New maps show where to generate solar energy in South Carolina

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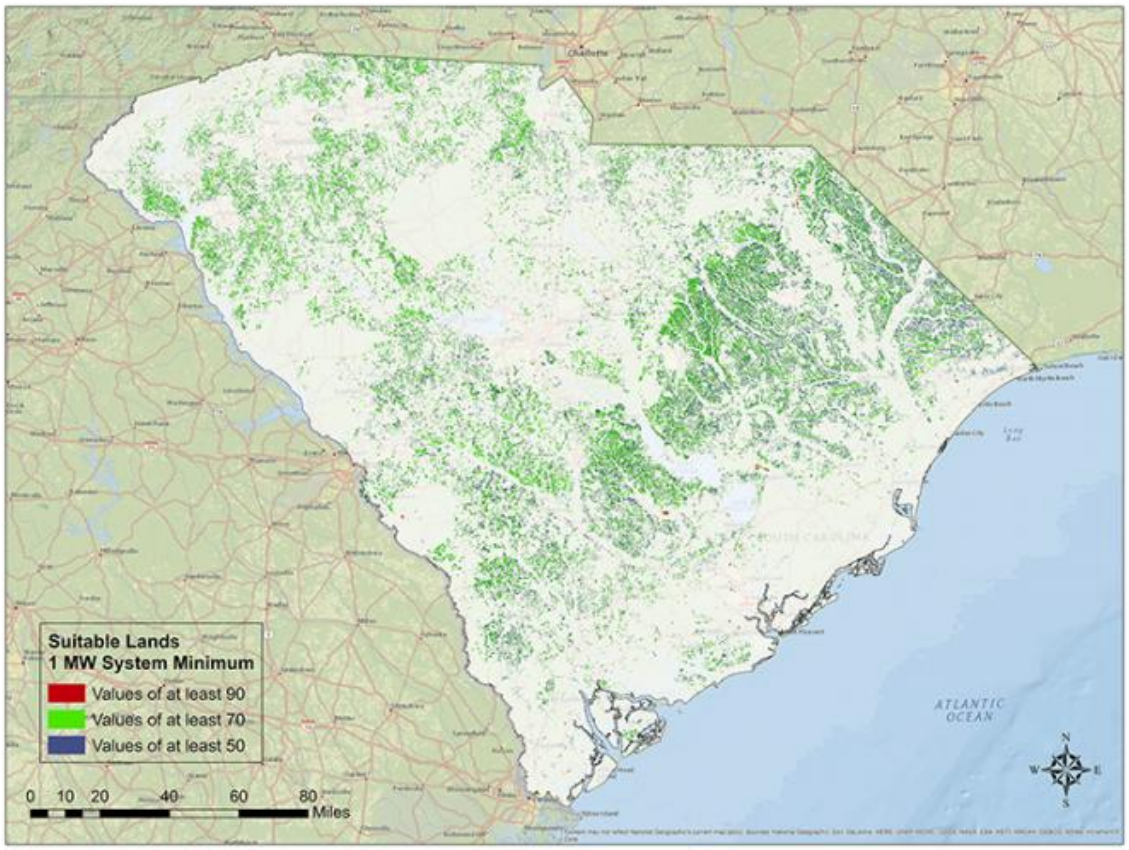

One of the maps that the Clemson University team created shows the best places in South Carolina for building one-megawatt developments. Credit: Clemson University

South Carolina has more than enough land suitable to generate the large amounts of solar power that would be needed to meet goals calling for all energy to come from renewable sources by 2050, according to new research at Clemson University.

Industrial engineering major Amanda Farthing led the study, working on it for two years as an undergraduate research project.

Farthing and the team at the university's Center for Geospatial Technologies created maps showing which lands in South Carolina would be most suitable for generating solar energy at utility scale. One map shows lands suitable for five-megawatt developments, and one map shows lands for one-megawatt developments.

"The big takeaway is that solar presents a great opportunity in South Carolina and that it can be developed in a way that considers both environmental and social preferences," Farthing said.

The research could help South Carolina continue its explosive growth in generating solar energy, while minimizing conflicts that could arise over land use. Installed solar capacity in the state grew 303 percent in the past year, according to the Solar Energy Industries Association.

Suitable lands for one- and five-megawatt developments are peppered across the state, but the highest concentration is in a swath that runs from the North Carolina state line around Marlboro, Dillon and Horry counties to the Lake Marion area.

"From this initial study, we've seen there are plenty of suitable land areas for the development of solar energy," co-author Michael Carbajales-Dale said. "Regardless of policy, it's very physically feasible."

The research was published by the journal *BioPhysical Economics and*

Resource Quality. It applies to utility-scale solar power only, Farthing said.

Farthing focused on South Carolina for her map study, but the model the team created could do the same analysis for other states, she said.

The Clemson team ranked South Carolina's lands on a scale from 0-100, with the higher numbers more suitable for development. The available solar resource was calculated for lands with values of at least 50, 70 and 90.

Farthing and her team found that about 1,256 square miles, or 4.2 percent of state land area, had a suitability value of at least 70 for five-megawatt developments.

For one-megawatt developments, about 2,340 square miles had suitability value of at least 70. That's slightly smaller than the size of Delaware and would be enough to install 69.6 gigawatts of capacity, researchers found.

It would be enough to power more than 7 million homes and would far exceed the 6.7 gigawatts that Stanford University researchers suggested the state generate in solar energy. Researchers in the Stanford study, which was separate from the Clemson research, provided roadmaps for all 50 states to convert energy systems to 100 percent wind, water and sunlight by 2050.

In the Clemson research, lands had to be about 44.5 acres for five-megawatt developments and about 8.9 acres for one-megawatt developments.

The team eliminated unsuitable lands, including urban areas, airports, national forests, parks, national wildlife refuges, wilderness areas, and

protected marine environments.

Researchers also considered slope and aspect. The best place to install the photovoltaic panels that soak up the sun's rays are in flat areas, Farthing said. When there is a slope, it should face south to get the most exposure to the sun, she said.

The Pee Dee and inland areas of the Lowcountry came out as the best places in the state for utility-scale solar generation.

A diagonal swath also runs from the southern Upstate and northern Midlands at the Georgia border northeast to the North Carolina border around Spartanburg, Cherokee and York counties.

The least suitable lands were along the coast.

"Wetlands have a lot of environmental benefits, and the wet ground is not a good place to install photovoltaic panels," Farthing said.

Farthing, a senior who is from Indialantic, Florida, did her work in part to meet the "hands-on project or research experience" component of the Grand Challenges Scholars Program. The program is tailored to create students ready to meet the 21st century grand challenges identified by the National Academy of Engineering.

Carbajales-Dale said it's unique for students to have research published as undergraduates.

"Amanda came to me in her second year and said, 'I want to work on a project, and I want to make it specific to South Carolina. I want to use my skills to benefit people here,'" he said. "Ever since we've been working together, she has performed amazingly, even with all her other commitments."

Provided by Clemson University