

ASU researcher outlines strategies to curb urban heat island

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Protect yourself from the summer sun is good advice to children who want to play outside on a hot summer day and it is good advice to cities as a way to mitigate the phenomenon known as urban heat island.

For children, a hat, long sleeves and sun block provide protection. For cities, it might be canopies, additives to construction materials and smarter use of landscaping that helps protect it from the sun, said Harvey Bryan, an ASU professor of architecture.

Bryan presented several possible strategies a city could use to help it fight urban heat island (UHI) in a presentation he made at the annual meeting of the American Association for the Advancement of Science, held in San Diego, Feb. 18 - 22. Bryan's presentation, "Digital Simulations and Zoning Codes: To Mitigate Urban Heat Island," was presented on Feb. 21 in a session on Urban Design and [Energy Demand: Transforming Cities for an Eco-Energy Future](#).

Urban heat island is a phenomenon experienced by large cities, especially those located in desert areas, where the constant heat of the day is absorbed by the buildings, pavement and concrete. The result is a rise in nighttime low temperature for a city's core from the stored heat of the day.

The higher nighttime temperatures mean more cooling is required for residents' comfort, resulting in increased power demand and potentially more [greenhouse gases](#) emitted. Phoenix, where summer nighttime

temperatures often do not go below 90 F, is a classic example of the UHI, Bryan said.

Citing work he participated in about a year ago - with Daniel Hoffman, an ASU professor of architecture and Akram Rosheidat, an ASU doctoral student - which focused on ways of improving pedestrian comfort in downtown Phoenix, Bryan outlined several methods a city can employ that will help alleviate the UHI. Shade, not surprisingly, is one of the prime tools.

"Canopies to shade streets and sidewalks keep the concrete and asphalt cooler," Bryan explained. "Interestingly, sidewalks in downtown Phoenix during the early 1900s were canopied."

Bryan said another key aspect is being smart on material choices for the canopies.

"In addition to shading devices, color and thermal properties are also important considerations," Bryan said. "Lighter colors are best for any surface in the Valley. You also have to consider the heat capacity of the materials - denser material will absorb heat during the day and are slow at re-emitting at night."

In areas that cannot be canopied, Bryan said material additives use could play an important role. Phoenix, for example, has a large number of parking lots and streets that constantly absorb daytime heat.

"Introducing additives, like crumb rubber to asphalt and concrete, are ways of reducing heat capacity at the surface and making for a better nighttime profile," he said.

"The important part is to look at materials performance more than just during the daytime. We need a 24-hour profile to see how materials

absorb heat during the day and how they emit it during the evening. We then look for materials that are reflective during the day and highly emitting during the evening."

All of this points to modeling as an important tool in mitigating UHI.

"It comes down to how we model the downtown and how we look at various scenarios with different materials using models that accurately simulate the radiative phenomena," Bryan explained. "Most cities have never used such powerful tools to find solutions to UHI."

Provided by Arizona State University

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