

**COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
HEARING CHARTER**

Federal Climate Adaptation and Resilience for the 21st Century

**Tuesday, March 8, 2022
10:00 AM EDT
Zoom**

PURPOSE

The purpose of this hearing is to evaluate the Federal Government’s vulnerability to the impacts of climate change, and to assess the status of ongoing efforts to promote greater climate adaptation and resilience throughout Federal programs, operations, and facilities. The hearing will explore the types of climate risks threatening Federal agencies and the urgent need to address those risks in order to protect Federal assets and investments. The hearing will detail the climate challenges confronting NASA, DOE, and NOAA, along with the adaptation and resilience strategies adopted by those agencies to respond to them. Finally, the hearing will discuss potential opportunities to bolster Federal climate adaptation tools, including enhanced interagency resilience collaboration and the incorporation of accurate, up-to-date climate data into agency planning, implementation, and outreach.

WITNESSES

- **Dr. Richard W. Spinrad**, Administrator, National Oceanic and Atmospheric Administration
- **Ms. Ingrid Kolb (pronounced Cobb)**, Director, Office of Management, and Chief Sustainability Officer, Department of Energy
- **Dr. Joel R. Carney**, Assistant Administrator, Office of Strategic Infrastructure, and Chief Sustainability Officer, National Aeronautics and Space Administration
- **Mr. Alfredo Gomez**, Director, Natural Resources and Environment, Government Accountability Office

Key Questions

- What are the Federal Government’s vulnerabilities to climate change impacts?
- How are Federal agencies such as NASA, DOE, and NOAA identifying urgent climate risks and developing adaptation and resilience strategies to address them?
- How can Federal science agencies maximize the use of their scientific programs and capabilities to promote climate adaptation efforts?
- What opportunities exist to strengthen interagency collaboration in support of climate adaptation and resilience?
- What level of resource support will be required for Federal agencies to effectively protect their programs and infrastructure against climate impacts in the coming decades?

Definitions

The terms vulnerability, adaptation and resilience have distinct meanings in the context of climate change. NOAA's Climate.gov defines each term as follows:¹

- *Vulnerability*: The propensity or predisposition of assets to be adversely affected by hazards. Vulnerability encompasses exposure, sensitivity, potential impacts, and adaptive capacity.
- *Adaptation*: The process of adjusting to new (climate) conditions in order to reduce risks to valued assets.
- *Resilience*: The capacity of a community, business, or natural environment to prevent, withstand, respond to, and recover from a disruption.

Executive Order 14008

On January 27, 2021, President Biden issued Executive Order 14008, entitled *Tackling the Climate Crisis at Home and Abroad*.² Section 211 of Executive Order 14008 directed Federal agencies to create "action plans" that would describe "steps the agency can take with regard to its facilities and operations to bolster adaptation and increase resilience to the impacts of climate change." The executive order designated the Federal Chief Sustainability Officer (CSO), within the White House Council on Environmental Quality (CEQ), as the lead official charged with supporting and coordinating agency action plans across the executive branch. On October 7, 2021, the White House released the first group of plans, identified as Climate Adaptation and Resilience Plans, encompassing 23 agencies across the Federal Government.³ The agencies are now working to implement their plans. Annual progress updates will be completed later in 2022.

Agency Climate Adaptation and Resilience Plans

The 23 agencies that released Climate Adaptation and Resilience Plans in October 2021 represent a diverse cross-section of Federal programs and activities.⁴ Nevertheless, common themes did emerge from the plans. The Federal CSO identified five broad challenges for Federal agency climate adaptation and resilience planning:

- Safeguarding Federal investments by incorporating climate impacts into agency planning processes, such as facility design and long-term budgeting;
- Ensuring clear leadership and accountability among top agency officials for promoting climate adaptation and resilience;
- Developing more resilient agency supply chains that can properly support the procurement capabilities necessary to strengthen climate adaptation;
- Reinforcing the resilience of the Federal workforce by protecting Federal employees from climate impacts and promoting climate education for Federal employees; and

¹ <https://toolkit.climate.gov/content/glossary>

² <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/>

³ <https://www.whitehouse.gov/briefing-room/statements-releases/2021/10/07/fact-sheet-biden-administration-releases-agency-climate-adaptation-and-resilience-plans-from-across-federal-government/>

⁴ <https://www.sustainability.gov/adaptation/>

- Promoting equity in Federal climate adaptation and resilience activities by ensuring that climate impacts for environmental justice communities are fully considered.

The Federal CSO also noted that the Federal Government’s scientific agencies and infrastructure possess distinct vulnerabilities and objectives within the broader climate adaptation and resilience framework. Particular challenges for scientific agencies include the need to mitigate climate vulnerabilities among expensive, technically complex physical assets with unique operational requirements, such as NASA launch facilities and DOE national laboratories; the responsibility to improve interagency data sharing processes for Federal climate data; and the obligation to provide technical support for non-scientific agencies seeking to integrate climate data more effectively into their programs and planning activities.

The National Aeronautics and Space Administration (NASA), the Department of Energy (DOE), and the Department of Commerce (DOC) – which includes the National Oceanic and Atmospheric Administration (NOAA) – all submitted Climate Adaptation and Resilience Plans in accordance with Executive Order 14008. Brief overviews are provided below.

NASA

The unique requirements of NASA’s highly specialized asset infrastructure create significant climate vulnerabilities for core agency functions. In its Climate Adaptation and Resilience Plan,⁵ NASA notes that fully two-thirds of its assets (measured by replacement value) are located within 16 feet of mean sea level along America’s coastlines. As a result, facilities that are essential to NASA’s ability to fulfill its mission are “imminently threatened” by climate impacts such as sea level rise, as well as changes in temperature and precipitation intensity. For example, Kennedy Space Center already requires periodic beach renourishment to protect launch-related mission assets, while Johnson Space Center’s location on the Gulf Coast exposes it to heightened risks from storm surge and coastal flooding. Moreover, many of these assets cannot be relocated due to “strict launch requirements,” such as general safety measures and the need to maintain a required distance from communities during launch activities, and thus must remain coastal. NASA asserts that “flooding and other natural forces exacerbated by climate change continue to pose significant risk to NASA’s launch infrastructure and mission.”

To further highlight the agency’s potential cost exposure to climate risk, NASA summarizes “Disaster Recovery Expenditures” for agency facilities related to extreme events such as hurricanes and flooding since 2003. According to the agency, total recovery expenditures during this period exceeded \$1 billion and were funded outside of the normal budget cycle.

In addition to its own climate vulnerabilities, NASA’s plan details the agency’s role as a source of climate research and data that will be critical to supporting greater climate adaptation and resilience across the Federal Government. NASA’s climate research programs, which extend to numerous aspects of climate change from sea level rise and global ice measurements to solar activity and atmospheric temperatures, supply crucial data for climate models that can be shared and adopted by other Federal agencies attempting to better understand their climate vulnerabilities. NASA’s responsibility to bolster the broader Federal climate resilience effort

⁵ <https://www.sustainability.gov/pdfs/nasa-2021-cap.pdf>

while simultaneously addressing its own climate vulnerabilities reflects the dual role of science-based agencies throughout the Federal Government.

NASA identifies five “priority adaptation actions” that the agency will undertake to achieve its climate adaptation and resilience objectives:

1. *Ensure Access to Space*: Identify and mitigate climate vulnerabilities related to critical launch facilities, supporting infrastructure, and the agency’s supply chain;
2. *Integrate Climate Adaptation into Agency and Center Master Plans*: Update existing master plans, at both the Agency and Center level, to incorporate climate adaptation;
3. *Integrate Climate Risks into Agency Risk Analysis and Resilience Planning*: Develop a new “Agency Resilience Framework” that will explicitly consider climate resilience, as well as new “Center Resilience Plans” that will assess vulnerabilities for each Center;
4. *Update Climate Modeling to Enable Better Understanding of Agency Threats and Vulnerabilities*: Develop “next generation climate models” that can more robustly support downscaled climate projections to facilitate asset-level vulnerability evaluations;
5. *Advance Aeronautics Research on Technologies and Processes that Reduce Contributors to Climate Change*: Promote aviation research that reduces the vulnerability of agency assets to extreme weather events.

NASA identifies several further initiatives that will support its climate adaptation and resilience strategy, including coordinated efforts to enhance climate literacy throughout the agency workforce and the comprehensive incorporation of climate risk considerations into agency management functions.

DOE

DOE oversees a sprawling and intricate asset infrastructure that exposes the agency’s unique scientific facilities and laboratories to a range of climate impacts. DOE’s Climate Adaptation and Resilience Plan⁶ therefore emphasizes the need to “successfully identify risks, hazards, and vulnerabilities from climate change that have the potential to impact operations” in order to devise adaptation strategies and maintain the agency’s operational capacity. DOE has already completed screenings and vulnerability assessments at 51% of agency sites using guidance from its 2021 Vulnerability Assessment and Resilience Plan (VARP) as well as related guidance from earlier initiatives. The agency describes a number of ongoing projects intended to address climate vulnerabilities and boost the climate resilience of specific facilities. For example:

- The National Energy Technology Laboratory (NETL) has identified climate risks due to more frequent and severe droughts, heat waves and storms at different sites in Oregon, West Virginia, and Pennsylvania. The sites are striving to bolster their electricity and water resilience through measures such as cooling tower renovations, boiler and chiller replacements, and energy efficiency upgrades.
- The Idaho National Laboratory (INL) has determined that climate risks stemming from rising summer temperatures and increased drought conditions pose a heightened risk of disruption to the proper functioning of the facility’s laboratories. INL is undertaking

⁶ <https://www.sustainability.gov/pdfs/doe-2021-cap.pdf>

“major renovation efforts,” such as modernizing HVAC control systems and installing new air volume hoods, in order to reduce lab energy usage and improve the control of pressure and temperature within each lab space to preserve safety standards.

DOE identifies five “priority adaptation actions” that the agency will undertake to achieve its climate adaptation and resilience objectives:

1. *Assess Vulnerabilities and Implement Resilience Solutions at DOE Sites*: Conduct site-level vulnerability assessments and develop site-level resilience plans;
2. *Enhance Climate Adaptation and Mitigation Co-Benefits at DOE Sites*: Promote dual climate adaptation and mitigation policies such as reducing facility energy demand;
3. *Institutionalize Climate Adaptation and Resilience Across DOE Policies, Directives and Processes*: Formalize the use of up-to-date climate data in support of adaptation and resilience across agency orders, directives, policies, and processes;
4. *Provide Climate Adaptation Tools, Technical Support, and Climate Science Information*: Utilize agency scientific capabilities, such as Argonne National Laboratory’s High Performance Computing (HPC) system, to assess climate models and support the development of climate adaptation policies throughout the agency;
5. *Advance Deployment of Emerging Climate Resilient Technologies*: Support research and development projects for innovative technologies that can enhance the resilience of DOE facilities, as well as assets across the Federal Government.

DOE identifies several further initiatives that will support its climate adaptation and resilience strategy, including the creation of an agency hub for climate change resources to enhance the climate literacy of the agency workforce and an effort to analyze the climate vulnerabilities of the agency’s supply chain.

NOAA

NOAA did not prepare its own distinct Climate Adaptation and Resilience Plan, but the agency occupies a prominent role within the DOC adaptation and resilience strategy.⁷ DOC’s plan notes that NOAA possesses climate vulnerabilities across the breadth of its geographically and technically diverse asset infrastructure, including supply chain vulnerabilities in support of its ships and aircraft, as well as agency systems, equipment and electronics that may confront weather conditions beyond their existing “operating parameters and capacities.” NOAA is currently overseeing “a phased approach to facility planning” that includes updated climate risk assessments to identify the agency facilities that are most vulnerable to climate impacts, along with new strategies to incorporate adaptation principles into facility planning, design, and investment decisions. For example, NOAA has implemented new design requirements that improve the climate resilience of its pier structures and support facilities by increasing their ability to protect agency ships from stronger hurricanes.

Beyond the climate vulnerabilities and mitigation strategies for its own infrastructure, NOAA is also charged with supporting adaptation and resilience planning by other Federal agencies (as well as society at large) through the sharing of climate data and models. DOC identifies NOAA

⁷ <https://www.sustainability.gov/pdfs/doc-2021-cap.pdf>

as a leader in this area for Federal interagency cooperation. NOAA identifies three primary implementation methods to achieve this objective:

1. *Engaging with Partners / Providing Technical Assistance*: Conduct outreach to Federal, state, and local stakeholders and communities to assist with climate adaptation planning, deliver targeted climate data and information, and support the prioritization of adaptation and resilience measures;
2. *Information/Tools/Services*: Expand and broadly disseminate the agency’s “suite” of programs, models, and guidance documents to provide scientific support for climate adaptation and resilience actions across society. Examples include NOAA’s Effects of Sea Level Rise Program⁸ that projects habitat vulnerability to sea level rise; the National Water Model⁹ that forecasts projected water levels in rivers and streams; and the U.S. Climate Resilience Toolkit¹⁰ for public and private sector stakeholders;
3. *Grants*: Execute grant programs and award grants to “advance the climate science that informs resilience measures,” as well as furthering the scientific understanding, planning, and implementation of “nature-based approaches to climate adaptation.”

Additionally, NOAA is a co-lead agency (along with NIST) in supporting “the development of climate-ready infrastructure via the development of forward-looking building standards.” As a part of this objective, NOAA is responsible for providing climate data, projections, and decision-support tools to assist the building science community and inform climate resilient building codes and standards. Initial efforts at the Federal level will be guided through existing inter-agency programs and partnerships that support climate resilient infrastructure planning.

GAO Assessment Framework for Climate Vulnerability, Adaptation and Resilience

The Government Accountability Office (GAO) possesses several analytical tools to evaluate climate vulnerabilities, as well as adaptation and resilience actions, among Federal agencies. GAO’s Disaster Resilience Framework offers a guide for assessing the resilience of Federal programs and infrastructure to natural disasters.¹¹ The framework emphasizes the importance of accurate information for agency decisionmakers in understanding disaster risk, as well as the need to integrate information into a coordinated response and incentivize investments to reduce risk and enhance resilience. The framework considers the increased rate of natural disasters due to climate change as a key factor for the ability of agencies to make informed decisions.

GAO’s High Risk List currently identifies the Federal Government’s fiscal exposure to climate change impacts as a “high risk area” for Federal agencies, based in part upon the Federal Government’s role as an owner and operator of facilities and infrastructure.¹² GAO highlights the need for Federal strategic leadership in promoting climate adaptation and resilience to reduce fiscal exposure, as well as the importance of Federal activities to provide climate data and technical assistance within that effort.

⁸ <https://coastalscience.noaa.gov/research/coastal-change/ecological-effects-sea-level-rise-program/>

⁹ <https://water.noaa.gov/about/nwm>

¹⁰ <https://toolkit.climate.gov/>

¹¹ <https://www.gao.gov/products/gao-20-100sp>

¹² <https://www.gao.gov/highrisk/limiting-federal-governments-fiscal-exposure-better-managing-climate-change-risks>

GAO has also issued numerous reports that address climate vulnerabilities and mitigation strategies to some extent, including:

- “U.S. Postal Service: Better Use of Climate Data Could Enhance the Climate Resilience of Postal Facilities” (GAO-21-104152)¹³
- “Climate Change: Improved Federal Coordination Could Facilitate Use of Forward-Looking Climate Information in Design Standards, Building Codes, and Certifications” (GAO-17-3)¹⁴
- “Climate Information: A National System Could Help Federal, State, Local, and Private Sector Decision Makers Use Climate Information” (GAO-16-37)¹⁵

Challenges and Next Steps for Federal Climate Adaptation and Resilience

Agencies described several common challenges for the implementation of their Climate Adaptation and Resilience Plans. One obstacle cited in multiple plans was the high upfront cost of many proposed adaptation actions, along with resource constraints and funding shortfalls for their execution.¹⁶ Budgetary concerns arose in relation to an array of agency adaptation and resilience requirements, including facility upgrades, partner outreach and staff support. Another difficulty was the need for improved interagency coordination, particularly regarding the sharing and use of updated Federal climate data for agency planning decisions.¹⁷ A third recurring impediment was the lack of climate awareness among many Federal employees engaged in activities that confront climate risks, and the importance of sustained climate education in order to integrate adaptation and resilience throughout agency planning and operations.¹⁸

Agency updates to the Climate Adaptation and Resilience Plans will be submitted to the Federal CSO later in 2022. The Federal CSO can provide technical assistance to agencies as they update their plans on an ongoing basis. However, the nature of those updates – including the process by which agencies will continually review and measure their progress towards climate adaptation and resilience goals – remains uncertain. Additionally, under President Biden’s Executive Order 14057 (*Executive Order on Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability*) issued on December 8, 2021, agency climate adaptation and resilience efforts will interact with a new Climate Adaptation and Resilience Federal Leaders Working Group.¹⁹ The working group will promote interagency collaboration and knowledge sharing in aspects such as disseminating climate data and reinforcing Federal supply chains.

¹³ <https://www.gao.gov/products/gao-21-104152>

¹⁴ <https://www.gao.gov/products/gao-17-3>

¹⁵ <https://www.gao.gov/products/gao-16-37>

¹⁶ <https://subscriber.politicopro.com/article/enews/2021/10/08/cost-data-trust-agencies-see-a-struggle-in-climate-prep-281750>

¹⁷ *Id.*

¹⁸ *Id.*

¹⁹ <https://www.sustainability.gov/federalsustainabilityplan/resilience.html>