



May 2016

CLIMATE CHANGE

Selected Governments Have Approached Adaptation through Laws and Long-Term Plans

Accessible Version

GAO Highlights

Highlights of [GAO-16-454](#), a report to the Honorable Matthew Cartwright, House of Representatives

Why GAO Did This Study

In 2013, GAO placed Limiting the Federal Government's Fiscal Exposure by Better Managing Climate Change Risks on its high-risk list because climate risks and weather-related disasters present a financial risk to the federal government. The 2017 President's Budget estimated that the U.S. government incurred over \$357 billion in direct costs because of weather-related disasters in the last decade. The U.S. Global Change Research Program states that climate change and associated weather-related disasters may increase these costs. These impacts call attention to the federal government's role as a leader in coordinating and informing government efforts. Enhancing resilience through hazard mitigation and climate change adaptation—for example, by building flood protections—may help reduce these costs. Other governments face similar risks and have developed strategies for enhancing resilience.

This report focuses on fiscal exposure to climate-related risks and describes (1) how selected governments have approached enhancing resilience to weather-related disasters through climate change adaptation and (2) steps the U.S. government has taken to enhance resilience through climate change adaptation. GAO reviewed literature and government documents; interviewed U.S. and other government officials and stakeholders; and selected a nongeneralizable sample of four countries—Mexico, the Netherlands, the Philippines, the United Kingdom—and the European Union for further examination, based on criteria including stakeholder recommendations.

View [GAO-16-454](#). For more information, contact J. Alfredo Gómez at (202) 512-3841 or gomezj@gao.gov.

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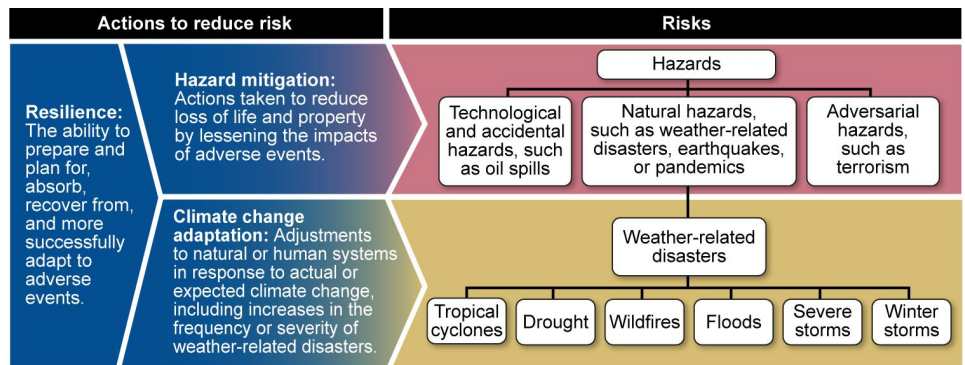
CLIMATE CHANGE

Selected Governments Have Approached Adaptation through Laws and Long-Term Plans

What GAO Found

Selected governments have approached enhancing resilience through climate change adaptation, and some have aligned adaptation with broader resilience efforts (see figure). All five selected governments have enacted laws and developed long-term plans as a part of their approaches to climate change adaptation. These plans established frameworks for addressing climate risks. For example, the European Union and the Netherlands made long-term funding commitments for enhancing resilience, and the United Kingdom developed a system for monitoring and evaluating its climate change strategy. These laws and strategies have helped governments identify priority actions, facilitate consensus among stakeholders, provide reliable resources, and identify areas for improvement. The Philippines and the United Kingdom have also aligned their adaptation strategies with broader resilience strategies that address other risks, such as terrorism and health pandemics. This alignment may provide co-benefits, such as infrastructure investments that protect against climate change impacts; enhance resilience to all disasters; and create economic opportunities.

Relationship among Risks, Resilience, Hazard Mitigation, and Climate Change Adaptation



Source: GAO analysis of Presidential Policy Directive 8, previous GAO work, and National Oceanic and Atmospheric Administration data. | GAO-16-454

The United States has taken steps to enhance resilience through climate change adaptation and aligning climate change adaptation with broader resilience efforts. Legislation has been introduced to enhance resilience to weather-related events. Specifically, in 2014 and 2015, a bill to enhance the federal government's planning and preparation for extreme weather was introduced in Congress but not enacted. In addition, the President issued an executive order directing federal agencies to develop or update adaptation plans and establishing the Council on Climate Change Preparedness and Resilience. Further, the President's Climate Action Plan sets strategic climate change adaptation priorities. The Executive Office of the President also collaborates with the Mitigation Framework Leadership Group, an intergovernmental coordinating body created to integrate federal efforts and incorporate risk management and hazard mitigation in all planning, decision making, and development.

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Abbreviations

CEQ	Council on Environmental Quality
Council	Council on Climate Preparedness and Resilience
EOP	Executive Office of the President
EU	European Union
FEMA	Federal Emergency Management Agency
HUD	Department of Housing and Urban Development
MitFLG	Mitigation Framework Leadership Group
NMF	National Mitigation Framework
OSTP	Office of Science and Technology Policy
UK	United Kingdom
USGCRP	United States Global Change Research Program

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May 12, 2016

The Honorable Matthew Cartwright
House of Representatives

Dear Mr. Cartwright:

From 2004 through 2014, the United States experienced 86 weather-related disasters, including severe storms, flooding, and drought, with damages exceeding \$1 billion each, according to the National Oceanic and Atmospheric Administration. The President's Fiscal Year 2017 Budget estimated that the federal government has incurred over \$357 billion in direct costs for managing all of the extreme weather and fire events in the last decade. The United States Global Change Research Program's (USGCRP) 2014 National Climate Assessment found that as extreme weather events become more frequent and intense, they pose increasing financial risks to the federal government.¹ The assessment also found that climate change has already increased the number and strength of some these events, such as heat waves.² Similarly, the National Academies reported greater confidence in the ability to attribute specific instances of certain kinds of extreme events, such as extreme heat or cold, drought, or heavy precipitation, to climate change.³ Table 1

¹Jerry M. Melillo, Terese (T.C.) Richmond, and Gary W. Yohe, eds., *Climate Change Impacts in the United States: The Third National Climate Assessment*, U.S. Global Change Research Program (Washington, D.C.: U.S. Government Printing Office, May 2014). USGCRP coordinates and integrates the activities of 13 federal agencies that conduct research on changes in the global environment and their implications for the United States. USGCRP began as a presidential initiative in 1989 and was codified in the Global Change Research Act of 1990 (Pub. L. No. 101-606, § 103 (1990)). The act requires USGCRP to periodically prepare a scientific assessment—known as the National Climate Assessment—which is an important resource for understanding and communicating climate change science and impacts in the United States.

²Melillo, Richmond, and Yohe, *Third National Climate Assessment*.

³The National Academies, Committee on Extreme Weather Events and Climate Change Attribution, *Attribution of Extreme Weather Events in the Context of Climate Change* (Washington, D.C.: 2016). According to this report, confidence in attribution depends on the type of event. Specifically, confidence in attribution analyses of specific extreme events is highest for extreme heat and cold events, followed by hydrological drought and heavy precipitation. There is little or no confidence in the attribution of severe convective storms and extratropical cyclones. Confidence in the attribution of specific events generally increases with increased understanding of the effect of climate change on the event type. Gaps in understanding and limitations in the historical data lead to differences in confidence in attribution of specific events among different event types.

shows the number of weather-related disasters affecting the United States with damages exceeding \$1 billion each for 2004 through 2014.

Table 1: Billion-Dollar Disasters Affecting the United States, 2004-2014

Dollars in billions

Disaster type	Number of events	Percentage of events	Unadjusted losses ^a	Percentage of total losses	Average cost ^a
Drought	9	11	\$80	14	\$9
Flooding	9	11	24	4	3
Severe storm	43	50	96	17	2
Tropical cyclone ^b	15	17	340	61	23
Wildfire	6	7	10	2	2
Winter storm ^c	4	5	7	1	4
Total	86	101^d	\$557	99^c	\$6

Source: National Oceanic and Atmospheric Administration. | GAO-16-454

Notes:

^aLosses and costs are rounded to nearest billion dollars and are not adjusted for changes in the consumer price index over the fiscal period. There is uncertainty associated with disaster cost estimates.

^bTropical cyclones refer to hurricanes and typhoons. According to the National Academies, confidence in attribution depends on the type of event. Specifically, confidence in attribution analyses of specific extreme events is highest for extreme heat and cold events, followed by hydrological drought and heavy precipitation. There is little or no confidence in the attribution of severe convective storms and extratropical cyclones. Confidence in the attribution of specific events generally increases with increased understanding of the effect of climate change on the event type. Gaps in understanding and limitations in the historical data lead to differences in confidence in attribution of specific events among different event types. For more information, see The National Academies, Committee on Extreme Weather Events and Climate Change Attribution, *Attribution of Extreme Weather Events in the Context of Climate Change* (Washington, D.C.: 2016).

^cThe winter storm category includes both winter storms and freezes.

^dNumbers do not add to 100 because of rounding.

In 2013, we placed Limiting the Federal Government’s Fiscal Exposure by Better Managing Climate Change Risks on our high-risk list because of the financial risk that climate change and associated extreme weather events present to the federal government.⁴ Our high-risk list called attention to areas where government-wide improvement is needed to reduce this fiscal exposure, including in the federal government’s role as

⁴GAO, *High-Risk Series: An Update*, [GAO-13-283](#) (Washington, D.C.: February 2013). Our high-risk list identifies federal areas at risk of fraud, waste, abuse, and mismanagement or that need transformation to address economy, efficiency, or effectiveness challenges.

the leader of a strategic plan that coordinates federal efforts and informs state, local, and private-sector action. In addition, our high-risk list notes that with the frequency of weather-related disasters increasing, disaster assistance is a key source of federal fiscal exposure.

The U.S. government coordinates federal disaster assistance and provides information, technical assistance, and financial support to federal, state, local, tribal, and private-sector stakeholders. The Federal Emergency Management Agency (FEMA) is the primary federal agency responsible for disaster response and assistance. We have previously found that the federal government does not fully budget for the costs of such assistance,⁵ in part because supplemental appropriations that occur outside of the annual appropriations process are largely used to fund this assistance.⁶ For example, the federal budget generally does not account for disaster assistance provided in cases such as Hurricane Sandy—for which Congress provided about \$60 billion in budget authority for such assistance in 2013.⁷ In addition to direct disaster assistance, we have found that the national flood and crop insurance programs are major sources of fiscal exposure for the federal government.⁸ Floods and other weather-related disasters can cause or exacerbate damage to housing,

⁵See GAO, *Flood Insurance: Status of FEMA's Implementation of the Biggert-Waters Act, as Amended*, [GAO-15-178](#) (Washington, D.C.: Feb. 19, 2015); *Disaster Resilience: Actions Are Underway, but Federal Fiscal Exposure Highlights the Need for Continued Attention to Longstanding Challenges*, [GAO-14-603T](#) (Washington, D.C.: May 14, 2014); and *Federal Disaster Assistance: Improved Criteria Needed to Assess a Jurisdiction's Capability to Respond and Recover on Its Own*, [GAO-12-838](#) (Washington, D.C.: Sept. 12, 2012).

⁶Supplemental appropriations provide additional budget authority usually in cases where the need for funds is too urgent to be postponed until the enactment of the regular appropriations act.

⁷Specifically, a supplemental appropriation law provided about \$50 billion in appropriated funds for expenses related to the consequences of Hurricane Sandy, and another law temporarily increased the borrowing authority for the National Flood Insurance Program, which makes federally backed flood insurance available to property owners in participating communities, by \$9.7 billion. Pub. L. No. 113-2, 127 Stat. 4 (2013); Pub. L. No. 113-1, 127 Stat. 3 (2013).

⁸See GAO, *Fiscal Exposures: Improving Cost Recognition in the Federal Budget*, [GAO-14-28](#) (Washington, D.C.: Oct. 29, 2013). Also, see GAO's Federal Fiscal Outlook webpage: http://www.gao.gov/fiscal_outlook/federal_fiscal_outlook/overview#t=3. The term fiscal exposure refers to the responsibilities, programs, and activities that may either legally commit the federal government to future spending or create the expectation for future spending.

crops, and other assets, resulting in potential increases in assistance and insurance claims and additional liabilities for the federal government. The National Academies define resilience as the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events.⁹ In July 2015, we found that the emphasis on the post-disaster environment can create a reactionary approach where disasters determine when and for what purpose the federal government invests in disaster resilience and can limit states' ability to plan and prioritize for maximum risk reduction.¹⁰ We and others have recommended building disaster resilience—by taking actions to mitigate vulnerabilities to the effects of severe weather and to adapt to the effects of climate change—as one strategy to help to limit the nation's fiscal exposure.

Our 2015 update to the high-risk list found that enhancing resilience to climate change could create up-front costs but could also reduce potential future damages from climate-related events.¹¹ Two related sets of actions that can enhance resilience by reducing risk include hazard mitigation and climate change adaptation. 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. For example, hazard mitigation activities may include activities such as increasing access to the flu vaccine, restoring wetlands and coastal areas to control erosion, or protecting critical facilities against power loss. Climate change adaptation involves adjustments to natural or human systems in response to actual or expected climate change, including increases in the frequency or severity of weather-related disasters.¹² For example, climate change adaptation activities taken to reduce the damages from weather-

⁹The National Academies, Committee on Increasing National Resilience to Hazards and Disasters and Committee on Science, Engineering, and Public Policy, *Disaster Resilience: A National Imperative* (Washington, D.C.: 2012).

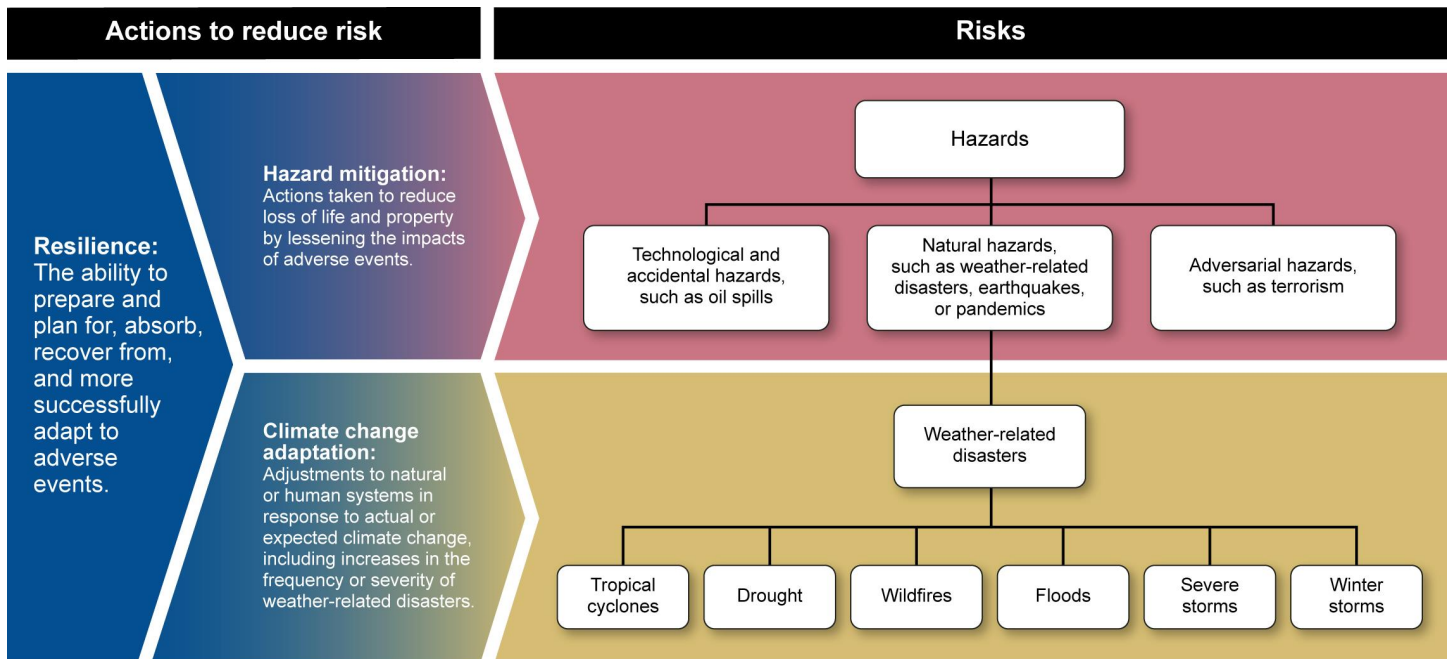
¹⁰GAO, *Hurricane Sandy: An Investment Strategy Could Help the Federal Government Enhance National Resilience for Future Disasters*, [GAO-15-515](#) (Washington, D.C.: July 30, 2015).

¹¹GAO, *High-Risk Series: An Update*, [GAO-15-290](#) (Washington, D.C.: Feb. 11, 2015).

¹²Climate change adaptation involves actions related to the chronic effects of climate change and those related to hazardous events. For example, climate change adaptation includes raising river or coastal dikes to protect infrastructure from chronic climate change impacts, such as sea level rise; building higher bridges; and increasing the capacity of storm water systems.

related disasters may include the addition of permeable surfaces and “green roofs”—roofs partially or completely covered with vegetation—in cities to absorb excess rainfall, provide insulation, and help lower urban air temperatures. Figure 1 shows the relationships among risks, resilience, hazard mitigation, and climate change adaptation.

Figure 1: Relationships among Risks, Resilience, Hazard Mitigation, and Climate Change Adaptation



Source: GAO analysis of Presidential Policy Directive 8, previous GAO work, and National Oceanic and Atmospheric Administration data. | GAO-16-454

Other governments face similar challenges in planning for and reducing fiscal exposure from weather-related disasters. For example, in 2015, the United Nations reported that estimates for the global costs of storms alone exceeded \$1 trillion over the previous two decades.¹³

You asked us to examine lessons learned from other governments in reducing fiscal exposure to climate change and weather-related disasters

¹³Centre for Research on the Epidemiology of Disasters and United Nations Office for Disaster Risk Reduction, *The Human Cost of Weather-Related Disasters 1995-2015* (Geneva: 2015).

through climate change adaptation. This report describes (1) how selected governments have approached enhancing resilience to weather-related disasters through climate change adaptation and (2) steps the U.S. government has taken to enhance resilience to weather-related disasters through climate change adaptation.

To address the first objective, we identified and interviewed representatives from 32 stakeholder groups involved in work related to climate change adaptation and enhancing resilience to weather-related disasters—including representatives from international organizations; nongovernmental organizations; universities; and private companies, such as reinsurance and consulting companies. We identified these stakeholder groups by reviewing relevant literature and using a snowball sampling method.¹⁴ We then asked representatives from these stakeholder groups to identify examples of governments that proactively enhance resilience to weather-related disasters. We also asked them to recommend relevant literature on this subject. We developed a list of governments most commonly cited by stakeholders or the literature and then applied a set of criteria to this list of governments. Our criteria were whether the government had a system for incorporating climate-related risks into disaster resilience efforts, was proactively addressing these risks, and had a strategy in place to enhance resilience through climate change adaptation; the frequency with which the country was cited in literature and stakeholder interviews as examples of leaders in climate change adaptation and disaster resilience; and time and resource considerations.

Based on these criteria, we selected a nongeneralizable sample of five of these governments for further examination: (1) the European Union (EU), (2) Mexico, (3) the Netherlands, (4) the Philippines, and (5) the United Kingdom (UK).¹⁵ We gathered and analyzed documents and interviewed government officials regarding the selected governments' approaches to

¹⁴In snowball sampling, the unit of analysis is a person. This methodology begins with an initial list of people to interview. When interviewed, each of the initially identified people is asked to refer the interviewer to additional cognizant persons. The group of referred cases (or "snowball") grows larger and then narrows as a group of individuals who are most frequently identified, along with those initially identified, become the pool of potential interviewees.

¹⁵The EU is a politico-economic union of 28 separate countries. The Netherlands and the UK are members of the EU, but we list them separately because we also reviewed efforts that their governments undertook independently from those taken by the EU.

enhancing resilience to weather-related disasters. Because this is a nongeneralizable sample, findings from governments we included cannot be generalized to other governments we did not include in our review but can provide illustrative examples. Specifically, our review of these governments' climate change strategies and related actions gave us insight into how such actions could be successfully applied to help increase disaster resilience.

To address the second objective, we interviewed officials from FEMA, the lead federal agency for disaster assistance. These officials helped us identify other federal entities involved in enhancing resilience to weather-related disasters. We then interviewed officials from the Departments of Housing and Urban Development (HUD), State, and the Treasury; and the Mitigation Framework Leadership Group (MitFLG), an intergovernmental coordinating body 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. We also interviewed officials from the Executive Office of the President's (EOP) Council on Environmental Quality (CEQ), Office of Science and Technology Policy (OSTP), and USGCRP because of their involvement in crosscutting climate change issues.¹⁶ We also reviewed relevant documents, including executive orders, several agency adaptation plans, agency and intergovernmental documents, and literature on best practices, including our past reports on national strategies.¹⁷

We conducted this performance audit from May 2015 to May 2016 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.

¹⁶CEQ coordinates federal environmental efforts and works closely with agencies and other entities within EOP in developing environmental initiatives. OSTP, among other things, is to provide the President and his senior staff with accurate, relevant, and timely scientific and technical advice on all matters of consequence and to ensure that the policies of the executive branch are informed by sound science.

¹⁷GAO, *Combating Terrorism: Evaluation of Selected Characteristics in National Strategies Related to Terrorism*, [GAO-04-408T](#) (Washington, D.C.: Feb. 3, 2004).

All Selected Governments Have Approached Climate Change Adaptation with Laws and Plans, and Some Have Aligned Adaptation with Broader Resilience

All of the governments in our review have approached enhancing resilience through climate change adaptation with laws and long-term plans. Some governments have also aligned government-wide climate change adaptation plans with broader disaster resilience efforts that attempt to protect against risks other than those related to climate change.¹⁸

All Selected Governments Have Approached Enhancing Resilience through Climate Change Adaptation by Enacting Laws and Developing Long-Term Plans

All five selected governments enacted laws as a part of their approaches to climate change adaptation, as follows:

- **European Union.** In 2013, the EU enacted the Union Civil Protection Mechanism legislation to strengthen the cooperation between the EU and member states and facilitate coordination of civil protection in order to improve the effectiveness of systems for preventing, preparing for, and responding to natural and man-made disasters.¹⁹ According to EU officials, member states are to take climate change into account when preparing risk assessments required under the Civil Protection Mechanism.
- **Mexico.** Mexico's General Law on Climate Change entered into force in 2012, making the federal government responsible for developing and implementing a national strategy and program for climate change and a system for monitoring and evaluating both.²⁰

¹⁸We use "some countries" to refer to three or more countries.

¹⁹Decision No. 1313/2013/EU of the European Parliament and of the Council of 17 December 2013 on a Union Civil Protection Mechanism, 2013 O.J. (L 347) 924.

²⁰Ley General de Cambio Climático [L.G.C.C.] [General Climate Change Law], as amended, art. 7(III), Diario Oficial de la Federación [D.O.], 6 de Junio de 2012 (Mex.).

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- **The Netherlands.** The Delta Act, which entered into force in 2012, addressed fresh water supply management and flood protection in relation to expected climate change.²¹
 - **The Philippines.** The Climate Change Act of 2009 established the Climate Change Commission and tasked it with formulating the Framework Strategy on Climate Change.²² In 2010, the commission issued a rule, in an administrative order, requiring it to formulate the National Climate Action Plan in accordance with the framework.
 - **United Kingdom.** The UK Climate Change Act of 2008 requires the development of a national adaptation plan and the issuance of a report on the impacts of climate change every 5 years, among other things.²³ In response, the UK developed its National Adaptation Programme.

All of the governments in our review also developed long-term government-wide climate change adaptation plans that established a framework for addressing climate risks. For example, Mexico's plan established a framework to guide national action for 40 years. In another example, the Netherlands' Climate Agenda established the government's vision of climate change adaptation, its national and international approach to turning its vision into reality, and priority measures and actions to be taken, including actions through 2030. According to the 2012 Intergovernmental Panel on Climate Change report, national systems are at the core of countries' capacity to meet the challenges of observed and projected trends in exposure, vulnerability, and weather

²¹Deltawet waterveiligheid en zoetwatervoorziening [Delta Act], 1 December 2011 (Neth.).

²²An Act Mainstreaming Climate Change Into Government Policy Formulations, Establishing the Framework Strategy and Program on Climate Change, Creating for this Purpose the Climate Change Commission, and for Other Purposes, Rep. Act 9729, §§ 4, 9(c) (2009) (Phil.).

²³Climate Change Act, 2008, c. 27, §§ 56, 58 (U.K.).

and climate extremes.²⁴ Table 2 identifies the selected governments' adaptation plans.²⁵

Table 2: Selected Governments' Climate Change Adaptation Plans

Government	Adaptation plan	Year published
European Union ^a	EU Strategy on Adaptation to Climate Change	2013
Mexico	National Climate Change Strategy 10-20-40 Vision	2013
Netherlands	Climate Agenda: Resilient, Prosperous and Green	2013
Philippines	National Climate Action Plan 2011-2028	2010
United Kingdom	National Adaptation Programme	2013

Source: GAO analysis of international documents. | GAO-16-454

Note: We selected these governments by first asking stakeholders knowledgeable about climate change adaptation and disaster resilience to identify examples of governments that proactively enhance resilience to weather-related disasters. We also asked them to recommend relevant literature on this subject. We then developed a list of governments most commonly cited by stakeholders or the literature and applied a set of criteria to this list of governments. Our criteria were whether the government had a system for incorporating climate-related risks into disaster resilience efforts, was proactively addressing these risks, and had a strategy in place to enhance resilience through climate change adaptation.

^aThe European Union is a politico-economic union of 28 separate governments. The Netherlands and the United Kingdom are members of the European Union, but we list them separately because we also reviewed efforts that their governments undertook independently from those taken by the European Union.

Coordination mechanisms. Some of the selected governments have established coordination mechanisms and facilitated knowledge sharing to implement their adaptation strategies. For example, in the Philippines, the Climate Change Commission coordinates across the national government to carry out the actions identified in the Philippines' climate plan. According to commission officials, coordination facilitates consensus among different stakeholders in implementing climate change adaptation and disaster risk reduction initiatives.²⁶ Governments may also facilitate

²⁴Intergovernmental Panel on Climate Change, *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation* (New York: 2012). According to the report, effective national systems comprise multiple actors from national and subnational governments, the private sector, research bodies, and civil society, including community-based organizations, playing differential but complementary roles to manage risk, according to their accepted functions and capacities.

²⁵Some governments' adaptation strategies are part of broader climate change initiatives.

²⁶Disaster risk reduction refers to the practice of reducing disaster risks through systematic efforts to analyze and reduce the causal factors of disasters.

coordination among different levels of government, as well as the private sector. For example, according to UK government officials, they built relationships with local government and private-sector stakeholders as part of their adaptation plan that allowed these stakeholders to invest in common resilience goals, such as building resilient infrastructure. To facilitate knowledge sharing, the EU established an online platform, Climate-ADAPT,²⁷ to enable information exchange on climate change data; adaptation strategies and related activities; and case studies on specific climate impacts, such as flooding or droughts, and adaptation sectors, such as biodiversity and disaster risk reduction.

²⁷For more information on Climate-ADAPT, see <http://climate-adapt.eea.europa.eu/>.

Funding: Financial Mechanisms to Manage Fiscal Exposure

There are a number of different types of financial mechanisms governments can use to manage their fiscal exposure to weather-related disasters and secure financial resources to cover any risks that cannot be reduced. Governments can establish plans for budgeting and allocating national resources. Governments can also establish lines of contingent credit, the terms of which they settle upon with creditors (such as international banks) ahead of time, but which they access only if and when a disaster occurs.

In some cases, creditors may require that governments invest in resilience to access credit. Governments can also transfer risk to a third party through insurance or alternative risk transfer instruments—those that transfer risk outside of the insurance markets. For example, catastrophe bonds are high-yield debt instruments designed to raise money in case of a catastrophe, such as a hurricane, to transfer financial risk from governments to capital markets. Catastrophe bonds have a measurable trigger, such as the economic value of damage inflicted, the intensity or severity of a storm, or mortality rates. The government issuing the bond may sell the bond to a variety of investors. If a natural disaster triggers the bond conditions, the government has access to the funds obtained through the bond sale to support response and recovery. If no event triggers the bond conditions before a specified time limit expires, the investors receive the funds and interest associated with the bond sale.

Governments can also obtain several different types of insurance, including (1) traditional insurance; (2) parametric insurance, in which payouts are triggered by predefined parameters, such as the wind speed of a hurricane; and (3) reinsurance that protects insurers against losses. The cost of using these financial mechanisms varies.

Source: GAO analysis of World Bank and Financial Industry Regulatory Authority documents. | GAO-16-454

Funding. Some of the selected governments have established budgets or dedicated funding mechanisms for enhancing resilience. For example, the EU has agreed to spend at least 20 percent of its budget for 2014 through 2020 on emissions reduction and climate change adaptation. In another example, the Netherlands committed an average annual budget of €1.2 billion through 2028 for the Delta Programme, which focuses specifically on reducing flood risk, improving water quality, and implementing climate change adaptation activities in cities.²⁸ The Philippines enacted a law establishing the People’s Survival Fund, a special fund to finance adaptation programs and projects for local governments and communities, based on the National Strategic Framework.²⁹ Projects in water resources management; land management; agriculture and fisheries; and a guarantee for risk insurance needs for farmers, agricultural workers, and others are among those eligible for funding. The law requires the Climate Change Commission to develop criteria to prioritize use of the fund based on specified factors, such as level of risk and vulnerability to climate change and cost-effectiveness and sustainability of the proposal. Mexico’s federal government established FONDEN, a fund for supporting natural disaster relief and reconstruction to which the government allocates national funds annually. Since 2003, Mexico has also financed disaster risk reduction activities through FOPREDEN—a program specifically focused on natural disaster prevention—which has an annual budget of around \$25 million. Officials in some countries emphasized the importance of long-term consistency in budgeting, which provides predictable, reliable resources for adaptation projects.

²⁸Based on currency conversion rates applied May 10, 2016, €1.2 billion was approximately \$1.4 billion.

²⁹An Act Establishing the People’s Survival Fund to provide long-term finance streams to enable the government to effectively address the problem of climate change, Amending for the Purpose Republic Act No. 9729, otherwise known as the Climate Change Act of 2009, and for Other Purposes, Rep. Act No. 10174, § 13 (2012) (Phil.).

Monitoring and Evaluation: International Auditing of Climate Adaptation

Governments around the world are considering how to address climate risks. Supreme audit institutions—national agencies responsible for auditing government revenue and spending—may play a major role in evaluating government activities, including those related to climate change adaptation. Audit institutions share a common responsibility to provide information about their nations' program implementation and performance. In 2010, 14 supreme audit institutions, including the United Kingdom's, worked on a cooperative audit of their governments' climate change-related policies and practices. They jointly reported that countries have initiatives under way, but that addressing climate change risks remains a formidable challenge. In another cooperative audit conducted by nine European supreme audit institutions, including the Netherlands', auditors found that very few countries have implemented adaptation actions or assessed future climate change implications.

Sources: International Organization of Supreme Audit Institutions Working Group on Environmental Auditing, *Coordinated International Audit on Climate Change, Key Implications for Governments and their Auditors* (Ottawa: November 2010), and European Organization of Supreme Audit Institutions Working Group on Environmental Auditing, *Adaptation to Climate Change: Are Governments Prepared?* (Oslo: 2012). | GAO-16-454

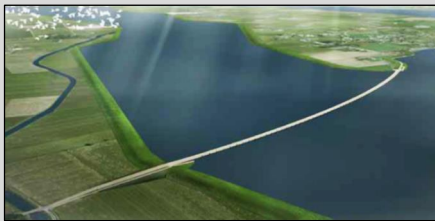
Monitoring and evaluation. Some of the selected governments use monitoring and evaluation mechanisms to demonstrate progress and identify areas for improvement. For example, under the UK's Climate Change Act of 2008, the Adaptation Subcommittee of the UK Committee on Climate Change regularly evaluates and reports on the progress made toward implementing the National Adaptation Programme.³⁰ Incorporating lessons learned through its evaluation of the first National Adaptation Programme, the subcommittee identified climate risks and adaptation opportunities for addressing these risks, such as introducing a standard to reduce the risk of new homes overheating during heat events. The subcommittee is currently working with the UK government to incorporate this information into the second National Adaptation Programme, slated for release in 2018, according to UK officials.

In another example, the European Commission is assessing EU member states' progress in preparing for the impacts of climate change as part of its adaptation approach. One of the EU's climate change adaptation objectives is to propose action by member states through guidance and funding to help member states build adaptive capacity. The European Environment Agency, an agency of the EU that provides independent environmental information, has published a number of reports on adaptation policies and actions of member states. The European Commission is also developing a scoreboard to assess progress on the EU strategy and climate adaptation preparedness in member states. The European Commission plans to use the scoreboard to assess the level of preparation of member states and the EU as a whole in 2017. According to the EU adaptation strategy, if the commission finds adaptation actions insufficient, it will consider proposing a legally binding instrument to require additional action.

³⁰Climate Change Act , 2008, c. 27, § 59 (U.K.).

Related Activities: Room for the River

As part of the Netherlands' Delta Programme, the Room for the River Programme includes measures in more than 30 locations to manage high water levels by creating space for rivers to flood. In the Netherlands, rivers lie wedged between progressively higher dikes (banks or mounds of earth built to protect an area from flooding) and have to accommodate increasing discharges because of climate change. At the same time, subsidence of the land (i.e., moving down to a lower level) behind the dikes combined with frequent or intense rains increases flood vulnerability. The Room for the River Programme is creating additional water flow capacity through flood plain restoration and dike realignment, or by constructing a bypass, for example, along the IJssel River.



Inlet of the bypass (bottom), and the IJssel River (top) with city of Kampen in background.

Source: Netherlands' Delta Programme, Room for the River Programme. | GAO-16-454

Related activities. In addition to government-wide climate change adaptation plans, some governments have related activities that support or complement them. For example, the Netherlands developed the Delta Programme as required by the Delta Act. The Delta Programme supports flood risk reduction actions, such as improving flood defenses.³¹ The government publishes an updated edition of the Delta Programme every year.

³¹Under the Delta Act, the Delta Programme must provide strategies for preventing and mitigating floods and water shortages.

Some Governments Align Climate Change Adaptation with Broader Disaster Resilience

Some governments' climate adaptation plans align with broader disaster resilience strategies that attempt to protect against risks other than those related to climate change. For example, the UK integrated climate change risks into its broader risk assessment of all hazards, the national risk assessment, which is meant to be the starting point for government-wide risk management. Further, the UK National Adaptation Programme aligns with broader risk management and preparedness efforts, according to UK officials. According to these officials, aligning climate adaptation with broader resilience efforts helps the government build resilience to all hazards, including terrorism, while reducing risks that are exacerbated by climate change.

The Philippines also aligned its national climate change adaptation plan with its disaster risk reduction plan. The Philippines' National Climate Change Action Plan states that climate change adaptation should complement disaster risk management to promote co-benefits and achieve efficiencies.³² The Philippines' National Disaster Risk Reduction and Management Plan emphasized the need to strengthen the capacity of the national and local governments to reduce risks, including climate risks.³³ Philippines officials stated that the government is linking its climate change and disaster management approaches through both policy and program development. For example, the Philippines established a policy and a system for identifying all climate-related national expenditures and developed guidance for local governments to incorporate climate and disaster risks into their land management plans, which direct land use and development. Further, the Philippines law that established the People's Survival Fund states that the government has a policy to integrate disaster risk reduction and climate change programs and initiatives because effective disaster risk reduction and management enhances adaptive capacity.³⁴

³²Climate Change Commission, *National Climate Change Action Plan 2011-2028* (Manila: Nov. 30, 2010).

³³Office of Civil Defense, Department of National Defense, *National Disaster Risk Reduction and Management Plan 2011-2028* (Philippines: December 2011).

³⁴An Act Establishing the People's Survival Fund to provide long-term finance streams to enable the government to effectively address the problem of climate change, Amending for the Purpose Republic Act No. 9729, otherwise known as the Climate Change Act of 2009, and for Other Purposes, Rep. Act No. 10174, § 1 (2012) (Phil.).

Lastly, the EU has taken steps to align climate change with broader disaster resilience. The Union Civil Protection Mechanism law states that an integrated approach to disaster management is increasingly important, as future disasters will be more extreme and complex as a result of climate change. In addition, another EU law requires member states to assess flood risk, including the impacts of climate change on the occurrence of floods, and then use the assessment to develop flood maps and flood risk management plans.³⁵ Further, according to EU officials, the EU's Directorate General for Climate Action and Directorate General for Humanitarian Aid and Civil Protection, which is responsible for disaster management, collaborate on reducing the risks associated with weather-related disasters. In addition, the European Commission recently launched the Disaster Risk Management Knowledge Centre, which includes information and assessments on observed and projected weather and climate risks across the EU.

The United States Has Taken Steps to Enhance Resilience through Climate Change Adaptation and Aligning Adaptation with Broader Resilience

Legislation to enhance resilience to weather-related disasters has been introduced in the United States, and the United States has developed climate change adaptation plans. The United States has also taken steps to align climate change adaptation with broader resilience efforts.

³⁵Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on Assessment and Management of Flood Risks, 2007 O.J. (L 288) 27.

Legislation to Enhance Resilience Has Been Introduced, and the United States Has Developed Climate Change Adaptation Plans

In the United States, legislation to enhance resilience to weather-related disasters has been introduced in Congress but has not been enacted. In 2014 and again in 2015, the Preparedness and Risk Management for Extreme Weather Patterns Assuring Resilience and Effectiveness Act was introduced in the U.S. House of Representatives to enhance the federal government's planning and preparation for extreme weather, with the intent to increase resilience and mitigate the federal government's financial risk from such weather, but the legislation has not been enacted.³⁶ Other legislation that would require the federal government to develop a national extreme weather resilience action plan has also been introduced but not enacted.³⁷ However, legislation that would hamper resilience also has been introduced in Congress. For example, a bill introduced in the U.S. House of Representatives would eliminate the Environmental Protection Agency's Climate Resilience Fund.³⁸ Laws with other purposes, such as the Coastal Zone Management Act of 1972—enacted to balance the often competing demands for economic growth and development with the need to protect coastal resources—may result in climate adaptation planning.³⁹ For example, the act created the National Coastal Zone Management Program, a voluntary federal-state partnership that provides financial and technical assistance to states that participate. Program funding can be used by states for, among other things, planning for coastal zone management and reducing and managing development in coastal hazard areas.

The United States has also developed a number of climate change adaptation plans. In June 2013, the President issued the Climate Action Plan, which described the federal government's existing and planned efforts to prepare for the impacts of climate change, such as flooding and severe storms, and set strategic priorities for the country. For example, the plan directs federal agencies to take appropriate actions to reduce risk to federal investments, specifically, to update their flood-risk reduction standards. Subsequently, an interagency effort resulted in an executive order establishing a federal flood risk management standard in January

³⁶H.R. 5314, 113th Cong. (2014). H.R. 3190, 114th Cong. (2015).

³⁷H.R. 2227, 114th Cong. (2015).

³⁸H.R. 2111, 114th Cong. (2015).

³⁹Pub. L. No. 92-583, 86 Stat. 1280 (1972) (codified as amended at 16 U.S.C. §§ 1451-1466).

2015 and implementing guidelines being issued in October 2015.⁴⁰ In November 2013, the President also issued Executive Order 13653, which directed federal agencies to develop or update comprehensive adaptation plans describing how they would consider the need to improve climate change adaptation and resilience, among other things.⁴¹ As of 2014, almost 40 federal agencies developed adaptation plans. In addition, a number of crosscutting interagency plans have been developed to address challenges and improve resilience to climate impacts, for example, by informing freshwater resource management through activities such as strengthening data for understanding the impacts of climate change on water resources.⁴²

Coordination mechanisms. The United States has established interagency and intergovernmental groups to coordinate the government's climate change adaptation efforts. In general, EOP entities coordinate climate change efforts across the federal government. For example, EOP entities co-chair the interagency Council on Climate Preparedness and Resilience (Council).⁴³ Executive Order 13653 tasked the Council with developing, recommending, and coordinating interagency efforts on, as well as tracking implementation of, priority federal government actions related to resilience, among other things. An intergovernmental group, the President's State, Local, and Tribal Leaders Task Force on Climate Preparedness and Resilience, provided

⁴⁰Exec. Order No. 13690, 80 Fed. Reg. 6,425 (Feb. 4, 2015).

⁴¹Exec. Order No. 13653, 78 Fed. Reg. 66,819 (Nov. 6, 2013).

⁴²Interagency Climate Change Adaptation Task Force, *National Action Plan: Priorities for Managing Freshwater Resources in a Changing Climate* (Washington, D.C.: October 2011).

⁴³The Council is co-chaired by the Chair of CEQ, the Director of OSTP, and the Assistant to the President for Homeland Security and Counterterrorism. In addition, the Council includes senior officials from federal agencies, including the Departments of Agriculture, Commerce, Defense, Education, Energy, Health and Human Services, Homeland Security, Housing and Urban Development, the Interior, Justice, Labor, State, Transportation, the Treasury, and Veterans Affairs and the Army Corps of Engineers, the Corporation for National and Community Service, the Council of Economic Advisers, the Environmental Protection Agency, the Domestic Policy Council, the General Services Administration, the Millennium Challenge Corporation, the National Aeronautics and Space Administration, the National Economic Council, the Office of the Director of National Intelligence, the Office of Management and Budget, the Small Business Administration, the United States Agency for International Development, the United States Trade Representative, and the White House Office of Public Engagement and Intergovernmental Affairs.

Rebuild by Design: New Jersey's "Resist, Delay, Store, and Discharge" Project

The Department of Housing and Urban Development awarded \$230 million to the state of New Jersey for the "Resist, Delay, Store, and Discharge" Project in the community of Hoboken. The project consists of four integrated components:

1. **Resist:** A combination of hard infrastructure (such as floodwalls and seawalls) and soft landscaping features (e.g., berms and or levees that could be used as parks) that act as barriers along the coast during storm surge events.
2. **Delay:** Policy recommendations, guidelines, and urban green infrastructure to slow stormwater runoff.
3. **Store:** Green and grey infrastructure improvements, such as green roofs that slow down and capture storm water and that will complement the efforts of Hoboken's existing Green Infrastructure Strategic Plan.
4. **Discharge:** Enhancements to Hoboken's storm water management system, including identifying and upgrading of existing storm water and sewer lines, outfalls, and pumping stations.

Source: OMA, *Resist, Delay, Store, Discharge: A Comprehensive Urban Water Strategy* (New York: 2014). | GAO-16-454

recommendations to the President and Council on how the federal government could support communities in building resilience, for example, through activities that create co-benefits, such as clean energy infrastructure investments that protect against climate change impacts, enhance resilience to all disasters, and create economic opportunities.⁴⁴

Funding. The resilience portion of the President's Climate Action Plan did not establish budget targets or specific financial strategies for enhancing resilience. Rather, the plan directed federal agencies to support climate resilient investments. For example, the plan highlighted HUD requirements for recipients of grants funded with supplemental appropriations to respond to Hurricane Sandy to take sea level rise into account in their projects and activities. Federal agencies have made other climate resilience investments. HUD, for example, initiated the Rebuild by Design urban design competition and provided \$930 million to fund projects to enhance disaster resilience in areas affected by Hurricane Sandy. One such project proposed building deployable walls attached to the underside of roads that can be used alongside roads during flood events in Manhattan. In another example, FEMA's Pre-Disaster Mitigation Grant Program provides resources to assist states, local governments, territories, and tribes in their efforts to enhance disaster resilience by funding hazard mitigation measures before disasters occur.⁴⁵ Activities eligible for grants include property acquisition, elevation, and retrofitting. By providing these grants, the program seeks to reduce overall risks while reducing reliance on federal funding during future disasters.

⁴⁴President's State, Local, and Tribal Leaders Task Force on Climate Preparedness and Resilience, *Recommendations to the President* (Washington, D.C.: November 2014).

⁴⁵FEMA and HUD have a number of other programs available for states, localities, and individuals to recover from disasters that may enhance resilience. FEMA's Hazard Mitigation Grant Program funds projects designed to enhance resilience by substantially reducing the risk of future damage resulting from a major disaster. HUD's Community Development Block Grant-Disaster Recovery is designed to address needs not met by other disaster recovery programs—including but not limited to disaster resilience initiatives—particularly for low- and moderate-income persons. Using the funds provided in the supplemental appropriation to respond to Hurricane Sandy, HUD launched the Rebuild by Design competition and later built on it, with the National Disaster Resilience Competition, which awarded \$1 billion to eight states and five localities across the nation in January 2016. According to HUD officials, the National Disaster Resilience Competition went beyond the Rebuild by Design competition in several ways, including that it was national in scope, encouraged states and localities to develop resilience plans in the absence of the promise of HUD funding to implement the plans, and in the commitment by applicants to long-term resilience-enhancing actions.

Monitoring and evaluation. The United States has begun monitoring and evaluating the government’s climate change adaptation efforts. Specifically, according to EOP officials, the Council is monitoring progress on the implementation of the President’s State, Local, and Tribal Leaders Task Force on Climate Preparedness and Resilience recommendations and has issued a report highlighting progress made toward meeting them.⁴⁶ In response to the President’s State, Local, and Tribal Leaders Task Force, the Council is supporting the efforts of the MitFLG⁴⁷—an intergovernmental coordinating body created to integrate federal resilience efforts—to identify existing federal programmatic data sources which could be used as future indicators or metrics of community resilience. Additionally, the Council is developing a road map to outline key opportunities on climate preparedness, adaptation, and resilience beyond this administration. However, as of May 2016, these have not yet been developed. For more information on U.S. actions related to climate change adaptation and resilience, see appendix I.

⁴⁶The White House, *Progress Report: Highlighting Federal Actions Addressing the Recommendations of the State, Local, and Tribal Leaders Task Force on Climate Preparedness and Resilience* (Washington, D.C.: July 2015).

⁴⁷In this context, mitigation refers to disaster risk mitigation as a means to enhance resilience rather than climate change mitigation—efforts to reduce or prevent emission of greenhouse gases. The MitFLG membership includes senior officials from federal agencies, including the Departments of Agriculture, Commerce, Defense, Energy, Health and Human Services, Homeland Security, Housing and Urban Development, the Interior, Justice, and Transportation and the Environmental Protection Agency, the General Services Administration, and the Small Business Administration. It also includes officials from relevant local, state, tribal, territorial, and insular areas.

The United States Has Taken Steps to Align Climate Change Adaptation with Broader Resilience

The United States has taken steps to align government-wide climate change adaptation with broader disaster resilience efforts that attempt to protect against risks other than those related to climate change. Specifically, EOP collaborates with MitFLG. MitFLG facilitates information exchange, coordinates policy implementation recommendations, and oversees the implementation of the National Mitigation Framework (NMF), the U.S. national strategy for resilience.⁴⁸ The NMF addresses, in part, how the nation will develop, employ, and coordinate core hazard mitigation capabilities to reduce loss of life and property by lessening the impact of all disasters, including weather-related disasters.⁴⁹ The NMF also links recovery and hazard mitigation to avoid repetitive losses resulting from rebuilding without hazard mitigation measures following disasters—for example, by elevating a property previously damaged by a flood in a flood-prone area to avoid similar damages from a future flood event.⁵⁰ EOP and MitFLG coordinate opportunities to integrate climate change adaptation with broader resilience efforts. For example, according to MitFLG and EOP officials, they worked together during the development of the guidelines for implementing the federal flood risk

⁴⁸The Department of Homeland Security developed the NMF in 2013 in response to the 2011 Presidential Policy Directive 8 on National Preparedness aimed at strengthening the security and resilience of the United States through systematic preparation for threats that pose the greatest risk to the country's security, including catastrophic natural disasters. The directive tasks the Secretary of Homeland Security, in coordination with other federal agencies and in consultation with others, with developing a national preparedness goal that among other things, defines the core capabilities necessary for preparedness and a national preparedness system. The national preparedness goal organizes these core capabilities into five mission areas: prevention, protection, mitigation, response, and recovery.

⁴⁹The NMF is to guide disaster resilience efforts of at least 13 federal agencies and departments, as well as relevant EOP entities.

⁵⁰In addition to the NMF, the National Disaster Recovery Framework provides guidance on building resilience to future disasters during the recovery process. Like the NMF, the National Disaster Recovery Framework was established in response to Presidential Policy Directive 8 on National Preparedness. It provides context for how a whole community works together to restore, redevelop, and revitalize its health, social, economic, natural, and environmental fabric.

management standard.⁵¹ Specifically, according to EOP officials, MitFLG consulted with EOP on developing both general policy as well as specific elements to comply with Executive Order 13690.

Agency Comments and Our Evaluation

We provided a draft of this report to the Departments of Homeland Security, Housing and Urban Development, State, and the Treasury as well as the Executive Office of the President's Council on Environmental Quality and Office of Science and Technology Policy and MitFLG for review and comment. They did not provide official written comments, but the Departments of Homeland Security and Housing and Urban Development, as well as the Executive Office of the President's Council on Environmental Quality and Office of Science and Technology Policy did provide technical comments, which we incorporated as appropriate. The Departments of State and Treasury, as well as MitFLG, did not provide comments.

As agreed with your office, 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 of the report to the appropriate congressional committees; the Secretaries of Homeland Security, Housing and Urban Development, State, and the Treasury; the Chair of the Council on Environmental Quality; the Director of the Office of Science and Technology Policy; the Chair of MitFLG; and other interested parties. In addition, the report is available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff members 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

⁵¹In January 2015, Executive Order 13690 was issued establishing a federal flood risk management standard to increase resilience against flooding and ensure that projects federal agencies fund with taxpayer dollars last as long as intended. The fiscal year 2016 appropriations act prohibits federal agencies from using appropriated funds in fiscal year 2016 to implement this executive order except in certain circumstances. Specifically, until fiscal year 2017, appropriated funds can only be used to implement the executive order when, except with respect to the nongrant components of the National Flood Insurance Program, (1) acquiring, managing, or disposing of federal lands and facilities; (2) providing federally undertaken, financed, or assisted construction or improvements; or (3) conducting federal activities or programs affecting land use.

the last page of this report. GAO staff members who made significant contributions to this report are listed in appendix II.

Sincerely yours,

A handwritten signature in black ink that reads "Alfredo Gómez". The signature is written in a cursive style with a large, stylized 'G'.

J. Alfredo Gómez
Director, Natural Resources and Environment

Appendix I: Selected Steps the United States Has Taken to Enhance Resilience

Table 3 describes selected steps the United States has taken to enhance resilience through climate change adaptation and broader resilience efforts.

Table 3: Selected U.S. Steps to Enhance Resilience

Selected step	Description
Executive Order 13693 (March 2015)	Revoked Executive Order 13514 (see below) and addressed federal leadership in sustainability with respect to energy, environmental water, fleet, buildings, and acquisition management to support preparations for the impacts of climate change.
Executive Order 13690 (January 2015)	Established a federal flood risk management standard to increase resilience against flooding and ensure that projects federal agencies fund with taxpayer dollars last as long as intended. Among other things, this Executive Order directed agencies to have federally funded projects meet a certain elevation level, using approaches that are designed to recognize and incorporate future conditions rather than rely solely on existing data and information. Guidelines implementing this Executive Order were issued in October 2015 so federal agencies must update their regulations and procedures in response to the Executive Order. The fiscal year 2016 appropriations act prohibits federal agencies from using appropriated funds in fiscal year 2016 to implement this executive order except in certain circumstances. ^b
President's State, Local, and Tribal Leaders Task Force on Climate Preparedness and Resilience (November 2014)	Provided recommendations on how the federal government can respond to the needs of communities nationwide that are dealing with the impacts of climate change by removing barriers to resilient investments, modernizing federal grant and loan programs, and developing the information and tools they need to prepare, among other measures. Issued recommendations to the President and Council on Climate Preparedness and Resilience, including requiring consideration of climate change risks and vulnerabilities in all federal activities, maximizing opportunities that offer co-benefits, and strengthening coordination and partnerships across government entities. Ended 6 months after submitting its recommendations.
U.S. Global Change Research Program's Third National Climate Assessment ^a (May 2014)	Assessed the science of climate change and its impacts across the United States. Described a number of barriers to effective adaptation, including policy and legal impediments, insufficient collaborative processes, and a lack of comprehensive evaluation metrics.
Executive Order 13653 (November 2013)	Among other things, directed federal agencies to develop or update comprehensive adaptation plans describing how each agency will consider the need to improve climate adaptation and resilience. Terminated the Interagency Climate Change Adaptation Task Force and established the Council on Climate Preparedness and Resilience.
Council on Climate Preparedness and Resilience (Council) (November 2013)	Established by Executive Order 13653, comprises more than 25 agencies. Among other things, was directed to coordinate interagency efforts on and track implementation of priority federal government actions related to climate preparedness and resilience and implement, as appropriate, recommendations of the State, Local, and Tribal Leaders Task Force on Climate Preparedness and Resilience.
Mitigation Framework Leadership Group (MitFLG) (October 2013)	Established by the National Mitigation Framework and serves an intergovernmental coordinating body 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. Is responsible for overseeing the implementation of the National Mitigation Framework.

**Appendix I: Selected Steps the United States
Has Taken to Enhance Resilience**

Selected step	Description
National Mitigation Framework (NMF) (May 2013)	Established a common platform for coordinating and addressing how the nation manages risk through mitigation. Described mitigation roles and addressed how the nation will lessen the impact of disaster by developing, employing, and coordinating core mitigation capabilities to reduce loss of life and property.
Hurricane Sandy Rebuilding Task Force (December 2012)	Established by the President, comprised officials from federal agencies and executive branch offices. Tasked with identifying and working to remove obstacles to resilient rebuilding while taking into account existing and future risks and promoting the long-term sustainability of communities and ecosystems in Hurricane Sandy-affected regions. Issued 69 recommendations to enhance disasters resilience, among other purposes.
Presidential Policy Directive 8: National Preparedness (March 2011)	Directed the development of a national preparedness goal that identifies the core capabilities necessary for preparedness and a national preparedness system.
Executive Order 13514 (October 2009)	Among other things, called for federal agencies to participate in the existing Interagency Climate Change Adaptation Task Force and directed the task force to develop federal recommendations for adapting to climate change impacts. Revoked by Executive Order 13693 in March 2015.
Interagency Climate Change Adaptation Task Force (Spring 2009)	Before it was terminated by Executive Order 13653, chaired by the Council on Environmental Quality, the Office of Science and Technology Policy, and the National Oceanic and Atmospheric Administration, and comprised more than 20 federal agencies and executive branch offices. In 2014, provided recommendations for elements that should be included in a national climate change adaptation strategy, including prioritization of risks, coordination, performance evaluation, and maximization of mutual benefits in related efforts, such as disaster preparedness.

Source: GAO analysis of government-wide efforts to address climate change or enhance resilience. | GAO-16-454

Note: The government has taken a number of actions to enhance resilience in addition to those described here.

^aThe U.S. Global Change Research Program (USGCRP) has issued two previous assessments. The Global Change Research Act of 1990 requires that not less frequently than every 4 years, USGCRP prepare and submit to the President and Congress an assessment of the effects of global change on the natural environment and biological diversity, among other things.

^bSpecifically, until fiscal year 2017, appropriated funds can only be used to implement the executive order when, except with respect to the nongrant components of the National Flood Insurance Program, (1) acquiring, managing, or disposing of federal lands and facilities; (2) providing federally undertaken, financed, or assisted construction or improvements; or (3) conducting federal activities or programs affecting land use.

Appendix II: GAO Contact and Staff Acknowledgments

GAO Contact

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Staff Acknowledgments

In addition to the individual named above, Mike Hix (Assistant Director), Christine Broderick, Alicia Cackley, Nicole Dery, Marissa Dondoe, Ellen Fried, Cindy Gilbert, Kathryn Godfrey, Matthew Hunter, Jessica Mausner, Tim Persons, Dan Royer, Stephen Sanford, Jeanette Soares, Kiki Theodoropoulos, and Joe Thompson made key contributions to this report.

Appendix III: Accessible Data

Accessible Text

Accessible Text for Highlights Figure and Figure 1: Relationships among Risks, Resilience, Hazard Mitigation, and Climate Change Adaptation

Actions to reduce risk

Resilience:

The ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events.

Hazard mitigation:

Actions taken to reduce loss of life and property by lessening the impacts of adverse events.

Climate change adaptation:

Adjustments to natural or human systems in response to actual or expected climate change, including increases in the frequency or severity of weather-related disasters.

Risks

Hazards

Technological and accidental hazards, such as oil spills

Natural hazards, such as weather-related disasters, earthquakes, or pandemics

Adversarial hazards, such as terrorism

Weather-related disasters

Tropical cyclones

Drought

Wildfires

Floods

Severe storms

Winter storms

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