

Exploring public acceptance of solar energy technologies in different settings in Denmark

Authors and affiliation: Sergio Espina Carreño, Matteo Zuch, and Jacob Ladenburg, Technical University of Denmark (DTU)

Abstract

In the pursuit of transitioning toward climate neutrality, Denmark focuses on expanding its national renewable energy capacity, including solar photovoltaic (PV) installations. Such development requires new infrastructure development, affecting local communities and their surroundings. Thus, public acceptance of solar PV technologies is a critical driver for the widespread adoption and efficient implementation of new projects, especially when considering different placement options.

This study explores the intricate dynamics shaping public attitudes toward new solar energy projects. We utilize nationally representative survey data from 4,133 respondents to investigate potential factors influencing public acceptance patterns for solar PV installations in different settings, i.e., on (a) private rooftops, (b) industrial rooftops, and (c) agricultural fields. The survey data is combined with detailed geospatial data capturing the individual experience with and exposure to existing solar energy infrastructure at the municipality and respondent level, respectively.

The results denote that solar PV installations in agricultural fields constitute the least accepted placement option among the Danish public. PV on private and industrial rooftops exhibit comparable acceptance levels. In addition, the study provides new insights into the relationship between locational factors and people's attitudes toward new solar PV installations. Our results indicate a negative relationship between the municipal share of residential PV installations and peoples' attitudes toward new solar energy projects, irrespective of the considered placement option. This effect appears to be mainly driven by respondents lacking personal experience with solar PV: Conditional on owning a PV system, the share of private PV installations within one's municipality positively influences public solar energy acceptance, especially when considering the expansion of PV installations on residential rooftops. This suggests that individual experience with the technology can mediate and counteract the observed distance-decay effects in PV acceptance.

Further, the study results indicate that peoples' exposure to existing large-scale solar farms influences their attitudes toward new PV installations. Having at least one solar farm present within a 2km vicinity from one's residence positively affects the acceptance of PV on industrial roofs. Conversely, the relative coverage of solar farms within a respondent-specific 2km accessible area appears to negatively influence public acceptance of expanding private rooftop PV installations.

The study outcomes hold significant policy implications for facilitating the adoption and integration of solar PV projects. The empirical findings can assist policymakers and energy planners in designing efficient pathways for expanding renewable energies and identifying optimal sites for future solar PV placements. Critically considering public perceptions when defining climate mitigation strategies will advance a sustainable energy landscape and, hence, promote a people-centered green energy transition.

Keywords: Solar energy, Photovoltaic (PV), Social acceptance, Public attitudes, Location dynamics