

COMMUNITY RESEARCH ON CLIMATE AND URBAN SCIENCE (CROCUS)

The Chicago Urban Integrated Field Laboratory led by Argonne National Laboratory



Funded by the U.S. Department of Energy, CROCUS seeks to advance climate and urban science to inform adaptation and energy solutions that promote social equity and strengthen community-scale resilience across urban landscapes.

OVERVIEW

An Urban Integrated Field Laboratory called Community Research on Climate and Urban Science (CROCUS) is focusing on the Chicago region. CROCUS studies the feedbacks between urban systems and climate, including the impacts and interactions between climate, energy, and environmental justice. CROCUS uses community input to identify questions and specific areas of urban climate change to study, ensuring that research results directly benefit local residents. While Chicago is the center of this study, the new insights and lessons learned will help researchers create a blueprint to

assist other cities across the country and around the world as they work to become climate change resilient.

CROCUS leverages existing, extensive observational and modeling capabilities and empowers and actively involves diverse communities as part of the research team to identify the right research questions to enable just, long-term societal benefits from climate mitigation and adaptation, such as reducing greenhouse gas emissions and adapting neighborhoods to address future effects of climate change. Through the planned research activities, CROCUS provides extensive educational opportunities to students

from Minority Serving Institutions and Historically Black Colleges and Universities, as well as charts the path to novel climate-focused careers.

CHICAGO-BASED UIFL

Climate change has compounded challenges in Chicago's low-income, predominantly minority neighborhoods by amplifying heat islands, poor air quality, high energy costs, and flooding. These challenges are pervasive and negatively impact the economic, social, and health status of these communities, yet they are historically poorly understood.

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Long-standing environmental injustice conditions have created unequal degrees of protection in these communities from environmental, economic, and health hazards exacerbated by climate change.

As a large city with a Great Lakes coastline, Chicago has significant environmental justice issues, a complex water system, and heterogeneous atmospheric and climate conditions at the local level. Chicago presents an urban ecosystem ripe for in-depth study. This work will also inform research in other urban settings and the adoption of climate solutions in other communities elsewhere most vulnerable to climate change.

THE PLAN

The CROCUS research approach integrates observations and modeling of local climate change and its impact on scales as granular as a city block or more. Example areas emphasize:

- **Observations** with a network of deployed climate sensors, to provide the most granular assessment of environmental conditions that are currently unavailable;
- **Modeling with high performance computing**, including artificial intelligence and machine learning;
- **Partnering** with Minority Serving Institutions (MSI) and Historically Black Colleges and Universities (HBCU) around scientific research, educational and workforce development opportunities;
- **Impact of Lake Michigan** on Chicago's climate;
- **Clean energy transition** scenarios development and assessment in underserved communities;
- **Communities help researchers** identify the most pressing research questions.

CROCUS includes a collaborative team with community and environmental justice leaders, scientific community, and institutional stakeholders in the region. The insight the scientific team receives from these stakeholders informs the scientists' research and positions the stakeholders as active contributors to CROCUS.

MSIs and HBCUs are significant CROCUS contributors. They actively contribute to the scientific research, bridge urban communities with the researchers, grow the climate-related research capacity of the region, improve researcher diversity to address the underrepresentation of people of color in the nation's scientific workforce, and train the next generation of climate and environmental workforce.

The CROCUS team includes Argonne National Laboratory, academic institutions (CIEMAT in Spain, Chicago State University, City Colleges of Chicago, North Carolina A&T State University, Northeastern Illinois University, Northwestern University, University of Chicago, University of Illinois at Chicago, University of Illinois Urbana-Champaign, University of Notre Dame, University of Wisconsin-Madison, University of Texas-Austin, and Washington University-St. Louis) and community organizations (Blacks in Green, Greater Chatham Initiative, Puerto Rican Agenda, and the Metropolitan Mayors Caucus).

SUMMARY

According to the United Nations Department of Economic and Social Affairs, 55% of the world's population lives in urban areas, and this fraction is expected to increase to 68% by 2050. It is, therefore, imperative to understand, intervene, and mitigate climate change impacts in urban settings. CROCUS environmental

scientists are building the foundation for an urban climate research ecosystem that responds to this need and will eventually expand to include broader themes, such as community health and socioeconomic implications, efficient transportation, and others.

CROCUS is pursuing the fundamental scientific understanding that will ultimately be necessary to inform the design and deployment pathways of technical solutions that promote social equity and enhance urban resilience in response to the climate crisis. In doing so, CROCUS is training and educating a skilled workforce that will be engaged and productive in the transition to a clean energy urban system.

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