Rooftop solar could cut global warming and provide 65% of the world's electricity, new study finds

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Covering the world's rooftops with solar panels could provide the majority of global electricity, and lower temperatures by 0.13 degrees according to new research (https://www.nature.com/articles/s41558-025-02276-3) by the University of Sussex.

Rooftops cover approximately 286,000 km² of the globe, an area similar in size to Italy or New Zealand. If every suitable roof was used, the study found photovoltaic solar (rooftop PV) could generate 19,500 TWh of electricity per year. This would cover 65 percent of current global consumption and almost completely replace fossil fuel-based electricity, if coupled with load shifting and battery-electric storage.

The researchers used advanced climate models to simulate the impact of widespread solar deployment by 2050. When it comes to global warming 0.13 degrees Celsius is a significant fraction. A 2023 Nature study (https://www.nature.com/articles/s41893-023-01132-6/figures/5) estimated that for every 0.1 degree of warming above current levels, another 140 million people will be exposed to dangerous heat.

Urging policymakers to prioritise this technology, the researchers argue that solar power offers taxpayers better value for money than nuclear. University of Sussex climate and policy researcher Prof Felix Creutzig said: "Solar is now outcompeting nuclear power in cost, deployment speed and environmental risks. Given its immediate carbon reduction benefits governments should consider shifting incentives toward rooftop PV instead of nuclear. This goes for cooler countries like the UK as well as those with more obvious solar potential."

Solar power costs have declined dramatically over the past decade. Data from the International Renewable Energy Agency suggests that the levelized cost of electricity for solar is now in the range of GBP£30 to £50 per MWh, while new nuclear projects such as Small Modular Reactors are estimated at between £100 and £150 per MWh.

Dr Creutzig adds: "Beyond carbon savings, reducing fossil fuel dependence also means cleaner air and better energy security. With so much untapped potential in solar it's hard to see how governments can justify investing in nuclear, or as yet unproven carbon capture projects."

Today's paper advocates for global cooperation to deploy solar panels where they can be most powerfully used. Despite being the continent with the world's highest solar energy resources, Africa accounts for only 1% of rooftop PV installations, highlighting the need for investment. High carbon intensity and large building stocks mean that East Asia has the highest potential in rooftop PV for climate change mitigation. Meanwhile, North America and Europe, despite lower solar intensity, have a high combined installation potential of over 4,300 GW or 25% of global capacity based on their high building stock.

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