Sources: The Science Behind "The Heat Island in Your Own Backyard"

This page lists the research and data sources cited in our blog post on urban heat islands, concrete thermal behavior, and living/green wall cooling performance, for readers who want to review the underlying research themselves.

Urban heat island fundamentals

Wikipedia contributors. "Urban heat island."
Reference summary of urban heat island mechanisms, including the comparative heat capacity of concrete versus air.
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Cited for: concrete's capacity to hold roughly 2,000 times as much heat as an equivalent volume of air.

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EPA Heat Island Reduction Program.
epa.gov/heatislands/what-are-heat-islands
Cited for: how heat islands build through the day and peak after sunset due to the slow release of stored heat from urban materials.

California Environmental Protection Agency (CalEPA). "Understanding the Urban Heat Island Index."
calepa.ca.gov/climate/urban-heat-island-index-for-california/understanding-the-urban-heat-island-index
Cited for: daytime urban temperatures averaging 1–6°F higher than rural areas, and nighttime temperatures running as much as 22°F higher.

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Cited for: roughly half of the ~800 W/m² of midday solar energy being absorbed and re-released by surfaces like concrete, adding measurable nighttime warming in dense cities.

Resources for the Future (RFF). "Urban Heat Islands 101." March 2023.
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Cited for: the estimate that urban heat islands cause roughly 6,700 premature deaths per year across 93 European cities (about 4% of summer deaths), and that health risk rises sharply above 86°F.

Concrete and pavement thermal behavior

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"Thermally Conductive Pre-cast Concrete Pavement for [Urban Heat Island Mitigation]." U.S. Department of Transportation / National Transportation Library (ROSAP).
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Cited for: conventional concrete pavement's moderate-to-low albedo and high heat storage capacity, and how it cools slowly overnight.

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Cited for: the finding that cooling electricity demand rises roughly 1.5–2% for every 1°F increase in air temperature.

Green wall and living wall cooling research

Salford University Research Repository. "Cooling Effect of Direct Green Façades During Hot Summer Days."
salford-repository.worktribe.com/OutputFile/1492957
Cited for: the Nanjing field study measuring a ~6°F reduction in ambient air temperature, an average ~4.6°F (up to ~8.4°F) reduction in wall surface temperature, and an ~89% reduction in solar radiation reaching the wall behind a vegetated façade.

Bakhtyari, V., Fattahi, K., Movahed, K., & Franz, A. "Investigating the Effect of Living Walls on Cooling Energy Consumption in Various Urban Microclimates, Building Heights, and Greenery Coverage Areas." *Sustainability* (MDPI), vol. 16, no. 2, 2024.
mdpi.com/2071-1050/16/2/920
Cited for: living walls reducing exterior surface temperatures by up to 37°F (Wuhan), 29°F (Hong Kong), and 18°F (Singapore); up to 36°F reported in Italy; average urban-block ambient air cooling of ~2.4°F (up to ~4.1°F); and cooling-energy savings of up to 15–31%.

Note: The green wall and living wall studies above were conducted on vegetated wall and façade systems generally, not on Varden blocks specifically. Verdtech cites this research because the same physical mechanisms — shading and evapotranspiration from foliage — are at work in a planted Varden wall.