



U.S. Environmental Protection Agency

Office of Research and Development

**2022-2023 Climate Adaptation Implementation
Plan**

October 2022

Disclaimer

To the extent this document mentions or discusses statutory or regulatory authority, it does so for informational purposes only. This document does not substitute for those statutes or regulations, and readers should consult the statutes or regulations to learn what they require. Neither this document, nor any part of it, is itself a rule or a regulation. Thus, it cannot change or impose legally binding requirements on EPA, States, the public, or the regulated community. Further, any expressed intention, suggestion or recommendation does not impose any legally binding requirements on EPA, States, tribes, the public, or the regulated community. Agency decision makers remain free to exercise their discretion in choosing to implement the actions described in this Plan. Such implementation is contingent upon availability of resources and is subject to change.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

SEP 1 2 2022



DEPUTY ADMINISTRATOR

Preface

Climate change is threatening communities across the nation. Millions of Americans feel the destructive effects of climate change each year when the power goes down, rivers and lakes go dry, homes are destroyed by wildfires and communities are flooded by hurricanes. Underserved communities are especially vulnerable to the climate crisis and are more likely to experience the negative health and environmental effects of extreme weather events.

The Biden-Harris Administration is actively confronting the climate crisis while also advancing environmental justice. As part of a whole-of-government approach, the U.S. Environmental Protection Agency is strongly committed to taking the actions necessary to protect human health and the environment and to increase the resilience of the entire nation, even as the climate changes.

The EPA's commitment to action is reflected in its FY 2022-2024 Strategic Plan and in the 2021 Climate Adaptation Action Plan. Both documents present priority actions the agency will take to ensure that its programs, policies and operations remain effective under future climate conditions while we work to support states, territories, tribes and communities in increasing their own adaptive capacity and resilience to climate change impacts.

From flooding at Superfund sites, to wildfires causing air pollution, to sea-level rise affecting water quality and infrastructure, the EPA will boldly address climate impacts in both its programs and the communities it serves. We recognize the importance of tribal, state and local government partnerships in efficient, effective and equitable implementation of climate change adaptation strategies. Our plans were informed and improved by input we received in listening sessions we held to engage these and other partners as we developed these plans.

To ensure we are addressing the climate crisis in a comprehensive way, each of our national program and regional offices has developed individual Climate Adaptation Implementation Plans that outline how the EPA will attain the agencywide goals described in the broader Climate Adaptation Action Plan. These plans describe how programs and regions will integrate climate adaptation into their programs, partnerships and operations. They also describe how they will help partners build their resilience and capacity to adapt, while delivering co-benefits, including curbing greenhouse-gas emissions and other pollution, and promoting public health,

economic growth and climate justice. Of course, the EPA has a major role to play on emissions reductions as well, though that is not the focus of these plans. Indeed, we must focus on both climate adaptation and mitigation to ensure our nation and communities thrive in an era of climate change.

As part of this effort, we will empower our staff and partners by increasing awareness of how climate change may affect our collective ability to implement effective and resilient programs. We will also provide them with the necessary training, tools, data, information and technical support to make informed decisions and integrate climate adaptation into our work.

The EPA will work to modernize its financial assistance programs to encourage climate-resilient investments across the nation. We will also focus on ensuring that investments funded by the Bipartisan Infrastructure Law, the Inflation Reduction Act and other government programs are resilient to the impacts of climate change. Finally, as our knowledge advances and as impacts continue to develop, our response will likewise evolve. We will work to share these developments to enhance the collective resilience of our nation.

The actions outlined in these implementation plans reflect the EPA's commitment to build every community's capacity to anticipate, prepare for, adapt to and recover from the increasingly destructive impacts of climate change. Together with our partners, we will work to create a healthy and prosperous nation that is resilient to the ever-increasing impacts of climate change — which is vital to the EPA's goal of protecting human health and the environment and to ensuring the long-term success of our nation.



Janet G. McCabe

Office of Research and Development Preface

Changing climate poses complex challenges to EPA’s mission of protecting human health and the environment. This is because changing climate is dynamically and systemically affecting communities and ecosystems. Examples include, but are not limited to: increased frequency and severity of extreme weather and events, such as drought, floods, heat, and wildfires; degradation of ecosystems and the services they provide of clean air, water, and soils that humans rely upon for health and sustenance; threats to infrastructure such as for drinking and wastewater treatment; and others.

President Joseph Biden has stated that climate change is a “clear and present danger to the United States.” The President issued Executive Order 14008 of January 27, 2021 in the first days of the Administration as a signal of the importance of taking action to tackle the climate crisis. Executive Order 13985 of January 20, 2021 recognizes that climate change exacerbates inequities faced especially by underserved communities. Under the leadership of EPA Administrator Michael Regan, EPA’s FY 2022-2026 Strategic Plan includes a strategic goal focused exclusively on addressing climate change – the first time that the Agency has had such a strategic goal. The Plan also includes an unprecedented strategic goal to advance environmental justice and civil rights. These strategic goals are supported by four overarching cross-agency strategies, the first of which is to “Ensure Scientific Integrity and Science-Based Decision Making.”

These goals and strategies are at the core of the Office of Research and Development (ORD) Climate Change Adaptation Implementation Plan. ORD’s mission is to develop the best available science and technology to support decisions by our partners within and outside of the Agency. ORD’s plan has two main components. The first is to identify and address the priority adaptation science needs of our EPA Program and Regional Office partners and our external partners, including states, tribes, and communities. The second is to ensure that ORD will identify and address the adaptation actions to enhance the resilience of our organization. ORD’s laboratories and facilities are geographically diverse. Our labs are located in the Nation’s heartlands, but also span the coasts of the Atlantic, Pacific, Gulf of Mexico, and Great Lakes. Thus, ORD is facing the same climate challenges as many parts of the nation and must be resilient to climate change to fulfill our mission.

Ensuring scientific integrity and conducting high-quality, problem-focused science is crucial to EPA’s continuing ability to protect human health and the environment. ORD is dedicated to developing scientific and technical information to support EPA’s ambitious climate adaptation actions for the nation.

ORD Climate Change Adaptation Implementation Plan Development Team

Andy Miller (Lead; Air, Climate, and Energy Research Program)

Peter Beedlow (Center for Public Health and Environmental Assessment)

Tim Benner (Office of the Science Advisor, Policy, and Engagement)

Rebecca Dodder (Center for Environmental Measurement and Modeling)

James Goodrich (Center for Environmental Solutions and Emergency Response)

Tom Johnson (Center for Public Health and Environmental Assessment)

Katherine Ratliff (Center for Environmental Solutions and Emergency Response)

David Shoffner (Office of Resource Management)

Tanya Spero (Center for Environmental Measurement and Modeling)

Jeff Yang (Center for Environmental Solutions and Emergency Response)

Contents

- Disclaimerii
- Preface iii
- ORD Climate Change Adaptation Implementation Plan* Development Teamvi
- Executive Summary 1
 - Background** 1
 - Vulnerability Assessment**..... 1
 - Priority Actions**..... 1
 - Training Plan** 2
 - Science Needs** 2
 - Conclusion** 2
- Background and Introduction..... 3
 - ORD’s Role**..... 5
 - ORD Adaptation Implementation Plan Overview**..... 6
- Senior Leadership and Staffing 6
- Climate Vulnerability Assessment..... 6
- ORD’s Five Priority Actions 9
 - ORD Priority Action 1. Identify and address climate adaptation science needs that yield benefits to multiple Offices, Regions, and/or state, local, tribal, and community partners. ..9**
 - ORD Priority Action 2. Ensure that science gaps related to climate change adaptation are included in solicitations for Agency-sponsored extramural research, as appropriate..... 11**
 - ORD Priority Action 3. Provide technical support and assistance on climate adaptation to EPA and agencies, as well as institutions outside of EPA..... 12**
 - ORD Priority Action 4. Build internal ORD adaptive capacity and processes to enhance resilience and reduce emissions. 13**
 - ORD Priority Action 5. Identify research systems and resources that are vulnerable to impacts from climate change and develop and implement protective measures..... 15**
- Training Plan for Enhancing Staff Knowledge About Climate Adaptation..... 15
- Science Needs 16
- Conclusion..... 19

Executive Summary

Background

EPA's Climate Adaptation Action Plan was published in October 2021 and presents five priority actions for EPA to meet the requirements of Executive Order 14008, *Tackling the Climate Crisis at Home and Abroad*. The Office of Research and Development (ORD) is the Agency lead for EPA Plan's *Priority Action 5: Identify and address climate adaptation science needs*: "The EPA Office of Research and Development (ORD) has the primary responsibility for coordinating with the Program and Regional Offices to identify the priority science needs of the agency and its partners." ORD's climate-related research focuses on climate change impacts to air quality, water quality, human and ecosystem health, and stormwater management and is designed to inform EPA's Program and Regional Offices as they develop and implement policies that will remain effective in a changing climate. ORD's Climate Adaptation Implementation Plan describes how ORD will support EPA's efforts to adapt to a changing climate and continue to achieve ORD's mission to provide the scientific and technical information needed by EPA. The ORD Plan describes four main topics:

1. A Climate Vulnerability Assessment for ORD.
2. Five priority actions per year that will be taken to address the agency-wide priorities identified in the 2021 EPA Climate Adaptation Action Plan.
3. A training plan for enhancing staff knowledge about climate adaptation.
4. Identification of science needs.

Vulnerability Assessment

ORD is working with EPA's Office of Mission Support (OMS) to ensure that research facilities and systems, Regional Laboratories, and those working at ORD facilities are adequately protected from the impacts of climate change, including extreme weather events (e.g., heat, precipitation, storms), increased exposure to wildfire smoke, and changing risks to climate-related diseases. ORD is working closely with OMS to assess and mitigate site-specific vulnerabilities to climate change. Potential vulnerabilities include structural and mechanical, electrical grid, water supply and quality, physical and cyber- security, worker safety, electronic information and communication, supply chains, and environmental justice. An important component to increasing ORD's resilience to climate impacts is improving sustainability and reducing emissions as required under Executive Order 14057, *Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability*.

Priority Actions

ORD's five Priority Actions are to:

1. Identify and address climate adaptation science needs that yield benefits to multiple Offices, Regions, and/or state, local, tribal, and community partners.
2. Ensure that science gaps related to climate change adaptation are incorporated in solicitations for Agency-sponsored extramural research, as appropriate.
3. Provide technical support and assistance on climate adaptation to EPA, as well as agencies and institutions outside of EPA.
4. Build internal ORD adaptive capacity and processes to enhance resilience and reduce emissions.
5. Identify research systems and resources that are vulnerable to impacts from climate change and develop and implement protective measures.

Training Plan

ORD will develop a training plan to enhance ORD staff awareness and knowledge of relevant climate impacts and adaptation approaches to build resilience of ORD's research and operations to climate impacts. The training will leverage existing materials available within EPA and through federal partners. The goals of the training will be to provide staff with 1) a basic understanding of relevant climate impacts and adaptation approaches, and 2) information on vulnerabilities and adaptation activities specific to their work site and locality. Broader training related to ORD's safety, health, and environmental management (SHEM) program and relevant to laboratory or field research will incorporate information about climate impacts and adaptation. Training materials will be developed by the end of FY22, and training will be conducted in FY23.

Science Needs

As the Agency lead for EPA Priority Action 5: *Identify and address climate adaptation science needs*, ORD's first priority action is to work with its EPA and external partners to "identify and address climate adaptation science needs that yield benefits to multiple Offices, Regions, and/or state, local, tribal, and community partners." This action involves extensive engagement with EPA's Regional and Program Office partners and outreach to states, tribes, and communities throughout development of research plans and implementation of research activities related to climate adaptation. Through workshops, focused listening sessions, ongoing partner participation in Research Area Coordination Teams, and evaluation of science needs identified in Office-specific adaptation plans, over 240 adaptation science needs of importance to multiple Offices, states, tribes, media, and research programs have been identified. These needs provide primary guidance to the development of ORD's Strategic Research Action Plans for FY23-26 and topics for future extramural research grants through the Science to Achieve Results (STAR) program.

ORD engages with independent expert panels and the broader research community to strengthen the quality and integrity of its research. The Board of Scientific Counselors reviews ORD's research plans and provides advice on strategic research directions and approaches. Publication of results in peer-reviewed journals and external review of major research products ensures ORD's science is of high quality. Engagement with interagency efforts, such as the U.S. Global Change Research Program, provides opportunities to apply and adapt external research to meet EPA's adaptation science needs.

Conclusion

The ORD Climate Change Adaptation Implementation Plan outlines the commitment to provide the scientific foundation for EPA to address the challenges of climate change, and it emphasizes enhanced partnerships with the EPA Program and Regional Offices. These efforts are designed address the priority climate adaptation science while enabling ORD to respond to future partner needs and ensure EPA has the scientific information needed to continue to achieve its mission as the climate changes.

Background and Introduction

Climate change poses challenges to EPA's mission of protecting human health and the environment. Many of the Federally mandated mission outcomes (e.g., clean air, clean water, and safe drinking water) are sensitive to changes in weather patterns and climate. Many of EPA's past policies and practices were developed when it could be reasonably assumed that the climate would remain relatively stable and future climate would mirror past climate. Now, faced with ongoing and anticipated future changes in climate, the impacts of climate change cannot be ignored. The pace and scale at which climate impacts are now occurring increases the rate at which new issues arise and new scientific and technical information is needed by the Agency.

The Office of Research and Development (ORD) has been conducting climate change research to support Agency needs for nearly 30 years. The research focuses on climate change impacts to air quality, water quality, human and ecosystem health, and stormwater management. These efforts, at their core, are designed to inform EPA's Program and Regional Offices as they develop and implement policies that will remain effective in a changing climate. The dynamic nature of climate change illustrates the need to address impacts that the Agency is already experiencing and is likely to face in the future, while maintaining flexibility to respond to unexpected issues.

EPA developed its first Agency-wide plan for adapting to the changing climate in 2012, following the first Agency-wide policy statement on climate change adaptation from Administrator Jackson in 2011. The 2011 policy statement and the 2012 EPA adaptation plan laid the foundation for efforts to mainstream climate adaptation into EPA's activities by understanding, identifying, and responding to the impacts of climate change that affect EPA's ability to fulfill its mission. The 2011 policy statement also required each EPA Office to develop an Office-specific plan to implement the Agency's climate adaptation goals. The ORD implementation plan was published in 2014¹ and included four priority actions:

1. Identify vulnerable research resources and develop response plans
2. Develop an approach to identify Agency-wide research priorities
3. Work with EPA partners to develop effective venues to communicate advances in climate impact and adaptation research
4. Design extramural research efforts that appropriately incorporate climate change adaptation questions and measures

While progress on each of the specific ORD actions has varied since the plan was completed, these priority actions have substantially increased awareness across ORD about how the impacts of climate change can affect ORD's ability to achieve its mission and the approaches to continue to provide needed scientific information as the climate changes. This increased awareness, and actions taken in response to that awareness, illustrate meaningful progress toward achieving the broader EPA goal of mainstreaming climate adaptation into EPA activities.

¹ <https://19january2017snapshot.epa.gov/sites/production/files/2016-08/documents/ord-climate-change-adaptation-plan.pdf>

Executive Order 14008 (Tackling the Climate Crisis at Home and Abroad),² signed by President Biden in January 2021, builds on these actions and similar actions taken across the Federal Government. EO 14008 requires each Federal agency to develop a plan “that describes steps the agency can take with regard to its facilities and operations to bolster adaptation and increase resilience to the impacts of climate change.” In response to EO 14008, Administrator Regan issued the “EPA Policy Statement on Climate Change Adaptation” on May 26, 2021. The EPA Policy Statement recognizes that impacts from climate change can pose significant challenges to EPA’s ability to fulfill its mission. Accordingly, it calls for the Agency to anticipate and plan for future changes in climate and incorporate considerations of climate change into its activities. The EPA Policy Statement calls for the Agency to update its 2012 climate adaptation plan, which resulted in the *2021 EPA Climate Adaptation Action Plan*, published in October 2021.³ The EPA Policy Statement requires all Agency Offices to update or complete their Office-specific plans for implementing the *2021 EPA Climate Adaptation Action Plan*.

The *2021 EPA Climate Adaptation Action Plan* identifies five Agency-wide climate adaptation priorities that the Office-specific adaptation implementation plans are expected to address:

1. Integrate climate adaptation into EPA programs, policies, rulemaking processes, and enforcement activities.
2. Consult and partner with states, tribes, territories, local governments, environmental justice organizations, community groups, businesses, and other federal agencies to strengthen adaptive capacity and increase the resilience of the nation, with a particular focus on advancing environmental justice.
3. Implement measures to protect the agency’s workforce, facilities, critical infrastructure, supply chains, and procurement processes from the risks posed by climate change.
4. Measure and evaluate performance.
5. Identify and address climate adaptation science needs.

In addition to these five priorities, EPA is committed to meeting its obligations to tribal nations. Under the Constitution, treaties with tribal nations are part of the supreme law of the land, establishing unique sets of rights, benefits and conditions for the treaty-making tribes who were forced to cede millions of acres of their homelands to the United States, in return for recognition of property rights in land and resources as well as federal protections. Tribal treaty rights have the same legal force and effect as Federal statutes, and they should be integrated into and given the fullest consideration throughout EPA’s collective work. Reserved rights are the rights tribes retain that were not expressly granted to the United States by tribes in treaties. Treaty and reserved rights, including but not limited to the rights to hunt, fish and gather, may be found both on and off-reservation lands. Agencies should consider treaty and reserved rights in developing and implementing climate adaptation plans in order to protect these rights and ensure the Agencies meet

² <https://www.federalregister.gov/documents/2021/02/01/2021-02177/tackling-the-climate-crisis-at-home-and-abroad>

³ <https://www.epa.gov/climate-adaptation/climate-adaptation-plan>

their legal and statutory obligations and other mission priorities as they work to combat the climate crisis.

In September 2021, EPA joined 16 Federal agencies in signing a Memorandum of Understanding (MOU)⁴ that committed those parties to identifying and protecting tribal treaty rights early in the decision-making and regulatory processes. Accordingly, EPA will consider and protect treaty and reserved rights in developing and implementing climate adaptation plans through strengthened consultation, additional staff training, and annual reporting requirements.

ORD's Role

Before describing the ORD Climate Change Adaptation Implementation Plan, it is important to recognize the unique role that ORD has within EPA. Including the Regional Laboratories, ORD has or manages facilities in every EPA Region. ORD facilities are therefore subject to the full range of climate change impacts that can occur across the Nation. ORD's mission to provide scientific and technical information to EPA also means that ORD works with, and on scientific topics of importance to, every EPA Program and Regional Office.

ORD must also look beyond EPA's immediate climate adaptation science needs to ensure EPA has the scientific foundation to address adaptation issues that will arise in the future. This is accomplished in two ways. First, ORD must continue to build its intellectual capital that will enable continuing capabilities to address increasingly complex problems. This is a long-standing challenge as described by Brown and Byerly:⁵ "Given limited resources, EPA must forgo certain short-term research activity in order to build understanding which in the long run is necessary to accomplish its mission. The accumulation of this intellectual capital through research creates opportunities for progress which would not otherwise exist." Second, ORD invests in investigator-driven research by the academic community through its Science to Achieve Results (STAR) research grants. Understanding EPA's adaptation science needs provides crucial guidance regarding topics for research investments for both development of ORD intellectual capital and topics for STAR grants.

Finally, ORD's mission requires an integrated approach to address EPA's climate adaptation science needs. A plan that concentrates on adaptation actions has substantial value for focusing attention and resources on implementing approaches to address the spectrum of adaptation needs. However, the benefits and impacts of those approaches are not isolated in practice. Providing the science to inform adaptation decisions requires understanding an action's potential for maladaptation, the ability to make adjustments as conditions and understanding change, and accounting for other complex consequences that can affect coupled human-natural systems. In the long run, adaptation measures can be effective when they are designed and implemented with a

⁴ <https://www.epa.gov/tribal/memorandum-understanding-regarding-interagency-coordination-and-collaboration-protection>

⁵ Brown, G., and Byerly, R., 1981. Research in EPA: A congressional point of view. *Science*, 211:1385-1390. <https://doi.org/10.1126/science.7466395>.

holistic understanding that requires research that addresses immediate needs while considering changes to system-wide behavior into the future.

Integrated approaches to adaptation generate effective adaptation actions and strengthen EPA's leadership in climate adaptation with sustainable and long-lasting benefits. For example, integrated responses to EOs 14008 and 14057 (Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability)⁶ will provide EPA with concrete opportunities to demonstrate leadership by example.

ORD Adaptation Implementation Plan Overview

This document updates the *2014 ORD Implementation Plan* and describes ORD's plans to meet the requirements of the *2021 EPA Climate Adaptation Action Plan*. The following five items are required and are discussed in detail in the following sections:

1. Designation of a Senior Career Leader responsible for overseeing climate adaptation activities in the ORD.
2. A Climate Vulnerability Assessment for ORD.
3. Five priority actions per year that will be taken to address the agency-wide priorities identified in the *2021 EPA Climate Adaptation Action Plan* (listed above).
4. A training plan for enhancing staff knowledge about climate adaptation.
5. Identification of science needs.

Senior Leadership and Staffing

The Senior Career Leader responsible for overseeing the climate adaptation activities described in the ORD Climate Change Adaptation Implementation Plan is Andy Miller, Associate National Program Director for the Air, Climate, and Energy Research Program and the Executive Lead for Climate Change in ORD.

Climate Vulnerability Assessment

As part of the development of the updated Office-specific implementation plans, each of EPA's Program and Regional Offices have developed vulnerability assessments of their programs and regions to climate change. These assessments cover (1) relevant risks to EPA programs and interests posed by the impacts of climate change (e.g., sea level rise and storm surges, more frequent and intense storms, wildfires, droughts); (2) communities and individuals that are particularly vulnerable to these impacts, such as low-income communities, communities of color, children, the elderly, tribes and indigenous people; and (3) actions already underway to address the risks, remaining vulnerabilities, and known barriers to further actions.

ORD's vulnerabilities to climate change take a different form from those of other program and regional offices. ORD's role is to provide the scientific and technical support needed by its

⁶ <https://www.federalregister.gov/documents/2021/12/13/2021-27114/catalyzing-clean-energy-industries-and-jobs-through-federal-sustainability>.

partners⁷ to achieve their mission. ORD's direct vulnerabilities to climate change thus may limit its ability to provide scientific and technical information because of damage or limited access to facilities or test sites, worker safety or security, or lack of fundamental resources such as water or energy.

ORD has the primary responsibility for most of the Agency's research and analytical systems, both in laboratories and in the field, which may be vulnerable to extreme temperatures or precipitation, exposure to wildfire smoke, changing prevalence of risks such as insect-borne disease, or other climate-associated impacts. The vulnerabilities identified by ORD's EPA partners (e.g., impacts of climate change to EPA programs and the communities they serve) can affect ORD's operational vulnerabilities by altering the research needed by its partners, including new locations for studies in the field, that can affect ORD's vulnerabilities to the impacts of climate change. The adaptation implementation plans of each partner Office includes their evaluation of the science needed to inform the decisions they and their partners in the states, localities, and tribes must make to adapt to the impacts of climate change.

ORD also has the primary operational responsibility for multiple research facilities across the country. However, EPA's appropriations limit the amounts ORD can invest to independently implement measures to reduce those facilities' climate-related vulnerabilities. Projects requiring investments more than the appropriation limit fall into the Buildings and Facilities category, managed by EPA's Office of Mission Support (OMS). Even for actions that fall within ORD's capacity to address, close interaction with OMS is needed to ensure actions fit into the longer-term plans for facility adaptation. ORD therefore works closely with OMS to integrate plans and actions to identify facility-related vulnerabilities and develop and implement appropriate mitigation measures.

Thus, ORD's vulnerabilities depend to a substantial degree upon information developed by and with its EPA partners. ORD's Office of Resource Management (ORM) and National Program Manager for Regional Laboratories (NPM RL)⁸ work closely with OMS and with ORD's research Centers and Regional Laboratories to ensure there is common understanding of facility-related vulnerabilities to climate impacts. Further, ORD's research planning activities continually provide multiple venues for identifying and discussing adaptation-related research needs across EPA.

The OMS Climate Adaptation Plan notes that there are a variety of hazards that climate change poses to EPA facilities, operations, and personnel across the country. Increasing prevalence and intensity of extreme weather events are just some of the effects of our changing climate, and they can result in increased flooding, wind damage from hurricanes, severe drought, uncontrolled fires, and other natural disasters that can impact physical infrastructure and research integrity at the Agency. The *2021 EPA Climate Adaptation Action Plan* outlines these potential climate impacts in more detail.

⁷ Throughout this document, "partners" refers to ORD's partner offices across EPA unless specifically noted otherwise.

⁸ ORD serves as the National Program Manager for Regional Laboratories (NPM-RL) and consults with Regional Laboratory Services and Applied Sciences (LSASD) Division Directors in the Regional Offices.

Many of the EPA facilities are home to ORD research Centers or Regional Laboratories. ORD will work closely with OMS to assess site-specific vulnerabilities to climate change. OMS is in the process of reassessing the climate vulnerabilities first identified in 2014 by surveying facility and lab managers and applying the results of the upcoming climate resiliency assessments (described below) to create a full picture of the disruptors that could arise from climate change and how vulnerable EPA is to the consequences of them:

- Structural and Mechanical Vulnerabilities: Extreme weather events and natural disasters have already caused significant damage to some EPA buildings. Even when the structure is sound, the mechanical, electrical, and process (MEP) equipment may not be in a weather-proof location to withstand water, winds, and other weather extremes.
- Electrical Grid Vulnerabilities: Unprecedented extreme heat days in the summer and freezing temperatures in the winter have exposed structural weaknesses in the nation's electrical grid. EPA's power supply could be threatened with rolling brownouts or blackouts, causing the Agency to experience interruptions in key research activities and compromising important support for its mission.
- Water Supply Vulnerabilities: Between droughts during extreme heat, and water grid/delivery issues during extreme cold, the water needed to supply EPA's cooling systems, research, and other processes could be vulnerable to climate impacts, potentially compromising Agency research and operations.
- Water Quality Vulnerabilities: Changes to water ecosystems—including increasing droughts, decreasing precipitation days, and rising water temperatures—could mean a change in the disposition of water supplies and potentially compromise the quality of water available for use in EPA experiments and for potable needs.
- Physical Security Vulnerabilities: Extreme weather events can impact facilities in ways that not only damage the physical structure and mechanical systems, but also affect the overall security of the building and its occupants. Many EPA locations have closed-circuit television (CCTV) cameras, intrusion detection systems, outdoor lighting, and access control devices that would be compromised by weather damage or electrical system/grid failures if uninterruptible power and backup power systems are limited.
- Cybersecurity Vulnerabilities: EPA servers, networks, and data centers require a continuous supply of power; while the Agency has sources of backup power for key aspects of its information systems, those backup sources may not adequately address the breadth of impacts from climate change events that could occur.
- Worker Safety Vulnerabilities: While many climate impacts can affect overall worker health, safety, and ability to do their jobs, field workers could experience a higher risk due to climate impacts. Outdoor fieldworkers are more vulnerable to increasing extreme temperatures or other weather events. Working conditions while conducting sampling, remediation, and other outdoor/field activities could be more hazardous after fires, hurricanes, tornados, and floods.

- Electronic Information and Communication Vulnerabilities: Severe weather events and other climate-related conditions causing interruptions in power could also limit employees' ability to communicate remotely or pose a vulnerability in locations where employee address systems are not connected to backup power.
- Supply Chain Vulnerabilities: In addition to EPA's own operations and facilities, the products and services it procures and organizations that create and supply them could also be vulnerable to climate change impacts, which could impact the Agency's ability to achieve its mission.
- Environmental Justice Vulnerabilities: Research has indicated that communities of color and low-income neighborhoods are more significantly affected by the impacts of climate change. From the perspective of both the communities surrounding EPA facilities and the priorities the Agency places on grant funding, OMS will need to assess the environmental justice vulnerabilities of climate change related to EPA facilities and operations.

The extent to which each of these vulnerabilities poses a threat to individual facilities and the Agency as a whole requires OMS to collect additional information. Plans to identify the risks and determine the potential for hazards across the Agency and at individual facilities to classify these vulnerabilities and develop strategies to address them are described below.

ORD's Five Priority Actions

The ORD adaptation implementation plan contains five Priority Actions to support EPA's efforts to fulfill its mission in the face of climate change. These Actions are based upon four underlying principles for ORD: (1) provide scientific and technical support to EPA; (2) act in partnership with the users of ORD's research; (3) maintain ongoing engagement with those using ORD's research; and (4) build and maintain scientific leadership on climate adaptation science.

ORD's five Priority Actions are:

1. Identify and address climate adaptation science needs that yield benefits to multiple Offices, Regions, and/or state, local, tribal, and community partners.
2. Ensure that science gaps related to climate change adaptation are incorporated in solicitations for Agency-sponsored extramural research, as appropriate.
3. Provide technical support and assistance on climate adaptation to EPA, as well as agencies and institutions outside of EPA.
4. Build internal ORD adaptive capacity and processes to enhance resilience and reduce emissions.
5. Identify research systems and resources that are vulnerable to impacts from climate change and develop and implement protective measures.

ORD Priority Action 1. Identify and address climate adaptation science needs that yield benefits to multiple Offices, Regions, and/or state, local, tribal, and community partners.

Description: ORD will engage with Program and Regional Offices and state, tribal, and local community partners to identify and document their adaptation research needs, incorporate those needs into ORD's Strategic Research Action Plans (StRAPs), and demonstrate completion and delivery of the research results.

ORD takes multiple actions to identify climate adaptation science needs: direct engagement with EPA Program and Regional Offices and state and tribal environmental agencies; workshops that bring together EPA regulatory and regional decision makers; and identification of science needs through anticipatory research to enable EPA to meet the complex and emerging environmental challenges identified in the EPA Office-specific climate adaptation plans. These needs are addressed to the extent possible by research activities in ORD's six National Research Programs: (1) Air, Climate, and Energy; (2) Chemical Safety for Sustainability; (3) Human and Environmental Risk Assessment; (4) Homeland Security; (5) Sustainable and Healthy Communities; and (6) Safe and Sustainable Water Resources. Additional ORD research is conducted through programs designed for direct partnership with and participation by with Regions, as well in ORD-sponsored innovation projects. Engagement with the users of ORD's research continues beyond identification of needs to ensure the design, conduct, and results of the research activities are focused on addressing those needs.

The impacts of global change, and the capacity to respond to them, are interconnected with historical and current disparities and injustices. Understanding and responding to these disparities and injustices are critical to effective climate adaptation and are incorporated across ORD's climate adaptation research activities. This includes the need to appropriately understand and incorporate indigenous and traditional ecological knowledge (ITEK). In one example, the Air, Climate, and Energy Research Program explicitly recognizes ITEK as an important component of its research area, Empowering Communities and Individuals to Improve Public and Ecosystem Health. In addition, several of ORD's research initiatives across all of its National Research Programs are designed to understand, quantify, and mitigate disproportionate impacts of poor environmental quality on underserved communities to address environmental justice. Poor environmental quality can involve anomalously poor air quality, poor water quality for drinking and recreation, contaminated soils and food sources, and the subsequent impacts on health. Climate adaptation strategies for EJ are natural extensions of research that is already underway within ORD.

Co-benefits: The co-benefits of this action depend upon the specific research needs that are identified by EPA and external partners.

Agency-wide priority addressed: This ORD Priority Action directly responds to *EPA Priority Action 5: Identify and address climate adaptation science needs*. Specifically, it responds to the *2021 EPA Climate Adaptation Action Plan's* call to conduct research to address EPA's adaptation research needs:

EPA's Office of Research and Development will reinforce scientific integrity and coordinate with the Program and Regional Offices to identify and address priority research needs for the entire agency to support the integration of adaptation planning into the agency's activities.

Lead organization: Air, Climate, and Energy National Research Program, in close partnership with the other National Research Programs and ORD Centers.

Timeframe: FY22–26. Research needs will be assessed on an annual basis. A summary of completed research products and outputs that address those needs will be reported on an annual basis, beginning in early FY23 reporting on FY22 completions.

Performance metrics: The performance measures for this ORD Priority Action are the following:

1. Convene an annual cross-EPA, cross-ORD workshop to identify and document the Agency’s climate science needs.
2. Develop an annual report documenting progress and completion of adaptation-related research products and outputs that address the identified needs.

Resource requirements: The *2021 EPA Climate Adaptation Action Plan* recognizes that ORD’s capacity to carry out this Priority Action requires additional personnel and funding.

Highlights of accomplishments to date: ORD conducted a cross-EPA, cross-ORD climate research workshop in October 2021 to identify EPA’s climate-related research needs. At that workshop, participants from each of the ten EPA Regions and relevant EPA Program Offices described their Office-specific research needs and issues and engaged in discussions to identify the science needs of multiple Offices and identify opportunities for collaboration across Offices and with ORD researchers. Additional input was provided through listening sessions with state and local agencies and, separately, with tribes designed to hear their perspectives on science needs related to climate change, including adaptation. The workshop and listening sessions laid the groundwork for ORD to address this Priority Action moving forward.

Key partners or stakeholders: This Priority Action requires close engagement with all EPA Regional and Program Offices, as well as with external users of EPA research. Guidance from EPA’s Science Advisory Board and ORD’s Board of Scientific Counselors will inform the development of the ORD climate adaptation research portfolio and subsequent updates to the portfolio.

ORD Priority Action 2. Ensure that science gaps related to climate change adaptation are included in solicitations for Agency-sponsored extramural research, as appropriate.

Description: ORD will require climate change adaptation to be included in the decision criteria of Science to Achieve Results (STAR) research grant solicitations across all ORD research programs, as scientifically appropriate. STAR solicitations will include questions and issues related to EPA’s climate change adaptation science needs and related opportunities for mitigation and their intersection with environmental justice.

Co-benefits: The co-benefits of this action will depend upon the specific research proposals that are submitted and the awarded grants.

Agency-wide priorities addressed: This ORD Priority Action responds to *EPA Priority Action 1: Integrate climate adaptation into EPA programs, policies, rulemaking processes, and enforcement activities*. Specifically, it addresses the *2021 EPA Climate Adaptation Action Plan* requirement to integrate climate adaptation criteria into financial mechanisms:

The Agency will modernize its financial assistance programs to encourage and support smarter, more climate-resilient investments by states, tribes, territories, and local communities. It will do so by integrating climate adaptation considerations, as appropriate, into discretionary and non-discretionary financial mechanisms. This includes agency grants, cooperative agreements, loans, technical assistance, contracts, and awards where the project's desired outcomes are sensitive to climate change (e.g., clean air; safe drinking water; site cleanups).

This ORD Priority Action also responds to *EPA Priority Action 5: Identify and address climate adaptation science needs*. Specifically, it addresses the *2021 EPA Climate Adaptation Action Plan* requirement to include climate adaptation in all mechanisms through which ORD conducts research, including extramural grants:

EPA will advance a rigorous exploratory and applied climate adaptation science program by conducting climate-related research in its labs and centers, supporting research through its grants program, conducting policy-relevant assessments, communicating research and assessment results, and delivering innovative and sustainable solutions.

Lead organization: ORD's Office of Science Advisor, Policy & Engagement (OSAPE) is the lead organization for implementing the STAR grant program. OSAPE works closely with other ORD components and with EPA partner Offices in development of research grant solicitations.

Timeframe: FY22–26. Multiple Requests for Application (RFA; research solicitations) are typically released each year. The standard RFA language for all STAR RFAs will be modified to reflect this Priority Action by the end of FY22.

Performance metrics: The performance measure for this Priority Action is documentation of the STAR grant announcements that incorporate science gaps and decision criteria related to climate change science and adaptation.

Resource requirements: Additional funding and FTE are needed to effectively implement an expected increase in STAR-funded research, including incorporation of climate adaptation criteria.

ORD Priority Action 3. Provide technical support and assistance on climate adaptation to EPA and agencies, as well as institutions outside of EPA.

Description: ORD will provide scientific and technical support on climate adaptation to EPA Offices and states, tribes, territories, communities, and businesses, as requested, to address issues that were not foreseen in the development of Agency-wide science needs. ORD will respond to these requests in ways that consider climate adaptation issues and incorporate climate adaptation responses, as appropriate to the particular issue and request. This action will build from the proposed internal ORD climate adaptation training to facilitate awareness of climate adaptation issues in the development of the support response. The ORD technical support tracking system, *ORD Assists*, will incorporate climate adaptation keywords to quantify adaptation-related assistance activities.

Co-benefits: Co-benefits of this action depend upon the specific support and assistance activities that are undertaken.

Agency-wide priority addressed: This ORD Priority Action responds to *EPA Priority Action 2: Consult and partner with states, tribes, territories, local governments, environmental justice organizations, community groups, businesses, and other federal agencies to strengthen adaptive capacity and increase the resilience of the nation, with a particular focus on advancing environmental justice*. Specifically, this ORD action responds to the requirement for EPA to provide data and information needed to adapt and increase resilience to climate change:

The EPA will support states, tribes, territories, communities, and businesses by producing and delivering the training, tools, technical support, data, and information they need to adapt and increase resilience to climate change.

Lead organization: Air, Climate, and Energy National Research Program will be the lead organization for reporting, in partnership with the other ORD National Research Programs. The ORD Centers will be the lead organizations responsible for providing the technical support and assistance.

Timeframe: FY22–26. Technical support and assistance activities are conducted on an ongoing basis. Annual summary reports will be prepared by the ACE National Research Program before the end of each calendar year to document relevant activities, beginning with FY22.

Performance metrics: The performance measure for this Priority Action is an annual summary of climate change-related technical support activities provided to EPA Offices and agencies and institutions outside of EPA, as recorded in ORD Assists.

Resource requirements: Technical assistance activities have been supported with existing resources to date. Additional resource requirements will depend upon the number and complexity of assistance requests and cannot be predetermined.

Highlights of accomplishments to date: In FY21, ORD estimated that over 29,000 hours of scientific and technical support were provided, with an average of 18 hours of support for each activity. A third of these activities supported Regional Office needs, about a quarter supported EPA Program Offices, and just under a third supported states and territories, cities and communities, tribes, and other external organizations. A portion of those hours was related to climate adaptation activities, but the activities were not tracked at that granularity. This Priority Action will enable ORD scientific and technical support for climate adaptation to be tracked to demonstrate and quantify progress toward this goal by modifying an existing system (ORD Assists).

ORD Priority Action 4. Build internal ORD adaptive capacity and processes to enhance resilience and reduce emissions.

Description: ORD will (1) ensure ORD staff have basic knowledge of climate change, climate adaptation, and climate mitigation; (2) as appropriate, incorporate climate adaptation factors into existing environmental management system (EMS) guidance and development of research health

and safety protocols (HSP); and (3) work with ORM and OMS to develop methods and procedures to document and reduce annual GHG emissions associated with ORD operations, including official travel, building energy use, commuting, and research activities, compared to an appropriate baseline.

Co-benefits: Establishing a knowledge baseline for the ORD staff can encourage staff to perform climate-resilient activities outside the professional setting. Building ORD's adaptive capacity will include actions to reduce operational GHG emissions through travel reductions and changes in official travel modes, reducing on-site energy consumption, expanding on-site energy generation, and expanded opportunities for remote work. Increased understanding of climate impacts and resilience opportunities coupled with measures to reduce reliance on external energy sources reduce ORD's vulnerability to operational disruptions related to extreme weather events. Taking an integrated approach to adaptation by reducing GHG emissions provides opportunities to demonstrate leadership in climate responses while also advancing progress toward the requirements of EO 14057, Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability.

Agency-wide priority addressed: This ORD Priority Action addresses *EPA Priority Action 3: Implement measures to protect the agency's workforce, facilities, critical infrastructure, supply chains, and procurement processes from the risks posed by climate change*. Specifically, it addresses the need to ensure ORD's workforce is aware of, and taking actions to mitigate, the impacts of climate change:

Where appropriate, EPA will develop and implement new measures to protect its workforce and increase the resilience of its facilities and operations to climate change.

This ORD Priority Action also addresses *EPA Priority Action 1: Integrate climate adaptation into EPA programs, policies, rulemaking processes, and enforcement activities*. Specifically, it addresses the need to reduce GHG emissions in ORD's operations:

EPA will develop decision-support tools and provide technical assistance to enable staff to integrate climate adaptation into programs and to identify strategies that will also yield co-benefits, such as reducing greenhouse gases and other pollution, and advancing environmental justice.

Lead organization: Office of Resource Management

Timeframe: FY22–26. Training materials and revision to EMS and HSP guidance will be completed by the end of FY22. A procedure to quantify operational GHG emissions will be completed by mid-FY23, and baseline emissions will be estimated by the end of FY23.

Performance metrics: The performance measures for this Priority Action are the following: (1) ORD meeting or exceeding the Agency-wide goal for percent of staff who have completed climate change training; (2) revision of EMS and HSP guidance to incorporate adaptation factors, as appropriate; and (3) development of a procedure to quantify annual ORD operational GHG emissions, including for an appropriate baseline year.

Resource requirements: Additional resources will be required for development and distribution of the training materials and evaluation and revision of EMS and HSP guidance. Additional resources

will be needed to develop the procedure to quantify annual ORD operational GHG emissions and reductions.

ORD Priority Action 5. Identify research systems and resources that are vulnerable to impacts from climate change and develop and implement protective measures.

Description: This ORD Priority Action focuses on ensuring ORD's facilities and equipment will be able to operate with minimal disruption as the impacts of climate change increase. ORD will coordinate with OMS to identify ORD research equipment and facilities that are vulnerable to the impacts of climate change and the specific threats to which they are vulnerable, and to identify potential measures to protect the vulnerable systems. In its role as the National Program Manager for Regional Laboratories, ORD will also consult with the Regions, as necessary, to ensure impacts from climate change are identified and protective measures are implemented for the Regional Lab Network. Potentially vulnerable systems include a range of ORD assets, research field equipment and study sites, including long-term field study sites and research vessels. Vulnerabilities can also include identification of climate-related risks that affect the ability of staff to access facilities or study sites, or the ability of staff to maintain continuity of remote access from alternative work locations.

Co-benefits: Where ORD is responsible for environmental monitoring activities, the continuity of data records can be maintained to reflect environmental conditions associated with extreme events.

Agency-wide priority addressed: This ORD Priority Action addresses *EPA Priority Action 3: Implement measures to protect the agency's workforce, facilities, critical infrastructure, supply chains, and procurement processes from the risks posed by climate change*. Specifically, it addresses the need to ensure ORD's facilities and equipment are minimally disrupted by the impacts of climate change:

Where appropriate, EPA will develop and implement new measures to protect its workforce and increase the resilience of its facilities and operations to climate change.

Lead organization: Office of Resource Management

Timeframe: FY22–26.

Performance metrics: Proposed performance measures: (1) work with OMS to complete inventory of vulnerable systems and their specific vulnerabilities; and (2) work with OMS to identify protective measures for those systems.

Resource requirements: Additional resources will be required to complete the inventory of vulnerable systems and identify protective measures by the end of FY23.

Training Plan for Enhancing Staff Knowledge About Climate Adaptation

ORD will develop a training plan to enhance ORD staff awareness and knowledge of relevant climate impacts and climate adaptation approaches to build resilience of ORD's research and operations to climate impacts. The training is expected to include background on climate impacts

and adaptation approaches for different sectors and regions of the U.S. The training will, where possible, leverage existing teaching and training materials available through the U.S. Global Change Research Program and other Federal partners, including resources at climate.gov, and information created as part of the Fourth National Climate Assessment. The goals of the training will be to 1) provide staff with a basic understanding of relevant climate impacts and adaptation approaches, and 2) provide staff with information on vulnerabilities and adaptation activities specific to their work site and locality. Training will also leverage the vulnerability assessments developed by EPA Program and Regional Offices, including ORD, to identify needs for targeted training, including site-specific training, where necessary, to understand the potential unique risks for facilities based on their site-specific climate vulnerabilities and research activities.

Adaptation training needs for ORD research operations related to safety, health, and environmental management (SHEM), relevant to laboratory or field research, in particular, will be incorporated as part of the broader SHEM training or developed as additional, site-specific SHEM modules (e.g., such as SHEM training specific to the High Bay Building in Research Triangle Park).

Training materials will be developed by the end of FY22 and training will be conducted in FY23.

Science Needs

Each Office-specific adaptation implementation plan must identify that Office's needs for scientific and technical information and understanding to inform decisions related to climate adaptation and resilience. ORD is the Agency lead for *EPA Priority Action 5: Identify and address climate adaptation science needs*:

EPA's Office of Research and Development will reinforce scientific integrity and coordinate with the Program and Regional Offices to identify and address priority research needs for the entire agency to support the integration of adaptation planning into the agency's activities.

Addressing this EPA Priority Action is the focus of ORD Priority Action 1: *Identify and address climate adaptation science needs that yield benefits to multiple offices, regions, and/or state, local, tribal, community partners.*

As part of the effort to implement EPA Priority Action 5, ORD held its first cross-EPA, cross-ORD climate research workshop in October 2021 to gather information to develop strategic research directions based on EPA's climate-related science needs and gaps in the science. The workshop format fostered participant exposure to perspectives from across EPA and toward developing a cross-ORD research portfolio that comprehensively addresses the range of EPA climate adaptation research needs. The workshop refined the outcomes from prior focused discussions on specific research areas and topics across ORD's research programs.

In addition, ORD held listening sessions for state and local agencies, and separate sessions for tribes, designed to hear provide their perspectives on research for climate change and related equity concerns. The information has been used to inform the development of ORD’s research plans for FY23-26.

The three-day cross-EPA, cross-ORD workshop offered a forum for each of EPA’s ten Regional Offices and the Offices of Air and Radiation, Land and Emergency Management, Water, and Policy. Perspectives were also provided by each of ORD’s National Research Programs and Centers. A summary of the workshop identified 88 climate-related needs and 42 science gaps in 18 categories. The top three categories, as indicated by the number of needs identified by ORD’s partners, were (1) extreme events (including wildfires, floods, and drought); (2) waste management; and (3) water quality and availability. Only slightly behind these categories were issues related to how research is developed and presented, as opposed to identifying specific research topics. Participants expressed their needs for visual presentation of results using maps and screening tools; development of location-specific data and information; and increased availability, accessibility, and usability of research data. These needs focused on providing useful information to and for communities. Information about co-benefits of adaptation and mitigation, nature-based solutions, and community capacity building were also identified as needs. ORD’s EPA partners also identified needs related to social sciences, including better understanding of behavior and a desire for consistent evaluation of social and economic disruption related to climate impacts.

The workshop and external listening sessions were an early part of a broader set of ORD’s ongoing efforts to identify and address EPA’s adaptation science needs. Additional information about adaptation science needs was collected from each of the Office-specific implementation plans. Those plans identified 243 science needs, which cut across all environmental media. The top twenty topics by frequency identified in the plans are shown in the table below. Note that some needs identified multiple topics.

Topic	Frequency	Topic	Frequency
Data accessibility	57	Water infrastructure	13
Water quality	44	Agriculture	11
Ecosystems	27	Wildfire	11
Extremes	24	Oceans & coasts	11
Sea level rise	22	Adaptation & resilience	11
Air quality	16	Economics	11
Harmful algal blooms	14	Superfund	11
Groundwater	13	Environmental justice	11
Health	13	Nutrients	10
Water infrastructure	13	Landfills	9

The information from the workshops and the adaptation plan needs was incorporated into the development of ORD's Strategic Research Action Plans (StRAPs) and will be supplemented by the ORD's ongoing engagement with partners throughout the development, implementation, and reporting phases of the StRAPs. Building on the success of the October 2021 workshop, ORD plans to conduct similar annual workshops to update partner needs and reflect newer Agency priorities and advances in science as noted in Priority Action 1 above.

ORD also has responsibilities regarding climate adaptation science that go beyond addressing the specific needs identified by its EPA partner Offices. The EPA Science Advisory Board and ORD's Board of Scientific Counselors (BOSC) have encouraged ORD to identify and address gaps in the science that may not yet be recognized by Program and Regional Offices (i.e., "anticipatory needs"). This broader view of adaptation science needs serves to improve the understanding of the broader system dynamics that can affect adaptation measure effectiveness and develop the foundational understanding and tools that can be applied to address current and future needs. ORD identified several topics related to these issues during the workshop, including understanding how multiple concurrent climate stressors will interact and examining pathways to prevention, preparedness, and long-term resilience.

An additional ORD responsibility is to lead EPA's engagement with the broader scientific community. This has multiple aspects, including conducting research with experts from other institutions, transfer and translation of science conducted outside of ORD for use within EPA, communicating EPA science needs to research institutions (including through STAR RFAs) and other federal agencies, and facilitating EPA engagement with interagency research activities, primarily through the US Global Change Research Program. These efforts are designed to maximize the impact of EPA resources by leveraging the broad range of expertise outside of EPA and ORD, improving the efficiency and effectiveness of Federal Government research, and expanding opportunities for EPA staff to directly participate with research and assessment activities related to climate change and adaptation. For example, ORD facilitates participation by Regional and Program Office experts in development and review of the National Climate Assessment, assessments of the Intergovernmental Panel on Climate Change, and other high-profile interagency and international climate science assessment activities.

Addressing the Needs

To address EPA's priority near-term climate adaptation science needs and conduct the research needed to prepare for the future, ORD follows a structured approach to develop its research plans. This approach involves close engagement with ORD's partner Offices in EPA from initial research planning and continuing through the conduct of the research and reporting of results. Representatives from Regional and Program Offices serve as members of Research Area Coordination Teams (RACTs) to assist ORD's National Program Directors in engaging partners, identifying priority research needs, reviewing Strategic Research Action Plans, and providing input on proposed research products. The RACTs provide the structure to ensure that research is focused on partner priorities and that the results of the research are provided on a schedule and in a form

that is of greatest value to the partners. In addition to this close partner engagement, each StRAP is reviewed by the BOSC to provide independent expert perspectives on the scientific value of the proposed research, as well as on the value of the research in addressing important national problems.

ORD is also investigating organizational structures to facilitate research that addresses the complexities of climate adaptation science. Efforts are underway to provide a focal point for climate-related research conducted by ORD researchers. Approaches to expand and enhance engagement with Regional staff will provide direct connections with the users of ORD's research in EPA's Regions and help build Regional capacity for climate-related analyses.

ORD researchers engage and collaborate with experts in other Federal agencies to take advantage of the full range of climate adaptation research capabilities across the Federal Government. ORD's active participation in interagency research coordinating groups, including the US Global Change Research Program, provides venues to communicate EPA's research needs to other agencies and enhance connections between experts in other agencies and EPA's Program and Regional Offices.

The ability of ORD to address the expanding and accelerating needs for climate adaptation science depends upon the availability of adequate funding and staff and the priority of those needs in context with other Agency priorities.

Conclusion

The ORD Climate Change Adaptation Implementation Plan demonstrates ORD's commitment to provide the scientific foundation for EPA to address the challenges of climate change. The five Priority Actions described in this Plan build upon ongoing efforts in ORD and the Program and Regional Offices to enhance and expand the partnerships that are fundamental components of EPA's science-based climate adaptation actions. ORD is engaging with its partners in the Program and Regional Offices on a continual basis to ensure that the Agency's research investments address the priority climate adaptation science needs identified by its partners, while simultaneously supporting research that enables ORD to respond to future partner needs. ORD's actions to prepare its staff and facilities across the Nation will ensure EPA has the capacity to achieve its mission well into the future.