of the model results at the individual asset level. Since the error is unbiased the aggregated result across a reasonable spatial domain (census block, county, etc.) can be used but evaluating risk at a single asset without expressing the uncertainty bands is reckless.

Speaker/Bio	Presentation Summary
Dr. Oliver Wing (continued)	Moving from current risk to future risk requires filling the gap of climate change. As with building flood models for the nation, there are problems with evaluating climate change reliably for the nation (Picture 2 with climate model and risk models on axis of 3d plot). Broadly speaking, the Global Climate Models are good at large scale, but translating that down to local scale to support local decisions is not well supported, therefore the outputs of the model should be used appropriately to identify trends but not to make specific local decisions without further analysis. With the current flood maps that are updated to present day climate and project forwards to 2050 the first number we come at is an estimated $32 Billion in AAL for 2020. Of note is that only 41% (≈$13B) are within FEMA flood zones. Socioeconomics are more important that climate. For example, 2050's total exposure increase will be of 97%. 75% due to population growth, 19% due to climate change, and 6% due to compound effect (citation Inequitable patterns of US flood risk in the Anthropocene | Nature Climate Change).

Turning the discussion to social vulnerability, the mapping programs do miss a lot the risk – an outsized proportion of which resides in disadvantaged communities. Inadequate coverage can impact the ability to limit future growth to areas of lower flood risk, which can lead to consequence creep. Inadequately describing the impacts of climate change or sea level rise can lead to unchecked hazard creep. In the absence of Federal information, society will fill the knowledge gap in one of two ways, ignorance or private industry will attempt to fill the gap. The emergence of large-scale modelling techniques resolves coverage problems to the detriment of accuracy in some areas. With FEMA is falling behind innovations in the private sector it seems that the private sector is filling the knowledge gap with no regard to the societal impacts. This graphic (Picture 3) from the First Street Foundation shows how their Flood Factor score impacts the decisions of homeowners on a local scale. Flood Factor is based on a flood model like Fathom's for the current and future condition. The graphic shows that individuals are less likely to buy houses exposed to flood risk as predicted by the models leveraged, however we have to remember that the error in those models are as high as 1-meter standard error normally distributed, which could mean a structure is simply not at risk when the model says it is. This behavior impacts those individuals who lack the means to change their housing situation and can erode what little equity they may have built up in their homes. The reckless use of the information regarding its ability to support asset level decision making has further complicated the situation by providing noise and reducing the credibility of the scientific community. Since the public mapping program itself is not comprehensive a lot of information is coming in and filling in those gaps and it's generating and exacerbating social inequities and reducing societies trust. FEMA can step in and fill the gap with credible information with appropriate caution in its use and help to mitigate the impacts of social inequality. For example, aggregating the loss information developed by these national scale modeling efforts reduces the impact of the error in the estimates (Figure 4), leveraging aggregated losses through products like the NRI can help bring information to the public without inappropriately using the data beyond its intent and capability. Until the FFRD products that provide sufficient resolution for local scale decision making, the portrayal of aggregated losses is the best way to provide analytical data to support risk informed decision making. |

DEMOGRAPHIC INFORMATION

1. What state/territory do you live in? Drop down box? Open answer?

2. What is your profession? Open answer

3. Do you live or work in a disadvantaged community?   Y/N

ABOUT DEFINING "DISADVANTAGED"

1. In order, what are the top five factors (1 high, 5 low) that indicate people within an area are **disadvantaged**?
   a. High Unemployment/Underemployment
   b. Lower income/persistent poverty Education
   c. Racial/Ethnic Residential Segregation
   d. English as a second language (ESL)
   e. High Housing burden/Substandard Housing
   f. Distressed Neighborhoods
   g. High transportation costs/low access to transportation
   h. Disproportionate environmental stressors and impacts
   i. Limited water and sanitation access and affordability
   j. Disproportionate Climate Change Impacts
   k. High energy cost burden/low energy access
   l. Jobs lost through the energy transition
   m. Access to Healthcare
   n. Add an "other" with write in – if possible

2. Communities are:
   a. Disadvantaged or not
   b. On a range from not disadvantaged to very disadvantaged
   c. "Other" – open space

3. How important is it for National Flood Mapping Program to identify disadvantaged communities when developing the products and strategies for delivery?
   a. Very Important – Without knowing a community is disadvantaged is essential to serve them.
   b. Important – Knowing that a community is disadvantaged is needed to properly serve them.
   c. Less Important – Knowing a community is disadvantaged might be helpful.
   d. Not Important – It is not important to know a community is disadvantaged.

ABOUT MITIGATION ACTION

1. What is the single biggest **barrier** disadvantaged communities have in managing their flood risks?
    a. Lack of money—People in disadvantaged communities do not have the necessary funds to manage their flood risks.
    b. Lack of support – People in disadvantaged communities have fewer choices to act due to a lack of a support network to help with addressing flood risk challenges.
    c. Lack of choice – extenuating circumstances cause disadvantaged communities/people to have fewer choices for taking mitigation actions.
    d. Other risks are more urgent – other risks are higher priority than mitigation flood risks.
    e. None – There are no barriers.
    f. Other
    g. Not Applicable

ABOUT UNINTENDED CONSEQUENCES

1. What do you see as the top 3 **unintended consequences** of National Flood Mapping Program products?
    – Increased cost of living – disproportionate burden on low-income households for cost of living.
    – Increased cost for new housing – new developments required to comply with minimum floodplain management requirements will be more expensive.
    – Gentrification – In the future, if the cost of living near water is prohibitively high, only those who can afford the risks will be able to live and work there.
    – Redlining – Deliberate targeting of select populations in areas exposed to flood risk.
    – Foreclosure – Increased rates of foreclosure.
    – Reduced job opportunities – businesses moving operations to safer areas.
    – Other: List up to three other negative outcomes or unintended consequences.

2. Which of the following options do you see as practical ways to limit the **potential negative unintended consequences** associated with increasing flood insurance costs or mandatory purchase requirements for disadvantaged communities (choose top 3)?
    – Grace Period – Rather than immediately requiring insurance or increasing insurance costs, defer mandatory purchase and insurance price increases for a given grace period.
    – Post storm/Event driven – Defer mandatory purchase and flood insurance cost increase until an existing building is substantially improved or damaged.

- Subsidies – In instances where it is demonstrated an individual cannot afford mandated insurance minimums or the increased cost of insurance, offer a subsidy to reduce the cost.
- Create a Market – Find ways to leverage market forces by commoditizing flood risk reduction. For example, lower upfront costs for developers when subdivisions and homes are designed with flood risk reduction elements or provide low interest mitigation loans when the primary purpose of a home upgrade is to reduce flood losses.
- Transfer Risk to General Taxpayer – In instances where it is demonstrated an individual cannot afford all or part of a mandated insurance minimum or the increased cost of insurance, quantify the risk and mark all or part of it as held by the general taxpayer. (is this the same as a subsidy?)
- Community level insurance – the ability for a community to purchase insurance and manage the distribution of funds within the community (parametric insurance).
- Other: List up to three other negative impacts not listed.

ABOUT IMPROVING STAKEHOLDER ENGAGEMENT

1. How might the National Flood Mapping Program better support disadvantaged communities through **stakeholder engagement** to encourage more mitigation actions (rank 1 to 5 with 1 being the best way)?
   - Targeted Outreach – Identify potentially disadvantaged areas and engage them more directly (e.g., mailers, door-to-door, fliers at churches and community centers)
   - Engage Early and Listen First – In the early stages of a National Flood Mapping Program project, listen to the unique concerns of disadvantaged communities and use the information to shape the project going forward.
   - Engage Leaders – Engage often and directly with leaders and influencers in disadvantaged communities (e.g., local faith leaders, business leaders, government officials, neighborhood organizations).
   - Adapt – If a standard National Flood Mapping Program product or process will not work for a disadvantaged community adapt or tailor it to better meet their needs.
   - Show Respect – Avoid talking down to people in disadvantaged communities. Show respect by having empathy, looking for common ground, affirm their opinions, and follow through on promises made.
   - Other: list up to five other ways to improve stakeholder engagement.

ABOUT USING DATA AND ANALYTICS TO INFORM INVESTMENTS DECISIONS REGARDING DISADVANTAGED COMMUNITIES

1. Identify the top 3 publicly available **data sets** as most helpful in identifying areas where disadvantaged communities might be present?
   – CJEST
   – SoVI
   – NRI
   – BRIC
   – Census Tract
   – Not aware – I'm not familiar enough with these data sets to answer.
   – Other: list up to three other publicly available data sets that might be used to identify areas where disadvantaged communities might be present.

2. How could **data** regarding disadvantaged communities be used by local decision-makers to make investment decisions regarding how flood hazard and risk information are developed and presented?
   – Tailored Outreach – It may be necessary to tailor outreach efforts in disadvantaged communities. Data and analytics regarding how people in a disadvantaged community consume information could help estimate the most effective outreach methods so an appropriate budget for these efforts is allocated.
   – Technical Assistance – Additional technical assistance might be needed in disadvantaged communities. Data and analytics regarding local capability and capacity might help identify where more or less support is warranted.
   – Modified Timelines – Disadvantaged communities may need more time to adapt to the new information thus project timelines may need to be adjusted. Data and analytics regarding the pace and nature of growth (thus risk) could be useful in estimating project timelines.
   – Other: What are some other ways data and analytics might help inform flood risk investment decisions?

APPENDIX **D**

SUMMARY OF PREVIOUS TMAC RECOMMENDATIONS ANNOTATED TO REFLECT 2022 RECOMMENDATIONS (2015–2022)

RECOMMENDATIONS AND IMPLEMENTATION ACTIONS

Note that this list incorporates changes to recommendation numbering as outlined in previous TMAC reports (See 2018 TMAC Annual Report Appendix D).

Recommendations from previous TMAC Annual Reports (AR)

Please note that recommendations from the 2021 TMAC Annual Report have been renumbered to be sequential with all other TMAC Annual Report recommendations.

AR 1 (2015)

FEMA should establish and implement a process to assess the present and anticipated flood hazard and flood risk products to meet the needs of the various users. As part of this process, FEMA should routinely:

a. Conduct a systematic evaluation of current regulatory and non-regulatory products (data, maps, reports, etc.,) to determine if these products are valued by users, eliminating products which do not cost-effectively meet needs;

b. Consider user requirements prior to any updates or changes to data format, applications, standards, products, or practices are implemented;

c. Proactively seek to provide authoritative, easy to access and use, timely, and informative products and tools; and

d. Consider future flood hazards and flood risk.

AR 1.1 (2016)

FEMA should construct and implement, and measure the effectiveness of public communication strategies that reflect how individuals acquire and process information on low-probability, high-consequence events. The strategies would include:

a. Using a variety of media to illustrate and communicate flood hazard and risk information to different audiences and generational groups;

b. Illustrating location-specific inundation levels by working with the private-sector mapping companies and other partners to integrate street-level photos with overlays of flood levels at multiple return intervals into FEMA's mapping platform;

c. Working with real estate listing services to display flood hazard and risk information data for their customers; and

d. Displaying historical flood information, including flood boundaries and depths where available.

AR 2 (2015)

FEMA should develop a national 5-year flood hazard and risk assessment plan and prioritization process that aligns with program goals and metrics (see Recommendation 3). This should incorporate a rolling 5-year plan to include the establishment and maintenance of new and existing studies and assessments in addition to a long-term plan to address the unmapped areas. Mapping and assessment priorities should be updated annually with input from stakeholders (e.g., Multi-Year Hazard Identification Plan). The plan should be published and available to stakeholders.

AR 2.1 (2016)

FEMA should publish the State GIS Standard Operating Procedures on a graphical web interface so that sources of local geospatial information are readily available to everyone.

AR 2.2 (2016)

FEMA should develop, with input from stakeholders, a list of factors to be used for prioritizing flood hazard and risk assessment studies across the country.

AR 3 (2015)

FEMA should develop National Flood Hazard and Risk Assessment Program goals that include well defined and easily quantifiable performance metrics. Specifically, the program goals should include metrics for the following:

a. Maintaining an inventory of valid (verified), expiring, unverified, and unknown flood hazard miles;

b. Addressing the non-modernized areas of the Nation and unstudied flood hazard miles;

c. Conducting flood risk analysis and assessments on the built environment; and

d. Counting population having defined floodplains using a stream level performance indicator for a better representation of study coverage.

AR 3.1 (2016)

FEMA should merge the Coordinated Needs Management Strategy (CNMS) and Risk Mapping, Assessment, and Planning (Risk MAP) Progress websites so users can see in one place what needs updating and what is being updated.

AR 3.2 (2016)

FEMA should evaluate whether adding the number or density of Light Detection and Ranging (LiDAR)-based Letters of Map Amendment (LOMAs) to Secondary Element contributes to the CNMS metric effectiveness.

AR 4 (2015)

FEMA should work with Federal, state, local, and tribal partners to ensure topographic, geodetic, water-level, and bathymetry data for the flood mapping program is collected and maintained to Federal standards. Future FEMA topographic and bathymetric LiDAR acquisition should be consistent with 3DEP and Interagency Working Group on Ocean and Coastal Mapping standards, and all geospatial data for the flood mapping program should be referenced to current national datums and the National Spatial Reference System. Water level gage datums for active gages should be referenced to current national datums and the National Spatial Reference System, and to the extent practical, datums for inactive gages should be converted to meet these standards.

AR 5 (2015)

FEMA should document the horizontal and vertical accuracy of topographic data input to flood study models and the horizontal and vertical accuracy of topographic data used to delineate the boundaries of the flood themes. These data should be readily available to users, and clearly reported with products.

AR 6 (2015)

FEMA should periodically review and consider use of new publicly available statistical models, such as the proposed Bulletin 17C, for flood-frequency determinations.

AR 7 (2015)

Riverine. FEMA should develop guidelines, standards, and best practices for selection and use of riverine models appropriate for certain geographic, hydrologic, and hydraulic conditions.

   a. Provide guidance on when appropriate models would be 1-D vs 2-D, or steady state vs unsteady state,

   b. Support comparative analyses of the models and dissemination of appropriate parameter ranges; and

   c. Develop quality assurance protocols.

Coastal. FEMA should develop guidelines, standards and best practices for selection and use of coastal models appropriate for certain geographic, hydrologic, and hydraulic conditions.

   a. Provide guidance on when appropriate models would be 1-D vs 2-D;

   b. Support comparative analyses of the models and dissemination of appropriate parameter ranges; and

   c. Develop quality assurance protocols.

AR 8 (2015)

FEMA should develop standards, guidelines, and best practices related to coastal 2-D storm surge modeling in order to expand the utility of the data and more efficiently perform coastal flood studies.

AR 9 (2015)

FEMA should review and update existing coastal event-based erosion methods for open coasts, and develop erosion methods for other coastal geomorphic settings.

AR 10 (2015)

FEMA should transition from identifying the 1-percent-annual-chance floodplain and associated base flood elevation as the basis for insurance rating purposes to a structure-specific flood frequency determination and associated flood elevations.

> **AR 10.1** (2016)
>
> FEMA should develop a strategy for obtaining the building footprints and relevant building elevations of properties throughout the Nation to be used in determining structure-based flood risk.
>
> **AR 10.2** (2016)
>
> FEMA and its partners should identify data needs and standards for developing and maintaining accurate, location-specific flood frequency information, including associated flood conditions (e.g., velocity, waves, erosion, duration), for both present and future flood conditions.
>
> **AR 10.3** (2016)
>
> FEMA should perform a demonstration(s) to learn from and document data requirements, processes, and standards necessary for nationwide implementation for structure-based risk assessment.

AR 11 (2015)

FEMA should modify the current workflow production process and supporting management system, Mapping Information Platform, to reduce unnecessary delays created by redundant tasks and inflexibility of the system. The process and system are not currently designed to properly manage non-regulatory products or products that do not fit predefined footprints. FEMA should modify the system to enable flexibility in project scope and size, such as the choice of watershed size, not limiting projects to only the hydrologic unit code 8 (HUC8).

> **AR 11.1** (2016)
>
> FEMA should develop a process for reviewing various aspects of the FIS workflow and procedures (to implement AR 11 - 2015), and to ensure that:
>
> - Workflow efficiencies and cost-effectiveness, including during the KDP process, are encouraged;

- Complementary reporting systems are integrated;
- Revisions to the FIS workflow and procedures incorporate a dynamic, digital display environment system;
- All internal paperwork required for publishing the notice in the Federal Register is reviewed;
- Best Management Practices are incorporated; and
- Guidance from FEMA HQ and/or Regional offices is documented and shared

AR 11.2 (2016)

FEMA should take into consideration the following items at the next review of the MIP system:

- Integrate the MIP and KDP process into one system.
- Provide mapping partners more visibility on Data Validation Tasks (i.e., who is responsible for these tasks at the Regional office) and ensure more proactive coordination is implemented before and after the data validation tasks.
- The MIP should take into account the uniqueness of CTPs and enable more flexibility in all areas of the flood production process, including product upload, geographic areas, metadata requirements, and QC reviews.
- Transition the MIP to a geodatabase system, similar to the CNMS, in which information is saved geospatially and run customized queries and reporting for Regional offices, mapping partners, and CTPs.
- Enhance functionality to create auto-generation of template correspondence (e.g., SOMA letters).
- Provide greater flexibility in user controls.
- Provide additional user access to related information.
- Add risk product workflows.
- Integrate an efficient solution to seamless mapping or HUC or State geographic areas.

AR 11.3 (2016)

FEMA Regions should clearly document and communicate MIP workflow validation and QA/QC procedures, correspondence protocols and approvals, documentation requirements, and other Region-specific guidance expectations of the flood study process. Additionally, FEMA Regions should regularly update partners with staff changes and roles and responsibilities for the Regional staff.

AR 11.4 (2016)

FEMA HQ should develop additional guidance and training for mapping partners related to the Code of Federal Regulations (CFR) requirements for due process

and Federal Register notifications. Regions should also be encouraged to create addendums that communicate their specific requests and internal timelines for their coordination activities with Production Technical Services (PTS) contractors and CTPs.

AR 11.5 (2016)

The TMAC recommends that FEMA work with the Customer and Data Services (CDS) contractor to evaluate the ability to migrate the MIP into a relational database system that can access data from other components of the flood insurance study program, such as a revised version of the FIRM database. Further efficiencies in reporting, data integration, and archival processes can occur if both a MIP database and FIRM database systems can relate to one another.

AR 12 (2015)

FEMA, in its update of guidance and standards, should determine the cost impact when new requirements are introduced and provide guidance to consistently address the cost impact to all partners.

AR 13 (2015)

FEMA should develop guidelines and procedures to integrate a mass LiDAR-based Letter of Map Amendment (LOMA) process into the National Flood Hazard and Risk Assessment Program. As part of this process, FEMA should also evaluate the feasibility of using parcel and building footprint data to identify eligible "out as shown" structures as an optional deliverable during the flood mapping process.

AR 14 (2015)

FEMA, and its mapping partners including the private sector, should transition to a flood risk assessment focus that is structure specific. Where data is available, FEMA and its partners should contribute information and expertise consistent with their interests, capabilities, and resources toward this new focus.

a. A necessary prerequisite for accurate flood risk assessments is detailed flood hazard identification, which must also be performed to advance mitigation strategies and support loss estimations for insurance rating purposes.

b. FEMA should initiate dialogue with risk assessment stakeholders to identify potential structure-specific risk assessment products, displays, standards, and data management protocols that meet user needs.

c. FEMA and its partners should develop guidelines, best practices, and approaches to implementing structure-specific risk assessments.

AR 14.1 (2016)

FEMA and its partners should identify data needs and standards for developing and maintaining accurate structure characteristics needed for risk estimation.

Included in this should be a review of building characteristics data in existing flood risk estimation models, projects, programs, and databases.

AR 14.2 (2016)

FEMA and its partners should review and, if needed, modify flood damage functions to better capture structure-specific damage resulting from various flood hazards.

AR 15 (2015)

FEMA should leverage opportunities to frame and communicate messages to stakeholders in communities so they understand the importance of addressing the flood risk today and consider long-term resilience strategies. Messages should be complemented by economic incentives such as low-interest loans and mitigation grants that lead community leaders and individuals to undertake cost-effective risk reduction measures.

AR 16 (2015)

FEMA should transition from the current panel-based cartographic limitations of managing paper maps and studies to manage National Flood Insurance Program (NFIP) data to a database derived, digital-display environment that are fully georeferenced and relational, enabling a single digital authoritative source of information and database-driven displays. Towards this transition, FEMA should:

a. Prepare a multi-year transition plan to strategically transition all current cartographic and/or scanned image data to a fully georeferenced, enterprise relational database.

b. Update required information for map revisions (MT-2 application forms) and Letter of Map Changes (LOMCs) applications to ensure accurate geospatial references, sufficient data to populate databases, and linkages to existing effective data.

c. Adopt progressive data management approaches to disseminate information collected and produced during the study and revision process, including LOMCs.

d. Ensure that the data management approach described in (c) is sufficiently flexible to allow efficient integration, upload, and dissemination of NFIP and stakeholder data (e.g., mitigation and insurance data that are created and maintained by OFA), and serve as the foundation for creating all digital display and mapping products.

e. Provide a mechanism for communities to readily upload jurisdictional boundary data, consistent with requirements to participate in the NFIP, as revised, allowing other stakeholders access.

AR 16.1 (2016)

FEMA should implement the following features into a future, dynamic, database-derived, digital display environment to manage the update, maintenance, and dissemination of all flood hazards and risk data across the country:

- Data are geospatial and captured in a relational geodatabase.

- Data can be dynamically queried and displayed (point and click).

- Develop a new website that features users-specific inputs, and where data provides one access point for multiple sources of flood hazard data and risk assessment information.

- Products are developed on-the-fly using dynamic data calling features.

- The new website and database support scalability, based on data availability, population, flood frequency and population impacted, and flood insurance penetration.

AR 16.2 (2016)

FEMA should perform a demonstration(s) to learn from, and document data requirements, processes and standards necessary for nationwide implementation of geodatabase-derived, digital display environment.

AR 16.3 (2016)

FEMA should utilize the National Flood Hazard Risk Management Coordination Committee to implement the TMAC's vision, including the new database-derived, digital display environment.

AR 17 (2015)

FEMA should consider National Academy of Public Administration (NAPA) recommendations on agency cooperation and federation (6, 7, 8, 9, 13 and 15) and use them to develop more detailed interagency and intergovernmental recommendations on data and program-related activities that can be more effectively leveraged in support of flood mapping.

AR 18 (2015)

FEMA should work with federal, state, local, and tribal agencies, particularly the U.S. Geological Survey (USGS) and the National Ocean Service, to ensure the availability of the accurate water level and streamflow data needed to map flood hazards. Additionally, FEMA should collaborate with USGS to enhance the National Hydrography Dataset to better meet the scale and resolution needed to support local floodplain mapping while ensuring a consistent national drainage network.

AR 19 (2015)

FEMA should develop and implement a suite of strategies to incentivize communities, nongovernment organizations and private sector stakeholders to increase partnering and subsequent contributions for flood hazard and risk updates and maintenance.

AR 19.1 (2016)

FEMA should investigate opportunities and obstacles to implementing multi-year funding cooperative agreements that complement the 5-year CTP Plan.

AR 19.2 (2016)

FEMA should facilitate and fund demonstration projects for CTPs to incentivize program innovation and efficiencies.

AR 20 (2015)

FEMA should work with CTPs to develop a suite of measures that communicate project management success, competencies, and capabilities of CTPs. Where CTPs demonstrate appropriate levels of competencies, capabilities and strong past performance, FEMA should further entrust additional hazard identification and risk assessment responsibilities to CTPs.

AR 20.1

FEMA should evaluate the LOMC Review Partnership pilot program and develop clear program requirements, responsibilities, and performance metrics. This information should be used to formally establish the LOMC Review Partnership program, and increase the number of designated communities, where appropriate.

AR 21 (2015)

To ensure strong collaboration, communication, and coordination between FEMA and its CTP mapping partners, FEMA should establish a National Flood Hazard and Risk Management Coordination Committee. The role of the committee should be focused around the ongoing implementation of the five-year Flood Hazard Mapping and Risk Assessment Plan. FEMA should add other members to the committee that have a direct bearing on the implementation of the plan.

AR 22 (2015)

FEMA should define the financial requirements to implement the TMAC's recommendations and to maintain its investment in the flood study inventory.

AR 23 (2016)

FEMA should develop, in conjunction with others in the public and private sectors, flood risk-rated insurance premiums for all structures within and outside the identified Special Flood Hazard Area. These premiums should be based on the nature and severity of the flood hazard, structure elevation, and other characteristics, as well as structure damage functions and vulnerability.

AR 24 (2016)

FEMA should communicate to the property owner and other interested parties on the cost of risk-rated insurance today and over time for new and existing structures to make the risk transparent. The data should include the benefits and cost that mitigation measures will have on these premiums.

AR 25 (2017)

As FEMA transitions away from the 1-percent-annual-chance line, a risk score for existing and proposed structures should be developed. Each structure should be assigned a current conditions risk score and a future conditions risk score.

AR 25.1

FEMA should perform pilot projects utilizing risk scores to determine the best data and methods to accurately calculate structure-specific risk for floodplain management for existing and new structures.

AR 26 (2017)

FEMA should coordinate with floodplain managers and mitigation planners to identify and test data and tools needed to support floodplain management and mitigation as it moves away from the 1-percent-annual-chance line.

AR 26.1

FEMA should perform pilot projects to understand the implications and opportunities for floodplain management in regard to moving to risk scores and determine other relevant data.

AR 26.2

FEMA should perform pilot projects to determine possible alternatives or modifications to the floodway concept.

AR 27 (2017)

FEMA should develop, in coordination with stakeholders, a transition plan for moving away from the 1-percent-annual-chance flood line.

AR 28 (2017)

FEMA should develop a series of mapping prototype products aimed at more effectively communicating residual flood risk related to levees, dams, and event-driven coastal erosion. Products developed should incorporate end user and stakeholder testing, and FEMA should develop standards for routine production and presentation, if applicable.

AR 28.1

FEMA should conduct pilot projects with communities and other stakeholders to evaluate how effective the prototypes are at communicating residual risk.

AR 28.2

Once prototypes are developed and evaluated, FEMA should leverage the existing flood study process and other community engagement touchpoints to communicate residual risk.

AR 28.3

FEMA should refine existing non-regulatory products and develop new non-regulatory products to clarify coastal flood risks in the vicinity of erodible features, and highlight the spatial areas affected by event-driven coastal erosion and primary frontal dune delineation. Possible products include:

- Delineation of model results in the vicinity of the eroded Primary Frontal Dune

- Representation of the regulatory flood zones in the absence of an erodible dune feature

AR 29 (2017)

FEMA should initiate stakeholder needs assessments to identify end users' highest priority needs for future conditions products and services that support its current flood-related program and their evolution over time.

AR 29.1

FEMA should engage a broad array of Federal, state, tribal, and community-level stakeholders, private-sector stakeholders, and partners throughout the design, planning, execution, and interpretation of the Needs Assessment.

AR 29.2

FEMA should ensure that the Needs Assessment collects information on users' intended applications and addresses key analytical variables, such as relevant timeframe(s), spatial resolution, level of study, future conditions scenarios (e.g., land use, erosion, sea-level rise), product type, uncertainty, and visualization preferences.

AR 29.3

FEMA should integrate an ongoing future conditions needs-gathering step as part of the standard flood study process and during other local community engagement touchpoints, using information gained to adapt FEMA's products to respond to evolving user needs and advancements in science and technology.

AR 30 (2018)

FEMA should establish upper and lower bounds for the 1%-annual-chance exceedance flood elevation using a confidence interval size of their choosing, and use those limits to map the SFHA "Boundary Zone"—the area where this SFHA boundary is most likely to be. FEMA should share SFHA Boundary Zone information with the public, and

other key interested parties, test how it is received, and make improvements prior to formalizing any specific standards or policy for routine map updates.

AR 31 (2018)

As part of efforts to communicate uncertainty, FEMA should periodically conduct behavioral risk audits and address the biases that characterize how individuals process information on flood risk to their property. The audits and actions taken (including language regarding the likelihood of flooding) to address biases will also help other key stakeholders, such as floodplain managers, local officials, lenders, developers, and real estate agents, to encourage property owners to invest in cost-effective mitigation measures and purchase flood insurance before the next flood occurs.

AR 32 (2018)

FEMA should modify its Flood Hazard Mapping Key Decision Point Process and adopt criteria to weigh the value of providing non-regulatory projects even where the development of Flood Insurance Rate Maps (FIRMs) or Flood Insurance Studies (FISs) is not warranted.

AR 33 (2018)

Building from AR16, FEMA should share and communicate data that can help drive decisions toward purchasing flood insurance, mitigation prioritization, and reducing risk. This data should support historical, future, and probabilistic analyses of coastal, fluvial, and pluvial flood hazards. FEMA should work with other agencies to assist data collection, creation, and sharing to support integrated water resources management and encourage data sharing.

AR 34 (2018)

To increase insurance coverage, expanding on AR28, FEMA should include, as part of their non- regulatory products suite, areas previously identified as SFHAs, including information available in the Community Information System, and areas of previous flooding. This information should be easily maintained, support and communicate the actuarial rating of NFIP flood insurance, and empower informed decisions by property owners and local, regional, Tribal, and State agencies.

AR 35 (2020)

TMAC recommends that FEMA explore how to implement enterprise risk management frameworks that help communities whose objectives are to become more flood resilient and to transition toward proactive flood risk management while meeting or exceeding existing minimum federal floodplain management requirements.

AR 36 (2020)

TMAC recommends that FEMA develop a set of integrated floodplain management- and mitigation-focused prototype products and services that help stakeholders better understand, communicate, and manage their current and future flood risks.

AR 37 (2020)

TMAC recommends that FEMA utilize the Cooperating Technical Partners and other partnerships for the implementation of this transition and investigate ways to incorporate data and technology from other stakeholders such as regional and local governments; state and federal agencies; and academic, nonprofit, and private stakeholders.

AR 38 (2021)

FEMA should incorporate the Future Conditions recommendations outlined in this report into the development, deployment, and continued enhancement of the Future of Flood Risk Data (FFRD) initiative. This includes supporting existing partnerships to leverage best available climate science and datasets that will support future conditions analyses through the lens of the FFRD initiative. Future conditions flood hazard and risk analyses should be standard approaches within the probabilistic modeling suite and resultant nonregulatory products that the FFRD initiative will employ.

AR 39 (2021)

The Technical Mapping Advisory Council (TMAC) recommends that the Federal Insurance and Mitigation Administration (FIMA) use Enterprise Risk Management (ERM) to accomplish its strategic objectives. ERM can guide FIMA's efforts to prioritize and then mitigate or take prudent risks that increase the likelihood that FIMA can achieve its organizational objectives.

AR 40 (2021)

The FIMA is building an analytical foundation of graduated risk data, concepts, and products, as recommended by the TMAC in 2017. FIMA should leverage ERM processes and concepts to prudently take opportunity risks to promote widespread use of graduated risk in flood risk management decision making by governments, businesses, and individuals.

AR 41 (2022)

Set goals and relevant program performance targets for improving the delivery of the National Flood Mapping Program in disadvantaged communities and evaluate progress to confirm that desired outcomes are being achieved.

AR 42 (2022)

Continue to provide reliable flood data to disadvantaged communities by maintaining and updating existing data and developing new data where none exists.

AR 43 (2022)

Provide additional support to those SLTT governments that need help increasing flood resilience in disadvantaged communities.

AR 44 (2022)

Work with Congress to directly and transparently improve equity by addressing the unique challenges faced by disadvantaged communities without slowing down the delivery of flood hazard and risk data.

Recommendations from TMAC Future Conditions (FC) Risk Assessment and Modeling (2015)

Please note that many of the recommendations from the Future Conditions Risk Assessment and Modeling Report from 2015 were rewritten as part of the 2021 TMAC Annual Report. The items crossed out are from the original 2015 report and have been since replaced with the underlined text in red from 2021.

FC 1 (2015)

Provide future conditions flood risk products, tools, and information for coastal, Great Lakes, and riverine areas. The projected future conditions should use standardized timeframes and methodologies wherever possible to encourage consistency and enable efficient analysis of varying expert-recommended, climate change adaptation timeframes and scenarios, which should be adapted as actionable science evolves.

FC 1.1

FEMA should define a future population metric that uses a standard future population database along with various budget scenarios for keeping the data current to predict the percent of the population covered at various points in the future.

FC 1.2

FEMA should take into account future development (excluding proposed flood control structures for the base condition/scenario) for future conditions mapping. An additional scenario can be generated that does include future flood control structures.

FC 1.3

FEMA should use population growth as an indicator of areas with increased potential flood risk.

FC 1.4

FEMA should develop guidance for how local zoning and land use planning can be used to identify where and how land use will change in the future, and incorporate that into local hazard and risk modeling.

FC 1.5

FEMA should develop a policy and standards on how to consider and determine erosion zones that are outside of the SFHA as they ultimately affect flooding and environmental conditions within the SFHA.

FC 1.6

FEMA should use a scenario approach for future conditions flood hazards calculation and mapping that will allow users to evaluate the robustness of proposed solutions to a range of plausible future conditions including uncertain land use and climate change impacts.

FC 2 (2015)

Identify and quantify accuracy and uncertainty of data and analyses used to produce future conditions flood risk products, tools, and information.

FC 2.1

FEMA should use future risk assessments to take into account the likelihood of events occurring and their impacts, as well as the associated uncertainties surrounding these estimates.

FC 2.2

FEMA should publish multiple future conditions flood elevation layers that incorporate uncertainty so as to provide a basis for building designs that lower flood risk.

FC 3 (2015)

Provide flood hazard products and information for coastal and Great Lakes areas that include the future effects of long-term erosion and sea/lake level rise. Major elements are:

- Provide guidance and standards for the development of future conditions coastal flood risk products.

- Incorporate local relative sea/lake level rise scenarios and long-term coastal erosion into coastal flood hazard analyses.

- Consider the range of potential future natural and man-made coastal changes, such as inundation and coastal erosion flooding, coastal erosion, and land use.

FC 3.1

FEMA should use a scenario approach when considering ensure FFRD methods incorporate multiple scenarios for future shoreline position and long-term erosion for the estimation of future conditions flood hazards. shoreline location for the estimation of future conditions flood hazards. Different process-based methods should be evaluated for different shoreline geology/morphology, erosion mechanics, and vertical land motion. At least two scenarios should be evaluated,

one in which the shoreline is restricted from eroding past existing infrastructure (e.g., revetments, sea walls, roads), ~~is held at its present location,~~ and another in which the shoreline is eroded assuming no infrastructure restrictions, both according to the best available shoreline erosion data and models.

FC 3.2

FEMA should develop guidance for incorporating future conditions into coastal inundation and wave analyses, including Great Lakes water levels, vertical land motion, and Arctic sea ice conditions for Alaska. Wave analysis should include future scenarios derived from latest Coupled Model Intercomparison Project (CMIP) models.

FC 3.3

FEMA should develop consistent methods and models for long-term coastal erosion hazard mapping to inform current and future erosion hazard zones for planning purposes in parallel to the flood hazard zones. The latest federal and academic shoreline modeling approaches should be leveraged.

FC 3.4

FEMA should use ~~Parris, et. al., 2012, or similar global mean sea level scenarios, adjusted to reflect local conditions, including any regional effects (Local Relative Sea Level) to determine future coastal flood hazard estimates. Communities should be consulted to determine which scenarios and time horizons to map based on risk tolerance and criticality~~ the latest federal guidance for regionally based sea level scenarios (from the latest National Climate Assessment). Scenarios and time horizons should use a consistent national approach based on risk tolerance and criticality.

FC 3.5

FEMA should work with ~~other Federal agencies (e.g., NOAA, USACE, USGS), the U.S. Global Change Research Program (USGCRP), and the National Ocean Council to provide a set of regional sea-level rise scenarios, based on the Parris, et al., 2012 scenarios, for the coastal regions of the United States out to the year 2100 that can be used for future coastal flood hazard estimation~~ the Interagency Working Group on Sea Level Rise and Coastal Flood Hazard Scenarios and Tools (IWG-SLR) to provide a set of regional sea-level rise scenarios that feed into the latest National Climate Assessment, including using updated historical trends and extrapolations to inform the most likely scenarios for shorter time horizons. Time horizons beyond 2100 should be considered.

FC 3.6

FEMA should prepare map and data layers displaying the location and extent of areas subject to long-term erosion and make the information publicly available. Elements include:

a. Establishing the minimum national standards for long-term erosion hazard zone mapping that ~~will be used by FEMA that must be met by partners/communities if it is to be incorporated into the FEMA products~~ incorporate both a median shoreline projection and a 95% confidence band, and should be produced for both storm conditions (extreme shoreline excursions) and daily conditions.

b. Working with Federal, State, and local stakeholders to develop these minimum standards via pilot studies.

c. Exploring use of non-traditional datasets such as satellite shoreline measurements that can be used at national scale to establish historical rates and to inform models for future projections.

d. Securing funding that can support sustained long-term erosion monitoring and mapping by allowing for periodic updates.

FC 3.7
FEMA should support additional research to characterize how a changing climate will result in changes in Great Lakes and ocean wave conditions, especially in Alaska, Pacific Coast, Pacific Islands and Caribbean Islands, and how changing storm and sea/lake ice patterns may impact future wave conditions. CMIP6 driven wave models that represent the state-of-the-science for projecting future wave conditions should be leveraged. ~~The relative importance of waves on this coast makes this an important consideration.~~

FC 3.8
For the Great Lakes, FEMA should use a scenario approach for high and low water level modeling and engage in future research efforts to more clearly characterize changing Great Lakes water levels and work on standards for Great Lakes water level projections. ~~the addition or subtraction of future lake level elevations associated with a changing climate is not recommended at this time due to current uncertainty in projections of future lake levels.~~

FC 3.9
FEMA should build upon the latest FFRD methods for determining current graduated flood risk to determine future flood risk. ~~the existing current conditions flood hazard analyses prepared by FEMA for the NFIP to determine future coastal flood hazards.~~

FC 3.10
FEMA should incorporate regionally based ~~local~~ Sea Level Rise scenarios into the existing FEMA FFRD coastal ~~flood insurance~~ study process ~~in one of the following ways~~ using dynamic modeling (Direct Analysis):

- Direct Analysis – Incorporate sea level rise directly into process modeling (i.e., surge, ~~tide,~~ wave setup, wave runup, overtopping, and erosion) for regions where additional sea level is determined to impact the BFE non-linearly (ex. 1FT SLR = 2FT or more BFE increase).

- ~~Linear Superposition – Add sea level to the final calculated total water level and redefine BFE for regions where additional sea level is determined to impact the BFE linearly (ex. 1FT SLR = 1FT BFE increase).~~

- ~~Wave effects should be calculated based on the higher Stillwater, including sea level rise.~~

FC 3.11

Maps ~~and data~~ displaying the location and extent of areas subject to long-term coastal erosion and future sea level rise scenarios should be advisory (non-regulatory) for Federal purposes. Individuals and jurisdictions can use the information for decision-making and regulatory purposes if they deem appropriate.

FC 4 (2015)

Provide future conditions flood risk products and information for riverine areas that include the impacts of future development, land use change, erosion, and climate change, as actionable science becomes available. Major elements are:

- Provide guidance and standards for the development of future conditions riverine flood risk products.

- Future land use change impacts on hydrology and hydraulics can and should be modeled with land use plans and projections, using current science and build upon existing model study methods where data are available and possible.

- Future land use should assume built-out floodplain fringe and take into account the decrease of storage and increase in discharge.

- ~~No actionable science exists at he current time to address climate change impacts to watershed hydrology and hydraulics.~~ Efforts to incorporate climate change impacts in flood risk products and information should be based on ~~existing methods~~ standardized scenarios, informed by historical trends, and incorporate uncertainty based upon sensitivity analyses.

- Where sufficient data and knowledge exist, incorporate future riverine erosion (channel migration) into flood risk products and information.

FC 4.1

FEMA should evaluate previously-issued guidance for future conditions land use and hydrology to incorporate best practices and lessons learned from communities that have implemented the guidance since ~~2001~~ 2015.

FC 4.2

FEMA should support research to identify important mechanisms and factors to help determine long-term riverine erosion hazard areas for areas subject to high erosion and provided to the public in a digital layer.

FC 4.3

FEMA should ~~utilize~~ develop a national standard for riverine erosion zone delineations that reflects ~~geographic variability~~ important mechanisms and factors.

FC 4.4

FEMA should take the impacts of future development and land use change on future conditions hydrology into account when computing future conditions for riverine areas.

FC 4.5

FEMA should ~~implement~~ support research to develop best practices for riverine erosion hazard mapping (E Zones that define channel migration zones), leveraging existing data, models, and approaches that reflect site-specific processes and conditions.

FC 4.6

~~FEMA should use observed riverine trends to help estimate what future conditions might look like. In watersheds where floods of interest may decrease in magnitude and frequency, then use existing riverine study results as the basis for flood hazard mapping. In watersheds where floods exhibit increase in magnitude or frequency, then use best available science to determine future hydrology and flood hazards.~~ FEMA should develop best practices and standards to leverage updated techniques to detect statistically significant changes, patterns, and trends, and attribute and model these nonstationarities continually to reevaluate flood flow frequencies (whether increased or decreased flows).

FC 4.7

FEMA should work with other Federal agencies ~~via the Advisory Committee on Water Information's Subcommittee on Hydrology~~ to produce a new method to estimate future riverine flood flow frequencies. This method should contain ways to consistently estimate future climate-impacted riverine floods and address the appropriate range of flood frequencies needed by the NFIP.

FC 4.8

FEMA should produce, and should encourage communities to adopt, future conditions products to reduce flood risk.

FC 5 (2015)

~~Generate~~ Assess and evaluate future conditions data and information such that it may frame and communicate flood risk messages to more accurately reflect the future

hazard in ways that are meaningful to and understandable by stakeholders. This should enable users to make better-informed decisions about reducing future flood-related losses.

FC 5.1

FEMA should frame future risk messages for future conditions data and information such that individuals will pay attention to the future flood risk. Messages may be tailored to different stakeholders as a function of their needs and concerns.

FC 6 (2015)

~~Perform demonstration projects to develop future conditions data for representative coastal and riverine areas across the Nation to evaluate the costs and benefits of different methodologies or identify/address methodological gaps that affect the creation of future conditions data.~~ FEMA should perform additional demonstration projects to further develop and refine future conditions data, modeling efforts, and flood hazard and risk products for representative coastal, riverine, and pluvial areas across the Nation.

FC 6.1

FEMA should ~~perform a study to~~ assess and report how FFRD will quantify the accuracies, degree of precision, and uncertainties associated with respect to flood studies and mapping products for existing and future conditions. ~~This should include the costs and benefits associated with any recommendation leading to additional requirements for creating flood-related products.~~

FC 6.2

FEMA should conduct future conditions mapping pilots to continue to refine ~~a process~~ processes and methods for mapping and calculating future flood hazards under FFRD and capture and document best practices and lessons learned for each.

FC 6.3

FEMA should support research for future conditions coastal, riverine, and pluvial flood hazard mapping pilots and case studies using the ~~latest~~ most current published methods to determine the best means to balance the costs and benefits of increasing accuracy and precision, and decreasing uncertainty.

FC 7 (2015)

Data and analysis used for future conditions flood risk information and nonregulatory products should be consistent with standardized data and analysis used to determine existing conditions flood risk, but also should include additional future conditions data, such as climate data, sea level rise information, long-term erosion data; and development scenarios that consider land use plans, planned restoration projects,

and planned civil works projects, as appropriate, that would impact future flood risk. (includes 2021 changes by TMAC)

FC 7.1

FEMA should support expanded research and innovation for understanding ~~water data collection, for example using Doppler radar.~~ the frequency and intensity of flood causing events and antecedent conditions and how those factors may change through time and affect future flood conditions.

FC 7.2

FEMA should use a scenario approach to evaluate the impacts of future flood control projects on future conditions flood hazards.

FC 7.3

FEMA should support research on future conditions land use effects on future conditions hydrology and hydraulics.

FC 7.4

FEMA should develop guidance for evaluating locally-developed data from States and communities to determine if it is an improvement over similarly-available national datasets and could be used for future conditions flood hazard analyses.

FC 7.5

FEMA should develop better flood risk assessment tools to evaluate future risk, both population-driven and climate-driven. Improve integration of hazard and loss estimation models (such as Hazus) with land use planning software designed to analyze and visualize development alternatives, scenarios, and potential impacts to increase use in local land use planning.

FC 7.6

Future flood hazard calculation and mapping methods and standards should be updated periodically as we learn more through observations and modeling of land surface and climate change, and as actionable science evolves.

Recommendations from the TMAC National Flood Mapping Program Review (PR) (2016)

PR 1 (2016)

FEMA should adopt TMAC's 2015 recommendations that relate to the National Flood Mapping Program's technical credibility from the TMAC 2015 Annual Report.

PR 2 (2016)

FEMA should adopt the future conditions recommendations from the 2015 TMAC Future Conditions Risk Assessment and Modeling report.

PR 2.1

FEMA should identify and summarize relevant future conditions-related modeling and mapping projects nationwide (Federal or non-Federal sources) that have technical relevance to the NFIP's mapping program, and capture any data standards, modeling and mapping methods, and/or best practices that can inform FEMA's future conditions mapping program.

PR 2.2

FEMA should review existing State-level riverine erosion hazard mapping programs to determine what data standards, modeling and mapping methods, and/or best practices are transferable (i.e., broadly applicable) for potential nationwide implementation of riverine erosion hazard mapping. FEMA should also capture those standards and methods that are applicable to specific geographies or physical settings (analogous to coast-specific models and guidance used in FEMA's current coastal flood study process).

PR 2.3

FEMA should include consideration of both SLR and long-term coastal erosion in the modeling and mapping of flood hazards in all new coastal future conditions pilots.

PR 2.4

FEMA should leverage completed FEMA pilot studies and other relevant coastal and riverine future conditions projects and programs nationwide to prepare a gap analysis that captures outstanding data standards and methodological elements critical to implementing future conditions mapping nationwide.

PR 2.5

FEMA should use the existing body of knowledge gained through completed future conditions pilots, evaluation of existing future conditions-related programs, and other relevant Federal and non-Federal efforts to commence development of future conditions modeling and mapping standards and guidelines.

PR 2.6

FEMA should convene stakeholders and subject matter experts in the initial scoping, development, and review of new future conditions modeling and mapping standards and guidelines (Implementation Action 8.5). This effort should begin as soon as possible to inform the gap analysis and gap prioritization (Implementation Action 8.4) and enable use of any near-term pilots to address critical information needs.

PR 2.7

FEMA should develop and test multiple approaches for visualizing future conditions flood risk in one or more future mapping pilots, drawing on relevant social science

expertise and lessons learned from prior pilots and other completed mapping projects.

PR 3 (2016)
FEMA should complete the implementation of the statutory requirements of the National Flood Mapping Program

PR 4 (2016)
FEMA should continue to enhance communication and transparency with program stakeholders by, for example, including organizational and contact information on the Internet.

PR 5 (2016)
FEMA should investigate offering multi-year program management grant periods (versus annual) to Cooperating Technical Partnerships (CTPs).

PR 6 (2016)
FEMA should facilitate, partner, and leverage current high resolution topographic data (e.g., Light Detection and Ranging [LiDAR] data, other new and emerging technologies).

PR 7 (2016)
FEMA should work with the Congress and other partners to examine ways to shorten the study process, including the time added to the mapping process by QRs, KDPs, and legislated due process, as identified in TMAC's 2015 Goal 2 Annual Report Recommendation Number 11.

PR 8 (2016)
FEMA should move to a database-derived display, as outlined in the TMAC 2015 Annual Report Recommendation Number 16.

PR 9 (2016)
FEMA should work to identify residual risk areas behind levees and other flood control structures and downstream of dams.

PR 10 (2016)
For non-accredited levees, FEMA should replace the Zone D designation in levee-protected areas with risk zones that are more appropriate for the level of risk.

PR 11 (2016)
FEMA should evaluate the current metrics to better measure the efficient production, valid inventory, and stakeholder acceptance of the National Flood Mapping Program. TMAC recommends that FEMA should:

- Discontinue the current Deployment and Mitigation Action metrics and replace them with more effective measures, and

- Focus revised metrics on measuring the quality and quantity of flood hazard and risk products delivered to communities.

PR 12 (2016)

FEMA should have an inventory metric that reports quantity, quality, and time aspects on national, regional, tribal, state, and watershed levels:

a. Quantity: Quantity should be tracked through the life of a floodplain from no study through to detailed study. Statistics should be provided annually.

b. Quality: Quality should be measured by retaining the existing NVUE metric of the current inventory and adding an NVUE metric for coastal flood hazard miles.

c. Time: Timing should be measured from Discovery to the issuance of Preliminary maps and from the issuance of Preliminary maps to Effective maps for active projects.

PR 13 (2016)

FEMA should have a metric that shows progress towards meeting a digital platform goal by area of the nation to compliment FEMA's current population metrics. This metric could include the total area of the country, as well as progress towards Goal 3 and Recommendation 16 in the TMAC 2015 Annual Report.

PR 14 (2016)

FEMA should evaluate the benefits and costs and its value to the nation as a result of different levels of funding to the National Flood Mapping Program.

APPENDIX **E**

INDIVIDUAL METRICS THAT COMPRISE EACH OF THE AVAILABLE SOCIAL VULNERABILITY METRICS DESCRIBED IN CHAPTER 5

Index Name	Source	Brief description, including social factors measured
Baseline Resilience Indicators for Communities (BRIC)	Cutter et al., 2014	Six broad categories of community disaster resilience, including social, economic, community capital, institutional, infrastructural, and environmental:

Social Resilience
- Educational attainment equality
- Pre-retirement age
- Transportation access
- Communication capacity
- English language competency
- Non-special needs
- Health insurance
- Mental health support
- Food provisioning capacity
- Physician access

Economic Resilience
- Home ownership
- Employment rate
- Race/ethnicity income equality
- Non-dependence on primary/tourism sectors
- Gender income equality
- Business size
- Large retail-regional/national geographic distribution
- Federal employment

Community Capital Resilience
- Place attachment-not recent immigrants
- Place attachment-native born residents
- Political engagement
- Social capital-religious organizations
- Social capital-disaster volunteerism
- Citizen disaster preparedness and response skills

Institutional Resilience
- Mitigation spending
- Flood insurance coverage
- Performance regimes-state capital
- Performance regimes-nearest metro area
- Political and jurisdictional fragmentation
- Disaster aid experience
- Local disaster training
- Population stability
- Nuclear plant accident planning
- Crop insurance coverage

Infrastructural Resilience
- Sturdier housing types
- Temporary housing availability
- Medical care capacity
- Evacuation routes
- Housing stock construction quality
- Temporary shelter availability
- School restoration potential
- Industrial re-supply potential
- High speed internet infrastructure

Index Name	Source	Brief description, including social factors measured
Baseline Resilience Indicators for Communities (BRIC) (continued)	Cutter et al., 2014	**Environmental Resilience** • Local food suppliers • Natural flood buffers • Efficient energy use • Pervious surfaces • Efficient water use
The Community Resilience Estimates (CRE)	United States Census Bureau, 2021	The CRE combines risk factors for households (HH) and individuals (I), including: • Income-to-Poverty Ratio (IPR) < 130 percent (HH). • Single or zero caregiver household - only one or no individuals living in the household who are 18-64 (HH). • Unit-level crowding defined as > 0.75 persons per room (HH) • Communication barrier defined as either limited English-speaking households (HH) or no one in the household over the age of 16 with a high school diploma • No one in the household is employed full-time, year-round. • Disability posing constraint to significant life activity • No health insurance coverage (I) • Being aged 65 years or older (I) • Households without a vehicle (HH) • Households without broadband Internet access (HH)
Environmental Justice Screening Tool v2.0 (EJScreen)	Environmental Protection Agency, 2019	**Environmental Indicators** • Particulate matter in the air • Air toxics cancer risk • Air toxics respiratory hazard index • Diesel particulate matter • Ozone • Lead Paint • Traffic Proximity and Volume • Proximity to Risk Management Plan Sites • Superfund proximity • Hazardous waste proximity • Wastewater discharge • Underground storage tanks (UST) and leaking UST (LUST) **Demographic Indicators** • People of color • Low-income • Unemployment rate • Less than high school education • Limited English speaking • Individuals under age 5 • Individuals over age 64

Index Name	Source	Brief description, including social factors measured
Social Vulnerability Index developed by the Centers for Disease Control and Prevention (SVI)	Centers for Disease Control and Prevention, 2020	16 social factors, including poverty, lack of vehicle access, and crowded housing, and groups them into four related themes, specifically: **Socioeconomic Status** • Below 150% Poverty • Unemployed • Housing Cost Burden • No High School Diploma • No Health Insurance **Household Characteristics** • Aged 65 & Older • Aged 17 & Younger • Civilian with a Disability • Single-Parent Households • English Language Proficiency • Racial & Ethnic Minority Status **Housing Type & Transportation** • Multi-Unit Structures • Mobile Homes • Crowding • No Vehicle • Group Quarters
Social Vulnerability Index (SoVI) developed at the University of South Carolina	Original methods published in Cutter et al., 2003	Uses 29 distinct variables: • Percent Asian • Percent Black • Percent Hispanic • Percent Native American • Percent Population under 5 Years or 65 and Over • Percent Children Living in 2-Parent Families • Median Age • Percent Households Receiving Social Security Benefits • Percent Poverty • Percent Households Earning over $200,000 annually • Per Capita Income • Percent Speaking English as a Second Language with Limited English Proficiency • Percent Female • Percent Female Headed Households • Nursing Home Residents Per Capita • Percent of Population Without Health Insurance (County level only) • Percent with Less than 12th Grade Education • Percent Civilian Unemployment • People per Housing Unit • Percent Renters • Median Housing Value • Median Gross Rent • Percent Mobile Homes • Percent Employment in Extractive Industries • Percent Employment in Service Industry • Percent Female Participation in Labor Force • Percent of Housing Units with No Car • Percent Unoccupied Housing Units • Hospitals per Capita (County level only)

Index Name	Source	Brief description, including social factors measured
Climate and Economic Justice Screening Tool (CEJST)	White House Council on Environmental Quality, 2022	• High school education • Lead paint • Linguistic isolation • Low income • Low median income • Poverty • Unemployment • Asthma • Diabetes • Heart disease • Low life expectancy • Energy cost • Lands of Federally Recognized Tribes, including the locations of Alaska Native Villages • Transportation barriers • Diesel particulate matter exposure • Particulate matter in the air • Proximity to hazardous waste facilities • Proximity to Risk Management Plan (RMP) facilities • Proximity to Superfund (or National Priorities List (NPL)) sites • Traffic proximity and volume • Underground storage tanks and releases • Wastewater discharge • Expected agriculture loss rate • Expected building loss rate • Expected population loss rate • Projected flood risk • Projected wildfire risk • Tracts determined to historically have been subject to redlining by the Home Owner's Loan Corporation between 1935-1940 • Housing cost • Lack of indoor plumbing • Lack of greenspace • Formerly used defense sites
Community Resilience Index (CRI)	Federal Emergency Management Agency, 2022	**Population Characteristics** • Population without a High School Education • Population 65 and Older • Population with a Disability **Household Characteristics** • Households without a Vehicle • Households with Limited English • Single-Parent Households • Households without a Smartphone **Housing** • Mobile Homes as Percentage of Housing • Owner-Occupied Housing **Healthcare** • Number of Hospitals* • Medical Professional Capacity* • Population without Health Insurance

Index Name	Source	Brief description, including social factors measured
Community Resilience Index (CRI) (continued)	Federal Emergency Management Agency, 2022	**Economic** • Population Below Poverty Level • Median Household Income • Unemployed Labor Force • Unemployed Women Labor Force • Income Inequality+ • Workforce in Predominant Sector **Connection to Community** • Presence of Civic and Social Organizations* • Population with Religious Affiliation* • Percent of Inactive Voters* • Population Change*

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