

EU spatial data and energy policy – are these coherent across the scales?

Ain Kull

**University of Tartu,
Department of Geography**

Ain.Kull@ut.ee

EU energy policy

- Ensure the functioning of the internal energy market and the interconnection of energy networks;
- Ensure security of energy supply in the Union;
- Promote energy efficiency and energy saving;
- Promote the development of new and renewable forms of energy to better align and integrate climate change goals

EU new Renewable Energy Directive for period 2020-2030:

- target share of renewable energy 32% in the energy mix (legally binding),
- in transport sector 14% renewable energy by 2030 with subtargets of 3.5% share of advanced biofuels, freeze/phase out of palm-oil and first generation biofuels such as ethanol,
- facilitates the generation and sale of electricity by citizens and small businesses without punitive taxes or excessive red tapes like “sun tax”,
- Member States to transpose new provisions of the Directive until 30.06.2021

	Number of electricity generating companies (¹)				Number of main electricity generating companies (²)			
	2005	2010	2013	2014	2005	2010	2013	2014
Belgium	3	4	>70	>100	2	3	2	2
Bulgaria	14	22	83	55	5	5	5	5
Czech Republic	18	24	215	217	1	1	2	2
Denmark	>1 000	>1 000	~1 450	~1 550	3	2	2	3
Germany	>450	>450	:	:	4	4	4	4
Estonia	2	6	8	10	1	1	1	1
Ireland	4	8	7	8	4	6	6	6
Greece	1	4	3	3	1	1	3	3
Spain (³)	:	:	>10	>10	4	4	5	4
France	4	>5	>5	>5	1	1	2	2
Croatia	2	2	2	2	2	2	2	2
Italy	88	185	493	652	4	5	4	3
Cyprus	1	1	1	1	1	1	1	1
Latvia	6	11	43	76	1	1	1	1
Lithuania	6	9	20	20	3	5	6	6
Luxembourg	>12	3	>10	>10	2	2	3	2
Hungary	40	68	40	32	3	3	2	2
Malta	1	1	1	1	1	1	1	1
Netherlands	100	700	700	350	5	5	4	4
Austria	53	126	169	201	4	4	4	4
Poland	70	68	103	128	5	5	4	4
Portugal	59	107	65	66	3	2	4	4
Romania	12	10	15	27	7	6	5	3
Slovenia	3	3	3	3	2	2	2	2
Slovakia	6	8	10	17	1	1	1	1
Finland	27	29	31	30	4	4	4	4
Sweden	14	24	35	32	3	5	3	3
United Kingdom	17	19	16	17	7	8	7	7
Norway	175	184	169	183	4	3	3	3
Montenegro	:	:	1	1	:	:	1	1
FYR of Macedonia	1	1	2	1	1	1	2	1
Serbia	:	:	4	4	:	:	4	4
Turkey	29	60	87	80	3	2	2	2
Bosnia and Herzegovina	:	:	2	2	:	:	1	1

(¹) Representing at least 95% of the national net electricity generations.

(²) Companies are considered as 'main' if they produce at least 5% of the national net electricity generation.

(³) This figure takes into account the shares of both traditional generating companies and operators that represent renewable and CHP generation units in the market (although they are not

the owners of the majority of these facilities). As renewables and CHP generation units represent a high percentage of the total capacity installed in Spain, and those units are participated by a great amount of small companies, it is not possible to determine the exact number of generating companies (owning the generation units) representing at least 95% of the national net electricity generation.

Source: Eurostat (This data is not yet available in the Eurostat dissemination database)

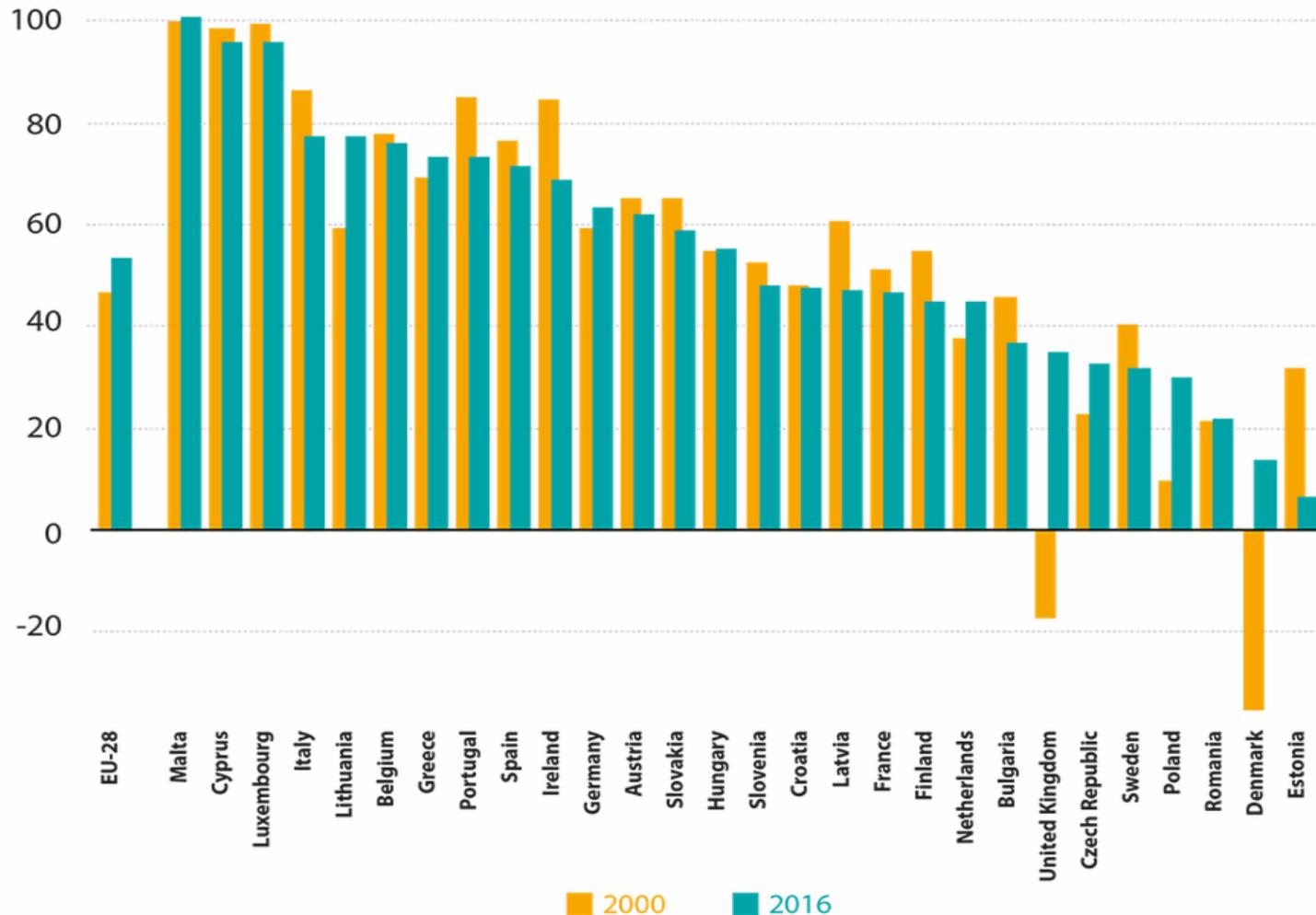
EU goal: To ensure the functioning of the internal energy market and the interconnection of energy networks

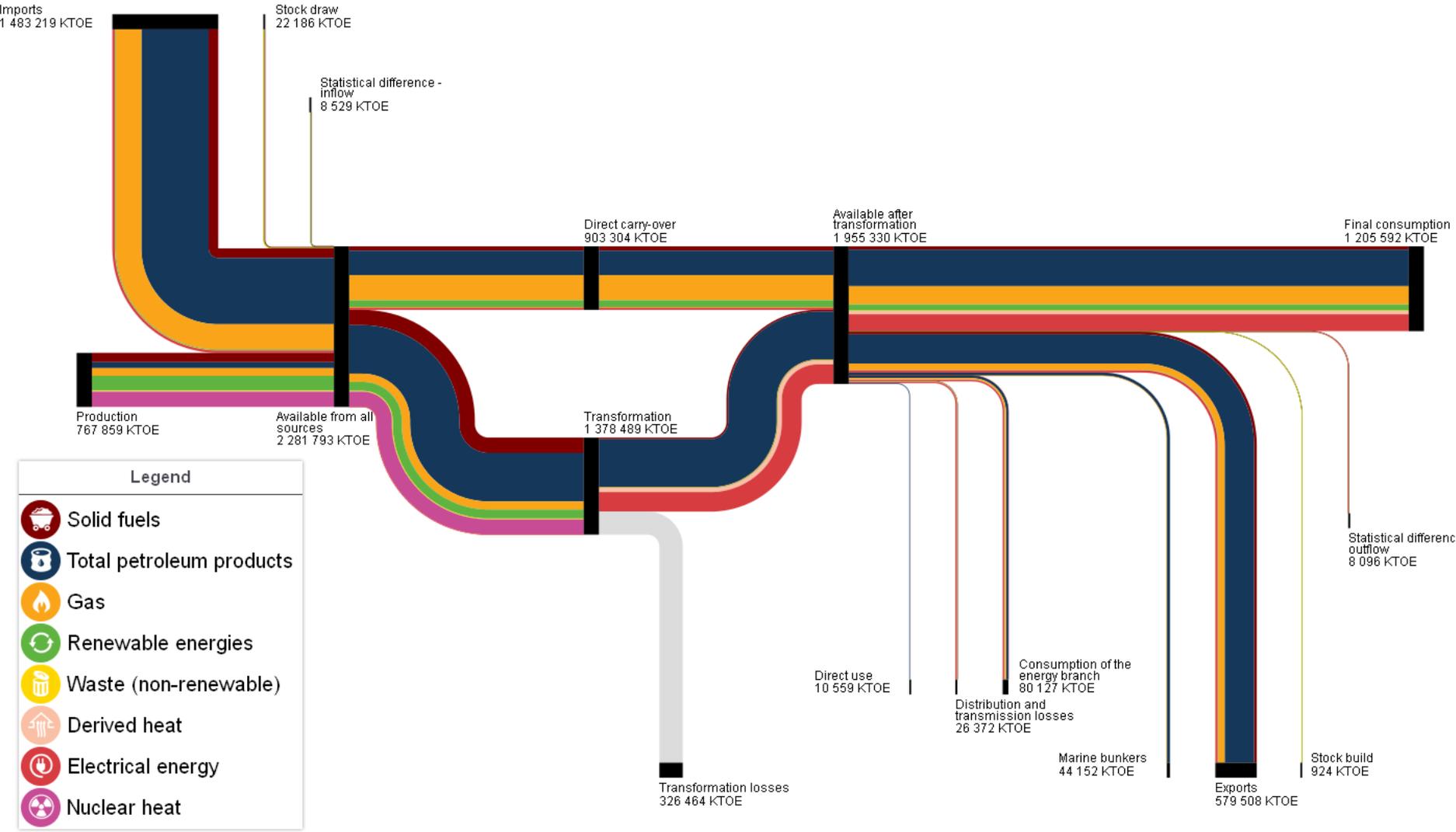
- Data inconsistent at national level
- No data/indicators at subnational level
- Highly limited number of main players on internal energy market (at least >5% of national electricity generation)
- Energy market often not fully open (mainly on pretext of specific technical standards)

EU goal: to ensure security of energy supply

Energy dependency rate (%)

Source: Eurostat





Legend

-  Solid fuels
-  Total petroleum products
-  Gas
-  Renewable energies
-  Waste (non-renewable)
-  Derived heat
-  Electrical energy
-  Nuclear heat

EU goal: to ensure security of energy supply

EU imports of crude oil
by partners 2016, (%)



EU imports of solid fuel
by partners 2016, (%)

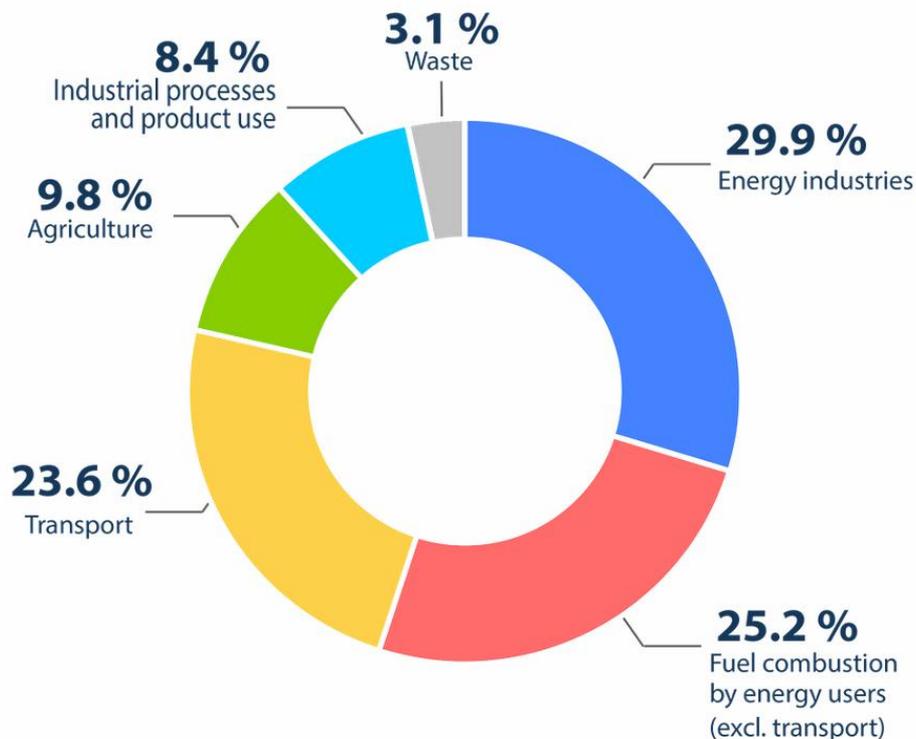


EU imports of natural gas
by partners 2016, (%)



... and actual energy import

Share of EU greenhouse gas emission by source, 2015



Energy industries: Emissions from fuel combustion and to a certain extent fugitive emissions from energy industries, for example in public electricity, heat production and petroleum refining.

Fuel combustion by users (excl. transport): Emissions from fuel combustion by manufacturing industries and construction and small scale fuel combustion, for example, space heating and hot water production for households, commercial buildings, agriculture and forestry.

Transport: Emissions from fuel combustion of domestic and international aviation, road transport, railways and domestic navigation.

Agriculture: This includes among others emissions from livestock-enteric fermentation – greenhouse gases that are produced when animals digest their food, emissions from manure management and emissions from agricultural soils.

Industrial processes: Emissions occurring from chemical reactions during the production of e.g.: cement, glass etc.

Waste: Emissions from landfills, wastewater treatment and composting among others.

Data including international aviation, excluding indirect CO₂ emissions and land use, land use change and forestry.

Source: European Environment Agency

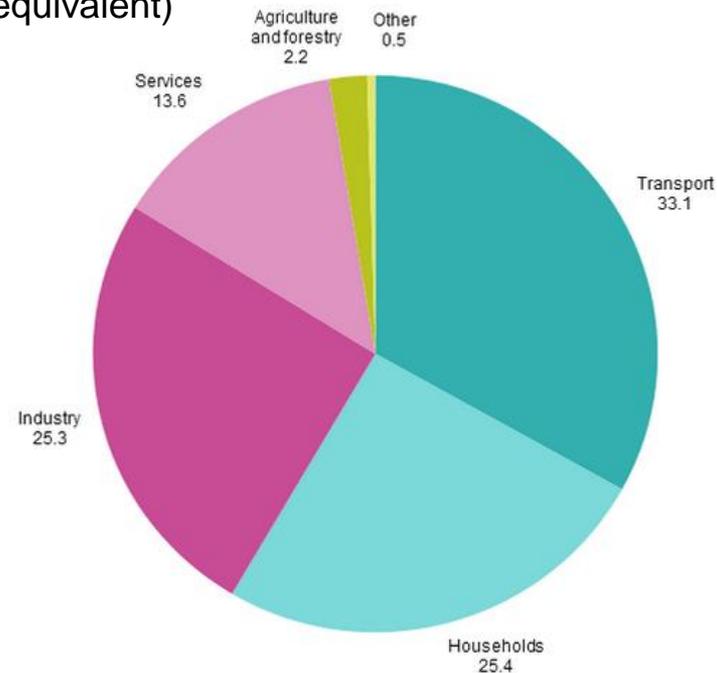
Greenhouse gas emissions, 1990-2015 (%) (index 1990 = 100)



Source: European Environment Agency

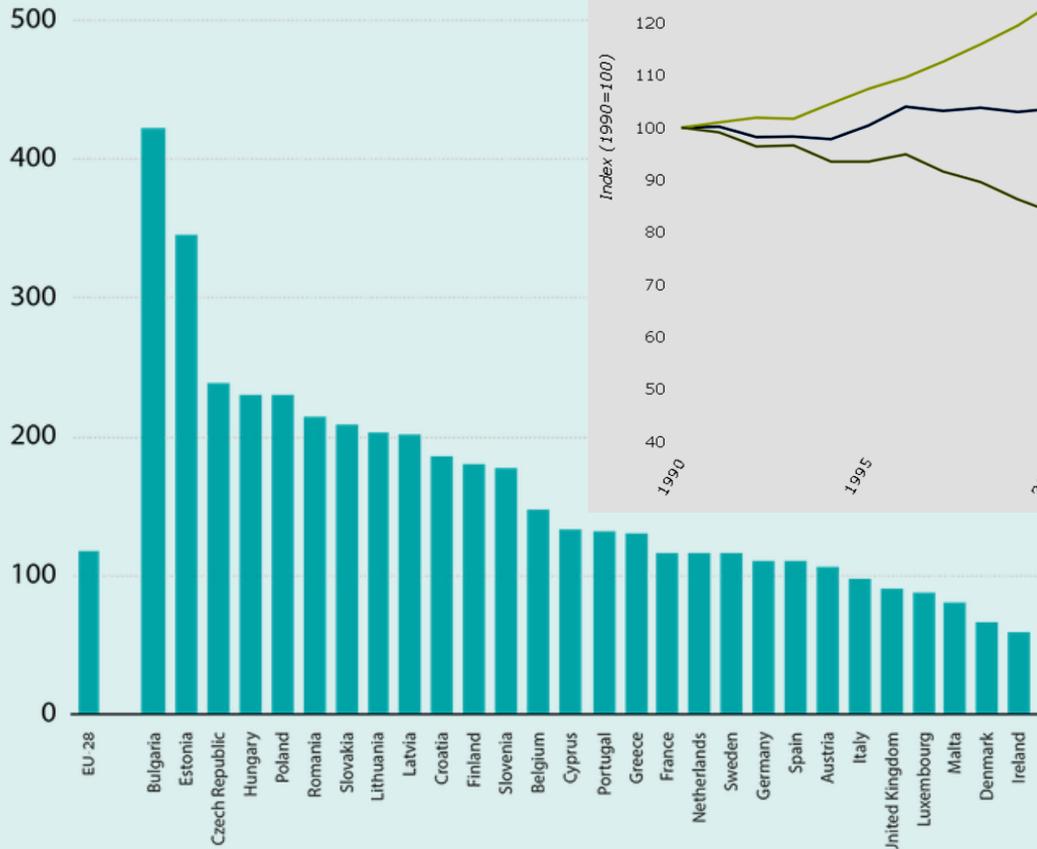
Data including international aviation and indirect CO₂ emissions, excluding land use, land use change and forestry

Final energy consumption, EU-28, 2015 (% of total, based on tonnes of oil equivalent)



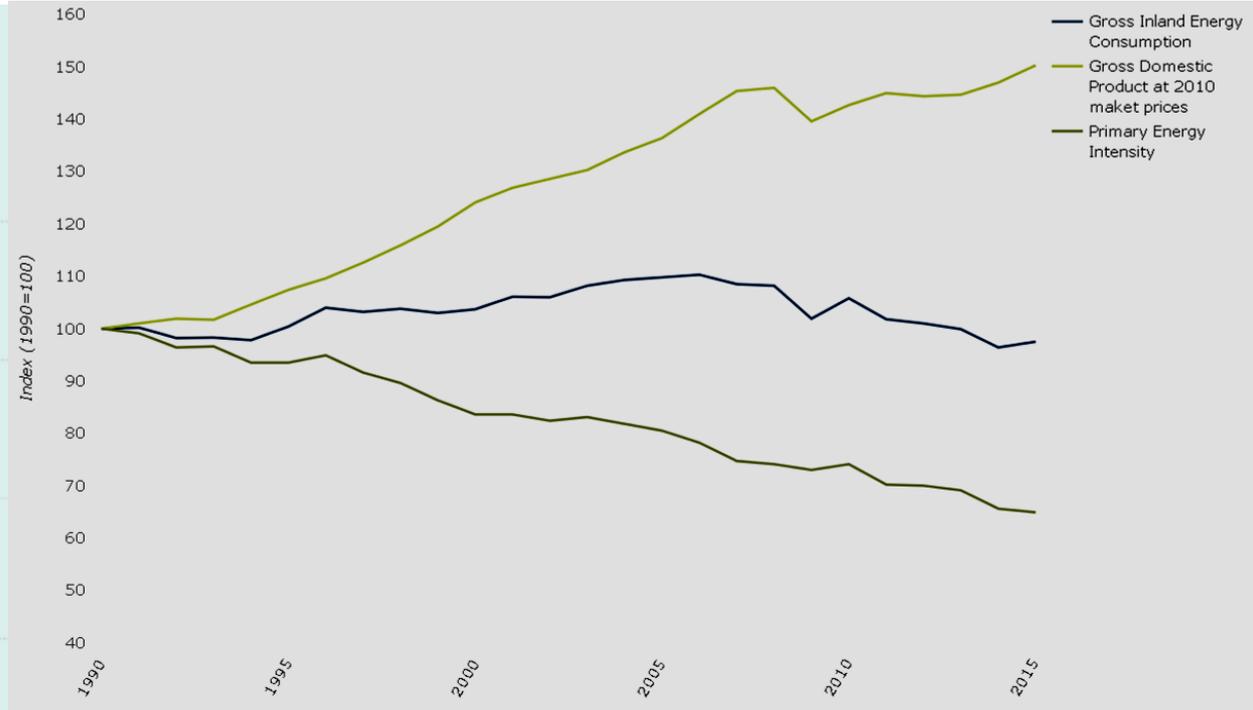
EU goal: energy efficiency and energy saving

Energy intensity, 2016 (kg of oil equivalent per 1 000 EUR)



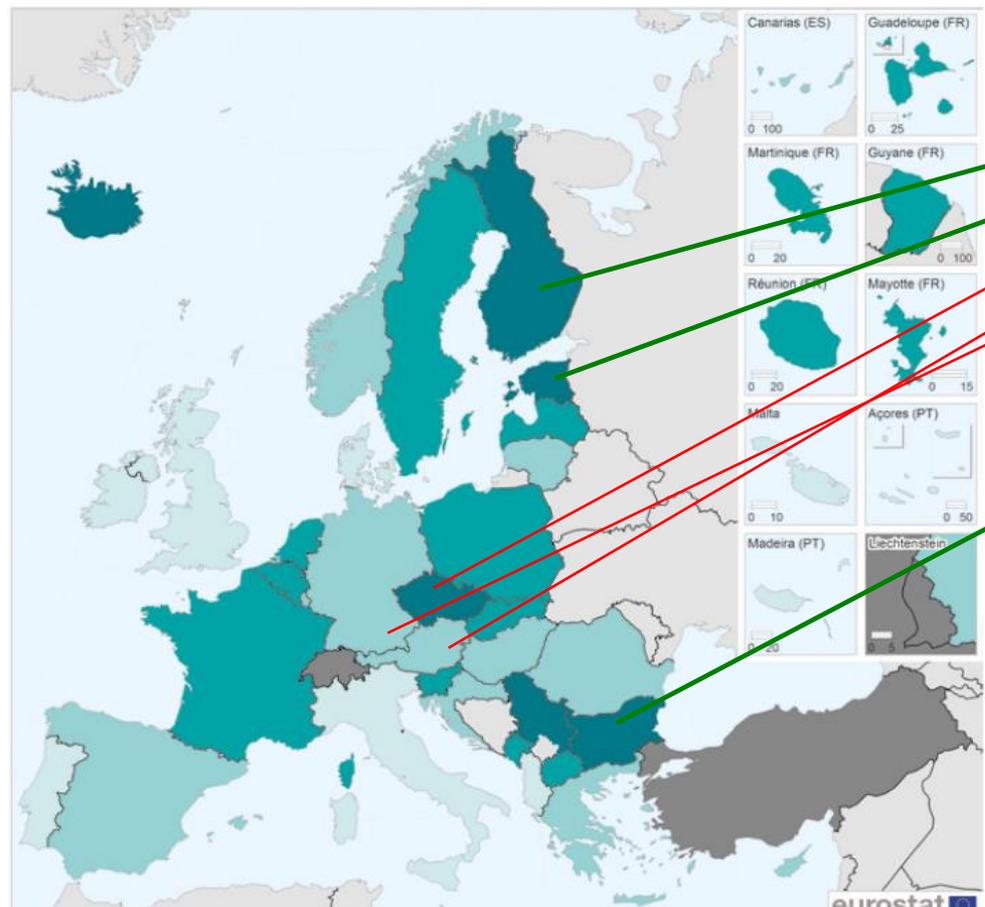
Ratio between gross inland consumption and GDP

Source: Eurostat

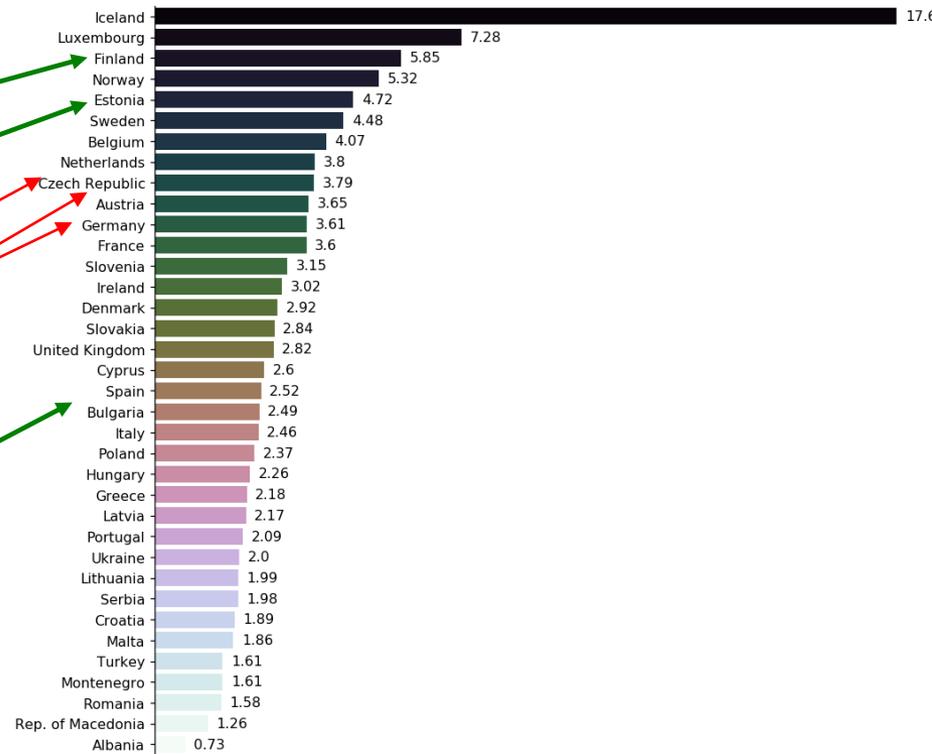


What to look for?

**Is it GDP, per capita,
per m², per hectare
or carbon footprint...**



Europe's Biggest Energy Consumers 2015
Primary Energy Consumption per Capita (Tonnes of Oil Equivalent (TOE) per Person)



Source: Eurostat Database, <http://ec.europa.eu/eurostat/data/database>, Author: Bjoern Springer

(tons of oil equivalent (toe) per million euro PPS)

Administrative boundaries: © EuroGeographics © UN-FAO © Turkstat
Cartography: Eurostat - GISCO, 07/2016

EU-28 = 115
 < 100
 100 — <125
 125 — <150
 ≥ 150
 Data not available

0 200 400 600 800 km

Source: Eurostat (online data codes: nrg_100a and nama_10_gdp)

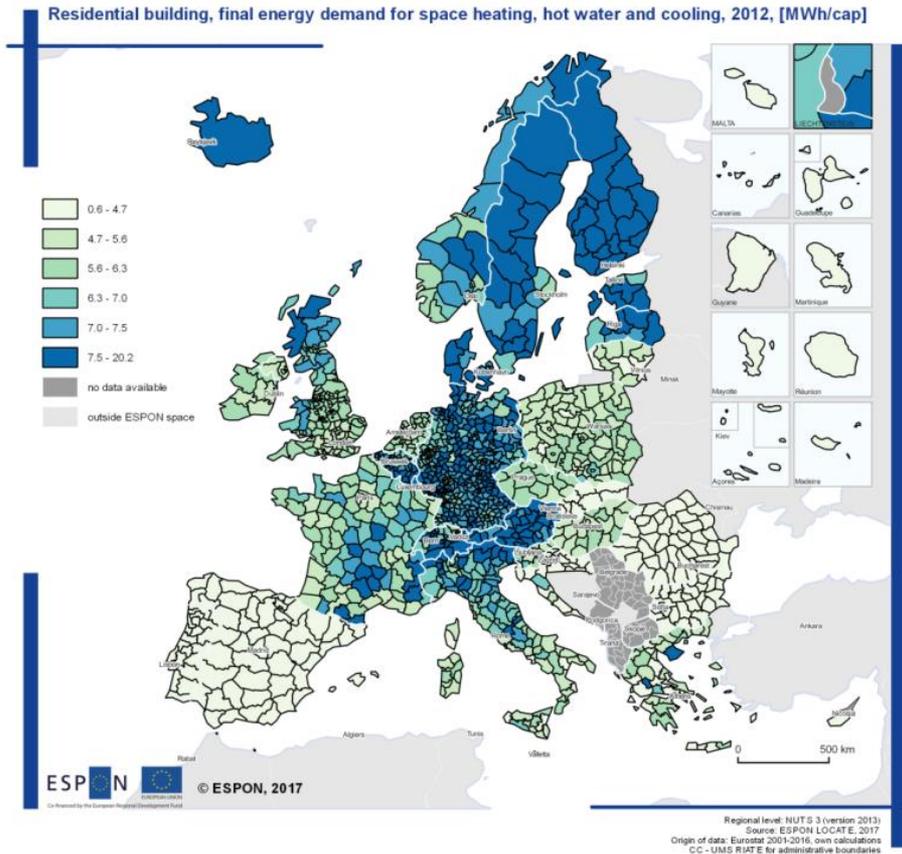
Energy intensity of the economy, 2014 (toe/million euro PPS)

Energy intensity of the economy, 2015 (toe/per capita)

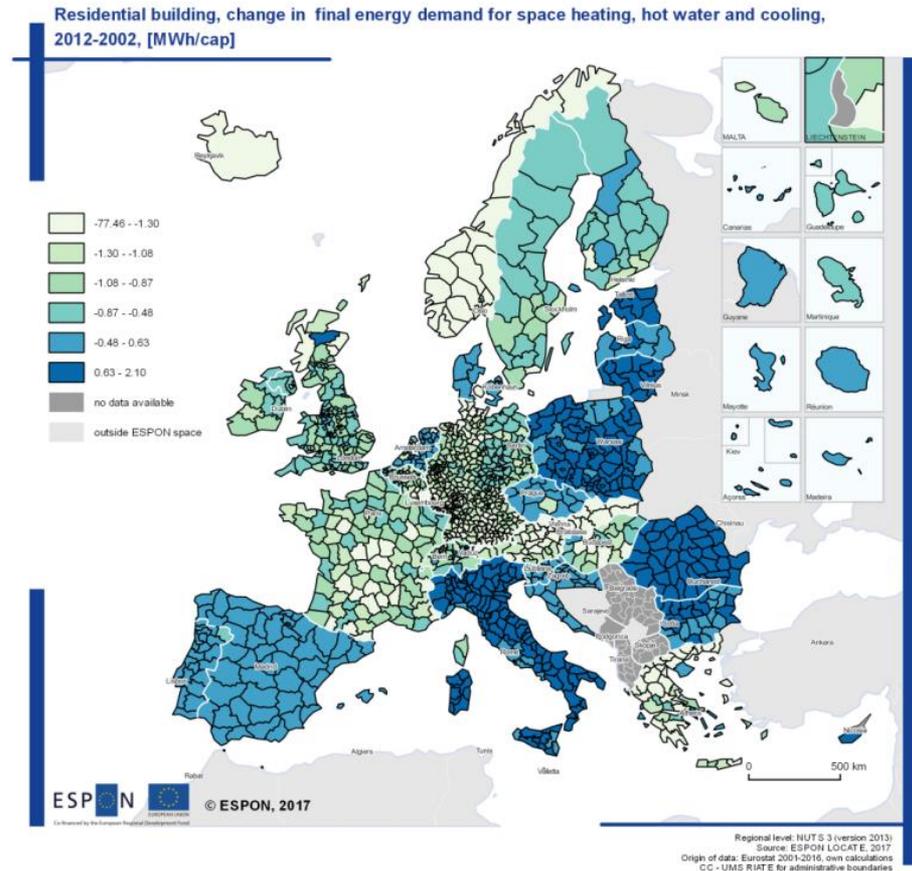
Stepping down to NUTS 3 level ...

Samples from: Territories and low-carbon economy (ESPON Locate)

Map 1.1: Final energy demand for space heating, domestic hot water production and cooling of residential buildings in 2012, MWh per capita



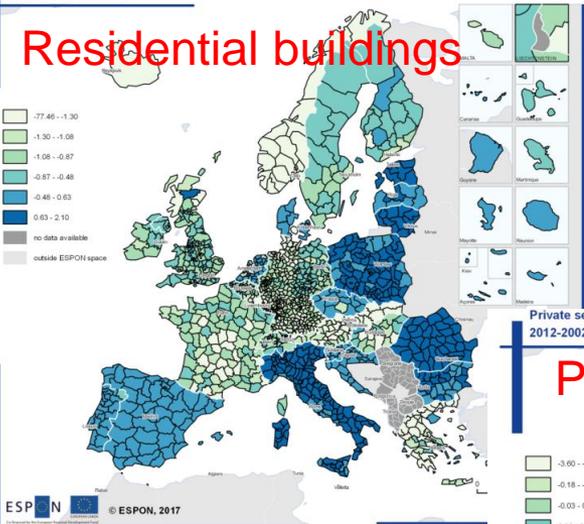
Map 1.2: Absolute change in final energy demand for space heating, domestic hot water production and cooling of residential buildings 2012-2002, MWh per capita



Data disaggregation, census data, data about buildings energy efficiency, number of heating/cooling days...

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

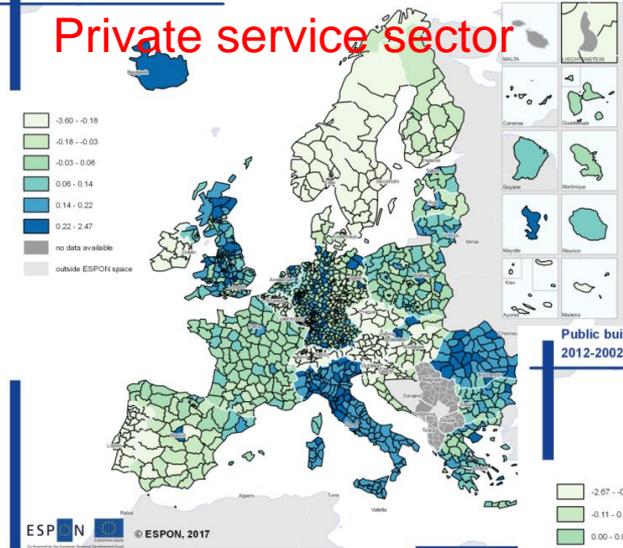
Residential buildings



Absolute change in final energy demand for space heating, domestic hot water production and cooling, 2012-2002, MWh per capita

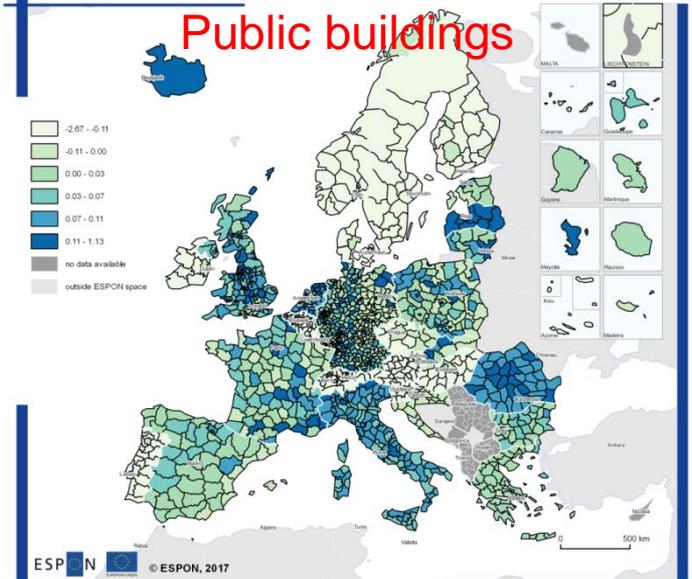
Private service sector, change in final energy demand for space heating, hot water and cooling, 2012-2002, [MWh/cap]

Private service sector



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

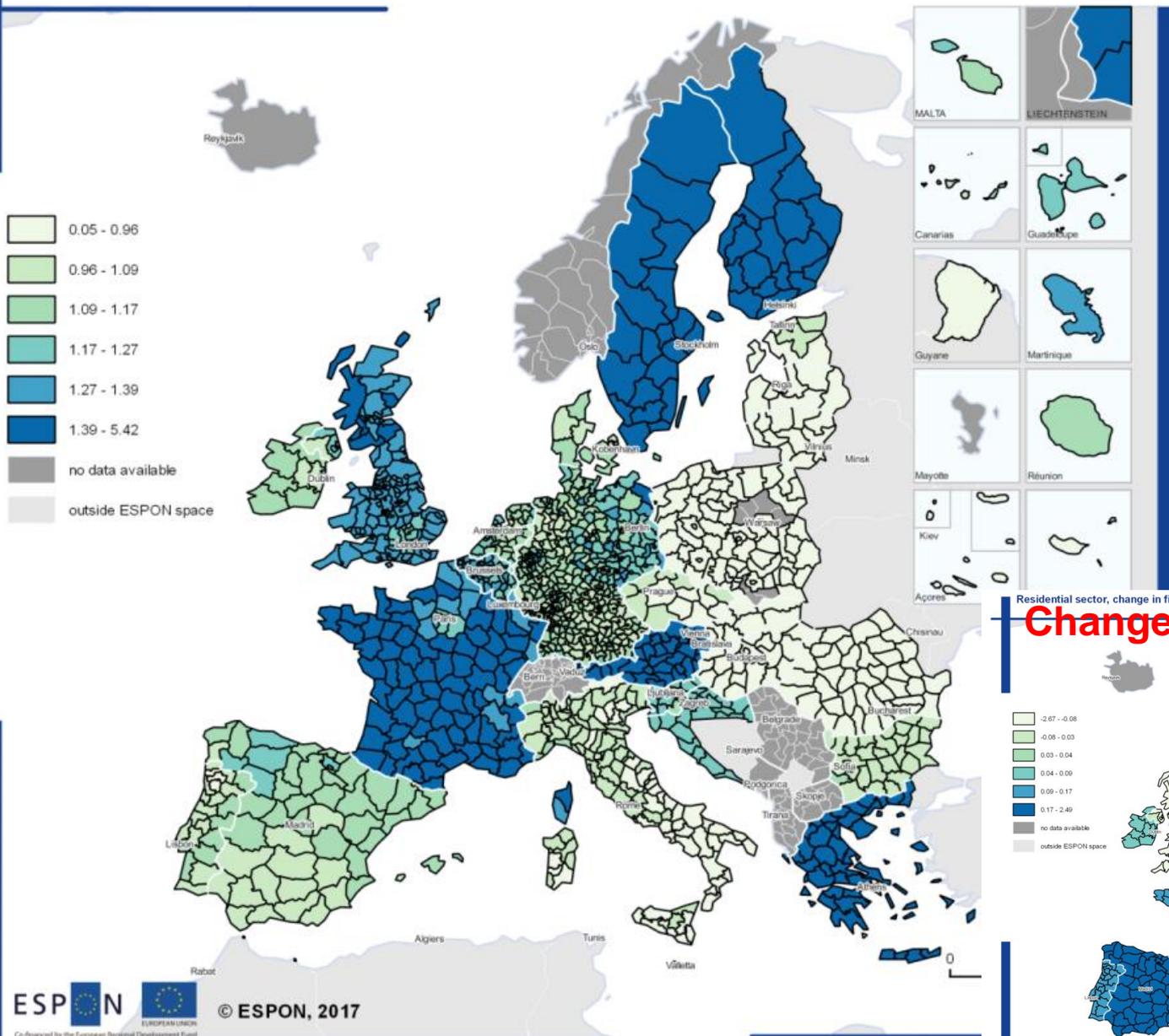
Public buildings



Can we see real change?

Where are the effects of heating systems renovation, measures for energy efficiency of block houses, new more efficient buildings...

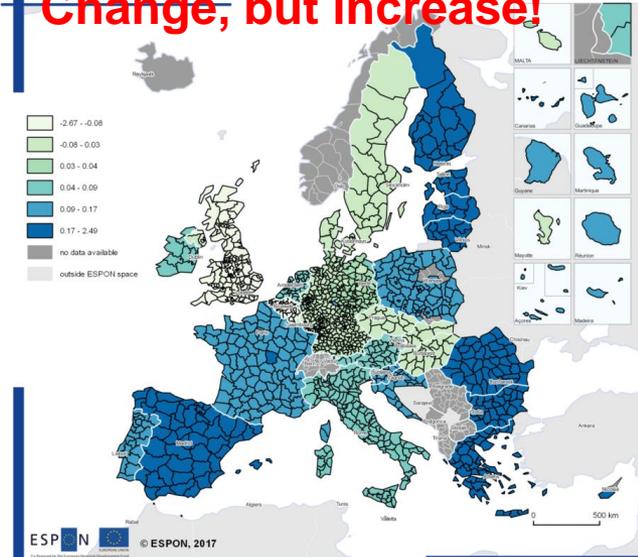
Residential sector, final electricity demand for appliances, 2012, [MWh/cap]



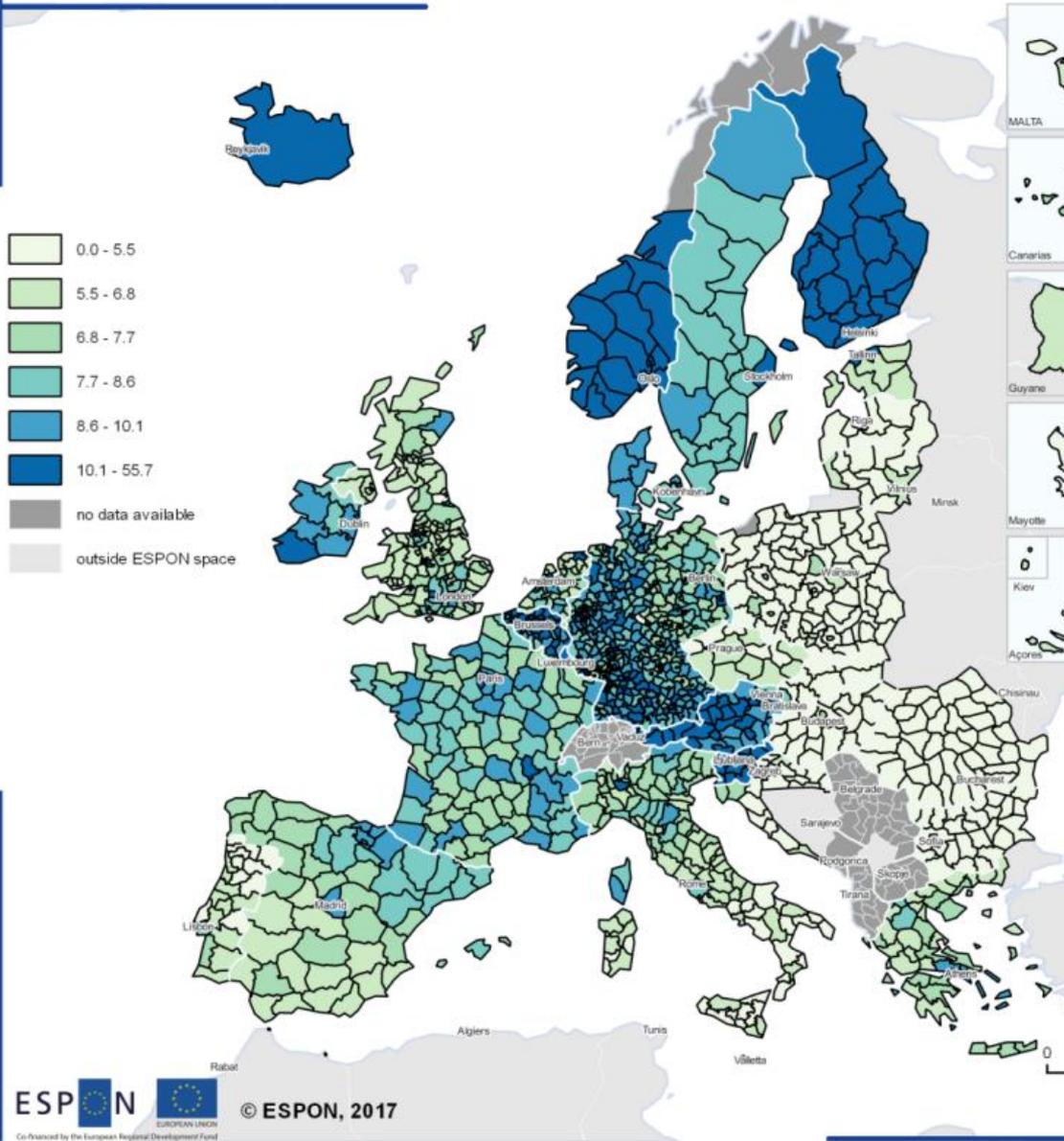
Electricity demand per capita for appliances and lighting in the residential sector in 2012, in MWh/capita

Residential sector, change in final electricity demand for appliances, 2012-2002, [MWh/cap]

Change, but increase!



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



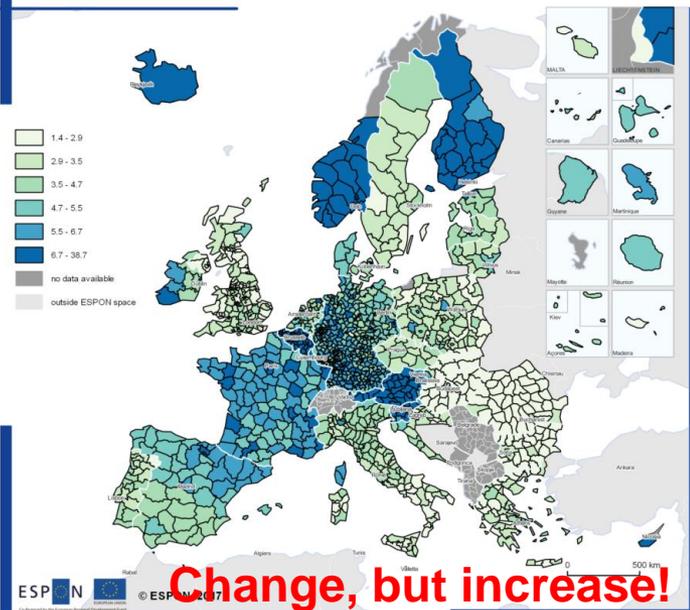
ESPON
EUROPEAN UNION
© ESPON, 2017
Co-financed by the European Regional Development Fund



The energy demand for road transport in 2012, MWh per capita

Too many assumptions for disaggregation to NUTS3 level: GDP, population density, modal value of travel, car types, fuel consumption etc.

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



1.4-2.9
2.9-3.5
3.5-4.7
4.7-5.5
5.5-6.7
6.7-38.7
no data available
outside ESPON space

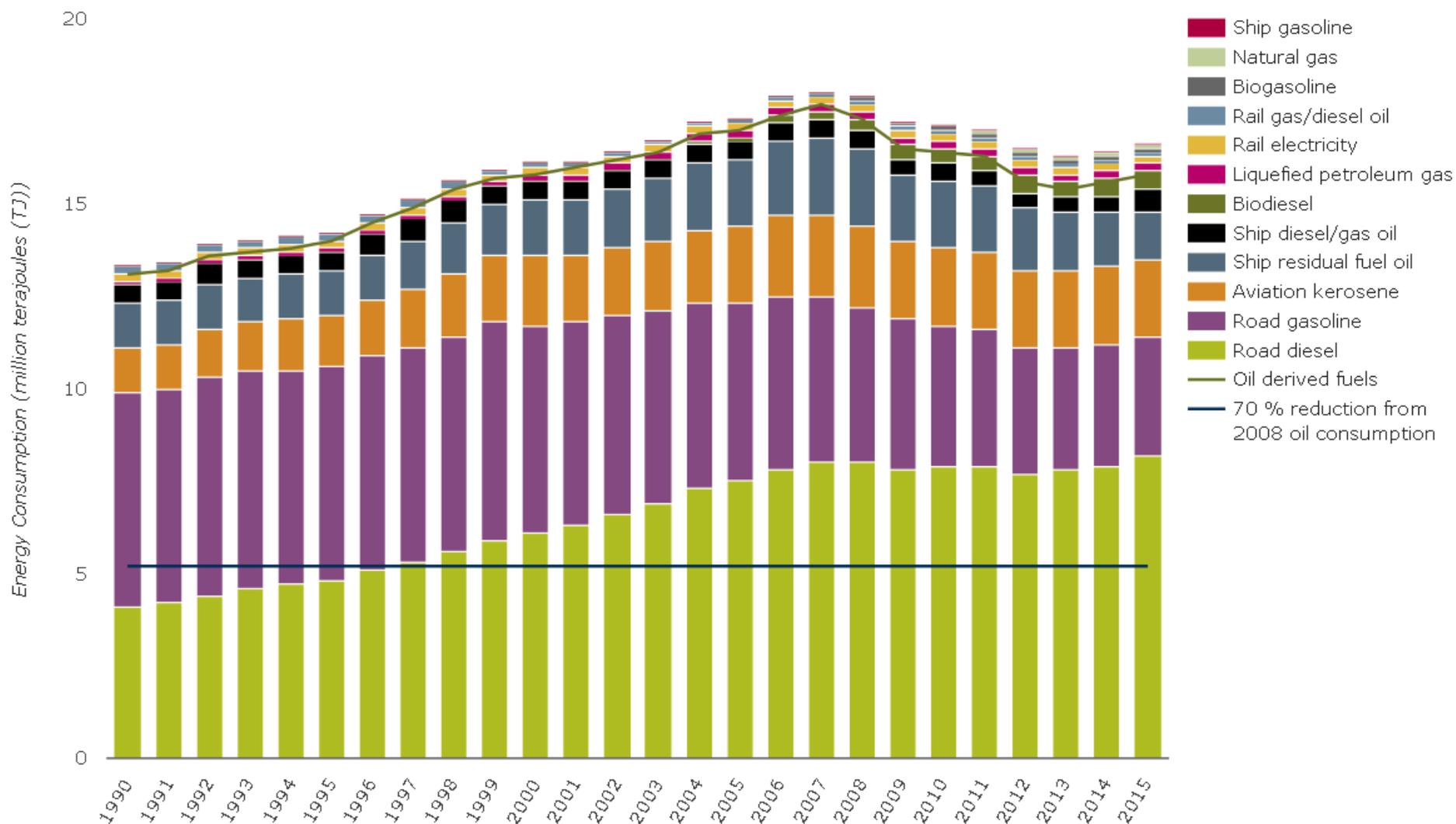
Region: St
Origin of data: I
CC - UMS RIAT

ESPON
EUROPEAN UNION
© ESPON, 2017

Change, but increase!

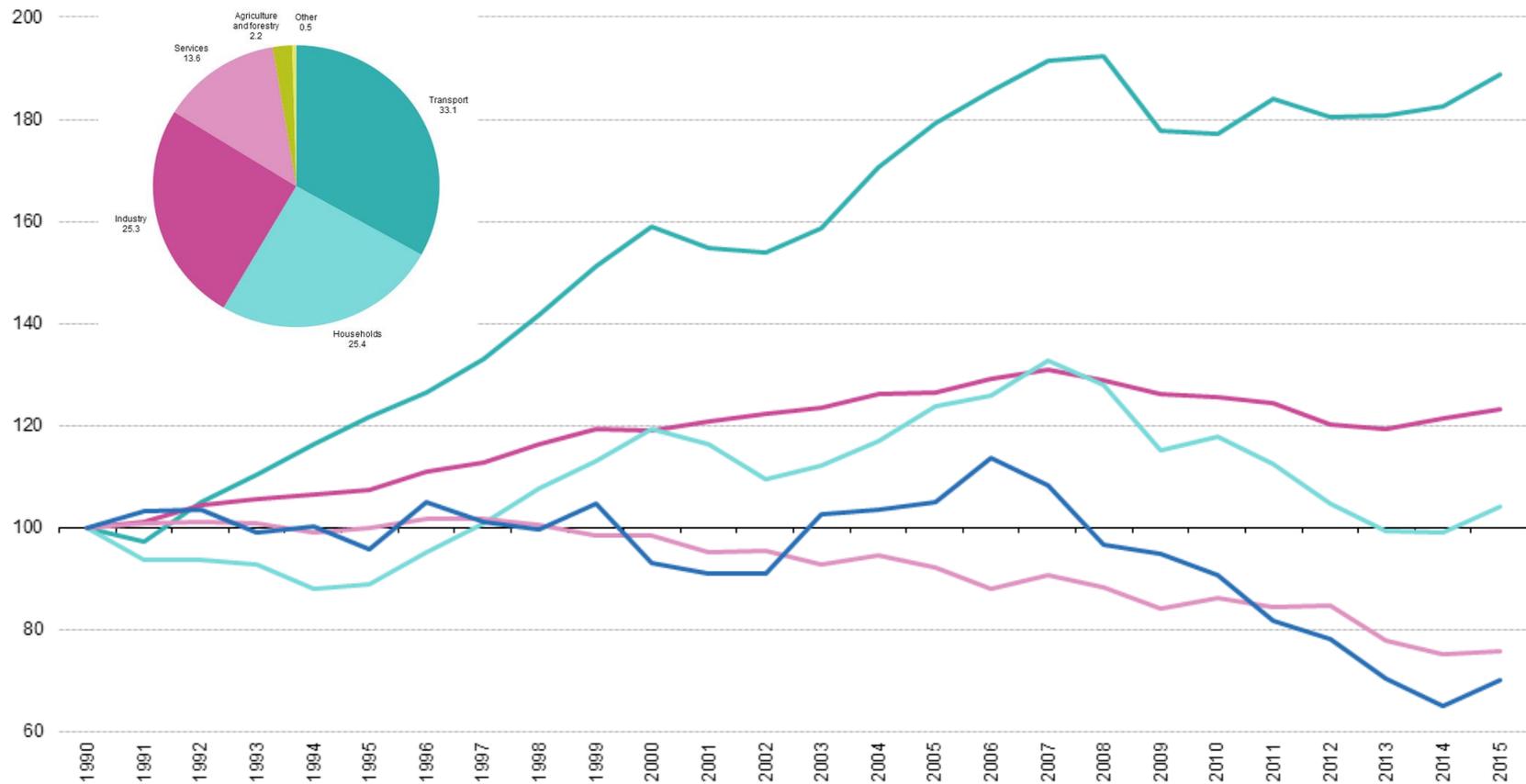
Regional level: NUTS 3 (version: 2013)
Source: ESPON LOCATE, 2017
Origin of data: Eurostat 2016, own calculations
CC - UMS RIAT for administrative boundaries

EU energy consumption in transport



Source: EEA

Energy consumption by transport mode, EU-28, 1990-2015 (1990 = 100, based on tonnes of oil equivalent)



Does electromobility save the transport sector...

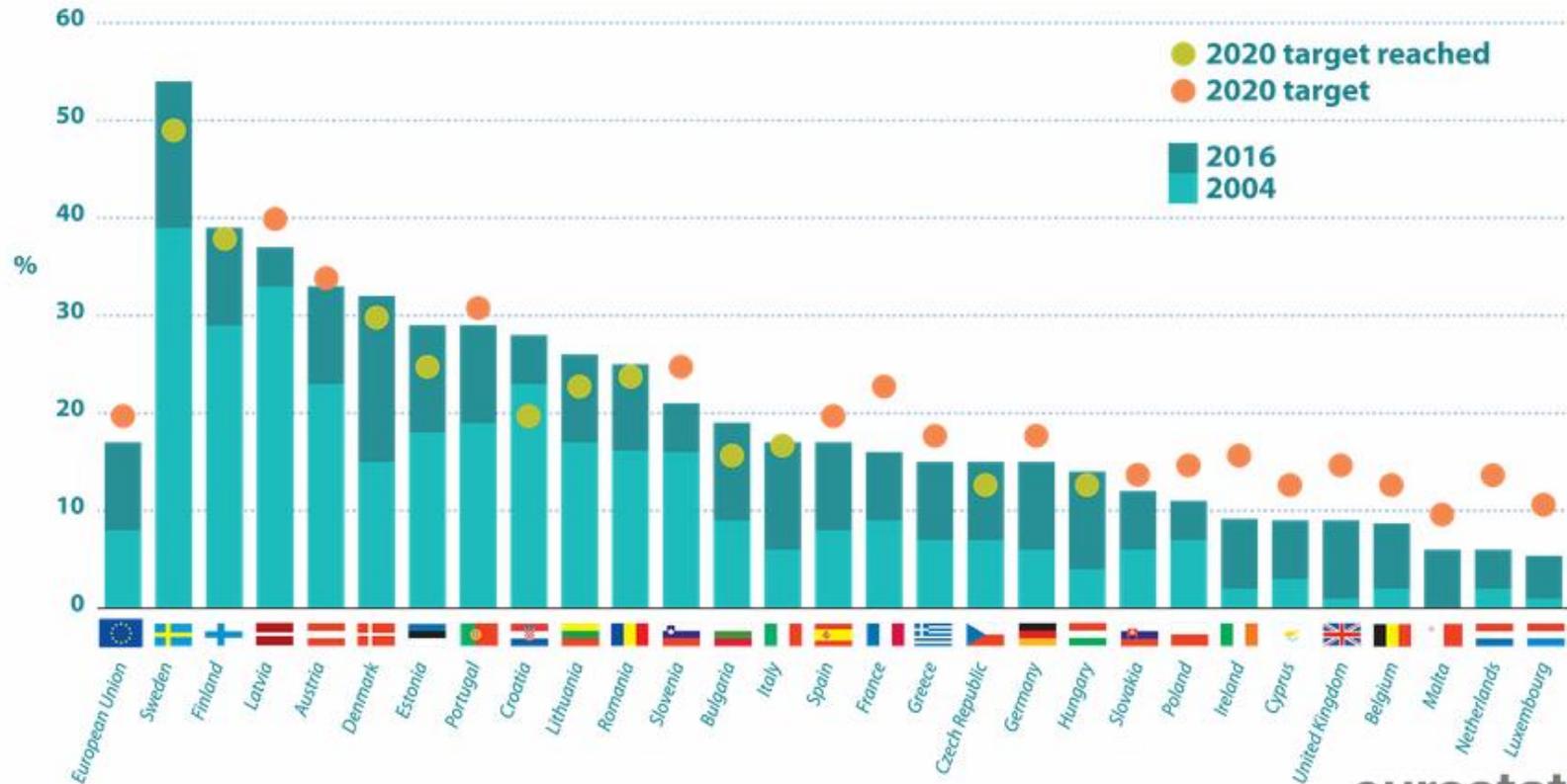
- International aviation
- Road
- Domestic aviation
- Rail
- Inland waterways

...or is it attempt to cure with the same medicine local (urban) and regional problems?

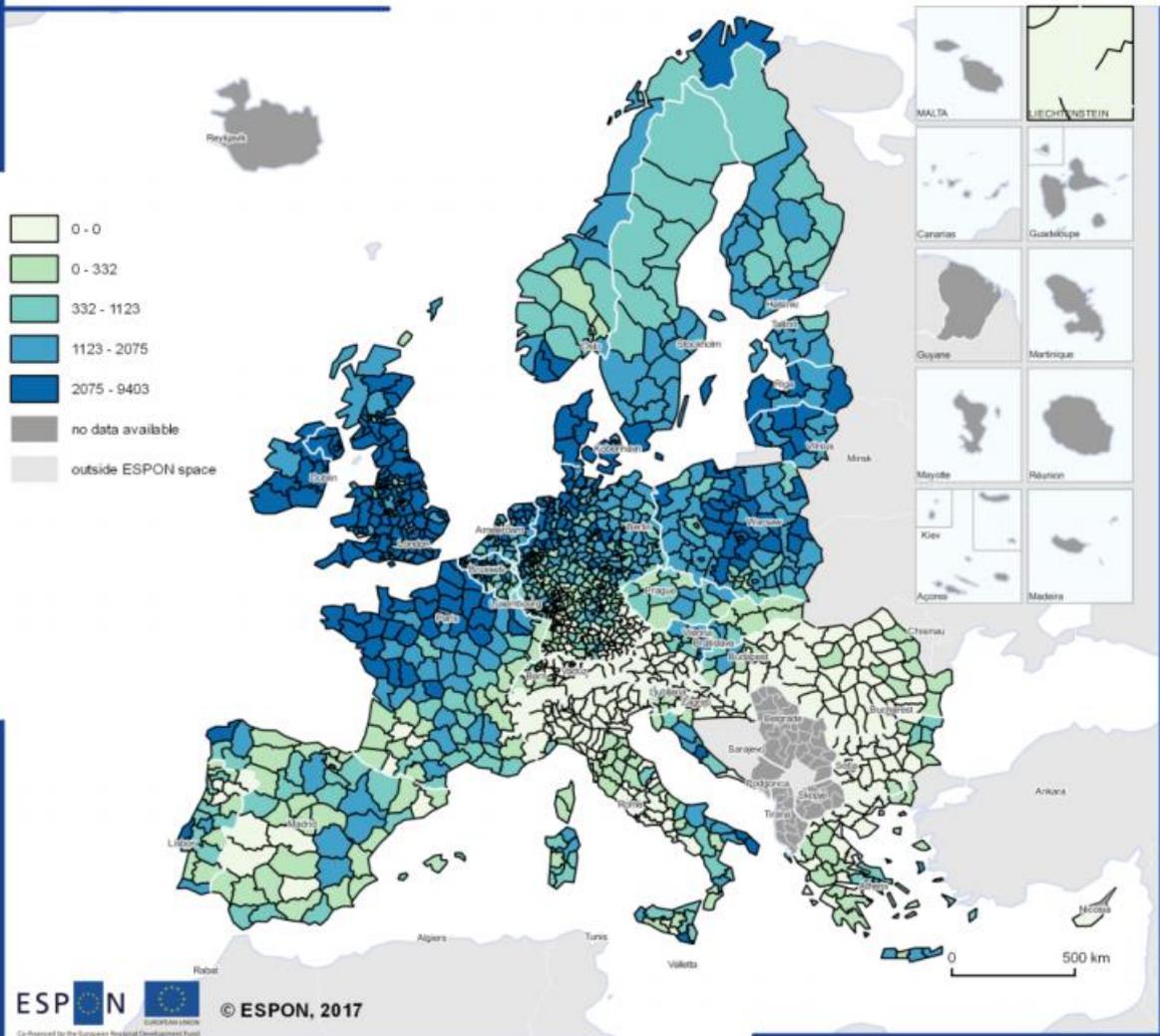
EU goal: Promote the development of new and renewable forms of energy

Share of energy from renewable sources in the EU Member States

(in % of gross final energy consumption)



Wind onshore, potential for electricity generation, [MWh/km²]



Use of indirect and low resolution data leads to unrealistic estimate of renewable energy potential.

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

Conclusions

- At national level implementation of energy policy can be assessed but efficiency of the policy or policy goals can't
- Subnational statistical units are covered with basic and some specific statistics but not evenly and not coherently among Member States
- Efficient energy policy at EU level is not necessarily good at regional or sub-national level as coherence with other sectors is weak