

DOE Plans to Compete Geographically Diverse, Highly Instrumented Field Laboratories for Climate Research

The Department of Energy (DOE) Office of Science plans to compete new Urban Integrated Field Laboratories at the end of calendar year 2021. The fiscal year (FY) 2022 budget request through the Biological and Environmental Research program would provide \$17 million to help launch these new field laboratories that would build integrated models and tools that improve understanding of the interdependence of the natural and human components of the climate system. Awards for these field labs would likely range from \$1 million to \$2 million a year over five years. Cities are seen as critical to informing future climate policy because the urban landscape is where the majority of industry operates, consumers live, and power is consumed, but there is a gap in understanding how human activity in urban areas impacts our climate system. While urban areas currently represent a small percentage of the terrestrial surface, they are the primary user of energy and generate more than 70% of the global greenhouse emissions. However, urban systems have been left out of climate models and are not part of most climate observing systems.

The initial scope would target a diverse set of urban regions around the country with the purpose of developing a science framework for advancing observational and prediction capabilities. The initial focus would be on tackling three specific interdependent challenges: constraining climate changes and its impacts on all scales across urban regions; evaluating the mitigation-potential for emerging energy technologies in urban regions and beyond; and addressing environmental justice through neighborhood scale evaluation of climate impacts and energy needs. The field data would feed into DOE's next-generation Earth System Modeling framework and provide state and local governments, and impacted communities, with the best possible tools to evaluate societal and environmental impacts of current and future energy policies.

A network of field laboratories could focus on scientific questions that investigate the consequences of both rapid urbanization and a changing physical climate system. The field labs could develop a new class of instruments, modeling tools, and data management techniques to address key science questions on carbon, water, and energy cycles within human-dominated landscapes. Areas of interest may include the urban atmosphere, built systems such as buildings and roads, terrestrial ecosystems such as soil and vegetation, and aquatic ecosystems such as rivers, lakes and coastal regions. Specific grand challenge questions may include:

- How does climate change cause and respond to human systems across heterogeneous urban landscapes?
- What are the dynamic connections involving climate extremes, infrastructure risk, and vulnerable population groups?
- How will uncertainties in predictions be constrained by using observational, modeling, and analytic systems?

Examples of geographically diverse cities that would be good candidates and have been highlighted in prior advisory committee meetings include:

- Baltimore, Maryland
- Boston, Massachusetts
- Chicago, Illinois
- Denver, Colorado
- Indianapolis, Indiana
- Knoxville, Tennessee
- Los Angeles, California
- New York, New York
- Phoenix, Arizona
- Portland, Oregon
- Salt Lake City, Utah
- San Francisco/Oakland, California
- Seattle, Washington