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Only 15% of California's Big Solar Projects Are on the Right Kind of Land

By Monica Heger

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The real estate agent's mantra is well known: location, location, location. But location is important, too, when considering where to site utility-scale solar projects, and most of California's projects or planned projects are in less-than-ideal spots, according to a new study. As a result, these projects may have negative impacts on the environment and will not be as cost-effective or as carbon neutral as they could be.

Researchers from Stanford University and the University of California's Riverside and Berkeley campuses identified 161 planned or proposed large-scale utility solar and applied an algorithm to determine how compatible they are with their location.

The results, which were published today in the *Proceedings of the National Academy of Sciences*, found that only 15 percent of sites were on compatible land.

74 percent of PV projects are within 10 kilometers of protected land

The researchers first classified California land into 10 different cover types, ranging from developed, barren, agriculture, and various types of wild habitats. Next, they used a computational tool that considered the land type, whether

the project was photovoltaic or concentrating solar power, and the proximity to existing infrastructure as well as protected lands. They considered only projects that were at least 1 megawatt in capacity.

The vast majority of projects were slated for a type of habitat called shrubland or scrubland. These are habitats dominated by sagebrushes and small plants that are common in Mediterranean climates. In California, they are "biodiversity hotspots," but have already lost around 70 percent of their original extent.

About 48 percent of the land sited for photovoltaic projects and 43 percent of the land for concentrating solar power (CSP) projects were on shrub or scrublands. The second most common area for utility-scale solar was on

agricultural land.

The study "shines a light on a lack of knowledge about land cover change," says Rebecca Hernandez, lead author of the study and now a postdoctoral fellow in University of California, Berkeley's [Energy and Resources Group](#). "We're not thinking as holistically as maybe we should be in terms of all the environmental impacts that siting decisions can make."

"The policy and structure we currently have has made it less expensive to site land in shrublands and scrublands"

—Rebecca Hernandez, University of California, Berkeley

Hernandez says that in determining whether a site is compatible or not, the model prioritizes land that has already been developed or disrupted in some way versus undeveloped areas that harbor wildlife and vegetation. Lower scores were also given to sites that would disrupt snow pack or water resources as well as to areas in close proximity to protected land.

Nearly 74 percent of PV installations and 90 percent of CSP installations were within 10 kilometers of a protected area—a range that Hernandez says is too close and could have ill effects.

"We really need to think especially hard about what we develop and the kind of activities that we do around protected areas or else it could compromise the protected area itself," Hernandez says.

For instance, developing large scale solar on rooftops of parking garages, for instance, makes a lot of sense because those installations are not disturbing habitat or replacing cropland. Those installations are also near infrastructure and the source of the energy consumption, so additional power is not lost in transmission.

In cases where building in densely populated areas is not an option, Hernandez says another good choice is to build on degraded or contaminated land. However, she says, the survey found that developers were not prioritizing these areas.

"It seems as though the policy and structure we currently have has made it less expensive to site land in shrublands and scrublands," she says, "at least in the initial cost analysis."

Going forward, she hopes that the study can be used to shape future policy on prioritizing land for utility-scale solar that makes both economic and environmental sense. One next step, she says, is to focus on California's central valley—where a large portion of solar projects are being planned due to the region's sunny climate. She says a more detailed analysis of land use there is needed to identify good locations for utility-scale solar and to make sure those locations are prioritized.

Similar types of analyses can also be done elsewhere in the country not only for solar, but also for large-scale wind developments, she says.

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