

Cities and States Struggling With Mitigation of Urban Heat Islands

As summer approaches, cities across the country are faced with a problem that only promises to intensify: urban heat islands. These spots of warmth occur when metropolitan air and surface temperatures are higher than those in surrounding rural areas due to greater impervious, heat-retaining surfaces, more buildings producing their own heat, and less shady vegetation. These effects, according to EPA, can result in pavement and roof top temperatures between 50 and 90 degrees Fahrenheit hotter than air temperatures. In large cities, mean air temperatures can range between 1.8 degrees and 5.4 degrees higher than in surrounding undeveloped areas. Evening temperatures can vary by over 20 degrees.

Urban heat islands are associated with a range of negative environmental effects including greenhouse gas emissions and other air pollution resulting from increased energy use to cool buildings; water quality impairment from high temperature stormwater runoff into rivers, streams, and lakes that harms aquatic species; and increased tropospheric smog-causing ozone. In addition, urban heat islands can cause serious health consequences, particularly for the elderly and other vulnerable populations. Heat island effects are also costly: expenditures include increased electricity bills for consumers and local governments, emergency response costs, and financing of mitigation measures.

Urban heat island temperatures are likely to increase even further as temperatures rise due to climate change. The Intergovernmental Panel on Climate Change concluded, however, that heat islands “have not biased the large scale trends.” Rather, the effects of heat islands “are real but local” and can in-

fluence precipitation, clouds, and daily temperature range.

Not only southern cities are experiencing these local heat island effects. For example, a Georgia Institute of Technology study found that among the top 20 urban areas with the fastest growing heat islands were, not surprisingly, cities such as Phoenix and Las Vegas, but also Louisville, Detroit, and Portland. In fact, Louisville topped the list, with urban temperatures as much as 20 degrees higher than in surrounding rural areas.

As a result, cities and states across the country are addressing heat islands with both adaptation and mitigation measures. Key mitigation features include cool roofs that reflect sunlight; green roofs that absorb sunlight and water; cool pavement that absorbs runoff and reflects sunlight; and urban forests that produce shade. These tools

can “drastically reduce the urban heat island effect,” according to the Georgetown Climate Center’s “Adapting to Urban Heat: A Tool Kit for Local Governments.”

The Natural Resources Defense Council estimates that green and cool roofs can reduce urban temperatures by as much as 3.5 degrees. In addition, a 2012 NRDC study found that if half the structures in southern California had green or cool roofs, it would reduce energy usage by an amount that could power 127,000 homes, save \$211 million in annual energy costs, and reduce carbon emissions by 465 metric tons per year.

The Tool Kit cites a plethora of policy approaches, including mandates, incentives, education, and government operations. For example, to promote cool roofs, cities can lead by example by installing them on new city-owned buildings, revising building codes to mandate cool roofs on certain build-

“Cool roofs” and more shady vegetation are some of the measures being promoted



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ing types, adopting utility rebate programs, and establishing outreach and education programs with utilities and community groups.

In addition to mitigation measures, cities can adapt by preparing for emergencies associated with heat island effects. EPA recommends that cities develop comprehensive heat response plans that could include forecasting and monitoring, education and awareness, and response options. Common response options adopted by cities include activating hotlines, providing transportation to air conditioned city-owned facilities, and prohibiting utilities from cutting off service.

Not only cities but states are taking actions to address heat islands. Among the approaches states can adopt are procurement policies, state building codes, and green building standards that require cool technologies, green roofs, or tree preservation in connection with government and private buildings. States also can incorporate into their State Implementation Plans under the Clean Air Act heat island mitigation measures that reduce concentrations of ground-level ozone. According to EPA, state SIPs already incorporate measures to address heat islands in Atlanta, Houston, Sacramento, and Washington, D.C.

Many localities and states already are addressing heat islands, but these mitigation and adaptation efforts will need not only to continue but to increase and spread as cities grow hotter in a warming world.