Science for Resilience in a Changing Climate

TR ISSUE SUMMARY:

Understanding the impacts of a changing climate on human health and the environment – and developing the science to help communities adapt and build resilience to those impacts – are key challenges of the coming decade. A critical charge for EPA science is to characterize the specific and system-wide risks associated with a changing climate and extreme events, such as extreme heat, drought, flooding, and wildfires. Another critical charge for EPA is to identify and evaluate science-based responses to reduce the impacts of a changing climate and build resilience of communities and ecosystems in both the near and long term.

EPA's research on adaptation and resilience in the face of a changing climate includes:

- Studying how extreme heat, wildfires, heavy precipitation, flooding, and drought affect air and water quality and human health.
- Understanding the public health impacts of climate-driven increases in ozone and particle air pollution.
- Determining how exposure to the complex combination of extreme heat and air pollution, including wildfire smoke, affects human health, particularly for vulnerable individuals and in overburdened communities.
- Developing information and tools that communities and individuals can use to reduce exposures and protect themselves from wildfire smoke.
- Advancing ways to monitor and prepare for the impacts of a changing climate and extreme events on U.S. water infrastructure, waste management facilities, and Superfund sites.
- Developing new measurement approaches that can enable us to better measure methane from sources such as landfills, oil and gas, and reservoirs.
- Understanding how a changing climate may affect natural resources – such as forests, wetlands, streams, and freshwater lakes – that are also affected by air pollution and deposition.
- Exploring how nature-based solutions can help both mitigate climate impacts – from exposure to extreme heat and urban heat island effects to coastal vulnerabilities – and build resilience.

UPCOMING MILESTONES:

- EPA researchers will be updating climate change and sea-level rise projections in the Global Change Explorer. The Global Change Explorer includes tools and data to inform adaptation planning.
- The EPA Dynamically Downscaled Ensemble ("EDDE"), recently released and is publicly available through the Amazon Web Service (AWS) Open Data project, is providing climate projections at high spatial and temporal resolutions in order to explore potential changes in extreme events. These datasets will be updated for even higher frequency and increased spatial resolution, as well as including the U.S. Caribbean, and will utilize the most state-of-the-art global climate modeling simulations (called CMIP6).

BACKGROUND:

Research Highlights

- EPA researchers help communities and individuals address the immediate threats created by wildfires, floods, droughts, and other extreme events and prepare and respond to the current and future impacts of a changing climate. Examples include:
    - The Wildfire Study to Advance Science Partnerships for Indoor Reductions of Smoke Exposures project worked directly with stakeholders to identify what information they need to effectively communicate actions that building owners and the public can take to reduce public health risks during smoke episodes, including DIY solutions.
    - Working with Region 10, EPA researchers are co-creating knowledge with Alaskan Tribes and rural communities on research and solutions for waste management in a landscape affected by climate change via permafrost degradation, erosion, and flooding.
    - The Equitable Resilience Builder (ERB) engages users in a guided process to inclusively assess local hazards, equity, and the resilience of built, natural, and social environment systems. Results can be used to collaboratively prioritize actions to build community resilience in an equitable way.
    - EPA developed the Adaptation Organon, a tool to build the capacity of EPA regions, partners, and local stakeholders to incorporate resilience and adaptation into programs and projects for sustainable natural resources such as coral reefs, streams, and salmon refugia. This work supported Region 9 in their Wetland Program Development Grants process to highlight resilience- and EJ-based planning.
- EPA researchers identify and quantify the public health and environmental benefits of strategies that increase community resilience and increase natural stores of carbon. Examples include:
    - EPA researchers are working with the community of Crisfield, Maryland to build resilience to coastal flooding by exploring nature-based solutions—such as marsh restoration, living shorelines, sand dune restoration, some of which can also provide carbon storage benefits.
    - EPA is studying how climate change and atmospheric deposition of nitrogen and sulfur impact the health and productivity of forests, finding that aboveground carbon sequestration and forest diversity were negatively impacted by modelled changes in climate.
- EPA researchers study how climate change impacts habitat for economically and culturally important species.
    - EPA researchers used high-resolution modeling to evaluate the impact cold-water refuges can have on the migration of salmon and trout during high-temperature days. Refuges can help salmon and trout fish maintain a diversity of migration patterns, which influence their survival and reproductive potential.

Federal Coordination

EPA coordinates with other agencies as a member of the U.S. Global Change Research Program (USGCRP). The USGCRP was established by Congress in 1990 to coordinate federal research and investments in understanding the forces shaping the global environment, both human and natural, and their impacts on society. USGCRP facilitates collaboration and cooperation across 15 federal member agencies. Research supported by USGCRP informs the Nation in navigating the challenges of a changing environment and identifying opportunities for a more resilient future. The USGCRP produces major assessments, including the Congressionally mandated National Climate Assessment. The 5th National Climate Assessment was released in November 2023 and the 6th National Climate Assessment is currently underway. The USGCRP is also accelerating the development of Climate Services, which are

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scientifically based, usable information, products, and activities that enhance knowledge and understanding about the impacts of climate change on potential decisions and actions.

Integrated Climate Sciences Division

In 2023, EPA established the Integrated Climate Sciences Division (ICSD) in ORD to advance climate-focused initiatives to address urgent priorities identified by EPA's program, regional, state, and Tribal partners and to advance critical scientific assessments of the climate impacts to EPA mission areas. The ICSD is focused on providing climate services within EPA, including through the Regional Climate Assistance Network (RCAN) – a central hub for EPA regional climate adaptation, resilience, and mitigation science needs that fosters community-engaged research.

KEY EXTERNAL STAKEHOLDERS:

☐ Congress ☐ Industry ☒ States ☒ Tribes ☐ Media ☒ Other Federal Agency
☐ NGO ☒ Local Government ☐ Other (Local unions)

States, Tribes, and local governments need information to make decisions to that will help protect their communities and build resilience in the face of extreme events.

MOVING FORWARD:

- EPA is committed to helping communities build resilience in the face of a changing climate and will continue its research to help inform federal, state, and local actions that advance resilient communities. EPA research will continue to:
  - Assess the consequences of climate change and the vulnerability of communities and ecosystems to climate change impacts, including wildfires and other extreme events, and identify and evaluate strategies to adapt and build resilience to these impacts.
  - Improve wildfire readiness by enhancing wildfire data and communications related to air quality and helping communities become "smoke ready." Smoke-ready communities benefit community health by coordinating community-level action related to monitoring outdoor air quality, creating clean indoor air, and communicating actionable public health messaging.
  - Provide human exposure and environmental modeling, monitoring, metrics, and information needed to inform air quality and climate change decision-making at the federal, state, Tribal, and local level.
  - Support regional offices, state, Tribal, and community partners in addressing increased needs for scientific information and tools to inform effective climate change actions at state and local scales.

LEAD OFFICE/REGION: ORD OTHER KEY OFFICES/REGIONS: OAR, REGIONS