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## Researchers discover solar heat island effect caused by large-scale solar power plants

by Graham Binder, University of Maryland



Credit: University of Maryland

Large-scale solar power plants raise local temperatures, creating a solar heat island effect that, though much smaller, is similar to that created by urban or industrial areas, according to a new study.

The finding by Mitchell A. Pavao-Zuckerman, an assistant professor from the University of Maryland's College of Agriculture and Natural Resources, and colleagues from the University of Arizona, University of Madison-Wisconsin, and the Nevada Center of Excellence appears to contradict previous theoretical work and modeling studies predicting solar power installations would decrease temperatures around them by intercepting some of the sun's potentially warming energy and converting it into electricity.

"The understanding of energy balance - how heat moves in and out of ecosystems that change from natural to built settings is a big game changer for the future. Consider how PV [solar] panels absorb and reflect certain types of radiation which prevents the soil beneath from cooling like it would under a regular night sky," said Pavao-Zuckerman. "With this knowledge at our fingertips, we can mitigate environmental impacts by creating novel systems to make PV power plants work more efficiently and produce other co-benefits."

The multidisciplinary team examined the "heat island" effect of solar energy installations using experiments that spanned three different desert ecosystems in Arizona:

1. a natural desert ecosystem,
2. the traditional built environment of a parking lot surrounded by buildings and
3. a photovoltaic (PV) power plant. Prior studies on the "heat island" effect of solar power installations have been confined to just one biome or ecosystem.

For this study, the team defined the heat island effect as the difference in ambient air temperature around the solar power plant compared to that of the surrounding wild desert landscape. Findings demonstrated that temperatures around a solar power plant were 5.4-7.2 °F (3-4 °C) warmer than nearby wildlands.

The result demonstrates that there are potential heat costs to generating green power although the added heat dissipates quickly and can't be measured 100 feet away from the power plants. Considering the external costs of solar power, the discovery of this heat island effect may affect future decisions on when and where to convert natural ecosystems into large-scale solar facilities.

Pavao-Zuckerman, lead author Greg Barron-Gafford of the University of Arizona School of Geography and Development, and their research colleagues recently published their findings in the journal *Nature Scientific Reports* in a paper titled "The Photovoltaic Heat Island Effect: Larger solar power plants increase local temperatures."

Continuing studies by the group will focus on determining how far away from solar power plants the temperature increases reach, and on mitigating impact through such strategies as growing plants next to and under solar panels.

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