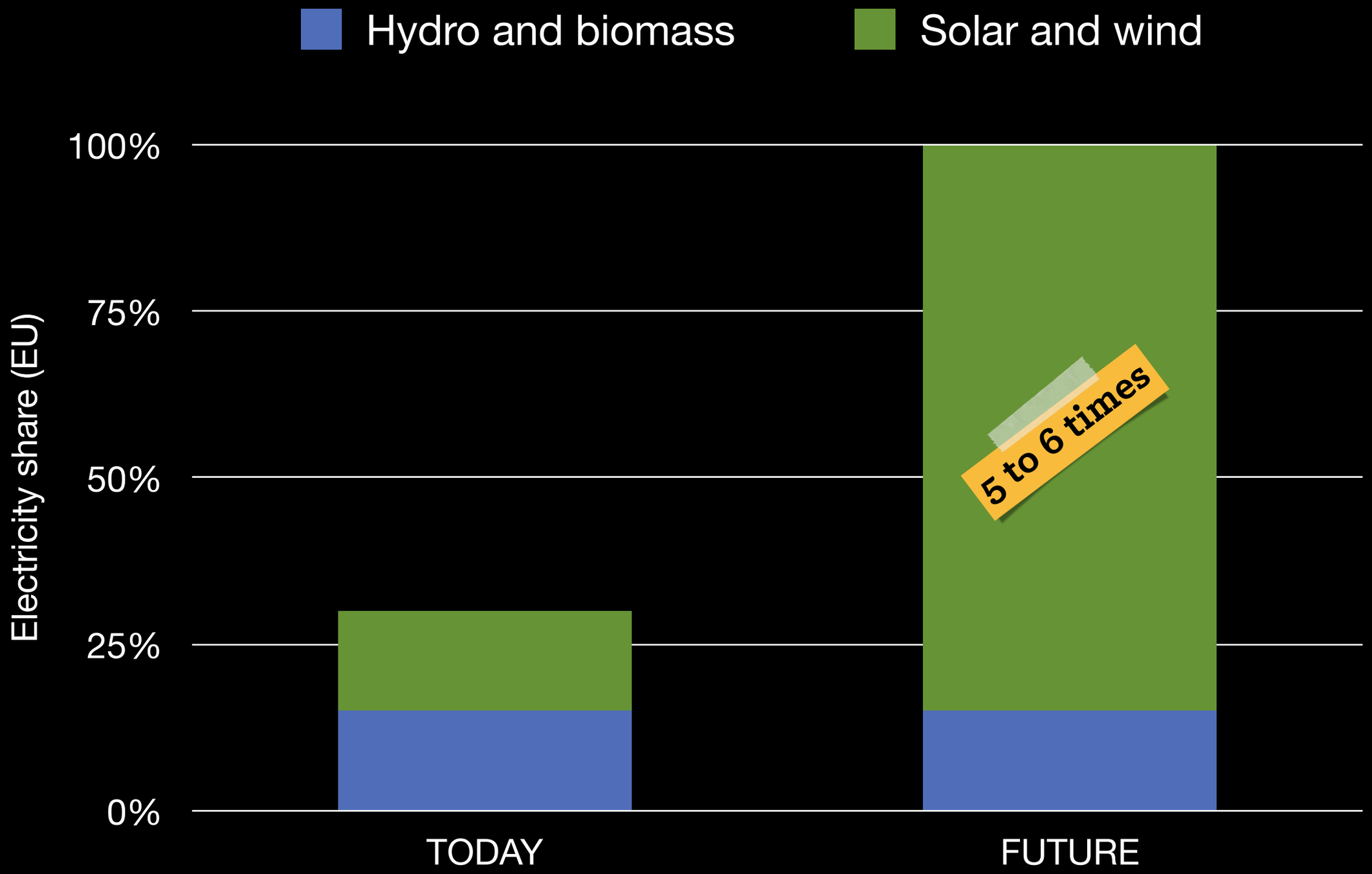
The most recent generation of spatially and temporally resolved energy system models

Key insights

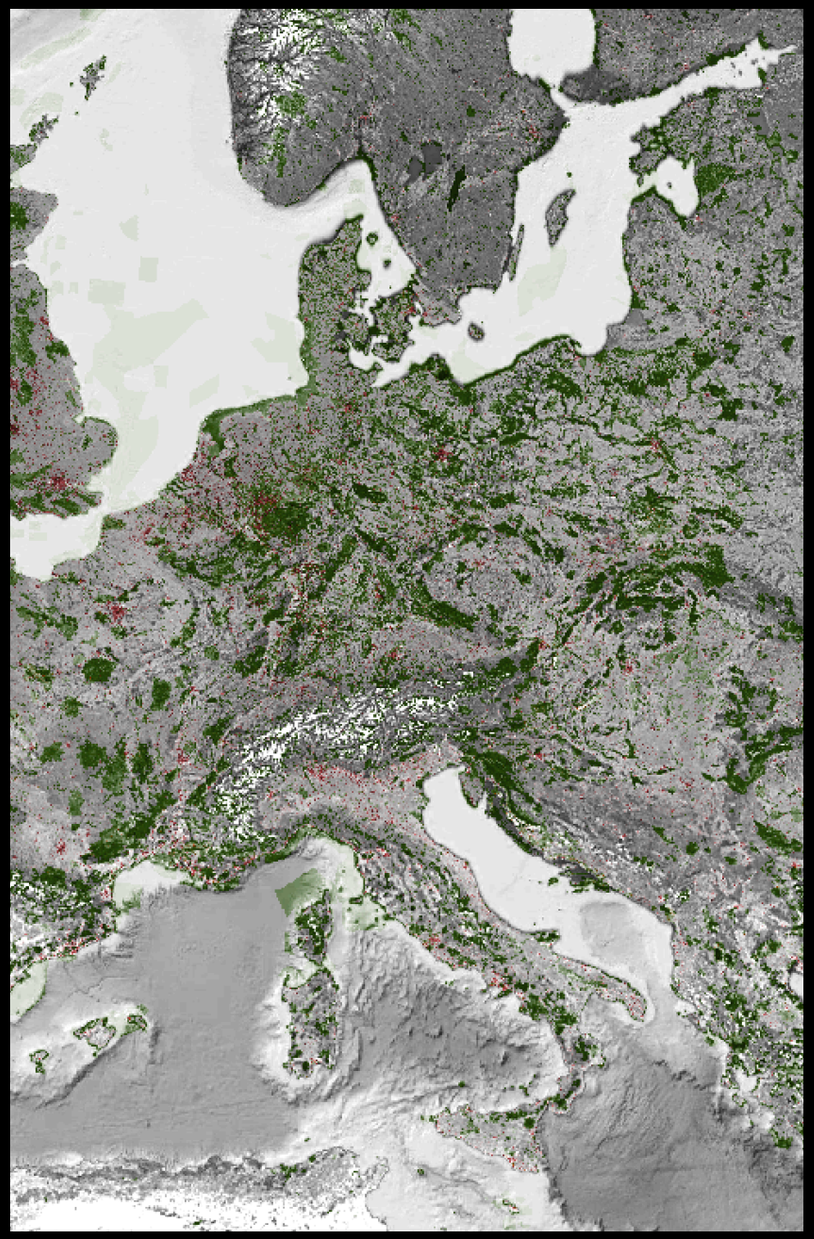
Tim Tröndle

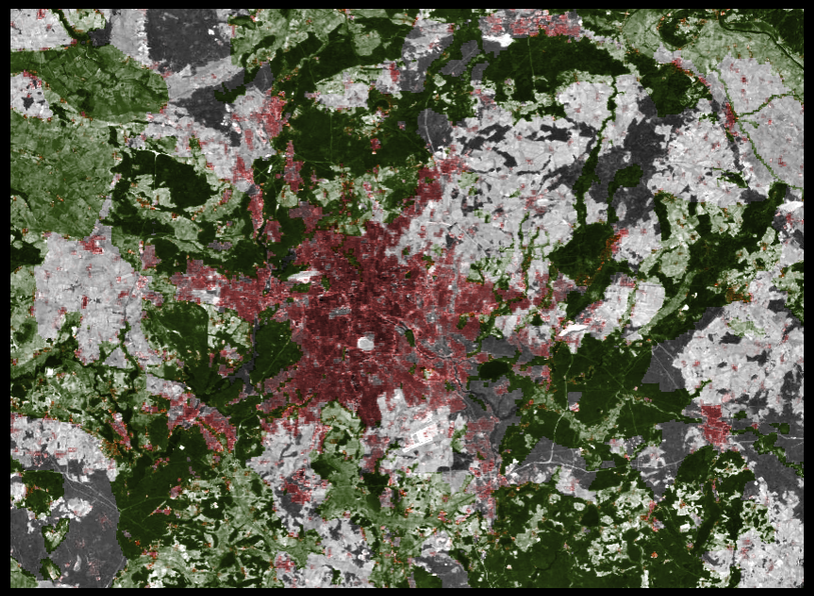
IASS POTSDAM

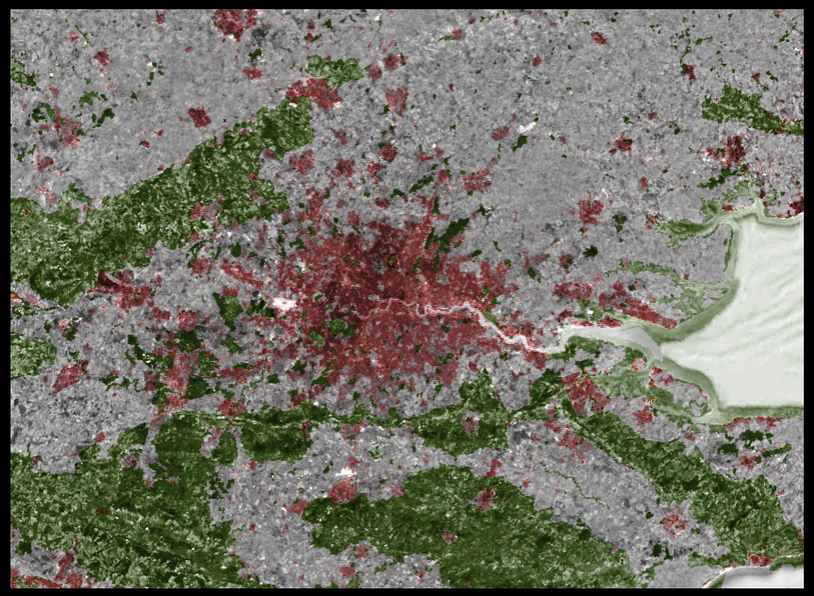


Source: Publications Office of the European Union, 2019. EU energy in figures: statistical pocketbook 2019. European Union, Luxembourg.

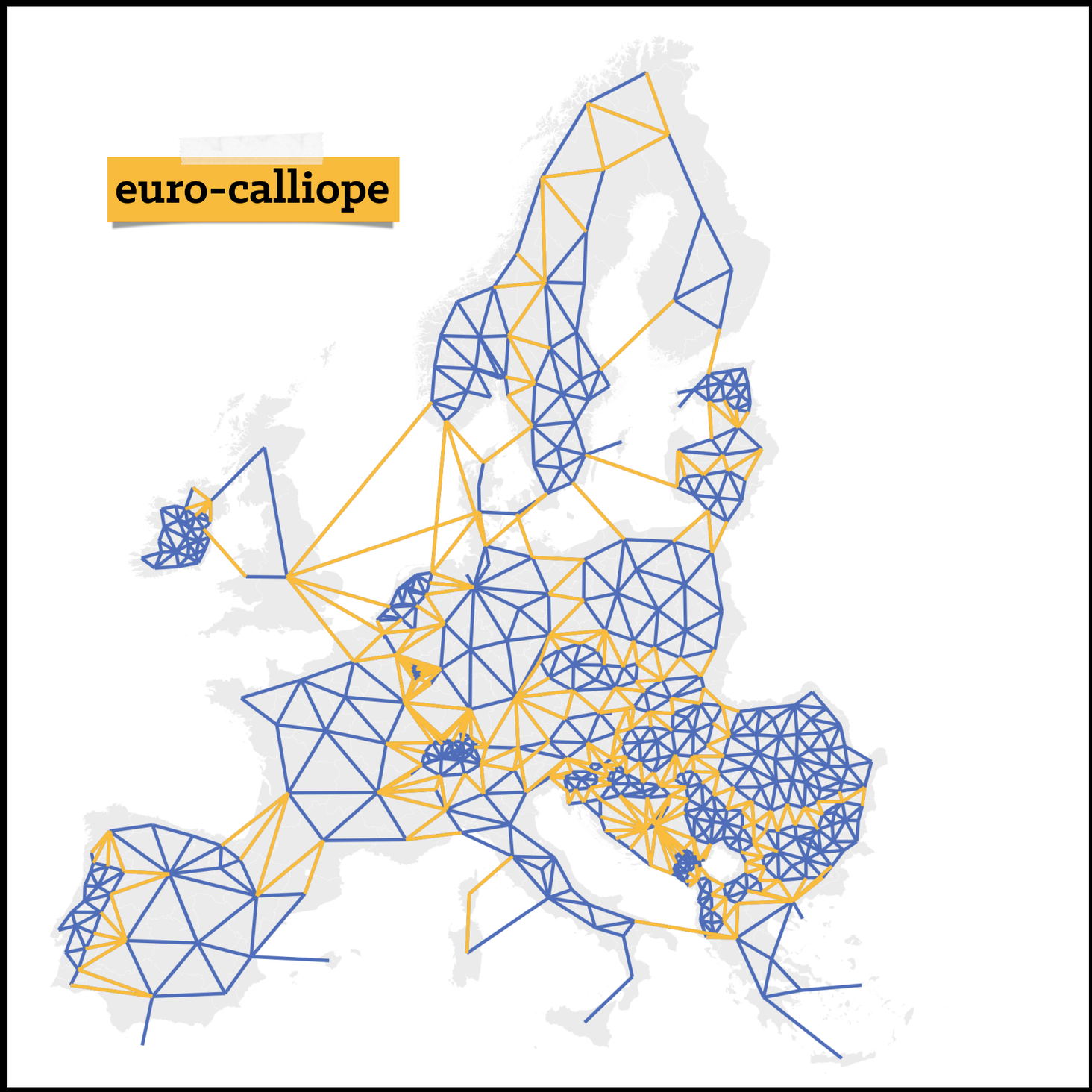
Where to build?







Sources: Google, GHSL JRC, IUCN

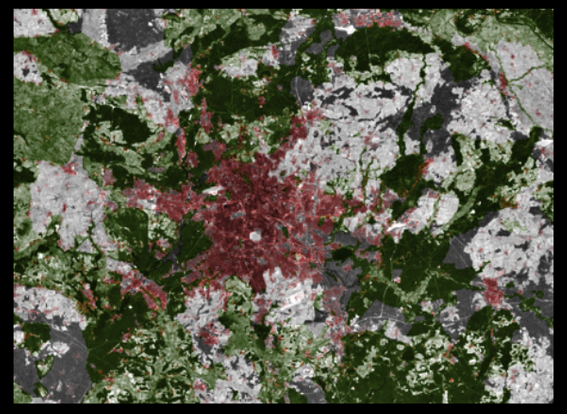


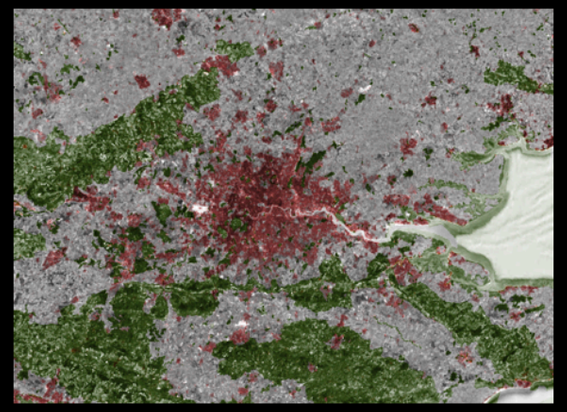
Sources: GEOSTAT, GADM

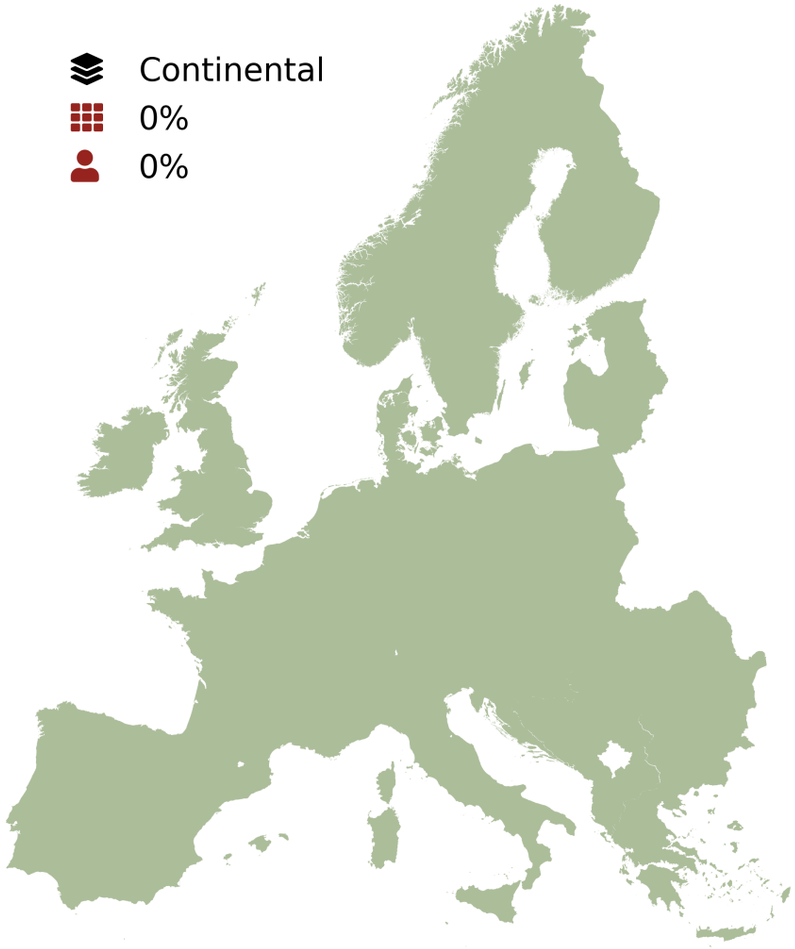
Possibility

On which geographic scales is the potential of renewable electricity in Europe large enough to satisfy annual demand?

Tröndle, T., Pfenninger, S., & Lilliestam, J. (2019). Home-made or imported: On the possibility for renewable electricity autarky on all scales in Europe. Energy Strategy Reviews, 26, 100388. https://doi.org/10.1016/j.esr.2019.100388



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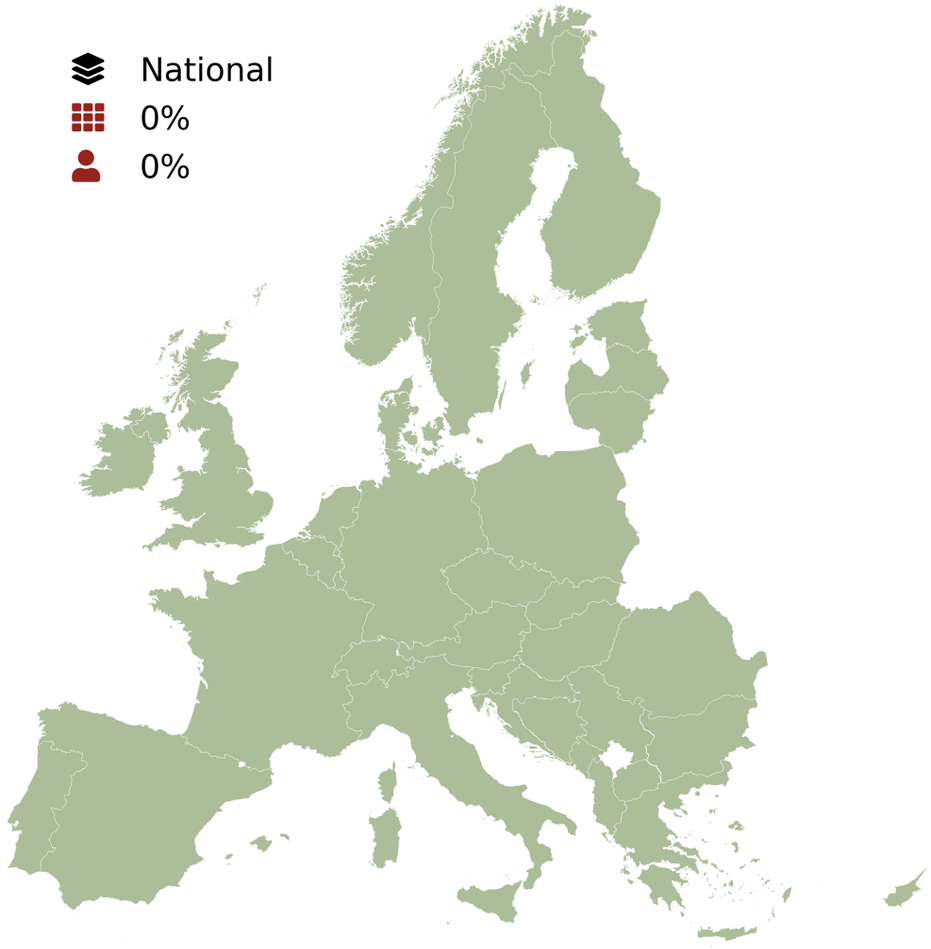
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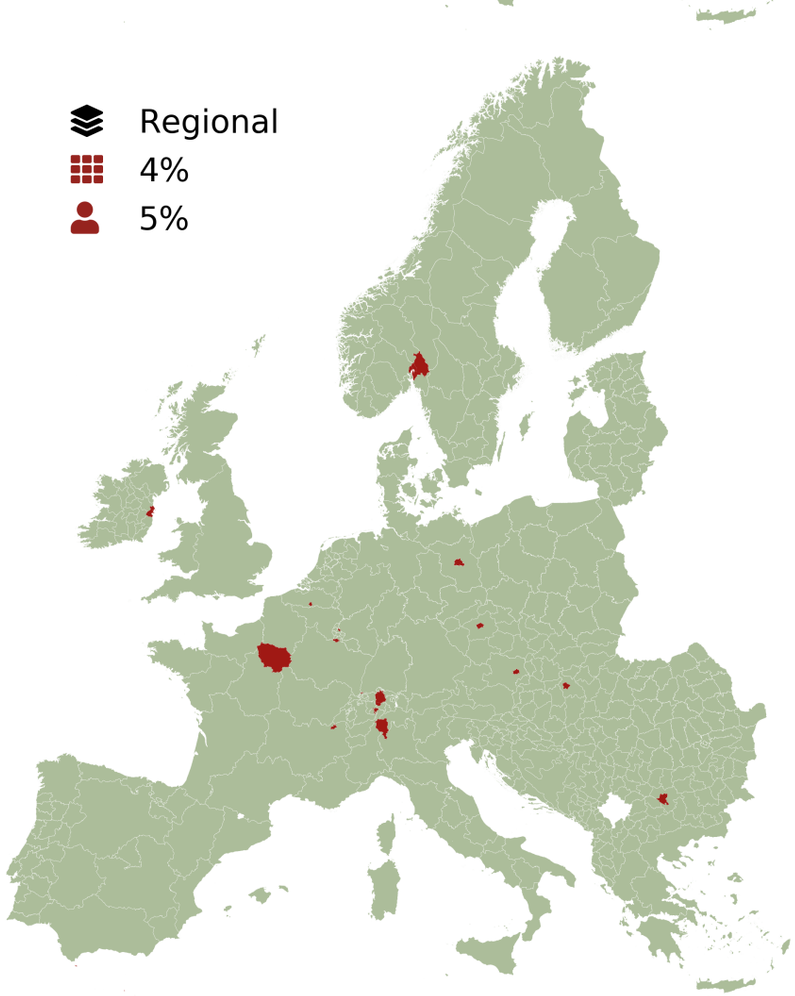
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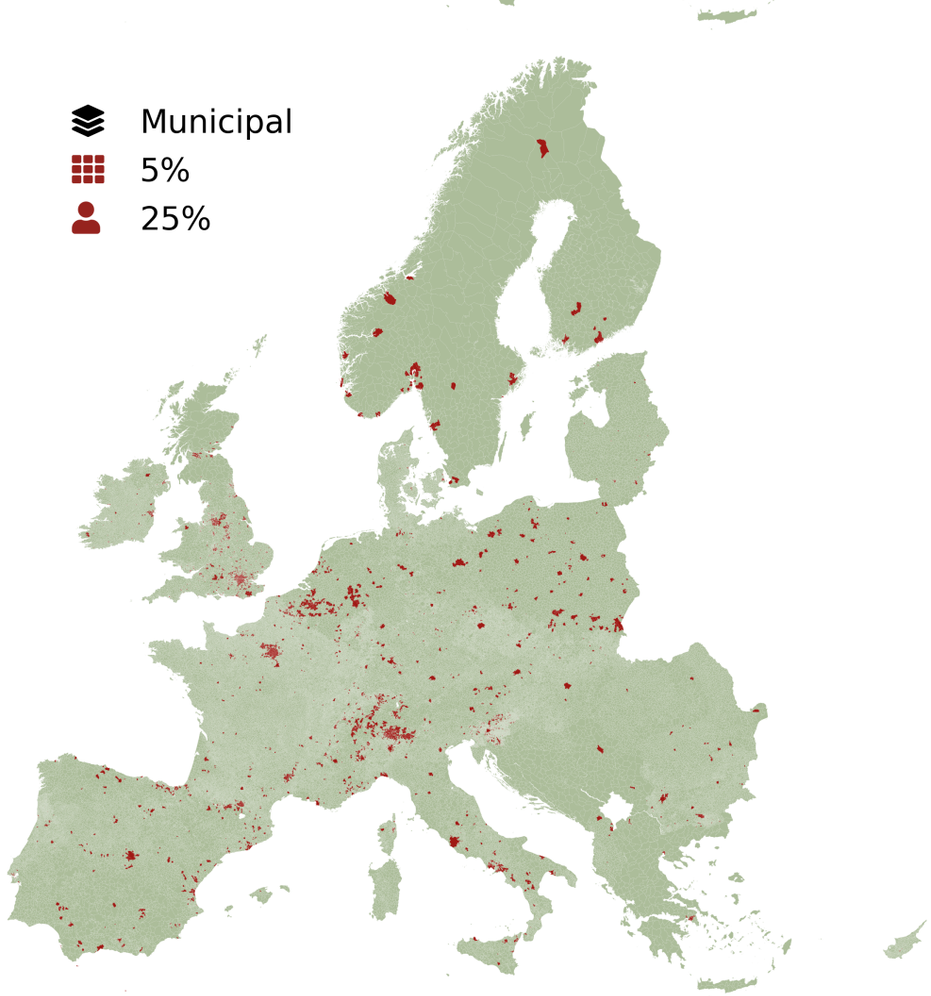
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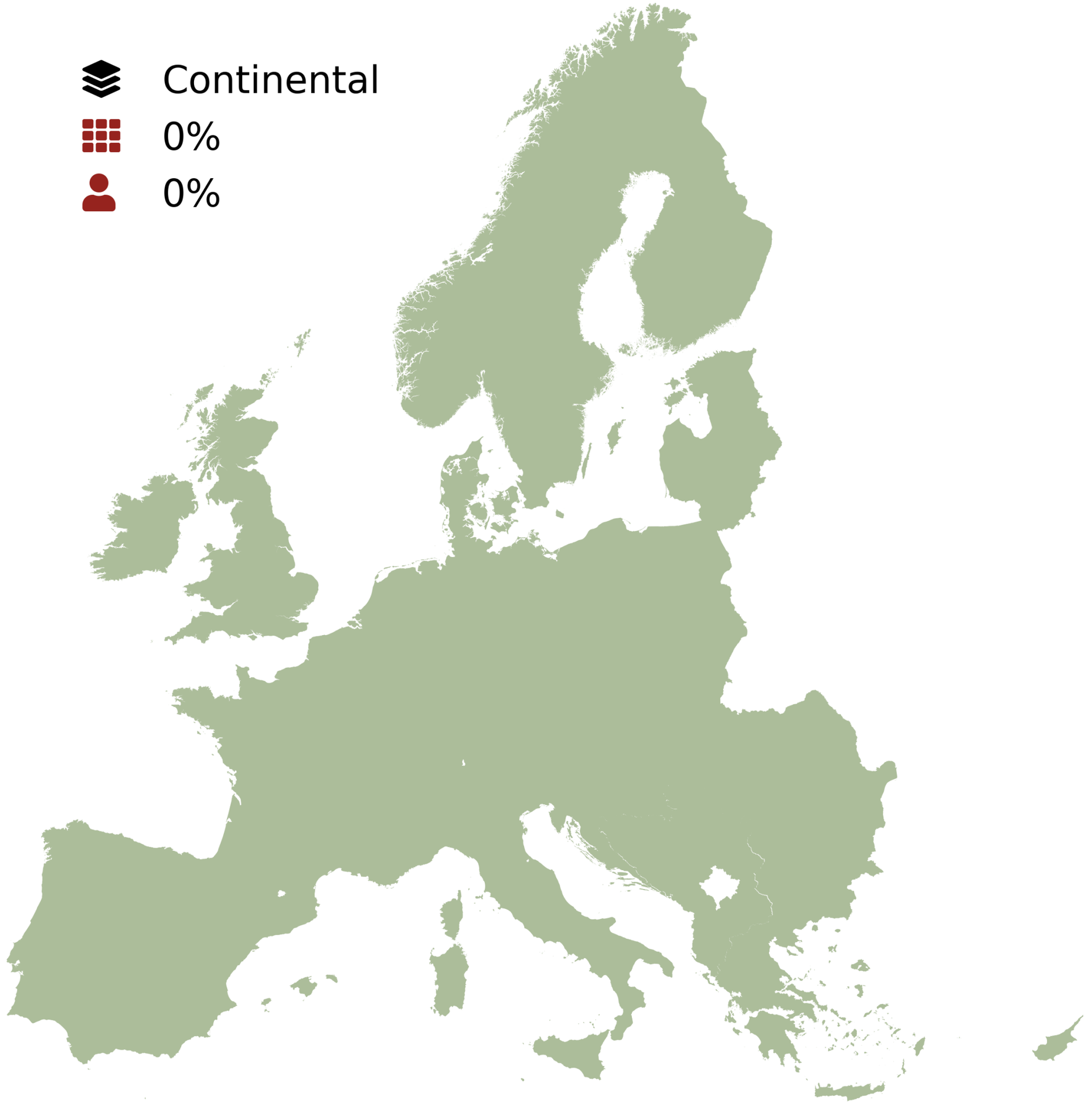

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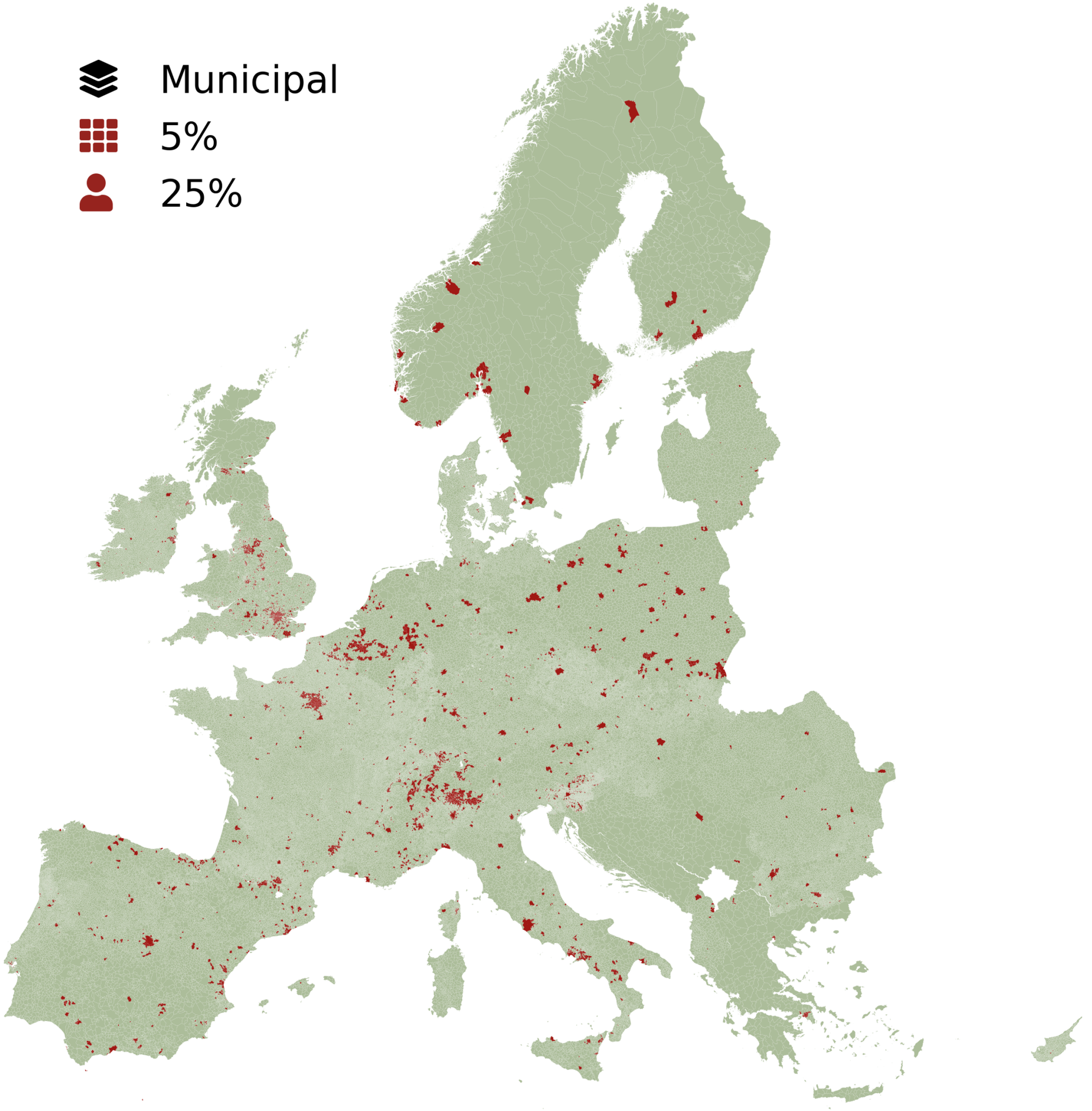

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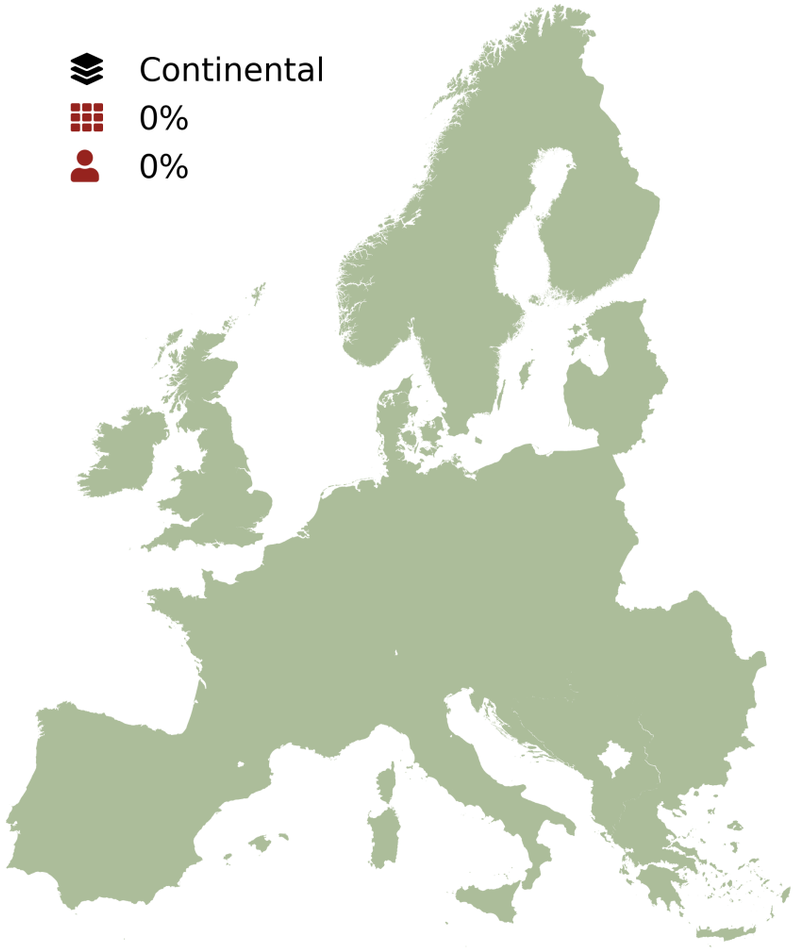

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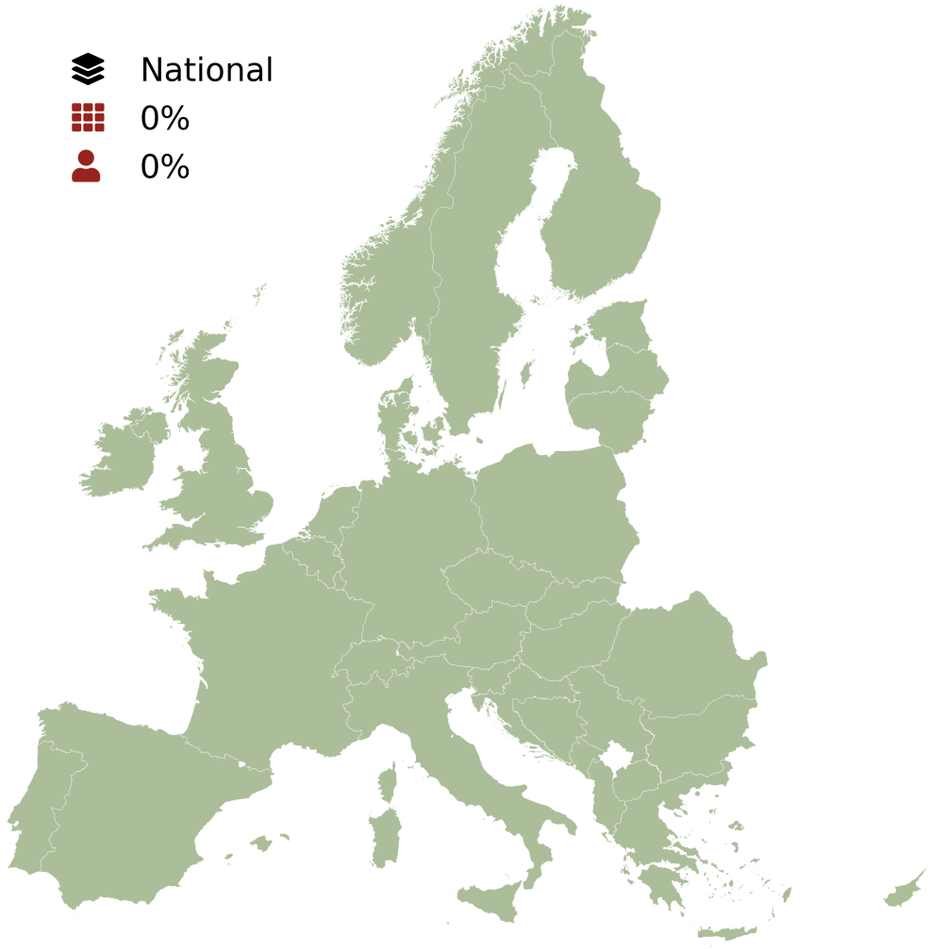

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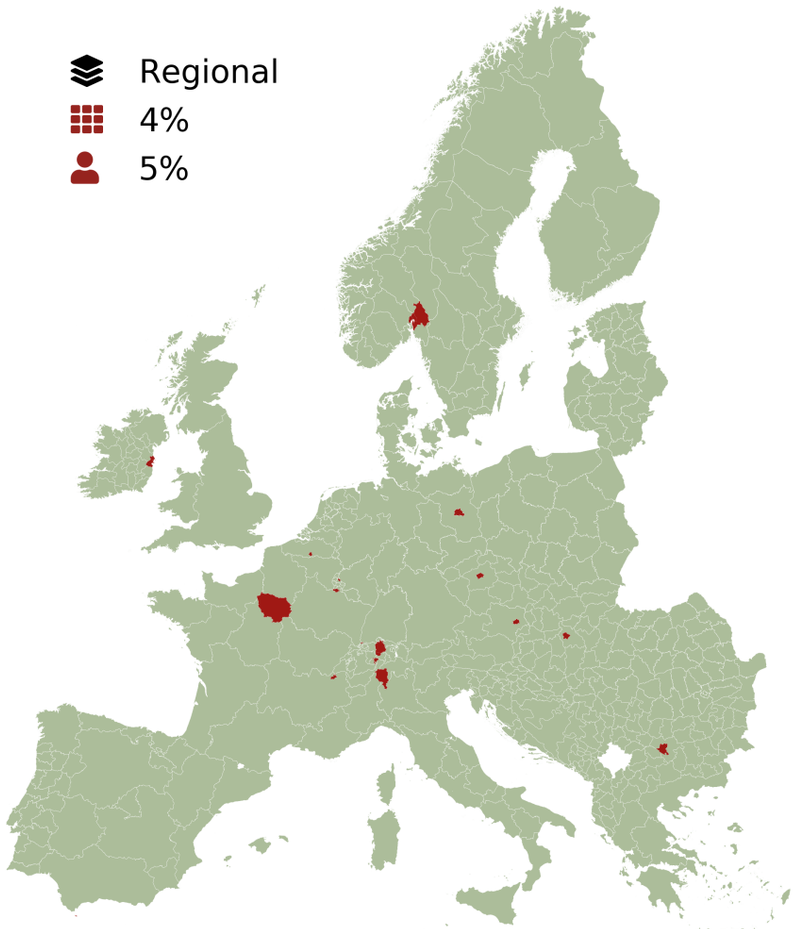

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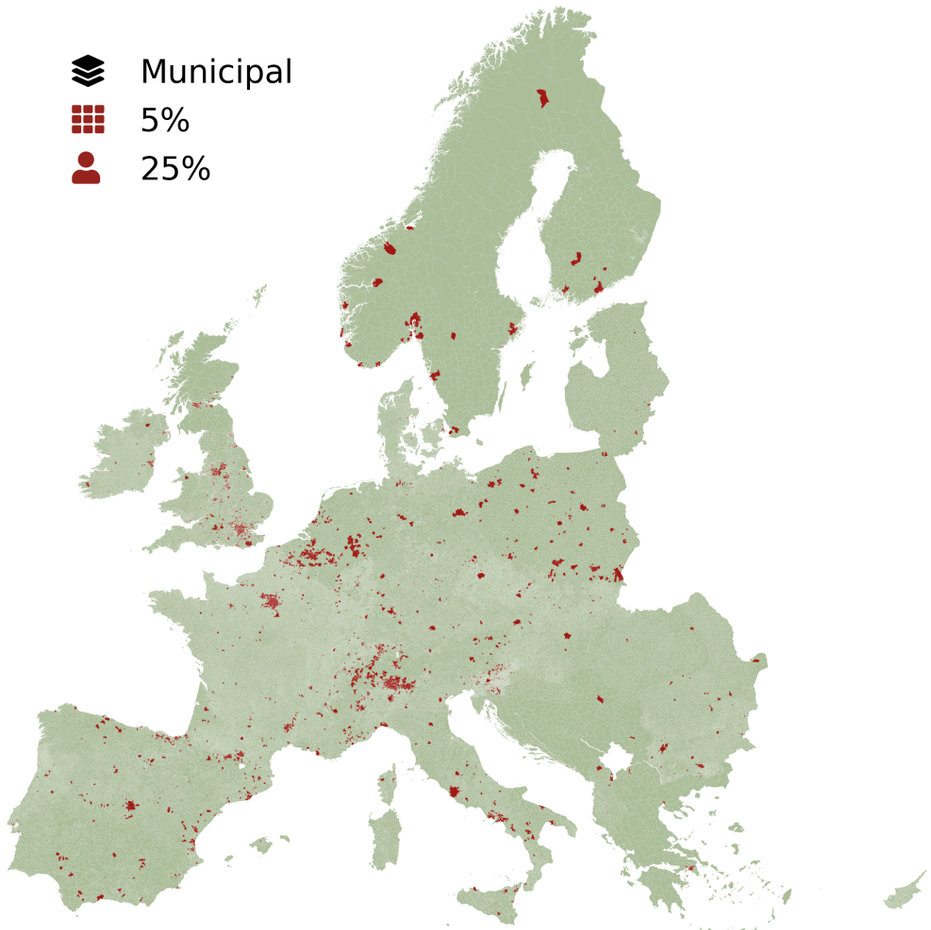
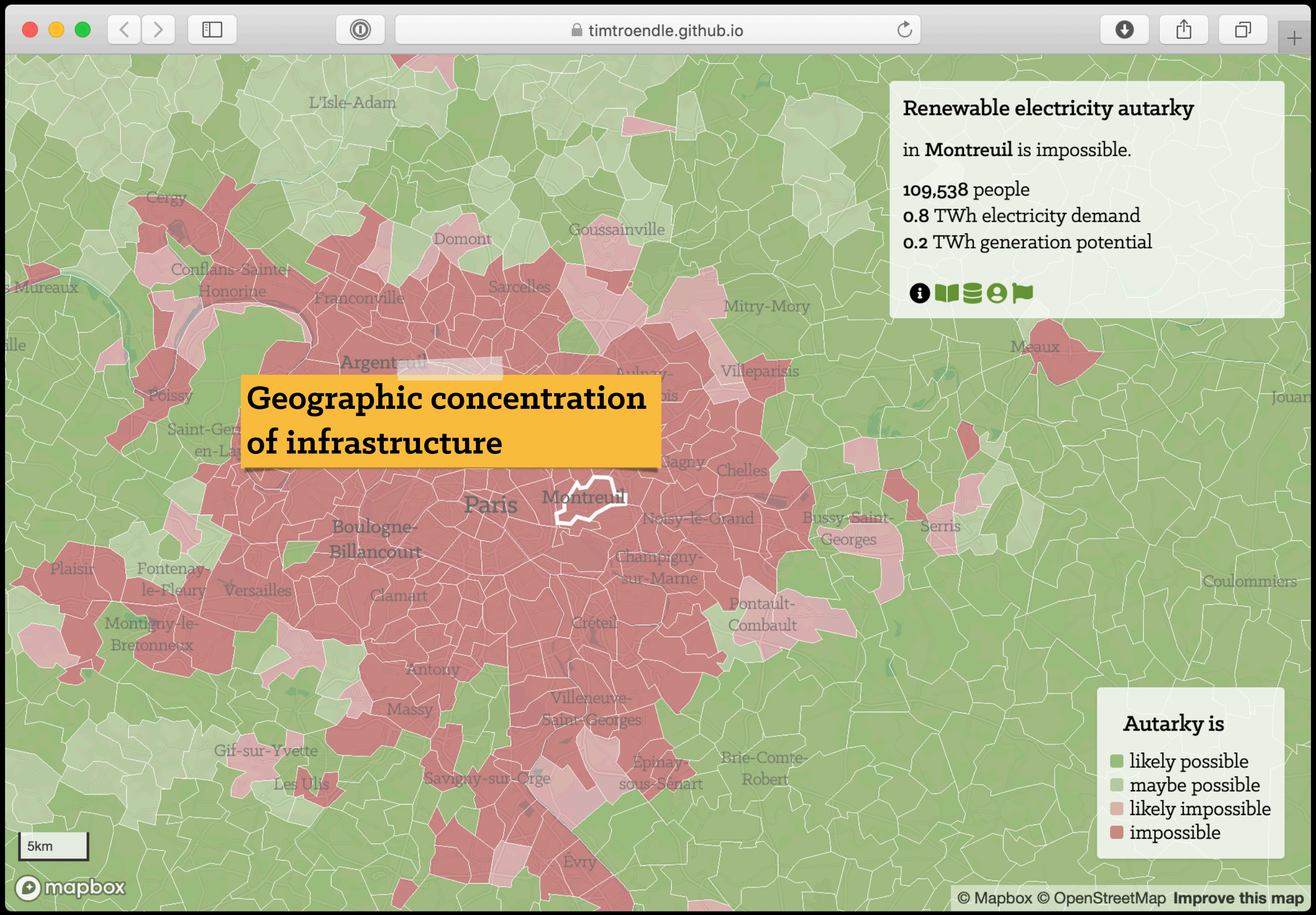


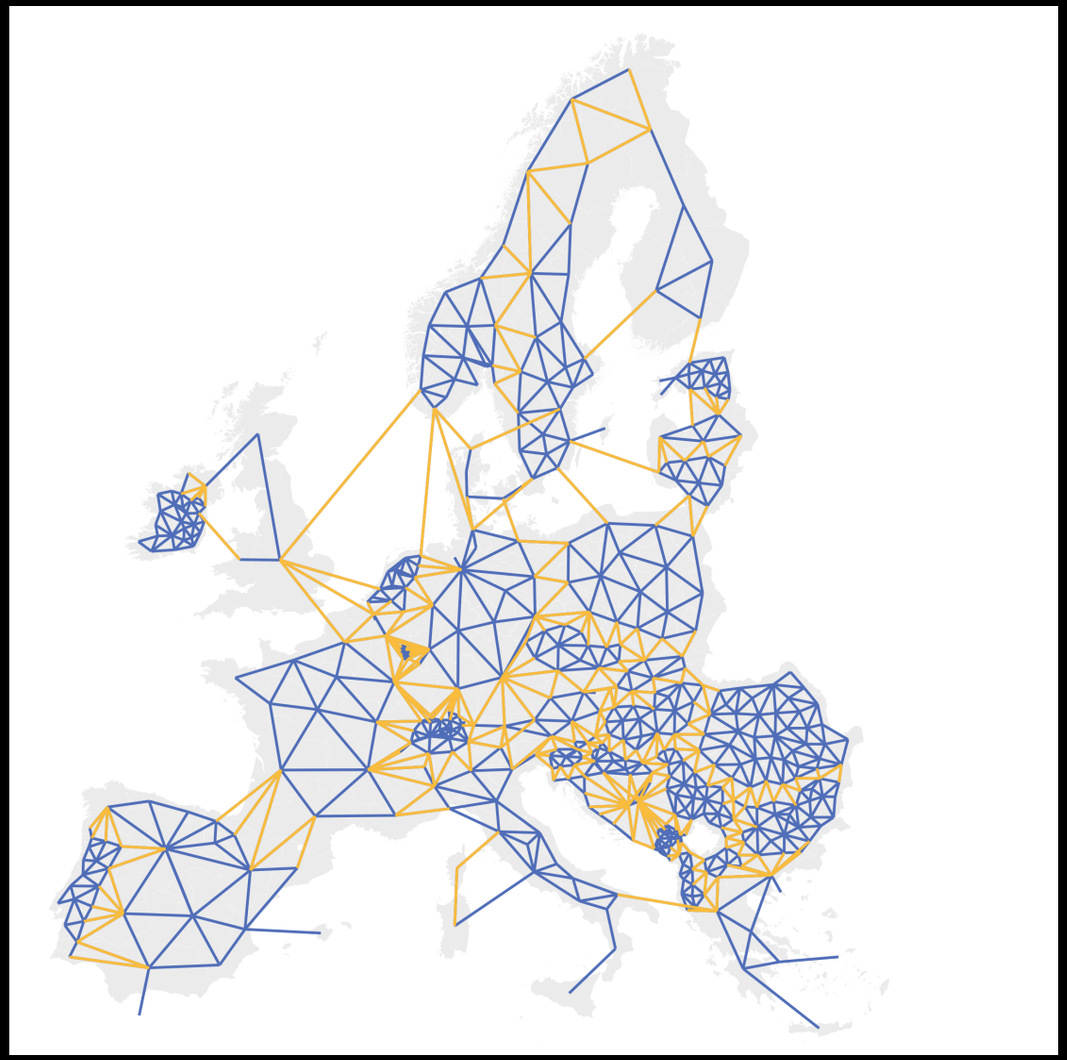


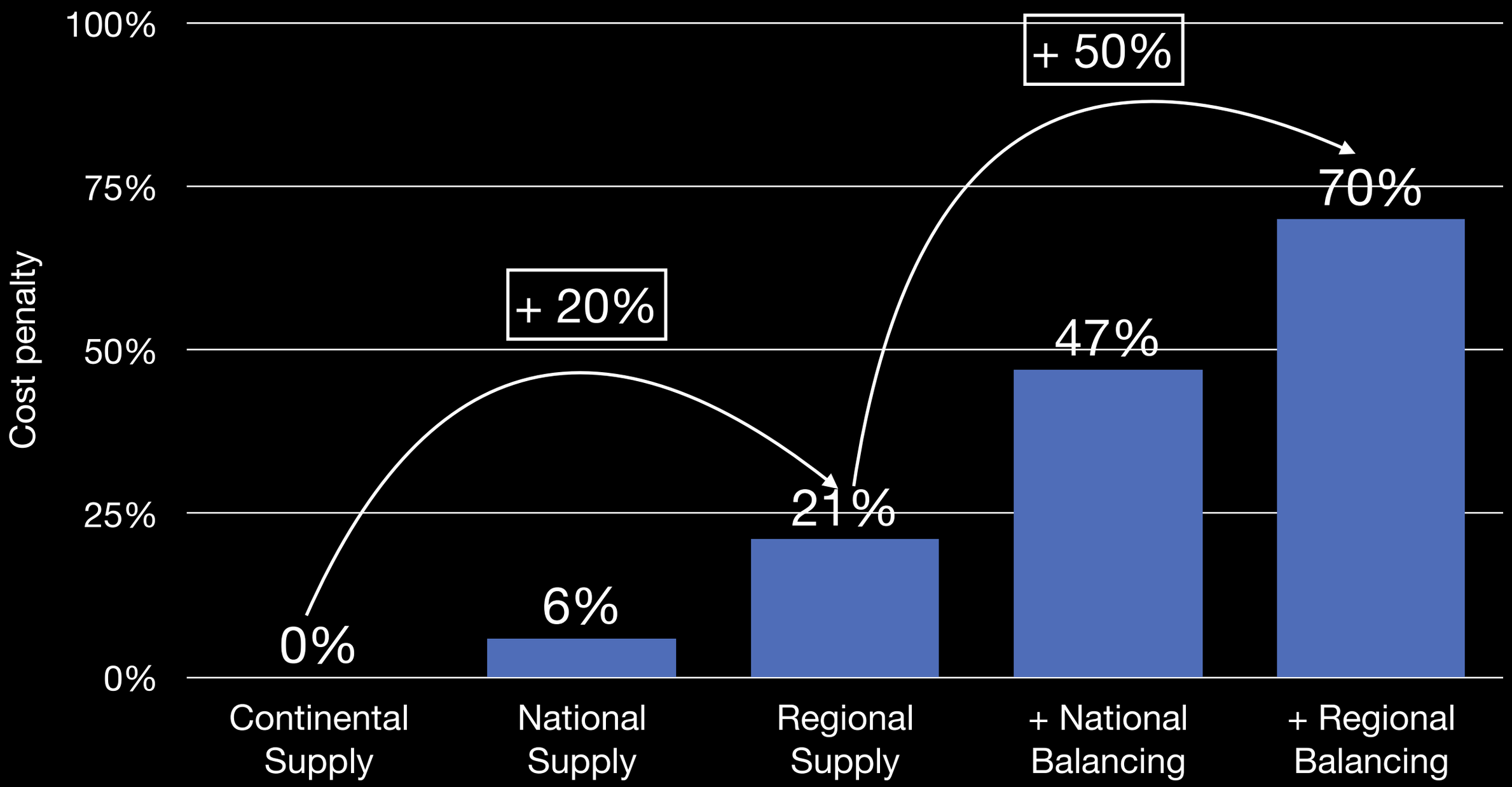
Source: https://timtroendle.github.io/possibility-for-electricity-autarky-map/

Cost

How does total system cost of fully renewable electricity supply in Europe change with geographic scale?

Tröndle, T., Lilliestam, J., Marelli, S., & Pfenninger, S. (2020). Trade-offs between geographic scale, cost, and infrastructure requirements for fully renewable electricity in Europe. Joule. https://doi.org/10.1016/j.joule.2020.07.018

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Cost penalty
+ 20%
+ 50%
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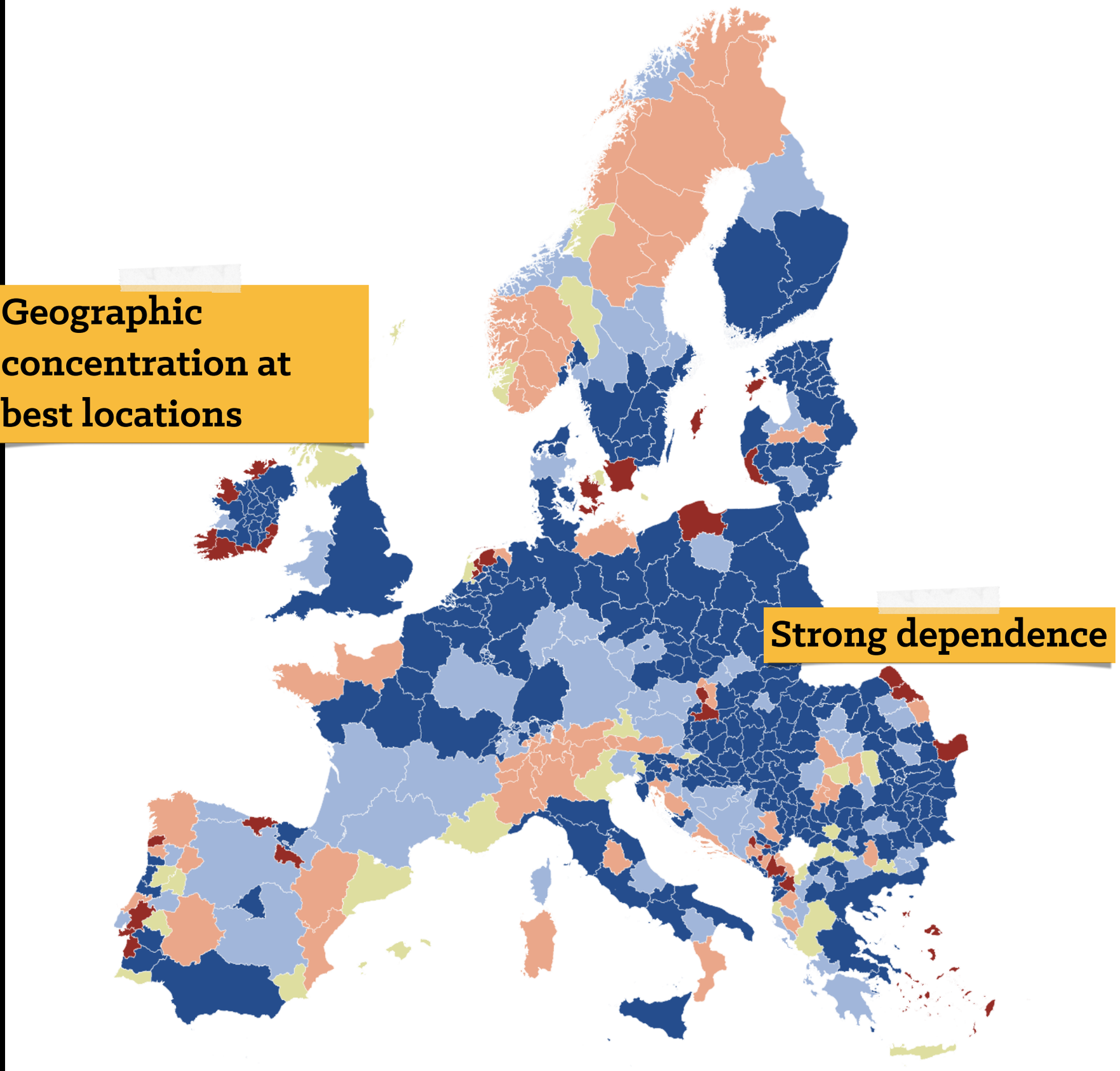
Continental Supply
National Supply
Regional Supply
+ National Balancing
+ Regional Balancing

Geographic concentration at best locations



Models with high spatial and temporal resolutions

- Increase fidelity of models with high shares of renewable energy.
- Allow to assess impacts relevant to the local population by being spatially explicit.
- Future challenge: Handle model complexity.

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