



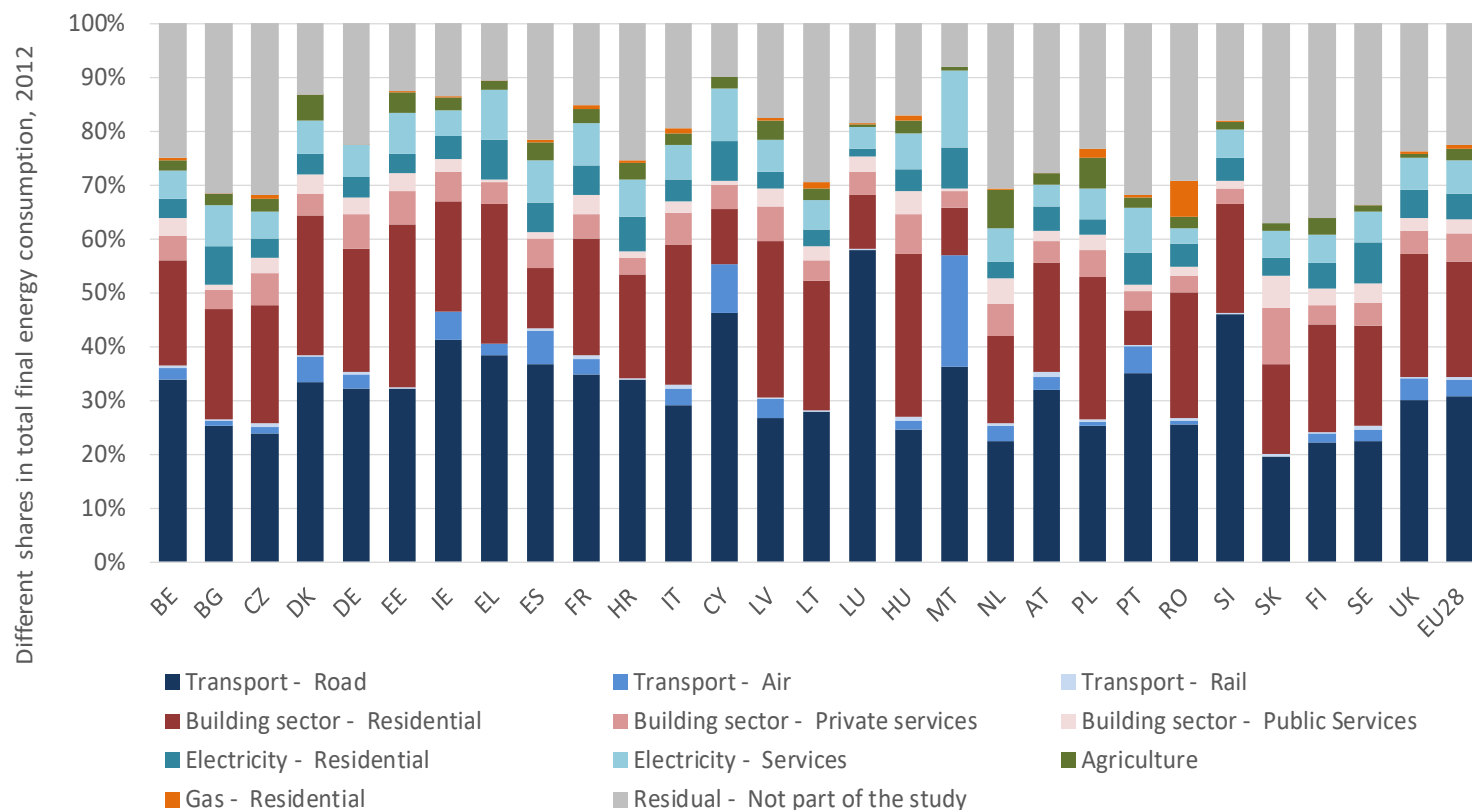
# Potential for renewable energy, its exploitation and energy consumption patterns at a regional level

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# Share of different sectors in total final energy consumption for selected countries in 2012



Source: ESPON LOCATE, Schremmer et al., 2017

# The project ESPON LOCATE

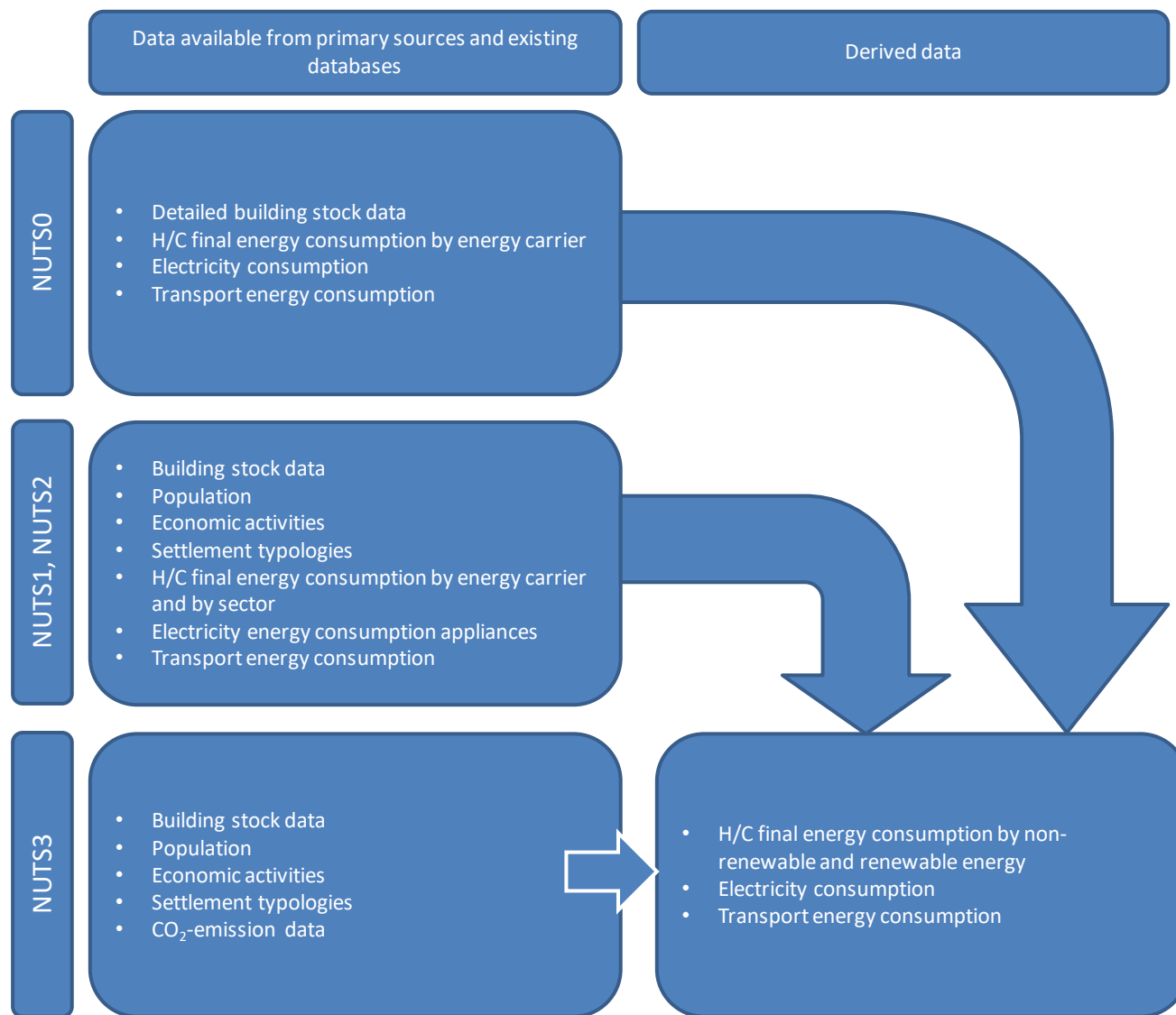
- ▶ Objective: to provide evidence on the territorial dimension of implementing the low-carbon economy approach in different parts of Europe and in different types of European regions and cities at NUTS 3 level
- ▶ Energy consumption patterns and the potential to produce (and use) renewable energy sources (quantitative research)
- ▶ Energy-relevant regional competencies and regional room for action and their interaction with EU and national levels of legislation and policy making (qualitative research).

# ESPON LOCATE: Elaborated datasets

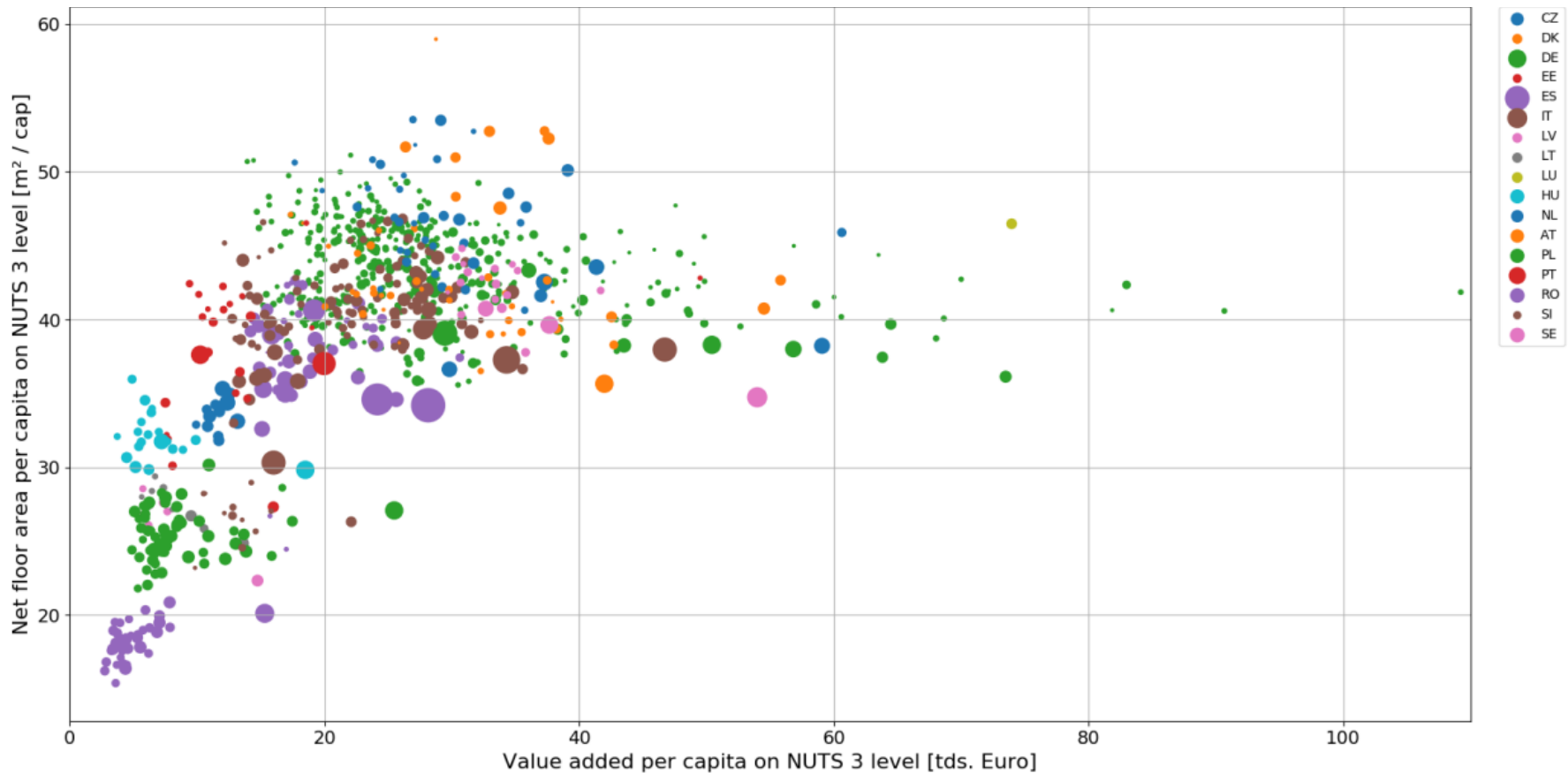
| SECTORS of Energy consumption                                               | Household sector      | Tertiary sector                  |                                 | Agriculture and forestry | Transport |      |     |       |
|-----------------------------------------------------------------------------|-----------------------|----------------------------------|---------------------------------|--------------------------|-----------|------|-----|-------|
| Sub sectors                                                                 | Residential buildings | Public non-residential buildings | Other non-residential buildings |                          | Road      | Rail | Air | Water |
| <b>HEATING AND COOLING</b>                                                  |                       |                                  |                                 |                          |           |      |     |       |
| space heating and domestic hot water, cooling                               |                       |                                  |                                 |                          |           |      |     |       |
| <b>OTHER END USES (excl. Space heating, cooling and domestic hot water)</b> |                       |                                  |                                 |                          |           |      |     |       |
| electric appliances, lighting and process energy demand                     |                       |                                  |                                 |                          |           |      |     |       |
| <b>RES-H/C share</b>                                                        |                       |                                  |                                 |                          |           |      |     |       |
| <b>RES-E share</b>                                                          |                       |                                  |                                 |                          |           |      |     |       |
| <b>TRANSPORT</b>                                                            |                       |                                  |                                 |                          |           |      |     |       |
| <b>RES-T share</b>                                                          |                       |                                  |                                 |                          |           |      |     |       |

- ▶ Most data sets developed on NUTS3 level (dark green)
- ▶ Some data sets on a higher level of spatial aggregation (light green)
- ▶ EU-28 (status 2017) member states plus Switzerland, Norway, Iceland and Liechtenstein for the years 2002 and 2012
- ▶ RES potentials: Wind, Solar, Hydro, Biomass, Geothermal, Tidal/Wave

# Methodology consumption patterns: Selected data sources



# Selected methodological aspects: Correlation of economic activities and average net floor area per capita

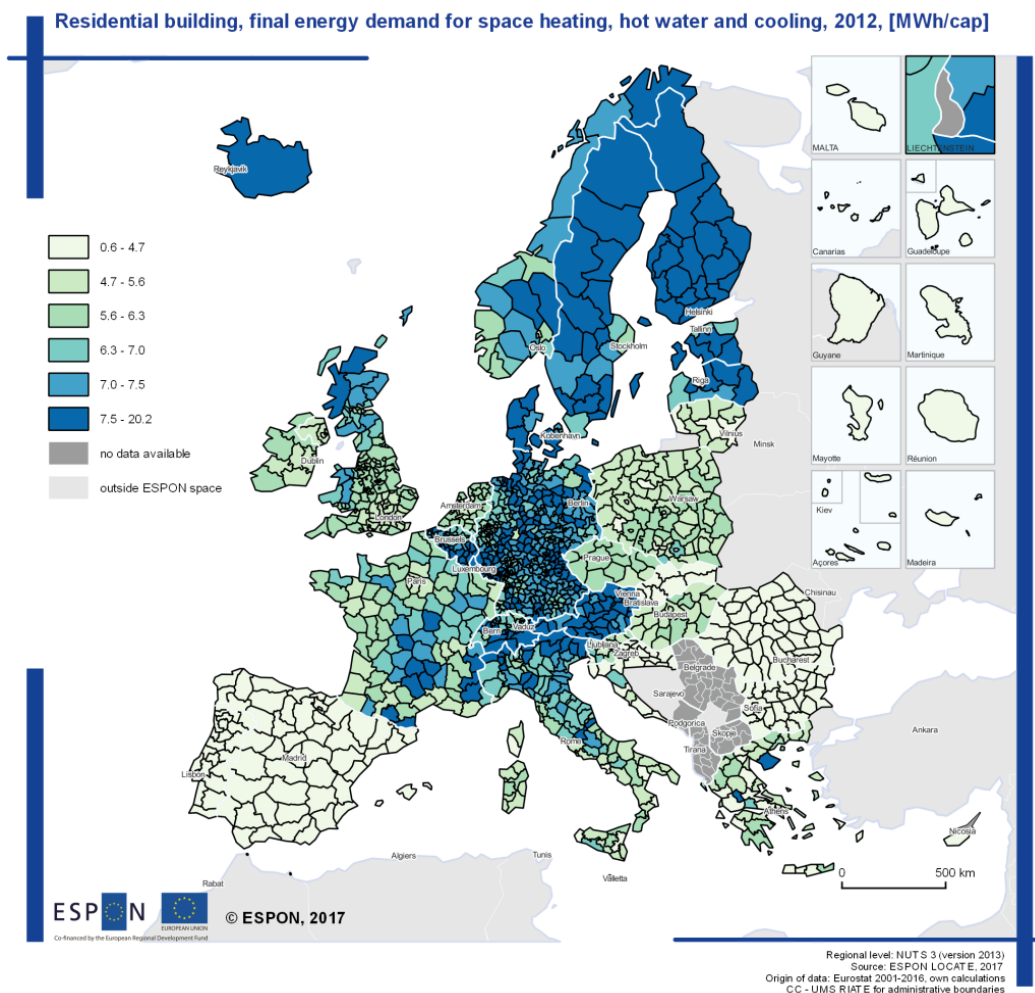


Source: ESPON LOCATE, Schremmer et al., 2017

## **Selected results (1):**

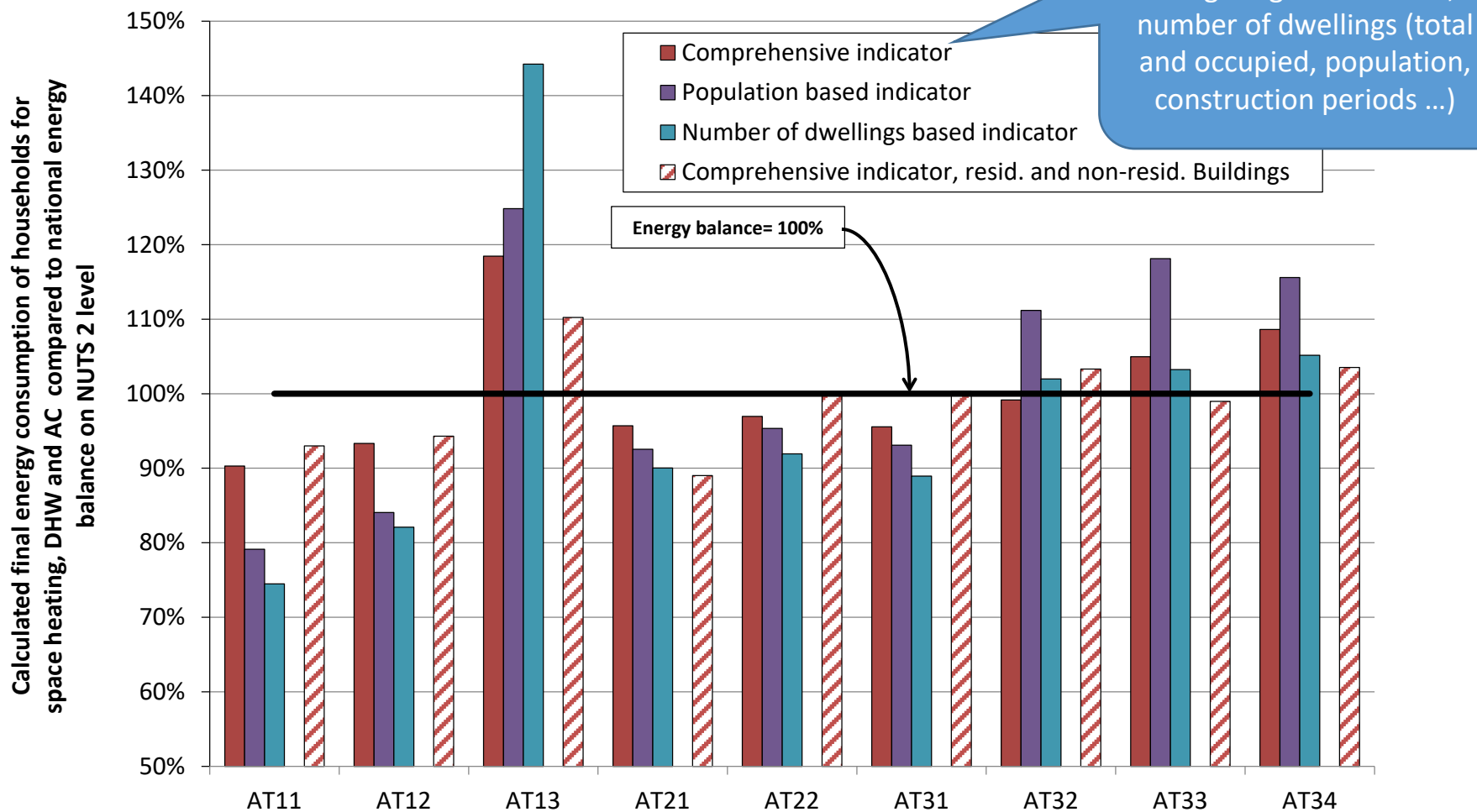
**Final energy demand for space heating, hot water and cooling, residential buildings**

# Final energy demand for space heating, domestic hot water and cooling of residential buildings, MWh per capita



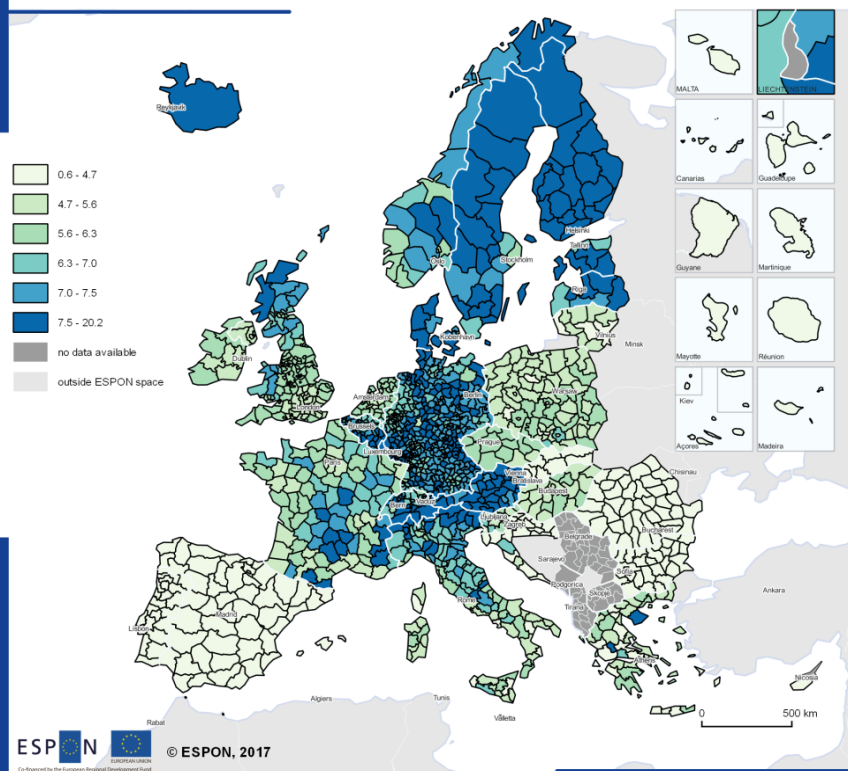
Source: ESPON LOCATE, Schremmer et al., 2017

# Energy consumption using a comprehensive indicator and two simpler indicators for Austrian NUTS2 regions

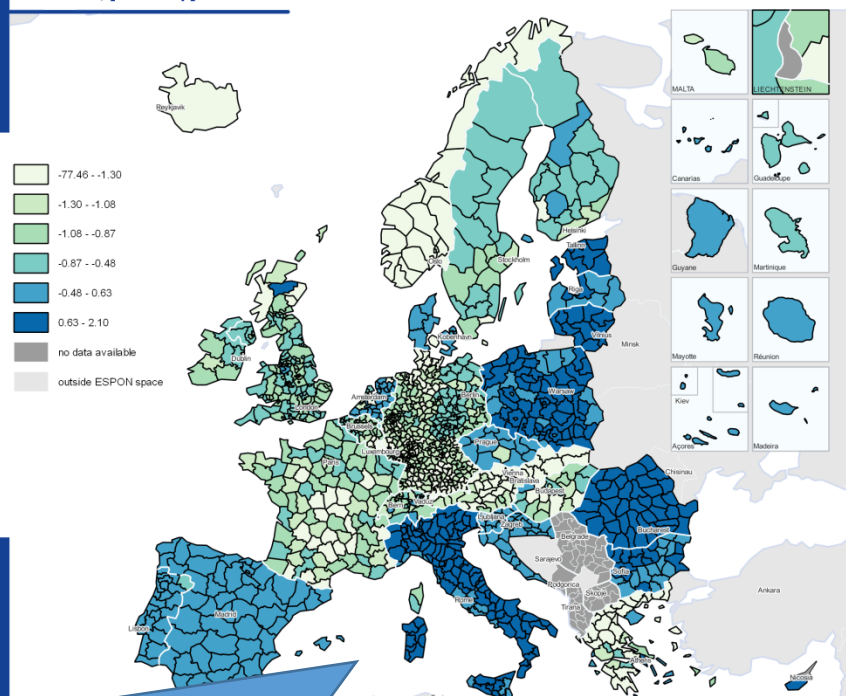


# Final energy demand for space heating, domestic hot water and cooling of residential buildings, MWh per capita

Residential building, final energy demand for space heating, hot water and cooling, 2012, [MWh/cap]



Residential building, change in final energy demand for space heating, hot water and cooling, 2012-2002, [MWh/cap]



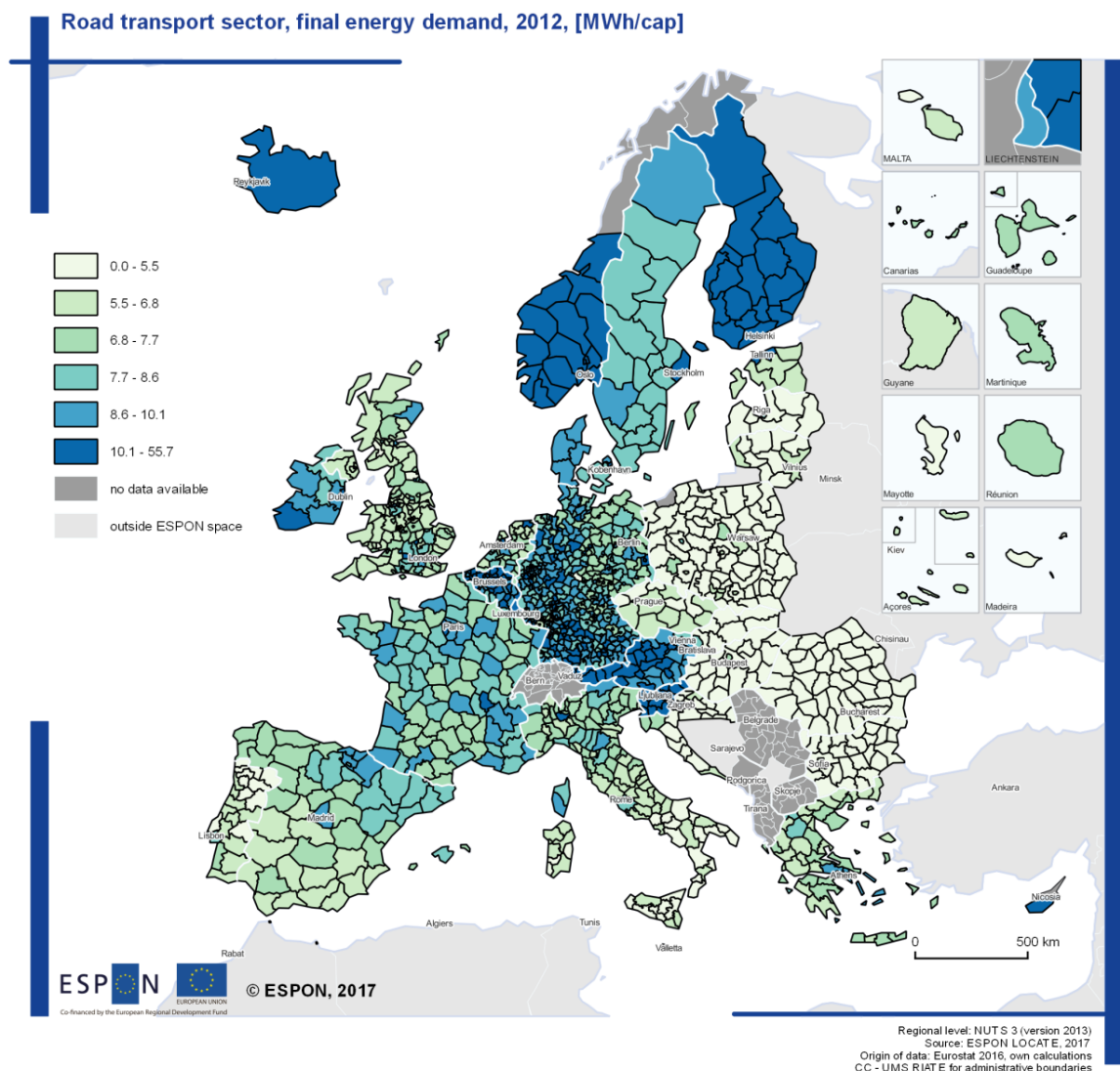
Change mainly driven by:

- Thermal building renovation and replacement of heating systems
- Change in the supply of energy services, e.g. the related floor area, change in comfort.

**Selected results (2):**

**Final energy demand for road transport**

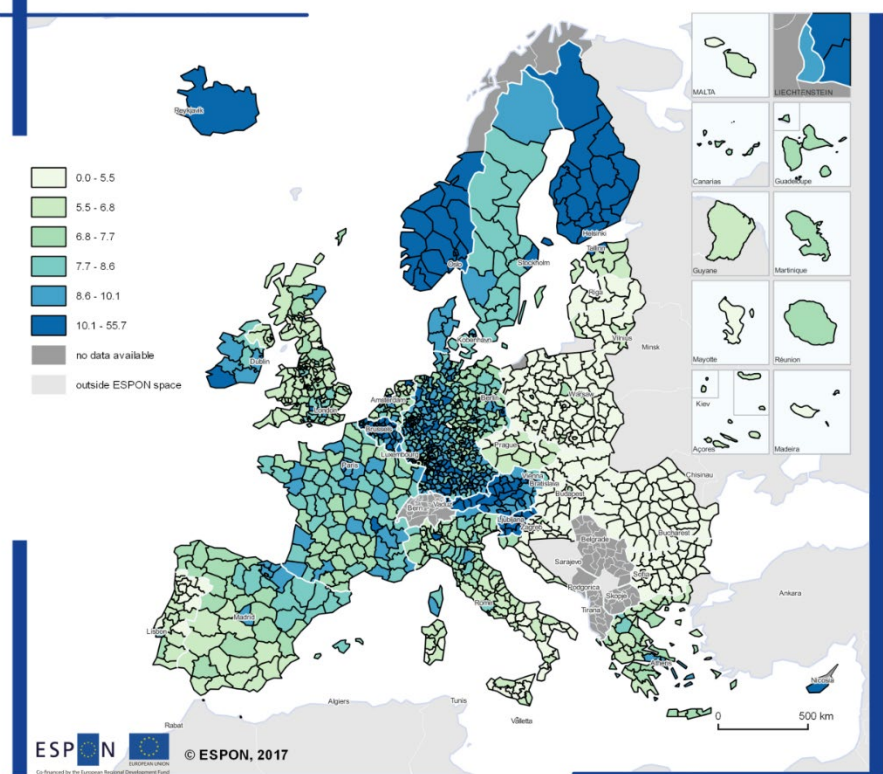
# Final energy demand for road transport, MWh per capita



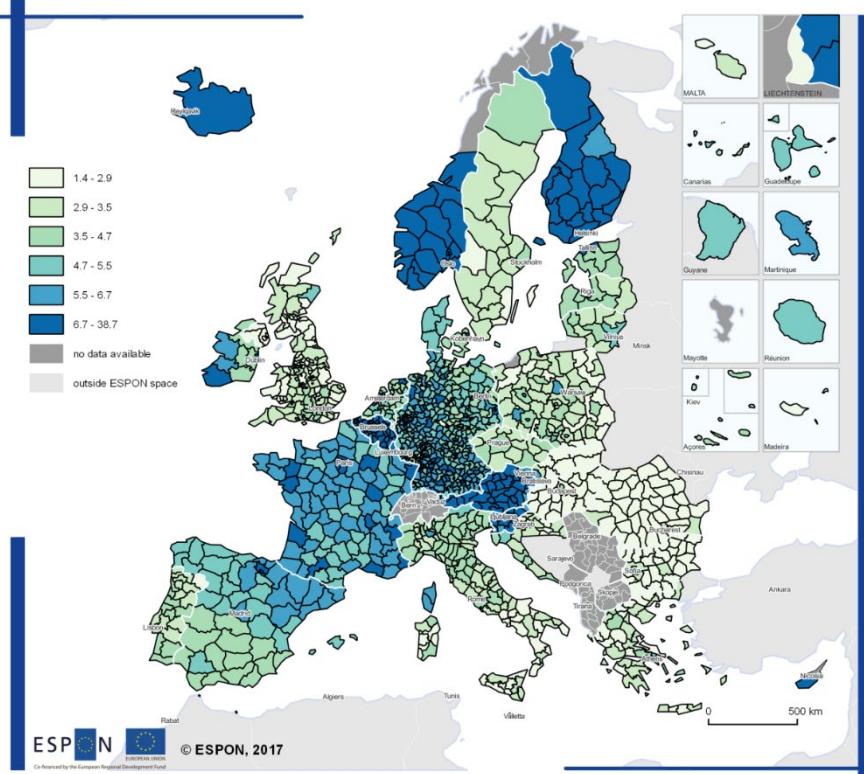
Source: ESPON LOCATE, Schremmer et al., 2017

# Final energy demand road transport, MWh per capita

Road transport sector, final energy demand, 2012, [MWh/cap]



Road transport sector, change in final energy demand, 2012-2002, [MWh/cap]

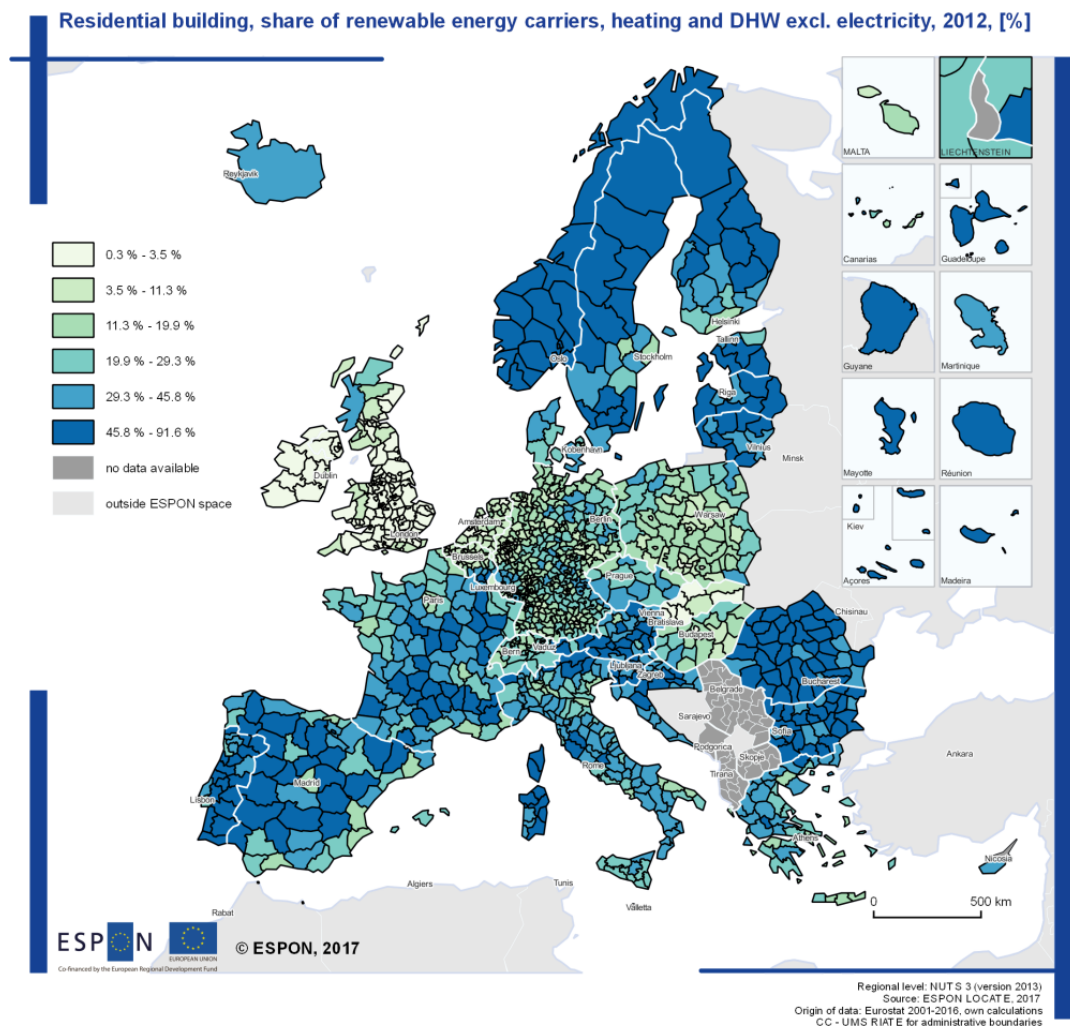


Source: ESPON LOCATE, Schremmer et al., 2017

## **Selected results (3):**

**Share of renewable energy carriers for space heating  
and hot water in residential buildings**

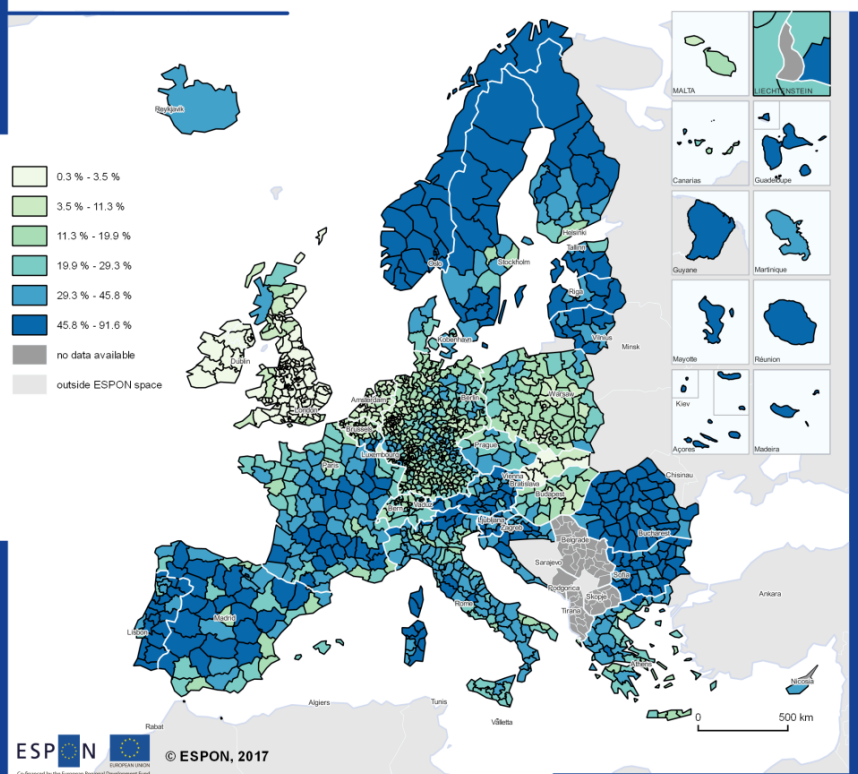
# Share of renewable energy carriers for space heating and domestic hot water production of residential buildings



Source: ESPON LOCATE, Schremmer et al., 2017

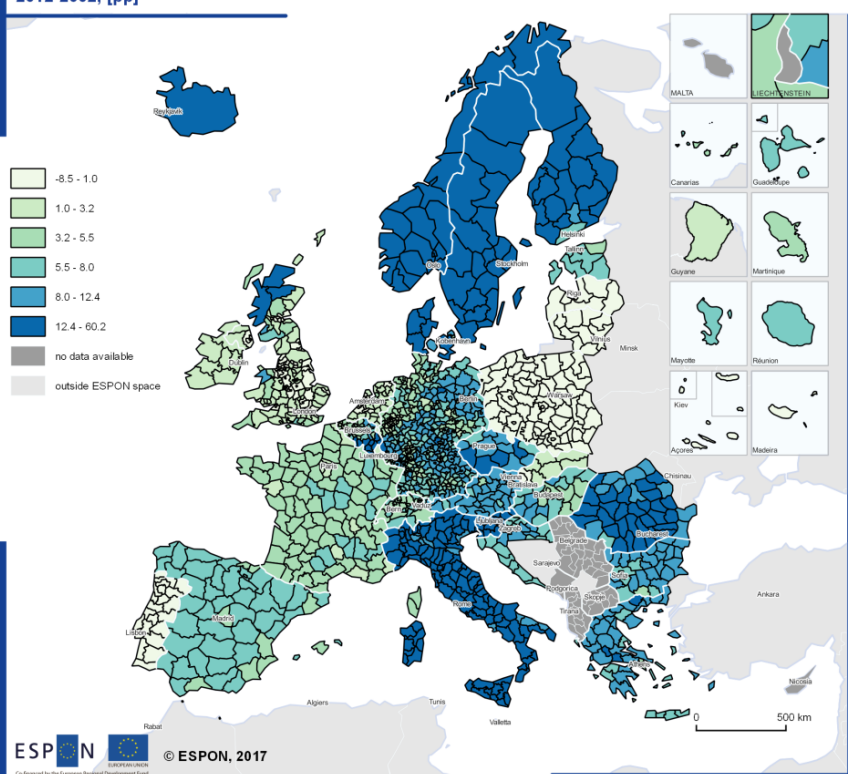
# Share of renewable energy carriers for space heating and domestic hot water production of residential buildings

Residential building, share of renewable energy carriers, heating and DHW excl. electricity, 2012, [%]



Regional level: NUTS 3 (version 2013)  
Source: ESPON LOCATE, 2017  
Origin of data: Eurostat 2001-2016, own calculations  
CC - BY-NC-SA for administrative boundaries

Residential building, change in share of renewable energy carriers, heating and DHW excl. electricity, 2012-2002, [pp]

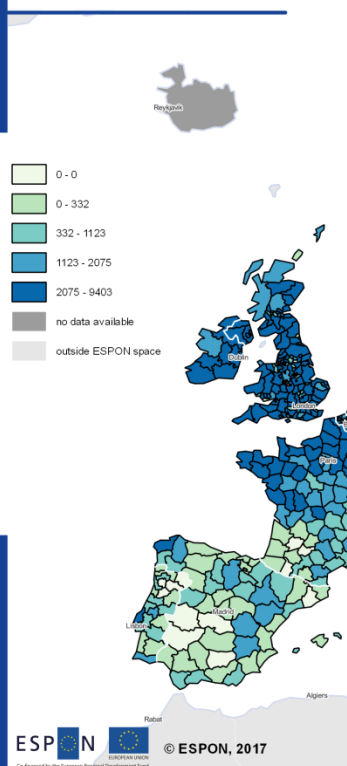


Regional level: NUTS 3 (version 2013)  
Source: ESPON LOCATE, 2017  
Origin of data: Eurostat 2001-2016, own calculations  
CC - BY-NC-SA for administrative boundaries

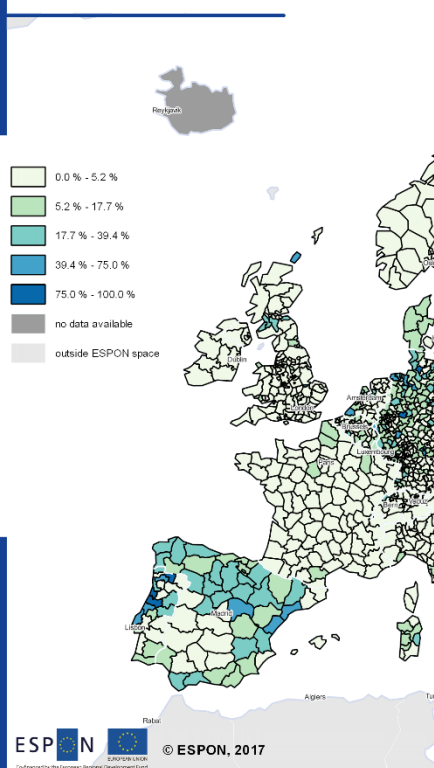
## **Selected results (4): Wind energy potentials**

# Wind onshore: potential, exploitation rate, growth 2002-2012

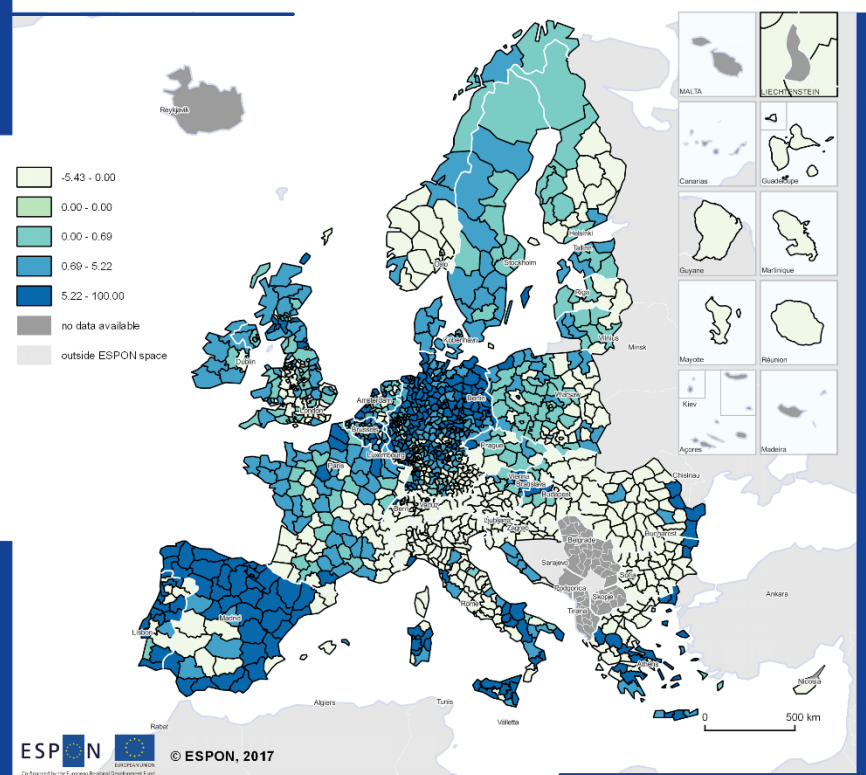
Wind onshore, potential for electricity generation, [MWh/km<sup>2</sup>]



Wind onshore, exploitation rate, 2012, [%]



Wind onshore, change in exploitation rate, 2012-2002, [pp]

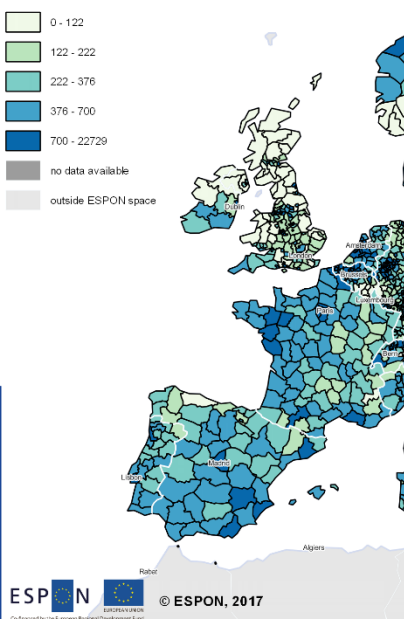


Regional level: NUTS 3 (version 2013)  
Source: ESPON LOCATE, 2017  
Origin of data: Eurostat 2016, own calculations  
CC - UMS RIAT E for administrative boundaries

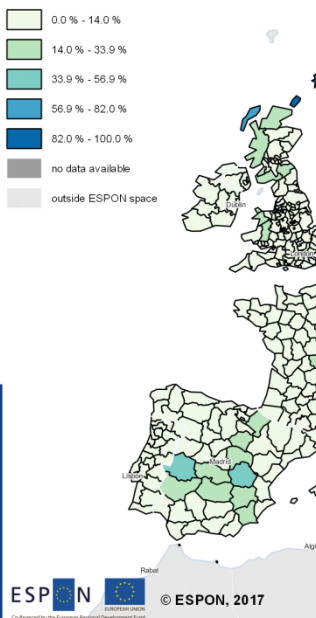
## **Selected results (5): Solar energy potentials**

# PV: potential, exploitation rate, growth 2002-2012

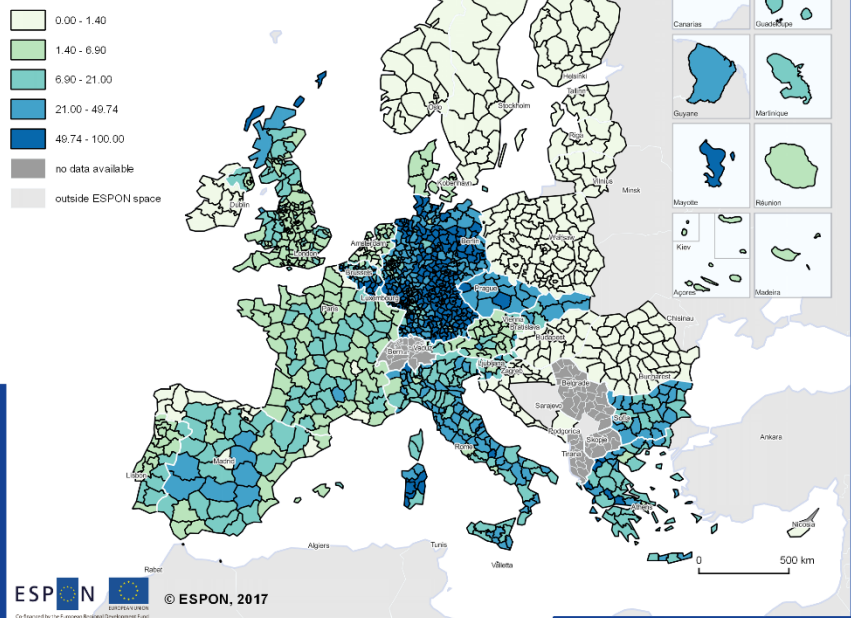
PV, potential for electricity generation, [MWh/km<sup>2</sup>]



PV, exploitation rate, 2012, [%]



PV, exploitation rate, 2012-2002, [pp]



Regional level: NUTS 3 (version 2013)  
Source: ESPON LOCAT E, 2017  
Origin of data: Eurostat 2015, own calculations  
CC - UMS RIAT E for administrative boundaries

# Summary

- ▶ Energy consumption of space heating and cooling are (amongst others) driven by
  - Climatic conditions (higher consumption in Central and Northern European Countries)
  - Energy performance of buildings
  - Economic wealth and resulting levels of energy services
  
- ▶ Renewable energy potentials show considerable variances due to geographical and climatic differences. Regions with high wind energy potentials are in particular North Sea and Baltic Sea, Northern France, Germany, Netherlands, Denmark, United Kingdom, Poland as well as Southern regions of Scandinavia.
  
- ▶ The change in the exploitation of renewable energy potentials from 2002 to 2012 was mainly triggered by national policies.
  
- ▶ The qualitative analysis of case studies showed the power of building a narrative of political autonomy linked to the idea of energy self-sufficiency (in the analysed period).

# Thank you!

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Schremmer, C., Derszniak-Noirjean, M., Keringer, F., Koscher, R., Leiner, M., Mollay, U., Stifter, E., Tordy, J., Kranzl, L., Fallahnejad, M., Liebmann, L., Müller, A., Resch, G., Steinbach, J., Elsland, R., Kühn, A., Mayer, F., Pudlik, M., Schubert, G., Davoudi, S., Cowie, P., Gazzola, P., 2017. Territories and low-carbon economy (ESPON Locate).

