

## BOSC REVIEW OF CLIMATE CHANGE RESEARCH ROADMAP FY16 ANNUAL REPORT

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### List of Acronyms

ACE	Air, Climate, and Energy
BOSC	Board of Scientific Counselors
CC	Climate Change
EC	Executive Committee
EPA	U.S. Environmental Protection Agency
FY	Fiscal Year
GHG	Greenhouse Gas
ORD	Office of Research and Development
PACTs	Partner Alliance and Coordination Teams
SHC	Sustainable and Healthy Communities
SSWR	Safe and Sustainable Water Resources
STAR	Science to Achieve Results
StRAP	Strategic Research Action Plan
USGCRP	U.S. Global Change Research Program

### Background

This report was drafted by the following members of the BOSC Executive Committee:

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The Climate Change Research Roadmap (Climate Roadmap) Annual Report is a snapshot of some of the key accomplishments, changes, and challenges that have occurred over the past year. Programmatically, 2016 has been a year of substantial effort to refine and implement the Strategic Research Action Plans (StRAPs) for the Office of Research and Development's (ORD) six National Research Programs and the four crosscutting research roadmaps, including the Climate Roadmap. The Climate Roadmap has undergone a major revision in response to comments from the Board of Scientific Counselors (BOSC), with the goal of more effectively highlighting current issues in the context of future challenges. It also was revised to better describe the numerous and dynamic interactions among U.S. Environmental Protection Agency (EPA) partners in Regional and Headquarters Offices, research colleagues in other Federal agencies, and their stakeholders across public and private sectors.

The Annual Report describes selected research accomplishments from across ORD's research programs, which cover a broad range of climate-related research topics of importance to EPA's ability to carry out its mission of protecting human health and the environment. These accomplishments include research on the impacts of climate change on human health; studies of the effects of climate change on watersheds,

estuaries, and nearshore environments, with ultimate impacts on water quality and aquatic ecosystems; expanded understanding of the links between air quality and a changing climate; evaluation of current and possible future greenhouse gas emissions; and approaches to facilitate local decision making on responses to climate change. The most notable of these accomplishments is the publication of *The Impacts of Climate Change on Human Health in the United States*, a product of the U.S. Global Change Research Program (USGCRP), the key findings of which relied on original ORD research.

The cross-EPA interactions associated with developing the revised StRAPs and roadmaps have highlighted the expanding opportunities for integration, interaction, and communication among the research programs, partners, and other agencies on climate change. New venues for interaction, including the topic-level Partner Alliance and Coordination Teams (PACTs) have been initiated to complement the existing cross-program PACT and other communication channels.

A significant indicator of the value of these interactions, including the roadmap revision efforts, is that the recent areas of research emphasis—the climate-health and climate-water quality assessments, wildland fires and integration of social sciences into that research, and emissions of methane—are all the product of substantial cross-program, cross-EPA, and cross-Agency interactions and coordination. The dedication of people from across ORD’s research programs and EPA’s Headquarters and Regional Offices in developing these research areas specifically, and the PACTs more broadly, reflects the commitment across EPA to work in concert to guide, develop, and apply ORD’s climate-related research.

While the expanded interactions and communications have led to growing awareness and consideration of the impacts of climate change across ORD’s programs and EPA’s activities more broadly, they have also highlighted the growing need for information on, and understanding of, climate change and responses to its impacts. The consideration of climate change impacts as an additional stressor in non-climate research areas has expanded the capability of ORD to meet the growing needs, but an increase in capacity has not occurred that would allow ORD to meet the growing demand for continuing needs for research in other areas.

## Charge Questions and Context

**Charge Question 1. Comment on areas of successful integration and implementation as articulated in the related Roadmap. This may include, but is not limited to, the following:**

- Levels of commitment to Roadmap recommendations as incorporated into the ORD StRAPs;
- Coordination across ORD’s six National Research Programs;
- Communication and outreach to partners and stakeholders; and
- Areas of innovation

**Charge Question 2. Provide suggestions for improving implementation of the roadmaps and research integration across the National Research Programs.**

- Are there additional opportunities for implementation or integration not highlighted in the annual report?
- Does “The Year Ahead section” adequately describe the next steps and short-term research areas and commitment?

## General Comments

The refinement of the Climate Change Research Roadmap (Climate Roadmap) was a major accomplishment during this year since the last meeting of the BOSC Executive Committee (EC). There were substantial revisions to the Climate Roadmap, which was tailored to accommodate changes made in the StRAPs and six National Research Programs. According to the Annual Report, the ORD portfolio of publications and presentation materials expanded. Furthermore, it provided evidence of increased collaborations and interactions across research programs and EPA partner offices, and the development of research projects in line with the climate research program.

The contributors to the Climate Roadmap have provided evidence of the successful execution of numerous research studies. These studies evaluated climate change (CC)-related impacts on human health, water quality and aquatic ecosystems, and greenhouse gas (GHG) emissions, and they provided evidence of an advanced understanding of the relationship between CC and air quality. Furthermore, the Climate Roadmap provides examples of approaches to address CC-related issues at local levels. The publication of “The Impacts of Climate Change on Human Health in the United States” is considered a significant achievement; although the report was published by the U.S. Global Change Research Program, it was based on research conducted by ORD.

In one year, more than 360 climate-related research products for internal review, 62 published articles in peer-reviewed journals, and 52 more submitted for internal review before journal submission; overall work in CC-related topics has progressed well to successfully complete many research studies identified in the revised CC Research Roadmap based on comments from the advisory committee. However, it is notable that this CC-related work was completed by different research groups.

## Coordination across National Research Programs

Since CC-related research has inextricable links with the six national research programs, the outcome of research efforts in the Climate Change Roadmap should be relevant and useable by the other research groups and vice-versa. In this context, climate data are being downscaled using approaches developed within the Air, Climate and Energy (ACE) Research Program under different scenarios of climate change. In return, these datasets will be used to model CC impacts on water quality in the Safe and Sustainable Water Resources (SSWR) Research Program. Similarly, outcomes of the impacts of CC-related research studies on coastal ecosystems are equally vital and connected with research objectives under the ACE, SSWR, and the Sustainable and Healthy Communities (SHC) research programs.

From the provided material on CC-related research efforts, there is evidence of effective coordination among all six research programs, and research projects are selected with broad and interdisciplinary applications. The Climate Roadmap Annual Report demonstrates commitment to CC-related issues across the range of ORD topics and projects. It is commendable that children’s environmental health issues are addressed in the Climate Roadmap through the Science to Achieve Results (STAR) grants awarded to investigate links between climate change and indoor air quality. The committee encourages the further pursuit of additional opportunities to coordinate climate-related research activities across all ORD research roadmaps.

## Communication and Outreach

There is evidence that ORD has continued to effectively execute communication and outreach efforts, both by initiatives that connect various initiatives within EPA, and by working with other government agencies.

The PACT meeting is a one such effort that will help with identifying internal expertise and use partner resources in more effective ways. An even better aspect of PACT is that its meetings are scheduled on regular basis. Similarly, a cross-EPA advisory group, consisting of representatives of research programs, will meet on monthly basis to discuss any changes in interagency climate change research priorities and research directions accordingly.

Outreach efforts to broader stakeholder groups outside EPA are commendable as well, which include sending updates on research outcomes and products. In addition, ORD is actively engaged in providing interagency guidance on climate change related issues, communicating its research needs to the other federal agencies, developing fourth quadrennial National Climate Assessment, and so on.

## Areas of Innovation

One activity worth mentioning was to seek public input to identify CC-related issues, and then invite community to identify innovative and best possible solutions to these tentative challenges. This truly is an out-the-box approach that should evolve in innovative strategies to address CC-related challenges in regional perspectives.

## Opportunities for Implementation and Integration

The crosscutting applications of CC research output are being shared with across the board such as Climate Impacts Subcommittee of the Federal Interagency Working Group on Environmental Justice by providing tools, systems, and policies to communities and businesses needed to mitigate impacts on natural resources and human health. Additional research activities will result in establishing interconnection and impacts of nitrogen and carbon cycles on climate change and vice-versa. STAR grants are investigating health impacts on children from changing indoor air quality resulting from climate change. The Annual Report notes that there are several opportunities to coordinate climate-related research activities across ORD roadmaps, and actively pursuing such opportunities is recommended.

## Next Steps and Short Term Research Areas and Commitment

The CC-related research is a dynamic effort and needs periodic review to meet the needs of its stakeholders. In this context, ORD plans to expand its research focused on links between climate change and health impacts and will continue focusing on climate change – wildland fire relationship and the role of social sciences in mitigating and adapting potential CC impacts. Moreover, ORD plans to continue providing guidance in selecting appropriate data and parameters to further refine climate models at local and regional levels under different scenarios.

## Recommendation

By addressing identified issues in the CC Roadmap, ongoing research activities appear to be proceeding in the right direction. The magnitude and scope of research effort may be worth considering, given limited resources. Nevertheless, the CC team should continue its efforts to come up with innovative solutions to address climate change challenges for its stakeholders. The CC Team should also continue regular discussions and meetings for feedback from its partners and interagency experts and should adjust its research directions and priorities accordingly. The integration of children's health issues in the Climate Roadmap through the STAR grant program is noteworthy; additional opportunities to coordinate climate-related research activities across all ORD research roadmaps is encouraged.

- 1. Recommendation 1:** Pursue opportunities to coordinate climate-related research activities across all ORD roadmaps.