



## Evaluating the relevance of the availability of variable renewable energy resources for the existence of citizen-led energy initiatives in Europe

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Energy communities (ECs) are expected to play a major role in the European Energy transition. However, quantitative evidence shows that these only represent a minor share of the installed capacity compared to commercial large scale installations. We argue that understanding better the conditions that facilitate of ECs emergence, will contribute to develop adequate strategies to foster their creation. In previous research we conducted an exploratory data analysis to understand the relation between the availability and quality of variable renewable energy sources (VRES) and ECs (Ramirez Camargo et al., 2023). This was done by calculating 38 indicators of VRES availability and quality for NUTS3 regions derived from four decades of ERA5 data, together with a data set of energy cooperatives (most common organizational form of ECs) as a proxy for ECs with less than 1,000 entries. With the publication of an extensive data set of citizen-led energy initiatives, agglomerating all sorts of ECs and with more than 10,000 entries (Wierling et al., 2023), we replicated the previously proposed methodology. The main results from previous research hold at the continental level: There is a slight predominance of citizen-led energy initiatives where wind resources are high and opposite results for solar resources. Nevertheless, the considerably higher data availability allows for a detailed analysis at the country level. We observe that while countries with large numbers of citizen-led energy initiatives, such as Germany, drive what we observed at the continental level, there are countries such as Denmark and Ireland with high positive correlation between citizen-led energy initiatives and wind power capacity factors. There are also clear exceptions to the rule, such as the Czech Republic, with a high positive correlation to solar resources that reaches 0.731. At the country level, just as at the continental level, we see that clusters of citizen-led energy initiatives develop where VRES availability is high but it also becomes more evident that there are large differences in the concentration of citizen-led energy initiatives between NUTS3 regions of individual countries. Finally, we see a large unexploited potential for development of ECs in the regions of the continent that are rich in solar resources.

Ramirez Camargo, L., Lode, M., & Coosemans, T. (2023, Januar 13). Assessing the relevance of renewable energy resources availability for the existence of Energy Cooperatives in Europe. *Volume 29: Closing Carbon Cycles – A Transformation Process Involving Technology, Economy, and Society: Part IV*. Applied Energy Conference 2022. <https://doi.org/10.46855/energy->

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