



# Solar/**Shade**

How to value the most undervalued commodity

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# Solar/ **Shade**

Shade is the most undervalued feature of the built environment. Protecting people and surfaces from direct sun exposure is the most effective way to cool the human body outdoors. Shade doesn't lower the air temperature- we just feel cooler in the shade because the sun's rays are not hitting our skin and the surfaces around us are not absorbing radiation and heating up. Shade also blocks UV and IR radiation, which can make you feel cooler.

Direct sunlight can make the air feel 10-15 degrees warmer than it actually is because of the sun's rays hitting your skin. Measuring air temperature alone does not tell the whole story about how and why we feel hot. A better way to understand heat and how to minimize its impacts is Mean Radiant Temperature which measures a variety of climate conditions, including direct sunlight exposure and the heat that surfaces around us give off and are transferred to our bodies. We have all experienced changes in mean radiant temperature as you walk from the sun and into the shade. We feel cooler in the shade because we are not exposed to direct sun, and the objects around us radiate less heat back to us.



# It feels hot vs it's actually hot

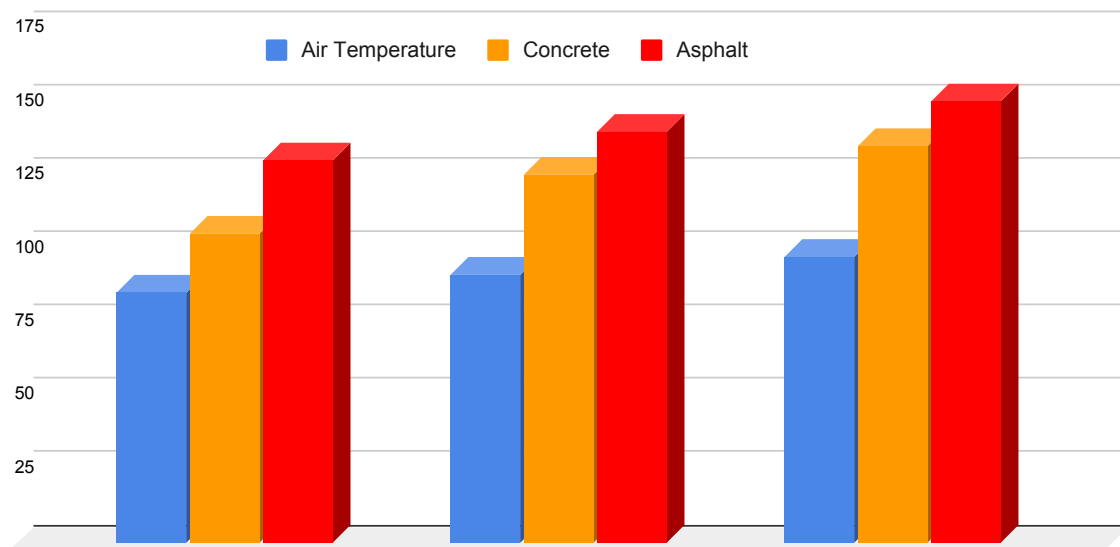
Beyond how we feel in direct sun compared to the shade, direct sunlight on surfaces like cars and concrete and asphalt parking lots create some shocking and dangerous effects.

When temperatures reach 100° outside, the temperature on your car's dashboard can get up to 150°-200°! You can literally cook an egg on your dashboard at temperatures that hot.

Materials such as concrete and asphalt have a much higher capacity for absorbing heat, meaning they can warm to higher temperatures and they release that heat more slowly, making them like heat batteries, releasing their heat long after the sun goes down.

Concrete and asphalt parking lots with large, wide open and unshaded areas are major heat generators.

The comparative effect of direct sunlight on different materials is dramatic.





## Shade with benefits

A recent piece in the Atlantic by Emma Marris said it all: “Shade Will Make or Break American Cities: Trees are nice and all, but they’re not enough”. If you want to create a cooler environment, trees are the “go to” shade solution. They are the preferred way to produce shade and cool their local environments, but using trees as a tool to combat heat in urban environments has some issues. Trees can’t grow everywhere, they take a long time to grow, they need water and soil and they don’t grow over parking lots. In order to meaningfully reduce mean radiant temperatures in urban areas, built structures will be required.

Using solar panels to create shade is a no brainer. Where you need shade the most, is also where you produce the most solar energy. Instead of letting direct sunlight heat up people, concrete and asphalt, how about harnessing it to produce clean, renewable solar energy?

Approximately 5.5% of the developed land in the contiguous United States is covered by parking lots, and that percentage is even higher in urban areas where parking lots occupy over 20% of the land area.

Covering parking lots in the United States with solar carports could significantly contribute to meeting the country's energy demand. If all suitable parking lots were covered with solar canopies, they could generate approximately 1,500 terawatt-hours (TWh) of electricity per year. This amount represents around 37.5% of the total electricity consumption in the United States, which was about 4,000 TWh in 2022 (Yale E360) (Environment America) (EnergySage).



## Win-win-win

The key to realizing the benefits of solar carports is monetizing shade. Solar carports and canopies are inherently more expensive than rooftop or ground mounted solar since in addition to the cost of the solar panels themselves, they require the installation of the canopy structures as well. Until there are agreed financial metrics to value shade, it is difficult to convince developers and landlords to justify investment in solar carports.

It will likely take a combination of sticks and carrots to place a financial value on shaded parking. Lowering the heat island effect and mean radiant temperature is a social benefit, and a place for the government to play a role through building codes and permitting and zoning requirements that incentive providing shade. The stick. When developers and landlords see their bottom lines benefitting from shaded parking through lower operating costs and revenue from solar generation, higher rents or tenant attraction and retention, that will be the real driver of adoption. The carrot.

Solar carport and canopy installations create a unique win-win-win. Individuals win with shaded parking. Developers and landlords win by making their projects and properties more valuable. We all win by adding shade to our communities, making them more livable by lowering mean radiant temperatures and making everything cooler.