

International Conference on Renewable & Sustainable Energy Engineering (ICRSEE 2026)

Conference Proceedings

February 24, 2026 - (Virtual)

Identifying Factors for Rooftop Solar Deployment: A Comparative Study of South and West Zones in Delhi

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Abstract

Solar energy has emerged as a cornerstone of the global transition toward sustainable energy, driven by the urgency to reduce carbon emissions and combat climate change. As one of the most abundant and renewable energy sources, solar power has witnessed remarkable advancements in technology, policy support, and large-scale deployment across various regions. India, in particular, has positioned itself as a leader in solar energy through strategic initiatives and policy frameworks that aim to achieve ambitious renewable energy targets. India's commitment to a 45 % reduction in emissions intensity of its GDP by 2030, compared to 2005 levels, is a very ambitious step (Ministry of Environment, Forest and Climate Change, 2022)¹. Further, the 14th National Electricity Plan (NEP14) aims to double the country's electricity generation capacity by 2032, with solar energy playing a pivotal role. Delhi's solar adoption has significantly increased, aiming to increase the state's solar capacity to 4,500 MW by 2026-27, meeting 20 per cent of electricity needs by 2027². The solar policy aims to reduce electricity bills to zero and slash commercial and industrial electricity bills by 50 per cent.

Several factors determine the deployment of rooftop solar at the residential level. Some of the selected factors are social factors (age, gender, marital status, educational qualification, occupation, population density, land area, number of members living in the house, number of bedrooms, rented or owner-occupied etc.), economic factors (household income, employment status, number of vehicles owned, operation and management costs, fuel costs, user costs etc.), policies and regulatory factors (feed-in- tariffs, net metering, subsidies to stakeholders, access to solar leasing, power purchase agreements (PPA), green loans), behavioural factors (social norms, peer influence. aesthetic concerns such as architectural features, degree or extent of public awareness), technological factors (efficiency, advancement, and cost-effectiveness, energy storage, invertors, generators, the life span of PV solar components, replacement costs, conversion efficiency, the potential to support basic appliances such as radio, TV, refrigerators, charging requirements), and environmental factors (emissions associated with electricity generation, recycling of batteries, land use, and degradation) affect the solar energy deployment.

The main objective of the study is to investigate various factors that determine rooftop solar deployment in the Delhi region. In addition, the study aims to examine the willingness of individuals to adopt rooftop solar deployment among residents that are without rooftop solar. Finally, the paper attempts to examine factors that determine the degree of awareness regarding rooftop solar deployment. The factors that are considered are socio-demographic, economic, policy and regulatory factors, behavioural factors, technological factors, and environmental sensitivity factors. The hypothesis that socio-economic factors, along with behavioural factors, play a critical role in determining solar deployment is tested in the paper.

Reference

1. <https://www.pib.gov.in/PressReleasePage.aspx?PRID=1885731®=3&lang=2#:~:text=India%20stands%20committed%20to%20reduce,by%202030%2C%20from%202005%20level>
2. <https://www.pib.gov.in/PressNoteDetails.aspx?id=155063andNoteId=155063andModuleId=3andreg=3andlang=2>