Contemporary Investigation and Prospective Analysis into China's Photovoltaic Infrastructure Development

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SUMMARY

Solar energy is a crucial component of the global transition to clean energy, with photovoltaic (PV power generation playing a key role by converting sunlight into electricity. Expanding PV power generation is a vital pathway to achieving Sustainable Development Goal 7. However, the current progress, challenges, and best practices in PV construction have not been fully examined and summarized. China, the world's most rapidly expanding PV market, offers a unique opportunity to analyze current trends and guide future developments in PV power generation. This study employs remote sensing data to assess the status of PV power plants across China as of 2022. Our investigation reveals that PV installations in China cover an area of 3.101 square kilometers and are projected to reduce carbon emissions by 167.61 Mt. By integrating electricity consumption data, we identify a spatial mismatch between PV power supply and regional demand, highlighting the need for balanced development or enhanced inter-regional transmission to optimize clean energy distribution nationwide. Additionally, we analyze the factors influencing PV deployment by integrating data on natural geography, socioeconomic factors, and policy frameworks. We construct a comprehensive map of PV development potential across China, providing a strategic reference for optimizing future PV investments and supporting the sustainable expansion of clean energy infrastructure.

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