

Probabilistic projections of granular energy technology diffusion at subnational level

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Updated projections for 2050, using the latest data of 2023

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These probabilistic projections are an update to the work of Zielonka et al. (1), using the latest data from 2023 on the actual uptake of solar photovoltaics (PV), heat pumps, and battery electric vehicles (BEVs) in Switzerland (3–5). The provided data files contain the estimated probabilistic projections for each of 2,131 Swiss municipalities (as registered 2024-01-01 by Federal Statistical Office (6)) for these three technologies for the years 2024-2050.

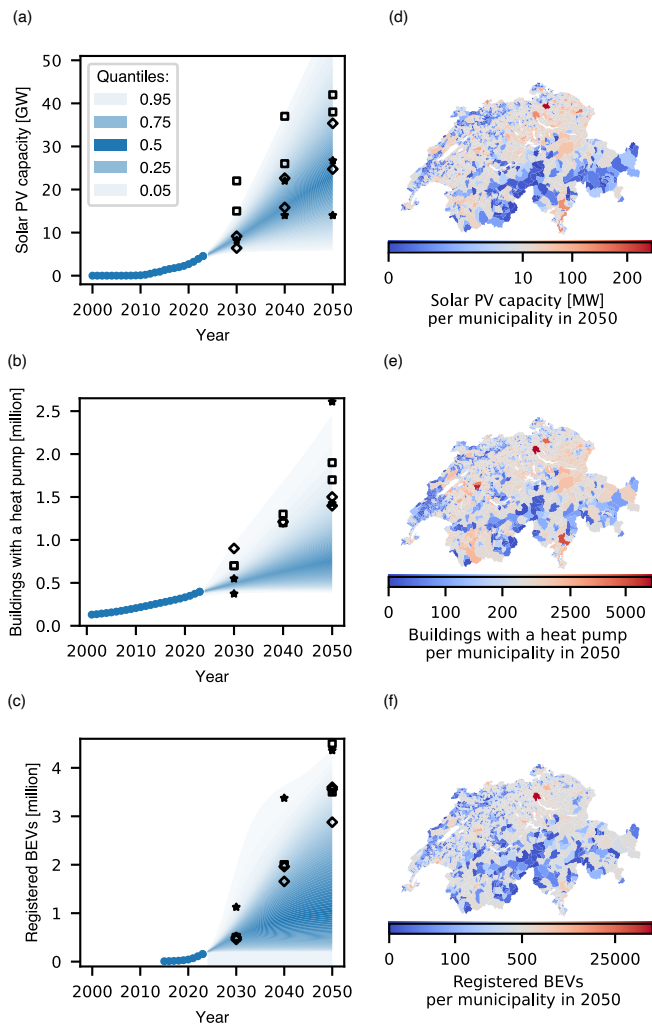


Figure 1. Probabilistic national projections (a-c) of the diffusion of solar PV, heat pumps, and battery electric vehicles (BEVs) in Switzerland until 2050 and maps (d-f) with the projected median values for each Swiss municipality in 2050, both with a quantile coloring scheme. The quantiles of the national projections are the sum of the respective quantiles of all municipalities. The markers set targets for reaching an energy system of net-zero greenhouse gas emissions by 2050, estimated in studies for the Swiss Federal Office of Energy (◇) (7), (□) (8), and for the association of Swiss electricity companies (*) (9). If different scenarios exist, highest and lowest values are shown.

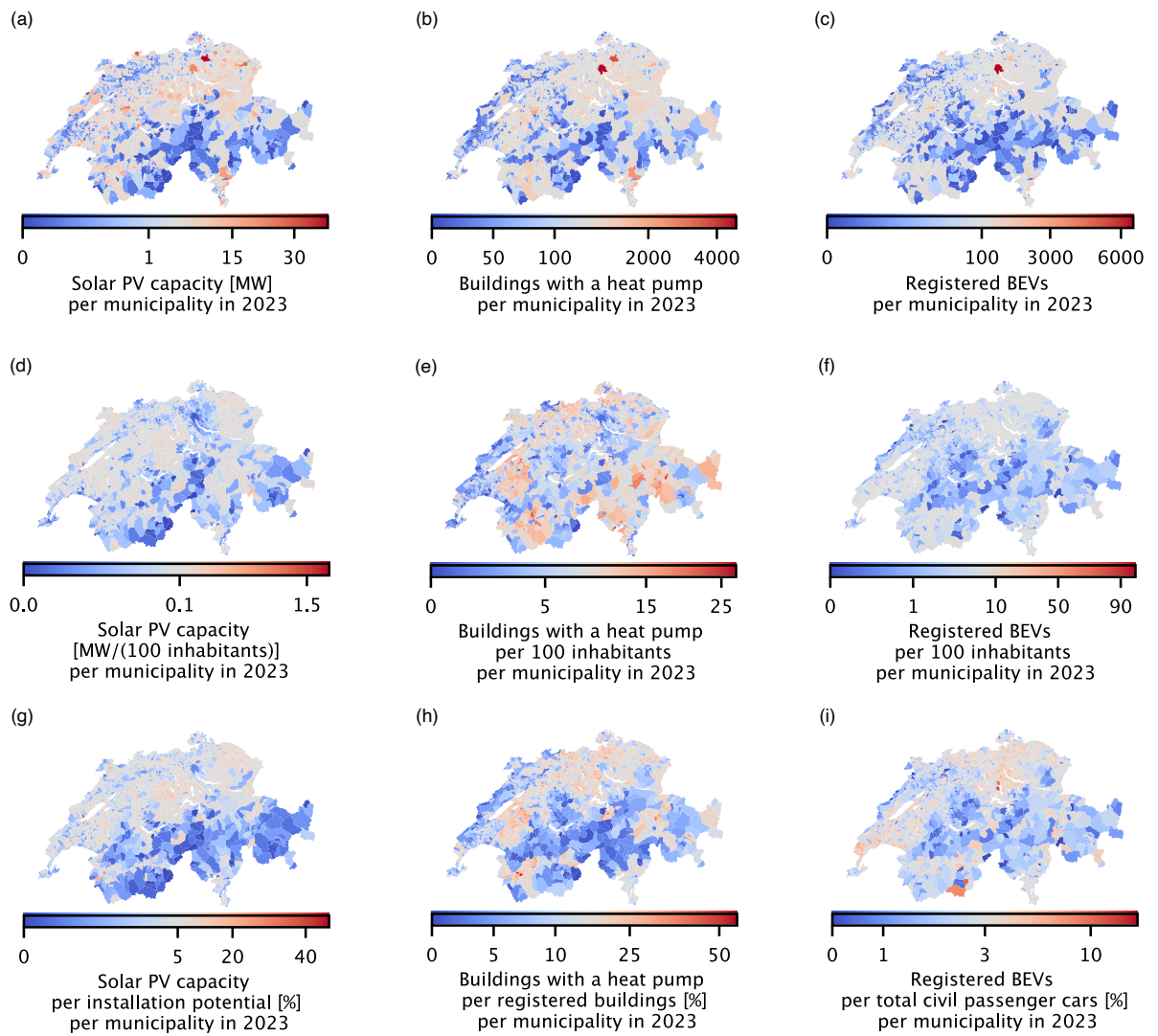


Figure 2. Distribution of solar PV capacities, heat pumps, and battery electric vehicles (BEV) in total (a-c), per 100 inhabitants (d-f), and per potential (g-i) across Switzerland in 2023 with a quantile coloring scheme. Own visualization based on data from Swiss Federal Office of Energy and Federal Statistical Office (3–5, 10, 11).

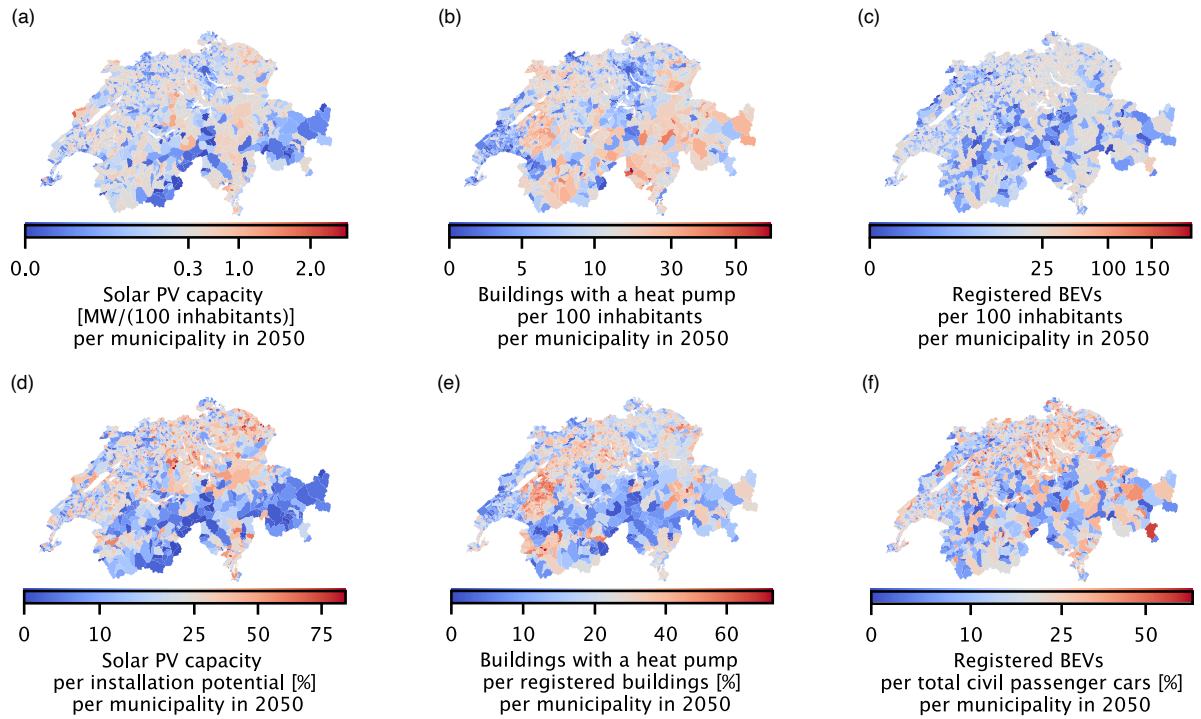


Figure 3. Distribution of solar PV capacities, heat pumps, and battery electric vehicles (BEV) per 100 inhabitants (a-c), and per potential (d-f) across Switzerland in 2050 according to the projected median values of the probabilistic projections of each municipality and a quantile coloring scheme.

Acknowledgements

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References

1. N. Zielonka, X. Wen, E. Trutnevyte, Probabilistic projections of granular energy technology diffusion at subnational level. *PNAS Nexus* **2** (2023).
2. N. Zielonka, X. Wen, E. Trutnevyte, Data from "Probabilistic projections of granular energy technology diffusion at subnational level - solar photovoltaics, heat pumps, and battery electric vehicles in Switzerland [Data set]". Available at <https://doi.org/10.5281/zenodo.8414845>. Deposited 6 October 2023.
3. Swiss Federal Office of Energy (SFOE), Data from "Elektrizitätsproduktionsanlagen". Available at <https://opendata.swiss/de/dataset/elektrizitatsproduktionsanlagen>. Deposited 29 August 2023.
4. Federal Statistical Office (FSO), Data from "Swiss Federal Register of Buildings and Dwellings (RBD)". Available at <https://www.housing-stat.ch/de/madd/index.html>. Deposited 25 September 2023.
5. Federal Statistical Office (FSO), Federal Roads Office (FEDRO), Data from "Bestand der Elektrofahrzeuge". Available at https://www.atlas.bfs.admin.ch/maps/13/de/17581_15115_164_3114/27575.html. Deposited 29 January 2024.
6. Federal Statistical Office (FSO), Data from "Amtliches Gemeindeverzeichnis der Schweiz". Available at <https://www.bfs.admin.ch/bfs/en/home/basics/swiss-official-commune-register.assetdetail.30186257.html>. Deposited 21 December 2023.
7. Prognos AG, INFRAS AG, TEP Energy GmbH, Ecoplan AG, "Energieperspektiven 2050+ Kurzbericht" (Swiss Federal Office of Energy, Bern, 2020).
8. Consentec GmbH, EBP Schweiz AG, Polynomics AG, "Auswirkungen einer starken Elektrifizierung und eines massiven Ausbaus der Stromproduktion aus Erneuerbaren Energien auf die Schweizer Stromverteilnetze" (Swiss Federal Office of Energy, Bern, 2022).
9. Verband Schweizerischer Elektrizitätsunternehmen (VSE), "Energieversorgung der Schweiz bis 2050 - Zusammenfassung von Ergebnissen und Grundlagen" (2022).
10. Federal Statistical Office (FSO), Data from "Ständige Wohnbevölkerung". Available at https://www.atlas.bfs.admin.ch/maps/13/de/17492_72_71_70/27090.html. Deposited 23 August 2023.

11. Swiss Federal Office of Energy (SFOE), Data from “Solarenergiepotenziale der Schweizer Gemeinden”. Available at <https://opendata.swiss/de/dataset/solarenergiepotenziale-der-schweizer-gemeinden/resource/079a8be9-3c45-41fc-9ffc-80cff94cc64f>. Deposited 19 April 2023.