11 Built Environment, Urban Systems, and Cities

Cleveland, Ohio

Key Message 1

Impacts on Urban Quality of Life

The opportunities and resources in urban areas are critically important to the health and well-being of people who work, live, and visit there. Climate change can exacerbate existing challenges to urban quality of life, including social inequality, aging and deteriorating infrastructure, and stressed ecosystems. Many cities are engaging in creative problem solving to improve quality of life while simultaneously addressing climate change impacts.

Key Message 2

Forward-Looking Design for Urban Infrastructure

Damages from extreme weather events demonstrate current urban infrastructure vulnerabilities. With its long service life, urban infrastructure must be able to endure a future climate that is different from the past. Forward-looking design informs investment in reliable infrastructure that can withstand ongoing and future climate risks.

Key Message 3

Impacts on Urban Goods and Services

Interdependent networks of infrastructure, ecosystems, and social systems provide essential urban goods and services. Damage to such networks from current weather extremes and future climate will adversely affect urban life. Coordinated local, state, and federal efforts can address these interconnected vulnerabilities.

Key Message 4

Urban Response to Climate Change

Cities across the United States are leading efforts to respond to climate change. Urban adaptation and mitigation actions can affect current and projected impacts of climate change and provide near-term benefits. Challenges to implementing these plans remain. Cities can build on local knowledge and risk management approaches, integrate social equity concerns, and join multicity networks to begin to address these challenges.

Executive Summary

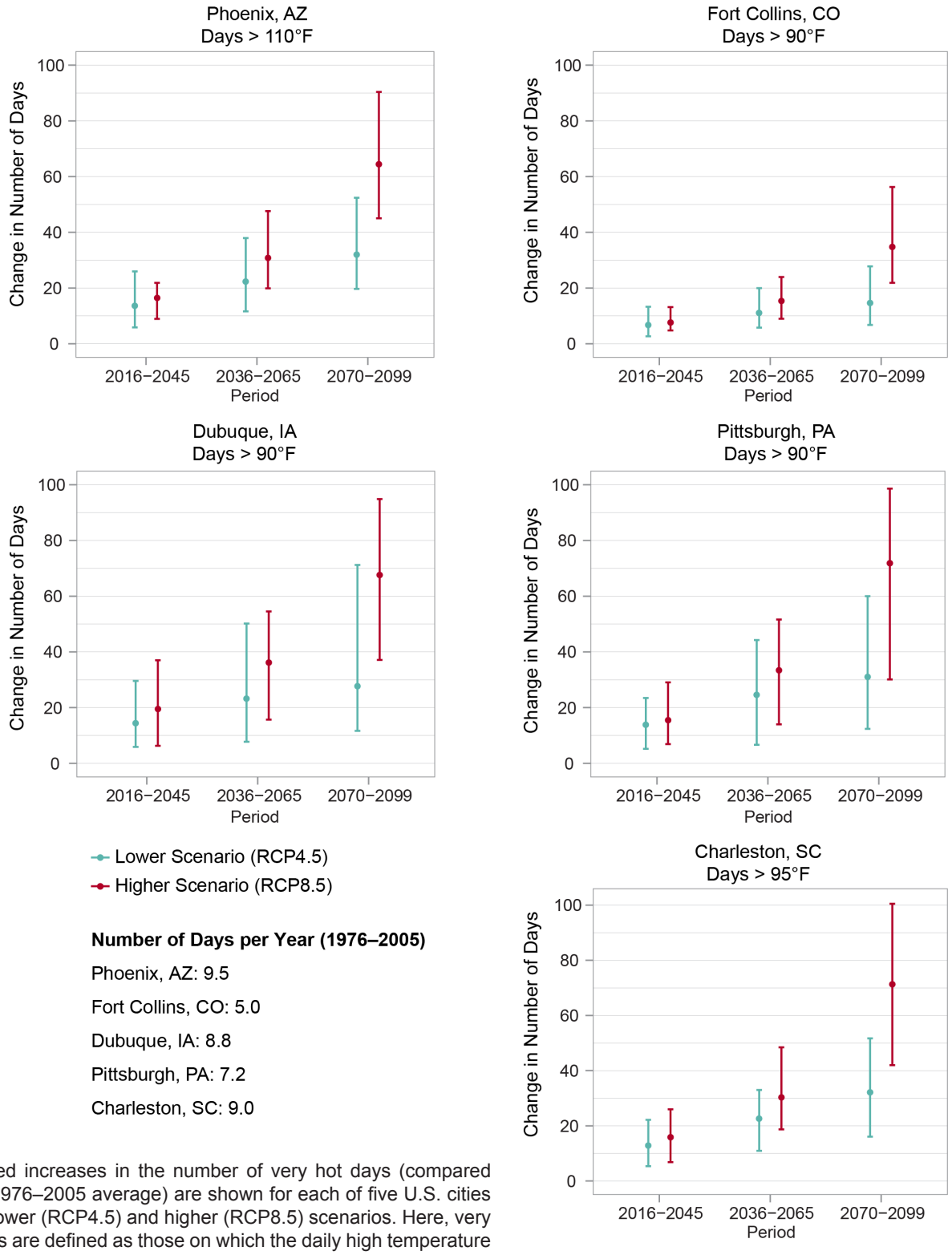
Urban areas, where the vast majority of Americans live, are engines of economic growth and contain land valued at trillions of dollars. Cities around the United States face a number of challenges to prosperity, such as social inequality, aging and deteriorating infrastructure, and stressed ecosystems. These social, infrastructure, and environmental challenges affect urban exposure and susceptibility to climate change effects.

Urban areas are already experiencing the effects of climate change. Cities differ across regions in the acute and chronic climate stressors they are exposed to and how these stressors interact with local geographic characteristics. Cities are already subject to higher surface temperatures because of the urban heat island effect, which is projected to get stronger. Recent extreme weather events reveal the vulnerability of the built environment (infrastructure such as residential and commercial buildings, transportation, communications, energy, water systems, parks, streets, and landscaping) and its importance to how people live, study, recreate, and work.

Heat waves and heavy rainfalls are expected to increase in frequency and intensity. The way city residents respond to such incidents depends on their understanding of risk, their way of life, access to resources, and the communities to which they belong. Infrastructure designed for historical climate trends is vulnerable to future weather extremes and climate change. Investing in forward-looking design can help ensure that infrastructure performs acceptably under changing climate conditions.

Urban areas are linked to local, regional, and global systems. Situations where multiple climate stressors simultaneously affect multiple city sectors, either directly or through system connections, are expected to become more common. When climate stressors affect one sector, cascading effects on other sectors increase risks to residents' health and well-being. Cities across the Nation are taking action in response to climate change. U.S. cities are at the forefront of reducing greenhouse gas emissions and many have begun adaptation planning. These actions build urban resilience to climate change.

Projected Change in the Number of Very Hot Days



Number of Days per Year (1976–2005)

Phoenix, AZ: 9.5

Fort Collins, CO: 5.0

Dubuque, IA: 8.8

Pittsburgh, PA: 7.2

Charleston, SC: 9.0

Projected increases in the number of very hot days (compared to the 1976–2005 average) are shown for each of five U.S. cities under lower (RCP4.5) and higher (RCP8.5) scenarios. Here, very hot days are defined as those on which the daily high temperature exceeds a threshold value specific to each of the five U.S. cities shown. Dots represent the modeled median (50th percentile) values, and the vertical bars show the range of values (5th to 95th percentile) from the models used in the analysis. Modeled historical values are shown for the same temperature thresholds, for the period 1976–2005, in the lower left corner of the figure. These and other U.S. cities are projected to see an increase in the number of very hot days over the rest of this century under both scenarios, affecting people, infrastructure, green spaces, and the economy. Increased air conditioning and energy demands raise utility bills and can lead to power outages and blackouts. Hot days can degrade air and water quality, which in turn can harm human health and decrease quality of life. *From Figure 11.2 (Sources: NOAA NCEI, CICS-NC, and LMI)*.