

# Price of idle land under photovoltaic panels

How much land is needed for solar energy installation?

In a recent study for the Great Center Valley, California, USA, Hoffacker et al. (2017) identified 8415 km<sup>2</sup> (15% of California area) as a potential land-use for solar energy installation with 19,561 TWh/annually produced from both PV and CSP systems. Table 1 shows the land requirements for solar and wind technologies.

How much land area does a photovoltaic need?

We find that conventional photovoltaic will require 0.5 to 1.2% of global land area to meet projected energy demands by 2085 without accounting for climate change effects. When considering climate impacts, this requirement increases to 0.7-1.5% of the global land area.

Are PV systems eco-friendly?

PV systems cannot be regarded as completely eco-friendly systems with zero-emissions. The adverse environmental impacts of PV systems include land, water, pollution, Hazardous materials, noise, and visual. Future design trends of PV systems focus on improved design, sustainability, and recycling.

How much energy does PV use in urban areas?

Considering the high energy demands in urban areas, utilising building facades, rooftops, footpaths, parking lots and other urban infrastructure for PV deployment could provide 1.4 to 4.2 times the energy demanded in 2085 across scenarios (Fig. 5). Alternatively, pastures could be used for large scale PV deployment as a multifunctional land-use.

Do reclaimable idle croplands generate more electricity?

Our method detected more reclaimable idle cropland than previous studies. Focusing on food security while limiting AVS installations to reclaimable idle croplands could still generate up to 4564.08 GWh of electricity (0.8% of regional consumption) and 930.82 tons of soybeans (6.2% of regional yield).

Can photovoltaics be used in degraded grasslands?

Zhang, B. et al. Deploying photovoltaic arrays in degraded grasslands is a promising win-win strategy for promoting grassland restoration and resolving land use conflicts. *J. Environ. Manag.* 349, 119495 (2024).  
Nowak, A. et al. Ecovoltaics-a truly ecological and green source of renewable goods. *Ecol. Chem. Eng. S* 30, 315-332 (2023).

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