



Dealing with Urban Heat

New building techniques, cool pavements and greenery combat urban heat islands.

BY JOHN KOSOWATZ

This year's scorching summer heat was especially felt in cities and urban areas where development has displaced natural surfaces. The urban heat island effect, where cities experience higher air temperature than the surrounding countryside, again showed the importance of natural surfaces to help moderate air temperatures. It is expected that about 70 percent of the world's population will live in cities by 2050, a United Nations prediction that makes finding solutions to blistering urban heat more pressing.

Urban heat islands can pose great health risks from heat stroke and heat exhaustion to heart attacks. Cities consume more energy to cope with higher temperatures, worsening air pollution from plants burning fossil fuels. To lessen the effects, cities can add vegetation, which may reduce temperatures as much as 4 °F. Building green roofs and cool pavements and roofs reflect more sunlight and absorb less heat. Here are some methods for reducing high urban temperatures.

COOL PAVEMENTS

Thermal infrared (left) and visible (right) images of a road with light and dark segments. The infrared image shows the light segment (bottom) is about 17° C cooler than the dark segment (top).
Image: Larry Scofield, APCA

Phoenix may be the poster child for urban heat islands because of its desert location and large population. In 2020 city officials started a cool pavement program using a water-based asphalt treatment applied to the top of existing asphalt. After one year of study, they found cool pavement had an average surface temperature between 10.5 °F and 12 °F lower than standard asphalt between noon and late afternoon. Surface temperature was lower at all times of the day compared to asphalt.

TREES AND VEGETATION

- By intercepting and absorbing rain, they reduce stormwater runoff.
- They absorb and store carbon dioxide.
- By creating shade for buildings, they can reduce energy demand, which also reduces waste heat from air conditioners.
- They can help clean the air by taking in air pollutants.
- In a process known as **evapotranspiration**, trees take up water from the ground and release it through the surface of their leaves, cooling the surrounding air.
- They block sunlight, helping to keep the ground below cool.

The hottest neighborhoods can be as much as 13 degrees hotter and have the least number of trees. Increasing the number of trees by 25 percent is projected to decrease local temperatures by up to 3.8 degrees.

COOL ROOFS

Cool roofs reflect solar heat away from the building, and reduce temperatures on the roof, inside the building, and the surround ambient air. Buildings with them use less air conditioning. The U.S. Environmental Protection Agency reports cool roofs in non-airconditioned buildings lower indoor temperatures up to 6 °F. There are numerous materials that can be used to cool roofs, but light colors are used in most.

RESPONSIVE FACADES

The Mideast has a high concentration of urban heat islands because of its geographic location. But designers are mitigating the effects. The Al Bahr Towers in the U.A.E. is fitted with a façade that opens and closes in response to sun exposure and its changing angles during different days of the year. It reduces solar gain by more than 50 percent, reducing the need for air conditioning, and resembles traditional Islamic shading known as “mashrabiya.”