United States Government Accountability Office

Report to Congressional Requesters

July 2020

CLIMATE CHANGE

A Climate Migration Pilot Program Could Enhance the Nation's Resilience and Reduce Federal Fiscal Exposure

Accessible Version

GAO-20-488

GAO Highlights

Highlights of GAO-20-488, a report to congressional requesters.

July 2020

CLIMATE CHANGE

A Climate Migration Pilot Program Could Enhance the Nation's Resilience and Reduce Federal Fiscal Exposure

Why GAO Did This Study

According to the 13-agency United States Global Change Research Program, relocation due to climate change will be unavoidable in some coastal areas in all but the very lowest sea level rise projections. One way to reduce the risks to these communities is to improve their climate resilience by planning and preparing for potential hazards related to climate change such as sea level rise. Climate migration—the preemptive movement of people and property away from areas experiencing severe impacts—is one way to improve climate resilience.

GAO was asked to review federal support for climate migration. This report examines (1) the use of climate migration as a resilience strategy; (2) federal support for climate migration; and (3) key challenges to climate migration and how the federal government can address them.

GAO conducted a literature review of over 52 sources and interviewed 12 climate resilience experts. In addition, GAO selected and interviewed 46 stakeholders in four communities that have considered relocation: Newtok, Alaska; Santa Rosa, California; Isle de Jean Charles, Louisiana; and Smith Island, Maryland.

What GAO Recommends

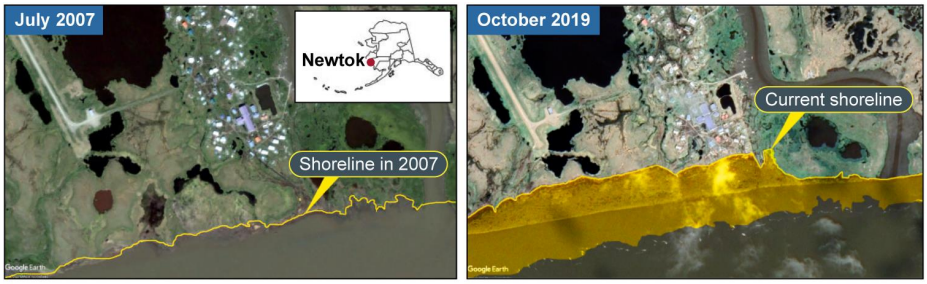
Congress should consider establishing a pilot program with clear federal leadership to identify and provide assistance to communities that express affirmative interest in relocation as a resilience strategy. The Departments of Homeland Security and Housing and Urban Development provided technical comments that GAO incorporated as appropriate.

View GAO-20-488. For more information, contact Alfredo Gómez at (202) 512-3841 or gomezj@gao.gov.

What GAO Found

GAO identified few communities in the United States that have considered climate migration as a resilience strategy, and two—Newtok, Alaska, and Isle de Jean Charles, Louisiana—that moved forward with relocation. Newtok, for example, faced imminent danger from shoreline erosion due to thawing permafrost and storm surge (see figure). Literature and experts suggest that many more communities will need to consider relocating in coming decades.

Shoreline Erosion at Newtok, Alaska, from July 2007 to October 2019.



Source: Federal Emergency Management Agency analysis. | GAO-20-488

Federal programs provide limited support to climate migration efforts because they are designed to address other priorities, according to literature GAO reviewed and interviews with stakeholders and federal officials. Federal programs generally are not designed to address the scale and complexity of community relocation and generally fund acquisition of properties at high risk of damage from disasters in response to a specific event such as a hurricane.

Unclear federal leadership is the key challenge to climate migration as a resilience strategy. Because no federal agency has the authority to lead federal assistance for climate migration, support for climate migration efforts has been provided on an ad hoc basis. For example, it has taken over 30 years to begin relocating Newtok and more than 20 years for Isle de Jean Charles, in part because no federal entity has the authority to coordinate assistance, according to stakeholders in Alaska and Louisiana. These and other communities will rely on post-disaster assistance if no action is taken beforehand—this increases federal fiscal exposure. Risk management best practices and GAO's 2019 Disaster Resilience Framework suggest that federal agencies should manage such risks before a disaster hits. A well-designed climate migration pilot program that is based on project management best practices could improve federal institutional capability. For example, the interagency National Mitigation Investment Strategy—the national strategy to improve resilience to disasters—recommends that federal agencies use pilot programs to demonstrate the value of resilience projects. As GAO reported in October 2019, a strategic and iterative risk-informed approach for identifying and prioritizing climate resilience projects could help target federal resources to the nation's most significant climate risks. A climate migration pilot program could be a key part of this approach, enhancing the nation's climate resilience and reducing federal fiscal exposure.

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List of Abbreviations

Corps	U.S. Army Corps of Engineers
FEMA	Federal Emergency Management Agency
HUD	Department of Housing and Urban Development
NOAA	National Oceanic and Atmospheric Administration
OMB	Office of Management and Budget
SIU	Smith Island United
USGCRP	United States Global Change Research Program

U.S. GOVERNMENT ACCOUNTABILITY OFFICE
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July 6, 2020

Congressional requesters

According to the United States Global Change Research Program's (USGCRP) *Fourth National Climate Assessment*, millions of Americans live in coastal areas threatened by sea level rise, and in all but the very lowest sea level rise projections, the retreat or relocation of people and infrastructure due to climate change will become an unavoidable option in some areas along the U.S. coastline.[1] One way to reduce such long-term risk to people and property from natural hazards is to enhance climate resilience. Enhancing climate resilience means taking actions to reduce potential future losses by planning and preparing for potential climate hazards, such as extreme rainfall, sea level rise, and drought.[2] Climate migration is one strategy to improve climate resilience.[3] For the purposes of this report, climate migration is the preemptive movement of people and property away from areas experiencing severe climate change

[1]U.S. Global Change Research Program, *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment,* vol. 2 (Washington, D.C.: 2018). Established under the Global Change Research Act of 1990, USGCRP coordinates and integrates global change research across 13 federal agencies. The Office of Science and Technology Policy within the Executive Office of the President oversees USGCRP. The *Fourth National Climate Assessment* is USGCRP's assessment of peer-reviewed scientific literature.

[2]We reported in May 2016 that two related sets of actions can enhance climate resilience by reducing risk. These are climate change adaptation and pre-disaster hazard mitigation. In general, the term "adaptation" is used by climate change professionals, and pre-disaster hazard mitigation is employed by the emergency management community, often to speak about the same thing: reducing the risk of climate change impacts. Adaptation is defined as adjustments to natural or human systems in response to actual or expected climate change. Pre-disaster hazard mitigation refers to actions taken to reduce the loss of life and property by lessening the impacts of adverse events and applies to all hazards, including terrorism and natural hazards such as health pandemics or weather-related disasters. In this report, we use the term "climate resilience" for consistency and to encompass both sets of actions as they relate to addressing climate risks. GAO, *Climate Change: Selected Governments Have Approached Adaptation through Laws and Long-Term Plans,* GAO-16-454 (Washington, D.C.: May 12, 2016).

[3]GAO, *Climate Resilience: A Strategic Investment Approach for High-Priority Projects Could Help Target Federal Resources,* GAO-20-127 (Washington, D.C.: Oct. 23, 2019); GAO, *Climate Change: Activities of Selected Agencies to Address Potential Impact on Global Migration,* GAO-19-166 (Washington, D.C.: Jan. 17, 2019); and R. Lempert et al., "Reducing Risks through Adaptation Actions," in *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment*, vol. 2 (Washington, D.C.: U.S. Global Change Research Program, November 2018).

impacts.[4] This definition encompasses both (1) the relocation and resettling of an entire community to a different site and (2) managed retreat, or the gradual, controlled movement of a portion of a community's infrastructure, facilities, homes, and businesses out of the most hazardous areas.[5]

The rising number of natural disasters and increasing reliance on the federal government for assistance is a key source of federal fiscal exposure. Since 2005, federal funding for disaster assistance has totaled at least $460 billion, which consists of obligations for disaster assistance from 2005 through 2014 totaling at least $278 billion[6] and select appropriations for disaster assistance from 2015 through 2019 totaling $183 billion.[7] In 2013, we placed "*Limiting the Federal Government's Fiscal Exposure by Better Managing Climate Change Risks*" on our high-risk list—a list of federal programs and operations with vulnerabilities to

[4]Because this topic is an emerging field of research, definitive terminology has yet to be established. However, this definition is consistent with literature we reviewed. For example, see M. Burkett, "Behind the Veil: Climate Migration, Regime Shift, and a New Theory of Justice," *Harvard Civil Rights – Civil Liberties Law Review*, vol. 53 (2018). M. Hino, C. Field, and K. Mach, "Managed retreat as a response to natural hazard risk," *Nature Climate Change*, vol. 7 (2017): 364-370.

[5]Relocating an entire community to a different site versus gradual retreat of parts of communities entail different planning and engineering challenges. According to Federal Emergency Management Agency (FEMA) officials, managed retreat may only impact a small portion of a community, and may be managed and planned on a smaller scale than relocation. Additionally, the term community can have different connotations depending on its location. For example, a community in Alaska could refer to an entire Native village, but in the continental U.S. the word could refer to a neighborhood in a more populated area such as Miami.

[6]GAO, *Federal Disaster Assistance: Federal Departments and Agencies Obligated at Least $277.6 Billion during Fiscal Years 2005 through 2014*, GAO-16-797 (Washington, D.C.: Sept. 22, 2016).

[7]This total includes, for fiscal years 2015 through 2019, $143 billion in supplemental appropriations to federal agencies for disaster assistance and approximately $40 billion in annual appropriations to the Disaster Relief Fund. It does not include other annual appropriations to federal agencies for disaster assistance. See Pub. L. No. 114-223, § 145, 130 Stat. 857, 916 (2016); Pub. L. No. 114-254, 130 Stat. 1005, 1019 (2016); Pub. L. No. 115-56, div. B, 131 Stat. 1129, 1136 (2017); Pub. L. No. 115-72, div. A, 131 Stat. 1224, 1224 (2017); Pub. L. No. 115-123, div. B, subdiv. 1, 132 Stat. 64, 65 (2018); Pub. L. No. 115-254, 132 Stat. 3186, 3531 (2018); Pub. L. No. 116-20, 133 Stat. 871 (2019). See also Pub. L. No. 114-120, 129 Stat. 39, 55 (2015); Pub. L. No. 114-113, 129 Stat. 2242, 2507 (2015); Pub. L. No. 115-31, 131 Stat. 135, 417 (2017); Pub. L. No. 115-141, 132 Stat. 348, 620 (2018); Pub. L. No. 116-6, 133 Stat. 13, 31 (2019).

fraud, waste, abuse, and mismanagement, or in need of transformation to address economy, efficiency, or effectiveness challenges.[8]

Our work over the last decade has identified a key federal role in recognizing and managing climate risks to limit such fiscal exposure.[9] We and others have recommended enhancing climate resilience to help limit the federal government's fiscal exposure to climate change because investing in resilience can reduce the need for far more costly steps in the decades to come.[10] As we reported in October 2019, large-scale climate resilience projects, such as climate migration projects, can convey benefits by, for example, protecting life and property from climate hazards.[11] Specifically, a 2018 interim report by the National Institute of Building Sciences estimated that benefits to society (i.e., homeowners and communities) would exceed costs for several types of resilience projects by protecting lives and property and preventing other losses,

[8]GAO, *High-Risk Series: An Update*, GAO-13-283 (Washington, D.C.: February 2013).

[9]See for example: GAO-20-127; GAO, *Climate Change: Opportunities to Reduce Federal Fiscal Exposure,* GAO-19-625T (Washington, D.C.: June 11, 2019); GAO, *Hurricane Sandy: An Investment Strategy Could Help the Federal Government Enhance National Resilience for Future Disasters,* GAO-15-515 (Washington, D.C.: July 30, 2015); and GAO, *Climate Change Adaptation: Aligning Funding with Strategic Priorities,* GAO-11-876T (Washington, D.C.: July 28, 2011).

[10]See: GAO-19-625T, GAO-16-454, and National Research Council of the National Academies, America's Climate Choices: Panel on Adapting to the Impacts of Climate Change, *Adapting to the Impacts of Climate Change* (Washington, D.C.: 2010).

[11]GAO-20-127.

although precise benefits are uncertain.[12] However, as we reported in October 2019, federal investment in projects designed to enhance climate resilience has been limited and most of the federal government's efforts to reduce disaster risk are reactive and revolve around disaster recovery.[13] We also reported that more strategic federal investments in large-scale climate resilience projects such as climate migration efforts may be needed to manage some of the nation's most significant climate risks, since climate change cuts across agency missions and poses fiscal exposures larger than any one agency can manage.

Recent legislation has authorized the Federal Emergency Management Agency (FEMA) and the Department of Housing and Urban Development (HUD) to use federal funding for mitigation activities to help reduce future losses to disasters.[14] The Disaster Recovery Reform Act of 2018 (DRRA), enacted in October 2018, allows the President to set aside up to 6 percent of the estimated aggregate amount of grants from certain emergency programs under a major disaster declaration to implement

[12]Multihazard Mitigation Council, National Institute of Building Sciences, *Natural Hazard Mitigation Saves: 2018 Interim Report* (Washington, D.C.: 2018). This interim report examined a sample of hazard mitigation grants awarded by the Federal Emergency Management Agency, the Economic Development Administration, and the Department of Housing and Urban Development from 1993 through 2016 to address various hazards. According to the interim report, for every grant dollar the federal government spent across the projects examined in the report, over time, society is estimated to accrue benefits amounting to the following: (1) About $3 on average from projects addressing the effects of fire in the wildland-urban interface, with most benefits (approximately 70 percent) coming from the protection of property (i.e., avoiding property losses); (2) About $5 on average from projects to address hurricane- and tornado-force winds, with most benefits (approximately 90 percent) coming from the protection of lives, including avoiding deaths, nonfatal injuries, and cases of post-traumatic stress; (3) About $7 on average from projects that buy out buildings prone to riverine flooding, with most benefits (approximately 65 percent) coming from the protection of property. The interim report also projected that society could accrue benefits amounting to about $11 on average for every dollar invested in designing new buildings to meet the 2018 International Building Code and the 2018 International Residential Code (the model building codes developed by the International Code Council). Benefit estimates from federal grants convey the magnitude of potential long-term benefits to society, primarily homeowners and local residents, and are not precise estimates. For more information on these potential benefits, visit the following link: https://www.nibs.org/page/mitigationsaves.

[13]GAO-20-127.

[14]GAO-20-127.

pre-disaster hazard mitigation activities.[15] FEMA is to administer the associated program, the Building Resilient Infrastructure and Communities program.[16] Additionally, the Further Additional Supplemental Appropriations for Disaster Relief Requirements Act provided Community Development Block Grant Mitigation program funds to HUD.[17] In August 2019, HUD issued guidance for allocating about $6.9 billion in funds through this program.[18] According to HUD, the program represents a unique opportunity for grantees to carry out strategic and high-impact activities to mitigate disaster risks and reduce future losses. These funds are available to grantees recovering from qualifying disasters that occurred in 2015, 2016, and 2017.

However, as of October 2019, the federal government did not have a strategic approach to guide its investments in high-priority climate resilience projects.[19] As we reported, no federal agency, interagency collaborative effort, or other organizational arrangement had been established to implement a strategic approach to climate resilience investment that includes periodically identifying and prioritizing projects. We also reported that such an approach could help target federal resources toward high-priority projects—including climate migration projects—that manage some of the nation's most significant climate risks. We recommended that Congress consider establishing a federal organizational arrangement to periodically identify and prioritize climate resilience projects for federal investment. In our October 2019 report, we also described potential steps and criteria for identifying and prioritizing

[15]FAA Reauthorization Act of 2018, Pub. L. No. 115-254, div. D, §§ 1206(a)(3), 1234(a)(5), 132 Stat. 3186, 3440, 3462 (2018). The FAA Reauthorization Act of 2018, which included the Disaster Recovery Reform Act of 2018, became law on October 5, 2018.

[16]As of June 2020, FEMA had not yet finalized program guidance, although the agency has sought input from the public on program design. FEMA officials estimate annual funds for the program will average from $300 million to $500 million.

[17]Pub. L. No. 115-123, div. B, 132 Stat. 65, 103 (2018). The primary objective of the program is the development of viable urban communities by providing decent housing and a suitable living environment and expanding economic opportunities, principally for persons of low and moderate income.

[18]Allocations, Common Application, Waivers, and Alternative Requirements for Community Development Block Grant Mitigation Grantees, 84 Fed. Reg. 45,838 (Aug. 30, 2019).

[19]GAO-20-127.

potential high-priority climate resilience projects for federal investment.[20] In that report, several stakeholders told us that it is important to prioritize federal financial assistance for communities that have limited financial capacity for projects that enhance resilience.

You asked us to review the extent to which the federal government supports communities' climate migration efforts. This report examines (1) what is known about communities' use of climate migration as a resilience strategy; (2) the extent to which the federal government supports communities' climate migration efforts; and (3) the key challenges associated with climate migration and how the federal government could help address them to reduce federal fiscal exposure.

For all three objectives, we conducted a literature search for articles and reports related to migration or relocation due to the impacts of climate change. To conduct the search, we used Elsevier's Scopus database to identify peer-reviewed articles, government reports, hearings and transcripts, industry and trade group publications, conference papers, books, think tank publications, and working papers published from January 2010 through July 2018. We identified 52 documents for our literature review that discussed issues relevant to our objectives, including the movement of humans due to potential climate change impacts, communities considering climate migration, and key challenges to climate migration related to the federal government. We supplemented the review with our own reporting, as well as reporting from USGCRP and the Mitigation Framework Leadership Group,[21] which examined projected climate change impacts and potential risk management strategies for reducing exposure to these impacts, including climate migration.[22]

[20]GAO-20-127.

[21]The Mitigation Framework Leadership Group, an interagency body chaired by FEMA, was created to integrate federal efforts and promote a national cultural shift that incorporates risk management and hazard mitigation in all planning, decision-making, and development to the extent practicable. It coordinates mitigation efforts across the federal government and assesses the effectiveness of mitigation capabilities as they are developed and deployed across the nation.

[22]For example, see GAO-20-127; GAO-19-166; Department of Homeland Security, Mitigation Framework Leadership Group, *National Mitigation Investment Strategy*. (Washington, D.C.: August 2019); and R. Lempert et al., "Reducing Risks through Adaptation Actions," in *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment.*

We also interviewed selected experts and federal officials about the use of climate migration as a resilience strategy, federal support to states and communities for climate migration, key challenges associated with climate migration, and how the federal government could help address those challenges. We selected 16 experts who had authored a publication within the previous 5 years; had expertise in a field relevant to our objectives; and worked in academia, at a nongovernmental organization, or in the federal, state, or local government.[23] Twelve of the experts we identified agreed to be interviewed for this study. We interviewed federal officials from USGCRP, the National Oceanic and Atmospheric Administration (NOAA), HUD, and FEMA, which chairs the Mitigation Framework Leadership Group.

To examine what is known about communities' use of climate migration as a resilience strategy and the extent to which the federal government supports communities' climate migration efforts, we conducted site visits to four selected communities. We selected these communities—Newtok, Alaska; Santa Rosa, California; Isle de Jean Charles, Louisiana; and Smith Island, Maryland—for site visits based on their geographic location, the type of climate-related risks facing the community, and whether the community received technical or financial assistance from the federal government for climate migration, among other factors. As part of these site visits, we interviewed stakeholders—including government officials, researchers, community groups, and consultants—knowledgeable about the potential climate change impacts facing the communities and the decision-making process states and communities use to plan and implement climate migration projects. We summarized and analyzed these stakeholders' responses.

To determine the key challenges associated with climate migration and how the federal government could help address them to reduce federal fiscal exposure, we used our literature review to identify and summarize examples of challenges to climate migration and examples of federal options to address these challenges. We also analyzed and summarized interview responses and documents provided by experts, federal officials, and stakeholders from our site visits, to identify challenges, relevant

[23]Relevant fields of expertise included climate change impacts and responses of indigenous, Native American, or Alaska Native peoples; climate change adaptation response, including climate migration; climate change resiliency planning or policy; environmental policy and law; anthropology; other social sciences such as psychology or demography.

lessons learned from their experiences, and how federal financial and technical assistance to states and communities for climate migration could be improved. Additionally, we reviewed our prior work on risk management, climate change, climate resilience, and hazard mitigation, including our Disaster Resilience Framework and our past work on enterprise risk management.[24] For additional details on our scope and methodology, see appendix I.

We conducted this performance audit from May 2018 to July 2020 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

This section describes (1) climate resilience as a risk management strategy to reduce federal fiscal exposure and (2) GAO's Disaster Resilience Framework to facilitate and promote resilience to natural disasters.

Climate Resilience as a Risk-Management Strategy to Reduce Federal Fiscal Exposure

We have previously reported that enhancing climate resilience can help reduce federal fiscal exposure.[25] According to the *Fourth National Climate Assessment*, enhancing climate resilience entails a continuous risk management process. Specifically, individuals and organizations become aware of and assess risks and vulnerabilities from climate and other drivers of change, take actions to reduce those risks, and learn over time.

[24]GAO, *Disaster Resilience Framework: Principles for Analyzing Federal Efforts to Facilitate and Promote Resilience to Natural Disasters*, GAO-20-100SP (Washington: D.C.: Oct. 2019); GAO, *Enterprise Risk Management: Selected Agencies' Experiences Illustrate Good Practices in Managing Risks,* GAO-17-63 (Washington, D.C.: Dec. 1, 2016).

[25]For example, see GAO-20-127 and GAO, *High-Risk Series: Substantial Efforts Needed to Achieve Greater Progress on High-Risk Areas*, GAO-19-157SP (Washington, D.C.: Mar. 6, 2019).

In December 2016, we reported on a risk management strategy that can help guide federal climate resilience efforts.[26] Enterprise risk management is a forward-looking management approach that can help federal agencies identify, assess, and manage risks, such as preparing for and responding to natural disasters. In our December 2016 report, we identified six essential elements of enterprise risk management: (1) aligning the enterprise risk management process to goals and objectives, (2) identifying risks, (3) assessing risk, (4) selecting a risk response based on risk appetite, (5) monitoring risks to see whether risk responses are successful, and (6) communicating and reporting on risks.[27] For example, prioritizing the federal response to risk requires considering both the likelihood of the risk and the impact of the risk on an agency's mission. Importantly, there must be a "risk owner" to manage the treatment of risks and opportunities to achieve agency goals.

Many current and future climate change impacts require immediate actions; therefore, climate resilience efforts need to be focused where urgent action is needed, according to the National Academies of Sciences, Engineering, and Medicine.[28] For example, climate change impacts, such as accelerated erosion, have resulted in an imminent threat to health and safety for some Alaska Native villages. In addition, while it will not be possible to eliminate all risks associated with climate change, if the nation prioritizes federal climate risk management activities—such as climate resilience projects—it may be possible to minimize negative impacts and maximize the opportunities associated with climate change, according to the National Academies. In July 2015, however, we found

[26]GAO-17-63. According to OMB Circular A-123, federal leaders and managers are responsible for implementing management practices that effectively identify, assess, respond, and report on risks. Enterprise risk management is an effective agency-wide approach to addressing the full spectrum of the organization's external and internal risks by understanding the combined impact of risks as an interrelated portfolio, rather than addressing risks only within silos.

[27]The six essential elements are generally consistent with the steps outlined in several resilience planning frameworks we reviewed, including in the National Infrastructure Protection Plan, a critical infrastructure risk management framework that includes five steps to protect critical infrastructure, manage risk, and increase resilience. The steps outlined in the National Infrastructure Protection Plan are: (1) set goals and objectives; (2) identify infrastructure (i.e., assets, systems, and networks); (3) assess and analyze risks; (4) implement risk management activities; and (5) measure effectiveness.

[28]National Research Council of the National Academies, America's Climate Choices: Panel on Adapting to the Impacts of Climate Change, *Adapting to the Impacts of Climate Change.*

that the emphasis on the post-disaster environment can create a reactive approach in which disasters determine when and for what purpose the federal government invests in disaster resilience, and this can limit states' ability to plan and prioritize for maximum risk reduction.[29] Further, our October 2019 report found that federal investment in climate resilience projects to date has been limited, reactive, and revolved around disaster recovery.[30]

Our past work and other sources show that an iterative and strategic risk-informed approach for identifying and prioritizing climate resilience projects could better target federal investment. As we reported in October 2019, a strategic approach would allow for a more purposeful, coordinated, and comprehensive federal response to climate risks.[31] Such an approach could help target federal resources toward high-priority projects—namely, those that address the nation's most significant climate risks—that are not already addressed through existing federal programs. Further, several stakeholders told us that such an approach could take into account social equity considerations by prioritizing projects in communities that have limited capacity to enhance their resilience without federal financial assistance. In particular, a strategic and iterative risk-informed approach for identifying and prioritizing climate resilience projects for federal investment could supplement the agency-specific approaches to climate resilience investment currently carried out by individual agencies with different statutes, goals, constituencies, and funding streams.

GAO's Disaster Resilience Framework

In October 2019, we issued the *Disaster Resilience Framework: Principles for Analyzing Federal Efforts to Facilitate and Promote Resilience to Natural Disasters* to support the analysis of federal opportunities to facilitate and promote resilience to natural hazards.[32] The framework provides a set of high-level principles to help officials who oversee and manage federal agencies or programs consider actions—such as climate migration—to increase their resilience to natural hazards. Among other uses, the framework can help identify opportunities to

[29]GAO-15-515.

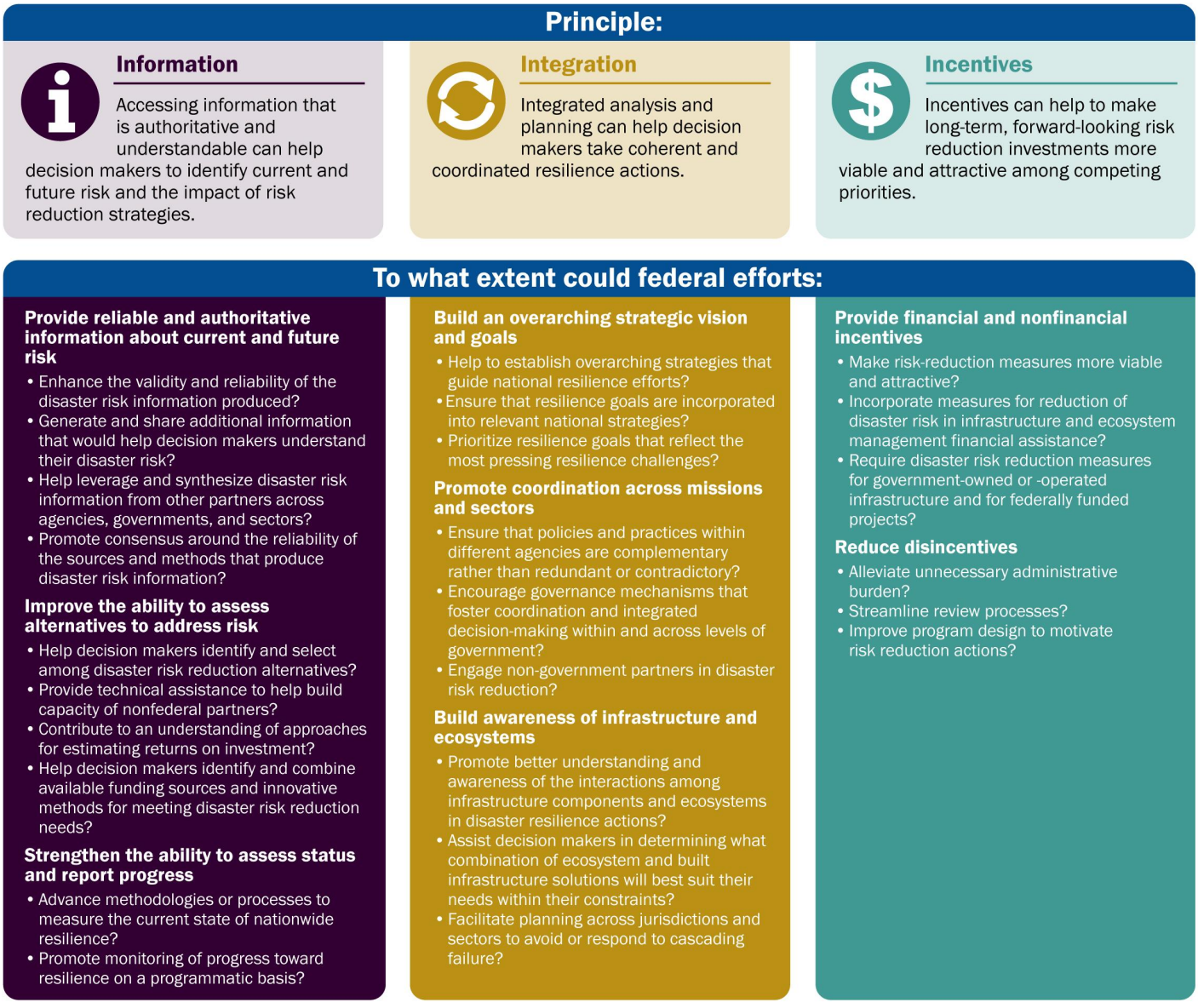
[30]GAO-20-127.

[31]GAO-20-127.

[32]GAO-20-100SP.

address gaps in federal efforts by asking key questions about the federal government's ability to address government-wide challenges. As shown in figure 1, the framework is organized around three separate but overlapping principles—information, integration, and incentives—and a series of questions that can help federal officials analyze the agencies and/or programs to identify opportunities to enhance federal efforts to promote disaster resilience.

Figure 1: GAO's Disaster Resilience Framework



Source: GAO. | GAO-20-488

Text of Figure 1: GAO's Disaster Resilience Framework

Information

Accessing information that is authoritative and understandable can help decision makers to identify current and future risk and the impact of risk reduction strategies.

Integration

Integrated analysis and planning can help decision makers take coherent and coordinated resilience actions.

Incentives

Incentives can help to make long-term, forward-looking risk reduction investments more viable and attractive among competing priorities.

To what extent could federal efforts:

Information

Provide reliable and authoritative information about current and future risk

- Enhance the validity and reliability of the disaster risk information produced?
- Generate and share additional information that would help decision makers understand their disaster risk?
- Help leverage and synthesize disaster risk information from other partners across agencies, governments, and sectors?
- Promote consensus around the reliability of the sources and methods that produce disaster risk information?

Improve the ability to assess □alternatives to address risk

- Help decision makers identify and select among disaster risk reduction alternatives?
- Provide technical assistance to help build capacity of nonfederal partners?

- Contribute to an understanding of approaches for estimating returns on investment?
- Help decision makers identify and combine available funding sources and innovative methods for meeting disaster risk reduction needs?

Strengthen the ability to assess status and report progress

- Advance methodologies or processes to measure the current state of nationwide resilience?
- Promote monitoring of progress toward resilience on a programmatic basis?

Integration

Build an overarching strategic vision and goals

- Help to establish overarching strategies that guide national resilience efforts?
- Ensure that resilience goals are incorporated into relevant national strategies?
- Prioritize resilience goals that reflect the most pressing resilience challenges?

Promote coordination across missions and sectors

- Ensure that policies and practices within different agencies are complementary rather than redundant or contradictory?
- Encourage governance mechanisms that foster coordination and integrated decision-making within and across levels of government?
- Engage non-government partners in disaster risk reduction?

Build awareness of infrastructure and ecosystems

- Promote better understanding and awareness of the interactions among infrastructure components and ecosystems in disaster resilience actions?
- Assist decision makers in determining what combination of ecosystem and built infrastructure solutions will best suit their needs within their constraints?
- Facilitate planning across jurisdictions and sectors to avoid or respond to cascading failure?

Incentives

Provide financial and nonfinancial incentives

- Make risk-reduction measures more viable and attractive?
- Incorporate measures for reduction of disaster risk in infrastructure and ecosystem management financial assistance?
- Require disaster risk reduction measures for government-owned or -operated infrastructure and for federally funded projects?

Reduce disincentives

- Alleviate unnecessary administrative burden?
- Streamline review processes?
- Improve program design to motivate risk reduction actions?

Under each of the principles, there are more specific questions that can be used to analyze federal efforts to enhance national resilience to disasters. For example, according to the framework, bringing together disparate agency missions and resources that support disaster risk reduction can help build national resilience to natural hazards. This is consistent with our October 2019 report, in which we identified programs within agencies such as FEMA, HUD, and the U.S. Army Corps of Engineers (Corps) that have provided technical and financial assistance for projects that may convey some climate resilience benefits, but only within the scope of their respective agency missions and requirements.[33] Accordingly, federal efforts can (1) promote coordination across agency missions and sectors, (2) help decision makers identify and combine available funding streams, and (3) help leverage the expertise of nonfederal partners and synthesize disaster risk information across agencies, governments, and sectors. For example, according to the framework, federal efforts can improve disaster resilience by facilitating the combination of funding streams, which may be particularly important for smaller, low-income, and historically disadvantaged communities or jurisdictions.

Few Communities Have Considered or Implemented Climate Migration, and Literature

[33]GAO-20-127.

and Experts Suggest Many Will Need to Consider Migrating in Coming Decades

Based on our review of the literature and interviews with experts, we identified few communities in the United States that have considered or implemented climate migration as a strategy to improve their resilience. Literature we reviewed and experts we interviewed suggest that in the coming decades many other communities will need to consider migrating because of changes in the climate.

Few Communities in the United States Have Considered or Implemented Climate Migration as a Resilience Strategy

The few communities that have considered or implemented climate migration as a resilience strategy that we identified included Newtok, Alaska; Isle de Jean Charles, Louisiana; Smith Island, Maryland; and Santa Rosa, California.[34] Two of these communities—Newtok and Isle de Jean Charles—decided to pursue migration to another site. In the other two communities—Smith Island and Santa Rosa—community residents or local officials decided that adapting in place was a sufficient risk management strategy. In addition to these four communities, we also reviewed documents describing lessons learned from the completed community-led migration effort by Valmeyer, Illinois, following the Midwest floods of 1993.

Newtok, Alaska

Newtok, a rural Alaska Native Yup'ik village of almost 400 residents located on the southwest coast of Alaska, has been experiencing an average loss of over 80 feet of land each year, according to an Alaska state official, to a combination of river scour, permafrost thawing due to

[34]Smith Island has three distinct villages: Ewell, Rhodes Point, and Tylerton. For the purposes of this report, we refer to Smith Island as a community because residents from the three villages formed Smith Island United (SIU), an island-wide grassroots organization to advocate collectively for Smith Island's future. In 2004, GAO identified Newtok as one of four Alaska Native villages in imminent danger from erosion. GAO, *Alaska Native Villages: Most Are Affected by Flooding and Erosion, but Few Qualify for Federal Assistance*, GAO-04-142 (Washington, D.C.: Dec. 12, 2003).

climate change, and storm surge, as shown in figure 2.[35] As of October 2019, the village had lost its barge landing and landfill to erosion, and the village's drinking water source, houses, school, and airport access are threatened.[36] Additionally, standing water pervaded Newtok due to thawing permafrost, and most homes were inundated with mold due to frequent flooding, resulting in significant health problems, particularly among young and elderly residents. According to a November 2019 Denali Commission statewide threat assessment for remote Alaska communities, the Commission expected Newtok to be uninhabitable within a few years.[37] Newtok is emblematic of other Alaska Native villages in low-lying wetlands that have considered climate migration as a resilience strategy and are subject to a combination of erosion, permafrost degradation, and flooding from storms.[38]

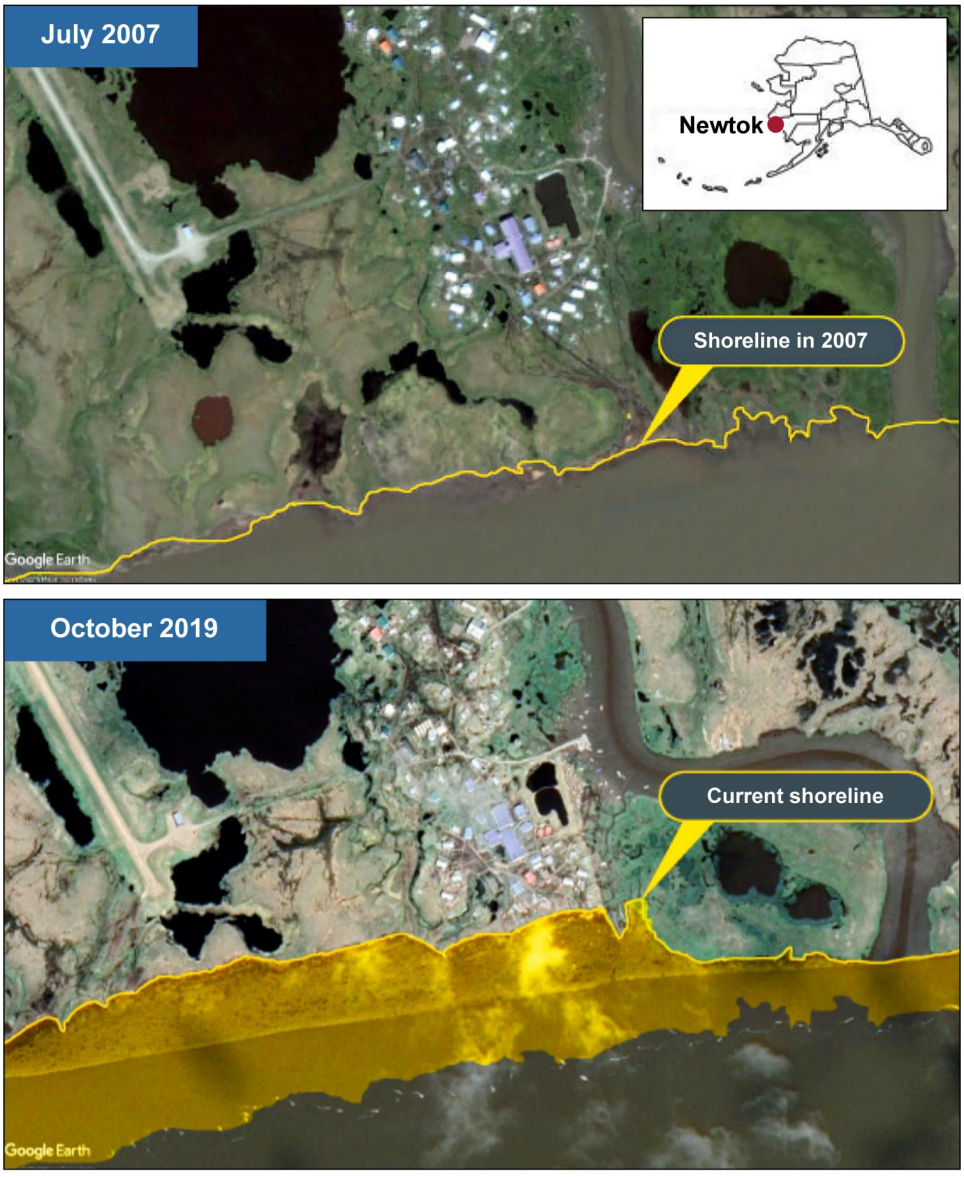
[35]The Yup'ik is the largest Alaska Native tribal grouping, according to the 2010 Census. According to a November 2019 threat assessment for rural Alaska villages, in many cases the impacts of erosion, flooding, and thawing permafrost amplify one another to form a combined threat known as usteq—a Yup'ik word that roughly translates to "surface caves in." River scour is defined as the erosion of a riverbed by flowing water. Scour often occurs during floods.

[36]The Denali Commission, *Record of Decision: Mertarvik Infrastructure Development, Nelson Island, Alaska* (Anchorage, AK: April 2018).

[37]University of Alaska-Fairbanks and U.S. Army Corps of Engineers, *Statewide Threat Assessment: Identification of Threats from Erosion, Flooding, and Thawing Permafrost in Remote Alaska Communities* (Anchorage, AK: November 2019). Report prepared for the Denali Commission.

[38]For example, in June 2009, we identified 31 Alaska Native villages that were imminently threatened by erosion, 12 of which had considered migrating to reduce their exposure to erosion and other hazards. GAO, *Alaska Native Villages: Limited Progress Has Been Made on Relocating Villages Threatened by Flooding and Erosion,* GAO-09-551 (Washington, D.C.: June 3, 2009).

Figure 2: Shoreline Erosion at Newtok, Alaska, July 2007 to October 2019.



Source: Federal Emergency Management Agency analysis. | GAO-20-488

The village identified the erosion problem as early as 1983, when an assessment found that unchecked erosion would endanger structures within 25 to 30 years. The assessment led the village government to decide to relocate, and officials began analyzing potential village resettlement sites in 1994. Ultimately it selected a site on Nelson Island approximately nine miles southeast of the village, named Mertarvik. The

community selected Mertarvik for several reasons, including its location within Newtok's traditional lands, access to subsistence resources, water availability, and geological resistance to erosion.[39]

In June 2009, we reported that the Newtok Planning Group, formed in 2006 by federal, state, regional, and village partners, helped accelerate the relocation process that the village initiated in 1994.[40] We also reported that both the lack of a lead federal agency and the lack of a dedicated funding source for relocation efforts were key challenges to further progress. We recommended that Congress consider designating or creating a lead federal entity for coordinating and overseeing Alaska Native village relocation efforts.

In 2015, the President designated the Denali Commission as the lead agency to help coordinate federal, state, and tribal resources to assist communities in developing and implementing short- and long-term solutions to address the impacts of climate change, including coastal erosion, flooding, and permafrost degradation. Working with state and federal agencies, private contractors, and tribal entities, Newtok has made incremental progress in relocating to Mertarvik.[41] However, according to documentation provided by the Newtok Village Council, the community has had difficulty accessing funding to invest in climate migration before a disaster hits. For example, Newtok's December 2016 submission for a formal disaster declaration was denied by the President. According to the Newtok Village Council, the submission was denied because slow-moving disasters, such as coastal erosion due to storm surge and permafrost degradation, do not qualify for federal disaster relief funds under the Stafford Act.

[39]The Denali Commission, *Record of Decision: Mertarvik Infrastructure Development*.

[40]GAO-09-551.

[41]Specifically, construction completed as of December 2019 included a quarry, landfill, barge landing, temporary airstrip, 21 houses, roads, a power plant, power distribution, bulk fuel storage, evacuation center (serving as a temporary school facility), in-home sanitation, a water treatment plant, a wastewater treatment plant, construction camp facilities, a temporary clinic, and community water-sewer service to public facilities, according to Denali Commission officials. According to Alaska state officials, the quarry, barge landing, the foundation of the evacuation center, and a portion of the houses were completed by agencies participating in the Newtok Planning Group before the Denali Commission was designated as the lead agency in 2015.

Through December 2019, the Newtok relocation effort received about $64 million in funds from federal agencies, the state of Alaska, and other organizations, according to the relocation project manager.[42] Infrastructure and housing construction continue at Mertarvik, and 135 people have moved there full time. However, the June 2019 Master Implementation Plan for relocation and Denali Commission officials estimated that the project would need around $115 million to develop the new site, provide sufficient infrastructure, and perform cleanup of the Newtok site.[43] According to federal and state officials and stakeholders in Alaska, Newtok residents face increased disaster risks because the relocation to Mertarvik will not be complete before coastal erosion and flooding make Newtok uninhabitable.

Isle de Jean Charles, Louisiana

Isle de Jean Charles is a narrow island in the bayous of South Terrebonne Parish, Louisiana, approximately 80 miles southwest of New Orleans. As figure 3 shows, the island has lost about 98 percent (22,000 of 22,400 acres) of its total landmass since 1955. This loss was driven by climate change, extreme weather, and unsustainable practices associated with water management as well as oil and gas production.[44] The sole connecting road to the mainland is often impassable due to high winds, tides, or storm surge, which restricts residents' access to school, work, and essential goods and services. The island's population had fallen from 400 to 85 as of 2018. Further, according to state planning documents, continued sea level rise and coastal erosion will likely make relocation inevitable for the remaining residents.

[42]According to Denali Commission documents, funding for the development of Mertarvik was provided by the following federal agencies: the Departments of Agriculture, Commerce, Defense, Homeland Security, Housing and Urban Development, Interior, and Transportation; and the Denali Commission. In fiscal years 2018 and 2019, the Denali Commission provided about $24 million in federal funding and the state of Alaska provided about $4.2 million, among other sources.

[43]According to the implementation plan, the cost of relocation varies depending on how relocation completion is defined, how substantial the final infrastructure is, and how much cleanup of the prior community is performed.

[44]L. Carter et al., "Southeast," in *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment*, vol. 2 (Washington, D.C.: U.S. Global Change Research Program, November 2018).

Figure 3: Land Loss at Isle de Jean Charles, Louisiana, 1963 to 2008

Source: U.S. Geological Survey. | GAO-20-488

Tribal leaders from two state-recognized tribes have identified Isle de Jean Charles' rapid land loss as an existential threat to their communities, livelihood, and culture because families have spread across the region and sacred places, cultural sites and practices, healing plants, traditional foods, and lifeways are being lost.[45] After almost 20 years of tribal persistence, HUD awarded the state of Louisiana $48.3 million in Community Development Block Grant funds in 2016 to resettle Isle de

[45]The two state-recognized tribes are the Isle de Jean Charles Band of Biloxi-Chitimacha-Choctaw and the United Houma Nation. Both tribes have worked with state officials to develop grant proposals for resettling Isle de Jean Charles. For more information, see Louisiana Recovery Authority, *United States Department of Housing and Urban Development Disaster Recovery Community Block Grant Proposal* (2008), and the Lowlander Center, Global Compact on Refugees, *Resettlement as a Resilience Strategy and the Case of Isle de Jean Charles* (2015).

Jean Charles, as part of the state's application to the 2014 National Disaster Resilience Competition.[46]

The state is managing resettlement because the Community Development Block Grant funding requirements restricted eligibility to states with qualified disasters and entities of general local government who received funding from HUD for disasters occurring in 2011 through 2013. One of the tribes, the Isle de Jean Charles Band of Biloxi-Chitimacha-Choctaw, worked with the state and other stakeholders to develop the resettlement proposal that was included in the second phase of the state's application for the 2014 National Disaster Resilience Competition.[47] After the state's outreach with island residents, the state submitted amended resettlement plans, which HUD approved in August 2019, according to state documents.[48]

As of June 2020, the state had completed its site selection and master planning activities, purchased 515 acres of land at a new site on the mainland, and started the development and construction phase. However, stakeholders told us that, due in part to federal funding requirements, the resettlement process has been more complex than originally expected, and tribal leaders from both of the state-recognized tribes have expressed concern that the process does not meet the unique needs of tribal

[46]L. Carter et al.,"Southeast," in *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment*. The National Disaster Resilience Competition was announced on June 14, 2014, and the Department of Housing and Urban Development released its initial Notice of Funding Availability for the competition on September 17, 2014. The Competition's Phase I application was due March 15, 2015, and its Phase II application was due on October 27, 2015. On January 21, 2016, HUD notified successful applicants they would receive awards. According to Louisiana officials, the state based its $48.3 million grant request on (1) the estimated costs to move the islands' residents without financially burdening the population and (2) the capital necessary to develop the new community in a sustainable manner.

[47]L. Carter et al., "Southeast," in *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment*. According to state officials, this 2015 proposal was produced by the Lowlander Center and Global Compact on Refugees at the direction of the State of Louisiana, for inclusion in the second phase of the HUD application process.

[48]State of Louisiana, Substantial amendment No. 5: Introduction of New Activities and Project Narrative Clarifications for the Utilization of Community Development Block Grant Funds under the National Disaster Resilience Competition Resettlement of Isle de Jean Charles.

residents.[49] Some tribal residents have chosen not to relocate, and will remain vulnerable to coastal erosion and storm surge, increasing the likelihood that they will be impacted by a disaster event.

Smith Island, Maryland

Smith Island—a collection of islands near the Eastern Shore of the Chesapeake Bay—is 12 miles off the mainland and is only accessible by boat.[50] Smith Island has three unincorporated villages (Ewell, Rhodes Point, and Tylerton) and almost 300 year-round residents.[51] According to an August 2015 planning document, Smith Island is facing several challenges, including declining population, deteriorating infrastructure, shoreline erosion, and flooding.[52] Although the community reported that erosion and flooding can impact the island's traditional fishing economy, reduce protective marshlands, and increase flooding during storms, they said that these impacts had not significantly affected residents' quality of life or access to essential services such as drinking water.

In 2013, when the state of Maryland received Hurricane Sandy recovery funding from HUD's Community Development Block Grant program, long-term risk reduction options for affected areas were assessed, according to state and local officials we spoke with. These options included buyouts

[49]For example, tribal leaders said that the federal requirements for restricted mortgages at the new site and for residents' property on Isle de Jean Charles have been confusing to residents whose families have passed down property for generations without these legal instruments. According to Louisiana officials, the state has developed a policy in which a non-payable mortgage will be placed on properties within the new community for a term of 5 years. The mortgage stipulates that Isle de Jean Charles residents who accept housing within the new community will not use their former Isle de Jean Charles dwellings as permanent residences, nor will they substantially improve those dwellings for the duration of the mortgage agreement.

[50]Consensus Building Institute and Horsley Witten Group, *Smith Island Vision Plan: A Vision for How Smith Island Will Look, Feel, and Thrive in the Coming Decades* (August 2015).

[51]Because its villages do not have any formal local government, Smith Island is governed by Somerset County. According to the August 2015 *Smith Island Vision Plan*, the number of residents can double during the months of May through November.

[52]Consensus Building Institute and Horsley Witten Group, *Smith Island Vision Plan.*

of properties on Smith Island.[53] However, local residents strongly opposed the proposed buyouts. Instead, Smith Island residents organized into Smith Island United (SIU), a grassroots organization to advocate for the preservation of Smith Island.

In part to rebuild trust, federal, state, and local government officials worked with SIU and residents to develop the August 2015 *Smith Island Vision Plan*—a community-led vision for how to address the environmental, economic, and infrastructure challenges Smith Island faces. According to this plan, in discussions with the community, shoreline protection consistently rose to the highest-priority level for infrastructure investment. SIU has successfully used its Vision Plan to obtain additional federal, state, local, and private sector investment in Smith Island, according to SIU members and local officials we spoke with. For example, with state and local support, the U.S. Army Corps of Engineers completed a combined channel dredge and shoreline stabilization project at Rhodes Point for about $9 million, as shown in figure 4.[54] Additionally, the state of Maryland pledged $8 million in 2018 to improve Smith Island's wastewater treatment plants, according to local officials.[55]

[53]According to Smith Island residents and local officials, flooding damage on Smith Island was limited because its topography allowed the storm surge to drain after the hurricane had passed. In contrast, Crisfield, Maryland—the closest community on the mainland—had substantial flooding damage because the storm surge could not drain and remained in place for weeks. According to state officials, the Crisfield housing development study investigated whether the development could be relocated in its entirety or if the housing capacity could be replaced with similar units in other parts of Somerset County that are closer to jobs and transit.

[54]According to SIU members, this project had been on the U.S. Army Corps of Engineers' project waiting list for over a decade.

[55]According to local officials, there are two wastewater treatment plants on Smith Island: one that serves the village of Tylerton and one that serves the villages of Ewell and Rhodes Point. The planned project will decommission the Tylerton plant and upgrade the Ewell and Rhodes Point plant to serve all three villages. The planned project will not add additional plant capacity to support projected economic growth on Smith Island.

Figure 4: Completed Rhodes Point Jetty, Smith Island

Source: U.S. Army photo by Sarah Lazo. | GAO-20-488

Santa Rosa, California

Santa Rosa is a city in Sonoma County, California, approximately one hour north of San Francisco. The city has about 175,000 residents, and its economy includes tourism, high-tech manufacturing, and retail, according to the Santa Rosa economic development office. Additionally, the surrounding county is one of California's top wine-producing regions, with over 400 wineries. Sonoma County's July 2016 regional climate action plan projects impacts through 2100 that include hotter, drier weather with longer summers, more variable rain, and sea level rise.[56] Hotter, drier weather with longer summers could lead to more frequent and intense drought and wildfires, according to the action plan. These changes are expected to have significant impacts on agriculture in the state as crop productivity decreases and growing conditions shift.[57]

California has experienced destructive wildfires throughout its history, but the costs associated with these fires is increasing due to wildland-urban interface expansion, fire suppression policies, and changing climatic

[56]Sonoma County Regional Climate Protection Authority, *Climate Action 2020 and Beyond* (Santa Rosa, CA: July 2016).

[57]State of California, *California's Fourth Climate Assessment: Statewide Summary Report* (Sacramento, CA: August 2018).

conditions that are conducive to fire, according to a study prepared for the July 2016 regional climate action plan.[58] For example, the October 2017 Sonoma Complex fires caused the death of 24 people, destroyed over 7,000 structures, burned about 110,000 acres, and displaced tens of thousands of residents. According to county documents, the fires' destruction to homes, livelihoods, and natural scenery has caused long-term emotional trauma for county residents.[59] According to one study, fire suppression costs for the 2017 North Bay fires—including the Mendocino Lake Complex, Wind Complex, and Cherokee fires—exceeded $400 million. These fires also resulted in $10 billion in insurance claims, with overall economic impacts, including evacuation and displacement of residents, estimated to exceed $85 billion.[60] Most recently, from October to November 2019 the Kincade fire burned over 77,000 acres and destroyed 374 buildings in Sonoma County.

Following the 2017 fires, one Santa Rosa council member raised the issue of a gradual retreat from the most hazardous areas by restricting rebuilding in the wildland-urban interface. However, city and county officials we spoke with said that, due in part to a statewide housing shortage, their top priority after the fires was to help residents rebuild or return to their homes and ensure the necessary infrastructure was in place. These officials also told us that without public support, retreat or migration is unlikely to become a primary wildfire strategy in the near future. Rather, the county has developed a recovery and resilience framework to guide efforts to adapt in place, such as by strengthening construction in the wildland-urban interface.[61] Figure 5 shows the Coffey Park neighborhood in Santa Rosa after the 2017 fires and the rebuilt neighborhood as of April 2019.

[58]C. Cornwall et al., "Climate Ready Sonoma County: Climate Hazards and Vulnerabilities," in *Climate Action 2020* (Santa Rosa, CA: North Bay Climate Adaptation Initiative for Sonoma County Regional Climate Protection Authority, December 2014). Federal agencies define the wildland-urban interface as the geographical area where structures and other human development meet or intermingle with wildlands and vegetative fuels.

[59]Sonoma County, *Recovery and Resiliency Framework* (Santa Rosa, CA: December 2018).

[60]N.J. Nauslar, J.T. Abatzoglou, and P.T. Marsh. "The 2017 North Bay and Southern California Fires: A Case Study." *Fire* vol. 1, no. 1 (2018): 18.

[61]Sonoma County, *Recovery and Resiliency Framework*.

Figure 5: Coffey Park Neighborhood, Santa Rosa, California, after the October 2017 Wildfire and in April 2019.

Source: G. Crutsinger, Scholar Farms. | GAO-20-488

Valmeyer, Illinois

At the time of the Great Midwest Floods of 1993, the Village of Valmeyer, Illinois, was a small farming community of about 900 people, located about 5 miles east of the Mississippi River. After a series of floods during

the 1940s, the Corps built a levee system along the eastern edge of the Mississippi. Upon its completion in 1950, this system protected Valmeyer from destructive flooding until 1993.[62]

In 1993, the Mississippi River breached Valmeyer's levee system on August 1 and flooded the village three separate times until floodwaters receded in mid-October. Fluctuating water levels, floating debris, and freezing temperatures contributed to major property damage, with over 90 percent of residences considered substantially damaged by FEMA's standards.[63] Many of the property owners were uninsured and therefore ineligible for individual buyouts under the National Flood Insurance Program.[64] It quickly became clear to local officials that there would not be a sufficient number of residents remaining to support the tax base necessary to provide village services. However, regional planning and FEMA officials told village officials that community-wide relocation could be an option to preserve the village.[65]

In September 1993, a majority of village residents approved the proposed community relocation. Concerned that a federally-led relocation would take 5 to 10 years, the village decided to lead the planning and site acquisition process. Over 100 village residents helped develop a preliminary relocation site plan, and the village purchased the land for the new site at a higher elevation in November 1993.[66]

[62]D.M. Knobloch, "Moving a Community in the Aftermath of the 1993 Great Midwest Flood," Journal of Contemporary Water Research and Education, no.130 (Universities Council on Water Resources, March 2005): 41-45. Knobloch was the mayor of Valmeyer at the time of its relocation.

[63]Gaetano Guzzo, *From River Rats to Bluff Dwellers: A Study of Community in a Relocated Town: A Sociological Case Study of the FEMA Flood Mitigation Project at Valmeyer, Illinois*, manuscript (2002); and E. Zawar, "An Analysis of Floodplain Buyout Memorials: Four Examples from Central U.S. Floods of 1993–1998," *Geojournal*, vol. 84 (2019).

[64]The National Flood Insurance Program aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners, renters, and businesses and by encouraging communities to adopt and enforce floodplain management regulations. These efforts aim to help mitigate the effects of flooding on new and improved structures. Overall, the program aims to reduce the socio-economic impact of disasters by promoting the purchase and retention of general risk insurance, but also of flood insurance specifically.

[65]Knobloch, "Moving a Community."

[66]Knobloch, "Moving a Community."

The village used FEMA Hazard Mitigation Grant Program funds to acquire 242 properties and National Flood Insurance Program buyout funds to acquire 92 properties, with a total cost of about $8 million, according to FEMA.[67] Despite some setbacks during the environmental assessment and construction phases, construction of the infrastructure at the new site was substantially completed by December 1995 at a total cost of about $40 million (about $63 million in 2019 dollars).[68] Even with the accelerated relocation process, only about 25 percent of Valmeyer's businesses relocated with the community, and 5 years after the floods, the population at the new site was about half of its pre-flood size.[69] The former village site has mostly been converted to farmland, but some infrastructure remains, such as the road intersection and manhole cover shown in figure 6.

Figure 6: Former Intersection in Old Valmeyer Town Site

Source: Paul Sableman; https://creativecommons.org/licenses/by/4.0/legalcode. | GAO-20-488

[67]Prior to 1994, the National Flood Insurance Program was authorized under section 1362 of the National Flood Insurance Act of 1968 to purchase repeatedly flooded properties and transfer the land to the community. Section 1362 was repealed in 1994 and section 1366, authorizing the Flood Mitigation Assistance program, was added.

[68]Guzzo, *From River Rats to Bluff Dwellers*, and Knobloch, "Moving a Community."

[69]Guzzo, *From River Rats to Bluff Dwellers*, and Knobloch, "Moving a Community."

Literature and Experts Suggest That Many Communities Will Need to Consider Relocating in Coming Decades

Our review of literature from more than 52 sources, including the *Fourth National Climate Assessment*, and interviews with 12 experts suggest that many communities will need to consider climate migration as a resilience strategy in coming decades. According to the *Fourth National Climate Assessment*, millions of Americans live in coastal areas threatened by sea level rise, and in all but the very lowest sea level rise projections, retreat or migration will become an unavoidable option in some areas along the U.S. coastline.[70] Threats from sea level rise are exacerbated by other processes such as high tide and storm surge flooding, erosion, saltwater intrusion into coastal aquifers and elevated groundwater tables, according to the assessment.

Additionally, as part of the Arctic, Alaska is warming faster than any other state, and the resulting impacts, such as thawing permafrost, are expected to threaten many more rural communities in the future. For example, a November 2019 Denali Commission threat assessment for Alaska identified communities immediately threatened by erosion (29 communities), flooding (38 communities), and thawing permafrost (35 communities).[71] Further, the study identified Alaska communities that face moderate risks from erosion (66 communities), flooding (55 communities), and thawing permafrost (54 communities) in the near term but which remain vulnerable to these threats over the long term.

The *Fourth National Climate Assessment* notes that, collectively, these threats present significant direct costs related to infrastructure. In addition, future climate change is expected to further disrupt many areas of life, exacerbating existing challenges to prosperity posed by deteriorating infrastructure, ecosystem degradation, and economic inequality. Moreover, the assessment says the potential need to relocate millions of people and billions of dollars of coastal infrastructure in the

[70]U. S. Global Change Research Program, *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment*.

[71]According to the study, for communities in the highest-risk category, the threat is commonly immediate to critical infrastructure. Damages resulting from a moderate flood or compounding erosion would impact community sustainability, present life safety concerns, affect access to emergency services, and/or require support from outside the region to help the community respond to the event. Some communities may be threatened by more than one impact.

future creates challenging legal, financial, and equity issues that have not yet been addressed.[72]

Our analysis of relevant literature as well as interviews with experts align with the findings of the *Fourth National Climate Assessment* that suggest many communities will need to consider relocating to reduce their exposure to climate change impacts in coming decades. For example, according to a 2017 study, in the absence of flood management measures, effective inundation—defined as having 10 percent or more of livable land area flooded at least 26 times per year—of coastal communities could become widespread within the next 40 years and encompass much of the coast by the end of the century.[73] According to this study, many communities are already facing disruptive, even transformative, flooding long before they will be rendered permanently inundated.

Further, in places such as Annapolis, Maryland; Norfolk, Virginia; and Miami Beach, Florida, substantial investments of time and money are being made to cope with frequent tidal flooding that disrupts daily life and business operations.[74] Our literature review also found that many communities will be directly affected by sea level rise in coming decades and that certain low-lying areas will be permanently lost.[75] Similarly, several experts we interviewed said that communities in western Alaska and low-lying coastal areas in Florida, Louisiana, and along the eastern seaboard will experience the most severe impacts because of climate

[72]U.S. Global Change Research Program, *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment*.

[73]K.A. Dahl, E. Spanger-Siegfried, A. Caldas, and S. Udvardy, "Effective Inundation of Continental United States Communities with 21st century Sea Level Rise," *Elementa: Science of the Anthropocene*, vol. 5 (2017): 37.

[74]K.A. Dahl, et al., "Effective Inundation of Continental United States Communities with 21st century Sea Level Rise."

[75]For example: R. McLeman, "Migration and Displacement Risks due to Mean Sea-Level Rise," *Bulletin of the Atomic Scientists*, vol. 74, no. 3 (2018): 148-154; J.K. Maldonado, C. Shearer, R. Bronen, K. Peterson, and H. Lazrus, "The Impact of Climate Change on Tribal Communities in the US: Displacement, Relocation, and Human Rights," *Climatic Change*," vol. 120 (2013) 601-614; and K.J. Curtis and A. Schneider, "Understanding the Demographic Implications of Climate Change: Estimates of Localized Population Predictions Under Future Scenarios of Sea-Level Rise," *Population and Environment*, vol. 33 (2011): 28-54.

change effects such as thawing permafrost, erosion, sea level rise, nuisance flooding, and storm surge.

Another important issue emerging from the climate migration literature we reviewed and the experts we interviewed is that institutional barriers to adaptation disproportionately affect the most vulnerable populations. For example, the ability to move is related to an individual or community's financial, human, and social capital or relationships. Therefore, low-income individuals and communities are at greater risk because they are more vulnerable to extreme events and have less ability to relocate out of harm's way.[76] Additionally, some literature we reviewed highlighted the efforts of tribal communities to identify and address climate change impacts, including climate migration.[77] The literature also found, however, that institutional barriers, such as federal programs that do not account for the unique context of tribal communities and tribal sovereignty, may constrain tribal communities' ability to pursue self-determined management of their resources and built environment. According to the *Fourth National Climate Assessment*, proactive efforts on the part of federal, state, and local governments to address institutional barriers could help improve access to additional resources for responding to climate change impacts.[78]

Our literature review and interviews with experts found that more research is needed to comprehensively assess the scale of potential climate migration in the United States, in part because future climate risks

[76]According to one study we reviewed, in coastal areas at risk for sea level rise, about 750,000 people are in the top two highest categories of social vulnerability. See Black, et al., "Migration, Immobility and Displacement Outcomes Following Extreme Events," *Environmental Science and Policy* (2013), and Martinich et. al., "Risks of Sea Level Rise to Disadvantaged Communities in the United States," *Mitigation and Adaptation Strategies for Global Change,* vol. 18 (2013).

[77]For example, see R. Bronen, and F.S. Chapin III, "Adaptive Governance and Institutional Strategies for Climate-Induced Community Relocations in Alaska," *Proceedings of the National Academy of Sciences of the United States of America*, vol. 110, no. 23 (2013): 9320-9325, and Cozzetto, et al., "Climate Change Impacts on the Water Resources of American Indians and Alaska Natives in the U.S.," *Climatic Change*, vol. 120 (2013): 569-584; and J.K. Maldonado, et al., "The Impact of Climate Change on Tribal Communities in the US: Displacement, Relocation, and Human Rights."

[78]Further, the assessment stated that prioritizing adaptation actions, such as changes to natural resource management strategies or changes to land use policies, for the most vulnerable populations would contribute to a more equitable future within and across communities. U.S. Global Change Research Program, *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment*.

are subject to several sources of uncertainty, as identified by USGCRP's *Fourth National Climate Assessment*.[79] According to the assessment, understanding the magnitude and timing of climate risks that can be avoided varies according to regions and by assumptions about how adaptation measures can change the exposure and vulnerability of people, ecosystems, and infrastructure. Several selected experts and federal officials we interviewed said that little research has been done on the potential use of climate migration as a resilience strategy to address these risks. Some selected experts and federal officials we interviewed also told us that the research and models have not reached the resolution necessary to precisely identify where and when communities will be in danger. As we reported in October 2019, along with other available information about current and future climate risks, collectively this information could inform federal decision makers about where strategies to enhance climate resilience could help reduce federal fiscal exposure.[80]

The Federal Government Provides Limited Support to Communities' Climate Migration Efforts because Federal Programs Are Designed to Address Other Priorities

Because federal programs are not designed to support climate resilience efforts in general or climate migration efforts specifically, the federal government provides limited support to communities' climate migration efforts. As we reported in October 2019, individual federal agencies have provided ad hoc funding through existing federal programs for projects that may convey some climate resilience benefits.[81] Current federal climate resilience investments primarily address agencies' own mission

[79]According to USGCRP's *Fourth National Climate Assessment*, climate scientists find varying ranges of uncertainty in many areas, including observations of climate variables, the analysis and interpretation of those measurements, the development of new observational instruments, and the use of computer-based models of the processes governing Earth's climate system. According to the assessment, the largest uncertainty in projecting future climate risks is the level of greenhouse gas emissions going forward, because the level of emissions depends on economic, political, and demographic factors that can be difficult to predict with confidence far into the future.

[80]GAO-20-127.

[81]GAO-20-127.

areas in the context of authorized activities and investment guidelines put forth by the Office of Management and Budget (OMB).

In addition, federal programs that provide assistance to communities for infrastructure, housing, or disaster recovery are not designed to address the size and complexity of relocating entire communities, according to literature we reviewed, stakeholders we interviewed at the four communities we visited, and federal officials we interviewed. According to literature we reviewed and interviews with federal officials at HUD, FEMA, and NOAA, federal programs are generally designed to fund buyouts of individual high-risk properties in response to a specific event (e.g., a hurricane) and not pre-emptively relocate an entire community to reduce risk from a slow-moving climate change hazard such as sea level rise. However, communities that have begun the relocation process to minimize the risk of climate change impacts have received limited federal support. For example:

- **FEMA's Pre-disaster Mitigation Grant Program** provides funding to assist states, local governments, territories, and tribes in their efforts to enhance disaster resilience against various natural hazards before a disaster occurs and, according to FEMA officials, to reduce loss of life and damages from future disasters.[82] The program's authorizing legislation, section 203 of the Stafford Act, does not specifically mention climate change, but in practice, individual mitigation projects may convey climate resilience benefits. Examples of these projects, other than property acquisitions, may include aquifer storage and recovery, flood diversion and storage, floodplain and stream restoration, and use of green infrastructure methods. Additionally, FEMA regulations require that state, local, and tribal governments include information on future risk from natural hazards in their hazard mitigation plans.[83] However, as we reported in July 2015, program rules emphasized planning as opposed to "brick and mortar" projects,

[82]According to FEMA officials, the Flood Mitigation Assistance Grant Program is another proactive program aimed at building community resilience before a disaster strikes by reducing overall risk to the population and structures from future hazard events while also reducing reliance on federal funding in future disasters. For severe repetitive loss properties, there is no nonfederal cost share requirement; for repetitive loss properties, there is a 10 percent nonfederal cost share.

[83]44 C.F.R. §§ 201.4(c)(2)(i), 201.6(c)(2)(i), 201.7(c)(2)(i).

according to state officials we interviewed.[84] Furthermore, funding for this program has historically fluctuated and been small compared to total disaster funding. Additionally, the program's individual funding awards have been capped, which may preclude funding of large-scale climate resilience projects, according to FEMA officials. However, as a result of the Disaster Recovery and Reform Act of 2018, FEMA developed a new program—the Building Resilient Infrastructure and Communities Program—with annual funding amounts that are expected to increase depending on disaster activity.[85] As of April 2020, FEMA had not yet finalized the new program's guidance. The agency sought input from the public on program design and published notice of the proposed guidance in the Federal Register for public comment on April 10, 2020.[86]

- **FEMA's Hazard Mitigation Grant Program** has provided limited funding for relocating portions of communities after disasters.[87] After a presidentially declared disaster, local officials may decide to request money from the state to purchase properties that have flooded or been determined substantially damaged. The state makes the decision to offer property acquisitions using money that FEMA allocates through the Hazard Mitigation Grant Program to reduce future disaster losses.[88] For example, after multiple Mississippi River

[84]GAO-15-515. We reported that the Pre-Disaster Mitigation Grant Program limited states to a certain number of applications per year. For instance, in fiscal year 2014, states could submit a maximum of 11 applications, of which only two could be for projects, as opposed to hazard mitigation planning or management costs. According to officials, this limits the states' capacities to implement "brick and mortar" hazard mitigation projects with the pre-disaster grant funds. According to FEMA officials, funding is available for state, territorial, tribal, and local governments to update hazard mitigation plans.

[85]See Congressional Research Service, *The Disaster Recovery Reform Act of 2018 (DRRA): A Summary of Selected Statutory Provisions,* R45819 (Washington, D.C.: July 8, 2019).

[86]For more information on FEMA's Building Resilient Infrastructure and Communities Program, see https:// fema.gov/bric.

[87]According to a FEMA official, some climate change impacts, such as sea level rise, may be too gradual to trigger a disaster declaration that would unlock federal post-disaster assistance. FEMA officials also said that funding is available through the Hazard Mitigation Grant Program for state, territorial, tribal, and local governments to update hazard mitigation plans.

[88]See Federal Emergency Management Agency, "Fact Sheet: Acquisition of Property After a Flood Event," press release (Nov. 13, 2018), accessed 05/01/2020, https://www.fema.gov/news-release/2018/11/13/fact-sheet-acquisition-property-after-flood-event, for more information on Hazard Mitigation Grant Programs buyouts.

flood incidents in 1993, the local government of Valmeyer, Illinois, combined funding from FEMA's Hazard Mitigation Program grants and the National Flood Insurance Program's property acquisition program to acquire more than 300 flood-damaged properties totaling over $8 million in acquisition costs and move the community to nearby bluffs above the floodplain.[89] Under all FEMA Hazard Mitigation Assistance programs, state, local, and tribal governments set priorities for mitigation funds, which may or may not include property acquisitions.[90]

- **HUD's Community Development Block Grant Disaster Recovery Program** provides funding for disaster recovery and hazard mitigation to address a wide range of needs after a disaster. Enhancing resilience to climate change is not a primary purpose of these funds, which are appropriated through supplemental appropriations legislation tied to specific disasters. When such funds are appropriated, they can be used for mitigation projects that could convey climate resilience benefits. For example, in 2013 and 2014, HUD funded two competitions—Rebuild by Design ($930 million)[91] and the National Disaster Resilience Competition ($1 billion)[92]—aimed at promoting community resilience to future disasters. In 2018, HUD also allocated nearly $16 billion to support mitigation activities. Specific to climate migration, HUD has provided Community Development Block Grant Disaster Recovery funding for relocating portions of communities. For example, the state of Louisiana received

[89]Federal Emergency Management Agency, *Mitigation Best Practices: Public and Private Sector Best Practice Stories for All Activity/Project Types in All States and Territories Relating to All Hazards*, (Washington, D.C.: Aug. 10th, 2011). Prior to 1994, the National Flood Insurance Program was authorized under section 1362 of the National Flood Insurance Act of 1968 to purchase repeatedly flooded properties and transfer the land to the community. Section 1362 was repealed in 1994, and section 1366 authorizing the Flood Mitigation Assistance program was added.

[90]These programs generally require a 25 percent nonfederal cost share for projects. According to FEMA officials, state, territorial, tribal, and local governments can use the hazard mitigation planning process to identify and prioritize climate resilience projects.

[91]The Hurricane Sandy Rebuilding Task Force launched the Rebuild by Design competition in June 2013, a multistage planning and design competition to promote resilience in the Sandy-affected region.

[92]Launched in 2014, the National Disaster Resilience Competition was a two-phased process that ultimately awarded nearly $1 billion in HUD Disaster Recovery funds to 13 states and communities across the country. According to HUD, it designed the competition with significant capacity-building assistance provided to develop an overarching resilience framework so that all applicants would benefit from competing.

$92.6 million in funding through the National Disaster Resilience Competition.[93] Of those funds, $48 million was awarded specifically to relocate the Isle de Jean Charles community to safer ground. HUD also provided about $1.4 million in multiple awards from another program—the Indian Community Development Block Grant program—for building homes in Mertarvik, Newtok's resettlement site in Alaska, and installing mechanical, electrical, and plumbing equipment at the Mertarvik Evacuation Center.

- **HUD's Community Development Block Grant Mitigation Program** represents a unique opportunity for grantees to carry out strategic and high-impact activities to mitigate disaster risks and reduce future losses, including community relocation. In August 2019, HUD allocated about $6.9 billion in funds to states and other jurisdictions through the program and issued grant requirements and procedures associated with those funds.[94] These funds are available to grantees in certain states and areas recovering from qualifying disasters in 2015, 2016, and 2017.[95] However, according to HUD officials, it is too soon to know the extent to which any grantees will carry out climate migration projects with these funds.
- **NOAA's National Coastal Zone Management Program** provides funding and technical assistance to states to support community-led strategic and adaptation planning and implementation projects to reduce the impacts from extreme weather and flooding in coastal areas.[96] For example, the state of Maryland used some of its funding

[93]The competition awarded almost $1 billion in funding for disaster recovery and long-term community resilience through a two-phase competition process. All states and units of general local governments with major disasters declared in 2011, 2012, and 2013 were eligible to participate in Phase 1 of the competition. The state of Louisiana was one of 13 states and communities to be awarded a grant.

[94]Allocations, Common Application, Waivers, and Alternative Requirements for Community Development Block Grant Mitigation Grantees, 84 Fed. Reg. 45,838 (Aug. 30, 2019).

[95]Columbia, South Carolina; Houston, Texas; Lexington County, South Carolina; Richland County, South Carolina; San Marcos, Texas; and the states of Texas and South Carolina were awarded funding for disasters that occurred in 2015. The states of Louisiana, North Carolina, West Virginia, Texas, South Carolina, and Florida were awarded funding for disasters that occurred in 2016. The states of California, Florida, Georgia, Missouri, and Texas were awarded funding for disasters that occurred in 2017.

[96]NOAA's National Coastal Zone Management Program gives states the flexibility to design programs that address their unique local coastal management challenges. According to Maryland officials, one of the state's key coastal management priorities is to support community-led climate changes adaptation planning and implementation projects.

from this program to support Smith Island's development of its Vision Plan for addressing coastal erosion and other challenges, and to provide a foundation for decisions and investments for Smith Island's future.[97] NOAA's Coastal Resilience Grants Program, which last accepted grant proposals in 2018, previously funded projects to help coastal communities and ecosystems prepare for and recover from extreme weather events, climate hazards, and changing ocean conditions. This program had awarded grants to improve the resilience of communities by, for example, restoring wetlands and improving risk communication.[98] NOAA officials said that these grant programs were not specifically designed for funding community relocation, though the funds from the National Coastal Zone Management Program and the previously funded Coastal Resilience Grants Program could be used to develop plans for community relocation.

- **The Denali Commission** is an independent federal agency designed to provide critical utilities, infrastructure, and support for economic development throughout Alaska. In September 2015, the President designated the commission as the lead agency to help coordinate federal, state, and tribal resources to assist communities in developing and implementing short- and long-term solutions to address the impacts of climate change, including coastal erosion, flooding, and permafrost degradation. Because the designation did not include additional funding at the time, the commission reprogrammed funding from health care, energy, and transportation programs to create a new Village Infrastructure Protection Program in 2016, according to commission officials. Since then, the agency has provided funding and technical assistance to Alaska Native villages facing climate change impacts, including villages considering or in the process of relocating. For example, according to commission officials, from 2016 through 2019, the commission invested $28.3 million in the Newtok relocation effort, including $4.2 million in funding from the state and $15 million in federal funding to assist rural Alaska villages' adaptation efforts. These funds have supported planning and

[97]According to local officials, the Maryland Department of Housing and Community Development also provided funding for the Smith Island Vision Plan.

[98]Likewise, the relatively new National Coastal Resilience Fund, a competitive program implemented in partnership with the National Fish and Wildlife Foundation, focuses on planning, design, and implementation of nature-based infrastructure and restoration projects that help protect coastal communities from storm and flooding impacts, according to NOAA officials.

constructing infrastructure, housing, and facilities at the Mertarvik site, as well as funded project management activities.[99] However, this relocation project is one of many priorities, according to commission officials, and while the agency's statutory authority is broad, it does not explicitly cover climate migration. Additionally, officials told us that the commission has fulfilled its designated role by providing "seed money" to several Alaska Native villages to fund community-led response efforts that could unlock additional funding from other sources. As a result, the commissioners voted to shift away from the Village Infrastructure Protection Program in fiscal year 2020 and direct funding back to health, energy, and transportation programs.

- **The U.S. Army Corps of Engineers Civil Works Program** plans, designs, and constructs large-scale civil works projects, such as sea walls and levees, that, among other things, aim to reduce flooding and storm damage.[100] These and other projects have the potential to convey climate resilience benefits by protecting communities from damage from flooding, storms, and other extreme weather events that may be exacerbated by climate change. The agency's policy is to integrate climate change preparedness and resilience in all activities—a concept known as mainstreaming.[101] However, the civil works program balances several diverse missions related to navigation, ecosystems management, and flood control, among others. As a result, while projects may individually incorporate consideration of climate change risk and resilience, they may not be prioritized to address the most severe expected future climate change risks. Specific to climate change, the agency contributed analyses of flooding and erosion impacts on rural Alaska communities to the

[99]For example, Denali Commission officials said that construction projects completed during this time period include a quarry expansion, a landfill, improved barge landing access, a temporary airstrip, 13 new homes, roads, a power plant, power distribution infrastructure, bulk fuel storage, an evacuation center, in-home sanitation, water and wastewater treatment plants, construction camp facilities, a temporary clinic, and community water and sewer service to public facilities.

[100]According to the U.S. Army Corps of Engineers website, the civil works program includes water resource development activities such as flood risk management, navigation, recreation, and infrastructure and environmental stewardship. U.S. Army Corps of Engineers, "Civil Works," accessed May 06, 2020, https://www.usace.army.mil/Missions/Civil-Works/.

[101]U.S. Army Corps of Engineers, *Adaptation Policy Statement* (June 2014).

Denali Commission's November 2019 statewide assessment.[102] According to the assessment, it can provide guidance to planners and decision makers regarding the relative threat to infrastructure in rural Alaska, and where further technical information is needed to inform mitigation and adaptation strategies to address these threats. As we reported in June 2009, the Corps was provided with authority "to carry out, at full federal expense, structural and non-structural projects for storm damage prevention and reduction, coastal erosion, and ice and glacial damage in Alaska, including relocation of affected communities and construction of replacement facilities" in fiscal year 2005.[103] However, this authority was repealed in March 2009.[104]

- **Other federal agencies** have provided climate migration assistance to communities on an ad hoc basis. For example, the Department of Defense provided assets, technical assistance, and labor for the relocation of Newtok to Mertarvik. Specifically, the department's Innovation Readiness Training program provided a base camp and helped construct essential infrastructure for the relocation effort, such as access roads, an evacuation shelter, and a quarry.[105] Similarly, the Bureau of Indian Affairs provided support and funded a Cold Climate Housing Research Center prototype house for Mertarvik. The Department of Energy provided technical assistance to Valmeyer, Illinois, to help design the new community using sustainable and energy-efficient standards.

[102]University of Alaska-Fairbanks' Institute of Northern Engineering, the U.S. Army Corps of Engineers' Alaska District, and U.S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory, *Statewide Threat Assessment: Identification of Threats from Erosion, Flooding, and Thawing Permafrost in Remote Alaska Communities* (November 2019). The report was prepared for the Denali Commission.

[103]GAO-09-551. Consolidated Appropriations Act, 2005, Pub. L. No. 108-447, Div. C, Title I, § 117,118 Stat. 2809, 2944-45 (2004).

[104]Omnibus Appropriations Act, 2009, Pub. L. No. 111-8, Div. C, Title I, § 117, 123 Stat. 524, 608 (2009).The U.S. Army Corps of Engineers was authorized to perform similar work in fiscal year 2010, with the inclusion of a nonfederal cost share of no more than 35 percent, subject to the ability of the non-federal interest to pay. Energy and Water Development and Related Agencies Appropriations Act, 2010, Pub. L. No. 111-85, Title I, § 116, 123 Stat. 2845, 2851 (2009).

[105]According to Alaska state officials, the Department of Defense's Innovation Readiness Team only provides labor, some logistics, and some supplies; the community is responsible for providing designs, permits, materials, and on-site support and logistics.

Even with these individual agency efforts, to date federal investment in projects specifically designed to enhance climate resilience and support climate migration efforts has been limited.[106] As we reported in July 2015, most federal funding for hazard mitigation—funding that could convey climate resilience benefits—is available only after a disaster occurs.[107] In April 2018, we found that since 1993, OMB reported minimal funding directed specifically at climate resilience projects.[108]

Unclear Federal Leadership Is the Key Challenge to Climate Migration as a Resilience Strategy

Unclear federal leadership is the key challenge to climate migration as a resilience strategy and inhibits the ability of federal agencies to provide effective assistance to states and communities. A well-designed climate migration pilot program based on best practices and that considers key factors could improve the federal institutional capability to assist states and communities with climate migration and limit federal fiscal exposure. Key factors to consider include the importance of community-led planning and increasing the technical and financial capacity of some communities.

Unclear Federal Leadership

Unclear federal leadership is the key challenge to climate migration as a resilience strategy, according to our analysis of literature we reviewed and interviews with agency officials, selected experts, and stakeholders during our site visits. Specifically, unclear federal leadership inhibits the

[106]According to FEMA officials, most grant and funding mechanisms have strict regulatory requirements that require funding to be used within several years, and a dedicated funding source that could be used over multiple decades will be required to ensure the completion of most relocation projects. FEMA officials also told us that a significant increase in federal funding would be required to relocate entire communities.

[107]GAO-15-515.

[108]As we found in April 2018, OMB reported on federal funding for wildlife and natural resource climate resilience activities from fiscal years 2010 through 2013. However, the data OMB reported in the climate resilience category do not fully represent federal climate resilience funding because they only include data from the Department of the Interior. OMB reported Department of the Interior funding for climate resilience as follows: fiscal year 2010, $65 million; fiscal year 2011, $87 million; and fiscal year 2012, $88 million. GAO, *Climate Change: Analysis of Reported Federal Funding,* GAO-18-223 (Apr. 30, 2018).

ability of federal agencies to provide effective assistance to states and communities for climate migration. Because no agency has been given the authority to lead and organize federal assistance for climate migration, the federal government's support for climate migration efforts has been limited and provided on an ad hoc basis under the broad legislative authority of programs designed for other purposes. Officials from the Denali Commission, FEMA, HUD, and NOAA said it is not clear who should lead such efforts, and this lack of clarity has led to problems in the few climate migration efforts currently under way.

For example, although the Denali Commission has played a significant role in helping Newtok relocate, the commission does not have explicit statutory authority to lead and coordinate federal assistance to other at-risk Alaska Native villages and, according to commission officials, has recently refocused its efforts on other priorities. According to stakeholders in Alaska and Denali Commission officials, this has limited the ability of Alaska Native villages to navigate federal program requirements, pool federal funding sources, and secure technical assistance for relocation planning and implementation. As a result, it has taken over 30 years to begin relocating Newtok, and, according to commission officials, it is unclear who will lead efforts to assist other at-risk Alaska Native villages. Unclear federal leadership and coordination has also contributed to a complex resettlement process for Isle de Jean Charles that has lasted more than 20 years and that may not meet the needs of the island's residents, according to stakeholders in Louisiana.[109]

In December 2016, to help the federal government develop the institutional capability to assist communities with relocation, HUD, the Denali Commission, FEMA, NOAA, the Corps and six other agencies established an Interagency Working Group on Community-Led Managed Retreat and Voluntary Relocation. One objective of the working group was to identify the federal role in community-led managed retreat and migration efforts, including developing a process to define individual

[109]For example, tribal leaders said that the federal requirements for restricted mortgages at the new site and for residents' property on Isle de Jean Charles has been confusing to residents whose families have passed down property for generations without these legal instruments. According to Louisiana officials, the state has developed a policy in which a non-payable mortgage will be placed on properties within the new community for a term of 5 years. The mortgage stipulates that Isle de Jean Charles residents who accept housing within the new community will not use their former Isle de Jean Charles dwellings as permanent residences, nor will they substantially improve those dwellings for the duration of the mortgage agreement.

agency roles and to select a lead federal agency.[110] However, the interagency working group was abandoned in 2017, and according to HUD and FEMA officials, did not issue any guidance or lessons learned to help develop the federal institutional capability to assist communities with retreat or relocation. As a result, according to FEMA and commission officials, there is little clarity on how the federal government could effectively assist communities with climate migration.

As we reported in our 2019 High-Risk Update, the increased reliance on federal disaster assistance programs caused by the rising number of climate-related disasters is a key reason that climate change is creating a significant fiscal risk to the federal government.[111] In addition, we reported in November 2015 that decisions state, local, and private sector entities make can affect the federal government's fiscal exposure to climate change since those entities are responsible for planning, constructing, and maintaining certain types of vulnerable infrastructure that are paid for partly with federal funds, insured by federal programs, or eligible for federal disaster assistance.[112]

Furthermore, we reported in our 2019 High-Risk Update that, to reduce its fiscal exposure, the federal government needs a cohesive strategic approach with strong leadership and the authority to manage climate change risks across the entire range of related federal activities, including federal support for climate resilience activities such as climate

[110]According to the Memorandum of Understanding establishing the working group, the group intended to develop a framework for managed retreat or migration that identified the federal role in a community-led process to address current and future needs. The group also intended to serve as an information-sharing forum for lessons learned by communities that have ongoing migration efforts. Lastly, the group intended to coordinate with communities considering managed retreat and relevant governments, non-governmental entities, and the private sector, to plan for and implement strategies for community-led managed retreat and migration. According to Department of Homeland Security officials, a federal working group or task force could help fill the gap in federal leadership and build capacity at the community level. For example, the working group could provide technical information and assistance to communities by establishing best practices for relocation, and developing frameworks that communities could use to guide their efforts.

[111]GAO-19-157SP

[112]GAO, *Climate Information: A National System Could Help Federal, State, Local, and Private Sector Decision Makers Use Climate Information*, GAO-16-37 (Washington, D.C.: Nov. 23, 2015).

migration.[113] Encouraging clearer federal leadership to help states and communities plan and implement climate migration projects is also consistent with our prior work on risk management best practices and improving disaster resilience.[114] For example, according to Enterprise Risk Management best practices, there must be a "risk owner" to manage the treatment of risks and opportunities to achieve goals within and across programs.[115]

Finally, according to some stakeholders we interviewed during our site visits, clear federal leadership for climate migration efforts would improve state and local decision-making on climate migration. For example, Louisiana officials said that improved federal leadership for climate migration or relocation, with better coordination and defined agency roles, would help communities access the best available federal expertise to identify climate risks and prioritize actions to improve their resilience. Similarly, stakeholders in Alaska stated that with explicit authority to lead and coordinate Newtok's relocation effort, the Denali Commission could have improved coordination across agencies to identify and access sources of federal technical and financial assistance for the communities at the most risk.[116]

A Well-designed Pilot Program That Considers Key Factors Could Help Improve Federal Leadership on Climate Migration

A well-designed pilot program that incorporates key factors could improve federal leadership to assist states and communities with climate migration and reduce federal fiscal exposure, based on literature we reviewed and our interviews with selected experts and stakeholders. Few communities have considered or implemented climate migration, and experts suggest many more will need to consider migrating in coming decades.

Risk management best practices and our 2019 Disaster Resilience Framework call on federal agencies to manage the risks posed by

[113]GAO-19-157SP.

[114]GAO-20-100SP and GAO-17-63.

[115]GAO-17-63.

[116]In our 2009 report on Alaska Native Villages, Denali Commission officials stated that significant staffing and funding increases would be needed for the commission to take the lead role for village relocations in addition to its existing responsibilities. See GAO-09-551.

changes in the climate to reduce federal fiscal exposure. However, the federal government provides limited support to communities' climate migration efforts because federal programs are designed to address other priorities. As a result, it is unclear how the federal government will address the federal fiscal exposure from communities that face the worst impacts from changes in the climate. According to our interviews with stakeholders during our site visits, if no action is taken to improve resilience to these impacts, communities such as Newtok and Isle de Jean Charles will likely rely on post-disaster federal assistance, increasing federal fiscal exposure.

Although stakeholders from our site visits and our literature review have identified lessons learned from climate migration efforts, little is known about whether federal programs should be modified, or if a new program should be created, and which agencies should coordinate and lead federal efforts to provide assistance to communities considering migration. We and others have found that pilot programs can be an effective tool for informing decisions on how to implement new approaches—such as climate migration—where it is not clear how to proceed.[117] Specifically, pilot programs can be used to test practices and procedures in various settings and assess lessons learned prior to scaling them up at a national level. For example, the Department of Homeland Security's August 2019 National Mitigation Investment Strategy recommends that federal agencies and their nonfederal partners use pilot programs to develop common measures and tools, and refine existing ones, to demonstrate the value of carrying out projects to improve resilience to natural hazards, including droughts, floods, wildfires, and sea

[117]For more information, see GAO, *VA Construction Design: Strengthened Pilot Design and a Dedicated Team Could Improve Real-Property Donation Pilot Program,* GAO-19-117 (Washington, D.C.: Dec. 13, 2018); GAO, *Data Act: Section 5 Pilot Design Issues Need to Be Addressed to Meet Goal of Reducing Recipient Reporting Burden,* GAO-16-438 (Washington, D.C.: Apr. 19, 2016); and S. Zbrodoff, "Pilot Projects—Making Innovations and New Concepts Fly" (paper presented at the Project Management Institute's 2012 Global Congress).

level rise.[118] Similarly, based on our review of Project Management Institute reporting, a pilot program allows for earlier discovery of potential risks and problems with particular approaches so that contingencies can be developed, which is particularly advantageous when dealing with large, mission-critical, or particularly risky environments.[119] Further, a pilot program can identify best practices that can be reused and therefore save costs when these practices are more widely applied. In our prior work, we have identified best practices that form a framework for effective pilot design.[120] These include identifying criteria or standards for learning lessons about the pilot to inform decisions about scalability and whether, how, and when to integrate pilot activities into overall efforts.

Officials from FEMA, NOAA, and the Denali Commission said that a pilot program would be a good first step for learning how to improve federal assistance for climate migration. Specifically, FEMA officials agreed with the idea of a pilot program, and said that it could be implemented by choosing an at-risk community or region, identifying a lead federal agency, working with impacted communities and stakeholders to scope and plan the project, and identifying relevant federal programs that could help meet the technical and financial assistance needs for successful migration. A pilot program could also streamline processes for federal programs that can provide technical and financial assistance. For example, the Denali Commission—as the designated lead federal agency for coordinating federal resources to help communities manage the impacts of erosion, flooding, and permafrost degradation in rural Alaska—worked with other federal agencies to facilitate the preparation of an

[118]Department of Homeland Security, Mitigation Framework Leadership Group, *National Mitigation Investment Strategy* (Washington, D.C.: August 2019). The Mitigation Framework Leadership Group, an interagency body chaired by FEMA, finalized the National Mitigation Investment Strategy—the national strategy to improve resilience to disasters—in August 2019. Specifically, the strategy states that successful risk mitigation requires shared priorities, consistent approaches, aligned funding, expanded incentives, and coordination between the federal government and nonfederal partners (i.e., state, local, tribal, and territorial governments and nonfederal organizations). However, the strategy does not explicitly address future climate change risks or include a strategic approach to identify and prioritize specific climate resilience projects—climate migration or otherwise—for federal investment. According to FEMA officials, the strategy provides an overarching framework that can accommodate strategic investment related to changing conditions that impact disaster resilience. FEMA officials also told us that specific implementation strategies will be addressed in a later phase of the high-level strategy.

[119]S. Zbrodoff, “Pilot Projects.”

[120]GAO-16-438.

environmental impact statement for the entire Newtok relocation project. Stakeholders in the Newtok Planning Group said this helped address a significant barrier to the successful relocation of Newtok.[121] Officials from HUD and USGCRP did not comment on the merits of a pilot program.

We also identified key factors to consider when designing a federal climate migration pilot program, based on our literature review and interviews with agency officials, selected experts, and stakeholders during our site visits. In particular, communities may lack the necessary technical and financial capacity to plan and implement climate migration projects. Building nonfederal decision makers' capacity to manage risks and combine funding sources can help communities access necessary resources for climate migration, according to our prior work on principles for evaluating federal efforts to promote disaster resilience.[122] In addition, climate migration changes a community's complex socio-economic, cultural, and political connections to their geographic region, making it particularly challenging for decision makers and communities to consider it as a resilience strategy. Consequently, partial or full community migration efforts should be community-driven, with agreement across all of the relevant levels of government, according to our literature review and interviews with stakeholders. For example, community-led groups that facilitate strategic planning and coordination across different levels of government and relevant sectors and stakeholders, such as the Newtok Planning Group and Smith Island United, can expedite and build public support for climate migration, according to federal officials and stakeholders in Alaska and Maryland. For additional information on key factors to consider when designing a climate migration pilot, see appendix II.

As we reported in October 2019, a strategic and iterative risk-informed approach for identifying and prioritizing climate resilience projects for federal investment, with an appropriate organizational arrangement, could

[121]In addition, in Newtok's case, the tribal organization planning and managing Newtok's relocation process developed a comprehensive implementation plan for developing the new site, which helped project managers identify the geotechnical survey needs for the life cycle of the relocation effort, and contract for a single, broad geotechnical survey that could meet multiple agencies' needs for various components of the project. Mobilizing engineers and survey equipment to remote locations in Alaska can cost between $80,000 and $100,000 because many locations are only accessible by air or barge, according to Denali Commission officials.

[122]GAO-20-100SP.

help target federal resources toward climate resilience projects that address the nation's most significant climate risks.[123] At that time, we asked Congress to consider establishing a federal organizational arrangement to periodically identify and prioritize climate resilience projects for federal investment. A well-designed climate migration pilot program could be a key part of such an effort and would allow for a more purposeful, coordinated, and comprehensive federal response to investments currently carried out by individual agencies with different statutory authorities, goals, constituencies, and funding streams. This presents an opportunity to both enhance the nation's resilience to climate change and reduce federal fiscal exposure.

Conclusions

Climate migration is an emerging issue with unique challenges that the nation has limited experience managing. Very few communities are migrating to reduce their exposure to climate change impacts, but many more will need to do so in the future, according to current climate change projections. Where communities have chosen to migrate, unclear federal leadership has increased the length and complexity of the migration process, increasing the risk to lives and property, and increasing the fiscal exposure of the federal government. Currently, federal programs that provide assistance to communities for infrastructure, housing, or disaster recovery are not designed to address projects with the scope and complexity of climate migration. In addition, there is little clarity on how the federal government could best assist communities with climate migration.

Although stakeholders and literature we reviewed have identified lessons learned from certain community-led climate migration efforts, not enough is known about what interventions work and do not work to modify existing programs or create a new permanent federal program. Our past work and other sources have found that pilot programs can be used to test practices and procedures in various settings and assess lessons learned prior to scaling them up at a national level. A pilot program with an appropriate organizational arrangement that incorporates risk management best practices could clarify federal leadership and define agency roles to better assist communities that consider migration. For example, under a defined organizational arrangement, the federal

[123]GAO-20-127.

government could reduce the burden on communities considering climate migration by establishing a lead agency to coordinate technical and financial assistance across multiple federal programs, and by streamlining the processes for these programs. Further, lessons learned from these and prior migration efforts could be used to inform decisions on how to implement climate migration in an equitable manner before applying it in a broader context to reduce federal fiscal exposure.

Matter for Congressional Consideration

Congress should consider establishing a pilot program with leadership from a defined federal organizational arrangement to identify and provide assistance to climate migration projects for communities that express affirmative interest in relocation as a resilience strategy. Such a pilot program could be designed for success by considering the key factors we identified in this report. (Matter for Consideration 1)

Agency Comments and Our Evaluation

We provided a draft of this report to the U.S. Global Change Research Program within the Office of Science and Technology Policy, the Department of Housing and Urban Development, the Federal Emergency Management Agency within the Department of Homeland Security, the National Oceanic and Atmospheric Administration within the Department of Commerce, and the Denali Commission for review and comment. The Federal Emergency Management Agency and the Department of Housing and Urban Development provided technical comments, which we incorporated as appropriate. The other agencies did not provide comments.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies to the appropriate congressional committees and the Director of the Office of Science and Technology Policy, Executive Office of the President. In addition, the report will be available at no charge on the GAO website at http://www.gao.gov.

If you or your staffs have any questions about this report, please contact me at (202) 512-3841 or gomezj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last

page of this report. GAO staff members who made key contributions to this report are listed in appendix III.

J. Alfredo Gómez
Director, Natural Resources and Environment

List of Requesters

The Honorable Sheldon Whitehouse
Ranking Member
Subcommittee on Clean Air and Nuclear Safety
Committee on Environment and Public Works
United States Senate

The Honorable Dianne Feinstein
United States Senate

The Honorable Edward Markey
United States Senate

The Honorable Jeff Alan Merkley
United States Senate

The Honorable Elizabeth Warren
United States Senate

Appendix I: Objectives, Scope, and Methodology

This report examines (1) what is known about communities' use of climate migration as a resilience strategy; (2) the extent to which the federal government supports communities' climate migration efforts; and (3) the key challenges associated with climate migration and how the federal government could help address them to reduce federal fiscal exposure.

For all three objectives, we conducted a literature search for articles and reports related to migration or relocation due to the impacts of climate change. To conduct the search, we used Elsevier's Scopus database to identify peer reviewed articles, government reports, hearings and transcripts, industry and trade group publications, conference papers, books, think tank publications, and working papers published from January 2010 through July 2018. We searched titles, abstracts, and keywords for "managed retreat," "migration," "relocation," "buyouts," or "coastal retreat" in close proximity to terms such as "climate change" and "climate change impacts" or "climate-induced." We identified approximately 92 documents that were relevant to any of our three objectives, and reviewed the documents to identify literature specific to the United States that: discussed the movement of humans due to potential climate change impacts, could inform the selection of site visits to communities considering climate migration, discussed the federal government or a federal agency, or identified key challenges to climate migration related to the federal government. Forty documents did not meet the criteria, and we used the remaining 52 documents for our literature review. We supplemented the review with our prior reports, as well as reports from the U.S. Global Change Research Program (USGCRP), and the Mitigation Framework Leadership Group,[1] which examined projected climate change impacts and potential risk

[1]The Mitigation Framework Leadership Group, an interagency coordinating body chaired by the Federal Emergency Management Agency (FEMA), was created to integrate federal efforts and promote a national cultural shift that incorporates risk management and hazard mitigation in all planning, decision-making, and development to the extent practicable. It coordinates mitigation efforts across the federal government and assesses the effectiveness of mitigation capabilities as they are developed and deployed across the nation.

management strategies for reducing exposure to these impacts, including climate migration.[2]

For all three objectives, we also interviewed experts and federal officials about the use of climate migration as a resilience strategy, federal support to states and communities for climate migration, key challenges associated with climate migration, and how the federal government could help address those challenges. To select experts, we identified an initial list of potential experts based on authors identified in our literature review, recommendations from other experts we interviewed, and participation in relevant expert panels or working groups. From this initial list of experts, we identified experts that had authored a publication within the previous five years, has expertise in a field relevant to our objectives, and worked in academia, at a non-governmental organization, or in the federal, state, or local government.[3] From this list, we identified 16 experts, 12 of which agreed to be interviewed. We interviewed federal officials from USGCRP (the federal program mandated by Congress to coordinate federal climate change research), the National Oceanic and Atmospheric Administration (NOAA), and the Department of Housing and Urban Development (HUD).[4] Further, we interviewed officials from the Federal Emergency Management Agency (FEMA), the agency that administers the National Flood Insurance Program and chairs the Mitigation Framework Leadership Group.

[2]For example, see GAO, *Climate Resilience: A Strategic Investment Approach for High-Priority Projects Could Help Target Federal Resources,* GAO-20-127 (Washington, D.C.: Oct. 23, 2019); GAO, *Climate Change: Activities of Selected Agencies to Address Potential Impact on Global Migration,* GAO-19-166 (Washington, D.C.: Jan. 17, 2019); Department of Homeland Security, Mitigation Framework Leadership Group, *National Mitigation Investment Strategy*. (Washington, D.C.: August 2019); and R. Lempert, et al., "Reducing Risks through Adaptation Actions," in *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment*, vol. 2 (Washington, D.C.: U.S. Global Change Research Program, November 2018).

[3]Relevant fields of expertise included climate change impacts and responses of indigenous, Native American, or Alaska Native peoples; climate change adaptation response, including climate migration; climate change resiliency planning or policy; environmental policy and law; anthropology; other social sciences such as psychology or demography.

[4]The Global Change Research Act of 1990 requires that a scientific assessment—which, among other things, analyzes the effects of global change on the natural environment, agriculture, and energy production and use—be provided to the President and Congress not less frequently than every 4 years. USGCRP conducts this National Climate Assessment, the most recent of which was released in 2018.

In addition to our literature review and interviews with experts and federal agencies, we conducted site visits to analyze and summarize the use of climate migration as a resilience strategy and the extent to which the federal government supports communities' climate migration efforts. To select potential site visits, we used the results of our literature review and interviews with agencies and experts to identify 12 communities considering climate migration as one of several options to reduce long-term exposure to natural disasters or climate change impacts. From those communities, we selected four—Newtok, Alaska; Santa Rosa, California; Isle de Jean Charles, Louisiana; and Smith Island, Maryland—for site visits. These sites were selected to ensure variation based on several factors: their geographic location; the type of climate related risks facing the community; whether those risks are imminent or long-term; how the community responded, or planned to respond, to those risks; and whether the community received technical or financial assistance from the federal, state or local government for climate migration. Decision makers in two of the communities we selected were planning and implementing climate migration projects, and decision makers decided not to pursue climate migration as a risk management strategy in the other two communities. As part of these site visits, we interviewed stakeholders, including federal agency officials; state, local, and tribal government officials; researchers; community groups; and consultants. The stakeholders were selected because of their knowledge about the potential climate change impacts facing the communities and their knowledge of the decision-making processes the communities used. Because this is a nonprobability sample, our findings cannot be generalized to other stakeholders we did not interview. Rather, these interviews provided us with information and opinions specific to the communities we selected.

To determine the key challenges associated with climate migration and how the federal government could help address them to reduce federal fiscal exposure, we used our literature review to identify and summarize examples of challenges to climate migration and federal options to address them. We also analyzed and summarized interview responses and documents provided by experts, federal officials, and stakeholders during our site visits to identify challenges, relevant lessons learned from their experiences, and how federal financial and technical assistance to states and communities for climate migration could be improved. To supplement this information, we also reviewed documents describing lessons learned from the relocation of Valmeyer, Illinois, following the Midwest Floods of 1993, because it was an example of a completed community-led relocation effort. Additionally, we reviewed our prior work on risk management, climate change, climate resilience, and hazard

mitigation, including our Disaster Resilience Framework and our past work on enterprise risk management.[5]

We conducted this performance audit from May 2018 to July 2020 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

[5]GAO, *Disaster Resilience Framework: Principles for Analyzing Federal Efforts to Facilitate and Promote Resilience to Natural Disasters*, GAO-20-100SP (Washington: D.C.: Oct. 23, 2019) and GAO, *Enterprise Risk Management: Selected Agencies' Experiences Illustrate Good Practices in Managing Risks,* GAO-17-63 (Washington, D.C.: Dec. 1, 2016).

Appendix II: Key Factors to Consider When Designing a Federal Climate Migration Pilot Program

Our analysis of literature and interviews with agency officials, selected experts, and stakeholders during our site visits identified key factors to consider when designing a federal climate migration pilot program. These key factors include (1) community-led planning of climate migration efforts, (2) addressing limited community capacity and access to funding, (3) coordinating climate migration efforts at multiple levels of government, and (4) planning for adequate public service delivery in receiving and migrating communities:

- **Community-led planning.** Climate migration changes a community's complex socio-economic, cultural, and political connections to their geographic region, making it particularly challenging for decision makers and communities to consider it as a resilience strategy. For example, coastal communities have place-based economies and moving to higher ground away from the coast may negatively impact residents' access to certain jobs. State officials in Maryland and Louisiana told us that maintaining access to commercial fishing jobs in Maryland and employment at oil and gas facilities in Louisiana were important to many residents in coastal communities. In addition, according to the *Fourth National Climate Assessment*, indigenous populations—some of which have lived on their traditional lands for thousands of years—have place-based cultural, religious, economic, and traditional knowledge systems that are foundational to their identities and physical and mental health.[1] For example, tribal officials in Isle de Jean Charles, Louisiana and Newtok, Alaska, said they view the loss of their land as an existential threat to their cultural identity and place-based traditions.

[1]L. Jantarasami et al., "Tribes an Indigenous Peoples," Chapter 15, in *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment*, vol. 2 (Washington, D.C.: U.S. Global Change Research Program, November 2018).

Consequently, partial or full community migration efforts should be community driven with coordination across all of the relevant levels of government. We have previously reported that promoting coordination across agency missions and sectors that support disaster risk reduction can help build national resilience to natural hazards including climate change.[2] According to federal officials and stakeholders in Alaska and Maryland, community-led groups that facilitate strategic planning and coordination across different levels of government and relevant sectors and stakeholders, such as the Newtok Planning Group and Smith Island United, can expedite and build public support for climate migration.

- **Addressing limited community capacity and access to funding.** Communities may lack the necessary technical and financial capacity to plan and implement climate migration projects. According to state officials we spoke with in Maryland, Alaska, and Louisiana, moving an entire community required technical expertise, such as engineering, legal, and project management skills, that many local communities do not have. Additionally, these officials told us that the cost of moving an entire community with the necessary infrastructure to provide public services, such as drinking water and wastewater service, exceeded the financial resources of the local tax base, or the tribal communities in Isle de Jean Charles, Louisiana and Newtok, Alaska. For example according to stakeholders we spoke with, about $64 million from federal, state, and private sector sources had been invested in Mertarvik as of February 2020, and an additional $150 million may be needed, exceeding the financial resources of Newtok, which has a subsistence-based economy.[3] Building nonfederal decision makers' capacity to manage risks and combine funding sources can help communities access necessary technical and financial resources, according to our prior work on principles for evaluating federal efforts to promote disaster resilience.[4] According to Isle de Jean Charles and Newtok stakeholders, federal and state officials provided planning assistance to the communities for relocation, and helped them identify and pool federal and state sources of financial assistance to fund housing, infrastructure, and other resettlement needs.

Further complicating community climate migration efforts are differences in application and eligibility requirements and project selection criteria

[2]GAO-20-100SP.

[3]Additionally, according to the state of Louisiana's application to the National Disaster Resilience Competition, the 2015 cost estimate for moving the community was about $100 million.

[4]GAO-20-100SP.

across different federal and state programs, according to federal and state officials and stakeholders we spoke with during our site visits. For example, federal funding for certain infrastructure, such as wastewater and drinking water treatment facilities, can only go to existing communities. According to stakeholders, under these programs, Newtok's relocation activities could only receive funding if some of its residents relocated to Mertarvik before permanent housing was available. As a result, according to Denali Commission officials, the project team had to build houses with temporary water infrastructure to support a small population in Mertarvik that will need to be replaced with permanent infrastructure once funding is obtained, which adds cost and time to the project as a whole.[5] Moreover, these officials told us that awarding funding on an ad hoc basis increases the length of the migration process and may increase the amount of time that lives and property are at risk. Additionally, communities with fewer resources also face barriers accessing funds for relocation due to non-federal match requirements for certain federal programs, according to National Oceanic and Atmospheric Administration (NOAA) officials.[6]

- **Coordination across multiple levels of government.** Decisions about climate migration involve multiple levels of government, according to federal, state, and local officials we spoke with. For example, NOAA officials said that states administer funds for certain federal programs and have substantial influence over which projects are funded within the state.[7] However, land-use planning decisions about where to allow and prohibit new development are generally controlled at the local government level, and partial or full community migration efforts may require coordination across all of the relevant levels of government. For example, according to Denali Commission officials, whether a community decides to migrate or protect in place, both options need agreement across all levels of government for implementation to work effectively. Moreover, Federal Emergency Management Agency (FEMA) officials told us that managed retreat is a politically unpopular option, unless there is a particularly catastrophic event that changes peoples' willingness to stay in place

[5]For example, typically a housing development will site underground utilities and roads first, and then build houses. In this case, the project team had to build houses first, and then will need to site utilities.

[6]For instance, FEMA's Hazard Mitigation assistance programs typically require a 25 percent non-federal match. This means, for example, that a community would have to provide $25,000 toward a $100,000 project.

[7]According to NOAA officials, states will follow a federal framework for determining project eligibility, but have a great deal of influence over the final projects.

and creates unified state and local support for relocation. Additionally, these officials said that political will for pursuing climate migration would need to be sustained over time for relevant policies to be implemented. According to Santa Rosa city officials, even if citizens are willing to relocate, the community must have the time and resources necessary to navigate the legal and technical challenges associated with acquiring land in locations vulnerable to climate risks and to secure the funds necessary to acquire it.

- **Public service delivery in receiving and migrating communities.** Climate migration may also stress state and local public service delivery in migrating communities. For instance, if a large number of people migrate to an existing city or town, the influx of new residents could strain the resources of the receiving community, such as affordable housing.[8] Conversely, the departure of one or more neighborhoods or communities from a larger political jurisdiction because of climate impacts could reduce the local tax base and negatively affect its ability to provide services to remaining residents. For example, one expert we spoke with described a scenario where affluent property owners with coastal vacation homes decided to leave the area. This could have a disproportionate impact on the local tax base, because the vacation home owners contributed to the tax base without necessarily using local services, such as public schools. Further, deciding to migrate as a community may reduce public sector willingness to invest in the existing community-even though migration may take several years. For example, in Newtok, Alaska, stakeholders told us that after the community decided to migrate, it was difficult to obtain federal and state assistance for maintaining the infrastructure necessary to provide public services in the existing location. As a result, the community has been living without a reliable way to safely dispose of human waste and trash since 2005. Moreover, the tribal government will need to operate and maintain two sets of infrastructure until there is sufficient housing in Mertarvik to move the remaining residents in Newtok to the new site, according to Denali Commission officials.

[8]National Academy of Sciences, Institute of Medicine. *Healthy, resilient, and sustainable communities after disasters: Strategies, opportunities, and planning for recovery*, (Washington, D.C.: 2015). For example, cities that unexpectedly receive a large influx of people following a disaster event elsewhere have reported difficulty meeting the housing and other needs of the incoming population.

Appendix III: GAO Contact and Staff Acknowledgments

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In addition to the individual named above, Joe Thompson and Lisa Van Arsdale (Assistant Directors); Micah McMillan (Analyst-in-Charge); Alicia Cackley, Colleen Candrl, Antoinette Capaccio, Nirmal Chaudhary, Karen Chen, Tara Congdon, Miriam Carroll Fenton, Ashley Gavin, Cindy Gilbert, Kathryn Godfrey, Tim Guinane, Holly Halifax, Susan Irving, Rich Johnson, Brian Lepore, Josie Ostrander, Oliver Richard, Danny Royer, Judith Schneider, Jeanette Soares, Kiki Theodoropoulos, Sarah Veale, and Patrick Ward provided key contributions to this report.

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