United States Government Accountability Office

Report to the Honorable Matthew Cartwright, House of Representatives

October 2015

FEDERAL SUPPLY CHAINS

Opportunities to Improve the Management of Climate-Related Risks

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GAO-16-32

GAO Highlights

Highlights of GAO-16-32, a report to the Honorable Matthew Cartwright, House of Representatives

October 2015

FEDERAL SUPPLY CHAINS

Opportunities to Improve the Management of Climate-Related Risks

Why GAO Did This Study

The federal government obligated about $445 billion in fiscal year 2014 for goods and services such as disaster response products and telecommunications. Agencies with missions that depend on the secure and efficient transit of goods and services have had their supply chains disrupted by weather-related events, such as Superstorm Sandy. According to the National Climate Assessment, the severity and frequency of such events is expected to increase. Agencies developed adaptation plans in response to executive orders and implementing guidance issued by CEQ, which coordinates federal environmental efforts. GAO was asked to review climate-related risks to federal supply chains.

This report examines (1) the extent to which selected federal agencies have identified climate-related risks to their critical supply chains, (2) the extent to which they have identified and implemented actions to manage these risks, and (3) what is known about the federal government's fiscal exposure to such risks. GAO reviewed executive orders; surveyed 24 agencies selected because they account for over 98 percent of federal contract obligations; analyzed their adaptation plans; and interviewed officials from 5 of these agencies selected because of mission and other factors.

What GAO Recommends

GAO recommends that CEQ clarify its guidance on including supply chain risks in adaptation plans and develop a plan for convening an interagency working group on supply chain climate vulnerability. CEQ agreed with GAO's findings and recommendations.

View GAO-16-32. For more information, contact J. Alfredo Gómez at (202) 512-3841 or gomezj@gao.gov.

What GAO Found

Selected federal agencies have identified climate-related risks to their critical supply chains to varying degrees—including not at all—based on GAO's analysis of survey responses and adaptation plans from 24 selected agencies. According to GAO's analysis of these plans, 12 included information on agency-specific risks, 6 acknowledged general risks, and 6 did not mention risks. In survey responses and interviews with GAO, agencies reported facing several challenges identifying these risks, including among others, unclear guidance on adaptation planning. According to interviews with officials from several agencies and survey responses, the Council on Environmental Quality's (CEQ) guidance does not clearly specify how agencies should meet Executive Order 13653's directive for them to consider in their adaptation plans the need to improve climate adaptation and resilience with respect to suppliers and supply chains. GAO reviewed the guidance and found that, although the executive order directs agencies to identify and assess risks to their ability to accomplish their missions in their adaptation plans, CEQ's guidance does not discuss how agencies should do so for risks to suppliers and supply chains. CEQ officials said this guidance was broadly written to allow agencies flexibility for differing missions. While CEQ has documented guidance, which is consistent with federal standards for internal control, discussing how agencies should identify and assess supply chain risks in adaptation plans could better position agencies in the early stages of planning.

Few selected federal agencies have identified and implemented actions to manage climate-related risks to their supply chains, in part because they are in the early stages of planning and have not yet fully identified these risks. Of the 24 adaptation plans GAO analyzed, 4 identified agency-specific actions to manage climate-related risks to their supply chains. In survey responses and interviews with GAO, agencies reported facing challenges in identifying and implementing actions to manage climate-related risks to their supply chains, such as planning timelines that do not align with budget cycles and limited expertise. Executive Order 13693 directs CEQ to establish, as appropriate, temporary interagency working groups, including one on agency supply chain climate vulnerability, but CEQ has no planned date for convening it. Developing a plan to do so could be an important step toward helping agencies share experiences and information about climate-related supply chain risks as they update their adaptation plans.

The federal government's fiscal exposure to climate-related disruptions in supply chains is unknown, largely because agencies have not identified their exposure. Of the 24 adaptation plans GAO analyzed, one discussed budget or resource needs for managing climate-related risks to supply chains, and none identified fiscal exposure from supply chain disruptions. According to survey respondents, 4 of the 24 agencies have tried to identify this exposure, and 3 identified a small number of qualitative examples, such as greater suppression costs for increased wildfires. Seven survey respondents said they did not try, or were unable, to identify their exposure because of the challenges discussed above—particularly limited information about risks. Many respondents described other challenges, including the lack of a standardized process for determining fiscal exposure. In survey responses and interviews with GAO, several agencies reported that an interagency working group could help agencies address such challenges.

Contents

Letter		1
	Background	7
	Selected Agencies Have Identified Climate-Related Risks to Their Supply Chains to Varying Degrees and Face Several Challenges in Doing So	15
	Few Selected Agencies Have Identified and Implemented Actions to Manage Climate-Related Risks to Their Supply Chains and Face Several Challenges in Doing So	24
	The Federal Government's Fiscal Exposure to Climate-Related Disruptions in Supply Chains Is Unknown, and Agencies Face Challenges Identifying Their Exposure	30
	Conclusions	37
	Recommendations for Executive Action	38
	Agency Comments	38
Appendix I	Objectives, Scope, and Methodology	41
Appendix II	Summary Results of GAO Survey of Senior Sustainability Officers	45
Appendix III	Comments from the United States Postal Service	60
Appendix IV	GAO Contact and Staff Acknowledgments	61
Related GAO Products		62
Table		
	Table 1: Extent to Which Selected Agencies Include Information on Climate-Related Risks to Their Supply Chains in Their Climate Change Adaptation Plans	16

Figures

Figure 1: New York Army National Guard Engineers Clear Debris from Roads in New York State after Superstorm Sandy 11
Figure 2: Members of the Maryland National Guard Help Recover a Utility Vehicle Stuck in Mud Following Heavy Snowfall That Occurred during Superstorm Sandy 12

Abbreviations

CEQ	Council on Environmental Quality
DHS	Department of Homeland Security
DOD	Department of Defense
GIS	geographic information system
GSA	General Services Administration
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
OMB	Office of Management and Budget
SSO	Senior Sustainability Officer
USGCRP	U.S. Global Change Research Program
USPS	U.S. Postal Service

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U.S. GOVERNMENT ACCOUNTABILITY OFFICE
441 G St. N.W.
Washington, DC 20548

October 13, 2015

The Honorable Matthew Cartwright
House of Representatives

Dear Mr. Cartwright:

The federal government obligated approximately $445 billion in fiscal year 2014 to purchase goods and services, such as military base supplies, disaster response products, and data and telecommunications services, according to federal procurement data.[1] The General Services Administration (GSA), which makes common-use items available to federal agencies, alone provides the federal government with 11 million different goods and services totaling more than $54 billion in annual sales.[2] As we and others have found, the efficient and secure transit of goods and services through federal supply chains is critical to agencies' missions.[3] For example, in July 2010, we found that the Department of Defense (DOD) spends billions of dollars to manage a vast and complex supply chain network—providing everything from spare parts and base support items to food and fuel—that is vital to supporting operations and maintaining readiness and is a critical link in determining outcomes on the battlefield and meeting national security goals.[4] However, federal agencies with missions that depend upon their supply chains have had their activities disrupted by weather-related disasters. For example, in October 2012, Superstorm Sandy caused widespread damage to logistics and transportation networks throughout the Northeast, leading to major fuel shortages for agencies to overcome while providing critical federal

[1]Federal Procurement Data System - Next Generation database, accessed July 6, 2015.

[2]GSA's acquisition solutions offer private-sector professional and other services, equipment, supplies, telecommunications, and information technology to federal government organizations and the military. More than 18,000 commercial companies hold long-term governmentwide contracts.

[3]The National Institute of Standards and Technology has defined the term "supply chain" to mean a set of organizations, people, activities, information, and resources for creating and moving a product or service from suppliers through to an organization's customers.

[4]GAO, *DOD's High-Risk Areas: Observations on DOD's Progress and Challenges in Strategic Planning for Supply Chain Management*, GAO-10-929T (Washington, D.C.: July 27, 2010).

services, such as disaster relief and mail delivery, and causing an estimated $70 billion in direct damages and lost economic output.[5] Further, according to a study commissioned by GSA, because of the complex nature of supply chains, which typically span many tiers of direct and indirect suppliers and have wide geographic dispersion, disruptions in one region of the world can have wide-ranging implications for parts of the supply chain in other regions of the world.[6]

According to the U.S. Global Change Research Program's (USGCRP) May 2014 National Climate Assessment,[7] climate change is expected to increase the severity and frequency of certain extreme weather events.[8] In February 2013, we recognized that climate change is a complex, crosscutting issue that presents a significant financial risk to the federal government and placed limiting the federal government's fiscal exposure by better managing climate change risks on our high risk list.[9] In the February 2015 update to our high risk list, we recognized that climate change also poses risks to private-sector decision makers by, for example, disrupting supply chains that provide the food, medicine, energy, and products that support the U.S. economy.[10] Because the federal government both relies on private-sector supply chains to provide

[5]In late October 2012, Superstorm Sandy, which had been a hurricane in the Atlantic Ocean, made landfall in southern New Jersey as an intense post-tropical cyclone, with effects felt across 11 states and the District of Columbia, particularly the densely populated New York and New Jersey coasts.

[6]Riverside Technology, Inc. and Acclimatise. *Climate Risks Study for Telecommunications and Data Center Services.* Report prepared for the General Services Administration (Fort Collins, CO: 2014).

[7]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.

[8] Jerry 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).

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

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

these goods and services and provides disaster assistance, including to the private sector, in the aftermath of extreme weather events, risks to the private sector also increase the federal government's fiscal exposure to a changing climate. While it may not be possible to link any individual weather event to climate change, these and other observed impacts of such events disrupt people's lives and affect many sectors of our economy, including the budgets of federal, state, and local governments.

To establish an integrated strategy towards sustainability in the federal government and prepare the United States for the impacts of climate change, the President signed two executive orders in 2009 and 2013, respectively.[11] The implementing instructions for the 2009 executive order, and the 2013 executive order itself, directed federal agencies to submit climate change adaptation plans—known as adaptation plans—to the Council on Environmental Quality (CEQ)[12] and the Office of Management and Budget (OMB). Under the 2013 executive order, these adaptation plans are to be updated regularly and are to evaluate agencies' most significant climate change related risks to, and vulnerabilities in, agency operations and missions in both the long and short term and outline actions the agency will take to manage such risks and vulnerabilities. In addition, under the 2013 executive order, agency adaptation plans are to describe how the agency will consider the need to improve climate adaptation and resilience with respect to suppliers and supply chains, among other things.[13] In response to these executive orders, agencies submitted the first round of adaptation plans to CEQ and

[11]Exec. Order No. 13514, 74 Fed. Reg. 52,117 (Oct. 8, 2009); Exec. Order No. 13653, 78 Fed. Reg. 66,819 (Nov. 6, 2013). In March 2015, Executive Order 13693 revoked Executive Order 13514. *See* 80 Fed. Reg. 15,871, 15,880 (Mar. 25, 2015).

[12]CEQ coordinates federal environmental efforts and works closely with agencies and other entities within the Executive Office of the President in the development of environmental initiatives. CEQ was established within the Executive Office of the President by the National Environmental Policy Act of 1969, and additional responsibilities were provided by the Environmental Quality Improvement Act of 1970.

[13]Executive Order 13653 defines "adaptation'' as adjustment in natural or human systems in anticipation of or response to a changing environment in a way that effectively uses beneficial opportunities or reduces negative effects; and ''resilience'' as the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions.

OMB in June 2012 and submitted the second, and most recent, round of plans in June 2014.[14]

You asked us to examine climate-related risks to federal supply chains.[15] In this report, we (1) evaluate the extent to which selected agencies have identified climate-related risks, if any, to their critical supply chains and challenges, if any, that they face in doing so; (2) evaluate the extent to which these agencies have identified and implemented actions to manage climate-related risks to their critical supply chains and challenges, if any, that they face in doing so; and (3) describe what is known about the federal government's fiscal exposure to climate-related disruptions in federal supply chains and challenges, if any, agencies face in identifying such exposure.[16]

To address these objectives, we analyzed the adaptation plans that 24 selected federal agencies submitted in 2012 and 2014 to determine the extent to which these agencies had identified climate-related risks to their supply chains and identified and implemented actions to manage these

[14]Agencies publicly released final versions of these plans in February 2013 and October 2014, respectively. Agencies, as defined in 5 U.S.C. § 105 with the exception of GAO, were subject to Executive Order 13514. Executive Order 13653 directs agencies to develop and update adaptation plans but does not define agencies. Not all agencies, as defined in 5 U.S.C. § 105, submitted adaptation plans in 2012 or 2014. For example, the Defense Nuclear Facilities Safety Board and the National Science Foundation are agencies as defined in 5 U.S.C. § 105, but neither submitted an adaptation plan. In addition, according to CEQ, the U.S. Postal Service voluntarily submitted an adaptation plan. Executive Order 13653 directs agencies to regularly update their adaptation plans with updates due not later than 1 year after the publication of each quadrennial National Climate Assessment report.

[15]This review was conducted in response to a 2014 request from Representative Matt Cartwright—then Ranking Member, House Subcommittee on Economic Growth, Job Creation, and Regulatory Affairs; Committee on Oversight and Government Reform—to review the management of climate-related risks to federal supply chains.

[16]This report refers to "climate-related risks," which we define as vulnerabilities of natural and human systems, such as environmental and economics systems, due to changes in the earth's climate—including higher temperatures, changes in precipitation, rising sea levels, and increases in the severity and frequency of severe weather events.

risks.[17] We selected these 24 agencies because they were expected to receive an OMB Sustainability and Energy Scorecard for fiscal year 2014 and, according to CEQ documents, are responsible for a significant portion of the federal government's spending on goods and services.[18] In particular, these agencies account for over 98 percent of the federal government's fiscal year 2014 contract obligations, according to federal procurement data.[19] In addition, we surveyed the Senior Sustainability Officers at these 24 agencies to better understand federal agency adaptation efforts and any challenges agencies face in these efforts and received responses from all 24 agencies.[20] From these 24 agencies, we selected a nonprobability sample of 5 key agencies—DOD, the Department of Homeland Security (DHS), GSA, the National Aeronautics and Space Administration (NASA), and the U.S. Postal Service (USPS)—for a more detailed review and to discuss specific examples of efforts to identify and manage climate-related risks to their supply chains. We selected these 5 key agencies based on a range of different factors such as agency size, geographic dispersion of facilities and infrastructure,

[17]The 24 agencies are 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; Environmental Protection Agency; General Services Administration; National Archives and Records Administration; National Aeronautics and Space Administration; Office of Personnel Management; U.S. Postal Service; Smithsonian Institution; Tennessee Valley Authority; and the U.S. Army Corps of Engineers.

[18]OMB and CEQ use this annual scorecard process to assess key agencies' performance in achieving, among other things, federal energy and environmental goals. Because the fiscal year 2014 scorecards were not yet released at the time of our review, we selected the 24 agencies that, according to CEQ officials and documents, were expected to receive scorecards for fiscal year 2014. Based on this information, we did not include the Social Security Administration, which went on to receive a 2014 scorecard. CEQ's instructions clarify that the U.S. Postal Service voluntarily receives a scorecard. *See* CEQ, *Implementing Instructions for Executive Order 13693 Planning for Federal Sustainability in the Next Decade* (Washington, D.C.: June 10, 2015).

[19]Federal Procurement Data System - Next Generation database, accessed August 31, 2015.

[20]Executive Order 13514 directed agencies to designate, within 30 days of the date of the executive order, a Senior Sustainability Officer to be accountable for agency conformance with the executive order, including preparing and implementing a multiyear Strategic Sustainability Performance Plan and updating and submitting this plan annually to OMB and CEQ for review. In March 2015, Executive Order 13693 revoked Executive Order 13514 and directed agencies to designate, within 45 days of the date of the executive order, an agency Chief Sustainability Officer and made the agency head responsible for developing, implementing, and updating the Strategic Sustainability Performance Plan.

types of supply chains, and mission. Because this is a nonprobability sample, our findings cannot be generalized to other agencies but provide us with examples of the extent to which agencies identify and manage climate-related risks to their supply chains. We conducted interviews with officials from these 5 key agencies. We refer to the 24 agencies we surveyed as "selected agencies" and to the 5 agencies with officials we interviewed as "key agencies." We also interviewed officials and staff from the coordinating entities that review and approve agency adaptation plans—that is, CEQ and OMB, respectively—and one that provides science support to agencies—USGCRP—regarding their roles and agencies' adaptation planning efforts and challenges. We compared agency efforts to relevant executive orders and related guidance[21] and compared the related guidance to federal standards for internal control.[22]

To describe what is known about the federal government's fiscal exposure to climate-related disruptions in federal supply chains, we conducted a literature review to determine what has been reported about the government's fiscal exposure to climate-related disruptions in federal supply chains. We interviewed officials from the 5 key agencies to obtain examples of fiscal exposure based on particular instances of supply chain disruptions and, through our survey results and interviews with officials and staff, identified challenges selected agencies and coordinating entities face in identifying such exposures. Appendix I contains more detailed information on the objectives, scope, and methodology of our review.

We conducted this performance audit from October 2014 to October 2015 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.

[21]Exec. Order No. 13693, 80 Fed. Reg. 15,871 (Mar. 25, 2015); Exec. Order No. 13653, 78 Fed. Reg. 66,819 (Nov. 6, 2013); and Exec. Order No. 13514, 74 Fed. Reg. 52,117 (Oct. 8, 2009).

[22]GAO, *Standards for Internal Control in the Federal Government,* GAO/AIMD-00-21.3.1 (Washington, D.C.: Nov. 1, 1999).

Background

This section describes (1) executive orders directing agencies to manage climate-related risks, (2) growing concerns about climate-related risks to supply chains, and (3) risk management as a strategy for managing climate-related risks to supply chains.

Executive Orders Directing Agencies to Manage Climate-Related Risks

In 2009, the President signed Executive Order 13514 which, among other things, called for agencies to designate a Senior Sustainability Officer responsible for preparing and implementing a multiyear Strategic Sustainability Performance Plan and updating and submitting this plan annually to OMB and CEQ for review and ultimate approval by OMB.[23] The executive order called for agencies' plans to evaluate climate change risks and vulnerabilities to manage the effects of climate change on their operations and missions, among other things.[24] It also called for agencies to participate in the existing Interagency Climate Change Adaptation Task Force co-chaired by CEQ. The executive order directed the task force to develop recommendations for the federal government on adapting to climate change impacts.

In 2010, the task force recommended, among other things, that agencies establish and implement coordinated adaptation plans that address unique challenges to their missions, operations, and programs. In 2011, based on these recommendations, CEQ issued detailed implementing instructions for adaptation planning.[25] The instructions directed each federal agency subject to the executive order to issue an agency-wide climate change adaptation policy statement that commits the agency to adaptation planning to address challenges posed by climate change to the agencies' missions, programs, and operations; pursue opportunities for sharing and coordination across the federal community; complete a high-level analysis of agency vulnerability to climate change; and submit to CEQ and OMB adaptation plans that reflect and advance, where

[23]74 Fed. Reg. 52,117 (Oct. 8, 2009).

[24]Under Executive Order 13514, agencies are to develop, implement, and annually update a plan that prioritizes actions based on a life-cycle return on investment and achieves greenhouse gas emissions, energy, water, and waste reduction goals and targets.

[25]CEQ, *Instructions for Implementing Climate Change Adaptation Planning in Accordance with Executive Order 13514 Federal Leadership in Environmental, Energy, and Economic Performance* (Mar. 4, 2011) and CEQ, *Implementing Climate Change Adaptation Planning in Accordance with Executive Order 13514, Support Document* (Mar. 4, 2011).

appropriate, interagency crosscutting national adaptation planning efforts. In June 2012, as directed by CEQ's instructions, these agencies submitted the first round of adaptation plans for implementation in fiscal year 2013 to CEQ and OMB as an appendix to their annual Strategic Sustainability Performance Plans.

In November 2013, the President signed Executive Order 13653, which directs federal agencies to develop or update comprehensive adaptation plans that include, among other things, a description of how the agency will consider the need to improve climate adaptation and resilience, including the costs and benefits of such improvement, with respect to agency suppliers and supply chain.[26] Agencies are to prepare such plans approximately every 4 years, although some agencies may choose to update their plans annually, according to officials and staff from CEQ, OMB, and USGCRP. In addition, the executive order terminated the task force and established an interagency Council on Climate Preparedness and Resilience to continue and build upon the task force's work. The council, co-chaired by the Chair of CEQ and other officials from the Executive Office of the President, was tasked with coordinating interagency efforts on and tracking implementation of priority federal government actions related to climate preparedness and resilience, among other things.[27] In December 2013, CEQ issued guidance for agencies on preparing adaptation plans in accordance with Executive Order 13653 and, in June 2014, agencies submitted the second and most recent round of adaptation plans to OMB and CEQ. These plans were made public at the end of October 2014.

In March 2015, the President signed Executive Order 13693, which replaced and revoked Executive Order 13514. Executive Order 13693 directs the Chair of CEQ to establish and disband, as appropriate, temporary interagency working groups to provide recommendations to the Chair of CEQ associated with the goals of the executive order, including agency supply chain climate vulnerability. In June 2015, CEQ issued

[26] 78 Fed. Reg. 66,819 (Nov. 6, 2013).

[27] Executive Order 13653 defines ''preparedness'' as actions taken to plan, organize, equip, train, and exercise to build, apply, and sustain the capabilities necessary to prevent, protect against, ameliorate the effects of, respond to, and recover from climate change related damages to life, health, property, livelihoods, ecosystems, and national security.

implementing instructions for Executive Order 13693.[28] These instructions directed both temporary and existing working groups to provide recommendations for policies, guidance, reporting metrics, and other tools to CEQ to improve agency implementation of the executive order.

Growing Concerns about Climate-Related Risks to Supply Chains

According to the Quadrennial Energy Review, extreme weather events resulting in more than $1 billion in damages have increased over the past decade.[29] The review states that these events can have a range of impacts on energy transmission, storage, and distribution infrastructures, which are key supply chain components. For example, according to the review, hurricane impacts on certain energy infrastructure, such as ports and electrical power, can have a high probability of damage, and the severity of the damage can be catastrophic (i.e., disrupting infrastructure for months, in addition to requiring rebuilding). Further, heat waves affect energy infrastructure in several ways, including reducing the efficiency of electric transmission and distribution circuits; increasing the load on the grid associated with additional demand for air-conditioning; and reducing the efficiency of cooling at thermal power plants that can result in lower power plant output. Drought and extreme cold pose challenges to energy infrastructure by, for example, impeding barge transport of energy products.

There is also growing recognition in reports and studies that climate-related impacts can pose significant financial risks to businesses worldwide. USGCRP has reported that climate change is projected to increase the likelihood or severity of certain extreme weather events,

[28]CEQ, *Implementing Instructions for Executive Order 13693*.

[29]*Quadrennial Energy Review: Energy Transmission, Storage, and Distribution Infrastructure* (Washington, D.C.: April 2015). In 2013, the President initiated a quadrennial cycle of energy reviews to provide a multiyear guide for U.S. energy policy. The President formed a task force—comprising 22 federal agencies and offices with equities in energy—to develop the review and directed the Department of Energy to provide analytical support for it and to help manage the interagency process. The review states that, in its development, the Department of Energy convened stakeholders through different efforts, including technical workshops, 13 formal public stakeholder meetings, and a series of roundtables. The review also states that it is envisioned as a focused, actionable document designed to provide policymakers, industry, investors, and other stakeholders with data and analysis on energy challenges, needs, requirements, and barriers to inform a range of policy options.

such as heat waves, floods, and droughts.[30] Further, some reports note that supply chains may be a particular source of climate-related vulnerability to business interests.[31] According to industry surveys, many businesses and investors are concerned about climate-related risks to supply chains and have begun taking steps to manage these risks.[32] For example, the Securities and Exchange Commission requires certain companies to disclose, among other things, known trends, events, and uncertainties that are reasonably likely to have a material effect on the company's financial condition or operating performance to investors through regular filings.[33] In 2010, the Securities and Exchange Commission issued guidance to these companies on how existing disclosure requirements apply to climate-related matters, including physical effects of climate change that can impact supply chains.[34]

In recent years, climate-related events have caused major disruptions to supply chains used by governments and businesses. For example, Superstorm Sandy destroyed communities along the New Jersey and New York coasts and knocked out power to over 8 million customers from North Carolina to Maine and as far west as Illinois. (See figs. 1 and 2.)

[30]Jerry M. Melillo, Terese (T.C.) Richmond, and Gary W. Yohe, eds., *The Third National Climate Assessment* (2014).

[31]*See* S. Agrawala, et al., *Private Sector Engagement in Adaptation to Climate Change: Approaches to Managing Climate Risks*, OECD Environment Working Papers, No. 39 (OECD Publications: 2011); Center for Climate and Energy Solutions, *Weathering the Storm: Building Business Resilience to Climate Change* (Arlington, Virginia: July 2013); and Gary L. Hanifan, Aditya E. Sharma, and Paras Mehta, *Supply Chain Management: Why a Sustainable Supply Chain is Good Business*, Outlook, No. 3 (Accenture: 2012).

[32]*See* Accenture Strategy. *Supply Chain Sustainability Revealed: A Country Comparison*. Report prepared for CDP (2014) and Accenture. *CDP Supply Chain Report 2012, A New Era: Supplier Management in the Low-Carbon Economy*. Report prepared for the Carbon Disclosure Project (2012).

[33]Material means that there is a substantial likelihood that a reasonable investor would consider the information important in making an investment decision or deciding how to vote.

[34]Securities and Exchange Commission, *Commission Guidance Regarding Disclosure Related to Climate Change*, 75 Fed. Reg. 6,290 (Feb. 8, 2010).

Figure 1: New York Army National Guard Engineers Clear Debris from Roads in New York State after Superstorm Sandy

Source: U.S. Army photo by Spc. J.P. Lawrence. The appearance of U.S. Department of Defense (DOD) visual information does not imply or constitute DOD endorsement. | GAO-16-32

Figure 2: Members of the Maryland National Guard Help Recover a Utility Vehicle Stuck in Mud Following Heavy Snowfall That Occurred during Superstorm Sandy

Source: Courtesy photo by the Maryland National Guard. The appearance of U.S. Department of Defense (DOD) visual information does not imply or constitute DOD endorsement. | GAO-16-32

Superstorm Sandy cost the United States an estimated $70 billion in direct damages and lost economic output. According to the Quadrennial Energy Review, Sandy's impact on the region's petroleum infrastructure—a key supply chain component—was severe, with flooding and power outages at refineries, pipelines, and petroleum terminals in the New York Harbor area, leading to depressed supplies of petroleum products in the Northeast and stock drawdowns and temporary price increases.[35] Nearly 2 weeks after the storm, deliveries from petroleum terminals in the New York Harbor had returned to only 61 percent of their prestorm levels, according to the review. The supply issues at New York Harbor terminals, combined with power outages at retail fueling stations, led to widespread gasoline shortages in the New York City area in the weeks after landfall. This was largely caused by flooding damage to major terminals and docks in New Jersey. As a result, portable generators sat unused, and lines at fueling stations were long and problematic, while

[35]See *Quadrennial Energy Review* (2015).

consumers struggled to identify which gas stations had power and were operational. According to the review, these fuel shortages delayed first responders and other disaster response and recovery officials.

According to a 2014 study GSA commissioned, climate impacts to one part of the supply chain in one part of the world can have consequences for other parts of the supply chain in other parts of the world, and a single climate-related event can have compound effects, with a range of direct and indirect impacts, across sectors.[36] According to the study, these effects were demonstrated in 2011 when severe flooding during successive monsoons disrupted electronics manufacturing in Thailand, leading to delays and disruptions to companies around the world. At the time of the flood, 45 percent of the world's computer hard drives were manufactured in Thailand. As a result of the flood, an international airport was closed for 6 months; 1,700 roads were damaged or destroyed, requiring $4.5 billion in repairs; and over 9,800 factories closed, resulting in more than a 35 percent decline in total manufacturing output. The flooding caused $45 billion in economic losses worldwide, including damage to global supply chains, and caused the global price of hard drives to double.[37]

Risk Management as a Strategy for Managing Climate-Related Risks to Supply Chains

Risk management strategies are used extensively where decision makers are faced with incomplete information or unpredictable outcomes that may have negative impacts.[38] This includes the management of supply chain risks. For example, in 2012 the White House issued its *National Strategy for Global Supply Chain Security*, which states that, as the global supply chain becomes more complex and global in scope, it is increasingly at risk from disruptions, including natural hazards.[39] The strategy's goals are to promote the efficient and secure movement of goods and to foster a resilient supply chain by, among other things,

[36]Riverside Technology, Inc. and Acclimatise, *Climate Risks Study for Telecommunications and Data Center Services* (2014).

[37]The World Bank, *Thai Flood 2011: Rapid Assessment for Resilient Recovery and Reconstruction Planning* (2012).

[38]Center for Climate and Energy Solutions, *Extreme Weather & Climate Change: Understanding the Link and Managing the Risk* (December 2011).

[39]The White House, *National Strategy for Global Supply Chain Security* (Washington, D.C.: Jan. 23, 2012).

managing supply chain risk for businesses and government. The strategy states that managing supply chain risks includes identifying, assessing, and prioritizing efforts to manage risk by using layered defenses, such as information gathering, technology, and effective partnerships.

Similarly, DOD supply chain policy emphasizes that supply chain risk management strategies should be employed to identify, monitor, assess, and reduce or eliminate potential disruptions within DOD's supply chain (e.g., unreliable suppliers, machine breakdown) and outside of it (e.g., terrorism, natural disasters).[40] Agencies generally have direct contractual relationships with the primary tier of their supply chains, which provides final goods and services, as suppliers in secondary and tertiary tiers, for example, provide goods or services to other suppliers.

Some businesses use risk management strategies to manage climate-related risks to supply chains. The Center for Climate and Energy Solutions identified a set of emerging practices based on the experiences of case-study companies that are working proactively to better understand and manage climate-related risks.[41] According to the Center for Climate and Energy Solutions, these companies generally follow a four-step process for managing climate-related risks: (1) identifying potential risks; (2) assessing and prioritizing them using corporate risk management frameworks; (3) developing plans and guidance to inform management decisions; and (4) incorporating risk factors into an ongoing, iterative review process.[42]

According to the National Research Council, adaptation is essentially a risk management strategy.[43] This is consistent with what we found in our adaptation reports. Specifically, in October 2009, we found that policymakers are increasingly viewing adaptation as a risk management

[40]DOD Instruction 4140.01, Supply Chain Materiel Management Policy (Dec. 14, 2011).

[41]The Center for Climate and Energy Solutions identifies itself as an independent, nonpartisan, nonprofit organization working to advance policy and action to address energy and climate-related challenges. It was formerly known as the Pew Center on Global Climate Change.

[42]*See* Center for Climate and Energy Solutions, *Weathering the Storm: Building Business Resilience to Climate Change* (Arlington, VA: July 2013).

[43]National Research Council of the National Academy of Sciences, *Adapting to the Impacts of Climate Change* (Washington, D.C.: May 19, 2010).

strategy to protect vulnerable sectors and communities that might be affected by changes in the climate.[44] Further, in April 2013, we reported on adaptation as a risk management tool.[45] We found that risk management is a strategic process for helping policymakers make decisions about assessing risk, allocating finite resources, and taking actions under conditions of uncertainty. We also found that leading risk management guidance recommends a sequence of activities that begins, in part, with identifying risks.

Selected Agencies Have Identified Climate-Related Risks to Their Supply Chains to Varying Degrees and Face Several Challenges in Doing So

The 24 selected agencies we reviewed have identified climate-related risks to their critical supply chains to varying degrees, based on our review of their adaptation plans and their responses to our survey. According to survey responses from the 24 selected agencies and interviews with officials from 5 key agencies, agencies face several challenges in identifying these risks. These challenges include unclear guidance on adaptation planning for supply chains—which includes identifying risks—and limited availability of some climate-related data, varying degrees of expertise and skills, and limited information about critical supplies and locations of supply chains.

Selected Agencies Have Identified Climate-Related Risks to Their Supply Chains to Varying Degrees, in Part Because They Are in the Early Stages of Planning

According to our analysis of 24 selected agencies' 2012 and 2014 adaptation plans and their responses to our survey, these agencies identified climate-related risks to their supply chains to varying degrees—from not including them at all to proposing a long-term plan with resource needs identified—as shown in table 1.

[44]GAO, *Climate Change Adaptation: Strategic Federal Planning Could Help Government Officials Make More Informed Decisions*, GAO-10-113 (Washington, D.C.: Oct. 7, 2009).

[45]GAO, *Climate Change: Future Federal Adaptation Efforts Could Better Support Local Infrastructure Decision Makers*, GAO-13-242 (Washington, D.C.: Apr. 12, 2013).

Table 1: Extent to Which Selected Agencies Include Information on Climate-Related Risks to Their Supply Chains in Their Climate Change Adaptation Plans

Extent to which information on climate-related risks to supply chains is included	Plans submitted in 2012[a]	Plans submitted in 2014
Not at all (i.e., the plan does not include climate-related risks to the agency's supply chains)	12	6
To a little extent (i.e., the plan acknowledges general climate-related risks to the agency's supply chains but does not identify agency-specific risks)	4	6
To some extent (i.e., the plan identifies potential agency-specific climate-related risks to the agency's supply chains, but does not propose actions or only proposes broad concepts or strategies)	3	8
To a moderate extent (i.e., the plan identifies potential agency-specific climate-related risks to the agency's supply chains and proposes targeted or systematic, agency-specific actions)	1	3
To a great extent (i.e., the plan proposes a long-term plan, including a general discussion of budget or other resource needs, for implementing agency-specific actions to address climate-related risks to the agency's supply chains; the plan does not necessarily acknowledge or estimate the cost of actual actions taken, if any)	0	1
Total number of plans submitted by selected agencies	**20**	**24**

Source: GAO analysis of agency climate change adaptation plans. | GAO-16-32

Note: We reviewed plans submitted by the following 24 agencies: 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; Environmental Protection Agency; General Services Administration; National Archives and Records Administration; National Aeronautics and Space Administration; Office of Personnel Management; U.S. Postal Service; Smithsonian Institution; Tennessee Valley Authority; and the U.S. Army Corps of Engineers.

[a]We analyzed the plans made available on a federal website where, according to officials from the Council on Environmental Quality (CEQ), we could find all plans submitted by agencies. We accessed the plans available on the website on several dates from September 2014 to June 2015. We verified the number of plans with CEQ officials and with information on two other federal websites where plans had also been made available. Based on this work, plans for 20 of the 24 selected agencies were available among the plans submitted in 2012. In technical comments provided on September 28, 2015, CEQ indicated that it had plans submitted in 2012 from 23 of the selected agencies. We received these comments too late to confirm or review the 3 additional plans.

The plans agencies submitted in 2012 were developed in response to CEQ's implementing instructions and supporting document for Executive Order 13514. Executive Order 13514 did not direct agencies to address climate-related risks to supply chains; rather, it provided a foundation for coordinated action on climate change preparedness and resilience across the federal government. More specifically, it directed agencies to evaluate agency climate-change risks and vulnerabilities to manage the effects of

climate change on the agency's operations and mission in both the short and long term, among other things.[46]

The plans agencies submitted in 2014 were developed in response to Executive Order 13653, which built on efforts under Executive Order 13514. Executive Order 13653 directed agencies to, among other things, develop or continue to develop, implement, and update comprehensive plans that integrate consideration of climate change into agency operations and overall mission objectives and submit those plans to CEQ and OMB for review.[47] In addition, the executive order directed agencies to include in their adaptation plans a description of how the agency will consider the need to improve climate adaptation and resilience, including the costs and benefits of such improvement, with respect to agency suppliers and supply chain, among other things. For any climate change related risk the agency deems so significant that it impairs an agency's statutory mission or operation, the executive order directs agencies to describe in their plans how that risk will be addressed.

According to our analysis of these agencies' 2014 adaptation plans, 18 of the 24 agencies' plans included information on climate-related risks to supply chains to varying degrees, and 6 agencies' plans did not mention climate-related risks to their supply chains at all. For example, one agency's plan states that transportation infrastructure may be damaged or obstructed by extreme weather events, disrupting operations and endangering employees, but this plan does not identify risks specific to this agency. In contrast, another agency's plan includes agency-specific risks with targeted actions to address these risks, including the specific division that would lead the actions. Another agency's plan identified agency-specific risks and also included long-term goals and a general discussion of resource needs for implementing agency-specific actions to manage these risks. In their survey responses, 11 agencies indicated that they have taken or plan to take actions to identify climate-related risks to their supply chains. These actions include initiating a review to better understand climate-related risks to supply chains and conducting

[46]74 Fed. Reg. 52,117 (Oct. 8, 2009).

[47]78 Fed. Reg. 66,819 (Nov. 6, 2013). Executive Order 13653 directs agencies to regularly update their adaptation plans, completing the first update within 120 days of the executive order's issuance, with additional regular updates thereafter due not later than 1 year after the publication of each quadrennial National Climate Assessment report required by section 106 of the Global Change Research Act of 1990 (15 U.S.C. § 2936).

readiness surveys aimed to assess operational capability in the event of emergencies or disasters.

According to officials and staff from CEQ and USGCRP, the reason that the 24 selected agencies have identified climate-related risks to their supply chains to such varying degrees—including not at all—is that they are generally in the early stages of climate change adaptation planning and have different levels of internal expertise and capacity. This reason was echoed by officials we interviewed from 3 of the 5 key agencies, who also said that agencies are in the early stages of planning for climate-related risks. This viewpoint is also consistent with a 2015 Congressional Research Service report that noted most agencies are in formative stages of their climate change vulnerability assessments and strategic planning.[48]

According to our analysis of agencies' 2014 plans, the plans that include information on agency-specific climate-related risks to supply chains describe risks such as sea level rise and extreme weather events that could affect communication and transportation infrastructure, including ports, roads, and airports, as well as energy infrastructure, such as oil and gas production. Of the 24 agencies we surveyed, 16 indicated that climate-related events, such as floods, hurricanes, droughts, and extreme cold, have already disrupted their agencies' supply chains in the past 15 years. For example, 7 of these 16 agencies described episodes of flooding that, among other things, disrupted fuel deliveries, altered transportation routes, and damaged agency equipment or facilities. According to officials we interviewed from NASA and USPS, a hurricane can be the worst-case immediate climate-related risk to supply chains due to the far-reaching effects of these storms. In their survey responses, several agencies described examples of supply chain disruptions that resulted from hurricanes, including the following:

- Damage from Hurricane Ivan in 2004 seriously disrupted the operations of one of an agency's laboratories when it flooded certain buildings with as much as 10 inches of water and washed away parts of the facility's piers.

[48]Congressional Research Service, *Climate Change Adaptation by Federal Agencies: An Analysis of Plans and Issues for Congress*, Publ. No. R43915 (Washington, D.C.: Feb. 23, 2015).

- Superstorm Sandy disrupted normal deliveries to one of an agency's sites, cut off electrical power, and severely reduced the site's ability to communicate via phone and Internet.

- Superstorm Sandy affected project schedules for an agency installing telecommunication services in areas not directly impacted by the storm, as telecommunication service crews from the Washington, D.C., area were redirected to the New York City area.

In addition, when we interviewed NASA officials, they expressed concern that a climate-related event that affects the power grid could disrupt a particularly critical component of their agency's supply chains. According to these officials, NASA tracks about 240 spacecraft at any given time, and any loss of power could mean losing navigational contact with these craft. Moreover, they told us that NASA pays for spacecraft up front and then downloads and stores unique data from the craft over time. Therefore, they said any gap in their access to these data could result in less data for the same cost.

Selected Agencies Reported Facing Several Challenges in Identifying Climate-Related Risks to Their Supply Chains

According to their responses to our survey and our interviews with officials and staff from CEQ, USGCRP, and key agencies, the 24 selected agencies we reviewed face several challenges in identifying climate-related risks to supply chains, including those below.

Unclear Guidance Related to Supply Chain Risks

CEQ has provided guidance to agencies for Executive Order 13653 but, according to the officials we interviewed from four of the five key agencies, several responses to our survey, and our review of CEQ's guidance, the guidance does not clearly specify how agencies should consider climate-related risks to agency suppliers and supply chain. For example, GSA officials we interviewed said many agencies they work with are just now thinking about climate-related risks to their supply chains and do not know where to begin to identify those risks because there is little guidance, in general, for how they should do so. In its survey response, one agency commented that guidance to better and more consistently define supply chain risks and governmentwide goals and objectives would help agencies identify climate-related risks to supply chains. Another agency indicated that, at this point, agencies are working mostly independently on these issues without a broader understanding of governmentwide goals and objectives or a federal approach to identifying climate-related risks to supply chains. We reviewed the guidance and

found that, although Executive Order 13653 directs agencies to identify and assess climate change related impacts on and risks to their ability to accomplish their missions, operations, and programs in their adaptation plans, CEQ's guidance does not discuss how agencies should do so for risks to suppliers and supply chain. CEQ officials noted that some agencies asked for clarification—for example, whether Executive Order 13653's references to supply chains applied to supplies they receive, supplies they provide, or both.

CEQ officials told us that its guidance was broadly written so that it would be useful for agencies with different missions. These officials also stated that agencies manage their supply chains differently, depending on their missions, which could be reflected in agencies' efforts to identify climate-related risks. Nonetheless, in its survey response, one agency commented that critical supply chain issues could be common across many federal agencies, and that guidance identifying some specific and broadly-applicable critical supply chain issues and their associated vulnerabilities and potential impacts to agency operations would be a useful starting point for agencies to identify climate-related risks to their supply chains. In addition, agencies that are in earlier stages of adaptation planning may not be aware of or know how to identify climate-related risks to their supply chains.

CEQ officials also told us they provided some informal feedback on agencies' efforts to implement the goals of the executive orders, including the development of their adaptation plans, by reviewing and providing comments on the plans, holding interagency workshops, and requesting agency input on guidance. According to officials and staff from CEQ, OMB, and USGCRP, agencies could also communicate with CEQ as they carried out these efforts. In response to our survey, 9 of 24 agencies indicated that CEQ provided feedback—formal, informal, or both—on their adaptation plans, and 2 of these agencies indicated that this feedback related to climate-related risks to their supply chains.[49] Executive Order 13653 does not direct CEQ to emphasize supply chains in its review of adaptation plans, and CEQ officials told us that their reviews, to date, did not specifically focus on supply chains.

[49]In our survey, we did not ask agencies whether they requested feedback from CEQ on their adaptation plans.

Under federal standards for internal control, agencies are to clearly document internal controls, and the documentation is to appear in management directives, administrative policies, or operating manuals.[50] CEQ has documented guidance, which is consistent with these standards. Nonetheless, by clarifying the guidance to discuss how agencies' are to consider the need to improve climate adaptation and resilience with respect to their suppliers and supply chains, CEQ will have better assurance that the guidance is helping more agencies to achieve the executive order's directive when they submit future updates to their adaptation plans.

Limited Availability of Some Climate-Related Data

According to officials and staff we interviewed from USGCRP, three of the five key agencies, and agency responses to our survey, climate-related data are often unavailable or exist in different formats, which poses challenges for agencies in identifying climate-related risks to supply chains. As we found in the February 2015 update to our high risk list,[51] the federal government's climate-related data—composed of observational records from satellites and weather monitoring stations, projections from complex climate models, and other tools—are fragmented across many individual agencies that use the information in different ways to meet their respective missions. As we concluded in February 2015, federal, state, local, and private-sector decision makers may be unaware that this information exists or may be unable to use what is available. Officials and staff we interviewed from USGCRP and three of the five key agencies told us that the physical impacts of a changing climate differ by location and can be very localized, but they do not have access to standardized, local-level data, which can pose challenges to identifying climate-related risks to supply chains at an agency-wide level. For example, USPS officials we interviewed said they use the geographic information system (GIS) mapping software to assess risks to its network facilities but, according to these officials, they are not aware of local-level data on floodplains (i.e., lowland and relatively flat areas adjoining inland and coastal waters) available in a format easily integrated into GIS.[52]

[50] GAO/AIMD-00-21.3.1.

[51] GAO-15-290.

[52] The primary function of a GIS is to link multiple sets of geospatial data and display the combined information as maps with different layers of information. Assuming that all of the information is at the same scale and has been formatted according to the same geospatial standards, users can potentially overlay geospatial data about any number of specific topics to examine how the data in the various layers interrelate.

Therefore, USPS is not able to overlay these data onto its maps to identify potential flood risks to its network facilities, limiting its ability to devise plans to minimize disruptions to its internal supply chain.

We have previously found similar challenges. For example, in April 2013, we found that infrastructure decision makers have not systematically incorporated potential climate change impacts in planning because, among other factors, they face challenges identifying and obtaining available climate change information best suited for their projects.[53] Further, in that report, we also found that, even when information is available, it may not be in the actionable, practical form needed for decision makers to use in planning and designing infrastructure. In this review, officials and staff we interviewed from CEQ, OMB, USGCRP, and three of the five key agencies told us that not having reliable, forward-looking data based on, for example, predictions or forecasting, poses a challenge to identifying climate-related risks to supply chains. For instance, DHS officials we interviewed said that a common practice for managing risks is to consider historical data, not future projections. They said this poses a challenge with adaptation planning when, for instance, there is a lot of uncertainty around sea level rise and engineers plan long-term projects using historical data. USGCRP officials and staff told us that no standard climate projections exist because (1) a range of future climate scenarios is typically assessed given the long time frames that need to be considered and (2) associated impact and risk assessments from those scenarios are currently drawn from a number of different climate models.[54]

Varying Degrees of Expertise and Skills

According to our interviews with officials and staff from CEQ, USGCRP, and GSA, agencies have identified climate-related risks to their supply chains to varying degrees due, in part, to differences across agencies in the sophistication of internal expertise and skills. For example, CEQ

[53]GAO-13-242.

[54]According to GSA and NASA officials we interviewed, the U.S. Climate Resilience Toolkit is an example of a resource that could help agencies access certain climate projection information. According to the U.S. Climate Resilience Toolkit's website, this resource provides scientific tools, information, and expertise to help people manage their climate-related risks and opportunities, and improve their resilience to extreme events. Version 1.0 of the U.S. Climate Resilience Toolkit was developed in 2014 by a partnership of federal agencies and organizations led by the National Oceanic and Atmospheric Administration. See https://toolkit.climate.gov.

officials told us that the National Oceanic and Atmospheric Administration (NOAA) and NASA have staff scientists who could provide weather projections to help NOAA and NASA make progress identifying climate-related risks, but GSA officials told us that agencies without particular skills such as these might need to contract out such expertise. In addition, officials from GSA told us that, while the agency could determine that its telecommunication and data centers are critical components of its supply chains, the agency did not have the technical expertise to identify the climate-related risks to the complex services provided through these supply chain components. DHS officials said that they rely on the expertise of other agencies or resources, such as NOAA and USGCRP, for the science involved in identifying climate-related risks to supply chains because DHS does not have the relevant scientific expertise.

Limited Information about Critical Supplies and Locations of Supply Chains

Officials we interviewed from four of the five key agencies said mapping their supply chains is a complex and expensive process that may compete with other agency priorities. In addition, several agency officials and staff we interviewed said it is too early in the planning process for agencies to conduct this type of effort. Specifically, officials from GSA and NASA said agencies generally only have direct contractual relationships with the primary tier of their supply chains and, therefore, have limited direct insight and influence regarding subcontractors at secondary or tertiary tiers, including any climate-related risks to them. Moreover, officials from GSA said supply chains are increasingly global and complex, with parts sourced, and systems accessed from around the world. According to these officials, this makes climate-related risks difficult to identify because they differ by location and can be very localized.

At this early stage of federal adaptation planning, several agency officials we interviewed said they believe that agencies should focus on identifying climate-related risks to their critical supply chains. According to officials we interviewed, and several agency responses to our survey, while critical supply chains are generally unique to each agency, most agencies' critical supply chains depend on certain components, such as telecommunications, fuel supplies, and electricity, which could serve as a starting point for agencies to identify climate-related risks to their supply chains. According to GSA officials, information about the mission-critical products and services customer agencies purchase through GSA would help GSA prioritize climate risk management activities with its suppliers. These officials told us that they have asked customer agencies to provide this information and that, to date, few have done so, but they are continuing to pursue this information.

Few Selected Agencies Have Identified and Implemented Actions to Manage Climate-Related Risks to Their Supply Chains and Face Several Challenges in Doing So

According to our analysis of agency adaptation plans and interviews with officials and staff from CEQ, USGCRP, and the five key agencies, few of the selected agencies have identified and implemented actions to manage climate-related risks to their supply chains, in part because, as discussed above, most agencies are in the early stages of identifying these risks. According to these officials and agency survey responses, agencies also face several challenges in identifying and implementing actions to manage these risks, such as planning timelines that do not align with budget cycles or processes, limited expertise, and limited visibility into critical suppliers.

Few Selected Agencies Have Identified Actions to Manage Climate-Related Risks to Their Supply Chains

Based on our analysis of agencies' 2014 adaptation plans, 4 of 24 selected agencies identified agency-specific actions to manage climate-related risks to their supply chains. For instance, one agency's adaptation plan identified its intent to partner with its acquisition workforce to consider whether climate change will affect its ability to procure critical materials and to revise procurement procedures (e.g., through diversifying its supply chains), as necessary. CEQ and GSA officials told us that many agencies have not yet identified or implemented actions because they are at the very early stages of identifying the climate-related risks to their supply chains and, as discussed above, identifying risks is the first step in risk management. According to our analysis of agencies' 2014 adaptation plans, of the 20 agencies that did not identify agency-specific actions to manage climate-related risks to their supply chains, 12 had not yet identified such risks.

Officials from four of the five key agencies told us that, although they are in the early stages of planning, they have taken certain limited steps to identify actions to manage climate-related risks to their supply chains. For example, GSA officials told us that a 2014 study the agency commissioned identified several actions agencies could take to manage climate-related risks to telecommunications and data centers, which GSA had previously determined were critical components of agency supply

chains.[55] GSA officials stated that they plan to share the results of this study with GSA acquisition staff, their customer agencies, and federal climate change working groups, so that more agencies can take actions to better manage these risks. In addition, USPS officials told us that, in 2014, the agency conducted a pilot project to evaluate increased climate-related risk to facilities in its internal supply chain in 2 USPS districts and plans to use the results of this pilot to develop an approach across all 67 districts. According to USPS officials, the agency has conducted risk assessment and planning for continuity of operations and demonstrated the effectiveness of these plans through actual climate-related events. USPS officials stated that the agency's efforts allow it to quickly restore distribution, transportation, and delivery capability.

Selected Agencies Face Several Challenges in Identifying and Implementing Actions to Manage Climate-Related Risks to Their Supply Chains

According to our survey results and interviews with officials and staff from CEQ, USGCRP, and the five key agencies, selected agencies that have attempted to identify or have already identified climate-related risks to their supply chains cited several challenges in identifying and implementing actions to manage those risks. Specifically:

- **Planning timelines that do not align with budget cycles or processes**. Officials we interviewed from three of the five key agencies identified the annual budget cycle as a challenge to identifying and implementing actions to manage climate-related supply chain risks that may not be seen for a number of years.[56] For example, GSA officials said that it is difficult to secure funding to build resilience to climate-related impacts when these impacts are expected to take more than 20 years to emerge, yet the federal budget process is on a 1-year cycle. In addition, DOD officials told us that, although military construction can be a long-term project, consideration of the long-term effects of climate-related risks may not align with the 2- or

[55]Riverside Technology, Inc. and Acclimatise. *Climate Risks Study for Telecommunications and Data Center Services* (2014).

[56]USPS, an independent establishment of the executive branch, is intended to be a financially self-sustaining entity that covers its expenses almost entirely through postal revenues. *See* 39 U.S.C. §§ 201, 2003. *See also*, *Payments on Unfunded Liability by the U.S. Postal Service to Civil Service Retirement Fund: Hearing Before the Committee on Post Office and Civil Service, United States Senate, on H.R. 29*, 93rd Cong. 1 (1974) (statement by Post Office and Civil Service Committee Chairman Gale McGee).

3-year time frames of DOD decision makers.[57] This is consistent with our February 2015 update to our high risk list and July 2014 testimony, in which we found that the federal budget generally does not account for the long-term impacts of climate change on existing federal infrastructure and programs.[58]

- **Limited expertise**. Officials from four of the five key agencies told us that they did not have the internal expertise to identify and implement actions to manage climate-related risks to their supply chains and would need to rely on staff from other agencies or contractors. For example, GSA officials said that they do not have actuaries who could provide quantifiable justification to allow GSA to invest in resilience efforts. According to these officials, climate-related risks need to be examined through their budget impacts, and this is currently not being done. This is a challenge for GSA because, according to these officials, the development of the necessary accounting standards and insurance or valuation methods are not part of GSA's core mission, and GSA does not have the expertise to conduct this type of analysis. Another agency indicated in its survey response that it relies on the expertise of other agencies to identify actions required to manage climate-related risks and that to add this expertise internally would be a fundamental change that would likely require significant additional resources. Similarly, DHS officials told us that it is challenging for the agency to understand climate-related risks because DHS is not a science agency. They stated that many agency staff are not yet familiar with the specific challenges climate change may present to

[57]In May 2014, we found that, according to DOD officials at selected DOD installations, they generally had not proposed projects to address potential climate change impacts or vulnerabilities because they believed that adaptation projects would not compete well in the military services' processes for approving and funding potential projects. These processes—often called "scoring" processes—generally consist of the following elements: they assign numerical values—or "points"—to certain project characteristics; potential projects' relative scores are used to rank the projects; and senior decision makers at the military services' headquarters review the rank-order list, selecting projects based on service priorities. In addition, even if a potential adaptation project is included in an installation's master plan, the projects must still be approved by the military-service headquarters, before being approved by the Office of the Secretary of Defense, OMB, and ultimately, by Congress. *See* GAO, *Climate Change Adaptation: DOD Can Improve Infrastructure Planning and Processes to Better Account for Potential Impacts*, GAO-14-446 (Washington, D.C.: May 30, 2014).

[58]GAO-15-290 and GAO, *Budget Issues: Opportunities to Reduce Federal Fiscal Exposures Through Greater Resilience to Climate Change and Extreme Weather*, GAO-14-504T (Washington, D.C.: July 29, 2014).

the agency's operations and mission. As a provider of professional services to the federal government, GSA has recognized that other federal agencies without climate change expertise may need contractor assistance in developing and implementing adaptation plans. According to GSA officials, the agency has taken steps to incorporate this type of expertise in its Multiple Awards Schedule Program.[59] For example, in September 2013, GSA issued a request for information to assess the marketplace for services to support federal climate change adaptation activities.[60]

- **Limited visibility into critical suppliers**. According to interviews with officials from GSA and NASA, and narrative comments from several agencies responding to our survey, agencies have limited visibility into their suppliers. This is consistent with our October 2010 report, in which we found that government visibility into subcontracts for major weapon systems is generally limited.[61] Among other things, we found that, while primary contractors have significant visibility into and control of their first-tier subcontractors, they acknowledged the challenges of managing sub-tier suppliers across highly complex supply chains. We recommended that DOD develop additional guidance for contracting officers on implementing acquisition provisions aimed at gaining insight into subcontractor performance. DOD concurred with our recommendation and, in October 2011, issued additional guidance on implementing such provisions. Limited visibility into its suppliers could hinder an agency's ability to identify all of its climate-related risks and, consequently, its ability to determine actions to manage these risks. For example, NASA officials told us that the agency's programs only have direct contractual relationships with the primary contractors in their supply chains, many of which they said overlap with other federal agencies; therefore, they have limited direct insight and influence regarding subcontractors that are components of NASA's complete supply chains. Officials from GSA

[59]GSA's Multiple Awards Schedule Program consists of contracting vehicles that establish long-term governmentwide contracts with commercial companies to provide access to commercial products and services at volume discount pricing.

[60]A request for information is generally used to ask for information about the capabilities of various suppliers to address a problem or an issue. It is primarily used to gather information to help make decisions.

[61]GAO, *Defense Acquisitions: Additional Guidance Needed to Improve Visibility into the Structure and Management of Major Weapon System Subcontracts,* GAO-11-61R (Washington, D.C.: Oct. 28, 2010).

and NASA said clauses in future procurement contracts could help agencies manage risks in their supply chain by, for example, requiring vendors to complete climate-related risk management plans. Officials from both agencies said such clauses could help individual agencies gain enough visibility to manage the impact of climate-related risks to their vendors' supply chains and, thus, could improve the management of these risks across the government.

Ten of the 24 agencies responding to our survey indicated that additional guidance or tools to help agencies define critical supply chains and identify associated climate-related risks could help agencies identify and implement actions to manage climate-related risks to their supply chains. In addition, in narrative comments, agencies responding to our survey mentioned other support, guidance, or tools, such as recommended climate scenarios and easy-to-use tools that identify regional and local supply chain systems at risk, would help.

In its survey response, one agency commented that interagency coordination is likely needed to develop a more systematic and consistent approach for understanding and managing climate-related supply chain risks and suggested that CEQ form a working group to improve coordination. Executive Order 13653 directs the Council on Climate Preparedness and Resilience to develop and coordinate interagency efforts on priority federal government actions related to climate preparedness and resilience, and provides for the council co-chairs and a steering committee to establish working groups, as needed. However, according to CEQ officials, while the council has several working groups, it does not have a working group specifically to develop information or support decision making regarding federal supply chains. More recently, Executive Order 13693 specifically directs the Chair of CEQ to establish, as appropriate, temporary interagency working groups, including one for agency supply chain climate vulnerability.

Officials and staff we spoke with from USGCRP and three of the five key agencies also expressed an interest in forming a working group to share knowledge on climate-related risks to supply chains. For example, a NASA official told us that officials from DOD, GSA, NASA, and the Environmental Protection Agency met twice to discuss whether to establish a working group focused on federal supply chains. However, GSA officials stated that participation in this working group had been limited. A USGCRP staff member told us that such a working group could be a good idea because, even though there is a lot of climate-related information available, the information is not focused on supply chains,

and agencies have expressed an interest and have identified a need for additional information and expertise. For example, in one survey response, an agency commented that several of its sites are collocated with another agency's sites, so the two agencies could share many of the same risks to their supply chains. Therefore, similar risk mitigation strategies could help both agencies. This is consistent with one of the practices we found in October 2005 that can help enhance and sustain collaboration among federal agencies.[62] We found that, by assessing their relative strengths and limitations, collaborating agencies can look for opportunities to address resource needs by leveraging one another's resources, thus obtaining additional benefits that would not be available if they were working separately. In addition, as we concluded in the February 2015 update to our high risk list, the federal government would be better positioned to respond to the risks posed by climate change if federal efforts were more coordinated and were directed toward common goals.[63]

CEQ officials said they agree that a working group could be useful and that they plan to convene one, but that they are busy implementing other aspects of Executive Order 13693 that are higher priorities due to imminent deadlines and have no planned date for when they will convene one. CEQ officials later stated that they have recently begun discussions with federal partners about related work that is taking place in order to determine how best to proceed. *Standards for Internal Control in the Federal Government* state that agencies are to assess the risks they face from both external and internal sources and that, because operating and other conditions continually change, mechanisms should be provided to identify and deal with any special risks prompted by such changes.[64] Developing a plan describing when CEQ will convene an interagency working group to provide recommendations on agency supply chain climate vulnerability could be an important step toward providing a

[62]GAO, *Results-Oriented Government: Practices That Can Help Enhance and Sustain Collaboration among Federal Agencies,* GAO-06-15 (Washington, D.C.: Oct. 21, 2005).

[63]GAO-15-290.

[64]GAO/AIMD-00-21.3.1. In addition to federal standards for internal control, OMB instructions on internal control state that management should identify internal and external risks that may prevent the organization from meeting its objectives and that identified risks should then be analyzed for their potential effect or impact on the agency. *See* OMB, Circular A-123, *Management's Responsibility for Internal Control*.

mechanism that could help agencies systematically share information and experiences as they update their adaptation plans. It could also help them begin addressing the challenges they have identified.

The Federal Government's Fiscal Exposure to Climate-Related Disruptions in Supply Chains Is Unknown, and Agencies Face Challenges Identifying Their Exposure

According to our literature review and interviews with officials from key agencies and coordinating entities, the federal government's overall fiscal exposure to climate-related disruptions in supply chains is unknown. Based on our analysis of the 24 selected agencies' 2014 adaptation plans and agency survey responses, this is largely because these agencies have not identified their fiscal exposure. In addition, according to interviews with officials from key agencies and agency survey responses, agencies face challenges in identifying their fiscal exposure to climate-related disruptions in their supply chains.

The Federal Government's Fiscal Exposure to Climate-Related Disruptions in Supply Chains Is Unknown

The federal government's fiscal exposure to climate-related disruptions in federal supply chains is unknown, in large part, because many agencies have not yet identified this exposure. In January 2003, we began using the term "fiscal exposure" to provide a conceptual framework for considering the wide range of responsibilities, programs, and activities that may explicitly or implicitly expose the federal government to future spending.[65] The aim is not to provide strict definitional guidelines, but rather to improve understanding of the exposures associated with certain activities. By extending beyond conventional accounting and fiscal analysis, the concept of fiscal exposure is meant to provide a broad perspective on long-term costs and uncertainties—which is particularly relevant for considering climate-related risks and future costs.

According to our literature review and interviews with officials from key agencies and coordinating entities, there is no information on the federal government's overall potential fiscal exposure to climate-related

[65]GAO, *Fiscal Exposures: Improving the Budgetary Focus on Long-Term Costs and Uncertainties*, GAO-03-213 (Washington, D.C.: Jan. 24, 2003).

disruptions in federal supply chains. In addition, according to our analysis of the most recent adaptation plans for the 24 selected agencies, one plan includes a general discussion of budget or other resource needs for implementing agency-specific actions to manage climate-related risks to supply chains. Moreover, according to our analysis, none of the plans identifies the fiscal exposure agencies may face from potential disruptions to their supply chains.

None of the recent executive orders regarding climate change directs agencies to identify such fiscal exposures. Executive Order 13693 directs agencies—as part of the development of agencies' Strategic Sustainability Performance Plans and consistent with Executive Order 13653's directive to develop adaptation plans—to calculate the potential cost and risk to mission associated with agency operations that do not take into account information on projected impacts of climate change in operational preparedness planning and consider that cost in agency decision making.

Of the 24 agencies surveyed, 4 agencies indicated that they have tried to identify their fiscal exposure to any potential climate-related disruptions to their supply chains. In doing so, 3 of these agencies were able to identify a small number of qualitative examples of exposure, such as greater fire suppression costs due to increases in the size and severity of wildfires, but they did not include estimated dollar values of any associated fiscal exposure. As we found in the February 2015 update to our high risk list, it is unclear how the various agency adaptation planning efforts relate to each other or what they amount to as a governmentwide approach for reducing federal fiscal exposures.[66]

Selected Agencies Face Challenges in Identifying Their Fiscal Exposure to Climate-Related Disruptions in Their Supply Chains

In their survey responses, 7 of the 24 agencies commented that they did not try or were unable to identify their fiscal exposure because of the challenges discussed above in identifying climate-related risks to supply chains and actions to manage them—particularly limited information about climate-related risks to their supply chains and actions to manage these risks. For example, several survey respondents commented that their agencies have not completed risk assessments to provide information necessary for determining fiscal exposure. In addition, NASA

[66]GAO-15-290.

officials we interviewed told us that they are in the early stages of thinking about how to estimate the agency's fiscal exposure, and that, to make progress, they would need to identify actions to manage these risks before quantifying this exposure.

Further, in other comments to the survey, 8 of 24 agencies described facing additional challenges in their efforts to identify their fiscal exposure to any potential climate-related disruptions to their supply chains, including limited information about climate-related events, a lack of risk assessments for quantifying fiscal exposure, and a lack of a standardized framework or process.[67] Several of these agencies cited the lack of a process for determining the advantages of costs avoided by investing in adaptation efforts to manage potential climate-related disruptions to their supply chains.[68] In addition, DHS, GSA, and NASA officials told us that the annual budget process does not generally include a standardized framework, including ways to determine the advantages of cost-avoidance, for funding activities across the long-term time horizons necessary for implementing most adaptation efforts. According to these officials, if funds are not spent at the end of the fiscal year, then budgets may be reduced the next fiscal year. Further, officials from key agencies told us that they believe managing these risks should be incorporated into agencies' overall budget processes. According to USPS officials, potential adaptation and other costs for facility and infrastructure investments include installing cables for alternate power, revisions to building design

[67]In their survey responses, 7 of the 24 agencies indicated that they have faced challenges in their efforts to identify their fiscal exposure to any potential climate-related disruptions to their supply chains. These agencies include the 4 agencies that tried to identify such exposure. In addition to these 7 agencies, several other agencies described challenges in their narrative responses to other questions in the fiscal exposure section of the survey. Of the 20 agencies indicating that they have not tried to identify their fiscal exposure, 9 indicated that they did not know or were not sure regarding challenges they have faced, and 8 agencies indicated that they have not faced challenges.

[68]Executive Order 13693 directs agencies—as part of the development of their Strategic Sustainability Performance Plans and consistent with Executive Order 13653's directive to develop adaptation plans—to identify and address projected impacts of climate change on mission critical water, energy, communication, and transportation demands and consider those climate impacts in operational preparedness planning for major agency facilities and operations. Further, the executive order directs agencies to calculate the potential cost and risk to mission associated with agency operations that do not take into account this information and consider that cost in agency decision making. *See* Exec. Order No. 13693, § 13, 80 Fed. Reg. 15871, 15880 (Mar. 25, 2015).

standards, facility leasing and closures, and network technology to support remote locations.

Similarly, according to our interviews with officials from several key agencies, agencies can face challenges breaking out specific costs for climate-related disruptions when preparing their budgets because they do not typically budget for activities associated with responding to specific types of climate-related events, such as hurricanes or floods.[69] For example, USPS officials stated that they track costs for certain mitigating activities, such as mobile fuel purchases, for "extraordinary" events, such as Superstorm Sandy or Hurricane Katrina, with significant disruptions over a long period. However, according to these officials, determining what constitutes an extraordinary event is a judgment call because there is no guidance on classifying budget activities for weather-related events. DOD officials told us that the agency opened limited budget codes for Superstorm Sandy, but that it does not examine the fiscal impacts of climate-related risks.[70] In addition, according to DHS officials, financial considerations of disruptions are part of the agency's planning efforts, but climate-related risks do not have a budget line item.

OMB provides guidance on preparing budgets; however, OMB staff told us this guidance does not include directions for assessing agency supply chains, including the fiscal exposure of these supply chains to climate-related disruptions. OMB staff also stated that they do not focus on supply chain disruptions in their review of agency adaptation plans. Nonetheless, over the past year, the Director of OMB has stated publicly that OMB should focus on ensuring that agency budgets fully reflect the costs of a changing climate. In January 2003, we recommended that OMB should report annually on fiscal exposures, including a concise list and description of such exposures, cost estimates, where possible, and an assessment of methodologies and data used to produce cost estimates

[69]In 2015, the Congressional Research Service analyzed agency adaptation plans and found that costs for federal adaptation efforts may be difficult to estimate or identify in agency budget requests because they may be incremental to and obscured within existing program efforts. *See* Congressional Research Service, *Climate Change Adaptation by Federal Agencies*.

[70]Agencies can use budget codes to track funding, such as obligations and expenditures related to a designated purpose. *See* GAO, *Climate Change: State Should Further Improve Its Reporting on Financial Support to Developing Countries to Meet Future Requirements and Guidelines,* GAO-13-829 (Washington, D.C.: Sept. 19, 2013).

for such exposures.[71] We further recommended that OMB should ensure that agencies focus on improving cost estimates for fiscal exposures, though the recommendation has not yet been implemented. In oral comments on our January 2003 report, OMB staff agreed that our concept of fiscal exposure is a valuable one, noting that it focuses attention on the fact that 1-year's surplus or deficit is not the only, or even the best, measure of the government's fiscal condition. OMB staff also stated that a number of the ideas and recommendations in the report are very good and point to improvements that should be made in the budget. However, OMB staff stated, among other things, that the analysis of recommendations should more explicitly consider their effects on the main purposes of budgeting to allocate resources, control agency spending, and set aggregate fiscal policy. In our response to OMB's comments, we agreed that the various purposes of the budget should be considered in assessing the merits of approaches and options for improving the budget treatment of fiscal exposures and stated that we did, in fact, structure our discussion around objectives of budget reforms. Also, we agreed that these issues warrant further investigation if specific reforms are pursued. We continue to believe this recommendation has merit and should be implemented.

In October 2013, we found that fiscal exposure for catastrophic weather-related events is difficult to estimate due to uncertainty over whether the events will occur, when they will occur, and their severity.[72] We also found that all estimates of future spending introduce some degree of uncertainty and that the ease of implementation differs based on several factors, such as whether estimation measures are new concepts that may involve developing new technical skills. We concluded that, even with implementation challenges, approximate estimates of the full cost to government may be preferable to, for instance, current measures that are incomplete. While we made no new recommendations in October 2013, we stated that we continue to support many past recommendations to improve budget recognition of fiscal exposures, both to increase the attention given to them and also to allow for more comparable cost information for decision makers to consider when determining the best way to achieve various policy goals or to design a program.

[71]GAO-03-213.

[72]GAO, *Fiscal Exposures: Improving Cost Recognition in the Federal Budget*, GAO-14-28 (Washington, D.C.: Oct. 29, 2013).

Of the 24 agencies surveyed, 12 identified additional support, guidance, or tools that could assist them in efforts to identify their fiscal exposure to climate-related disruptions in their supply chains. In particular, many of these agencies cited a need for guidance with directions for assessing agency supply chains to determine fiscal exposure. GSA officials told us that it is important to include directions in OMB budget guidance for assessing the fiscal exposure of climate-related risks to supply chains; otherwise, agencies face challenges prioritizing these risks over other expectations in the guidance. Several survey respondents also cited a need for opportunities to develop and share common information across agencies, and 3 agencies cited a need for technical assistance assessing risks. GSA's 2014 adaptation plan states that the federal government needs information on how to monetize costs avoided by investing up front in risk management because such information is critical to measure the long-term benefits of adaptation efforts. GSA's plan states further that agencies need an open-source risk model and approach to monetizing the cost and payoff of risk management.

As we concluded in the February 2015 update to our high risk list, the impacts of climate change risks will result in increased fiscal exposure for the federal government in many areas.[73] For example, according to NASA's 2012 adaptation plan, supply chain risks are a particular concern to the agency because 80 to 90 percent of NASA's budget is spent on acquisitions. In addition, DOD officials stated that thawing sea ice in the Arctic is opening shipping channels that will likely cause the Navy to incur additional costs for creating new supply chains for fueling its ships in that region,[74] which has historically been unnavigable.[75] According to GSA documents, GSA and its customer agencies have experienced a variety

[73]GAO-15-290.

[74]In July 2015, DOD reported that, regarding the integration of climate-related risk management into planning processes, acquisition and supply chain requirements for the Arctic are considerably longer and much more costly than other areas of responsibility for the North American Aerospace Defense Command/U.S. Northern Command. See DOD, *National Security Implications of Climate-Related Risks and a Changing Climate* (July 23, 2015).

[75]In June 2015, we found that DOD is in the process of updating its regional plans for the Arctic and is conducting analysis to determine future capability needs. *See* GAO, *Arctic Planning: DOD Expects to Play a Supporting Role to Other Federal Agencies and Has Efforts Under Way to Address Capability Needs and Update Plans*, GAO-15-566 (Washington, D.C.: June 19, 2015).

of climate-related impacts, such as extreme weather, that could disrupt some of the more than 11 million commercial products and services totaling more than $54 billion in annual sales that GSA procures for the federal government. GSA's 2014 adaptation plan states that the agency's vulnerabilities—including to fluctuations in demand exceeding its suppliers' ability to deliver in a timely manner and supply chain disruptions in manufacturing, transportation, or other capacities—could be increased substantially by climate-related events and, thus, have cascading impacts on GSA's customers, which include most federal agencies. Further, a 2014 study commissioned by GSA found that climate change poses a significant risk—including global risks to supply chains—to the telecommunications and data center services sectors, which represent $20 billion in potential sales to federal agencies through GSA service contracts.[76] According to this study, these sectors provide mission critical services to federal agencies and serve as the backbone for much of the work that is executed in today's technology dependent workplace.

Standards for Internal Control in the Federal Government state that agencies are to assess the risks they face from both external and internal sources,[77] and an improved understanding of their fiscal exposure to climate-related disruptions in supply chains could help agencies more fully assess the potential costs or resources needed to manage these risks.[78] Further, Executive Order 13653 calls for agencies' adaptation plans to describe how the agency will consider the need to improve climate adaption and resilience, including the costs and benefits of such improvement, with respect to supply chains, among other things. In the February 2013 update to our high risk list,[79] we found that while implementing adaptive measures may be costly, there is a growing recognition that the cost of inaction could be greater and—given the

[76]Riverside Technology, Inc. and Acclimatise. *Climate Risks Study for Telecommunications and Data Center Services* (2014).

[77]GAO/AIMD-00-21.3.1.

[78]In October 2013, we found that expanding the availability and use of supplemental information, including measures that can signal significant changes in the magnitude of fiscal exposure, would be an important first step to enhancing oversight over federal resources and can aid in monitoring the financial condition of programs over the longer term. Incorporating measures of the full cost into primary budget data would provide enhanced control over future spending, which can help both improve the nation's fiscal condition and enhance budgetary flexibility. *See* GAO-14-28.

[79]GAO-13-283.

government's precarious fiscal position—increasingly difficult to manage given expected budget pressures, which will constrain not just future ad hoc responses but other federal programs as well.[80] An interagency working group on agency supply chain climate vulnerability could help agencies begin working together to address challenges they face identifying this fiscal exposure.

Conclusions

Supply chain disruptions due to weather-related events, such as Superstorm Sandy and the 2011 floods in Thailand, have resulted in billions of dollars in economic damages. Because such events are expected to increase in frequency and severity, they could increase the vulnerability of the supply chains that the federal government relies on to provide billions of dollars in goods and services. Many agencies have begun taking steps to plan for these risks to their supply chains and, since late 2013, the administration has issued executive orders and guidance aimed at helping agencies identify these risks and possible solutions to manage them. Since most agencies are at the early stages of planning, clearer guidance from CEQ could help agencies understand how to identify and assess climate-related risks to their supply chains to include in future updates to their adaptation plans.

Because the extent to which agencies have identified climate-related risks to their supply chains varies, agencies do not have a complete understanding of the risks they face. Without knowing about their potential risks, agencies are not well-positioned to identify and implement actions to manage these risks, which could compromise their missions and stretch limited resources. Further, because this information is limited, Congress and other decision makers do not have the information to understand the magnitude of the government's potential fiscal exposure to climate-related disruptions to federal supply chains and, thus, cannot accurately gauge trade-offs between adaptive measures and inaction.

As we have found, the federal government would be better positioned to respond to climate-related risks if federal efforts were more coordinated and were directed toward common goals. Executive Order 13693 directs the Chair of CEQ to establish, as appropriate, temporary interagency

[80]Regarding fiscal exposure, in October 2013, we found that the budget provided incomplete information or potentially misleading signals about the full cost of the commitments made today. *See* GAO-14-28.

working groups to provide recommendations on, among other things, agency supply chain climate vulnerability, but CEQ officials have no planned date for when they will convene one. By developing a plan describing when it will do so, CEQ could take an important step toward providing agencies an opportunity to systematically share information about and experiences with climate-related supply chain risks as they prepare their next adaptation plans.

Recommendations for Executive Action

To help agencies manage climate-related risks to their supply chains, we recommend that the Chair of CEQ take the following two actions:

- Clarify the guidance for Executive Order 13653 to better assist agencies in including information on climate-related risks to their supply chains in their adaptation plans.
- Develop a plan describing when CEQ will convene an interagency working group to provide recommendations on, among other things, agency supply chain climate vulnerability to assist agencies as they are preparing their next adaptation plans.

Agency Comments

We provided a draft of this report for review and comment to CEQ, DOD, DHS, GSA, NASA, OMB, USGCRP, and USPS. In oral comments provided on September 25, 2015, senior officials and staff speaking on behalf of CEQ, OMB, and USGCRP confirmed that their agencies agreed with the report findings and recommendations. CEQ officials stated that convening a working group on supply chain climate vulnerability is a priority for CEQ and that CEQ is in the process of working with other agencies to determine options for doing so.

In a follow-up e-mail received on September 25, 2015, CEQ's acting Chief Sustainability Officer stated that CEQ is aware of ongoing efforts to examine potential supply chain impacts from climate in more than one federal agency that may overlap with an effort to stand up a new working group and is facilitating discussions to determine what the scope of ongoing efforts is and how to best proceed to leverage existing efforts. The e-mail further stated that, over the past 2 months, CEQ has been working with several agencies, including DOD and GSA, to develop options for convening a working group on supply chain climate vulnerability and that their goal is to produce an options paper in late fall of 2015. USGCRP officials stated that it is important for the report to emphasize that the long time horizons associated with climate change,

alongside the difficulty in identifying regional and local climate-related impacts, make it challenging for any entity, not just federal agencies, to identify climate-related risks to their supply chains.

Only USPS provided written comments, which are reproduced in appendix III. In its written comments, USPS stated that it is in general agreement with the report and its findings and provided two technical corrections, on which it stated it believed agreement had been reached. However, USPS also stated that it had a general concern that the report does not appear to reflect the risk assessment and planning for continuity of operations that had already taken place at USPS. We added a statement to the report acknowledging that, according to USPS, the agency has conducted risk assessment and planning for continuity of operations and demonstrated the effectiveness of these plans through actual climate-related events.

In e-mails received on September 21, 2015, from DOD and NASA, and on September 25, 2015, from DHS, the respective liaisons stated that their agencies did not have any comments on the draft report. GSA provided technical comments only, and CEQ, OMB, and USGCRP also provided technical comments, which we incorporated into the report, as appropriate.

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 to the appropriate congressional committees, the Chair of CEQ, the Secretaries of Defense and Homeland Security, the Administrators of GSA and NASA, the Director of OMB, the Executive Director of USGCRP, the Postmaster General, and other interested parties. In addition, the report will be 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

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

Sincerely yours,

J. Alfredo Gómez
Director, Natural Resources and Environment

Appendix I: Objectives, Scope, and Methodology

In this report, we (1) evaluate the extent to which selected agencies have identified climate-related risks, if any, to their critical supply chains and challenges, if any, that they face in doing so; (2) evaluate the extent to which these agencies have identified and implemented actions to manage climate-related risks to their critical supply chains and challenges, if any, that they face in doing so; and (3) describe what is known about the federal government's fiscal exposure to climate-related disruptions in federal supply chains and challenges, if any, agencies face in identifying such exposure.

To evaluate the extent to which selected agencies have identified climate-related risks to their critical supply chains and identified and implemented actions to manage these risks, we analyzed climate change adaptation plans publicly released in February 2013 and October 2014 by 24 federal agencies.[1] We selected these 24 agencies because they were expected to receive an Office of Management and Budget (OMB) Sustainability and Energy Scorecard for fiscal year 2014 and, according to the Council on Environmental Quality's (CEQ) documents, are responsible for a significant portion of the federal government's spending on goods and services.[2] In particular, these agencies account for over 98 percent of the federal government's fiscal year 2014 contract obligations, according to federal procurement data.[3] To perform this analysis, two analysts separately reviewed each adaptation plan and then, based on this review,

[1]The 24 agencies are 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; Environmental Protection Agency; General Services Administration; National Archives and Records Administration; National Aeronautics and Space Administration; Office of Personnel Management; U.S. Postal Service; Smithsonian Institution; Tennessee Valley Authority; and the U.S. Army Corps of Engineers.

[2]OMB and CEQ use this annual scorecard process to assess key agencies' performance in achieving, among other things, federal energy and environmental goals. Because the fiscal year 2014 scorecards were not yet released at the time of our review, we selected the 24 agencies that, according to CEQ officials and documents, were expected to receive scorecards for fiscal year 2014. Based on this information, we did not include the Social Security Administration, which went on to receive a 2014 scorecard. CEQ's instructions clarify that the U.S. Postal Service voluntarily receives a scorecard. *See* CEQ, *Implementing Instructions for Executive Order 13693 Planning for Federal Sustainability in the Next Decade* (Washington, D.C.: June 10, 2015).

[3]Federal Procurement Data System - Next Generation database, accessed August 31, 2015.

categorized the extent to which the plans include information on supply chain climate-related risks according to the following scale:

- Not at all (i.e., the plan does not include climate-related risks to the agency's supply chains);
- To a little extent (i.e., the plan acknowledges general climate-related risks to the agency's supply chains but does not identify agency-specific risks);
- To some extent (i.e., the plan identifies potential agency-specific climate-related risks to the agency's supply chains, but does not propose actions or only proposes broad concepts or strategies);
- To a moderate extent (i.e., the plan identifies potential agency-specific climate-related risks to the agency's supply chains and proposes targeted or systematic, agency-specific actions); or
- To a great extent (i.e., the plan proposes a long-term plan, including a general discussion of budget or other resource needs, for implementing agency-specific actions to address climate-related risks to the agency's supply chains; the plan does not necessarily acknowledge or estimate the cost of actual actions taken, if any).

The analysts then compared and discussed results to resolve any differences in their categorization.

To address each of our objectives, we obtained information from a survey we emailed to the Senior Sustainability Officers (SSO) at the 24 selected agencies.[4] In our survey, we collected information on, among other things, agency efforts to (1) identify climate-related risks to agency supply chains, (2) develop climate change adaptation plans, (3) identify and estimate fiscal exposure due to climate-related risks to supply chains, and (4) coordinate with other agencies to support adaptation regarding supply chains. Before we e-mailed the survey to SSOs, we revised the survey to reflect comments from an independent reviewer within GAO. We revised the survey again after we further pretested it in person and over the

[4]Executive Order 13514 directed agencies to designate, within 30 days of the date of the executive order, a Senior Sustainability Officer to be accountable for agency conformance with the executive order, including preparing and implementing a multiyear Strategic Sustainability Performance Plan and updating and submitting this plan annually to OMB and CEQ for review. In March 2015, Executive Order 13693 revoked Executive Order 13514 and directed agencies to designate, within 45 days of the date of the executive order, an agency Chief Sustainability Officer and made the agency head responsible for developing, implementing, and updating the Strategic Sustainability Performance Plan.

telephone with three SSOs from the study population. The survey used for this review is in appendix II. We e-mailed the survey in an attached Microsoft Word form that SSOs could return electronically after marking checkboxes or entering narrative responses into open answer boxes. In an e-mail or phone call in advance of distributing the survey, we asked relevant officials at the 24 selected agencies if we had the correct name of their current SSO, based on CEQ's most recent list of SSOs. Five officials indicated that someone else was serving as their agency's SSO, and we addressed further correspondence to those individuals. We e-mailed the survey on April 20, 2015. After the requested return date passed, we e-mailed or telephoned respondents who had not returned the survey and asked them to respond. All surveys were returned by May 28, 2015. Surveys were completed by SSOs or their designates from 24 selected agencies, for a response rate of 100 percent. Because this was not a sample survey, it has no sampling errors. However, the practical difficulties of conducting any survey may introduce nonsampling errors, such as difficulties in interpreting a particular question or sources of information available to respondents, which can introduce unwanted variability into the survey results. We took steps in developing the survey, collecting the data, and analyzing them to minimize such nonsampling error. Surveys may also be subject to error in entering, processing, and analyzing data. We verified the accuracy of a randomly-selected sample of keypunched records by comparing them with their corresponding surveys, and there were no errors found in the verified files. We noted any missing, irregular, or incorrect marks by the respondent and resolved these marks, as needed, through e-mail correspondence with the relevant agencies.

To address each of our objectives and gather information on specific examples of efforts to identify and manage climate-related risks to their supply chains, we identified the following 5 key agencies from the 24 selected agencies: Department of Defense, Department of Homeland Security, the General Services Administration, the National Aeronautics and Space Administration, and the U.S. Postal Service. We selected these 5 key agencies based on a range of different factors such as agency size, geographic dispersion of facilities and infrastructure, types of supply chains, and mission. We conducted semistructured interviews with officials from these 5 key agencies and, during these interviews, we asked officials about their (1) agency's critical supply chains, (2) adaptation planning efforts, (3) agency's fiscal exposure from climate-related risks to supply chains, and (4) views on interagency efforts to manage climate-related risks to federal supply chains. Because this is a nonprobability sample, our findings cannot be generalized to other

agencies but provided us with examples of the extent to which agencies identify and manage climate-related risks to their supply chains. We also interviewed officials and staff from the coordinating entities that review and approve agency adaptation plans—that is, CEQ and OMB, respectively—and one that provides science support to agencies—the U.S. Global Change Research Program—regarding their roles and agencies' adaptation planning efforts and challenges. In addition, in evaluating the extent to which the selected agencies have identified and implemented actions to manage climate-related risks to their supply chains, we compared agency efforts to relevant executive orders and related guidance[5] and compared the related guidance to federal standards for internal control.[6]

To describe what is known about the federal government's fiscal exposure to climate-related disruptions in federal supply chains, we conducted a literature review to determine what has been reported about the government's fiscal exposure to climate-related disruptions in federal supply chains. We interviewed officials from the five key agencies to obtain examples of fiscal exposure based on particular instances of supply chain disruptions and, through our survey results and interviews with officials and staff, identified challenges selected agencies and coordinating entities face in identifying such exposures.

We conducted this performance audit from October 2014 to October 2015 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]Exec. Order No. 13693, 80 Fed. Reg. 15,871 (Mar. 25, 2015); Exec. Order No. 13653, 78 Fed. Reg. 66,819 (Nov. 6, 2013); and Exec. Order No. 13514, 74 Fed. Reg. 52,117 (Oct. 8, 2009).

[6]GAO/AIMD-00-21.3.1.

Appendix II: Summary Results of GAO Survey of Senior Sustainability Officers

We distributed this survey to the 24 federal agencies that were expected to receive a Sustainability and Energy Scorecard from the Office of Management and Budget (OMB) for fiscal year 2014.[1] In this survey, we collected information on, among other things, agency efforts to (1) identify climate-related risks to agency supply chains, (2) develop climate change adaptation plans, (3) identify and estimate fiscal exposure due to climate-related risks to supply chains, and (4) coordinate with other agencies to support adaptation regarding supply chains. The following copy of the survey includes a summary of the agencies' survey responses. This summary includes the responses to questions that could be answered 'Yes,' 'No,' or 'Don't know/not sure,' as well as the number of instances of 'Missing data'—i.e., when a survey respondent did not provide a response to a question or provided a response that was inconsistent with the question (e.g., the respondent responded 'No' to a question but then responded to an "if Yes" follow-up to that question).

[1]The 24 agencies are 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; Environmental Protection Agency; General Services Administration; National Archives and Records Administration; National Aeronautics and Space Administration; Office of Personnel Management; U.S. Postal Service; Smithsonian Institution; Tennessee Valley Authority; and the U.S. Army Corps of Engineers. OMB and the Council on Environmental Quality (CEQ) use this annual scorecard process to assess key agencies' performance in achieving, among other things, federal energy and environmental goals. According to CEQ documents, the scorecard agencies are responsible for, among other things, a significant portion of the federal government's spending on goods and services. Because the fiscal year 2014 scorecards were not yet released at the time of our review, we selected the 24 agencies that, according to CEQ officials and documents, were expected to receive scorecards for fiscal year 2014. Based on this information, we did not include the Social Security Administration, which went on to receive a 2014 scorecard. CEQ's instructions clarify that the U.S. Postal Service voluntarily receives a scorecard. *See* CEQ, *Implementing Instructions for Executive Order 13693 Planning for Federal Sustainability in the Next Decade* (Washington, D.C.: June 10, 2015).

U.S. GOVERNMENT
ACCOUNTABILITY OFFICE

SURVEY OF SENIOR SUSTAINABILITY OFFICERS: CLIMATE-RELATED RISKS TO FEDERAL SUPPLY CHAINS

Project background & scope:

The U.S. Government Accountability Office (GAO) is examining the management of climate-related risks to federal supply chains (GAO job code 361603). We are undertaking this work at the request of Congressman Matt Cartwright, Committee on Oversight and Government Reform, U.S. House of Representatives. Through this work, we are pursuing the following three research objectives:

(1) What is known about the government's fiscal exposure to climate-related disruptions in federal supply chains?

(2) To what extent have key agencies identified climate-related risks, if any, to their critical supply chains, and what challenges, if any, do they face in doing so?

(3) To what extent have key agencies identified and implemented actions to manage these risks, and what challenges, if any, do they face in doing so?

This is a government-wide review to better understand federal agency adaptation efforts—including agency efforts to develop climate change adaptation plans, identify climate-related risks to agency supply chains, and incorporate such risks into these plans—and any challenges federal agencies may face in these efforts. We have discussed this work with the Council on Environmental Quality (CEQ), an applicable central entity responsible for reviewing agencies' climate change adaptation plans and coordinating government-wide efforts to address climate-related risks.

Purpose:

We are distributing this survey to the federal agencies, including your agency, that are expected to receive a Sustainability and Energy Scorecard from OMB for fiscal year 2014. **The purpose of this survey is to collect summary-level information that will allow us to address the research objectives above. Recognizing that agencies are in the early stages of identifying and managing climate-related risks to their supply chains, our primary goal in distributing this survey is to better understand the climate-related risks agencies may have considered when developing their adaptation plans, any challenges they may face in doing so, and possible opportunities to help agencies manage these challenges.** As such, a portion of the survey will request information about your agency's efforts to develop its climate change adaptation plan. We will follow-up with the Senior Sustainability Officer (SSO) or other pertinent agency official(s), if needed, to discuss and clarify any outstanding questions about your responses as they relate to the objectives stated above. We are also obtaining more in-depth information by conducting interviews with officials at five selected agencies: U.S. Department of Defense, U.S. Department of Homeland Security, General Services Administration, NASA, and the U.S. Postal Service.

1

Instructions:

The survey is divided into five sections and should be completed by your agency's SSO or designate. Please feel free to share this survey with other officials in your agency who are knowledgeable about the questions. The survey was designed such that you should not have to conduct significant research to answer questions—much of this information should be readily known by the SSO. If you are not sure about any of the answers, please respond with "don't know/not sure."

Please complete all questions and **submit the survey electronically no later than May 4, 2015**, two weeks from today.

1) Use your mouse to navigate by clicking on the field or check box you wish to answer.

2) To select a check box or button, click on the center of the box, and an 'X' will appear

3) To change or deselect a check box response, click on the center of the box, and the 'X' will disappear.

4) To answer a question that requires a comment, click on the answer box and begin typing. **The box will expand to accommodate your answer.**

Saving and Returning your Survey:

When you first open the survey, save it to your hard drive. Then add your responses to the file saved to your hard drive. You can save your responses and return to the survey later, if needed. When you are ready to return the survey, attach the file from your hard drive to an email, and email it to either contact listed below. If you would like to provide supporting documentation for any of your responses, please include it as an attachment in the email as well.

If you are unsure of how to respond to a question, please contact Michelle Wong at wongm@gao.gov or 415-904-2229 or Celia Mendive at mendivec@gao.gov or 202-512-3285 for assistance.

Thank you very much for your assistance.

2

Definitions:

For the purpose of this work, we are using the following defined terms. You may need to refer back to these definitions throughout the survey.

- **Adaptation (sometimes referred to as 'resilience' or 'preparedness')**: Adjustment in natural or human systems in anticipation of or response to a changing environment in a way that effectively uses beneficial opportunities or reduces negative effects.
- **Climate-related risks**: Vulnerabilities of natural and human systems, such as environmental and economic systems, due to changes in the earth's climate—including higher temperatures, changes in precipitation, rising sea levels, and increases in the severity and frequency of severe weather events.
- **Fiscal exposure**: Responsibilities, programs, and activities that may explicitly or implicitly expose the federal government to future spending.
- **Supply chains**: Any network of systems—such as transportation, communications, and infrastructure—used to provide raw materials, energy, and other resources to produce, acquire, and deliver federal goods to fulfill an agency's mission.

Background

For the questions that follow, we are interested in understanding whether climate-related events have disrupted your agency's supply chains.

1. **Has your agency taken steps to identify supply chains that it considers to be critical?** *(By 'supply chains,' we mean any network of systems—such as transportation, communications, and infrastructure—used to provide raw materials, energy, and other resources to produce, acquire, and deliver federal goods to fulfill an agency's mission..)*

Yes	**18**	→ **1a). If yes, how does your agency define its 'critical supply chains?'**
No	**3**	
Don't know/ not sure	**3**	
Missing data	**0**	**1b). If yes, using your agency's definition of critical supply chains in the response above, what supply chains does your agency consider to be critical?**

3

2. **Over the last 15 years, have any climate-related events disrupted any of your agency's supply chains?** *(By 'disrupted,' we mean any alterations to standard operations of your agency's supply chains–for example, diverting supplies through alternate locations or means—regardless of whether they affected your agency's mission.)*

Yes	16	→ **2a). If yes, can you briefly describe examples of these events and how they disrupted your agency's supply chains?**
No	2	
Don't know/ not sure	6	
Missing data	0	

Climate change adaptation planning efforts

Section 5(a)(iv) of Executive Order 13653 directs agencies to include in their adaptation plans a description of how the agency will consider the need to improve climate adaptation and resilience, including the costs and benefits of such improvement, with respect to agency suppliers and supply chain. For the questions that follow, we are interested in understanding the steps your agency has taken so far to carry out this directive and any challenges it may have faced in doing so.

3. **Has your agency taken any actions to carry out this directive?**

Yes	21	→ **3a). If yes, can you briefly describe these actions at a high level?**
No	2	**3b). If no, can you please explain why your agency has not taken actions?**
Don't know/ not sure	1	
Missing data	0	

4. **Other than the actions described in your agency's climate change adaptation plans, has your agency taken or does your agency plan to take any additional actions to identify climate-related risks to its supply chains?**

Yes	11	→ **If yes, can you please describe these additional actions and any related timelines for these actions?**
No	8	
Don't know/ not sure	5	
Missing data	0	

4

5. Does your agency have a mechanism (for example, a tool, process, or guidance) to manage risks to its supply chains?

Yes	**14**
No	**6**
Don't know /not sure	**4**
Missing data	**0**

5a). If yes, has your agency taken any steps to use this mechanism to manage climate-related risks to its supply chains as it would any other risks (for example, security) to the agency's supply chains?

Yes	**11**	→ **If yes, please explain:**
No	**1**	
Don't know /not sure	**2**	
Missing Data	**0**	

5b). If no, can you describe how the mechanism to manage climate-related risks to your agency's supply chains differs from how your agency manages other risks to its supply chains?

Additional comments:

5

Climate change adaptation planning challenges

*For questions 6 through 11, we are interested in learning more about any challenges your agency may face in its efforts to identify climate-related risks to its **critical** supply chains, identify actions to manage climate-related risks to its **critical** supply chains, and implement actions to manage climate-related risks to its **critical** supply chains.*

6. **Does your agency face any challenges in its efforts to identify climate-related risks to its *critical* supply chains?**

Yes	14	→ **If yes, can you please describe these challenges?**
No	4	
Don't know/ not sure	6	
Missing data	0	

7. **What additional support, guidance, or tools, if any, could help your agency identify climate-related risks to its *critical* supply chains?**

8. **Does your agency face any challenges in its efforts to identify actions to manage climate-related risks to its *critical* supply chains?**

Yes	11	→ **If yes, can you please describe these challenges?**
No	7	
Don't know/ not sure	6	
Missing data	0	

9. **What additional support, guidance, or tools, if any, could help your agency identify actions to manage climate-related risks to its *critical* supply chains?**

6

10. Does your agency face any challenges in its efforts to implement actions to manage climate-related risks to its *critical* supply chains?

Yes	**14**	→ **If yes, can you please describe these challenges?**
No	**3**	
Don't know/ not sure	**7**	
Missing data	**0**	

11. What additional support, guidance, or tools, if any, could help your agency implement actions to manage climate-related risks to its *critical* supply chains?

7

Fiscal exposure

For the questions that follow, we are interested in understanding your agency's efforts to identify and estimate its fiscal exposure due to climate-related risks to its supply chains.

12. At any point, has your agency tried to identify its fiscal exposure to any potential climate-related disruptions to its supply chains? *(By 'fiscal exposure', we mean responsibilities, programs, and activities that may explicitly or implicitly expose the federal government to future spending.)*

Yes	**4**
No	**15**
Don't know/ not sure	**5**
Missing data	**0**

12a). If yes, has your agency been able to identify its fiscal exposure to any climate-related disruptions to your agency's supply chains?

Yes	**3**
No	**1**
Don't know/ not sure	**0**
Missing data	**0**

If no, please explain why not.

12b). If yes, what is your agency's fiscal exposure to any climate-related disruptions to your agency's supply chains? *(We recognize agencies might have identified different types of fiscal exposure to climate-related disruptions to their supply chains, but we are interested in what your agency has identified as its fiscal exposure. If available, please include dollar values.)*

12c). If yes, what steps did your agency take to identify this fiscal exposure? *(We recognize agencies might have taken different steps to identify fiscal exposure to climate-related disruptions to their supply chains, but we are interested in how your agency has identified its fiscal exposure.)*

8

13. At any point, has your agency faced any challenges in its efforts to identify its fiscal exposure to any potential climate-related disruptions to its supply chains?

Yes	7	→ If yes, can you please describe these challenges?
No	8	
Don't know/ not sure	9	
Missing data	0	

14. What additional support, guidance, or tools, if any, could assist your agency in its efforts to identify its fiscal exposure to climate-related disruptions to its supply chains?

9

Interagency coordination

For the questions that follow, we are interested in understanding interagency coordination efforts—both formal and informal— to support climate preparedness and adaptation with regard to agency supply chains.

15. Has your agency coordinated—either formally or informally—with any of the following entities regarding its climate preparedness and adaptation efforts related to its supply chains?

a) Council on Environmental Quality	Yes	**13**	→ **If yes, can you please describe the coordination and indicate whether this was formal, informal, or both?**
	No	**8**	
	Don't know/ not sure	**3**	
	Missing data	**0**	
b) Office of Management and Budget	Yes	**8**	→ **If yes, can you please describe the coordination and indicate whether this was formal, informal, or both?**
	No	**11**	
	Don't know/ not sure	**5**	
	Missing data	**0**	
c) Council on Climate Preparedness and Resilience	Yes	**8**	→ **If yes, can you please describe the coordination and indicate whether this was formal, informal, or both?**
	No	**11**	
	Don't know/ not sure	**5**	
	Missing data	**0**	

d) Any other entities? If yes, please describe:

10

16. Did any of the following entities provide feedback—either formal or informal—on your agency's most recent climate change adaptation plan (i.e., the plan released in October 2014), either before or after you submitted it for review?

a) Council on Environmental Quality

Yes	9
No	10
Don't know/not sure	4
Missing data	1

If yes, can you please describe the feedback and indicate whether this was formal, informal, or both?

If yes, did the feedback relate to climate-related risks to your agency's supply chains?

Yes	2
No	7
Don't know/not sure	0
Missing data	0

b) Office of Management and Budget

Yes	6
No	12
Don't know/not sure	5
Missing data	1

If yes, can you please describe the feedback and indicate whether this was formal, informal, or both?

If yes, did the feedback relate to climate-related risks to your agency's supply chains?

Yes	1
No	5
Don't know/not sure	0
Missing data	0

c) Any other entities? If yes, please describe:

11

17. In your opinion, are there any opportunities for your agency to coordinate with another agency or agencies to support efforts to identify climate-related risks to federal supply chains?

Yes	18	→ If yes, can you please describe these additional opportunities?
No	1	
Don't know/ not sure	5	
Missing data	0	

18. In your opinion, are there any opportunities for your agency to coordinate with another agency or agencies to support efforts to identify and implement actions to manage climate-related risks to federal supply chains?

Yes	17	→ If yes, can you please describe these additional opportunities?
No	0	
Don't know/ not sure	7	
Missing data	0	

19. In your opinion, are there additional opportunities for any agencies or other federal entities to take the lead on any government-wide efforts to identify climate-related risks to federal supply chains?

Yes	11	→ If yes, who or what agency(ies) is best positioned to lead such efforts?
No	5	↓
Don't know/ not sure	8	If yes, can you please describe these additional opportunities?
Missing data	0	

12

20. In your opinion, are there additional opportunities for any agencies or other federal entities to take the lead on any government-wide efforts to identify and implement actions to manage climate-related risks to federal supply chains?

Yes	11	→ If yes, who or what agency(ies) is best positioned to lead such efforts?
No	3	↓
Don't know/ not sure	10	If yes, can you please describe these additional opportunities?
Missing data	0	

21. In your opinion, do your agency's efforts to manage climate-related risks to its supply chains include any promising practices that other agencies might want to consider using to manage climate-related risks to their supply chains?

Yes	5	→ If yes, can you please describe these practices and how they could help other agencies?
No	5	
Don't know/ not sure	14	
Missing data	0	

22. Has your agency adopted or considered any promising practices used by other agencies to address climate-related risks to their supply chains?

Yes	4	→ If yes, can you please describe these practices and how they could help other agencies?
No	9	
Don't know/ not sure	11	
Missing data	0	

13

23. Is your agency aware of existing interagency efforts—beyond what has been covered above—to support climate preparedness and adaptation related to supply chains?

Yes	**5**	→ **If yes, can you please describe them?**
No	**8**	
Don't know/ not sure	**11**	
Missing data	**0**	

24. Do you have any comments on these or other related topics you would like to share? If yes, please use the space provided. If you would like to provide supporting documentation, please include it as an attachment in the email used to return the completed survey.

Thank you for your time!

14

Appendix III: Comments from the United States Postal Service

THOMAS G. DAY
CHIEF SUSTAINABILITY OFFICER

UNITED STATES
POSTAL SERVICE

September 29, 2015

Mr. J. Alfredo Gómez
Director, Natural Resources and Environment
Government Accountability Office
441 G Street NW
Washington, DC 20548-0001

Dear Mr. Gómez:

This letter is the US Postal Service response to the draft report, titled "Federal Supply Chains – Opportunities to improve the Management of Climate-Related Risks". The Postal Service is in general agreement with the report and its findings, but does have a few technical corrections and a concern about a missing aspect of the efforts at the Postal Service to date.

From a technical standpoint, we believe we have already reached agreement via email on two items. The first was from page 1 and dealt with the Postal Services ability to quickly resume delivery as a result of our existing mobile fuel contracting resources. The second was regarding the use of GIS to overlay data. The original draft used the term "mail routes", when in fact what actually was referenced were the processing centers in our network. In Postal Service terminology, a "mail route" would be the routes assigned to individual employees for the delivery of mail. It has never been our intent to overlay data down to this level of specificity.

Beyond these two technical corrections we also have a general concern. The report does not appear to reflect the risk assessment and planning for continuity of operations that already has taken place at the Postal Service. As indicated during various meetings, we not only have well-designed continuity of operations plans we also have repeatedly demonstrated the effectiveness of these plans through actual climate-related events. Fundamental structure, such a mobile power generation capability and existing contracts for mobile vehicle fueling, allow the Postal Service to quickly restore distribution, transportation and delivery capability.

Finally, as the report suggests a more standardized approach to determine fiscal exposure should prove helpful. We would add that such an effort should also make available a common set of data that can be easily overlaid to physical infrastructure of each agency. Most importantly, this data needs to shift from historic to predictive. Given the very nature of climate change, the last 30 to 100 years of data is not as important as reasonable predictions for the next 30 to 100 years.

Thank you for the time invested in this report on such an important topic and the opportunity to provide further comments.

Thomas G. Day

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WASHINGTON DC 20260
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Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

J. Alfredo Gómez, (202) 512-3841 or gomezj@gao.gov

Staff Acknowledgments

In addition to the individual named above, Barbara Patterson (Assistant Director), Ben Atwater, John Bumgarner, Cindy Gilbert, Chad M. Gorman, Caryn Kuebler, Jessica Mausner, Celia Rosario Mendive, Marmar Nadji, Alison O'Neill, Jeanette Soares, Kiki Theodoropoulos, and Michelle R. Wong made key contributions to this report.

Related GAO Products

High-Risk Series: An Update. GAO-15-290. Washington, D.C.: February 2015.

Climate Change: Better Management of Exposure to Potential Future Losses Is Needed for Federal Flood and Crop Insurance. GAO-15-28. Washington, D.C.: October 29, 2014.

Budget Issues: Opportunities to Reduce Federal Fiscal Exposures Through Greater Resilience to Climate Change and Extreme Weather. GAO-14-504T. Washington, D.C.: July 29, 2014.

Defense Inventory: Actions Needed to Improve the Defense Logistics Agency's Inventory Management. GAO-14-495. Washington, D.C.: June 19, 2014.

Climate Change Adaptation: DOD Can Improve Infrastructure Planning and Processes to Better Account for Potential Impacts. GAO-14-446. Washington, D.C.: May 30, 2014.

Extreme Weather Events: Limiting Federal Fiscal Exposure and Increasing the Nation's Resilience. GAO-14-364T. Washington, D.C.: February 12, 2014.

Climate Change: Energy Infrastructure Risks and Adaptation Efforts. GAO-14-74. Washington, D.C.: January 31, 2014.

Climate Change: Federal Efforts Under Way to Assess Water Infrastructure Vulnerabilities and Address Adaptation Challenges. GAO-14-23. Washington, D.C.: November 14, 2013.

High-Risk Series: An Update. GAO-13-283. Washington, D.C.: February 2013.

Climate Change Adaptation: Federal Efforts to Provide Information Could Help Government Decision Making. GAO-12-238T. Washington, D.C.: November 16, 2011.

Climate Change Adaptation: Aligning Funding with Strategic Priorities. GAO-11-876T. Washington, D.C.: July 28, 2011.

Climate Change: Improvements Needed to Clarify National Priorities and Better Align Them with Federal Funding Decisions. GAO-11-317. Washington, D.C.: May 20, 2011.

Climate Change Adaptation: Strategic Federal Planning Could Help Officials Make More Informed Decisions. GAO-10-175T. Washington, D.C.: October 22, 2009.

Climate Change Adaptation: Strategic Federal Planning Could Help Government Officials Make More Informed Decisions. GAO-10-113. Washington, D.C.: October 7, 2009.

Climate Change: Observations on Federal Efforts to Adapt to a Changing Climate. GAO-09-534T. Washington, D.C.: March 25, 2009.

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