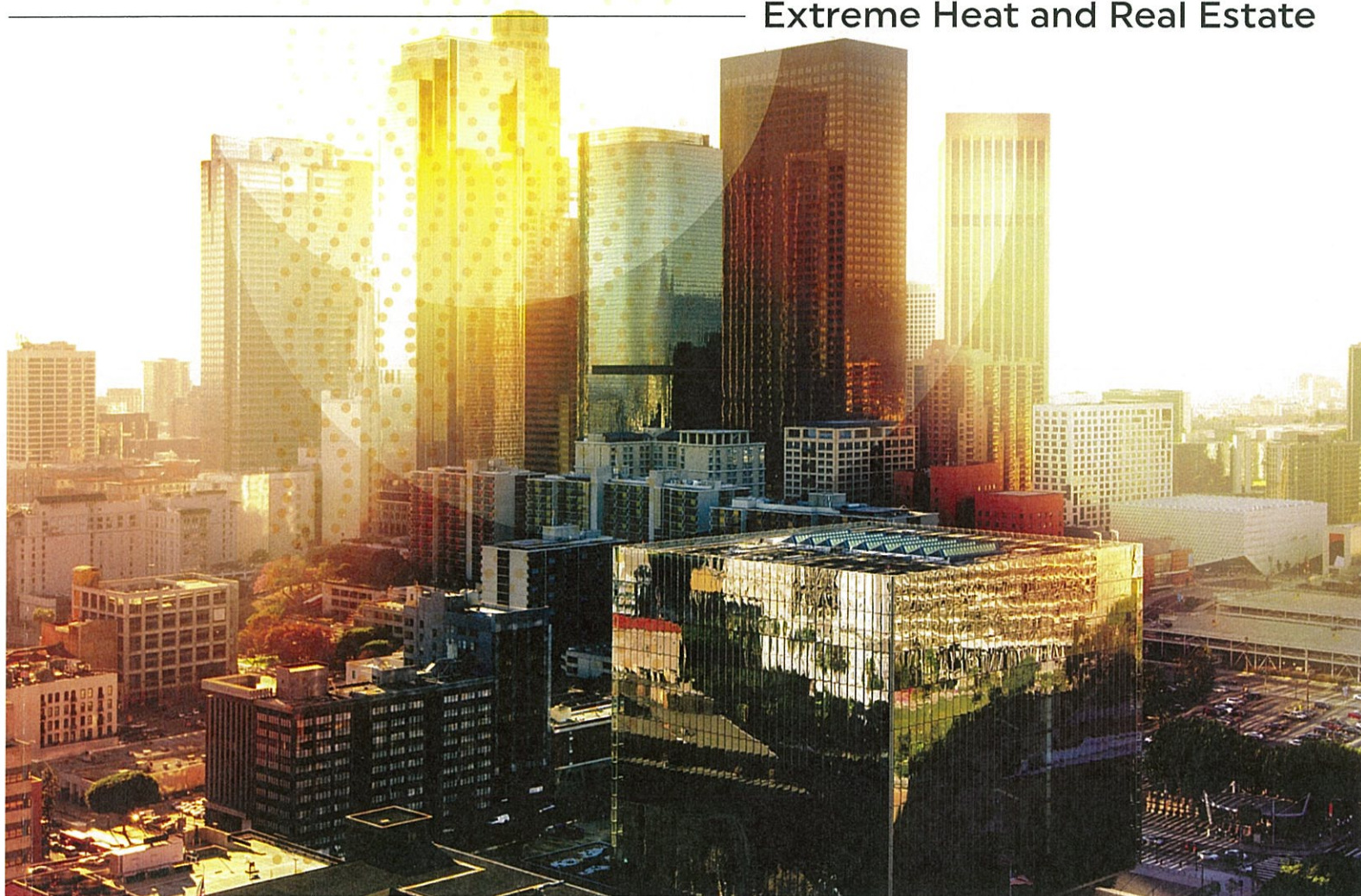


# SCORCHED

Extreme Heat and Real Estate







An iconic 125-foot-tall shade sail at SkySong, the Arizona State University Innovation Center, anchors the 42-acre development and is part of a heat-conscious design that helps attract tenants and reflects the founding partners' forward-thinking, entrepreneurial vision.

## EXECUTIVE SUMMARY

### Heat is the number-one natural disaster killer in this country.

**DANIEL HOMSEY**  
Director of Neighborhood Resilience, City and County of San Francisco

Soaring temperatures and dangerous heat waves are the uncomfortable reality in communities across the United States. Extreme heat risks are not limited to historically hot environments or summer months; heat is the most widespread and deadly weather-related hazard in the United States.<sup>1</sup> With the projected impacts of climate change and continued urban development, many communities are likely to experience higher-temperature days; longer, more frequent heat waves; and intensified impacts in cities where "urban heat islands" (UHIs) form because of the heat-absorbing properties of urban surfaces.

Urban areas are the most at-risk locations from extreme heat in the United States. This heat has the potential for devastating public health consequences—as seen in the Chicago Heat Wave of 1995, the European heat wave of 2003, and more recently, the near global summer heat wave of 2018.

Extreme heat also has the potential for long-term impacts on local economies and consumer market preferences.

In response, U.S. real estate developers, designers, and policymakers increasingly acknowledge the consequences of extreme heat and are seeking solutions to make buildings, neighborhoods, parks, and outdoor spaces more adaptable to environmental conditions and comfortable for occupants. Although managing extreme heat has no one-size-fits-all approach, particularly given different humidity levels and other local conditions, a suite of potential options is available, many of which also build amenity value and address other environmental needs such as stormwater management. Broadly, developments can prevent the absorption of heat with light-colored surfaces and materials, provide direct cooling with increased shade from built and natural shade canopies, and better cope with extremes



through “heat-aware” building envelopes and heating, ventilation, and air conditioning (HVAC) choices that stabilize indoor temperatures even during power outages.

Policymakers are considering how to address extreme heat in land use and building regulations as well as through social services and emergency preparedness. Urban greening programs and community resources to protect the most affected demographics are well-established approaches. New programs and technologies are seeking to better understand and apply the nuances of urban heat dynamics to planning policies that can improve climate resilience through extreme heat mitigation and adaptation.

The built environment is ultimately both a contributor to and a solution for extreme heat, especially in cities, and presents numerous opportunities for mitigation and

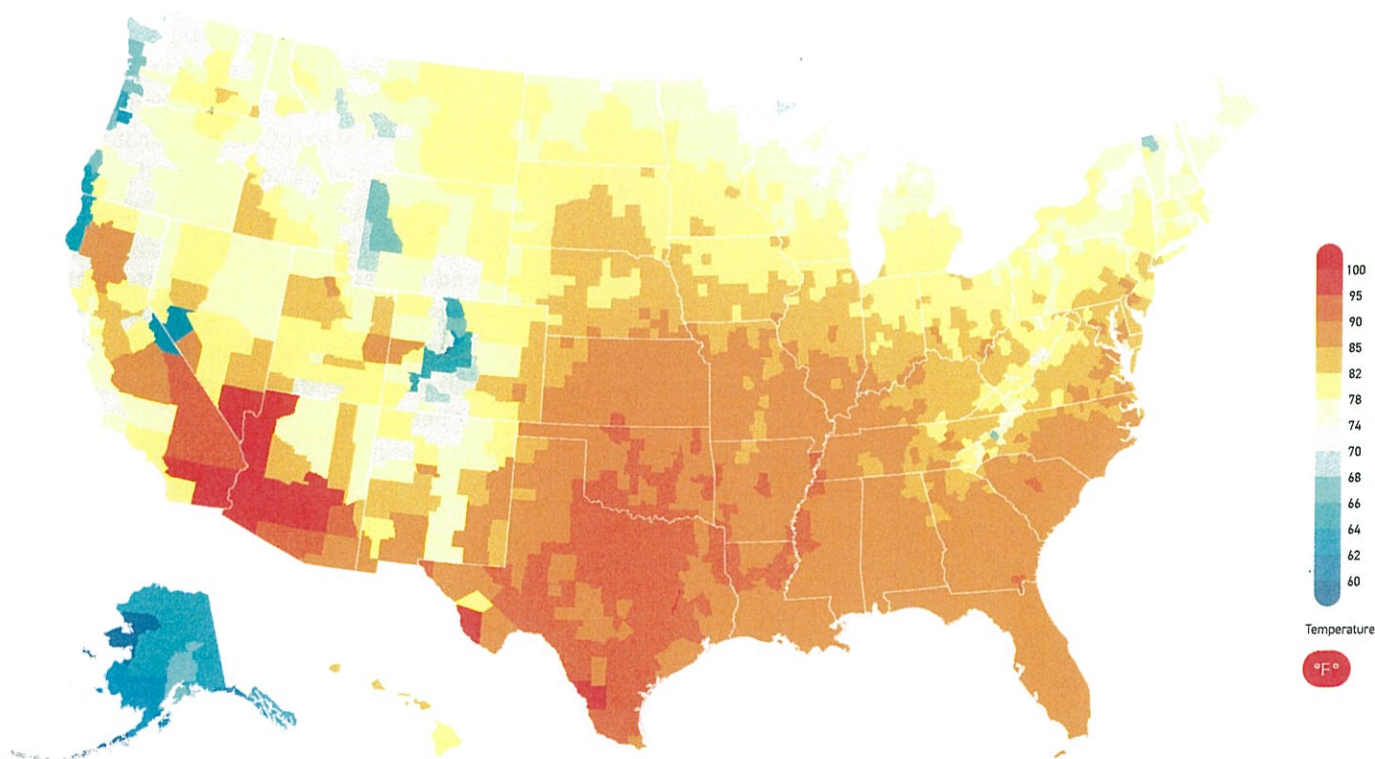
adaptation at the building and neighborhood scales. Although designing for extreme heat is an emerging issue that is not yet mainstream in many U.S. markets, it is likely to become more prevalent as extreme heat increases and is acknowledged by both consumers and local regulators and as economic, infrastructural, and public health impacts make the risks of extreme heat more visible.

This report explores how extreme heat is emerging as a growing risk factor and planning consideration across the United States and why this trend is likely to continue. The report also explores how the land use, design, and real estate sectors are responding with design approaches, technologies, and new policies to mitigate the infrastructure impacts of extreme heat and to protect human health.

**Heat, especially in our market during the hot and humid months, is top of mind.**

**BRYAN MOLL**  
Executive Vice President of  
Development, JBG Smith

## PROJECTED SUMMER TEMPERATURE BY 2080–2099



This map displays the average U.S. summer temperatures projected by the end of the century (2080–2099) if climate change continues at a rapid rate (emissions scenario RCP 8.5). (Climate Impact Lab 2019)



## SCOTTSDALE, ARIZONA

## SKYSONG

## DEVELOPMENT TEAM:

Plaza Companies, Holualoa Companies, City of Scottsdale, Arizona State University Foundation, Butler Design Group

## EXTREME HEAT MANAGEMENT FEATURES:

Building orientation and siting, efficient facade, vegetative and built shade, energy-efficient lighting and HVAC

## YEAR CONSTRUCTED:

2006, ongoing

## SIZE:

42 acres

## COST:

\$300,000,000

SkySong, the ASU Scottsdale Innovation Center, is a high-profile mixed-use development where responsible planning has resulted in heat-conscious site layout, building design, and landscaping that help attract tenants and reflect the founding partners' forward-thinking, entrepreneurial vision.

SkySong is a partnership between Arizona State University Foundation, the city of Scottsdale, and Plaza Companies, as master developer. Plaza Companies and Holualoa Companies are partners on the office buildings. The center is a hub for academic and private entrepreneurship that has revived the previously declining McDowell Corridor neighborhood. Before the center's construction, surrounding companies were relocating and property values decreasing. SkySong itself is on the site of Los Arcos Mall that had been sitting vacant since the mid-1990s.

The center includes five class A four- and six-story office buildings, built between 2008 and 2019, 325 luxury rental apartments, a 157-bed hotel, retail shops, and several restaurants supported by an on-site urban garden. SkySong totals about 1.2 million square feet of commercial office.

The center's sustainable design and extreme heat management features address local climate extremes, demonstrate Arizona State University (ASU)'s renowned built environment programs and initiatives, and are integral to SkySong's ability to attract and retain innovative tenants. "The goal," says Sharon Harper, president, CEO, and cofounder of Plaza Companies, "was to create healthy buildings and healthy environments that would set SkySong apart."

We started with understanding our climate and understanding the new way that people and companies are spending their days. We are tremendously successful because of that sensitivity.

SHARON HARPER  
President, CEO, and Cofounder,  
Plaza Companies



Efficient building operations that moderate cooling costs and normalize indoor temperatures are important to SkySong's investors and tenants.





SkySong's development team prioritized heat mitigation and adaptation as part of their tenant attraction and placemaking strategy; the site layout, building design, and shaded pedestrian walkways create a comfortable and creative atmosphere that have helped attract over 57 companies, contributing to a projected regional output of \$32 billion.

## EXTREME HEAT RESILIENCE STRATEGIES

Organized in four quadrants around an iconic, 150-foot-tall shade structure covering a central plaza, SkySong's buildings are near one another, thus allowing the structures themselves to provide shade to neighboring buildings as well as the pedestrian circulation points around the site. The buildings are oriented to minimize solar heat gain and incorporate multiple facade improvements, including horizontal and vertical shade screens, high-performance window glazing, and small windows on the west and east-facing sides.

Each building capitalizes on the north face with "windows to innovation" where clearer glass components allow additional natural light and views while vertical shade elements prevent glaring sun during parts of the day and year when solar angles reach that face of the building. SkySong buildings 3 and 4 use a standard metal lath in a favorable solar orientation such that the shape of the punch in the panel provides transparency at lower viewing angles and opaqueness at the higher sun angles.

The site layout facilitates efficient pedestrian travel between indoor, air-conditioned lobbies and comfortable and engaging outdoor spaces. Buildings share centralized parking to minimize outside travel time, and pedestrian pathways are well shaded by vegetation, built structures, or both. The centrally located custom 50,000-square-foot shade structure consists of eight conical-shaped pieces covered with tensile fabric supported by eight, 111-foot-long steel legs.<sup>59</sup> Indoor bike parking, showers, and connections to two nearby parks encourage nonmotorized travel.

Developer Sharon Harper also notes that "the efficient operation of the buildings is a key component for investors and tenants and for managing temperature." SkySong has LED lighting as well as daylight harvesting and motion sensors to minimize lighting use. All cooling equipment has nighttime setbacks when buildings are less occupied and staggered start times to minimize peak electric demand. Similarly, SkySong's construction was largely completed early in the morning and partially at night to protect workers' health and ensure daytime heat exposure would not reduce the quality of building materials.

## SkySong is architecturally appealing with functional components for managing heat.

KOREY WILKES  
Principal, Butler Design Group

## OUTCOME

Achieving the objective of revitalizing the McDowell Corridor neighborhood and spurring innovation, SkySong has generated over \$588 million in local economic output with a projected regional output of \$32.17 billion by 2046.<sup>60</sup> "The economic output is phenomenal," says Harper. SkySong draws over 5,500 visitors each month and houses 57 companies.

The first two commercial buildings are over 90 percent leased, the more recent SkySong 3 and 4 are 100 percent leased, and the new SkySong 5 is nearly 80 pre-leased. Prominent tenants include multiple enterprising cloud computing firms such as Oracle, photography and imaging equipment supplier Canon, CenturyLink Communications, TicketMaster, Groupon, a research and development subsidiary of Bridgestone Tires, and companies in accelerator programs run by ASU's Office of Entrepreneurship and Innovation. Many of SkySong's early tenants have experienced significant growth and relocated to larger office spaces within the development.

SkySong's buildings are all LEED Silver certified and have achieved Energy Star certification. The heat-conscious landscaping and design creates outdoor amenity spaces that are enjoyed year-round. "Even when it's 115 degrees," says Harper, "there are people sitting in the shade, connected and social."



The "shade sail" that protects SkySong's central plaza was custom-built for the development and is one strategy that ensures outdoor amenity spaces are enjoyable year-round.