



The Smart Surfaces Coalition is made up of more than 40 leading national and international organizations with a shared commitment to creating **cooler**, **healthier**, and **more resilient** cities by cost-effectively working to reduce the impacts of extreme urban heat and flooding.

# What Are Smart Surfaces?

Infrastructure strategies that cost-effectively manage urban heat and stormwater while maximizing health, energy, climate, and resilience co-benefits

Cool Roofs



Green Roofs



Porous + Permeable Pavements



Solar Photovoltaics



Cool Pavements



Trees and Rain Gardens



Low- and Zero-Carbon Concrete



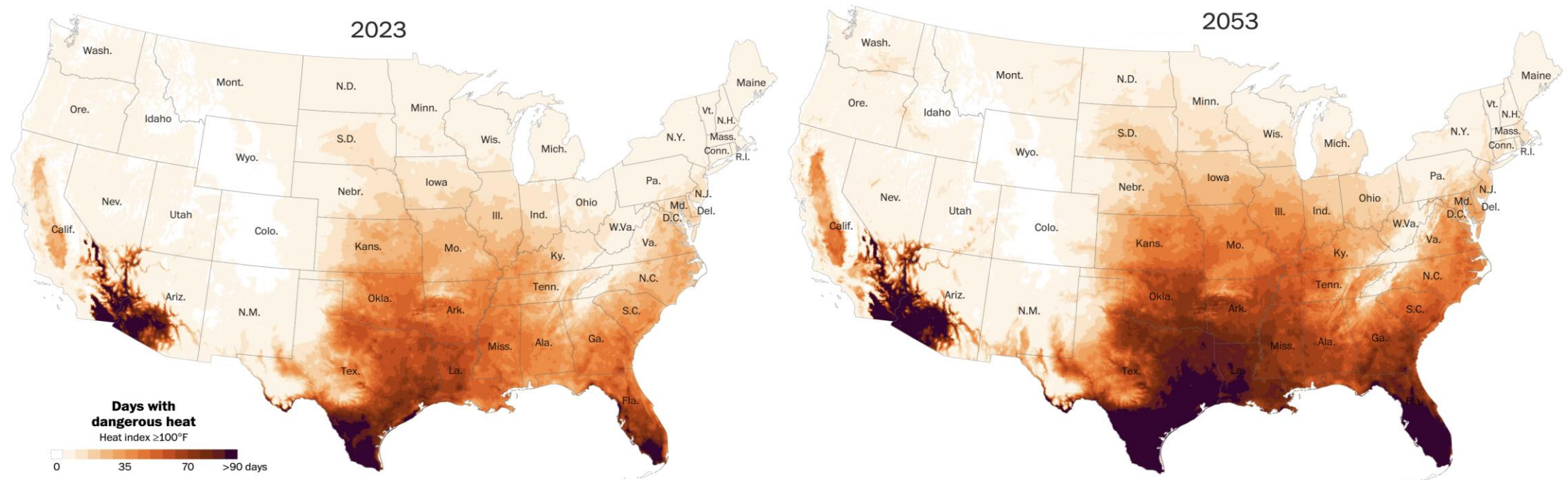
Combined Surfaces



Source: [Smart Surfaces Coalition & Carnegie Mellon University](#)

# Increases in Extreme Heat

By mid-century, nearly two-thirds of Americans will experience perilous heat waves.<sup>1</sup>



<sup>1</sup>Washington Post, 2023

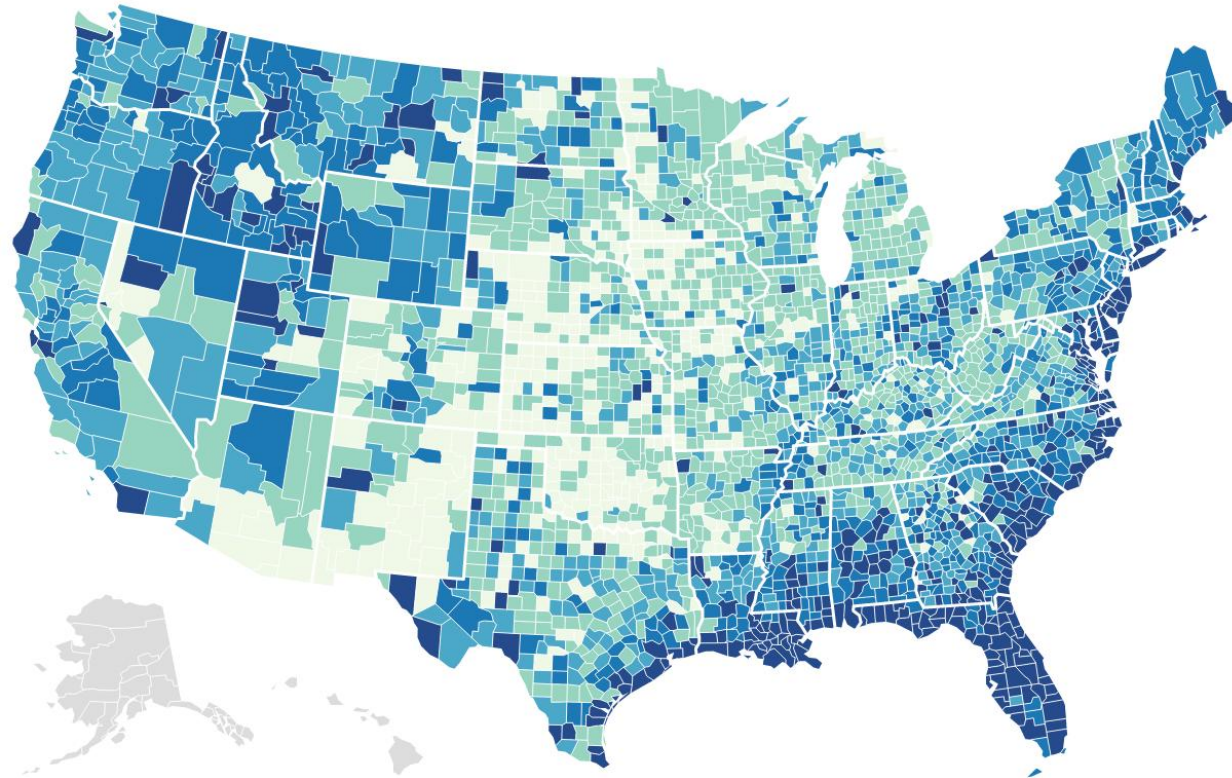
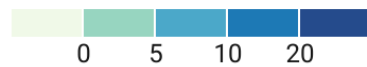
Source: [Washington Post](#)

# Increases in Flood Risk

## Where flood risk is projected to rise fastest in the US

A new analysis projects changes in flood risk between 2020 and 2050 by zooming in on every neighborhood across the U.S.

Percentage rise, 2020-2050



*Flood damage measured in 2020 U.S. dollars.*

Map: The Conversation/CC-BY-ND • Source: Wing, et al. 2022 • Created with Datawrapper

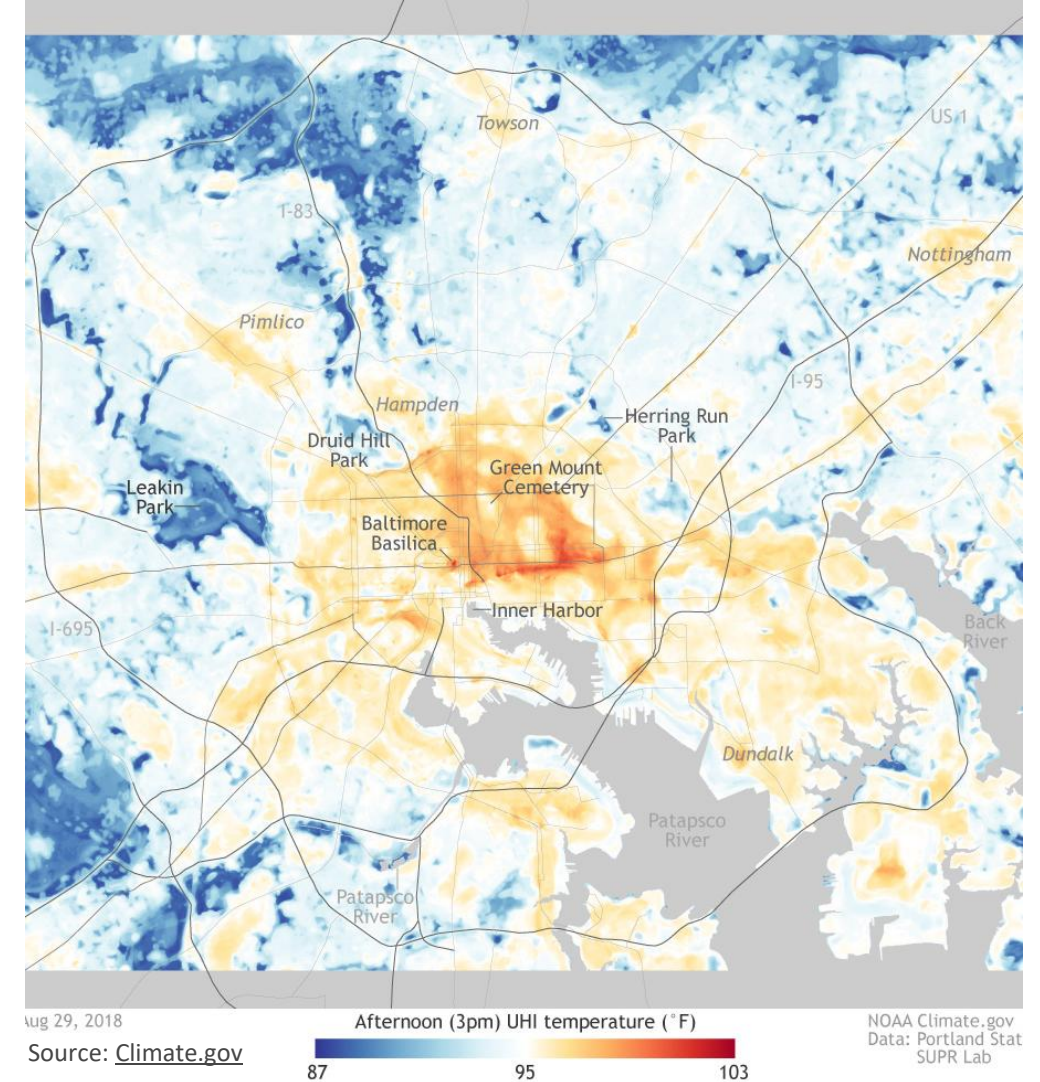
# Urban Heat Island Effect

Urban heat islands can be **5 to 9 degrees Fahrenheit hotter** than rural areas during the day and can be as much as **22 degrees F hotter at night.**<sup>1</sup>

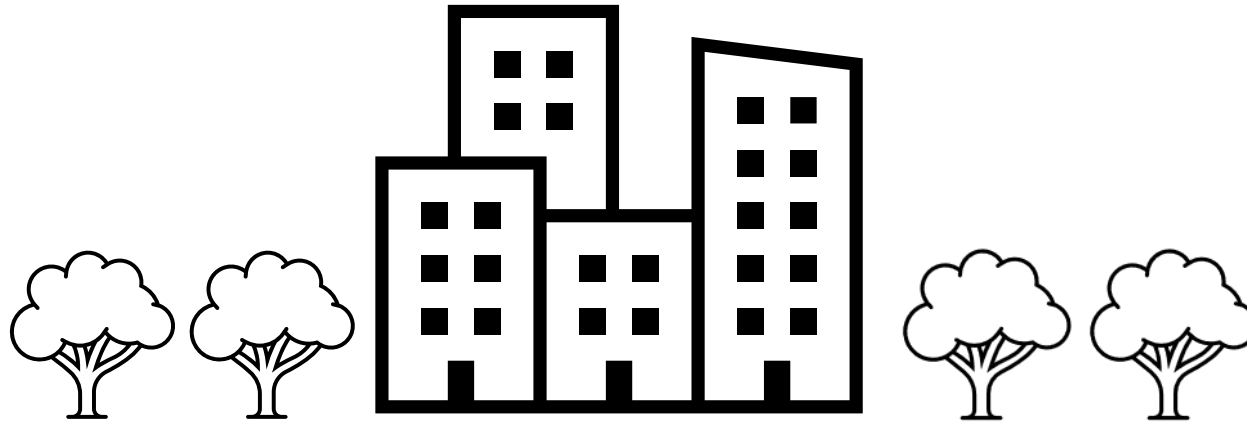
**Some neighborhoods** in cities, often in low-income areas, can be as much as **15-20 degrees F hotter** during the day.

<sup>1</sup>American Forests, 2021

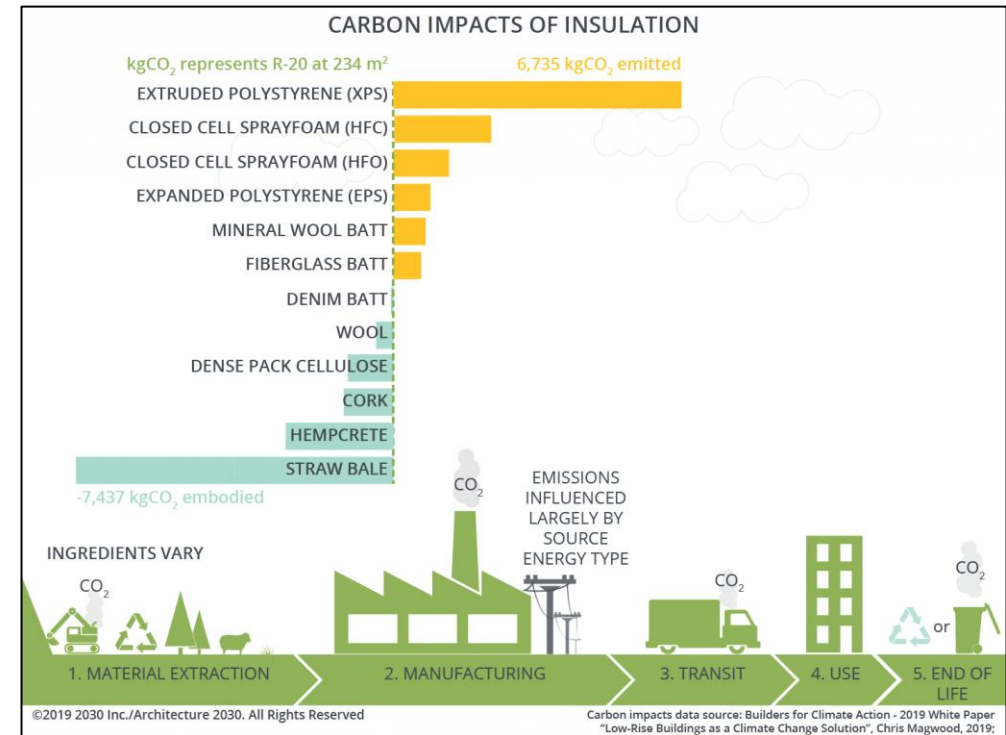
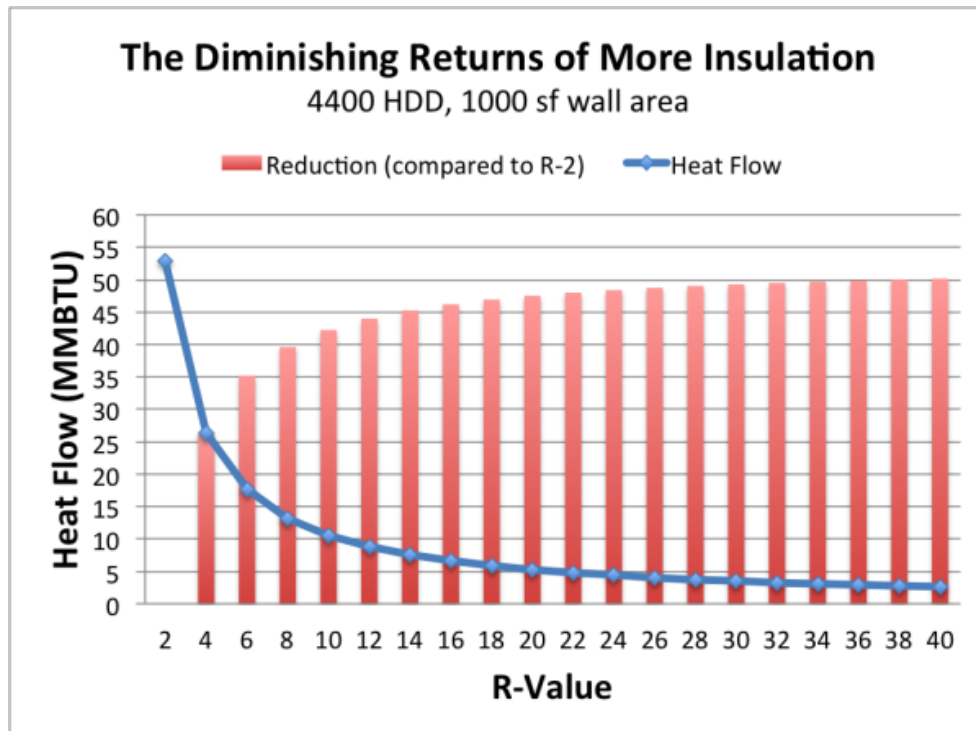
Heat Map of Baltimore, MD



# THINKING OUTSIDE THE BOX



# Diminishing Returns for Traditional EE Measures



# Energy Efficiency Benefits of Smart Surfaces

- **Cool Roofs & Walls**

- Cool Roofs lead to [11-27% peak cooling reductions](#) in residential air-conditioned buildings (3-4% total energy reductions)
- Retrofitting 80 percent of commercial building roof area in the U.S. would yield [net annual energy cost savings of \\$1.1 billion](#), and annual CO2e reduction of 6.2 million tonnes
- For cool walls, [research shows up to 25%](#) in annual HVAC energy cost savings

- **Green Roofs**

- Cooling season - [Up to 84% lower thermal heat gain](#) in comparison to black roofs
- Heating season - [13% to 33% savings](#) compared to black roofs
- [Simple payback of 6.2 years nationally](#) (based on 50-year average annual savings), internal rate of return of 5.2% and an ROI of 224%

- **Trees**

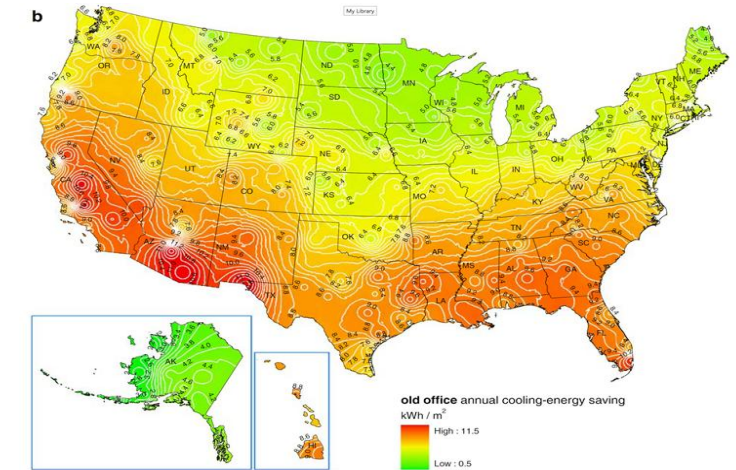
- [Energy savings up to 25%](#) for residential buildings

- **Radiative Cooling Films & Panels**

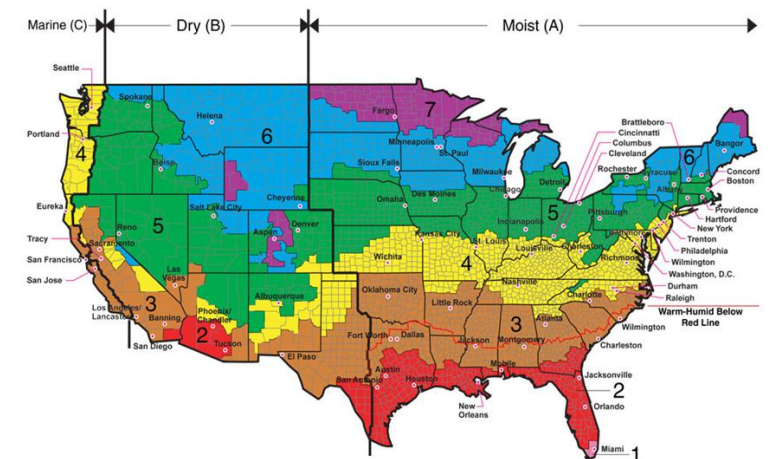
- [Energy savings 15-40%](#) - 2x-3x more energy savings than PV generates per unit area in some applications and climate zones

- **Combined Surfaces**

- Solar + Cool Roof – [Increase solar power efficiency by ~10%](#) and energy output 3-4%
- Solar + Green Roof – [Increase solar energy output 3-4%](#)



Levinson et al. (2010). <https://doi.org/10.1007/s12053-008-9038-2>

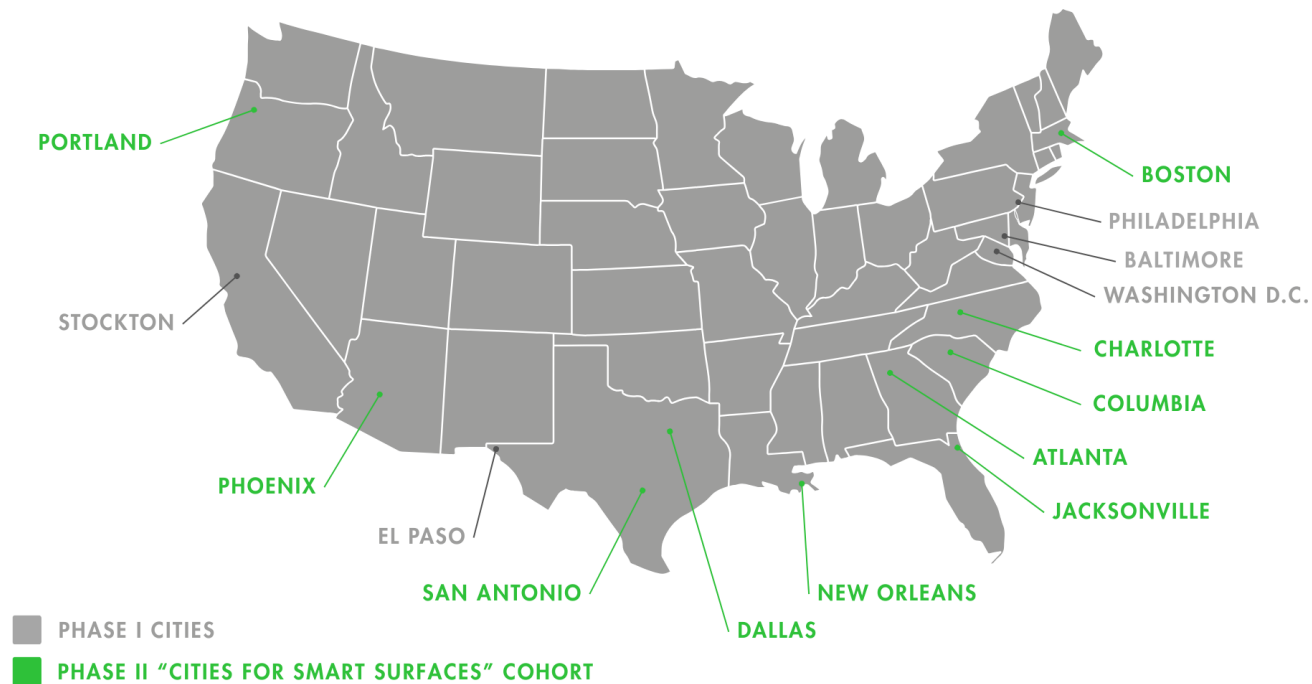


# Peak Demand Reduction Potential for Smart Surfaces

- Our modeling shows we can [double the albedo/solar energy reflectance](#) with city-scale smart surface interventions
- We can reduce peak summer temperatures [city-wide by 5°F](#), and much more in some neighborhoods -- [generally historically disinvested low-income areas](#)
- Each 1°C/1.8°F of temperature [increases peak electricity load up to 4.6%](#)
- [Increase of total electricity consumption of up to 8.5%](#) for every 1°C/1.8°F of temperature increase
- Potential for reductions of [peak electricity demand in cities up to 15%](#) and decreases of [total city electricity consumption up to 25%](#)

# Cities for Smart Surfaces Program

SSC is partnering with metro areas across the US to facilitate the adoption of Smart Surfaces projects and policies.



# SSC Web Tools

✓ Decision Support Tool



✓ Benefit-Cost Analysis Tool



✓ Smart Surfaces Policy Tracker



Together, these three tools help cities and metro areas develop and implement resilience policies, plans, grant applications and infrastructure investments

# Online Resources

- SSC Home Page - <https://smartsurfacescoalition.org/>
- Cities for Smart Surfaces Program - <https://smartsurfacescoalition.org/cities-for-smart-surfaces>
- Smart Surfaces for Airports - <https://smartsurfacescoalition.org/sfo-airport>
- Smart Surfaces Policy Tracker Tool - <https://smartsurfacespolicy.org/policies/>
- Smart Surfaces Peer Learning Network - <https://smartsurfacescoalition.org/peer-learning-network>
- Cool Roadways Partnership - <https://smartsurfacescoalition.org/cool-roadways-partnership>