



Tackling Urban Heat

A LEED for Cities Case Study Featuring Cincinnati, OH; Louisville, KY; and Miami Beach, FL

Globally, Earth's surface temperature is on the rise, with 2020 meeting and nearly beating past records. The impact of warming in cities is dramatic, where surfaces like rooftops and roadways absorb heat, increasing temperatures and creating what is called the urban heat island effect.

From a public health perspective, heat waves and extreme heat can be deadly. When combined with air pollution, heat exacerbates conditions like asthma and respiratory disorders. As urban heat intensifies, building occupants need to cool off their indoor environments too, causing utility bills and associated emissions to soar.

Sharing replicable strategies and effective approaches that certified LEED cities have taken helps other places advance progress. The following case studies from Louisville, KY; Miami Beach, FL; and Cincinnati, OH highlight challenges and paths forward for reducing urban heat and improving residents' quality of life in warming cities.

Louisville, Kentucky

"We know that our urban heat island can cause, at times, a 10 degree difference between our urban areas that have lots of pavement and buildings versus our more rural and suburban areas with lots of tree canopy and green space."

**– Julie Donna, Sustainability Coordinator,
Louisville Metro Government**

Louisville, KY's journey to address urban heat began in 2012, when the city undertook a comprehensive Urban Heat Management Study. The first assessment of its kind conducted by a major city, the study found that temperatures in downtown Louisville can be up to 10°F higher than in surrounding areas. Around the same time, the Urban Climate Lab identified Louisville as the fastest-growing urban heat island of all the cities it surveyed. "This really woke us up," says Julie Donna, sustainability coordinator for Louisville Metro Government.

Since identifying Louisville's urban heat problem, local leaders have moved quickly to identify effective strategies for mitigation and adaptation. Because urban heat does not affect all residents equally, sustainability and planning staff must also address the impacts of historical inequities: across Louisville, tree coverage is lower and temperatures are higher in historically redlined neighborhoods, where Black and low-income community members have fewer resources to help them stay cool.

To improve residents' quality of life and reduce its urban heat island effect, the city of Louisville is implementing the following measures:

- **Investment in cool and reflective roofs** through the Cool Roof Rebate Program, which offers a \$1 per sq. ft. rebate for installing an ENERGY STAR roof on any type of property. In addition to cooling the city, property owners who install light or reflective roofs save 7 to 15 percent on cooling costs. To focus on the communities that can benefit the most from this program, Louisville Metro Government has devoted 70 percent of the program's funding on high-heat neighborhoods affected by redlining. Since 2017, the Cool Roof Rebate Program has incentivized the installation of over 820,000 sq. ft. of cool roofs.
- Rolling out the Green Heart Louisville program to **test the effects of greening on health and wellbeing** in high-heat neighborhoods. Led by the University of Louisville's Envirome Institute, the program is the first and only controlled study that investigates urban greening as though it were a pharmaceutical intervention. In addition to planting trees along highways and in residential areas, public and private partners will conduct environmental monitoring and medical evaluations to find potential correlations with heart disease, diabetes, stress, and social ties.
- The community-driven transformation of Parkland Plaza from an unused, city-owned parking lot to a **sustainable neighborhood green space**. Partnering with residents of the high-heat Parkland neighborhood, Metro Government officials hope to integrate as many cooling elements as possible into the renovated plaza, including partial de-paving, planting trees, and the installation of cool pavement.



Miami Beach, Florida

"Whenever we're looking at the species of trees that we'll be planting across the city, we're taking into consideration trees that are resistant to drought, trees that are resistant to saltwater intrusion."

– Flavia Tonioli, Sustainability Manager, City of Miami Beach

Back in the 1960s, the city of Miami Beach, FL, experienced approximately 85 days a year where temperatures reached 90°F, according to the Climate Impact Lab. By the end of the 21st century, these high temperatures are expected to occur between 147 and 184 days per year. Sustainability and planning staff in Miami Beach are testing and implementing strategies focused on adapting the city's infrastructure and utilizing its zoning code to meet this warming trend head-on.

Miami Beach is also meeting other challenges associated with warming, including sea level rise, saltwater intrusion, and stormwater management. Key interventions in the built environment are designed to address multiple, related climate challenges at the same time. In particular, building out the city's urban tree canopy is essential to meeting Miami Beach's sustainability and resilience goals.

Local leaders in Miami Beach are relying in part on city ordinances to keep residents cool in the face of climate change and urban heat:

- In 2019, Miami Beach passed an [**Urban Heat Island Ordinance**](#) to specifically **address the impacts of the urban heat island effect**. Provisions for sustainable roofing, solar carports, and cool or porous pavement are designed to limit the warming effect of new construction.
- Under the [**Green Building Ordinance**](#), all new construction over 7,000 sq. ft. must either be **certified LEED Gold** or meet the Living Building Challenge. If new buildings are unable to comply, they pay a noncompliance fee that supplements a sustainability fund used for public works and resiliency investments.
- **Landscaping and tree provisions** in the city zoning code are designed to grow the urban tree canopy in sustainable ways. Requirements for tree planting, removal, and preservation are paired with minimum percentages of native and drought- or salt-tolerant trees to proactively address urban heat and other climate challenges.
- Adopted in October 2020, Miami Beach's first [**Urban Forestry Master Plan**](#) aims to **increase canopy coverage** to 22 percent by 2040 and replace many of the city's palm trees with trees that provide more shade and ecological benefits.

How the City of Miami Beach Tackles Urban Heat

Landscaping and tree provisions in the city's zoning code take steps to expand the tree canopy and keep residents cool

- Minimum number of trees on new construction sites
- Requirements for tree removal and preservation
- No less than 30 percent of required trees planted will be native species
- At least 50 percent of required trees planted will be low maintenance or salt- or drought-tolerant
- Provisions to ensure diversity of species among required trees
- Guidance about percentage of landscaped areas in parking lots
- Guidance about percentage of open space in single-family homes



Takeaways

- Climate change is making it all the more important for cities and counties to address urban heat by reducing its effects and safeguarding residents' quality of life.
- By mapping the effects of urban heat in a particular place, sustainability and planning staff can focus time and resources on the most-affected residents and neighborhoods.
- Targeted interventions in tree canopy expansion and preservation, sustainable roofs and roadways, and other infrastructure and amenity projects can substantially mitigate the effects of urban heat.
- Reducing urban heat can go hand-in-hand with addressing other concerns such as energy efficiency, public health, and historical inequity.
- Cities and counties getting started on addressing their urban heat islands can use the LEED for Cities rating system to find technical guidance, resources, and additional case studies of communities leading the way in urban heat mitigation and adaptation.

Cincinnati, Ohio

"So many of the problems we are trying to address today were problems that were written into institutional policy in our past. Understanding the policies that engendered this problem today is a big part of undoing and correcting these issues."

- Oliver Kroner, Sustainability Coordinator, Cincinnati, OH

In Cincinnati, OH, local leaders are strategizing to mitigate the urban heat island effect with policies and programs that are mindful of the city's geographic constraints and historical inequities. Cincinnati's hilly landscape limits airflow through the city, leading to high rates of asthma and other respiratory conditions that are exacerbated by heat waves and extreme heat. Neighborhoods with the worst respiratory conditions are more likely to be home to low-income residents and residents of color, placing equity front and center in the city's approach to mitigating urban heat.

In order to assess the problem, the Cincinnati government received a grant from the National Oceanic and Atmospheric Administration to study the city's urban heat island effect. Citizen scientist volunteers collected over 10,000 data points over the course of a day to isolate high-heat areas, mostly concentrated along highways and in industrial areas.

Sustainability and planning staff are implementing several measures to reduce Cincinnati's urban heat island effect and address its disproportionate impact on the city's most vulnerable residents:

- Cincinnati has recently revised its citywide goal of 40 percent tree canopy coverage to make **targeted improvements to high-heat neighborhoods**. While tree coverage in some neighborhoods exceeds 70 percent, some historically redlined neighborhoods have less than 10 percent. With these equity concerns in mind, the city has pivoted to ensuring a residential neighborhood minimum of 30 percent coverage.
- **Pavement reduction and heat reflection** are also promising strategies for reducing urban heat in Cincinnati. City officials have rolled back parking lot requirements in select zones and are piloting a reflective sealant that cools pavement.
- The city is also **investing in indoor and outdoor cooling stations**. **In addition to recommending** that all rental units have at least one air-conditioned room, sustainability staff have also driven investment in public pools and spraygrounds that keep residents cool at a low cost.



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Photos courtesy of Louisville Metro Government, City of Miami Beach, and City of Cincinnati