



Risk Mapping, Assessment, and Planning (Risk MAP) Multi-Year Plan: 2023 – 2027

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FEMA

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Executive Summary

The Risk Mapping, Assessment, and Planning (MAP) program provides flood hazard and flood risk information that powers resilient decisions and actions which reduce disaster suffering. Flooding is the costliest natural hazard in the United States, causing over \$155 billion in property damages over the last decade.

The purpose of this plan is to describe the strategy and direction for the Risk MAP program over the next five years. This plan is an update to the 2009 Risk MAP Multiyear Plan that initially defined the Risk MAP program. It responds to the U.S. Government Accountability Office’s 2021 recommendations for FEMA to update its multiyear plan for Risk MAP and to establish mechanisms for periodically assessing the usefulness of its Risk MAP non-regulatory products.

The plan outlines how Risk MAP will move from the Present Phase, through an Interim Phase where FEMA addresses existing gaps in flood resilience processes, to a Future Phase that more effectively reduces disaster suffering.

FEMA flood maps and the National Flood Insurance Program have helped the nation avoid billions of dollars in flood damage over the past 50 years. Since 2009, FEMA has made significant progress toward achieving the Risk MAP goals. FEMA also has learned a lot about both what is effective in achieving the program goals and what needs to be improved to better address the capability gaps that Risk MAP was designed to address. These insights are the basis of shifts in the Risk MAP goals and the strategy detailed in the plan.

Table 1: Program Insights

Insights	Changes to Strategy
Existing regulatory Flood Insurance Rate Maps oversimplify flood hazard and risk.	The program must move beyond updating out-of-date regulatory maps toward more comprehensive flood hazard and risk information.
Increasing stakeholder awareness of flood risk is not enough to drive resilient actions.	The program must understand what drives communities and NFIP customers to take action and must deliver audience specific messages.
Building synergies within FEMA Resilience is not sufficient for Risk MAP to be most effective.	The program will take a customer-centered approach to program delivery and expanding integration and alignment with key partners.

The Risk MAP goals work together to drive resilient action through customer-centric engagement to meet the audience where they are, in the way they want to be engaged. This entails FEMA listening to what stakeholders need and delivering messaging and engagement that is designed to reach specific stakeholders. This engagement leverages available and accessible foundational hazard and

risk data and supports implementation of actionable resilience policies and practices. The foundation of this cycle is based on coordination and partnership with other natural hazards risk information and management activities.

Summary of Commitments

Goal 1: Address gaps in flood hazard and flood risk data to form a solid foundation for flood risk assessments, floodplain management, and actuarial soundness of the National Flood Insurance Program.

SUPPORTING OBJECTIVES

- Objective 1: Ensure that the regulatory flood mapping information is current and up to date.
- Objective 2: Build national flood modeling framework.
- Objective 3: Address unmet statutory requirements.
- Objective 4: Deliver products that power a risk informed National Flood Insurance Program (NFIP).

Goal 2: Consult with, and empower, communities to measurably reduce current and future flood risk.

SUPPORTING OBJECTIVES

- Objective 1: Develop national and regional outreach strategies that include shared priorities and multi-year plans for advancing equitable risk reduction through outreach and engagement.
- Objective 2: Implement strategies for gaining insight that inform a customer-centric approach to community engagement, partnerships, and other aspects of program design.
- Objective 3: Develop community specific outreach strategies that compel and empower people to take action to reduce their risks.
- Objective 4: Establish a baseline and measure progress of the impact of engagement activities toward advancing equitable risk reduction.

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

SUPPORTING OBJECTIVES

- Objective 1: Communicate the value of hazard mitigation and community planning.
- Objective 2: Engage and partner to build capabilities.
- Objective 3: Integrate hazard mitigation into other planning processes.
- Objective 4: Demonstrate effective risk reduction through planning.

Goal 4: Provide a sustainable and modern IT portfolio that optimizes delivery of flood hazard and flood risk data, helping customers reduce current and future risks to life and property.

SUPPORTING OBJECTIVES

- Objective 1: Establish mechanisms to assess and improve customer experience with Risk MAP systems and applications.
- Objective 2: Migrate Risk MAP IT systems and applications to the cloud to optimize our existing investment in flood hazard data and set the technical foundation for implementing the future of Risk MAP.
- Objective 3: Initiate development of new applications and services to address unmet statutory requirements, replace obsolete software, and meet requirements for the future of Risk MAP.

Goal 5: Support enhanced risk reduction decision-making by aligning Risk MAP delivery with the Whole Community through customer-centric engagement and products.

SUPPORTING OBJECTIVES

- Objective 1: Build organizational understanding of how stakeholders use and are influenced by flood risk information and products.
- Objective 2: Begin to organize Risk MAP in a customer-centric manner that more efficiently and effectively drives toward the outcome of a more flood resilient nation.
- Objective 3: Continue evolution and advancement of partnerships that drive and empower risk reduction action through structure, engagement, and messaging.

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Introduction

RISK MAPPING, ASSESSMENT, AND PLANNING (RISK MAP) PURPOSE

Flooding is the costliest natural hazard in the United States, causing over \$155 billion in property damages in the last decade¹. Disaster costs are projected to increase as some extreme weather events become more frequent and intense due to climate change, and simultaneously the people and property at risk increase with demographic changes.

The Risk MAP program delivers quality flood hazard and flood risk information, risk communications, and mitigation planning support that power resilient decisions and actions to reduce disaster suffering. FEMA flood maps and the National Flood Insurance Program have helped the nation avoid billions in flood damage over the past 50 years. Yet, more is needed.

PROGRAM AUTHORITIES

The key authorities for Risk MAP are defined in the National Flood Insurance Act (and related statutes) and the Robert T. Stafford Act, as amended by the Disaster Mitigation Act of 2000. These authorities designate the Federal Emergency Management Agency (FEMA) a primary provider of flood hazard and flood risk information to the nation. Risk MAP forms one of the foundational legs of the National Flood Insurance Program (NFIP), through its role in providing authoritative flood hazard and flood risk data the NFIP relies on and communicating with individuals and communities about their flood hazards and risk. The Stafford Act, as amended, authorizes FEMA to implement and lead mitigation planning with state, local, tribal, and territorial (SLTT) governments. Risk MAP fulfills these authorities in an integrated, customer-centric way to maximize effectiveness.

Risk MAP implements these authorities through collaboration with SLTT entities to reduce losses of life and property. Risk MAP provides comprehensive and reliable flood mapping products, risk assessment tools, community focused risk communications, and planning support. All of these products enable effective local mitigation activities, including those required under the NFIP.

PURPOSE OF THIS PLAN

The purpose of this plan is to describe the strategy and direction for the Risk MAP program over the next five years (2023-2027). The plan outlines the program goals, major objectives for the next few years, and the key strategies to achieve these goals and objectives. At a high level, this plan links the Risk MAP mission and authorities to the goals, measures, and major activities that FEMA will implement to achieve the program goals and fulfill the program mission.

¹ [Association of State Floodplain Managers. 2020. Flood Mapping for the Nation: A Cost Analysis for Completing and Maintaining the Nation's NFIP Flood Map Inventory. Madison, WI](#)

This plan is an update to the 2009 Risk MAP Multiyear Plan that initially defined the Risk MAP program goals and described the program strategy to achieve those goals. It responds to the recommendation from the GAO for FEMA to “update its multiyear plan for the Risk MAP program to identify program goals, objectives, activities, performance measures, and time frames for its various efforts to address challenges in reflecting current and future flood hazards and to transition to a future program” (See Appendix D). It is also intended to provide other stakeholders with current information about the Risk MAP program and future plans.

RISK MAP ACCOMPLISHMENTS

Since 2009, FEMA has made significant progress toward the Risk MAP goals. Risk MAP achieved the primary program target of 80 percent New, Validated, or Updated Engineering (NVUE). NVUE measures whether the available regulatory flood hazard information reflects current conditions. The program has enhanced communication and engagement activities across the Risk MAP lifecycle. Furthermore, Risk MAP continues to deliver national support for natural hazards mitigation planning. The percent of the U.S. population covered by a current mitigation strategy has increased from 80 percent at the end of September 2009 to 85 percent in September 2022, meaning tens of millions more Americans are covered under current hazard mitigation plans. Engagement by tribal governments in mitigation planning has more than tripled over the same time period, from 75 to 238 Federally recognized Tribes. Risk MAP has substantially enhanced its information technology platform. Additionally, Risk MAP has achieved significant synergies across related programs within FEMA Resilience.

RISK MAP EVOLUTION

Since the start of Risk MAP in 2009, FEMA has learned a lot about both what is effective in achieving program goals and what needs to be improved to better address capability gaps.

The program was created in 2009 to address these gaps:

- Gap 1. Lack of available flood data;
- Gap 2. Lack of a quantifiable relationship between flood risk communications and reductions in flood vulnerability;
- Gap 3. Lack of coordination in SLTT mitigation planning efforts;
- Gap 4. Technical debt and aging IT systems; and
- Gap 5. Limited alignment of program delivery.

Despite the progress of the program, the same fundamental capability gaps that existed in 2009 remain. However, through the delivery of Risk MAP, FEMA has developed an improved understanding of how to address these gaps.

The key insights that influence the path forward described in this plan are:

- **Gap 1:** The binary depiction of a single representative flood hazard scenario on the regulatory Flood Insurance Rate Maps (FIRMs) is oversimplified. FEMA must provide comprehensive flood

hazard and flood risk information which reflects flooding of all types and severity for both the present and the future.

- **Gap 2:** Increasing stakeholder awareness is not enough to drive resilient actions. FEMA must implement targeted, customer-centric flood risk management communications grounded in evidence of what drives communities and individuals to take resilient actions.
- **Gap 3:** FEMA must continue to support the natural hazard mitigation planning efforts of SLTT governments integrated with other community planning frameworks, including land use planning and community development.
- **Gap 4:** FEMA must incrementally transform its existing information technology portfolio to a modern architecture that sustains program delivery, supports future developments in flood hazard and risk analysis, and makes the resulting information easily accessible.
- **Gap 5:** Building synergies within FEMA Resilience is not sufficient. For Risk MAP to be most effective at building flood resilience nationally, FEMA must shift to a customer-centric approach by understanding what truly motivates resilient action and aligning efforts with those of other organizations doing relevant work.

RISK MAP GOALS

Based on the key program insights above, FEMA has made some small but important shifts in the Risk MAP Goals.

Table 2: Risk MAP Goals Comparison (2009 vs 2023)

Risk MAP Goals	
2009	2023
Goal 1	
Address gaps in flood hazard data to form a solid foundation for flood risk assessments, floodplain management, and actuarial soundness of the National Flood Insurance Program.	Address gaps in flood hazard and flood risk data to form a solid foundation for flood risk assessments, floodplain management, and actuarial soundness of the National Flood Insurance Program.

Risk MAP Goals

Goal 1 focuses on delivering flood hazard and risk information needed by the NFIP and the Nation to support flood risk management. The key insight is that FEMA needs to move beyond the binary depiction of flood hazard on the FIRMs to provide more comprehensive graduated flood hazard and risk information. This change is driven by statutory changes, the goal of a risk informed NFIP, and a customer centered approach to equipping and compelling people to take action to increase flood resilience. Goal 1 was updated to specifically include flood risk in addition to hazard and the focus is on moving beyond updating out-of-date regulatory maps from 2009 toward more comprehensive flood hazard and risk information.

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.

Consult with, and empower, communities to measurably reduce current and future flood risk.

Goal 2 focuses on using outreach and communication to drive flood resilient actions. FEMA recognizes that simply delivering data or raising awareness does not always lead to action. Risk MAP continues to explore how to use the foundation of reliable flood data and risk communications to better drive resilience and how to measure the impact. Goal 2 was updated to remove increasing awareness as the main mechanism for driving resilient actions.

Goal 3

Lead and support states, local and tribal communities to effectively engage in risk-based mitigation planning resulting in sustainable actions that reduce or eliminate risks to life and property from natural hazards.

Lead and support states, local and tribal communities to effectively engage in risk-based mitigation planning resulting in sustainable actions that reduce or eliminate risks to life and property from natural hazards.

Goal 3 continues to focus on supporting SLTT governments’ understanding of strategies to reduce natural hazard risks that enable implementation of resilient actions through hazard mitigation planning and other community planning activities. No changes have been made to Goal 3

Goal 4

Provide an enhanced digital platform that improves management of limited Risk MAP resources, stewards information produced by Risk MAP, and improves communication and sharing of risk data and related products to all levels of government and the public.

Provide a sustainable and modern IT portfolio that optimizes the distribution and communication of flood hazard and flood risk data to help customers reduce current and future risks to life and property.

Goal 4 describes how FEMA continues to develop and incrementally transform the technology foundation for Risk MAP. Risk MAP will build and sustain robust IT capabilities that support development, management, sharing, and communication of flood hazard and risk information and support hazard mitigation planning nationally. Goal 4 was altered slightly to emphasize the importance of sustainable modernization and the need for multiple platforms (i.e., a portfolio) to address the full spectrum of Risk MAP’s IT use cases.

Goal 5

Risk MAP Goals

Align Risk Analysis programs and develop synergies to enhance decision-making capabilities through effective risk communication and management.

Support enhanced risk reduction decision-making by aligning Risk MAP delivery with the Whole Community through customer-centric engagement and products.

Goal 5 describes how Risk MAP seeks to integrate program delivery. Building synergy within FEMA activities is not enough. FEMA also needs to align its work with the Whole Community. Better alignment with other organizations will improve decision making and drive more resilient outcomes. Goal 5 was updated to focus on a customer-centered approach to program delivery and expand alignment with key partners.

OTHER STRATEGIC LINKAGES

Risk MAP is a component of how FEMA Resilience works to increase the Nation’s resilience to all hazards. Over the past few years, FEMA Resilience has developed a strategy for risk information and risk management. This strategy supports Goal 3 to promote and sustain a ready FEMA and prepared nation of the 2022-2026 FEMA Strategic Plan

The Resilience risk information and management goals are:

- A. Consult with communities to act on their present and emerging resilience opportunities;
- B. Translate knowledge into actionable resilience policies and practices;
- C. Be the trusted source of comprehensive flood hazard and risk information;
- D. Equip communities with accessible solutions to meet their multi-hazard risk information needs; and
- E. Invest in strategic partnership networks that expand our reach to increase the Nation’s resiliency.

While these strategies are broader in scope than Risk MAP, the goals derive from the same basic concepts. This approach aims to drive resilient action with customer centric public engagement where FEMA listens to what stakeholders need and delivers messages designed to reach specific stakeholders. This engagement leverages reliable foundational data on hazard and risk, made available and accessible through well designed solutions, and supports implementation of actionable resilience policies and practices. Risk MAP is delivered in coordination with other natural hazards risk information and management activities (Figure 1).

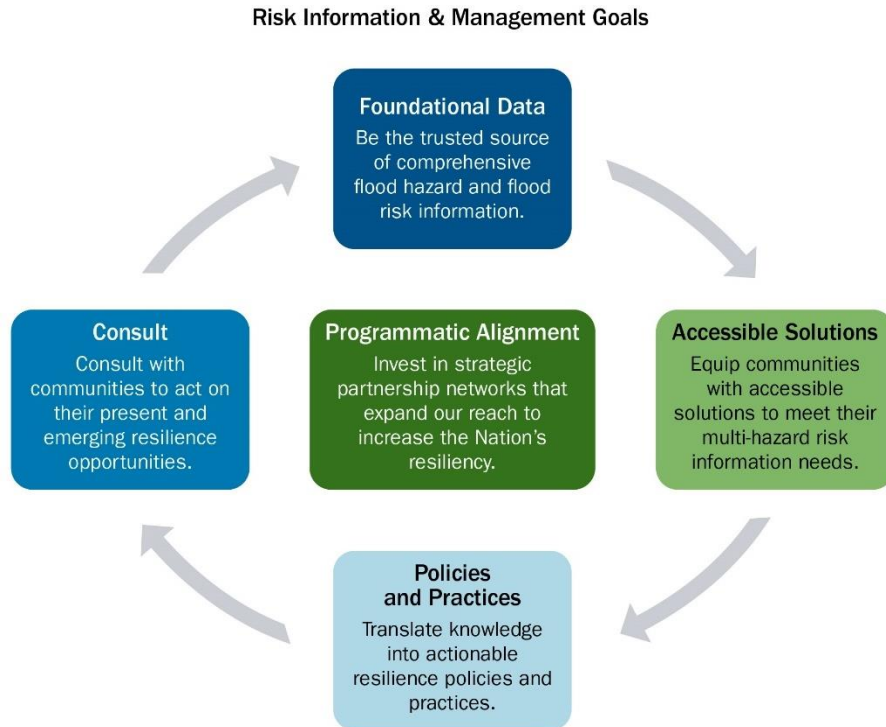


Figure 1: Resilience Risk Information and Management Goals

The Risk MAP goals are closely aligned with this approach. Risk MAP functions in coordination with other Resilience programs supporting this strategy to deliver data, risk analysis, risk communications, and adaptable risk management tools, policies, and practices to equip and compel people and the Nation to reduce disaster suffering for all. While the goals are not an exact match one-for-one, the same key themes are embodied in both (Figure 2).

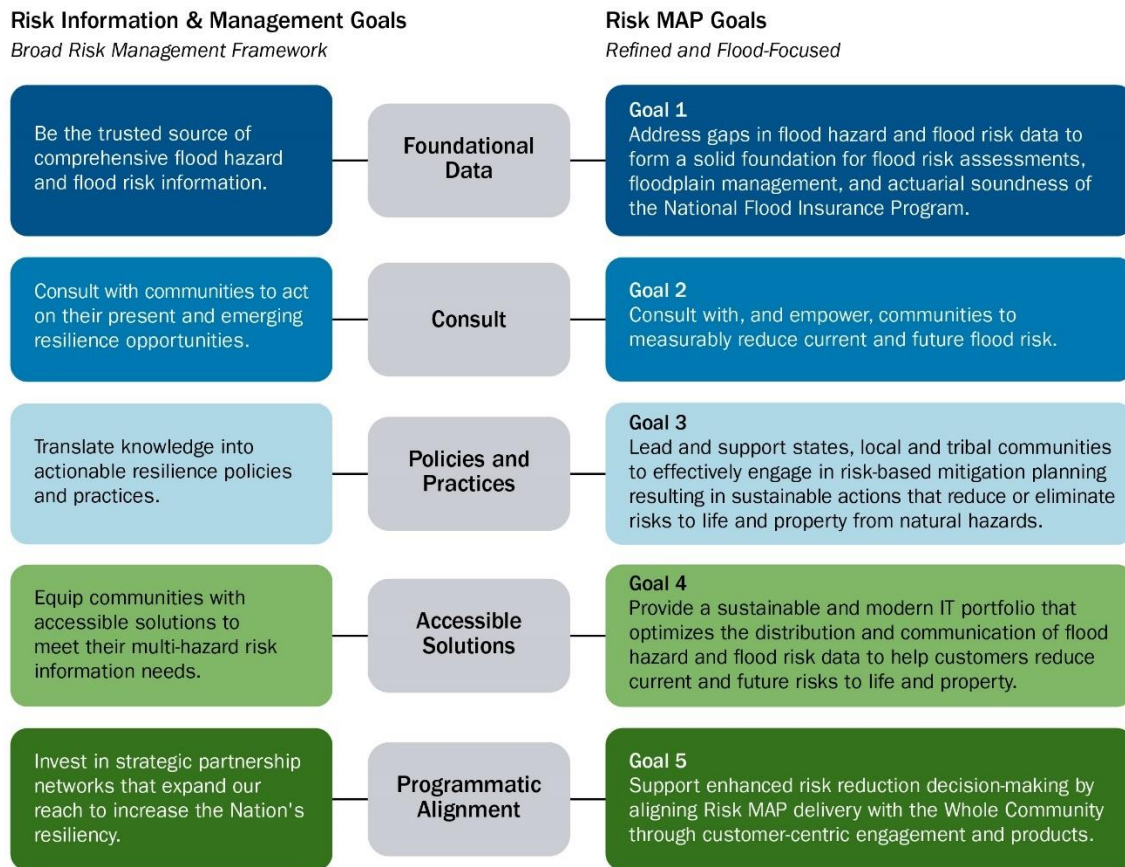


Figure 2: Alignment between Risk Information and Management Goals and Risk MAP Goals

RISK MAP PHASES

This plan describes how FEMA intends to use the key insights developed since 2009 to adapt the Risk MAP strategy and tactics and improve program delivery. The objectives for each goal describe the major milestones FEMA will accomplish as it moves from the Present Phase of the program, through a period of adjustment in the Interim Phase, to achieve the vision for the Future Phase.

Present Phase

Risk MAP is primarily focused on producing regulatory flood maps. The flood hazard and flood risk information available is not sufficient to support risk-based decisions for the present and future. Furthermore, the way FEMA communicates flood hazard and flood risk is not impactful enough. SLTT hazard mitigation planning does not, by itself, lead SLTTs in taking the most effective actions to reduce risk. FEMA's Risk MAP IT systems do not support customer needs adequately, nor do they support the Risk MAP program internal operations as they should. Across the board, FEMA's delivery of Risk MAP is not sufficiently customer-centric and does not fully take advantage of other activities that support SLTT flood risk management.

Interim Phase

FEMA must move beyond the current binary regulatory flood maps toward a more sophisticated, customer-centric approach to comprehensive flood hazard and flood risk information delivery. Over the next five years, FEMA will begin to produce more comprehensive flood data by building a new flood hazard and flood risk framework, develop a consistent communications approach refined for specific audiences, improve integration of hazard mitigation planning with other community planning activities, design a modern IT system architecture and incrementally transform the existing IT portfolio to implement this vision, and increase its understanding of both what motivates action to increase flood resilience as well as how customers currently receive flood risk management data and messages.

Future Phase

In the future, Risk MAP will build flood resilience with customer-centric delivery of comprehensive, graduated flood hazard and risk information and flood resilience messages supported by modern IT systems. Delivery of Risk MAP will be integrated with partners serving complementary roles in risk communication and risk management. Hazard mitigation planning will be integrated with other community planning activities. Risk MAP will have improved ability to measure program effectiveness. Through these efforts Risk MAP will help build flood resilience nationally and reduce disaster suffering. The implementation of the future phase is outside the timeframe of this plan. Achievement of the future phase will depend on what FEMA learns during the interim phase and program funding.

EQUITY

Through the Justice40 Initiative, the Federal Government is prioritizing equity by focusing program benefits on disadvantaged communities that are marginalized, underserved, or overburdened by pollution. Equity is also one of the 3 main goals in the 2022-2026 FEMA Strategic Plan, with Goal 1 to instill equity as a foundation of emergency management. The portfolio of NFIP programs collectively supports the efforts of reducing the effect of natural hazards across the Nation. These programs support regulatory mapping, community engagement, technical and financial assistance to the SLTT governments, including special districts and authorities (such as dam and levee owners/operators) that constitute the complex network of jurisdictions that serve the Nation's collective communities. Risk MAP provides a credible, risk informed foundation for these programs by producing the flood hazard and flood risk data to guide decision-making with respect to risk informed land development, zoning, permitting, new construction and redevelopment as well as to inform the purchase of flood insurance. Further, through mitigation planning, SLTTs engage vulnerable populations and underserved communities in a process designed to identify risks and develop implementable strategies to increase resilience.

The benefits Risk MAP yields are the products of data. That data benefits the Nation as a whole, as documented in several studies tying program data to building codes, mitigation efforts, and the NFIP. As documented by these studies, Risk MAP data guides a responsible public discourse related to the manner government officials manage communities.

As an enabler of mitigation action, Risk MAP is working with other FEMA Justice40 programs and the NFIP to gather information about what data is needed to drive shared outcomes in implementing Justice40. Understanding these needs to support communities will inform Risk MAPs distribution, product, and engagement.

Risk MAP was selected as one of four programs to be part of the 'pilot program' for FEMAs contribution towards the Justice 40 initiative to increase benefits to disadvantaged communities. In 2022, FEMA conducted an analysis of planned and ongoing work and determined data does not indicate a selection bias nationally. Risk MAP has been actively working for years to provide flood data for unmapped stream miles (see Goal 1, Objective 3). Over 50% of the currently unmapped stream miles with base level engineering data available or in progress are in disadvantaged communities. FEMA has the ability to provide advisory information without introducing a requirement of flood insurance on disadvantaged communities but where appropriate these new analyses will also be used for regulatory updates.

However, FEMA also determined that how data is delivered is as important as what data is delivered and where the data is delivered for disadvantaged communities.

Accounting for a broader range of needs and approaches when delivering Risk MAP can help build trusting relationships with underserved and disadvantaged communities. Any combination of factors can restrict access to standard outreach practices and limit someone's ability to prepare for, weather and recover from a disaster event.

The Risk MAP program must learn the obstacles communities face with hazard risk mitigation and apply what is learned to program delivery and tailoring solutions that respond to each communities' unique needs. Helping to remove barriers and making resources more widely available will help to advance inclusive community engagement practices that lead to equitable outcomes.

In addition, the Technical Mapping Advisory Council will complete their annual report with recommendations in the following areas:

- Ways for the program to overcome these obstacles that disadvantaged communities face in understanding their risk and acting to reduce their risk and better meet the needs of these communities.
- How Risk MAP can identify and limit the potential negative impact and unintended consequences that might result from Risk MAP products and program delivery.
- How Risk MAP can improve stakeholder engagements with disadvantaged/underserved communities; and
- How the agency might use statistical data and analysis regarding social vulnerability and underserved populations; and how that data and analysis should inform future annual investment decisions for Risk MAP.

Upon receipt and evaluation of these recommendations along with information on the needs of other FEMA Justice40 programs, Risk MAP will take steps to meet the flood risk data needs of disadvantaged communities and the FEMA programs that support them.

For FY23 Risk MAP projects are identified for current year funding using data from Coordinated Needs Management Strategy database and the Mapping Information Platform. The project data are intersected with the Climate and Economic Justice Screening Tool data to determine those disadvantaged communities within the project footprint. The total dollars allocated for these projects are proportionally attributed towards the FEMA Investment in disadvantaged communities as determined by the Climate and Economic Justice Screening Tool.

The results of this analysis will help shape future investments in flood risk data, to equitably support communities across the country.

CONTINUOUS LEARNING

As FEMA implements Risk MAP, it continues to focus on improving program strategies and tactics to maximize successful outcomes. FEMA will do this through performance measurement and collecting data (evidence) around the impact of our program delivery (Results Framework) that will help us evaluate our program. It will enable FEMA to identify the relative effectiveness of activities and our program (in achieving targets) and provide evidence for prioritization decisions and undertaking strategic adaptive management. The 2022-2026 FEMA Strategic Plan emphasizes equity, environmental justice, and climate resilience, which are at the heart of these efforts.

Implementation Approach

Overview

Risk MAP has made significant progress in advancing the goals established in 2009 and is evolving while continuing to focus on these goals. This section discusses the current implementation approach, including updated objectives, for the Risk MAP Goals.

Risk MAP's approach seeks to drive resilient action with reliable foundational data on flood hazard and risk, made available and accessible through well designed solutions that are guided and supported by customer-centric engagement and national policies and practices for natural hazard mitigation planning. All these elements are delivered in partnership with other natural hazards risk information and management activities.

With investments through FY20 in flood map projects, FEMA reached the primary program target of 80 percent NVUE. Since then, the Risk MAP priorities have been:

- Maintaining NVUE;
- Completing the large number of flood risk projects that have been initiated to address the NVUE gaps;
- Addressing the unmapped areas of the country and developing the methodologies to meet other unmet statutory requirements;
- Investing in its IT capabilities; and
- Developing approaches to better address national gaps in flood hazard data and communicate that data in more impactful ways through the Future of Flood Risk Data exploration efforts.

Over the next five years, FEMA is making several key updates to the Risk MAP approach based on what has been learned during the implementation of Risk MAP since 2009. FEMA will move beyond oversimplified regulatory maps and begin producing comprehensive flood hazard and flood risk information. Then, FEMA will use a better understanding of what motivates action on flood resilience to implement a consistent communications approach refined for specific audiences and aligned with current flood risk management messaging formats.

The work over the next five years will be the bridge from the present program phase to the future phase. The phases provide a way to organize the changes to the Risk MAP program described in this plan. The shifts between phases will be gradually and at times the program will have characteristics of more than one phase. The implementation of the future phase is outside the timeframe of this plan. Achievement of the future phase will depend on what FEMA learns during the interim phase and program funding.

The graphic below describes the overall program state in each phase, with details for each goal. The implementation approach outlines the objectives for each goal that will enable Risk MAP to move from the present to the future. Each goal includes a similar graphic providing a more detailed description of the program characteristics and activities for each phase specific to that goal.



PHASE 1: PRESENT

Maintain NVUE, complete ongoing projects, begin to address unmapped inventory and other unmet statutory requirements, develop FFRD and invest in IT foundation.

<p>Goal 1</p> <ul style="list-style-type: none"> Focus on NVUE and Unmapped inventory Exploring FFRD and developing methodologies 	<p>Goal 2</p> <ul style="list-style-type: none"> Program-centric communications No uniform system for understanding audiences to inform effective communications Reliance on traditional communication materials 	<p>Goal 3</p> <ul style="list-style-type: none"> SLTTs perform hazard mitigation planning to create more resilient communities and meet one criterion to receive certain non-emergency assistance FEMA helps build SLTT capability for resilience and mitigation planning 	<p>Goal 4</p> <ul style="list-style-type: none"> Legacy FEMA IT systems support management and delivery of regulatory and non-regulatory mapping, assessment, and planning products 	<p>Goal 5</p> <ul style="list-style-type: none"> Legacy risk management programs are aligned as Risk MAP
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PHASE 2: INTERIM

Building a comprehensive flood hazard and flood risk assessment framework, developing a consistent, targeted communications approach, improving integration of planning, modernizing IT systems, and understanding customer behavior and other organizations supporting community risk management.

<p>Goal 1</p> <ul style="list-style-type: none"> Continue to maintain FIRMs using legacy methods Initial deliveries of coastal probabilistic data, including future conditions Focus on building 2D data and models for inland Build risk assessment framework 	<p>Goal 2</p> <ul style="list-style-type: none"> Develop, implement, and maintain national and regional outreach strategies Implementing processes to systematically identify audiences and measure impacts of communications 	<p>Goal 3</p> <ul style="list-style-type: none"> Value of hazard mitigation planning is better recognized Promoting further integration with resilience, adaptation, and community planning activities 	<p>Goal 4</p> <ul style="list-style-type: none"> IT systems are migrated to the cloud Implement customer experience measurement with IT systems Modernize the program IT systems to provide new and expanded capabilities 	<p>Goal 5</p> <ul style="list-style-type: none"> Research stakeholder behavior and motivations to understand what drives resilient action Understand SLTT flood risk management ecosystem and other participants' roles
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PHASE 3: FUTURE

Risk Informed NFIP supported by customer-centric delivery of comprehensive flood information and flood resilience messages. Delivery is supported by modern IT and integrated with partners and SLTT practices. Program impacts are measured.

<p>Goal 1</p> <ul style="list-style-type: none"> Probabilistic coastal and inland models provide foundation for regulatory and non-regulatory products Consistent data and models available nationally Robust risk assessment framework that includes future conditions and is adaptable to changing stakeholder needs New products support risk informed NFIP including future conditions 	<p>Goal 2</p> <ul style="list-style-type: none"> Program communications are customer-centric following outreach strategies and using information about the audience Impacts of communications are consistently measured and used to continue a cycle of improvement 	<p>Goal 3</p> <ul style="list-style-type: none"> Hazard mitigation planning is routinely integrated with other community planning activities Effectiveness of hazard mitigation planning is demonstrated 	<p>Goal 4</p> <ul style="list-style-type: none"> Program delivery is supported by powerful, modern IT systems 	<p>Goal 5</p> <ul style="list-style-type: none"> Program delivery is customer-centric and aligned with partners in flood risk management ecosystems Program activities are informed by evidence of what drives action and routinely updated as understanding of stakeholder behavior improves
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1. Goal 1: Address gaps in flood hazard and flood risk data to form a solid foundation for flood risk assessments, floodplain management, and actuarial soundness of the National Flood Insurance Program.

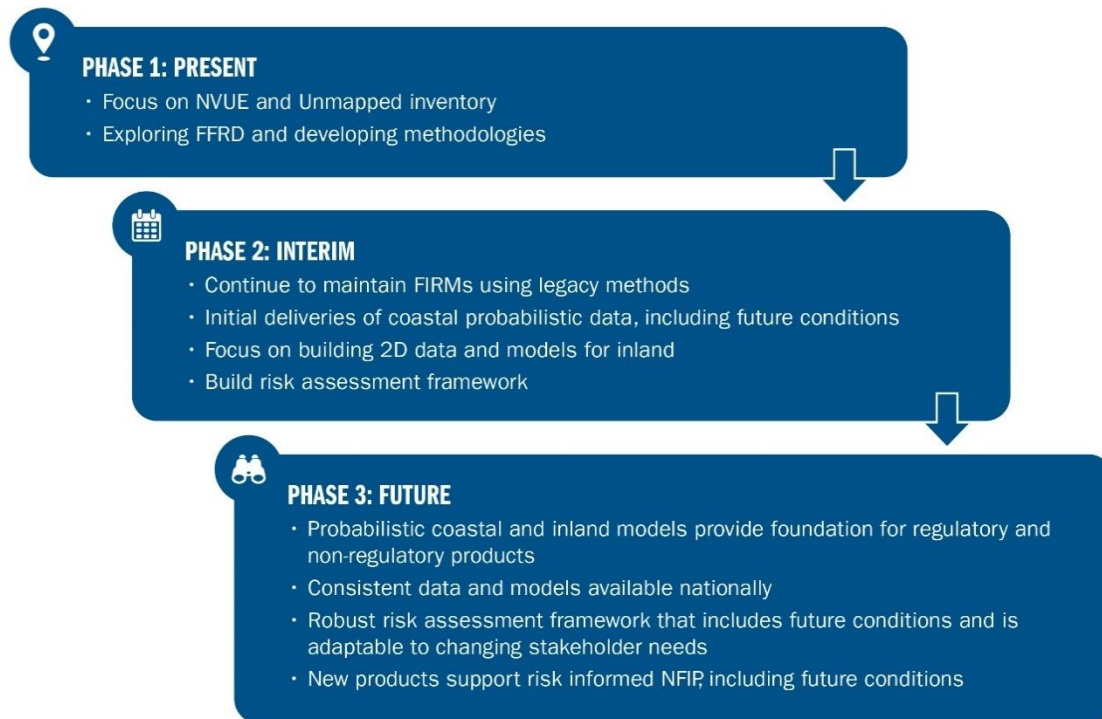


Figure 3: Goal 1 Implementation Phases

1.1. Overview

Under Goal 1, Risk MAP has been focused on addressing the gap of existing outdated flood hazard data in order to reach the 80 percent NVUE target. However, FEMA reached this target early, and now that all the work is underway to address the existing backlog of outdated information, FEMA has begun to reorient its flood mapping approach toward addressing additional flood data gaps. This shift will allow FEMA to develop and deliver more comprehensive flood hazard and risk information.

To address this gap, Risk MAP will implement the methodologies and strategy developed through the Future of Flood Risk Data (FFRD) exploration work. This exploration effort will define a new national flood hazard and risk analysis framework to be built through Risk MAP and delivered through a modernized IT capability. This comprehensive framework is needed to:

- support risk-based insurance rates;
- portray a graduated view of flood hazards and risk;

- provide communities a solid, consistent base on which they can build more detailed local flood analyses;
- provide a national framework to address the unmet statutory mapping requirements; and
- ensure flexible capability to support future products that drive a risk informed NFIP.

FEMA will introduce new flood hazard and risk products to meet customer and partner needs. FEMA will also continue to provide and maintain regulatory determinations of special flood hazard areas and base flood elevations for the current NFIP that comprise the FIRMs. Over the long term, maintenance of these traditional regulatory products will shift to the new framework.

As FEMA expands the non-regulatory products available that depict more comprehensive, graduated flood hazard and risk, these will become the authoritative national information on flood hazard and risk. Use of FIRMs will be focused on compliance with NFIP minimum requirements.

There are four objectives under Goal 1.

OBJECTIVE 1: ENSURE THAT THE REGULATORY FLOOD MAPPING INFORMATION IS CURRENT AND UP TO DATE

FIRMs are used for two primary regulatory purposes – designating the minimum area where mandatory insurance purchase requirements apply and defining minimum floodplain management requirements. The official determinations of special flood hazard areas and base flood elevations shown on the FIRM represent a single scenario, a best estimate of areas with a 1-percent-annual-chance flood. FEMA has made significant investments through Risk MAP in addressing outdated FIRMs. Risk MAP will continue to maintain FIRMs and ensure that the projects started to address outdated FIRMs are completed.

OBJECTIVE 2: BUILD NATIONAL FLOOD MODELING FRAMEWORK

The FIRM provides quality flood hazard information that builds flood hazard awareness and supports NFIP minimum requirements, but the special flood hazard area does not reflect how flood hazards may change in the future or support planning needs for floods smaller or larger than the 1-percent-annual-chance. This approach of using one specific flood estimate as the minimum NFIP criteria for insurance and floodplain management was appropriate to the science and technology of the time when it was implemented and has produced huge benefits. Today, however, more comprehensive information is needed to support a risk informed NFIP and to support resilient flood actions nationally. This has been clearly demonstrated by updates to NFIP insurance rates. The rating analysis showed that flood risk and flood loss in many locations is not fully captured by the traditional flood study methods and models used to create FIRMs. Properties that have similar exposure to the base flood on the FIRM have significantly different total flood risk. It also showed that protecting a property against the base flood sometimes leaves that property vulnerable to very high flood risk. For example, there are areas behind levees or coastal areas where homes built in compliance with the minimum standards based on the 1-percent-annual-chance event may be

subject to total loss from an event that overtops the levee or a direct hit from a hurricane. Modern technology can support a much more comprehensive understanding of flood hazard and risk than was possible when the NFIP minimum standards and FIRMs were designed.

Future flood hazard and risk analysis needs to depict flood hazard and risk much more comprehensively, considering multiple flooding causes and providing a graduated view of the associated hazard and risk rather than a single hazard threshold like the special flood hazard area. FEMA intends to build a modern flood hazard and risk modeling framework that will support comprehensive flood hazard and risk information.

OBJECTIVE 3: ADDRESS UNMET STATUTORY REQUIREMENTS

This modernized flood hazard and risk modeling framework will allow FEMA to address statutory requirements that have been unmet to date. These requirements will be elements of the comprehensive flood hazard and flood risk data produced including completing coverage of unmapped areas and the 0.2-percent-annual-chance floodplain, developing future condition scenario products, and identifying areas of residual risk, inundation areas, and level of protection associated with levees, dams and other flood control structures. These efforts will require close coordination with federal partners during development.

OBJECTIVE 4: DELIVER PRODUCTS THAT POWER A RISK INFORMED NFIP

This modernized flood hazard and risk modeling framework will also allow FEMA to deliver products, tools, and information that power a risk informed NFIP and flood resilient decisions and actions. Some new products will be available quickly, but the details of future products, tools, and information needed will change over time. As the NFIP evolves to be more risk based and Risk MAP is better aligned with what truly drives resilient action, the products and tools needed will evolve. FEMA is designing the modernized flood hazard and risk modeling framework to support whatever future products and tools are needed.

GOAL 1 STRATEGIC LINKAGES

These efforts on Risk MAP Goal 1 are directly aligned with Goal C of the FEMA Resilience risk information and management strategy: *Be the trusted source of comprehensive flood hazard and risk information*. Under the NFIP, FEMA has a unique role to produce flood hazard and risk information for the nation. FEMA Resilience supports people and the nation with products, tools, and information to take actions to reduce disaster suffering across many perils. But, for flooding, FEMA has a specific mandate to maintain an ongoing program to produce flood hazard and risk information. Risk MAP Goal 1 and Resilience risk information and management Goal C are both focused on this mission.

As described above, the Risk MAP Goals are mutually supportive. Risk MAP Goal 1 relies on Goal 2 and Goal 4 to help deliver the information stakeholders need in accessible ways and relies on Goal 5 to understand what customers really need and how to best align program delivery with the customers' needs.

1.2. Objective 1: Ensure that the regulatory flood mapping information is current and up to date

MAINTAIN NVUE

Risk MAP achieved its target of ensuring that 80 percent of the nation’s flood hazards, as mapped for the NFIP, are valid and meet the NVUE standard two years before its 2022 target date. Risk MAP must now maintain the regulatory inventory of stream and coastal miles so that flood hazard information continues to meet current program standards as change occurs. This objective applies to the existing inventory of regulatory mapped miles that are subject to the NVUE assessment process and, as such, represents both a continuation of on-going work and maintenance of previous investments in flood risk information.

FEMA is required by statute to assess on a five-year cycle the need to revise and update all floodplain areas and flood risk zones identified, delineated, or established on regulatory flood maps. This assessment is important because communities are required to use these maps to administer their floodplain management requirements and lenders use them to determine when insurance is mandatory for covered mortgages. Problems with the effective FIRMs create difficulties for communities and homeowners required to use them.

Over time, manmade development and natural processes can alter the land and hydraulic characteristics for a given area, resulting in changes to the flood risk. Revisions to the delineated floodplains are initiated and prioritized based upon multiple factors, including the identification of instances where FIRM data no longer reflects the current risks in flood prone areas.

FEMA has a mature process for tracking the regulatory map inventory in the Coordinated Needs Management Strategy database that Regions, Cooperating Technical Partners, and mapping providers access for programmatic decision making. In addition to tracking cyclical NVUE validation reviews, the Coordinated Needs Management Strategy system allows community officials and FEMA personnel to analyze and track the validity of flood studies to inform community resilience actions and identify inventory update needs.

Using the inventory of flooding sources in the Coordinated Needs Management Strategy System, FEMA established a baseline of flooding sources using three categories:

1. The existing regulatory map inventory is comprised of 1.1 million miles of flooding sources.
2. 1.3 million miles are in areas of potential population growth and FEMA has a mandate to map these miles. These are referred to as unmapped miles.
3. The remaining 1.1 million miles lie on Federal lands and do not need to be mapped on regulatory FIRMs.

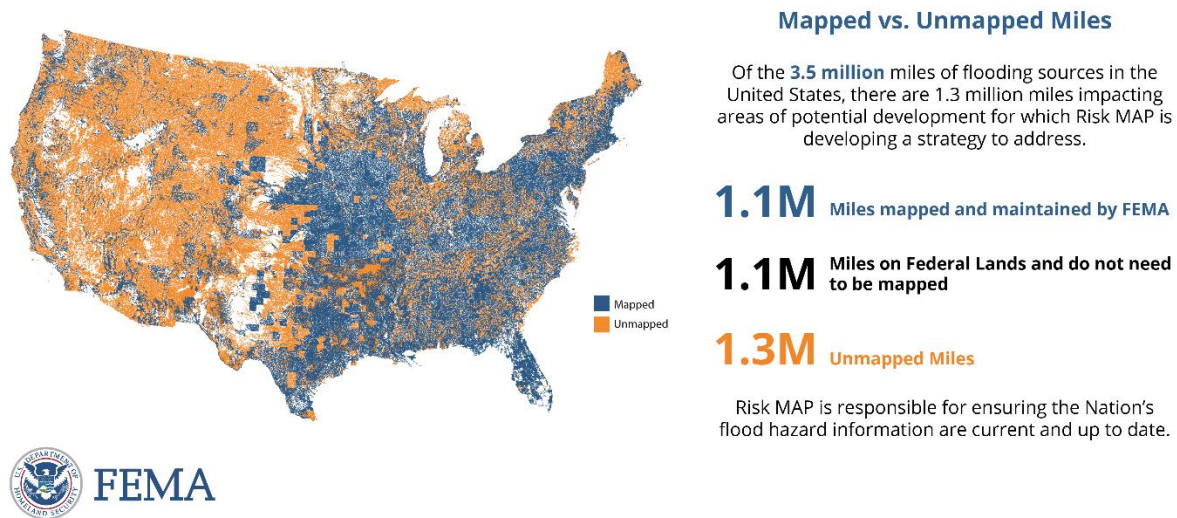


Figure 4: Overview of Mapped and Unmapped Miles

The NVUE measure and Coordinated Needs Management Strategy System are effective for tracking the current regulatory inventory. However, as Risk MAP addresses the gaps in flood hazard and risk information with comprehensive regulatory and non-regulatory flood hazard inventory, more comprehensive tracking is needed. The Coordinated Needs Management Strategy System has already begun tracking some non-regulatory products. FEMA's further tracking will likely include expanding from managing the inventory around rivers and coastline to managing areas that have comprehensive information and expanded assessment and validation procedures.

The program will maintain NVUE as a measure of the percentage of regulatory flood hazards that are new, have been updated, or are deemed to be still valid. NVUE is a ratio of all valid regulatory miles divided by the total miles in FEMA's regulatory inventory. Ongoing projects, including those that address the unmapped inventory, will sometimes add more miles to the regulatory inventory impacting the calculation. This is discussed further under Objective 3.

FINISH ONGOING PROJECTS

The total number of projects in progress varies based on the pace of project completion and initiation. It is the program's goal to reduce the number of ongoing projects. Currently, there are approximately 1,100 ongoing Risk MAP projects that were initiated prior to FY21 to support achieving 80 percent NVUE. NVUE is measured at project initiation and projects take multiple years to complete. These 1,100 projects contributed to the achievement of the 80 percent NVUE metric in FY2020 and this objective is focused on completing them. These projects will produce regulatory flood hazard data products that are formally adopted by NFIP-participating communities. To maintain the focus on closing out this important work, FEMA plans to establish a new program measure focused on the completion of this group of projects.

The duration of each project from initiation to completion is about six to eight years, due to regulatory and statutory requirements. This process includes discovery outreach to stakeholders, development of new/updated flood modeling, the creation of preliminary flood maps, a community comment and appeals procedure, map revisions (if necessary), further community comments and appeal periods (if necessary), and, ultimately, a community's adoption of a regulatory FIRM. The program will continue to follow this process to manage the lifecycle of these regulatory projects from initiation to completion.

Risk MAP utilizes three applications, hosted by the Risk Analysis and Management general support system, to track the progress of projects: the Mapping Information Platform Studies Workflow, the SharePoint-based Key Decision Point process, and the previously discussed Coordinated Needs Management Strategy System. The program uses the Mapping Information Platform to track the map production process. The Key Decision Point process contains the six distinct phases of the flood study procedure. In each phase, FEMA must review and evaluate the progress of the studies, technical components, impacts, and schedules. FEMA then decides to either move forward with or end the project. The Coordinated Needs Management Strategy System aggregates existing digital map data to inventory and manage flood map update issues and to support FIRM revision and production planning activities. Risk MAP will continue to use these tools to track the progress of its projects when they are initially delivered to the community in preliminary format, when the statutory 90-day appeal period is underway, and when the community receives its Letter of Final Determination prior to adoption of a regulatory map.

1.3. Objective 2: Build National Flood Modeling Framework

To better address the gaps in existing flood hazard and flood risk information and support for a risk informed NFIP, a comprehensive flood modeling framework is needed. The new framework will support risk-based insurance rates. It will support moving beyond the binary in/out focus of the legacy FIRMs and support a comprehensive, graduated view of hazard and risk. It will provide communities a solid, consistent base on which they can build more detailed local flood analyses, as well as a national framework to address the unmet statutory mapping requirements like future flood conditions. Finally, it will provide flexible capability to support additional products that drive a risk informed NFIP.

This comprehensive framework is needed to achieve FEMA's strategic goal of a risk informed NFIP. The transition from the legacy NFIP insurance rating methods to the current rating system was the first major step, but not the last. The new insurance rates show the potential for a risk informed NFIP to drive better decision making and increased flood resilience by aligning the cost of insurance much more closely to the true risk of flood loss than before. The development and implementation of the new rates also highlighted many of the limitations of the legacy NFIP structure. To effectively support this new rating approach and other changes needed for a risk informed program, a new comprehensive flood hazard and flood risk framework is needed. FEMA will develop a new program measure that focuses on comprehensive, national coverage of flood information to measure progress on these efforts.

This message has been echoed by many stakeholders, including the Technical Map Advisory Council, a federal advisory committee established to review and make recommendations to FEMA on matters related to the national flood mapping program. The Technical Map Advisory Council’s members include various stakeholders in the mapping process including representatives from other federal agencies, Cooperating Technical Partner representatives, surveyors, and state floodplain managers. In the Technical Map Advisory Council 2020 Annual Report they said *“A structure-based, graduated flood-hazard and food-risk approach greatly advances the ability to understand food hazards and communicate food risks, which is vital to protecting lives and property. The models upon which graduated food risk depictions and other food-risk products rely require detailed and accurate data representations of the real world. These models, and the underlying data, are undergoing empowering technical transformations that will benefit FEMA in the FFRD initiative.”*

GAPS IN FLOOD HAZARD AND FLOOD RISK INFORMATION

The legacy insurance rates, floodplain management regulations, and current FIRMs were developed, based on the science and technology of the time, to be mutually reinforcing and usable by insurance agents and community officials who helped to implement the program. The legacy FIRMs primarily depict special flood hazard areas and associated base flood elevations based on a specific 1-percent-annual-chance flood estimate. Only looking at a single hazard scenario does not provide reliable information about total risk. Today’s science and technology will allow the NFIP to implement new flood risk analysis and mapping approaches that support the risk-based insurance rates and support a risk informed NFIP.

While there is often other flood hazard and risk information on the FIRMs many stakeholders still perceive the FIRMs as saying there is no risk outside of the special flood hazard area. This happens even though one of the core principles for the NFIP is to establish minimum criteria where national policy mandates specific requirements in place of community or individual choices. The NFIP does not require buildings to avoid all flood risk nor to require every building with flood risk to be insured. This binary perception of flood risk was reinforced by the old rating method where nearly all properties outside the special flood hazard area paid the same premium rates and by land use requirements that usually did not apply if you demonstrated you were outside of the special flood hazard area. Flood hazard and risk products need to communicate flood hazard and risk information everywhere, not just in the 1-percent- or 0.2-percent-annual-chance floodplains. FEMA needs to provide information that communicates the variation in hazard and risk from the high-risk locations in the heart of the special flood hazard area to areas where the chances of flood impacts are very low, though rarely, if ever, non-existent. **FEMA must present a graduated view of flood hazard and risk.**

The special flood hazard area only represents one specific flood scenario. It is calculated assuming a 1-percent-annual-chance flood driven primarily by overflow from rivers and streams or storm surge and waves along the coast. The current maps do not attempt to identify flood hazards and risks from other flood causes such as pluvial flooding that results from the accumulation of heavy rainfall in flat or low spots outside of the usual stream network. More flood types, flood frequencies, and spatial

coverage are needed to manage flood risk. **FEMA must present a more comprehensive view of possible floods.**

Statutory requirements enacted in the Biggert-Waters Act of 2012 (BW-12) and the Homeowner Flood Insurance Affordability Act of 2014 (HFIAA) also require new analysis throughout the country to address unmapped areas, provide 0.2-percent-annual-chance floodplain information everywhere mapped, provide future conditions flood risk information and residual risk, inundation, and level of protection associated with levees, dams and other flood control structures. These requirements are addressed under Objective 3 of this goal. **FEMA needs a new modeling framework to efficiently meet these new requirements with nationally consistent products.**

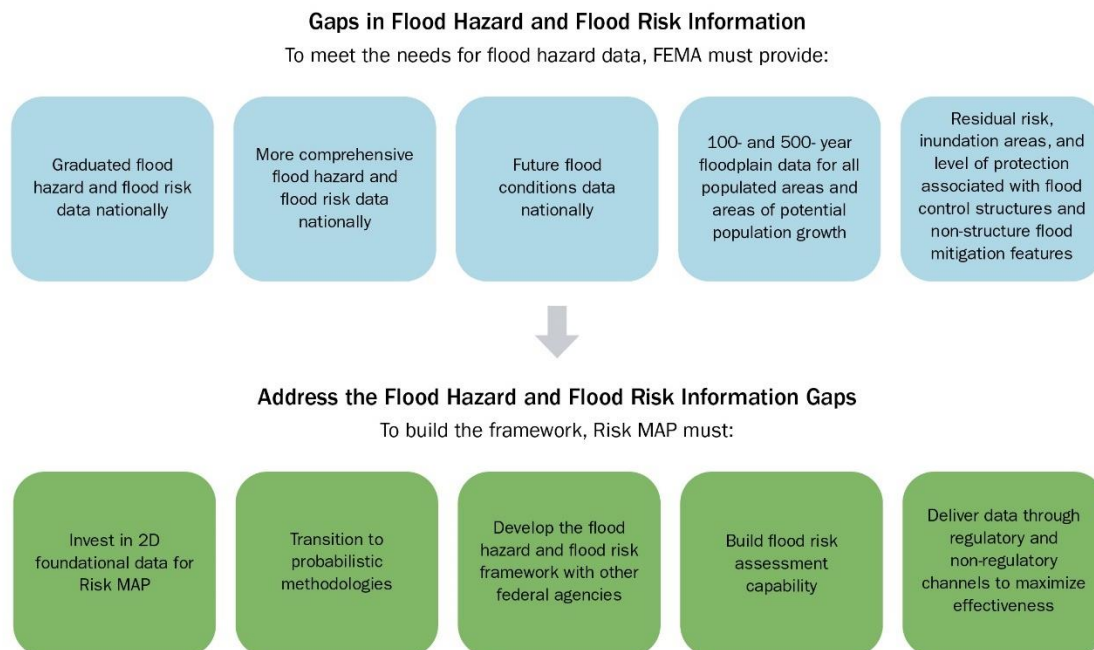


Figure 5: New Modeling Framework to Address Flood Data Gaps

ADDRESSING THE FLOOD HAZARD AND RISK INFORMATION GAPS

To meet all these needs and to have a solid foundation for flood hazard analysis and flood risk management for the future, a new framework is needed. It might be feasible to address one or two of these gaps in flood hazard and flood risk data by building on and extending the current flood hazard analyses. But that is not a feasible way to address them all. The following elements will be required:

2D Modeling

2-dimensional (2D) modeling is the best approach to account for a wider variety of flood modes (e.g., fluvial, pluvial, coastal) and better characterize the flood hazard and risk across the entire landscape. 2D modeling is already the foundation of coastal flood risk analysis.

This approach was impractical in the past, but data suitable for a 2D model development is far more available than in the past for the interior of the nation. This shift in data availability continues to make 2D an easier option to automate and update as data sets are updated. Support for 2D modeling in the core products from the United States Army Corps Hydrologic Engineering Center has also enabled this approach and FEMA is working with the Hydrologic Engineering Center to update their models as needed to support the vision of a new 2D probabilistic modeling framework. This will help reduce computational and program costs.

FEMA has already been making investments in 2D engineering to develop initial information for unmapped areas and potential updates to mapped inventory in several Regions. In FY23, FEMA will continue to invest in large scale 2D models that can be used as the base for both deterministic regulatory products and graduated, probabilistic flood hazard assessments.

Over the next several years, Risk MAP will be phasing out new 1D (one-dimensional) deterministic analysis for the interior of the nation in nearly all cases. 1D deterministic modeling only supports legacy regulatory products and will likely need to be replaced in the future with the new framework based on 2D models. In the interim FEMA will better define the requirements for developing 2D models and deriving regulatory products from the 2D models.

A Probabilistic Approach

As mentioned above, a limitation of the current analyses is the somewhat simplified approach to modeling inland hazards. FEMA flood hazard modeling has historically used a deterministic modeling approach to produce a single best estimate of the 1-percent-annual-chance flood event to align with the NFIP legacy insurance rating and regulatory requirements. But this approach provides little information about the uncertainty in this estimate and can be very sensitive to assumptions or estimates needed for the analysis.

Flood modeling requires the combination of complex computational systems. These systems can compound uncertainty in ways that are challenging to assess, and a single best estimate result does not provide enough information about the range of possible solutions. Probabilistic modeling methods use statistical relationships to help understand the variability and uncertainty in a flood risk estimate. Transitioning from a traditional deterministic flood hazard analysis to robust probabilistic analysis will result in more reliable results that more comprehensively characterize the range of possible outcomes.

That does not mean public facing information must be complex. Probabilistic information can empower simple, graduated products. The results can still provide an estimate of the 1-percent-annual-chance event, other specific probabilities, or other easy ways to understand flood risk information. The same analysis can also give a robust analysis of total risk.

While FEMA's coastal mapping products have been similar to inland products in depicting a binary view of the hazard, the analysis methodologies have been more similar to this future vision because

of the state of the science in coastal flood hazard modeling versus inland modeling. This provides an existing foundation in the eastern U.S. to start building the new framework.

Work is underway to deliver comprehensive probabilistic hazard and risk information within the future national framework for the entire Atlantic and Gulf of Mexico U.S. coastlines. FEMA and the United States Army Corps of Engineers (USACE) have developed baseline data with methodologies to produce comprehensive probabilistic hazard information and have initiated full scale production of these framework data for the Atlantic Ocean and Gulf of Mexico coastlines in the United States. The expectation is that these data will be available in 2025. This work will provide a shared interagency coastal flood hazard framework used to derive flood risk data for each agencies' requirements.

For the interior of the nation, the shift to probabilistic methodologies still needs to occur and is a focus of current efforts. FEMA needs to work across the Federal government over the next five years to address science and data gaps.

An Interagency Framework

FEMA is working to build the flood modeling framework collectively as an interagency effort. The new flood hazard and risk modeling framework will be built with shared baseline data sets and a collection of shared framework models. USACE and FEMA are using this approach to develop the framework coastal analyses for the Atlantic and Gulf of Mexico mentioned above.

The framework FEMA requires must include flood hazard and risk, but it would help enable science agencies to understand broader water resource issues for current conditions and future climate scenarios. A non-exhaustive example of this type of framework and specific interagency collaboration are below for fluvial and pluvial flood hazards.

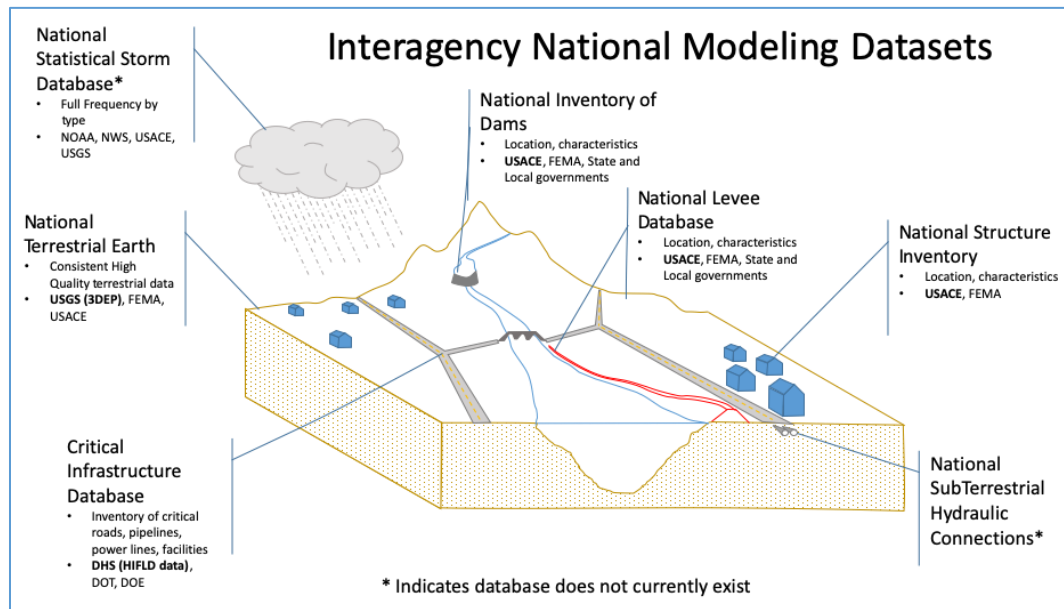


Figure 6: Interagency National Modeling Datasets

FEMA has been advocating for this interagency approach through water resources interagency coordination groups, through ongoing work agreements with the U.S. Army Corps of Engineers and at the staff level on individual projects. More detail on current interagency collaborations is provided in Appendix E.

Risk Assessment Capability

The flood mapping program historically has just mapped flood hazards. Understanding how those hazards can affect people and property, however, is important to resilience planning, risk management, and (risk communication) communication of risk. The Natural Hazards Risk Assessment Program, using authorities under Section 216 of the Biggert-Waters Flood Insurance Reform Act of 2012 (42 U.S.C. 4101b) provides a framework for establishing a common understanding of risk assessment data for all hazards that are flood-related. The Natural Hazards Risk Assessment Program uses hazard identification and consequence data to provide risk assessment capabilities and methodologies to SLTT partners. Ensuring that the best science and most relevant data is being leveraged for risk assessment and loss modelling activities is foundational to maintaining credibility and providing risk information that can lead to resilient decision-making.

Probabilistic flood hazard assessments, derived from an interagency framework, will provide detailed information on the probability and magnitude for different flood hazards (e.g., surge, riverine, pluvial, waves). FEMA will go beyond just mapping the hazard to build a flood risk assessment capability, rooted in site-specific analysis. Foundational to the risk assessment capability for FEMA will be the access to flood hazard information, as discussed above, in concert with the ability to leverage infrastructure (site-specific) information, such as a national structure inventory, and damage functions that estimate how infrastructure responds to different flood conditions. Open science approaches rooted in transparent, accessible, inclusive, and reproducible data and methodologies will drive the development of our framework outlined in Objective 2 and products, tools, and resources outlined in Objective 4.

The Natural Hazards Risk Assessment Program’s activities over the next five years will support the Risk MAP program to power a risk informed NFIP by:

- Supporting the development of credible and relevant risk assessment and loss modelling methodologies;
- Continuing research and data development activities to further advance climate change adaptation, social equity, and risk data accessibility initiatives;
- Continuing support of the National Risk Index, which provides FEMA programs, other Federal agencies, and SLTT partners with a quantitative tool that can be used to examine the intersection of natural hazard risk and social equity for the implementation of FEMA programs and efforts to advance resilience;
- Support maintenance of [Community Disaster Resilience Zones](#). [Community Disaster Resilience Zones](#) aim to build and strengthen community resilience across the nation by driving federal, public, and private resources to the most at-risk and in-need communities. The [Community Disaster Resilience Zones Act](#) uses FEMA’s [National Risk Index](#) the [Climate and Economic Justice Screening Tool](#) to identify the most at-risk and in-need communities to identify resilience zones. Designated zones will be prioritized for targeted federal support, such as increased cost-share for resilience and mitigation projects, lessening the financial burden on communities to perform resilience-related activities.
- Supporting the transition of the National Risk Index program funding to the Disaster Relief Fund (DRF) as outlined in the Community Disaster Resilience Zones Act of 2022;
- Continuing investments in the transformation of FEMA’s loss estimation software (Hazus) to an open science environment (OpenHazus) that will provide stakeholders with freely accessible and credible risk assessment methodologies and risk assessment models and approaches, allowing for a more robust collaboration with the risk assessment community; and
- Providing risk assessment guidance, tools, standards, best practices, to ensure FEMA programmatic integration.

Regulatory and Non-Regulatory Data

Risk MAP will expand the production of non-regulatory products which supplement regulatory products. The regulatory FIRMs are constrained in many ways that limit their usefulness as flood hazard and flood risk communication tools. FEMA will introduce new non-regulatory, comprehensive, and graduated flood hazard and flood risk data products that will serve as the primary public flood hazard and risk communications tools. Limiting the regulatory review and approval processes to the compulsory special flood hazard area and base flood elevation data will allow FEMA to deliver other products more quickly, flexibly, and cost effectively.

The flood mapping program was created to develop data on special flood hazard areas and base flood elevations as official determinations by the FEMA Administrator to define the regulatory minimums for the NFIP. The original mandate for the mapping program also included establishing flood risk zone data and providing data to support the estimate of rates of flood caused losses. Over the years, Congress has expanded the scope of the mapping program multiple times to mandate analysis, mapping, and sharing of a wide variety of additional flood hazard and flood risk data and related information beyond official determinations of special flood hazard areas and base flood elevations.

The NFIP statutes include extensive coordination and due process procedures for the development and finalization of regulatory special flood hazard area and base flood elevation determinations shown on FIRMs. Because of the compulsory nature of these determinations and the mandates they impose on communities and individual property owners for land use and insurance purchase, these process safeguards are essential to preserving property owners' rights. However, the safeguards typically add years to the time it takes to deliver final determinations and updated FIRMs. While the processes are integral to preserving the rights of those impacted by the FIRMs, they often have the effect of limiting the availability of flood hazard and risk information that could benefit many stakeholders. Historically, FEMA has followed this full regulatory process to develop and publish all flood hazard and risk information. This process resulted in the publication of FIRMs and more recently the publication of FIRMs and the National Flood Hazard Layer.

To meet the mandate to provide regulatory determinations of special flood hazard areas and base flood elevations and maximize availability of a wide variety of flood hazard and risk information, FEMA plans to deliberately separate the delivery of regulatory determinations from the delivery of other non-regulatory flood hazard and flood risk information. FEMA will continue to update FIRMs and the National Flood Hazard Layer with new official special flood hazard area and base flood elevation determinations where appropriate, but FEMA will also expand sharing of flood hazard and risk information through parallel non-regulatory² channels to maximize information availability. FEMA and its state partners have already been using this approach to share early drafts of flood hazard

² FEMA generally describes these supplemental flood hazard and risk products that are not official determinations as “non-regulatory” because they are not used as part of the NFIP mandatory minimum requirements although some communities may choose to use them in local zoning.

and risk information before deciding whether these analyses will eventually be refined and issued as official determinations.

Sharing flood hazard and flood risk information through non-regulatory channels is a key element of FEMA's plan to address the flood hazard data gaps described above. Many of the unmet statutory requirements discussed under Objective 3 call for expanded flood hazard and flood risk information beyond official determinations. FEMA intends to make most of this information available through these alternative channels. This will increase the availability of reliable flood hazard and risk information, reduce the time it takes to make updated information available, and provide more flexibility to deliver the information in ways that are community and customer focused. Community actions would therefore be more effective at equipping and compelling people to take actions to reduce their risk in support of Goal 2 and Goal 5. Regulatory special flood hazard area and base flood elevation determinations will still be available through FIRMs and the National Flood Hazard Layer, but the primary source of flood hazard and risk information from FEMA will shift from those regulatory products to the newer, more comprehensive non-regulatory products. Through this approach, Risk MAP will be positioned to support the NFIP as it progresses along its risk informed transformation effort.

SUMMARY

This new national flood modeling framework will better address the gaps in existing flood hazard and flood risk information. The framework will support a risk informed approach to flood risk management for the NFIP. NFIP insurance rating, floodplain management regulations, flood mitigation grants and FIRMs were designed to be mutually reinforcing in support of managing and reducing the nation's flood risk. The modernization of insurance rating is a significant first step forward toward a risk informed NFIP. A new national flood hazard and risk analysis framework is needed to achieve this vision.

1.4. Objective 3: Address Unmet Statutory Requirements

Several additional statutory flood hazard and flood risk analysis and mapping requirements have been enacted in NFIP reform bills, including the Biggert-Waters Act of 2012 (BW-12) and the Homeowner Flood Insurance Affordability Act of 2014 (HFIAA). These Acts introduced the requirement for FEMA to analyze and map flood hazards for areas of possible population growth, in addition to analyzing and mapping currently populated areas. The law requires FEMA to analyze and map:

- the 500-year [0.2-percent-annual-chance] floodplain for all these areas, in addition to the 100-year [1-percent-annual-chance] floodplain;
- future flood conditions;
- areas of residual risk, including areas protected by levees, dams, and other flood control structures;

- areas of inundation due to failure of levees, dams, or other flood control structures;
- the level of protection provided by flood control structures and non-structural flood mitigation features; and
- areas protected by non-structural flood mitigation features.

These requirements address some of the gaps in flood hazard data that the Risk MAP program is designed to address. These recent statutory changes also included many communication and outreach requirements to help increase the public's awareness and understanding of flood risk management. Risk MAP prioritized achieving the NVUE target while developing approaches to address these requirements. Since reaching the NVUE target, FEMA has prioritized addressing the unmapped inventory and plans to address all these requirements through the comprehensive flood hazard and flood risk information FEMA will produce.

FEMA has begun projects to address unmapped areas and expand coverage of 0.2-percent-annual-chance floodplains and is developing methodologies that will support all these requirements. FEMA is beginning to shift the Risk MAP mapping approach from the legacy approach to the new framework described in Objective 2. The new approach will support mapping future flood conditions, analysis of levees, dams, flood control structures and non-structural flood mitigation features, remaining work to address unmapped areas and 0.2-percent-annual-chance floodplains in addition to the broader gaps in flood hazard and flood risk data.

UNMAPPED AREAS AND NATIONAL COVERAGE FOR 0.2-PERCENT-ANNUAL-CHANCE FLOODPLAIN:

In looking at populated areas and areas of possible population growth, FEMA is evaluating its current inventory against national flooding source inventories. Approximately 1.3 million of the 3.5 million miles of flooding sources in the United States are riverine miles of potential flood risk with a drainage area of one or more square miles on non-Federal lands that are not currently mapped on a FIRM. These are referred to as “unmapped miles”. Additionally, some areas of the country do not have 0.2-percent-annual-chance floodplains available. Mapping unmapped areas and the 0.2-percent-annual-chance floodplain are both requirements under BW-12.

In order to meet the requirements, address the unique mapping needs of communities around the United States, and determine how to best allocate federal resources to those communities, FEMA intends to develop a national flood hazard baseline. This baseline will include unmapped areas and 0.2-percent-annual-chance floodplain through the investments in 2D modeling and a national flood modeling framework. As FEMA looks to its future investments, it will balance current program needs such as maintaining NVUE and completing ongoing projects with building the national coverage framework. The benefit of continuing to invest in 2D modeling while the framework design is refined is that these investments can support the development of regulatory products, non-regulatory information, 0.2-percent-annual-chance floodplains, unmapped areas, and the future framework.

FEMA will develop criteria to determine whether new flood hazard and flood risk data developed are most appropriate for production as a FIRM or an alternate mechanism, such as a digital display of non-regulatory information. As discussed in Objective 2, the non-regulatory approach will make more data available more quickly where it is appropriate in these unmapped areas. A better understanding of capability gaps, through community engagement and the more detailed evaluation of the technical criteria to understand a threshold of need, will also allow the Risk MAP program to tailor technical assistance to the needs of the communities using the data.

FEMA has already made progress in mapping the 1.3 million miles of unmapped inventory of flooding sources, with nearly one-third of the unmapped inventory since 2021 currently in data production. This will be a component of how FEMA measures progress in the future.

ANALYZING LEVEES, DAMS, OTHER FLOOD CONTROL STRUCTURES AND NON-STRUCTURAL FLOOD MITIGATION FEATURES

Per statute, FEMA must analyze and identify the residual risk, inundation areas, and level of protection (flood risk reduction) associated with levees, dams, and other flood control structures, as well as identify similar information for non-structural flood mitigation features.

The primary challenge to implementing these statutory requirements has been the lack of consistently available data across the nation. FEMA and USACE have made progress to implement these requirements by collaborating to develop a consistent nationwide levee dataset in the National Levee Database (NLD) and to evaluate and develop methods to estimate flood risk in areas behind levees.

Through this collaboration, FEMA has been working with USACE to utilize and refine levee data in the NLD and Levee Screening Tool (LST), both maintained by USACE. The NLD is the federally recognized source for levee information in the nation, as authorized by Congress, and is a dynamic database that is continually updated to add or refine levee data from federal agencies, states, tribes, territories, and local sources. The LST is a risk assessment tool used by USACE to efficiently characterize levee risk based on available information about hazards, conditions and performance of a levee and the potential consequences of flooding. FEMA intends to partner with USACE to use the LST to develop flood risk information and inundation areas for all levees in the nation, as funding allows.

Similar progress is anticipated to be made for dams via ongoing and planned federal, state, tribal, territorial, and local coordination to maintain and enhance data in the National Inventory of Dams under the authorities of BW-12 and the National Dam Safety Program. The National Inventory of Dams is the federally recognized data source for dam information and is maintained primarily by states and federal agencies such as USACE. FEMA and USACE are exploring the feasibility of developing a Dam Screening Tool, similar to the LST, to develop flood risk information and inundation areas associated with dams across the nation in order to meet statutory requirements, as funding allows.

It should be noted that there is no existing national dataset for “other flood control structures” or “non-structural flood mitigation features.” However, through the implementation of the Risk MAP flood study process, FEMA routinely identifies and includes the impacts of these structures and features as part of hydrologic and hydraulic analyses and the resulting flood hazard mapping, as appropriate.

The new framework described under Objective 2 will provide nationally consistent multi-frequency current and future conditions flood hazard and flood risk information to support analyses of all these various structures and features.

Under the current paradigm of regulatory products, the oversimplification of flood hazards on FIRMs is often most acute where flood control structures are designed to protect against (reduce risk from) the base flood scenario, particularly for communities seeking FEMA accreditation for their levees on a FIRM. Levee accreditation has inadvertently prompted communities to focus on designing or improving their levee systems to meet the minimum requirements set forth in 44 CFR 65.10, which is tied to the 1-percent-annual-chance flood event but is not a design or safety standard. Instead, levee design should be based on each community’s unique flood risk, which is informed by the consequences that may occur when a particular levee fails or is overtopped. The depiction of flood hazards around these structures on FIRMs is often misleading and does not represent the total flood risk and possible consequences for other potential flooding scenarios.

As part of building the new national flood modeling framework, FEMA will continue to work closely with USACE to enhance national datasets and develop consistent methodologies to identify areas of residual flood risk and inundation due to failure of levees and dams. FEMA and USACE routinely collaborate through the implementation of Risk MAP, the National Levee Safety Program, and National Dam Safety Program (NDSP) authorities to jointly develop and manage flood hazard and flood risk information associated with levees, dams, and other flood control structures.

FEMA and USACE will continue to improve key levee data elements needed to refine risk assessment methodologies and are actively planning to work together to identify and assess dams, in conjunction with the National Dam Safety Program. The use of authoritative data sources allows FEMA to consistently evaluate flooding within a watershed and collaborate with federal partners to achieve each organization’s mission more efficiently. Leveraging these data sources within the national flood modeling framework will allow FEMA to more efficiently identify residual risk, areas of inundation and level of protection associated with levees, dams, and other flood control structures, while also advancing related national flood risk management objectives in tandem.

ANALYZING FUTURE FLOOD CONDITIONS

Risk MAP will develop data showing future flood hazard and risk based on estimates of future conditions. These data will complement the regulatory flood data and new, more comprehensive products showing current conditions flood hazard and flood risk. To achieve this, FEMA has been working with other federal agencies and key stakeholders to determine the best approaches within the proposed national flood model framework. FEMA has collaborated with the Flood Resilience

Interagency Working Group’s Science Subgroup as well as the Technical Map Advisory Council. Both groups have independently assessed the state of the science for future flood conditions and the approaches of flood modeling planned for the new national flood modeling framework, and both have endorsed the approach. The Technical Map Advisory Council’s Future Conditions Risk Assessment and Modeling Report (2015) recommended that FEMA develop non-regulatory products that reflect information about future conditions. These recommendations were updated (2021) to reflect the Technical Map Advisory Council’s recommendation that FEMA transition to a graduated flood risk framework (objective 2) with probabilistic methodologies to support analyzing future conditions.

The Flood Resilience Interagency Working Group, created under the National Climate Task Force, created a Science Subgroup in 2021 to review and update the best-available, actionable science for analyzing future flood conditions. The Science Subgroup recommends “Climate-Informed Science” approaches³, which use the best-available, actionable methods to evaluate future changes in flooding, which FEMA envisions developing through the new national flood modeling framework. The new framework described in Objective 2 will provide the ability to extend the current conditions analyses to estimate future flood hazards. Through the national modeling framework, changes in water-resource management (dams, levees, mitigation features), changes in land-use (impervious cover, post-fire, vegetative migrations), and changes to precipitation, sea levels, storm intensity and other factors impacted by climate change can be evaluated to support both scenario-based calculations and future flood hazard and flood risk information development.

The Risk MAP program does not intend to develop independent estimates of future changes to precipitation, sea level rise, storm intensity and frequency or other conditions affecting flooding; these estimates will be used from other Federal agencies and/or other authoritative sources. FEMA is focusing on building the flood hazard analysis framework. The new framework will allow these estimates to be incorporated to produce various future flood hazard scenarios. The initial products with these expanded capabilities are expected to be available by 2025 for the Northeast, Atlantic, and Gulf coasts and will provide future flood hazard data incorporating potential sea level rise scenarios.

As previously mentioned, FEMA is also working with the Interagency on several other projects related to future climate. FEMA has evaluated pilots on long-term erosion for production of national products and is collaborating with USACE on advancing future lake scenarios for the Great Lakes. To support advances in hydrologic and hydraulic methods to estimate future conditions, FEMA has begun work with both USACE and USGS to address storm typing that will allow evaluation of future flood forcing scenarios.

³ <https://www.whitehouse.gov/wp-content/uploads/2023/03/Federal-Flood-Risk-Management-Standard-Climate-Informed-Science-Approach-CISA-State-of-the-Science-Report.pdf>

In the interim, FEMA will produce flood hazard data, based on its current conditions flood hazard inventory, that depict the floodplain and flood elevation requirements for the Federal Flood Risk Management Standard. The Federal Flood Risk Management Standard is a flood standard that applies to federally funded buildings and projects. The Federal Flood Risk Management Standard requires higher levels of flood resilience than the National Flood Insurance Program minimum standards to provide greater flood resilience against current and future flooding.

These products will help communicate possible future scenarios to property owners and support the implementation of the Federal Flood Risk Management Standard policy. As the more realistic, science based future conditions products from FEMA become available, they should provide actionable data for the Climate Informed Science Approach under Federal Flood Risk Management Standard.

1.5. Objective 4: Deliver Products that Power a Risk-informed NFIP

The future flood hazard and risk modeling framework will allow FEMA to deliver products, tools, and information that power a risk informed NFIP and flood resilient decisions and actions for current and future flood conditions. Building on credible underlying data, FEMA will deliver products to make flood hazard and flood risk information easily accessible to a wide variety of stakeholders. These products will expand well beyond the limited view of flood hazard depicted on the regulatory FIRMs.

The Risk MAP vision described in this plan is comprehensive, graduated flood hazard and risk information to support a risk informed NFIP. The details of future products, tools, and information that are most effective for stakeholders will be further defined and change over time. One key element of Goal 5 of this plan is to develop improved, evidence-based information about what drives people to take resilient actions. Under Goal 2, FEMA also intends to better understand the unique characteristics of communities and refine the delivery of Risk MAP messages, tools, and information to fit the specific recipients. This learning will help to guide the design and development of future products and tools. The modern base of a comprehensive flood hazard and risk framework will provide reliable national data for professionals to use and build on and will also allow FEMA to produce customer centric national products and tools that drive resilient flood actions as well as customized local solutions.

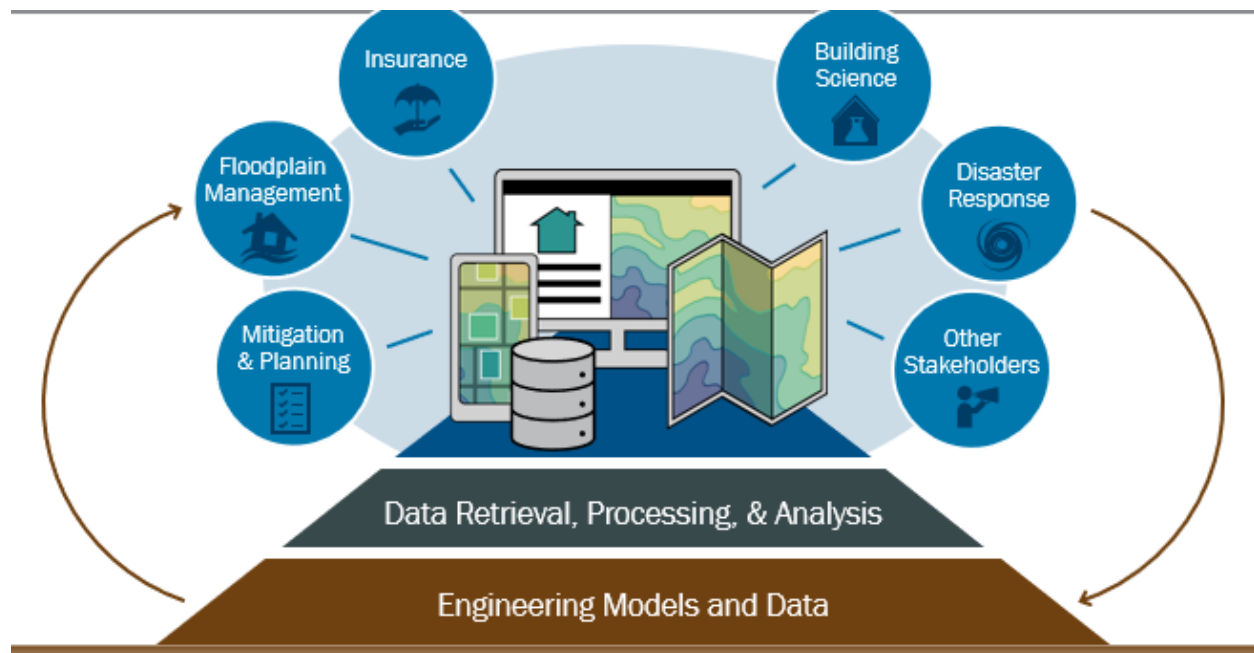


Figure 7: New Flood Modeling Framework Supports Products for Many Users

One of the foundational changes FEMA is committed to is providing structure specific (site-specific) graduated flood hazard and flood risk data. This is a fundamental shift away from the legacy regulatory flood maps and a past emphasis on analyzing and mapping the magnitude of a specific hazard scenario (i.e., 1-percent-annual-chance flood estimate). FEMA will provide products showing comprehensive flood hazard data for possible flooding scenarios. FEMA will also provide flood risk assessment capabilities at the individual structure level (site-specific).

Risk management and resilience planning need to begin with credible and readily available risk information (both the probability of a hazard occurring and the potential impacts). The Risk MAP Program will provide cutting-edge flood risk assessment tools, datasets, and methodological guidance that power a risk informed NFIP and effective community resilience planning. This supports resilient actions to reduce disaster suffering by ensuring that all communities have the risk information they need to make data driven decisions through FEMA’s risk reduction programs (Mitigation Planning, Risk MAP, Hazard Mitigation Assistance, NFIP, Building Resilient Infrastructure and Communities (BRIC), catastrophic planning, etc.). Credible risk assessment information is also important to delivering programs with equity and responsiveness to our changing climate.

2. Goal 2: Consult with, and empower, communities to measurably reduce current and future flood risk.

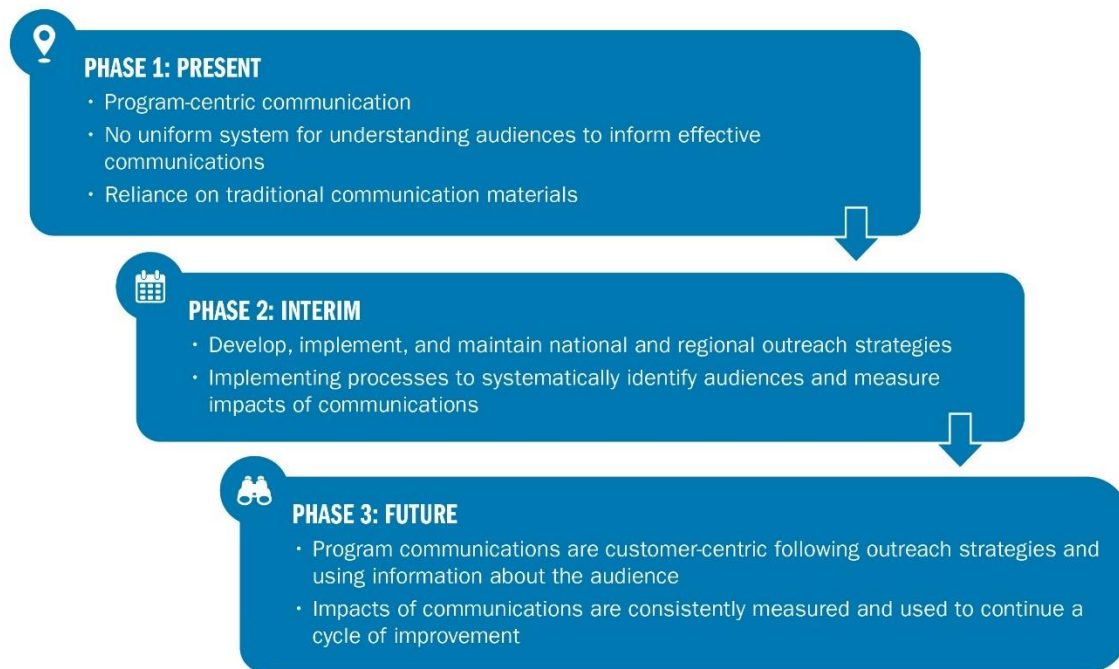


Figure 8: Goal 2 Implementation Phases

2.1. Overview

To achieve Goal 2, Risk MAP will develop and deliver on national and regional outreach strategies. These strategies will be customer-centric, in conjunction with the framework outlined under Goal 5. Risk MAP will also create and implement processes to gain insights about communities so that delivery can be tailored to meet their specific needs. Risk MAP will maximize and measure the effectiveness of program communications and engagement by delivering on a vision for Risk MAP’s role within the complex network that is risk information. This will be done, in part, by gaining and leveraging a broad understanding of what customers and communities need and what drives, motivates, and enables of resilient action for those stakeholders.

Risk MAP Goal 2 supports Goal A of the FEMA Resilience risk information and management strategy: Consult with communities to act on their present and emerging resilience opportunities.

2.2. Objective 1: Develop national and regional outreach strategies that include shared priorities and multi-year plans for advancing equitable risk reduction through outreach and engagement.

The National Outreach Strategy (NOS) and Risk MAP Regional Outreach Strategies (ROS) help Risk MAP organize around FEMA strategic doctrine and use community outreach, strategic

communications, and partnership engagement to support and enable communities. The Risk MAP NOS includes specific emphasis on three focus areas and three foundational principles.

Focus areas are elements of the Risk MAP NOS that align with critical programmatic priorities and require concerted effort and attention to achieve longer-term objectives. They include:

- Incorporating climate adaptation and future conditions into communications and engagement strategies;
- Integrating equity into service delivery; and
- Engaging partners to drive resilient outcomes.

Foundational principles are key elements of effective communications and should be considered fundamental to all outreach and engagement. They include:

- Strategic communication is integrated into all program and project planning and execution;
- All outreach and engagement strategies and tools are designed to meet audience needs; and
- Outcomes are tracked and measured through a robust research and measurement framework.

Through the NOS and ROS, Risk MAP can:

- Intentionally plan and execute results-oriented projects and initiatives;
- Effectively manage staffing and resource requirements;
- Identify knowledge and capacity gaps;
- Plan with clear roles and responsibilities in mind;
- Foster better collaboration across programs, branches, and divisions;
- Add structure and cohesion to organizational change management; and
- Benchmark, monitor, and measure results, impacts, and outcomes of projects and initiatives.

Establishing a NOS is key to driving aligned outcomes and levels of effort that better support the intent of Risk MAP and this goal. These strategies were developed, and are revised, in an iterative manner to foster alignment and to identify themes, opportunities for collaboration, and needs for support. This improves the consistency of outreach and engagement across the country while better leveraging work across regions. Lastly, the development and implementation of these various strategies foster alignment in support of Agency, Administration, and Congressional priorities and legislation, as well as stakeholder feedback. The connectivity between the NOS and ROSs will

continue as each strategy is updated, the NOS twice per year and each ROS annually. This iteration allows for the incorporation of best practices and lessons learned and evolution based on progress.

National strategy efforts will include defining how Risk MAP can increase the effectiveness of key strategies like delivering structure specific flood risk information through OpenHazus, providing a more comprehensive view of flood hazards through regulatory and non-regulatory data and tools, and supporting SLTT government hazard mitigation planning.

Each ROS aligns to the NOS while allowing for regional-specific focus areas that are responsive to their stakeholders' needs and priorities. These strategies were developed by, and with, HQ and Regional staff to cultivate alignment and feedback. This approach will be repeated in accordance with their respective update cycles. Further, the process improves consistency in outreach and engagement across regions.

The National Outreach Strategy and Regional Outreach Strategies support each of the risk information and management goals, but are particularly aligned to the risk information and management strategy objective A1: work with regional staff and programs in FIMA and Resilience that employ community engagement and identify common outcomes and shared priorities. This objective also informs engagement and resource development under goals 3, 4, and 5, serving as the foundational understanding of customer needs and enabling requirements. This objective is also informed by Goals 1, 3, 4, and 5 as their priorities and activities influence how current and future NOS and ROS versions prioritize activities.

Objectives 2 and 4 of this goal create a cycle of insights and iterative learning that informs future versions of the NOS and ROSs. By understanding the customer and evaluating impact of current programs, Risk MAP will be able to update and revise NOS and ROS strategies and priorities to be more customer-centric and increase effectiveness. Objective 3 of this goal builds on the appropriate ROS, which is already building upon the NOS, to ensure tailored yet consistent engagement for each community.

2.3. Objective 2: Implement strategies for gaining insight that informs a customer-centric approach to community engagement, partnerships, and other aspects of program design.

Customer-centric work is a focus for the entire agency. Insights gathered from work conducted under this objective will prepare FEMA staff, contractors, and partners to work with the customer in mind, to understand the community they're engaging with, and to design communications and programs that equip and empower communities by meeting them where they are.

Collecting quantitative and qualitative information about communities will also help establish a baseline of the community's knowledge about and attitude toward flooding so that FEMA can understand whether they are increasing awareness and action, as described in Objective 4.

In addition to the insights listed below, Risk MAP is developing a Customer eXperience (CX) framework to better learn about the customer journey, pain points, and desired outcomes to better align and deliver the program in a way that is easier to interact with and more effective at increasing understanding and reducing risk. The CX framework is under development while Risk MAP onboards CX capability and capacity to meet the emerging needs of these activities and the OMB A-11 Section 280 Managing Customer Experience and Improve Service Delivery requirements regarding how federal agencies should manage, measure, and report customer experience.

Examples of the relevant and valuable customer insights that will be collected include:

- Community structure and demographics;
- Mindset and community personality;
- Potential partners and other influencers;
- Equity and social vulnerability factors;
- Community priorities;
- Areas of risk;
- Past resilience-related efforts; and
- Current community resilience capacity.

These insights will be garnered from data collected from:

- Traditional and social media analyses;
- Consumer behavior databases;
- Existing secondary research studies;
- Community input;
- Regulatory and non-regulatory hazard risk databases/tools;
- Building code databases;
- Primary research; and
- Surveys and other direct feedback mechanisms,

This objective provides the insights necessary to connect the NOS and ROS developed in Objective 1 to tailored community-level outreach strategies as laid out in Objective 3 of this goal. This drives consistent outreach by relying on the NOS and ROSs while considering the community-specific needs

and opportunities. An effective CX program also supports all goals in this plan by serving to evaluate effectiveness and inform how best to create and deliver the data, platforms, and plans that result in reduced current and future flood risk.

2.4. Objective 3: Develop community specific outreach strategies that compel and empower people to take action to reduce their risks.

Developing community-specific outreach strategies that equip, motivate, and empower communities to act starts with a better understanding of the community – who they are, where they are, and what they need. These strategies must and will be informed by the continually gathered insights from Objective 2. As FEMA works to embrace a customer-centric approach to community engagement, partnerships, and other aspects of program design, it will be important to develop tools that align insights and engagement strategies across risk information and management activities to reach the agency’s broader goals. Community Engagement Strategies and Plans (CESPs) will align community-specific engagements to the NOS and ROS and serve as a resilience roadmap for each individual community. These Community Engagement Strategies and Plans will include elements of the following:

- Data and insights for a comprehensive assessment of key research findings about the community and its risk understanding and capacity to act;
- Mitigation objectives that are informed by the data and insights gathered about a community and aligned to the priorities outlined in the ROS. They provide a lens for helping to decide where and how to allocate resources in that community;
- A strategic timeline to lay out the long-term vision for that community and steps for achieving community ownership of their resilience efforts;
- Audience map and messaging that shows the landscape of audiences in the community, who to target, and messages that will resonate with those specific audiences;
- An engagement plan that provides a comprehensive outline for the activities (capacity building, partnerships, equity-building strategies) FEMA plans to collaborate on in a community during the year; and
- Plans for measurement and iterative improvement for assessing the success and progress of the overall objectives.

As Risk MAP continues to build out its research and measurement framework, it will continue to iterate, evaluate, and improve all forms of Risk MAP delivery and the organization’s role in reducing current and future vulnerability to flooding.

This objective is the tailored application of the NOS and ROS of Objective 1, informed by the insights gained in Objective 2. This approach ensures that each strategy is community-specific in a way that best compels and empowers risk reduction action by tailoring outreach, engagement, and

partnership strategies to the unique characteristics of the community. These community-specific strategies will help the data, platform, and plans to be developed and applied in ways that maximizes effectiveness. This will also inform the partnerships necessary and the program design that is laid out in Objective 2.

2.5. Objective 4: Establish a baseline, and measure progress, of the impact of engagement activities toward advancing equitable risk reduction.

A measurement framework is vital for an effective customer centric approach to program design and allows the program to:

- Develop key performance indicators that align to desired program outcomes and evaluate the effectiveness of ongoing activities, as well as the design and implementation of new programmatic activities;
- “Right-size” metric collection, pulling from established data sources along with direct community feedback, making a community's time spent collecting and contributing data less onerous and rewarding it with valuable insights and learnings at the local and national level;
- Leverage community-level data to develop, evaluate, and iterate programs, providing insights into which programs are most effective at moving NOS and ROS objectives forward and the conditions that supported it; and
- Develop tools and dashboards that combine data with a library of strategic next steps to help performance metrics lead to insights and those insights lead to actionable change.

As the measurement framework is developed, FEMA will adhere to the following guiding principles:

- Tying together qualitative and quantitative performance feedback will yield the richest and most informative assessment and insights;
- Being consistent with data collection will allow insights to be gained on the local and national levels; and
- Allowing communities who are trying new tactics to provide additional performance metrics and benchmark against other initiatives working toward the same goals will increase the learnings and success for all.

To truly obtain a nationwide view of progress, it will be critical to have a clearly defined methodology for comparing strategies across communities. The methodology and measurement system laid out in this objective will learn from the application of the outreach strategies in Objective 3 to identify effective approaches that can be replicated and how best to apply them. It also will inform updates to the NOS and ROSs in Objective 1 to ensure that the regional and national approaches are in line with customer needs and ensure investment in the most effective strategies. The measurement activities here will also complement the CX program laid out in Objective 3 to similarly support the

other goals of this plan by evaluating effectiveness and inform how best to create and deliver the data, platforms, and plans that advance risk reduction.

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



Figure 9: Goal 3 Implementation Phases

3.1. Overview

Goal 3 aligns closely with Goal B of the FEMA Resilience risk information and management strategy: *Translate knowledge into actionable resilience policies and practices*. This goal moves mitigation planning beyond information sharing and communication to emphasize implementation of hazard mitigation plans and their mitigation actions by providing support to SLTTs to assess their risk and develop actionable activities to mitigate those risks.

Mitigation planning is the typical entry point for SLTTs and their communities to become engaged with the risk reduction process. It serves a crucial role in Risk MAP using flood risk data to inform hazard identification and risk assessment information essential to drive implementation of effective strategies and actions. At the National Mitigation Planning Program’s inception, the focus of its regulations and policies was to encourage SLTTs to engage in a planning process to inform decisions about mitigation investments. As the National Mitigation Planning Program has matured, the focus has expanded to include support for building SLTT capabilities, integrating mitigation into other community planning efforts and partnerships, and implementing hazard mitigation plans using a wide range of public and private resources.

3.2. Objective 1: Communicate Value of Hazard Mitigation and Community Planning

ASSIST SLTTS TO DEVELOP OR UPDATE, ADOPT, AND IMPLEMENT APPROVED HAZARD MITIGATION PLANS.

On October 30, 2000, the Disaster Mitigation Act of 2000 amended the [Robert T. Stafford Disaster Relief and Emergency Assistance Act](#) (Stafford Act) providing the primary legal basis for mitigation planning that sets forth requirements and procedures for SLTT governments to develop a hazard mitigation plan as a condition for receiving certain types of FEMA non-emergency disaster assistance.

In recent years, additional laws⁴ have been passed that help to shape hazard mitigation planning policy. Over these two decades, tremendous progress has been made allowing SLTTs with approved mitigation plans access to FEMA assistance programs, including Public Assistance Categories C-G, Fire Management Assistance Grants, Hazard Mitigation Assistance (HMA) including Hazard Mitigation Grant Program (HMGP), HMGP – Post Fire, and Flood Mitigation Assistance, as well as the Building Resilient Infrastructure and Communities (BRIC) and Rehabilitation of High Hazard Potential Dams grant programs.

FEMA's Headquarters staff develop and maintain regulations, policy, products, and training. Regional staff provide training, technical assistance, and build partnerships with SLTTs engaged in and supporting mitigation planning. As of January 1, 2023, all 50 states, five territories, and the District of Columbia have approved mitigation plans. Additionally, over 24,000 local and 240 tribal governments have current mitigation plans. 85 percent of all Americans live in communities with current mitigation plans.

COMMUNICATE THE VALUE OF MITIGATION PLANNING THROUGH THE RISK MAP OUTREACH STRATEGY.

Risk MAP emphasizes the value of mitigation and community planning as part of an overarching outreach strategy. SLTT governments that engage in effective planning for natural hazards receive benefits that are both fiscal (reduction of property damage and insurance premiums) and community-oriented (more resilient structures, prevention of business and education interruptions, enhanced public safety, increased equity, and improved public spaces).

Of critical importance to the continuing success of mitigation planning is the ability to communicate this value to its partners. The design and implementation of a communication plan provides standards and protocol to promote consistent messaging through a variety of tools. One example is the development and deployment of the story map, [Mitigation Planning Success Stories](#), which

⁴Including the Sandy Recovery Improvement Act (SRIA) of 2013, the National Flood Insurance Act of 1968 (Revised 2012, 2014), and the Water Infrastructure Improvements for the Nation (WIIN) Act of 2016

showcases mitigation planning “best practices.” Risk MAP will continue to support mitigation and community planning communication and outreach efforts, including communicating examples so that communities can apply lessons to their own jurisdictions and planning efforts. Mitigation planning outreach and communication goals focus on:

- Increasing awareness of the value and benefits of hazard mitigation and community planning;
- Demonstrating the value of mitigation planning beyond statutory, regulatory and policy requirements;
- Ensuring greater consistency in messaging; and
- Delivering messages and communication products to targeted stakeholders on topics that promote FEMA’s hazard mitigation and planning goals and best practices.

3.3. Objective 2: Engage and Partner to Build Capabilities

BUILD RESILIENCE PLANNING PARTNERSHIPS AND CAPABILITIES TO SUPPORT EARLY AND OFTEN ENGAGEMENT WITH COMMUNITIES.

FEMA partners with other Federal agencies, academic institutions, and non-governmental organizations to advance Resilience objectives. By leveraging the subject matter expertise, professional networks and other programs administered by partners, FEMA can extend the reach of its messaging, training, and technical assistance. Risk MAP will assess and grow partnerships that advance resilience, mitigation, and community planning initiatives and promote risk reduction through planning.

The implementation of effective mitigation strategies is predicated upon building the capabilities of staff supporting mitigation and community planning, including FEMA, SLTTs, and contractors. FEMA supports mitigation planning with both the development and delivery of formal foundational and advanced training courses on mitigation planning. Foundational courses are essential to establishing knowledge and consistency of practice for mitigation plan development, integration, and implementation. Advanced training uses targeted approaches to build on foundational training content. In addition, internal capability building is a necessary first step before FEMA staff can support SLTT partners. FEMA staff need the right knowledge, skills, and awareness of the Program messaging and resources before they can provide effective training and technical assistance.

The Program has developed a portfolio of foundational training courses that are delivered under our continued partnership with the FEMA Emergency Management Institute (EMI). More information on these courses is available from [Mitigation Planning Training | FEMA.gov](#).

CONDUCT ANNUAL MITIGATION PROGRAM CONSULTATIONS AND ENHANCED STATE VALIDATIONS.

The National Mitigation Planning Program will continue to lead FEMA’s delivery of Mitigation Program Consultation meetings with each state annually. For “enhanced” states, an annual Enhanced State Validation meeting is required to review grants management capabilities. The Mitigation Program Consultations have evolved since 2015 when first introduced to include a growing range of stakeholders that collectively assess the state mitigation program. FEMA will annually evaluate the Consultations and Validations and utilize the results to inform program capability building needs. The requirements for both meetings are found in the [State Mitigation Planning Policy Guide](#) (FP 302-094-2, April 19, 2022).

IMPROVE IMPLEMENTATION OF MITIGATION PLANNING THROUGH TECHNICAL ASSISTANCE.

To reliably support local and tribal partners and their capabilities, FEMA is committed to building mechanisms for technical assistance. FEMA requires communities to engage in a community-wide mitigation planning process to identify and assess risks and adopt a mitigation plan to reduce those risks, while considering equity and climate change. Currently, approximately 24,000 local governments and over 240 Tribal governments have approved mitigation plans. Although planning is an ideal opportunity for communities to assess equity and climate change challenges, mitigation plans are an opportunity to do a better job at informing and directing funding from a wide range of public and private sources to disadvantaged and underserved communities and vulnerable populations. FEMA is not currently staffed to provide direct technical assistance for mitigation planning to all SLTT governments that lack the capability or capacity to address resilience through their community planning efforts. However, FEMA will explore opportunities to develop and deliver support for a variety of technical assistance approaches that serve disadvantaged communities and create tailored, comprehensive resilience strategies, leverage data analytics and promote partnerships. [Incorporating Mitigation Planning Technical Assistance into Risk MAP Projects \(fema.gov\)](#) continues to be available to support communities.

Technical assistance delivery complements training and represents both formal and informal protocols and products to deliver tailored content to SLTTs. Due in part to staff turnover and other factors, training and technical assistance is needed on a regular basis to ensure that SLTTs understand the mitigation planning requirements well in advance of hazard mitigation plan review and approval. This includes identification of gaps in course content and curriculum and maintaining currency through necessary updates in delivery methods (e.g., on-demand). FEMA continues to explore collaboration with partner programs that are updating courses related to mitigation planning (HMA, EMI, Hazus, FEMA Qualification System, National Disaster Preparedness Training Center at the University of Hawaii, etc.) and other federal and non-federal partners that can help support the Program’s priorities (Environmental Protection Agency, Department of Housing and Urban Development, Coastal States Organization, NOAA, National Park Service, etc.)

The regions are expanding, refining, and targeting technical assistance to advance implementation. Region 3 established the mitigation Plan Implementation and Grants Development (PIGD) workshop

that engages a wide range of jurisdictional attendees, focused on collaboration with states to help SLTTs apply for grants and to transform their hazard mitigation ideas into actionable mitigation projects. It is a model being adopted by other regions. Region 1 continues its mitigation planning Skill Share conferences to creatively engage state staff in mitigation plan review, approval, policy, and implementation. Region 1 is expanding the concept to tribal partners. Region 9 is expanding its plan review workshops and has established a dedicated unit to support implementation. Other regions have conducted land use solutions workshops and regional webinars. FEMA plans to continue this transformation by extending the principles of foundational courses to place-based and tailored delivery of support that is more responsive to community priorities.

FEMA will continue to integrate efforts to support identifying and reaching vulnerable populations and underserved communities as new authorities are passed, such as the [Community Disaster Resilience Zones Act of 2022](#). While the National Mitigation Planning Program is not part of the Justice40 Initiative, assessment of hazard mitigation plan status for underserved communities has been preliminarily conducted based on available data standards. More information on plan status can be found on the interactive [FEMA Hazard Mitigation Plan Status](#) map. The updated state and local mitigation planning policies, [State Mitigation Planning Policy Guide](#) (FP 302-094-2, April 19, 2022) and [Local Mitigation Planning Policy Guide](#) (FP-206-21-0002, April 19, 2022), guide engagement of vulnerable populations and underserved communities as part of the planning process.

In addition, through the use and continued investment of the National Risk Index, the Natural Hazards Risk Assessment Program will provide FEMA programs and SLTT partners with a quantitative tool that can be used to examine the intersection of natural hazard risk and social equity for the implementation of its programs. Also, investment in the transformation of FEMA's loss estimation software (Hazus) to an open-source web environment (OpenHazus) will provide SLTTs with a lower barrier of entry to credible risk assessment methodologies, results, and analysis, while allowing for more robust collaboration with the wider risk assessment community.

3.4. Objective 3: Integrate Hazard Mitigation into Other Planning Processes

SUPPORT ASSISTANCE PROGRAMS THAT REQUIRE A HAZARD MITIGATION PLAN AS A CONDITION OF ELIGIBILITY.

The National Mitigation Planning Program continues to support FEMA assistance programs with a hazard mitigation plan requirement as one condition of eligibility. Activities related to program delivery include partnership and outreach, technical assistance, direct technical assistance, training, mitigation plan review and approvals, and national policy and guidance development. Over the next five years, plans affecting every state and U.S. territory, the District of Columbia, 240 tribes, and more than 24,000 jurisdictions, will expire if SLTTs do not engage in the update process. Resources will be required at every level of government to update these plans. FEMA's Hazard Mitigation Assistance programs provide many SLTTs these resources through hazard mitigation planning grants.

PROMOTE THE INTEGRATION OF MITIGATION PLANNING INTO RELATED SLTT PLANNING.

Consistently over the last decade, more than 80 percent of the nation’s population have lived in local and tribal jurisdictions with approved mitigation plans. However, mitigation plans, often developed by local emergency managers, frequently do not include input from land use, zoning, or development officials, nor do they coordinate with other community planning processes that impact land use and other development decisions. Risk MAP provides a suite of land use decision-making tools for communities, and will inform communities of the benefits of integrating hazard mitigation into ongoing SLTT planning processes and plans, e.g., comprehensive, land use, capital improvement, economic development, transportation, etc.

FEMA partners with non-governmental organizations that promote hazard mitigation through community development. For example, the National Mitigation Planning Program continues to work with the American Planning Association (APA). FEMA’s partnership with APA provides a dissemination point to over 40,000 planning officials nationally. In the long term, this strategy will continue to evolve to target other professional organizations, as well as advancing professional curriculums via universities with planning programs.

COORDINATE WITH OTHER FEDERAL AGENCIES TO IDENTIFY OPPORTUNITIES TO REDUCE DUPLICATIVE PLANNING PROCESSES AND IMPROVE EFFICIENCIES.

Other federal agencies administer programs or initiatives for SLTT governments related to hazards or natural resource planning. For example, coastal zone management through the National Oceanic and Atmospheric Administration, watershed planning through the Environmental Protection Agency, and wildfire management through the Bureau of Land Management all contain land use elements that may align with the planning processes set forth under FEMA’s Mitigation Planning Program. FEMA will identify synergies and work toward cooperation with these organizations and efforts.

3.5. Objective 4: Demonstrate Effective Risk Reduction through Planning

MAINTAIN AND IMPROVE THE MITIGATION PLANNING PORTAL DATABASE USED TO MANAGE, ANALYZE, AND REPORT STATUS OF MITIGATION PLANS.

Risk MAP will support the maintenance and improvement of the Mitigation Planning Portal (MPP), which will provide the ability to store, track, and manage hazard mitigation plan status and plan review workflow, as well as support reporting of progress on program evaluation measures and metrics. Risk MAP will show plan data geographically through a geographic information system (GIS) generated map of the nation displaying all approved mitigation plans, made available via the FEMA website ([Hazard Mitigation Plan Status | FEMA.gov](https://www.fema.gov/hazard-mitigation-plan-status)). The MPP data may be exported and combined with other data to evaluate program delivery and progress in engaging underserved communities and other applications.

SUPPORT EVALUATION OF THE EFFECTIVENESS OF HAZARD MITIGATION PLANNING IN REDUCING RISK.

The measurement and documentation of the effectiveness of mitigation planning is critical to the National Mitigation Planning Program, as well as Risk MAP. Currently, FEMA reports the population and number of approved hazard mitigation plans but does not have an established mechanism to demonstrate the effectiveness of the plan itself; this measurement takes place on an ad hoc basis. Progress will be made through the systematic evaluation of the elements of a hazard mitigation plan, which will provide insight regarding the effectiveness of the planning process, risk assessments, mitigation strategies, and implementation strategy. This can be aided by technical improvements such as the automation of the Plan Review Tool and tracking of mitigation actions, possibly as part of the MPP. The program continues its efforts to measure and report on planning effectiveness particularly for local mitigation plans.

4. Goal 4: Provide a sustainable and modern IT portfolio that optimizes delivery of flood hazard and flood risk data, helping customers reduce current and future risks to life and property.

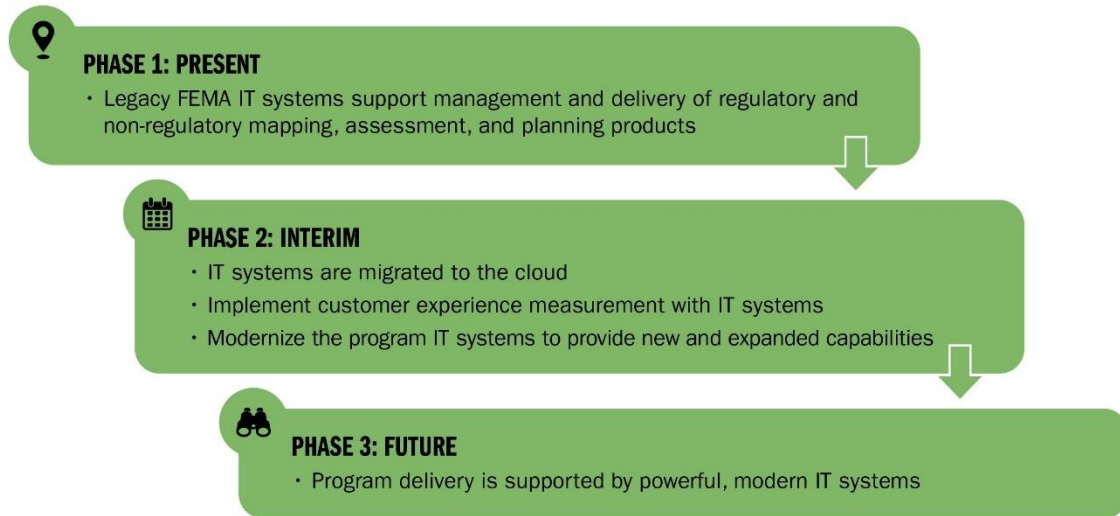


Figure 10: Goal 4 Implementation Phases

4.1. Overview

Information Technology touches nearly every facet of the Risk MAP mission and directly affects the quality, availability, and accessibility of the flood hazard, flood risk, and mitigation planning information produced by the Risk MAP Program. The current Risk MAP IT portfolio consists of multiple systems, platforms, and software, to include:

- Risk Analysis and Management (RAM) on-premise (i.e. non-cloud) general support system, which supports:
 - 38 active applications (e.g., Mapping Information Platform, Map Service Center, Coordinated Needs Management Strategy System, National Risk Index, eLOMA, Online LOMC, Automated Map Production, National Flood Hazard Layer, Hazus Loss Library, Flood Hazard and Risk Data Viewer, Mitigation Planning Portal, Floodmaps File Exchange);
 - 500+ TB data;
 - 1,000+ PIV-authenticated users; and
 - 200,000+ public user accounts.
- Federal Insurance Customer Relationship Management (FICRM) platform:

- 100+ Flood Mapping and Insurance eXchange (FMIX) contact center agents; and
- Risk MAP IT Help Desk and Hazus Help Desk ticket management
- Hazards GeoPlatform (HGP):
 - 265+ FEMA, SLTT, and Cooperating Technical Partner users
- Desktop software and mobile applications:
 - Hazus desktop software;
 - Engineering models (e.g., WHAFIS, RunUp);
 - Floodwalk mobile application; and
 - Immersed virtual reality application.

Risk MAP inherited systems and applications from the Map Modernization program (i.e., pre-2009) and continued to extend the codebase to meet Risk MAP program needs. The Risk MAP IT portfolio evolved organically over a ten-year period, from 2009 to 2019. During this period, the capabilities of Risk MAP’s initial digital platform (i.e., Mapping Information Platform and the Map Service Center) were modified and extended to adapt to changing engineering guidelines and standards, automate manual processes, and accommodate new technologies. Many of these changes were ad-hoc in nature and did not account for long-term maintenance costs.

In 2017, the Risk MAP program identified system degradation as the program’s single biggest risk and began steadily increasing the resources dedicated to IT management, operations, and maintenance. From 2017 to 2020, the increased resources were largely consumed by vulnerability remediation efforts needed to secure the system and keep it online. System stability and performance continued to suffer during this time, and the gap between customer expectations and system capabilities grew. In late 2020, FEMA redoubled its efforts address these issues through reorganization, increased federal and contractor staffing levels, SAFe Agile software development practices, and reallocation of funding to support increased IT expenditure.

As a result of this investment, the Risk MAP IT portfolio’s posture has transformed from “reactive and under-resourced” to “capable and ready for strategic change.” The Program has corralled multiple systems, dozens of applications, and several pieces of software into a cohesive portfolio. And the largest system, RAM, is ready to undergo an incremental and iterative architectural transition from monoliths toward microservices that is needed to improve system performance and support the future Risk MAP program requirements.

To continue this transformation and deliver on FEMA’s Strategic Plan, the Risk MAP program is pursuing three objectives over the next five years:

- **Objective 1:** Establish mechanisms to assess and improve customer experience with Risk MAP systems and applications.
 - To empower disaster-resilient decisions and actions, all IT management decisions must be grounded in a clear understanding of the program’s highest priority customers and how they experience information and interactions related to flood hazard, flood risk, and mitigation planning information. This insight will enable FEMA to rapidly identify the most important service gaps, streamline existing capabilities and IT investments, integrate information silos, optimize our IT infrastructure, and extend new or different service offerings to fill the identified gaps.
- **Objective 2:** Migrate Risk MAP IT systems and applications to the cloud and lay the technical foundation for future modernization.
 - The Risk MAP program’s ability to operate with the agility and scalability necessary for the program’s data-intensive future has been limited by a combination of tightly coupled applications, on-premises IT infrastructure, and insufficient management capacity. To address these constraints, Risk MAP IT is pursuing a strategy of continuous, adaptive maintenance to create a more flexible system architecture and scalable hosting environment(s). Major elements of this adaptive maintenance strategy include: migrating the RAM general support system to FEMA’s Enterprise Cloud (FEC); rationalizing the existing Risk MAP IT application portfolio; introducing application performance monitoring capabilities and expanding the use of automated testing; incrementally transforming Risk MAP’s legacy systems and applications from monolithic structures to a modern technology stack with a service-oriented architecture; and introducing API management capabilities.
- **Objective 3:** Initiate development of new applications and services to address unmet statutory requirements, replace obsolete software, and meet requirements for the future of Risk MAP.
 - RAM-Cloud will offer a flexible, moderate-risk hosting environment that can scale to meet changing program needs. Architectural changes made under Objective 2 will make it easier to develop, deploy, and host new applications in the RAM-Cloud environment. These changes will also enable increased data sharing with end users and partners in other federal agencies, SLTTs, the private sector, non-profits, and academia. At least two projects to support the new modeling framework will take advantage of RAM-Cloud’s new features: OpenHazard and the model library. Additional IT development projects are expected to result from Risk MAP’s creation of a results framework and analysis of our stakeholder ecosystem and customer journey. These projects will be specified and on-boarded as requirements are solidified.

4.2. Objective 1: Establish mechanisms to assess and improve customer experience with Risk MAP systems and applications.

This objective supports the CX activities initiated under Goal 2, Objective 2 and applies the results of those activities to ongoing IT development, operations, and maintenance to reduce barriers to effective use of Risk MAP products and services. A few of the mechanisms for assessing and improving Customer Experience with Risk MAP systems and applications include:

SUPPORT CUSTOMER EXPERIENCE ANALYTICS WITH APPLICATION USER ACTIVITY METRICS

Customer research is essential to understanding the gap between the existing and ideal customer journey and overall customer experience. The Risk MAP program is adding user behavioral data collection tools (e.g., Google Analytics) to its public-facing applications to gather aggregate, anonymous data about how customers interact with individual web pages and the efficiency and effectiveness of their movement throughout the web application. Additionally, the Risk MAP program is exploring options for gathering attitudinal metrics about usability and overall satisfaction with customers' interactions with the Program's products and services. As the CX framework evolves and desired customer journeys and experiences are specified, the Risk MAP Program will also look for opportunities to support data collection for Key Performance Indicators.

PUBLISH AND MAINTAIN A DESIGN SYSTEM LIBRARY

Creating and maintaining a design system library improves all customer journeys that intersect with a Risk MAP web application by creating consistent User Interface components. The Risk MAP program is using the U.S. Web Design System (USWDS) 3.0 as the basis for a design system library that has been tailored to meet the needs of Risk MAP customers. This design system library will be incrementally incorporated into the existing Risk MAP IT portfolio during routine operations and maintenance activities. In addition to creating a seamless user experience across Risk MAP applications, adoption of the design system library enables faster design and development timelines and reduces technical debt by making it easier to maintain applications' user interfaces. The design system library also makes it easier to engage multiple IT development vendors simultaneously, which encourages competition and innovation, without negatively impacting the end-user's experience.

INCORPORATE RESULTS OF CUSTOMER JOURNEY ANALYSIS INTO PORTFOLIO AND PRODUCT ROADMAPS

Most Risk MAP customers will encounter a Risk MAP web application, data service, or piece of desktop software as part of their customer journey. As the Risk MAP program's CX capabilities grow and desired customer experiences and journeys have been specified, the Risk MAP program will expand its use of Design Thinking and other customer-centric user interface/user experience (UI/UX) design techniques to update existing product roadmaps and make plans to introduce new products, where needed. These plans shape the Program's development, operations, and maintenance backlogs and help steadily transform the Risk MAP IT portfolio from the as-is to the ideal state.

4.3. Objective 2: Migrate Risk MAP IT systems and applications to the cloud to optimize our existing investment in flood hazard data and set the technical foundation for implementing the future of Risk MAP.

IMPLEMENT ADAPTIVE MAINTENANCE STRATEGY

Risk MAP operates in a dynamic environment where changes in engineering methodologies, information technologies, climate science, land-use, and climate are constant. To maintain operational relevance, Risk MAP's IT portfolio must continuously adapt and evolve. The program refers to these necessary changes and enhancements as "adaptive maintenance." These changes are a type of IT operations and maintenance activity that enable the non-IT portion of the program to continue operating at full capability and capacity. These adaptive maintenance projects are typically larger efforts to address obsolescence, architecture transition, UI/UX strategy alignment, and responses to congressional mandates and Executive Orders. In addition to sustaining performance levels, these projects eliminate the need for high-risk, "modernization" efforts that force a hard cutover to a new, replacement system. FEMA's Office of the Chief Information Officer maintains oversight of these projects through the System Engineering Lifecycle process. The remaining topics discussed under Objective 2 are examples of strategically important operations and maintenance activities, including a few adaptive maintenance projects.

MIGRATE THE RISK ANALYSIS AND MANAGEMENT SYSTEM TO FEMA ENTERPRISE CLOUD

In CY2023, Risk MAP is migrating its large general support system, RAM, to FEMA's Enterprise Cloud environment. This adaptive maintenance project is largely a lift and shift migration; application functionality will not change while the underlying hardware is replaced by "infrastructure as code." This change is essential to resolving a long-standing security risk, improving system stability and performance, and preparing to support the new modeling framework requirements. After migrating to the cloud, the system will be more resilient – using Amazon Web Services Availability Zones to keep the system online in the event of a disaster. Tiered data storage and the ability to scale-on-demand are expected to introduce cost savings while also ensuring the system can handle spikes in demand for system resources and house increasingly large datasets produced by the new modeling framework. Finally, the program is adding a staging environment, which mirrors the Production environment, to the RAM-Cloud system boundary. This new environment and system architecture supports high-fidelity testing and enables the Program to release changes into production quickly and without interruption – experimenting with canary releases (i.e., releasing changes to a small subset of users) and working toward blue/green deployments (i.e., roll out software updates without downtime).

RATIONALIZE THE EXISTING RISK MAP IT PORTFOLIO

The Risk MAP Program is conducting an in-depth analysis of its portfolio during the first half of CY23 to determine which applications should be kept, replaced, retired, or refactored. This effort will create an inventory of IT-supported Risk MAP use cases and assess the business value, technical fit, and total cost of ownership for each item in the Risk MAP IT portfolio. The findings are expected to

help the program eliminate redundancies, lower costs, and maximize efficient maintenance of existing capabilities while also creating digital platforms that can be modified to support the modeling framework data requirements.

INTRODUCE APPLICATION PERFORMANCE MONITORING AND EXPAND AUTOMATED TESTING

Before making large changes to the RAM system architecture, the Risk MAP Program will implement an Application Performance Monitoring tool and continue efforts to increase automated testing. These activities will reduce the risks associated with refactoring, rewriting, or replacing portions of the RAM system in the future by enabling a proactive risk management posture.

Application Performance Monitoring tools alert the team to what is in the process of failing – helping system administrators and developers spot problems before they cascade throughout the system. These tools provide a critical safety net when deploying larger changes. Without application performance monitoring, performance issues are often identifiable only *after* the application has failed in a visible way.

Automated testing is a key component of continuous integration and continuous delivery, a software development best practice. Testing helps validate that new or refactored code functions as intended and doesn't break existing code and functionality. The Risk MAP program is steadily expanding its code coverage – a measure of the quantity (percentage) of the codebase with a corresponding unit test – to improve the utility and effectiveness of automated testing and increase the speed and reliability of software deployments.

DECOMPOSE MONOLITHS INTO SERVICE-ORIENTED ARCHITECTURE

Using insights gained from the Risk MAP IT Portfolio Analysis and domain-driven modeling, the program will undertake an adaptive maintenance project to incrementally transform the Risk Analysis and Management system's architecture. The effort will move from monoliths to a service-oriented architecture with microservices, where practical. Code will be refactored or replaced as needed to improve system performance and increase ease of maintenance. The goal is to enable quick changes to system functionality without having to change the entire surrounding system.

INTRODUCE API MANAGEMENT CAPABILITIES

The Risk MAP program currently makes the National Flood Hazard Layer dataset available through a web-viewer and several public web Application Programming Interfaces (APIs). These publicly available data services are used by private companies, academics, and others who wish to bypass FEMA's Mapping Information Platform and Map Service Center web application interfaces and pull FEMA's authoritative data directly into their own software program.

FEMA will introduce an API management capability to understand, support, and optimize the experience of different types of customers who rely on Risk MAP APIs to access the program's authoritative data. Calls to Risk MAP's public APIs are currently handled on a first-come, first-served

basis. While there is endpoint security, we do not require authentication or authorization to use the service. This approach supports open data objectives; however, the absence of an API management solution means that FEMA does not know, definitively, who is consuming these services or the extent to which these customers rely on FEMA's data. As a result, we cannot establish different service level expectations for various user types and use that differentiated service level to effectively manage planned and unplanned service disruptions. This capability is needed to support the Program's desire for improved Customer Experience.

An established API management process is part of a larger API governance strategy; both are needed to effectively design, develop, deploy, consume and deprecate APIs. As the program moves toward a service-oriented architecture and the Risk MAP Programs' APIs multiply and evolve, an API management capability will become increasingly important to ensure that each API is secure, performing as expected, and meeting customer needs.

4.4. Objective 3: Initiate development of new applications and services to address unmet statutory requirements, replace obsolete software, and meet requirements for the future of Risk MAP.

The adaptive maintenance activities outlined in Goal 4, Objective 2 enable the Risk MAP Program to sustain operations until ongoing projects are finished. They also lay the technical foundation for the introduction of new applications and services that are needed to address unmet statutory requirements, replace obsolete software, and meet requirements for the future of the Risk MAP program. Depending upon the magnitude of the changes required and their impact on Risk MAP's present-day Concept of Operations, the activities described in Goal 4, Objective 3 may cross the threshold of programmatic and technical "modernization." More analysis is required, however, before this determination can be made.

NEW FLOOD MODELING FRAMEWORK AND UNMET STATUTORY REQUIREMENTS

As discussed under Goal 1, Objective 2 FEMA will build a comprehensive flood modeling framework. The new framework will support risk-based insurance rates, products that go beyond the binary in/out focus of the legacy FIRMs and portray a comprehensive, graduated view of hazard and risk. This flood modeling framework will provide communities a solid, consistent base on which they can build more detailed local flood analyses, provide FEMA a national base to address the unmet statutory mapping requirements and provide flexible capability to support future products.

The Flood Modeling Framework described in Goal 1, Objective 2 uses highly automated probabilistic analyses that require the ability to run a model thousands of times using integrated datasets from multiple government agencies, and the ability to store and analyze the results. To support this analysis, the Program must have the ability to store engineering models, model results, and related data. It must also be able to share models, model results and data with partners to support the joint development of this new framework. Unmet statutory requirements will be satisfied by analyzing outputs of the flood modeling framework; technology requirements are shared with Goal 1, Objective 2. The initial capabilities required for Goal 1, Objective 2 and Objective 3 include:

1. Increase data storage by orders of magnitude;
2. Provide a structured format and standardized method for accessing models and datasets that enable highly automated probabilistic analyses;
3. Support better two-way data sharing/access with Federal and SLTT partners through standardized data interfaces and other mechanisms; and
4. Facilitate end-users' and partners' access to models, data, and analyses to support direct-service requirements and encourage innovative distribution of flood hazard and risk information.

The RAM-Cloud environment described in Goal 4, Objective 2 will store the models and model inputs managed by FEMA as well as model outputs. This environment offers the scalability and data recovery capabilities needed for FEMA's contribution to the flood modeling framework.

MODEL LIBRARY

One of the keys to an interagency approach to building the new modeling framework is a “model library,” a shared system for cataloging, discovering, and accessing models across agencies. The model library does not function as a storage system or data repository, but as a visualization tool and organizational schema to index model locations. Using the model library, users will be able to upload, catalog, and access catalogued models. Users will also be able to analyze the models, use the models for computation, and annotate the models based on their findings. The model library facilitates interagency model discovery and access and creates opportunities for collaboration and data sharing between agencies and, potentially, other organizations.

OPENHAZUS

FEMA's Hazus software delivers standardized tools and data for estimating risks from earthquakes, floods, tsunamis, and hurricanes. Currently, Hazus software is distributed as a GIS-based desktop application that runs within the proprietary Environmental System Research Institute (Esri) ArcGIS Desktop platform. Hazus will reach end-of-life in January 2024, when Esri deprecates ArcGIS Desktop. Rather than migrate Hazus to a newer desktop solution, FEMA seeks to eliminate Hazus' cost barrier by replacing the desktop software with a web-based application that prioritizes open-source software components. OpenHazus is also being designed to support a broad array of stakeholders and community users, from scientific modelers to emergency managers and informed citizens.

OpenHazus will provide analytical, visualization, and repository functions for loss modeling and risk assessment stakeholders. Specifically, the OpenHazus web-based platform will:

1. Provide transparent and accessible risk assessment tools for a broad range of risk management stakeholders;
2. Ensure OpenHazus is reliable, scalable, and state-of-the-art; and
3. Update OpenHazus functionality with the latest established science.

The OpenHazard application is being designed to assist planners and analysts in making decisions based on possible structural, economic, and social loss in a particular geography due to natural hazard. The future OpenHazard solution must be flexible enough to accommodate various risk assessment stakeholder preferences and restrictions and must also allow for effective user interaction in an iterative problem-solving environment. To accomplish this, OpenHazard functionality will include spatial decision support – interactive, web-based decision-making assistance by solving semi-structured spatial problems. OpenHazard will also offer capabilities to support open science by making data, spatial and non-spatial models, and the OpenHazard software itself, broadly available through a user-friendly interface.

OpenHazard will be developed with a bias toward free and open-source software. In addition to eliminating cost barriers, using free and open-source software makes it easier to leverage the untapped expertise of the nationwide risk modeling community consistent with the open science concept. Specifically Risk MAP and Natural Hazards Risk Assessment Program are exploring the feasibility of allowing advanced users to develop customized versions of risk assessment analytical processes and integrating them into the official OpenHazard architecture. Finally, by developing OpenHazard using free and open-source software, FEMA also expects to increase trust in model outcomes by creating transparency around Hazardus' highly requested data and methodology.

Risk MAP IT will continue to conduct architecture, design, and general project planning for OpenHazard throughout FY2023, in preparation for the start of development in early FY2024.

5. Goal 5: Support enhanced risk reduction decision-making by aligning Risk MAP delivery with the Whole Community through customer-centric engagement and products.

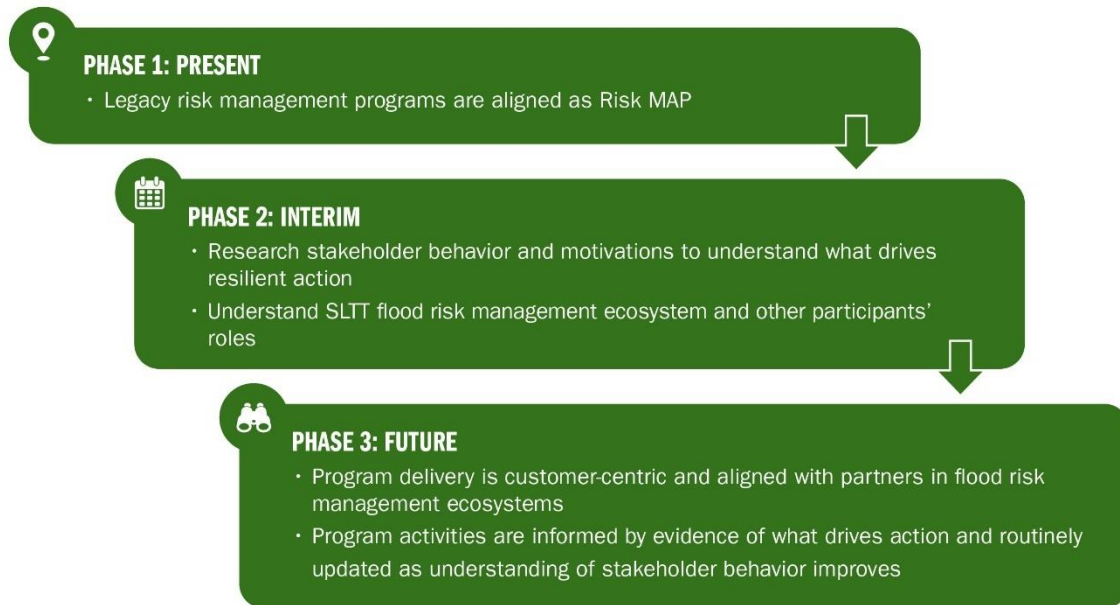


Figure 11: Goal 5 Implementation Phases

5.1. Overview

With this goal, Risk MAP focuses on how FEMA can better understand the complex flood hazard and risk information network and how that network interacts with the overall natural hazard risk management network. Understanding the flood hazard and risk information network is critical to understanding how best Risk MAP can drive risk reduction and where partnerships and empowering stakeholders is required. We will use this information to align risk information and risk management programs in a customer-centric approach to delivering Risk MAP outreach, community engagement, mitigation planning support, data, products, and tools to communities. To accomplish this, we will prioritize current and new partnerships inside and outside of the government.

Risk MAP Goal 5 aligns with Goal E of the FEMA Resilience risk information and management strategy: Invest in strategic partnership networks that expand our reach to increase the Nation's resiliency. This goal serves to maximize the effectiveness of the other four goals of this plan by ensuring Risk MAP is appropriately positioned and informed as it develops and delivers data, consults with, supports, and empowers communities, leads risk-based mitigation planning, and provides a modern digital platform. This goal identifies where Risk MAP can have the greatest impact, where partners can be more effective or better suited to a critical component of driving risk reduction, and where gaps may exist that partnerships can address.

5.2. Objective 1: Build organizational understanding of how stakeholders use and are influenced by flood risk information and products.

As communities' needs continue to evolve and new organizations step up to fill their needs, Risk MAP must be effectively positioned to support this changing landscape.

Risk MAP has clear goals, as laid out in this plan, and a regulatory mission that it must continue to meet. In addition to those activities, Risk MAP must answer several key questions related to reducing current and future flood risk:

- Stakeholder Ecosystem:
 - What other organizations seek to influence community and individual decision-making through flood risk information and hazard mitigation planning?
 - How are they better situated than Risk MAP to be impactful?
 - What challenges are they facing and how might Risk MAP partner with them to increase the impact of their programs?
 - What gaps remain between the present state of the Risk MAP program, the services provided by other stakeholders, and stakeholder needs?

- Customer Journey – Decision Making:
 - How are communities, individuals, and developers making decisions today?
 - What data sources are most trusted?
 - What information and data are not currently available to decision makers, or not available in an easily digestible format?
 - How can information be presented to ensure it is reaching decision-makers, is comprehensible, and has the greatest possible impact?

Answers to these questions will support Risk MAP's shift to a customer-centric approach to delivering outreach, community engagement, mitigation planning support, data, products, and tools to communities.

This end state will be realized over the next several years as we take the following concrete steps:

- Develop a results framework;
- Perform an assessment of the universe of flood hazard and flood risk data and products;
- Map existing customers and customer interactions;

- Build customer and stakeholder personas;
- Identify the products communities and individuals currently use and actually need;
- Understand what complementary products exist outside of Risk MAP;
- Assess gaps in the current flood hazard and flood risk data products and make recommendations for improvement;
- Increase data accessibility;
- Develop partner profiles to understand how partnerships can support the process; and
- Create an approach to maximize economies of scale across the whole ecosystem.

MEASURING USE OF FLOOD RISK PRODUCTS: A NATIONAL SURVEY

As part of the initial assessment of flood hazard and flood risk products, FEMA is developing a national survey of NFIP communities where FEMA's non-regulatory flood risk products have been developed and delivered. This survey will be sent to those communities' executives and floodplain managers to assess the utility of FEMA's flood risk products' ease of use, efficacy of use to take mitigation actions to reduce future flood losses, and how new or adjusted flood risk products may help meet unmet needs.

The community survey will serve as the initial mechanism to assess the utility of the flood risk products, with the intent to conduct a new survey every three to five years. While the initial assessment mechanism is qualitative rather than quantitative, future assessments will include a quantitative measure to measure communities' flood resilience within a certain time period after receiving flood risk products. A continuous feedback process with communities regarding flood risk products will be created during the Risk Map lifecycle for all communities.

The survey addresses the GAO's Recommendation 2 from October 2021 to develop a framework to measure successful uses of the flood risk products by communities to increase their flood resilience (see Appendix D for more information).

The survey will be developed in FY2023 and fielded in the first half of FY2024. Results will guide future improvements to existing flood risk products, inform new products, and a framework to measure flood risk products impacts. This information will improve FEMA's capacity to provide data in support of community flood resilience.

5.3. Objective 2: Begin to organize Risk MAP in a Customer-Centric manner that more efficiently and effectively drives toward the outcome of a more flood resilient nation.

This will allow Risk MAP to design, develop, and deliver tools, resources and networks that drive individuals and groups to:

- Take ownership over community resilience;
- Build skills in resilience topic areas and community organizing;
- Increase demand for action at the SLTT level on policies that increase resilience (e.g., higher building codes, stronger development ordinances, smart growth); and
- Re-frame topics of risk and reduction in terms of larger community and national goals and objectives, changing the conversation and increasing relevance to all community members.

To effectively empower stakeholders and partners, Risk MAP will identify opportunities for collaboration and potential customer-centric revision of program design. This process will include evaluation of what other Resilience or FEMA programs customers may need as part of their decision-making and action to reduce risk, better connecting them with information and resources inside FEMA and potentially in collaboration with external partners. The focus will be on better supporting customers and stakeholders throughout the life of their resilience journey to ensure they have access to the necessary information and resources.

5.4. Objective 3: Continue evolution and advancement of partnerships that drive and empower risk reduction action through structure, engagement, and messaging.

Using the framework and strategy identified under objective 2, FEMA will prioritize the most effective partnerships for empowering and compelling resilient action. These partnerships will expand the capacity of Risk MAP to reach stakeholders by leveraging the capacity and efforts of these partners and increase the effectiveness of Risk MAP messages and information by delivering them through trusted and connected messengers.

FEMA will also foster partnerships and information sharing by convening key participants in the risk information, risk management ecosystems to collaborate and share strategies, information, and messages.

Using the customer-centered framework from objective 2 and the partnership strategy from objective 3 will help Risk MAP develop appropriate roles for all levels of government and the private sector to participate in the flood risk information and flood risk management ecosystem to maximize resilient actions in the nation. Instituting clear and appropriate roles for FEMA and others allows FEMA to focus on the core mission and authorities of Risk MAP and leverage partnerships to fill in key gaps. The work FEMA has been doing to use the results-based programming methodology to map out the

causes for low flood resilience and the theory of change for how to increase resilience will help to prioritize and guide the development of these roles.

Leveraging the insights and activities of the prior two objectives, Risk MAP will evaluate and pursue a wide array of potential partnerships, including those that support: data and product development, risk communications, engagement, CX, and planning, all of which are needed in resilient decision-making and risk reduction action. Filling gaps and presenting consolidated data and products are instrumental parts to both a customer-centric program but also to connecting more fields, forums, and organizations that can advance risk reduction. In support of these partnerships, Risk MAP will also leverage the flood information and resource ecosystem to identify non-traditional stakeholders and partners that can be engaged directly or indirectly and empowered with data and products to reduce risk.

Appendix A. Glossary

Term	Definition
Base Flood Elevation (BFE)	The elevation of the water surface resulting from a flood that has a 1-percent-chance of equaling or exceeding that level in any given year.
Binary depiction	Description of how the National Flood Insurance Program displays the special flood hazard area, which can give the impression that a location either has flood risk or has no flood risk.
Coordinated Needs Management Strategy (CNMS)	The system that FEMA uses to track that status of the program flood map and model inventory.
Cooperating Technical Partners Program (CTP)	A collaborative program with state, local, tribal, and territorial entities that supports Risk MAP by delivering quality flood data that increases public awareness and leads to reduced flood risk.
Federal Flood Risk Management Standard (FFMRS)	A flood standard that applies to federally-funded buildings and projects. FFRMS requires higher levels of flood resilience than the National Flood Insurance Program minimum standards to provide greater flood resilience against current and future flooding.
Future of Flood Risk Data (FFRD)	The Future of Flood Risk Data is an initiative to better address national gaps in flood hazard data and to communicate that data in more impactful ways. FFRD describes the exploration and learning efforts to evolve Risk MAP in support of a risk informed National Flood Insurance Program.
Flood Insurance Rate Map (FIRM)	Official map of a community on which FEMA delineates the determinations of Special Flood Hazard Areas (SFHAs) and Base Flood Elevations (BFEs).
Flood Risk Products (FRPs)	Non-regulatory flood hazard and risk products produced by Risk MAP that supplement regulatory flood hazard information.

Term	Definition
Hazus Program	The Hazus Program provides standardized tools and data for estimating risk from earthquakes, floods, tsunamis, and hurricanes. Hazus models combine expertise from many disciplines to create actionable risk information that increases community resilience. Hazus software is distributed as a GIS-based desktop application.
National Flood Hazard Layer (NFHL)	Continuously updated geospatial database that contains effective National Flood Insurance Program flood hazard data.
Natural Hazards Risk Assessment Program (NHRAP)	Program that creates a multi-hazard view of risk which combines the likelihood and consequences of natural hazards with community risk factors to provide a holistic view of community risk.
Non-regulatory product	FEMA flood hazard and risk products that go beyond the determinations of special flood hazard areas and base flood elevations.
National Risk Index (NRI)	A dataset and online tool to help illustrate the United States communities' risk of 18 natural hazards.
New, Validated, or Updated Engineering (NVUE)	NVUE measures whether the available regulatory flood hazard information reflects current conditions.
OpenHazus	Online application that will provide a lower barrier of entry to credible risk assessment methodologies, results, and analysis while allowing for robust collaboration. Will replace the existing Hazus GIS-based desktop application.
Risk Analysis and Management System (RAM)	The RAM system comprises the majority of the IT capabilities and applications that support Risk MAP.
Resilience	Ability to adapt to changing conditions and withstand and rapidly recover from disruption due to emergencies.
Resilient Action	Decisions, projects or other activities that increase resilience.
Regulatory product	Products that provide the official determinations of SHFAs and base flood elevations for National Flood Insurance Program.

Term	Definition
Special Flood Hazard Areas (SFHA)	The land in the floodplain subject to a 1 percent or greater chance of flooding in any given year.
Systems Engineering Life Cycle (SELC)	A governance process used to monitor and approve Federal IT projects.
US Army Corps of Engineers, Hydrologic Engineering Center (USACE-HEC)	The Hydrologic Engineering Center supports the USACE Civil Works water resources and water management responsibilities by increasing technical capability in hydrologic engineering and water resources planning and management. USACE-HEC products, technical methods documents, computer software and user's manuals, are widely used for flood hazard and risk analysis.

Appendix B. Risk Information and Management Strategy

		MISSION: Equipping and compelling people and the Nation to reduce disaster suffering for all.			VISION: Powering disaster resilient decisions and actions.	
		GOAL A Consult with communities to act on their present and emerging resilience opportunities.	GOAL B Translate knowledge into actionable resilience policies and practices.	GOAL C Be the trusted source of comprehensive flood hazard and risk information.	GOAL D Equip communities with accessible solutions to meet their multi-hazard risk information needs.	GOAL E Invest in strategic partnership networks that expand our reach to increase the Nation's resiliency.
SHORT-TERM OBJECTIVES		Work with Regional staff and programs in FIMA and Resilience that employ community engagement and identify common outcomes and shared priorities by the end of FY23.	Commit increased regional/HQ multi-hazard & risk program resources (including grants) that address gaps and deliver actionable information in alignment with defined future budget cycles.	Establish updated goals for the Risk MAP program by the end of CY22.	Increase internal capability to evaluate risk management data and tool effectiveness for meeting community needs by the end of FY23.	Establish a partnership process and metrics that advance risk management goals by the end of FY24.
		Begin implementing strategies for collecting information about communities and their risks that informs a customized approach to community engagement by the end of FY23.	Provide risk management multi-hazard expertise (building codes, mitigation planning, other) to increase resilience in FEMA programs and policies by the end of FY24.	Define requirements for developing and delivering graduated flood hazard and risk information by the end of CY23.	Determine the needs of high-risk, underserved communities for multi-hazard risk assessment and management activities by the end of FY23.	Equip staff to foster impactful partnerships to advance risk management goals by the end of FY24.
		Identify potential partnerships and other mechanisms that will address gaps in a community's risk reduction needs by the end of FY23.	Inform agency efforts to integrate climate change and equity into FEMA policies and practices by the end of FY23.	Determine the final year for initiating current, binary, Risk MAP products no later than FY24.	Increase communities' use of risk assessment and management data and tools for decision making by the end of FY25.	Prioritize and adequately resource partnerships founded in mutually agreed upon objectives and parameters by the end of FY24.
		Begin monitoring and assessing community engagement's impact on facilitating risk informed decision-making and investment by the end of FY23.			Launch and implement an agile effort to modernize IT systems and services to equip communities with integrated multi-hazard risk assessment and risk management information by the end of FY22.	Partner with programs in other FEMA mission areas to mutually improve the impact of programs and tools on natural hazard mitigation by the end of FY24.
ENABLERS		FIMA Enabling Objectives				
		Ensure integrated and consistent, multi-year execution of Program Management (such as JPR, ERM, & PPBE) processes to align program implementation and effectively deliver on program commitments.	Increase the capability and diversity of FIMA's workforce.		Increase customers' access to, understanding of, and trust in FIMA products and services.	

June 2021

Appendix C. National Outreach Strategy

Long-Term Vision

Partnering with communities and empowering their journey toward an equitable and resilient future.

FOUNDATIONAL PRINCIPLES

SPECIAL FOCUS AREAS (FY 22-26)

1

Incorporating climate adaptation and future conditions into communications and engagement strategies.

2

Delivering services more equitably.

3

Engaging partners to drive resilient outcomes.

A

Strategic communication is integrated into all program and project planning and execution.

B

All outreach and engagement strategies and tools are designed to meet audience needs.

C

Outcomes are tracked and measured through a robust research and measurement framework.

Appendix D: U.S. Government Accountability Office (GAO) Recommendations

In October 2021, GAO released a report⁵ looking at FEMA’s regulatory and non-regulatory flood mapping activities. The GAO provided 3 recommendations:

Recommendation 1: The Administrator of FEMA should update its multiyear plan for the Risk MAP program to identify program goals, objectives, activities, performance measures, and time frames for its various efforts to address challenges in reflecting current and future flood hazards and to transition to a future program.

Recommendation 2: The Administrator of FEMA should establish mechanisms for periodically assessing the usefulness of its Risk MAP nonregulatory products for communities in increasing their flood resilience. Such mechanisms could include tracking increases in building standards among those communities that use nonregulatory products or conducting periodic loss avoidance studies.

Recommendation 3: The Administrator of FEMA should consider ways to leverage and integrate available flood risk data, such as through statistical analyses, into its annual process for prioritizing flood mapping investments. Such available data sources include its Risk MAP’s inventory of [Flood Insurance Rate Map] FIRM mapping projects and FEMA’s national disaster risk assessment tools.

With this plan, FEMA has addressed each of these recommendations. The plan itself addresses Recommendation 1 by updating the multiyear plan for Risk MAP. Recommendation 2 is addressed within this plan, which describes the processes that FEMA is implementing to assess the usefulness of the non-regulatory products it produces. These assessments will be part of comprehensive listening and learning efforts described under Goal 5 and throughout the plan. These efforts are intended to better understand customer needs, deliver adaptable products and information specific to those evolving needs, and measure the effectiveness of FEMA’s flood hazard and risk information and messages. Recommendation 3 was addressed in 2022 with the development of new Risk MAP standards and guidance addressing annual prioritization of flood mapping investments.

⁵ [FEMA Flood Maps: Better Planning and Analysis Needed to Address Current and Future Flood Hazards | U.S. GAO](#) GAO-22-104079

Appendix E: Current Interagency Collaborations

Interagency Framework Development

FEMA is working with agencies across the Federal government to develop its flood modeling framework and advance agencies’ diverse array of water resource management objectives. FEMA is a member of the Integrated Water Resources Science and Services interagency consortium. FEMA uses these platforms to advocate for a coordinated interagency approach to flood hazard modeling and analysis. Risk MAP personnel also represent the Department of Homeland Security in the U.S. Global Change Research Program, which can deliver the science needed to advance Risk MAP’s strategy around modeling future conditions.

At the project level, FEMA and USACE are developing a method to catalog and share models online to facilitate interagency collaboration. This decentralized platform of models will support coordinated science approaches while enabling Agency specific products. As part of the agreement with USACE to develop methodologies for building the new modeling framework, FEMA is also working with USACE to design and scope the development of a hypothetical storms database to support probabilistic flood risk assessments, develop a model library, improve 2D modeling capabilities for pluvial flood risk, develop data and probabilistic flood risk assessment methodology for levees and dams in order to identify areas of residual risk and inundation due to overtopping and/or failure of levees and dams.

Coastal Flood Modeling

FEMA and USACE have developed baseline data with methodologies to produce comprehensive probabilistic hazard information and have initiated full scale production of these framework data for the Atlantic Ocean and Gulf of Mexico coastlines in the United States. The expectation is that these data will be available in 2025. This work began with a major investment at the start of Risk MAP to update the regulatory coastal analyses for the entire populated coastline and has continued over the past several years working with USACE. This work will provide a shared interagency coastal flood hazard framework used to derive flood risk data for each agencies’ requirements. This initial phase will provide new flood analysis for a significant portion of the nation that is at high risk of flooding and where future flooding is being directly impacted by sea level rise.

Table 3: Coverage of Initial Coastal Probabilistic Analysis (Atlantic and Gulf Coasts)

	Estimated Structures	Estimated Population	NFIP Participating Communities	CRS Participating Communities
Total	17,255,673	52,879,121	2,218	612

	Estimated Structures	Estimated Population	NFIP Participating Communities	CRS Participating Communities
AL	207,031	461,105	31	5
CT	301,658	1,188,886	68	12
DC	53,772	530,427	1	0
DE	292,795	687,333	48	10
FL	6,296,034	15,873,941	350	234
GA	251,260	597,361	58	16
LA	1,014,994	2,695,474	126	31
MA	768,489	2,779,972	118	19
MD	603,229	1,619,129	78	12
ME	3,486	4,404	157	5
MS	171,897	395,836	19	14
NC	742,034	1,462,515	187	72
NH	17	37	10	0
NJ	763,750	2,567,686	288	70
NY	1,833,828	9,364,968	202	6
PA	334,498	1,181,477	40	1
PR	309,183	2,079,220	50	0
RI	226,525	755,144	30	11
SC	639,751	1,474,007	84	36
TX	1,779,781	5,267,197	190	37
VA	658,733	2,133,764	80	21
VI	2,928	58540	3	0

In future fiscal years, FEMA will continue to develop coastal probabilistic products for the other parts of the United States, including the Great Lakes and Pacific Ocean in coordination with other agencies such as USACE, NOAA (National Oceanic and Atmospheric Administration) and the USGS (United States Geological Survey). This will require an expanded consideration of coastal flood hazards to include impacts of tsunamis, coastal erosion, bluffs, and some of the hazards unique to areas like Alaska. Due to some of the processes associated with coastal flood hazards in these other geographic areas, more work will be required to ensure an appropriate modeling and statistical framework in these areas. In the Atlantic, Gulf of Mexico and U.S. Virgin Islands, and Puerto Rico this framework exists and provided foundation for the ongoing work. Investments in coastal hazards information in Alaska requires further coordination in upcoming years with state agencies and other federal agencies to identify needs.

Inland Flood Modeling

For the interior of the nation, the shift to probabilistic methodologies still needs to occur and is a focus of current efforts. FEMA needs to work across the Federal government over the next five years to address science and data gaps. To enable the transition, FEMA has an agreement with USACE to develop standard operating procedures (SOP) for probabilistic methodologies for hydrology and

hydraulics to support pluvial and fluvial flood risk calculations for the interior of the nation. FEMA is also collaborating with USGS, NOAA, and other agencies on shared national approaches and enhancements to foundational data to support these approaches.

Subject Matter Experts at USACE, USGS and FEMA must improve methods for estimating flood recurrence intervals. Staff have agreed that an improved understanding of the frequency of floods is critical information for effective risk communication, planning, and mitigation. This will require further coordination with NOAA in future years to assess what datasets and methods help provide more causal information on flood forcing.