

# Integration of Climate Research Across ORD

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# Outline

- Context of ORD's climate research
- Role of ORD's climate research
- Climate research goals
- Climate research activities
- Approach to climate research integration
- Summary



## Context of ORD's climate research

- About \$2.7 billion in Federal research related to climate change and response (\$18 million for ORD)
  - Distinct responsibilities for each agency
- EPA's role in climate change research is to provide data, tools, and understanding needed to support EPA's regulatory activities
  - EPA is not involved in climate science or mitigation technology development

# The role of ORD's climate research

- Support EPA regulatory and implementation efforts
  - Support climate adaptation
    - Assess impacts to human health (via air quality, water quality), ecosystem health
    - Develop information and tools needed to adapt to those impacts
  - Support development of mitigation policies
    - Assess technology performance and environmental impacts
    - Evaluate costs of climate impacts and mitigation approaches



# Climate research goals

- Provide the scientific and technical information needed by EPA to achieve the Agency's strategic goals, in the context of a systems-oriented approach.
  - “Taking action on climate change” is a specific EPA strategic goal and Administrator priority
- Expand the capacity of EPA to employ systems analysis approaches to evaluate the environmental impacts of climate change, adaptation to those impacts, and mitigation to minimize those impacts.
- Develop tools, data, and solutions that address the challenges of climate change in ways that advance sustainability.
- Anticipate the possible environmental impacts of large-scale deployment of new technologies and practices.

## Approach to climate integration

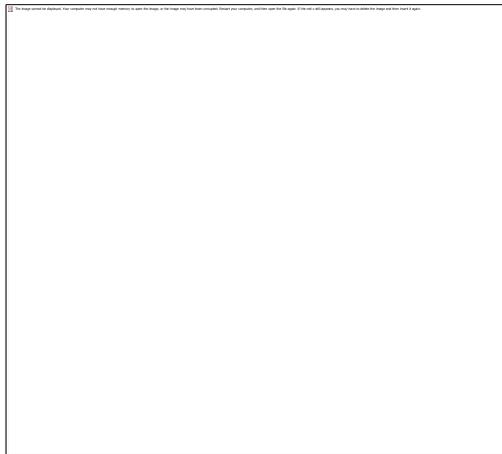
- Dedicated senior-level position leads climate integration effort
- Engaging cross-EPA, cross-Program team to:
  - Identify current research efforts related to climate change
  - Develop plans that incorporate climate-related research questions from partners
  - Identify future, cross-ORD directions for climate research
  - Coordinate across programs to identify where such work is most effectively done
  - Communicate future climate research directions

## Example integrated research efforts

- Connect atmospheric and hydrological models to understand watershed responses to changes in climate, precipitation, and land use (ACE, SSWR, SHC)
- Gain insight into impacts of extreme events, particularly related to water resources, vulnerability of treatment systems, and emergency response (SSWR, ACE, HS)



6 *Floods in Oklahoma, June 2010*



*Wildfires in Moscow, August 2010*



*Floods in Pakistan, August 2010*

## Example integrated research efforts

- Climate impacts to aquatic ecosystems (ACE, SSWR)
- Future energy impacts on water demand (ACE, SSWR)
- Climate-driven changes in ozone concentrations (ACE, HHRA)
- Development and maintenance of National Atlas for Sustainability (SHC, ACE)



*National Atlas for  
Sustainability*

# Integration with federal programs

- Interagency climate research is coordinated through the US Global Change Research Program (USGCRP), under the Committee on Environment, Natural Resources, and Sustainability (CENRS)
- USGCRP coordinates major research directions across 13 Federal agencies
  - EPA’s role as user of Federal research provides greater leveraging of ORD resources
- EPA focus is on impacts to air quality, water quality, and human/ecosystem health and approaches to mitigate and adapt to those impacts



# Integration with EPA activities

- EPA-wide Climate Adaptation Strategy outlines efforts to adapt Agency and external partner (e.g., state, local, industry) activities to adapt to a changing climate
  - Requires development of Agency-wide adaptation research needs
- On-going interactions with Agency partners
  - Frequent conversations with OAR, OW (joint with SSWR), Regions
  - Growing involvement with development and review of Office-specific strategies (e.g. OW's Energy-Water Principles)

# Integration across ORD programs

- Cross-program interactions with partner offices
- Monthly coordination meeting brings together Lab/Center, program, and partner representatives to discuss activities, opportunities, progress
- Integrating at the PI level – many PIs work with on research under ACE, SHC and/or SSWR
- Climate research roadmap outlines goals and challenges to guide development of climate-related work in each ORD research program

# Integration across disciplines

- Climate change impacts, and is impacted by, natural and human systems (e.g., energy, agriculture, cities, economy)
  - Impacts are global and long term, resulting in changes to these systems and how they interact
  - Systems analyses need input from across the spectrum of science and engineering disciplines – many projects incorporate these capabilities from the outset
- It is critical to develop transdisciplinary efforts
  - Particular emphasis placed on integration of social sciences into research to understand interactions between human and natural systems
  - ORD has growing expertise in policy, economics, and decision science

# Summary

- Climate change is highly complex, long term, and impacts all environmental systems and human systems that rely on the environment
- Climate change therefore impacts nearly all of EPA's activities and cuts across ORD's research programs
- The basic goal of ORD's climate integration effort is to work across ORD, EPA, and federal programs to support the partners' highly diverse climate change science needs
  - Challenge is to balance diverse, near-term partner needs and long-term scientific questions



# Additional Material

# Integration with Federal and other partners - Examples

- USGCRP (13 agencies)
- Climate Change and Water Working Group (CCAWWG) (6 agencies)
- Atmospheric modeling efforts (NASA, NOAA, NCAR)
- Ecosystem studies (USGS)
- National Climate Assessment – involves several research and assessment efforts, participation in NCA development (DOI, USDA)
- Climate Smart Workgroup (NOAA, FS, NPS, USGS)
- MARKAL energy systems modeling (DOE, USDA)
- Technical work group (NAS Ocean Board)

# Climate research activities

- Understand impacts of climate on water utilities, approaches for adaptation (SSWR, ACE)
- Connect atmospheric and hydrological models to understand watershed responses to changes in climate, precipitation, and land use (ACE, SSWR, SHC)
- Gain insight into impacts of extreme events, particularly related to water resources, vulnerability of treatment systems, and emergency response (SSWR, ACE, HS)

Text in blue indicates increased focus on systems-oriented approach to support sustainable solutions, underlined text indicates highlighted innovative approaches

## Climate research activities (Cont'd)

- Development and maintenance of National Atlas of Ecosystem Services (SHC, ACE)
- Community-scale approaches to materials management, transportation, and the built environment impact (SHC, ACE)
- Direct health impacts of heat stress (ACE, HHRA)
- Climate-driven changes in ozone concentrations (ACE, HHRA)

Text in blue indicates increased focus on systems-oriented approach to support sustainable solutions, underlined text indicates highlighted innovative approaches

## Climate research activities (Cont'd)

- Climate impacts to aquatic ecosystems (ACE, SSWR)
- Global warming potential of new chemicals (ACE, CSS)
- Air quality and climate interactions (ACE)
- Innovative modeling approaches to evaluate combined health and climate benefits (ACE)
- Evaluating links between energy system futures and emissions of GHGs and air pollutants (ACE)

Text in blue indicates increased focus on systems-oriented approach to support sustainable solutions, underlined text indicates highlighted innovative approaches

## Climate research activities (Cont'd)

- Future energy impacts on water demand (ACE, SSWR)
- Assessment of environmental impacts associated with GHG mitigation approaches and technologies (ACE)
- Interactions between adaptation and mitigation options (ACE)
- Decision making with uncertainty (ACE)
- New methods for measuring fugitive and area source GHG emissions (ACE)

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