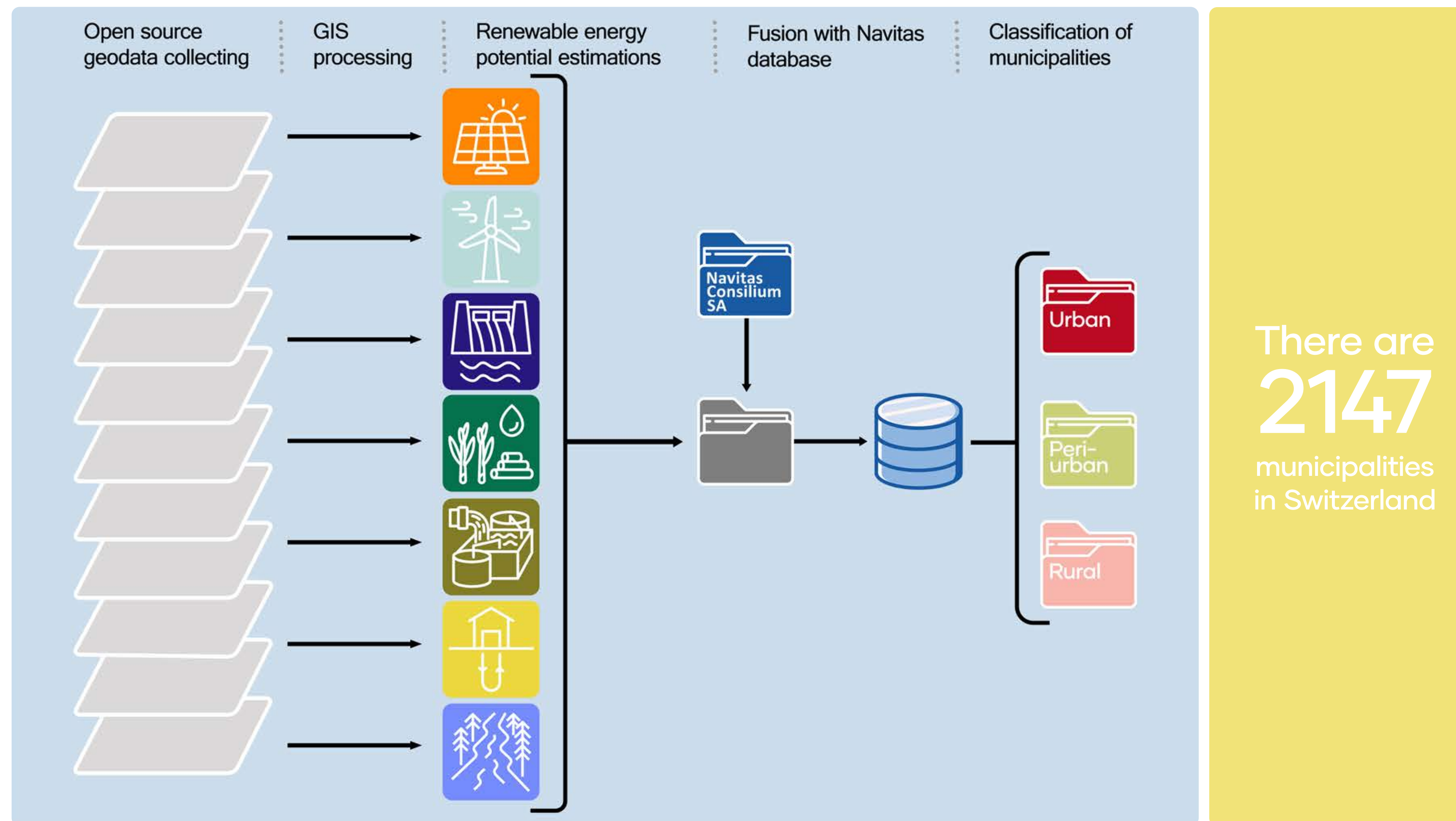


Context

This project develops a systematic analysis of Swiss municipal territories to identify available energy sources and evaluate their theoretical potential. Municipal-level energy system transformation lacks a comprehensive strategy, therefore it is necessary to find patterns and group municipalities for which a similar strategy could be adopted. The theoretical potential is not specific to local conditions and estimable using open source data on geography and demography making it the perfect candidate for the basis of such a classification.

Methodology

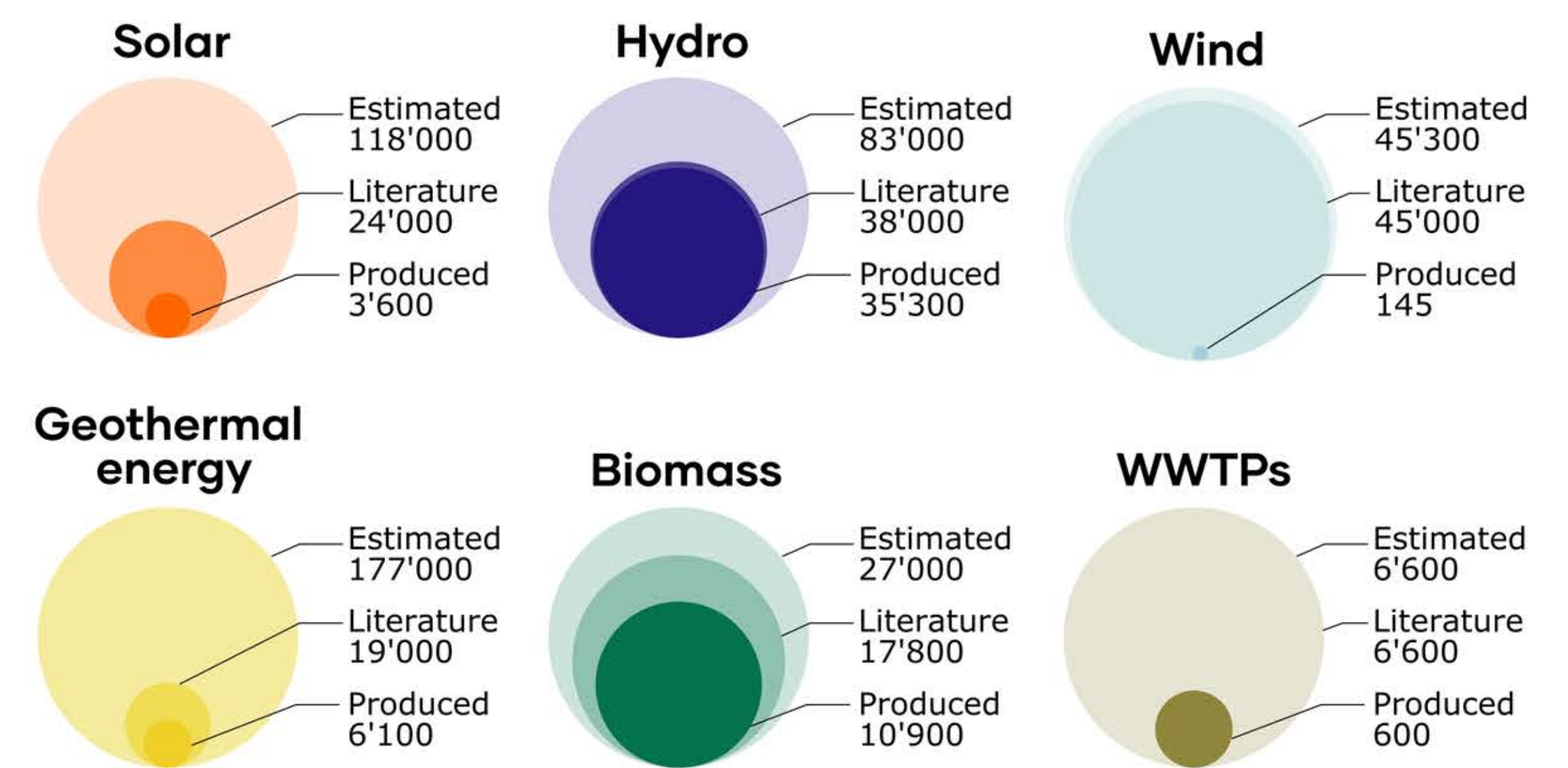


Objectives

1. Identify and quantify the renewable energy sources on the territory of each Swiss municipality
2. Completing the existing Navitas database with the renewable energy potential and demographic data of the municipalities
3. Classify Swiss municipalities according to various characteristics related to energy planning, in order to establish guidelines for energy transition

Results

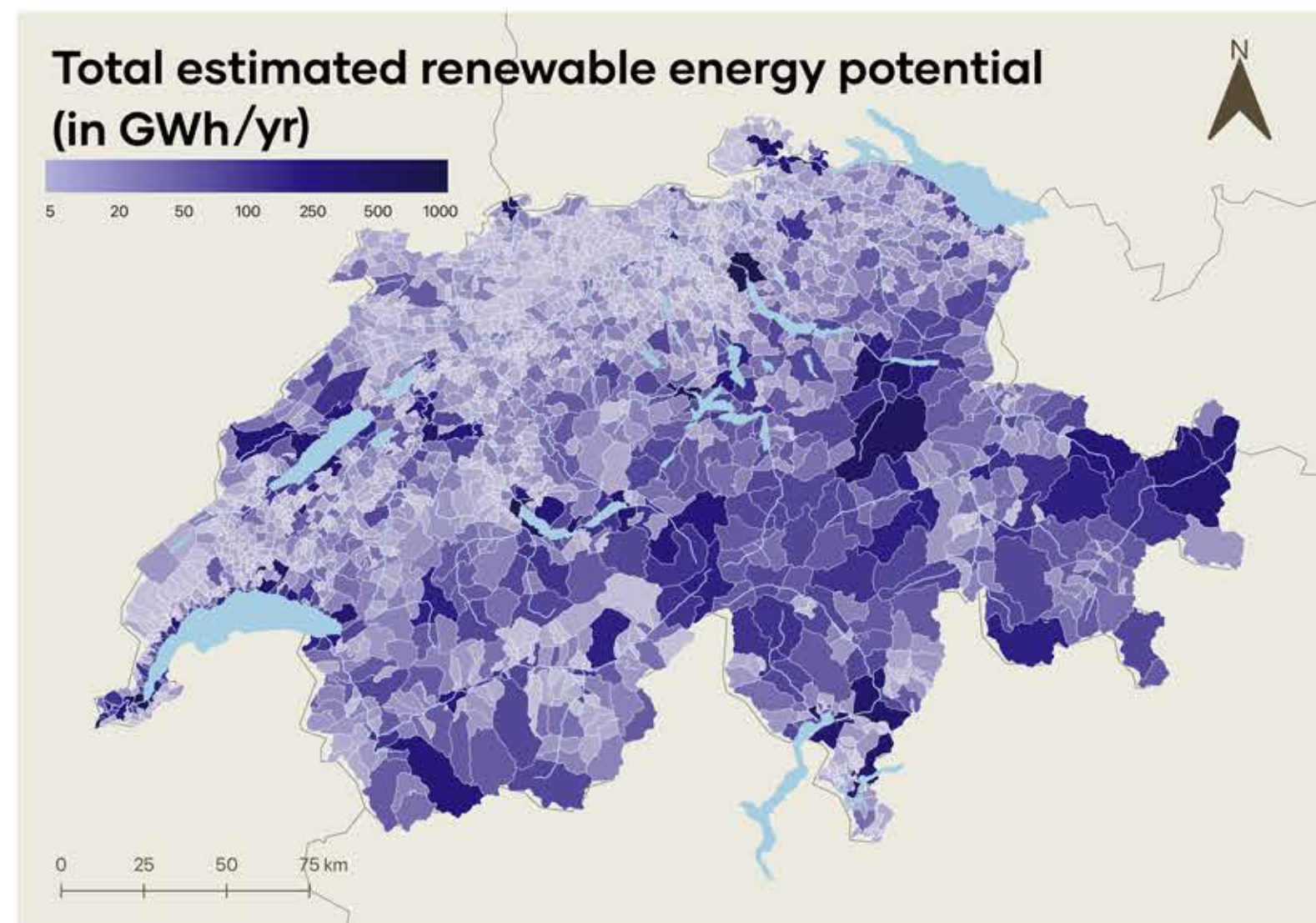
Comparison of the **estimated potential** values for each renewable energy source to values found in **scientific literature** and the actual amount of **energy produced** (in GWh/yr):



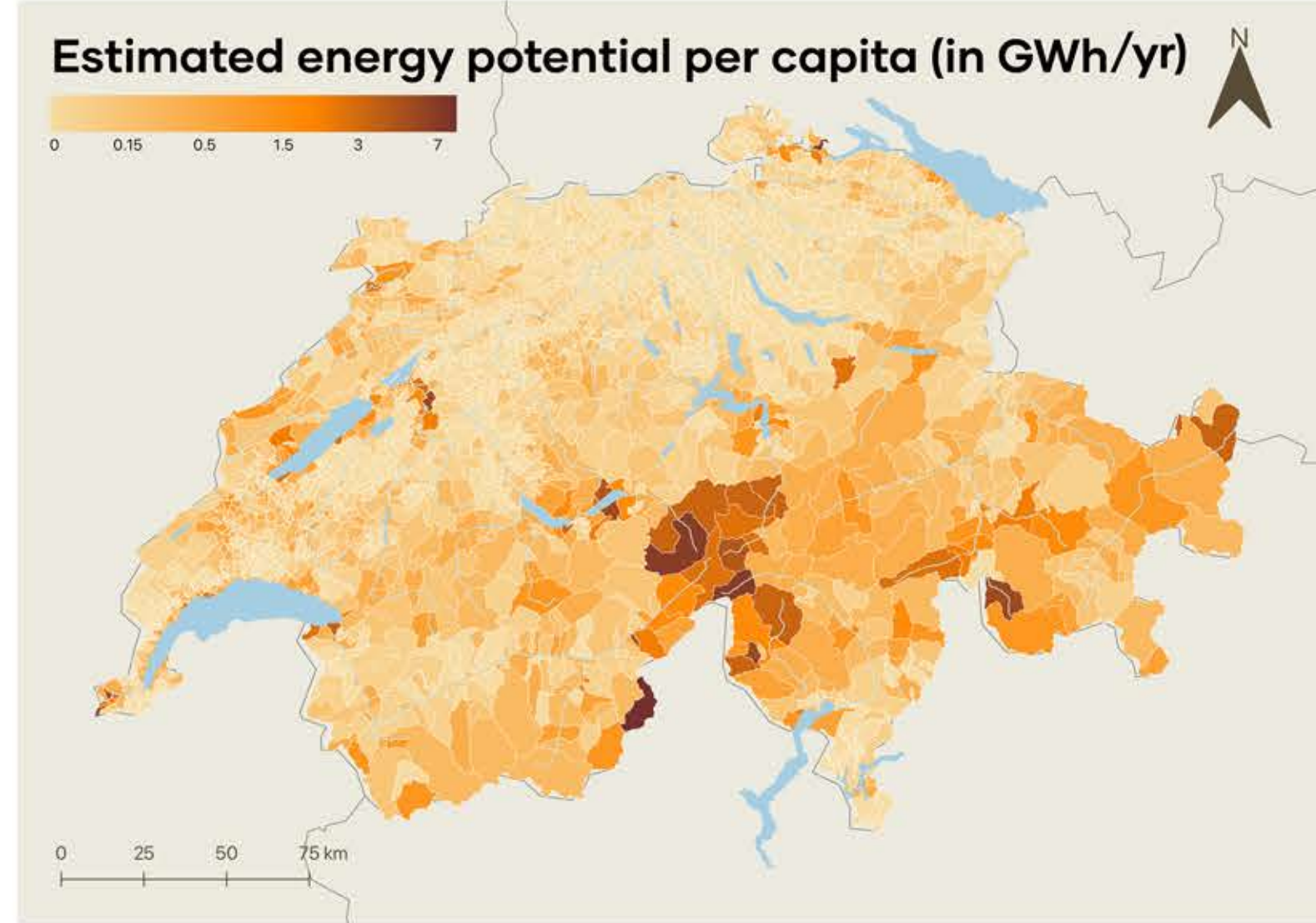
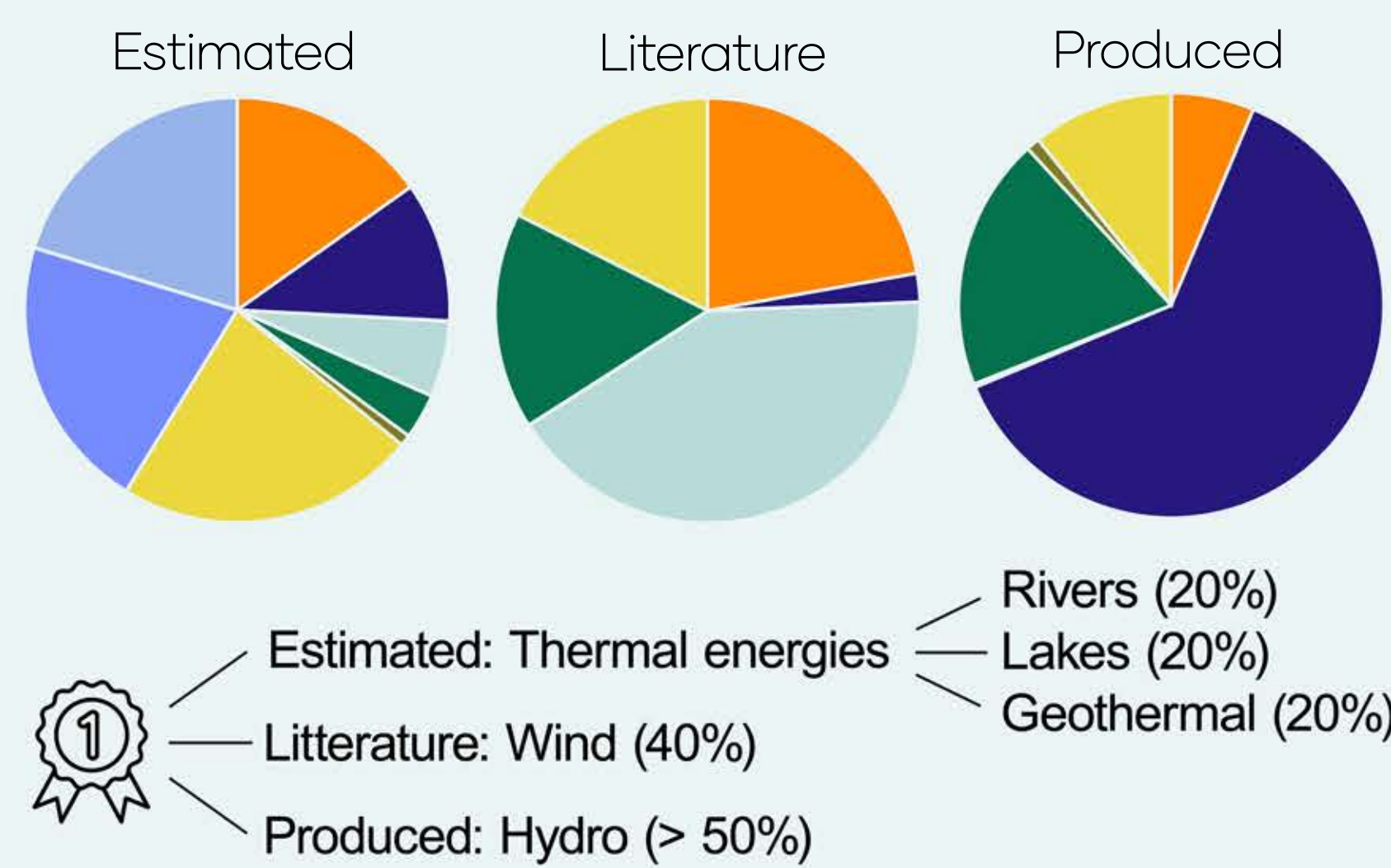
Across the 6 listed sources, the estimated potential far exceeds the actual production:

- Hydroelectricity and biomass energy show comparatively smaller disparities
- Solar energy, geothermal energy, and heat from WWTPs are significantly underutilized
- Wind energy production represents less than 1% of its potential, and despite its high potential, hydrothermal energy remains untapped

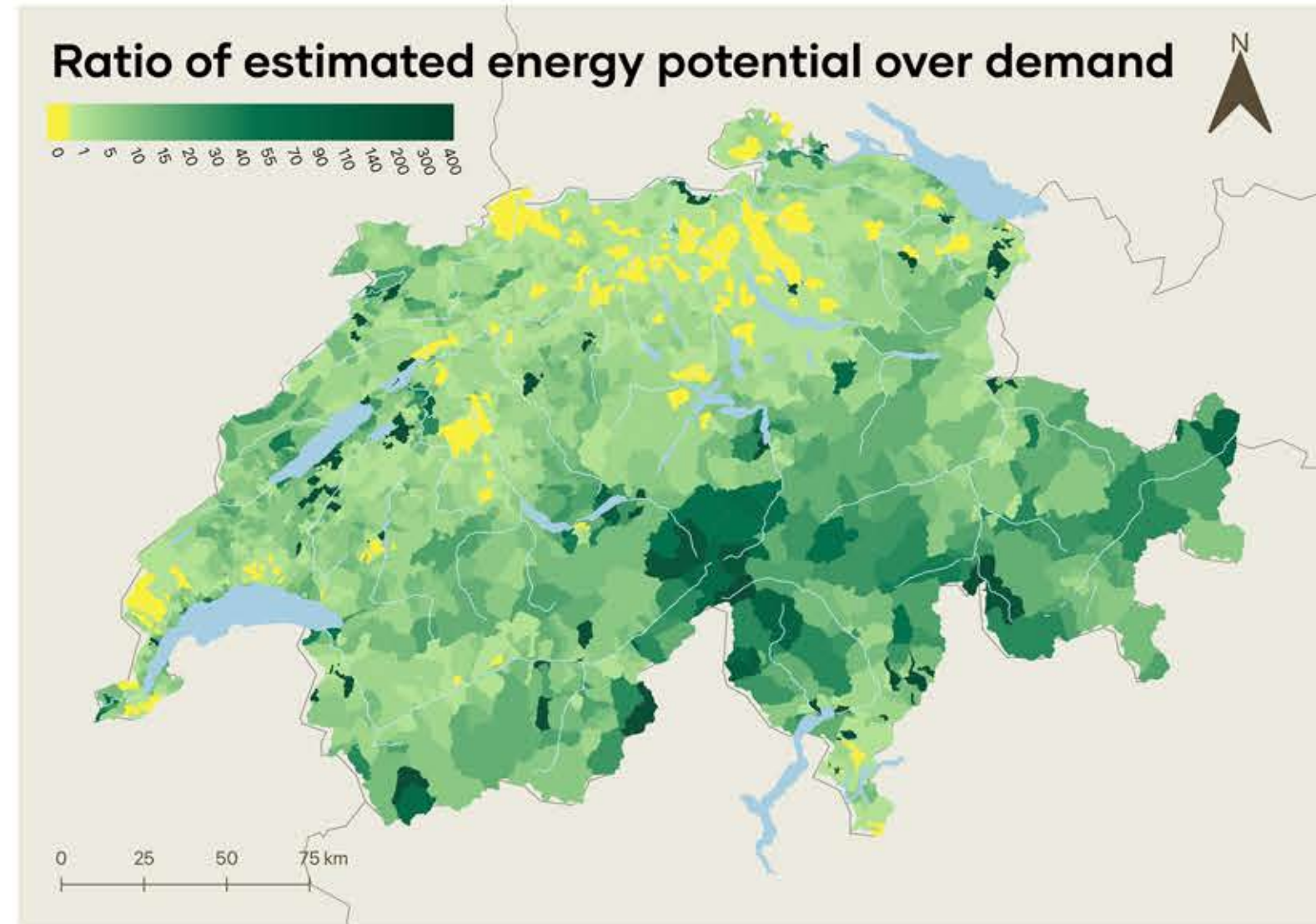
Comparing our estimations with the literature provides insights on methodology accuracy and identifies overestimations or realistic estimates for each energy source.



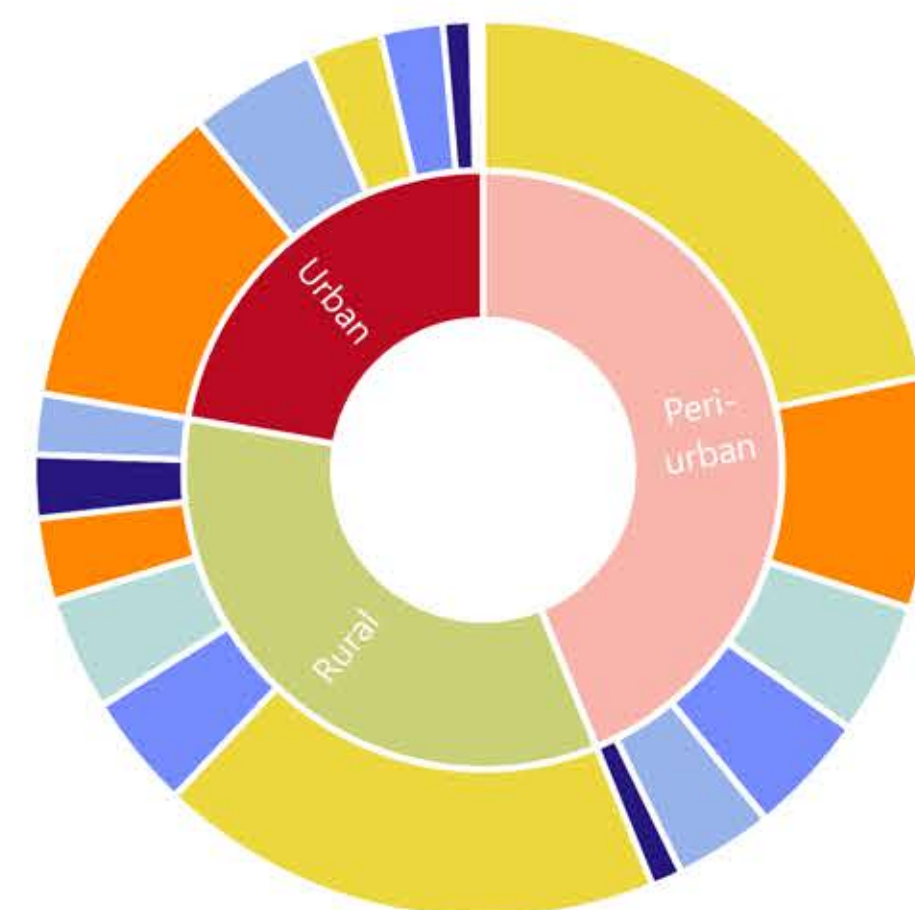
The **distribution of estimated potentials** in this study differs significantly from what is found in the **literature** and the **actual energy production**.



The total energy consumption in Switzerland was 794'720 TJ (= 220'756 GWh) in 2021

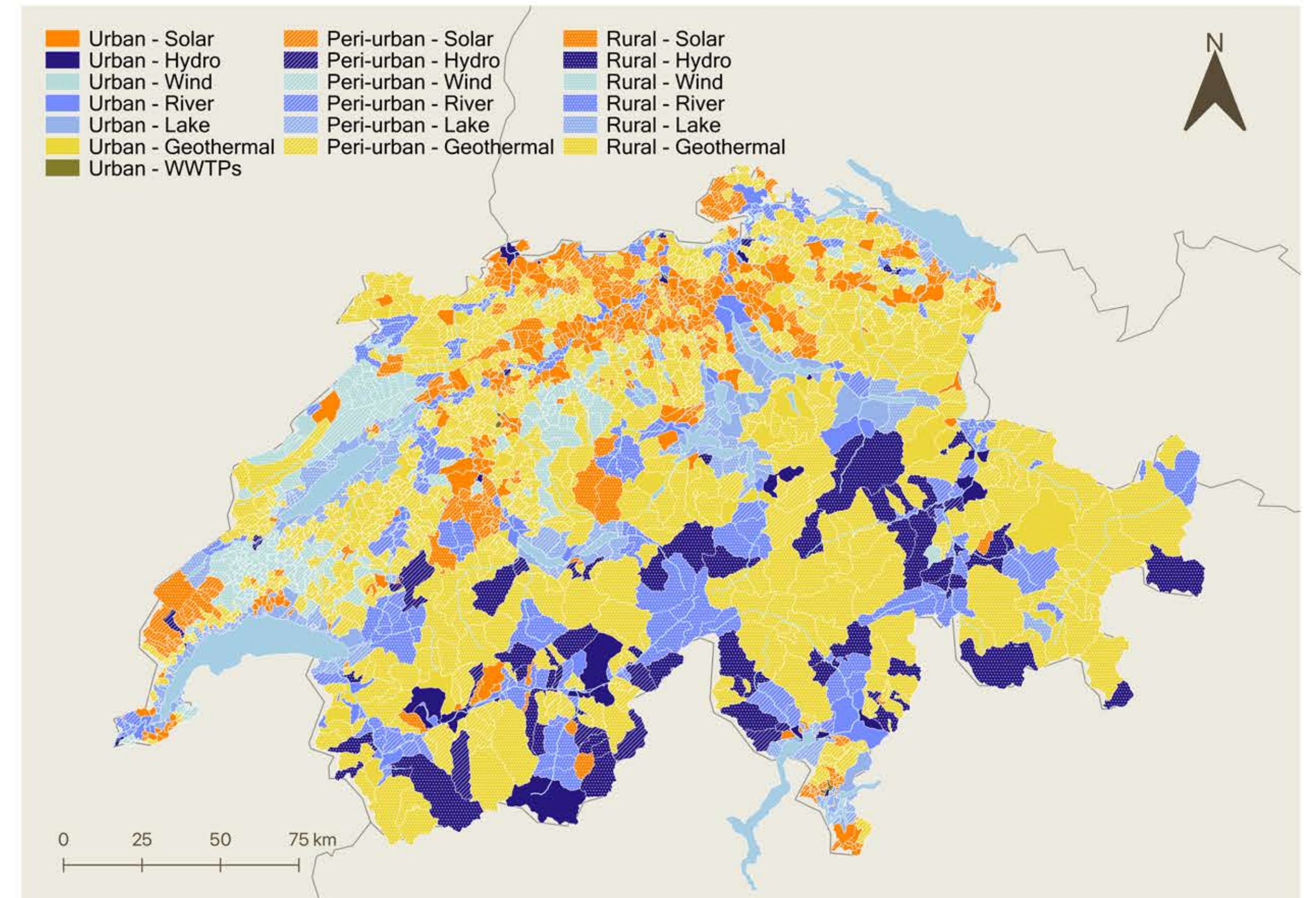


Final classification

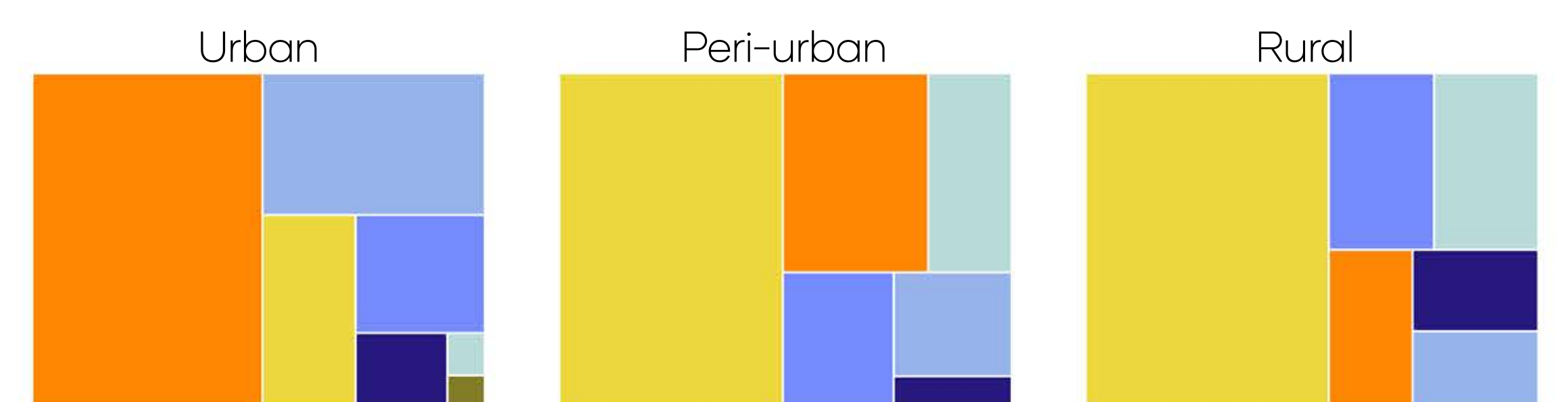


The final classification contains 19 classes based on
 • municipality type (urban, suburban, rural) and
 • main renewable energy source
 Most classes contain 40 to 100 municipalities

Classification by dominant energy and municipality type



Energy source distribution for each municipality type:



Conclusion

This project enabled the creation of a database containing the estimated energy potential on a municipal level for each commonly available renewable energy source. The estimated values were compared to other studies and values of production to identify firstly the most and least exploited energy sources and secondly the limitations and weaknesses of the estimation method. Geothermal energy clearly has a high potential in many municipalities and the country as a whole but is far from being exploited to its fullest. The same goes for solar energy and hydrothermal extraction. Switzerland is however doing well in terms of hydropower and energy from biomass.

Legend

- Solar energy
- Hydropower
- Wind energy
- Energy from biomass
- Heat recovery from WWTPs
- Geothermal energy
- Heat extraction from lakes
- Heat extraction from rivers