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Joint Research Centre



Renewable Strategies for Coal Regions in Transition

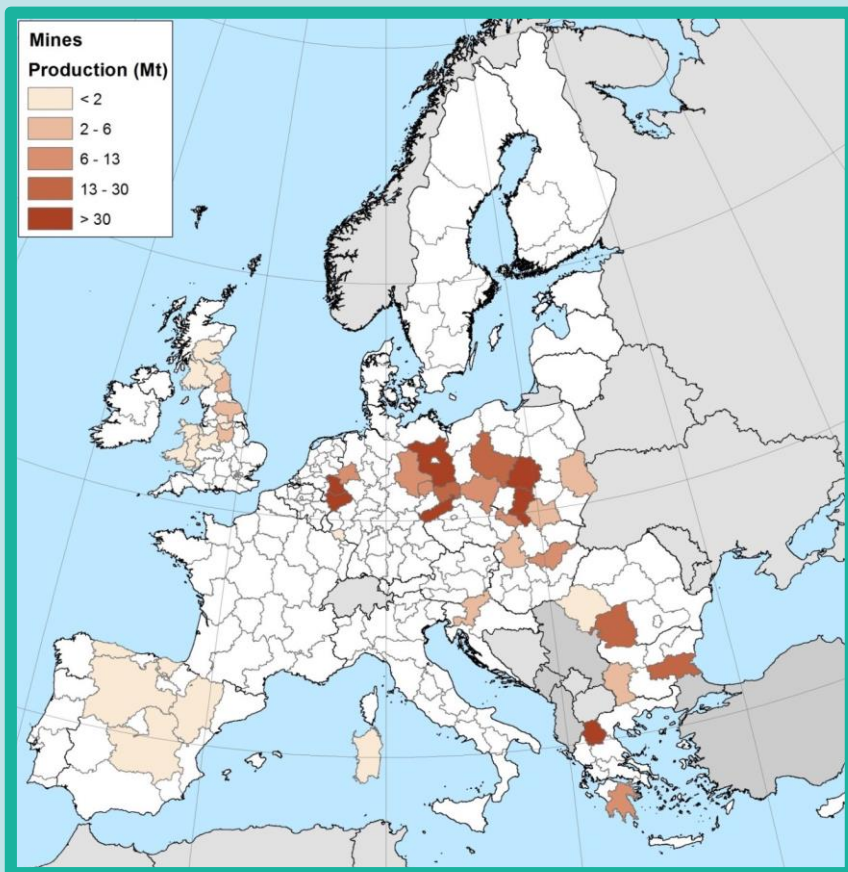
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DG JRC - Energy, Transport and Climate Directorate

European Commission

The challenge of Coal Regions in Transition



Coal Mines

128 coal mines
in 12 Member States

41 NUTS-2 regions

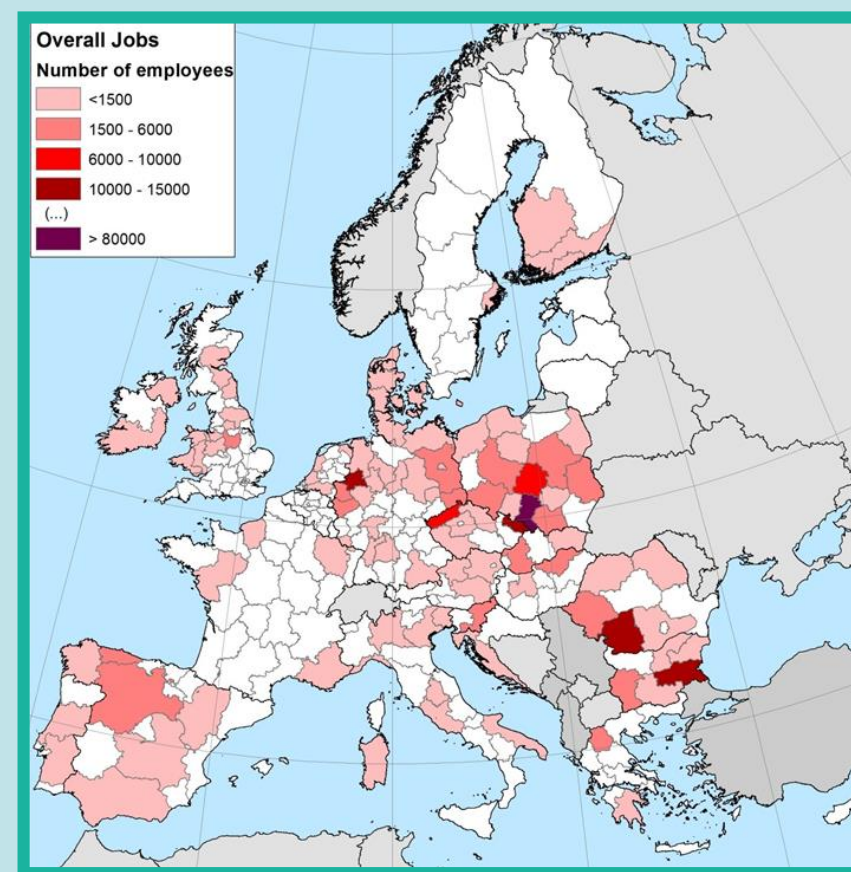
500 Mt of hard coal and lignite

Direct jobs

55 000 in coal power plants

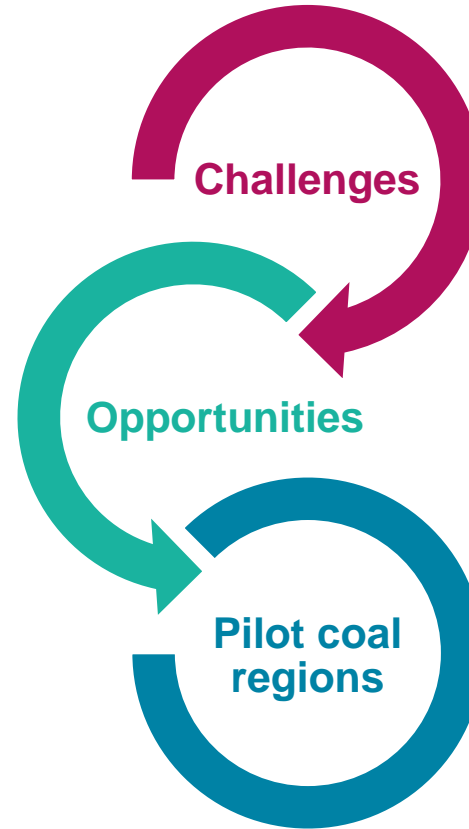
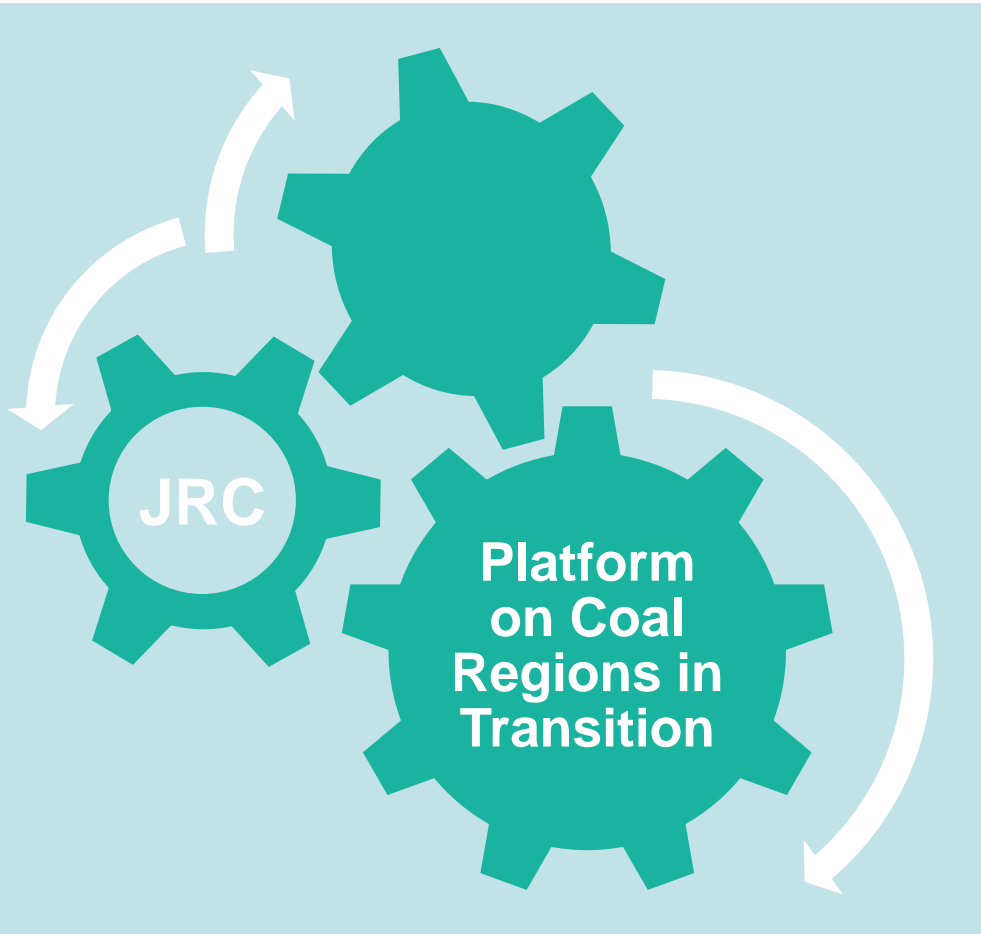
185 000 in mining

215 000 indirect jobs



Source: JRC

JRC support to coal regions



Which EU regions will be most affected by the decline of coal?

How many jobs may be threatened?

Past successful transitions? Experiences and examples of best practices?

Which opportunities in the clean energy sector? Natural potentials (e.g. solar, wind, geothermal, biomass) in coal regions?

Which strategic approaches to address the challenges at regional level?

A need for early action

- **Alternative business opportunities** for employment and economic growth in coal regions, **based on regional potential** in the context of:
 - Broader socio-economic transformation
 - Matching skills
 - Policies
 - Human capital development
- **New, competitive industries and services:** investment in renewable energy technologies as part of portfolio of options



Reconversion of coal mines for renewable energy generation is already happening



PV power plants (Visonta, HU):

16 MW PV plant

72 500 PV panels

Located on top of lignite mine dump site



Wind farms (Klettwitz, DE):

5 wind parks

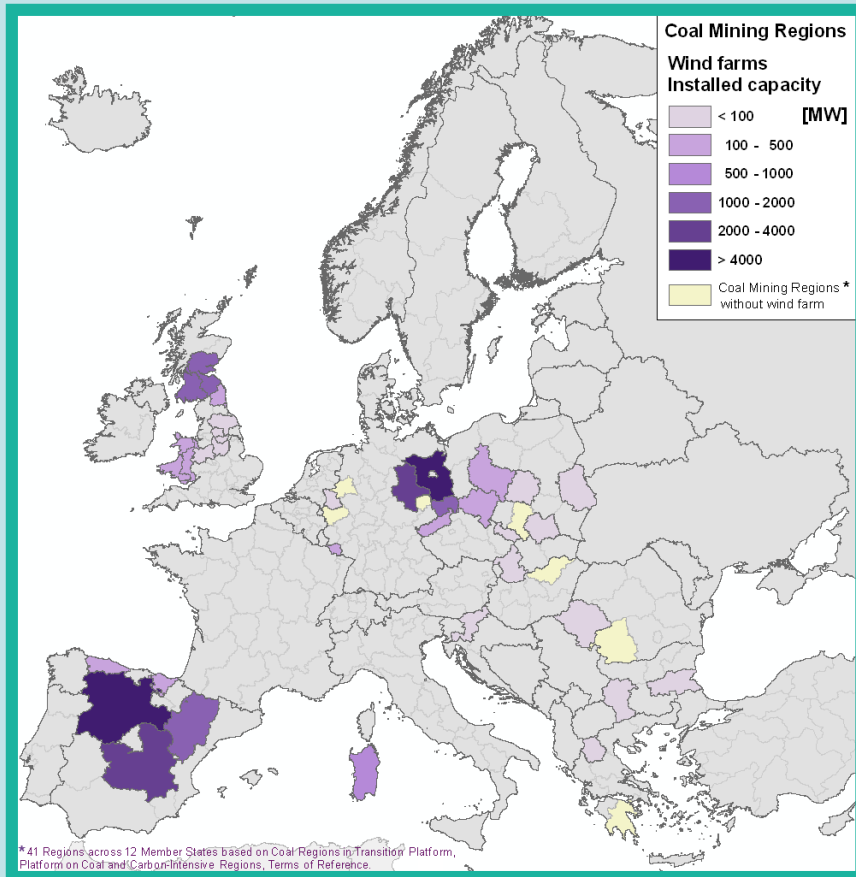
145.5 MW

Source: Szabó, S., Bódis, K., Kougiás, I., Moner-Girona, M., Jäger-Waldau, A., Barton, G., Szabó, L., 2017, A methodology for maximizing the benefits of solar landfills on closed sites, *Renewable and Sustainable Energy Reviews*, Volume 76, September 2017, pp. 1291-1300, doi: 10.1016/j.rser.2017.03.117.

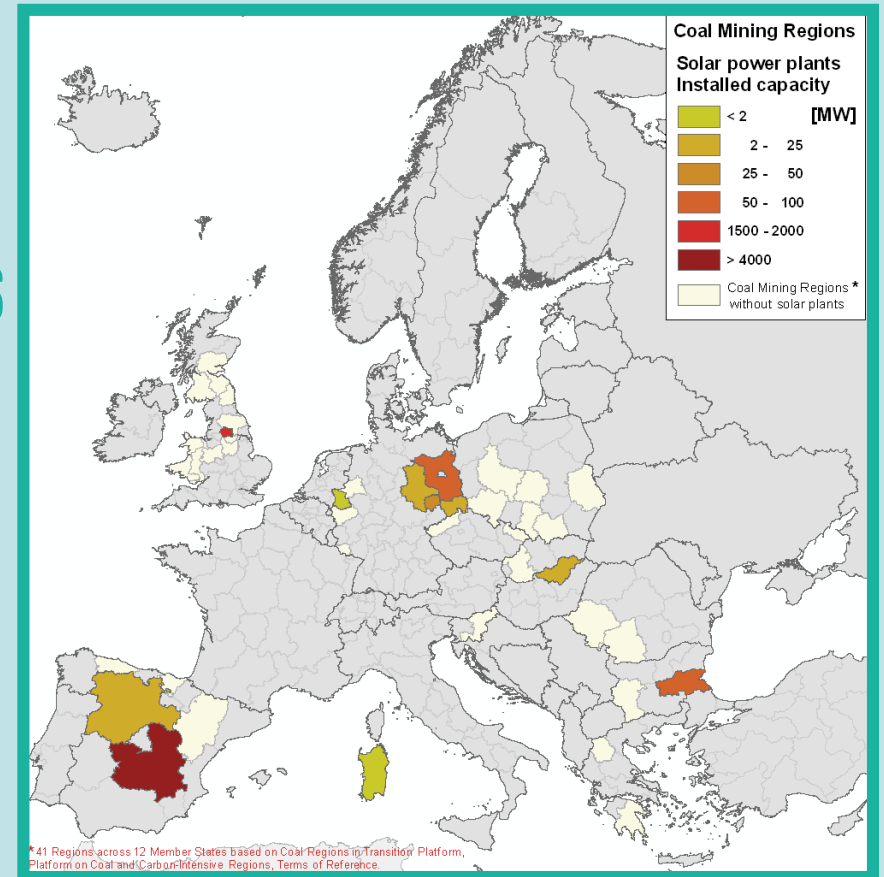
Sources: Google Earth; Ra Boe/Wikipedia, 2013, http://www.wikiwand.com/de/Windparks_in_Schipkau

Renewable deployment in coal regions

Wind energy



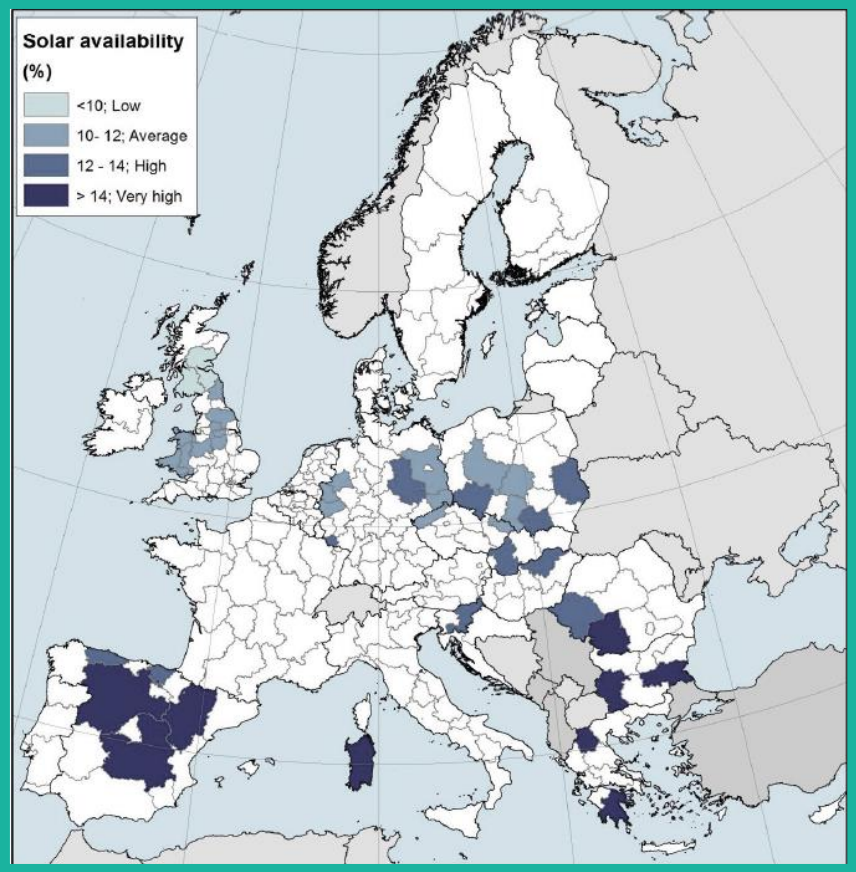
Solar energy



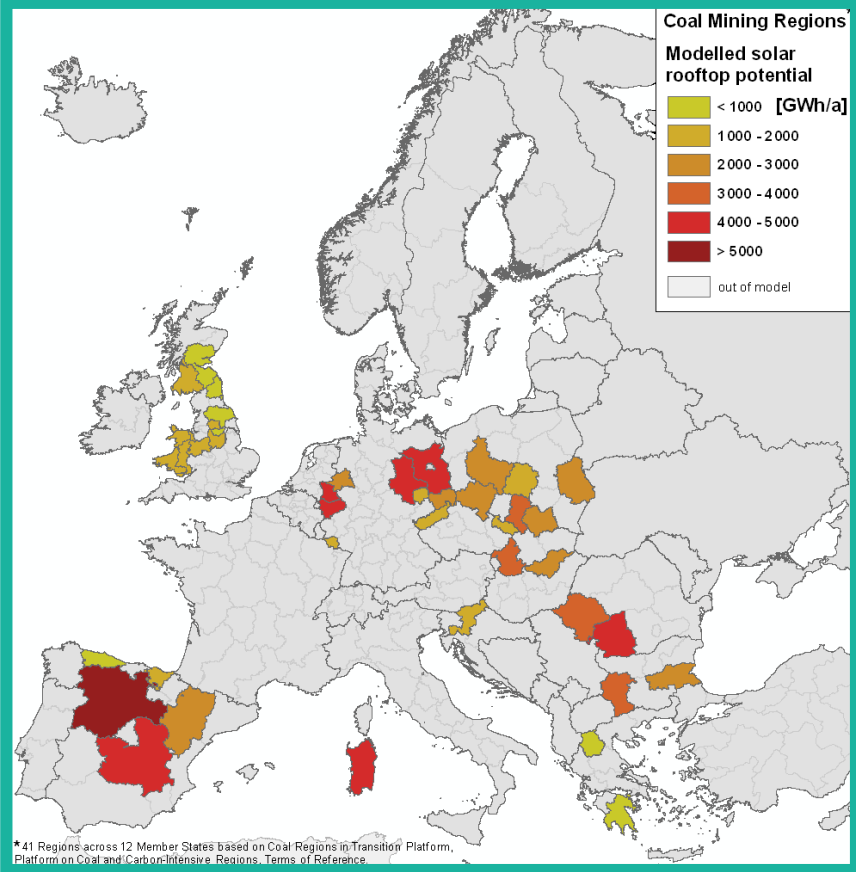
Source: JRC

Solar energy potential

Solar availability



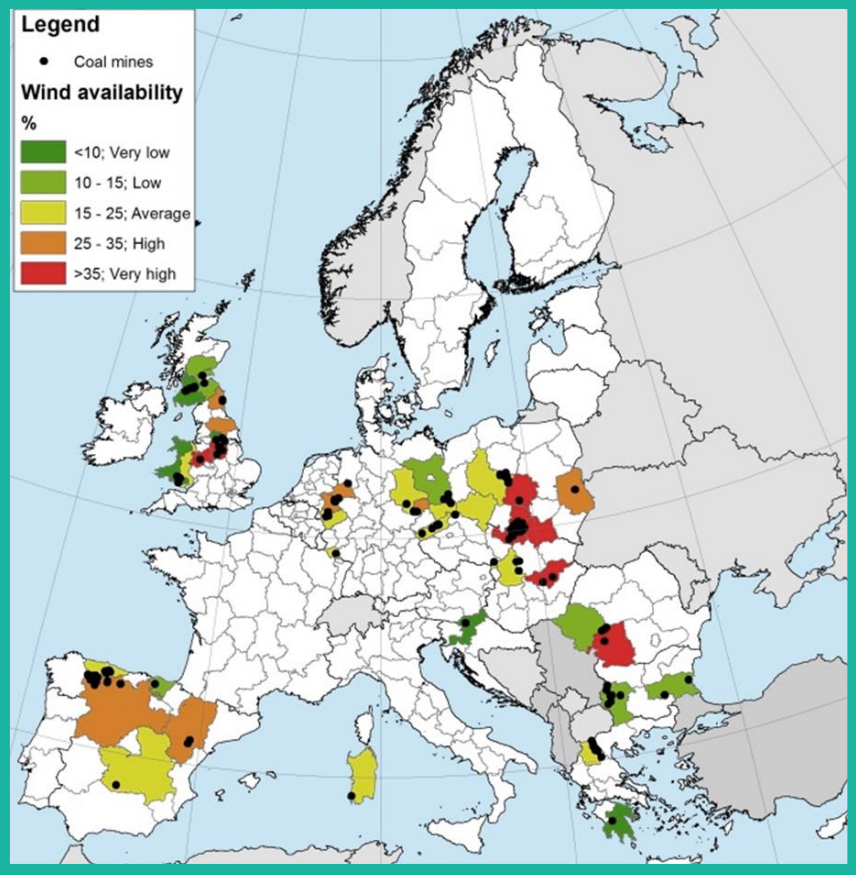
Solar rooftop potential



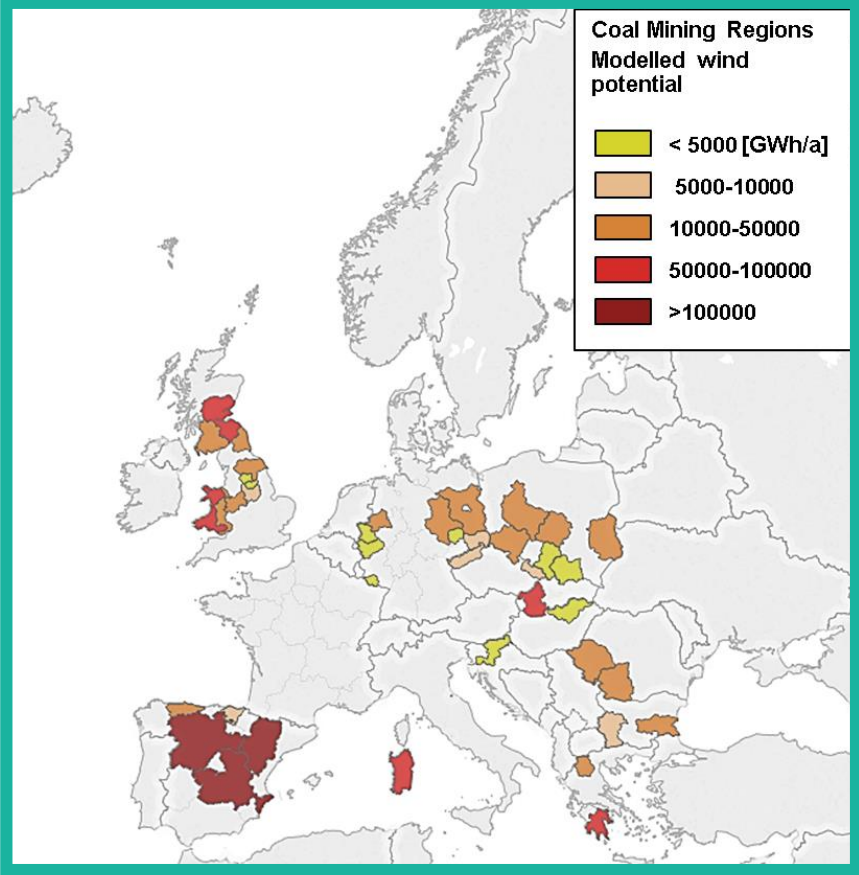
Source: JRC

Wind energy potential

Wind availability



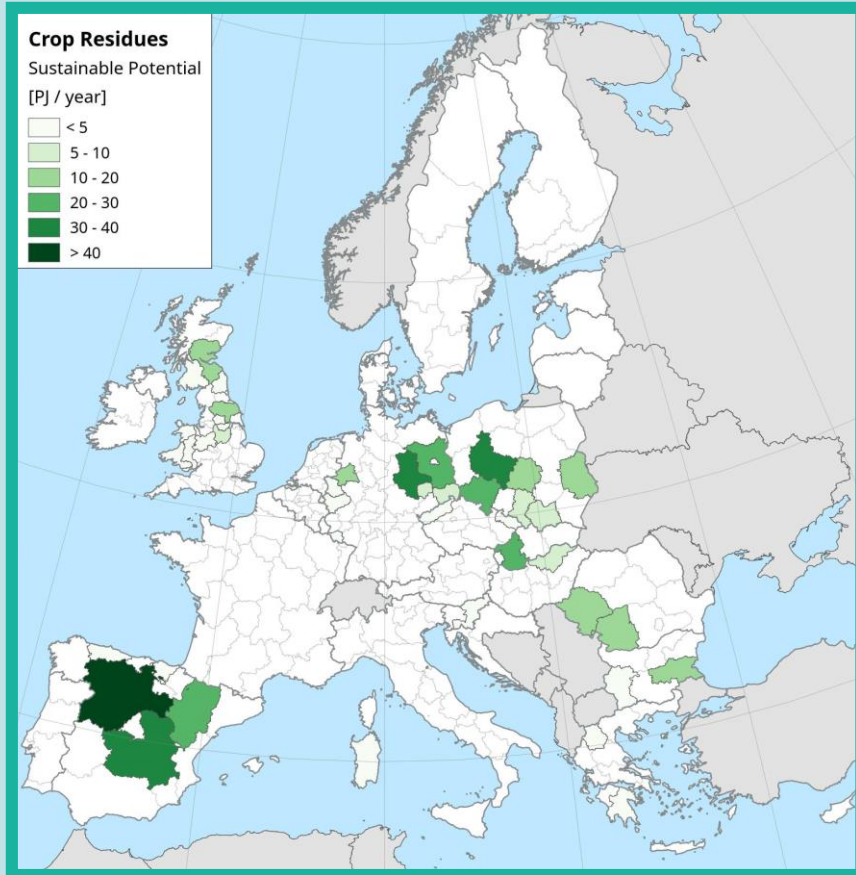
Wind potential



Source: JRC

Biomass potential

Crop residues production

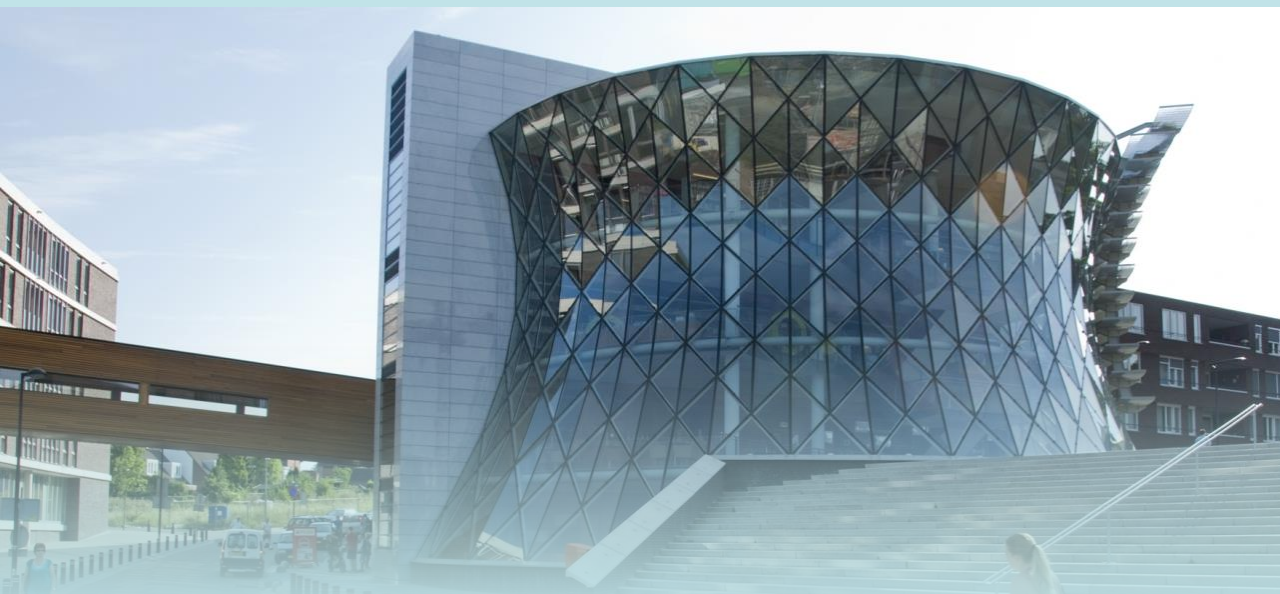


Sustainable agricultural potential

- Maximum amount of biomass that could be removed in order to maintain Soil Carbon Content and soil fertility at least at current level
- Further analysis can look at how coal mining sites could be used for biomass power plants, exploiting existing grid infrastructure.
- Existing previous analysis cases:
 - Danube project
 - Region in Austria

Source: JRC

Alternative renewables should not be overlooked



Minewater district heating project- Heerlen (NL)

- 0.5 MW_{th} capacity servicing 800 000 m²
- 65% reduction of CO₂ emissions on heating and cooling for these

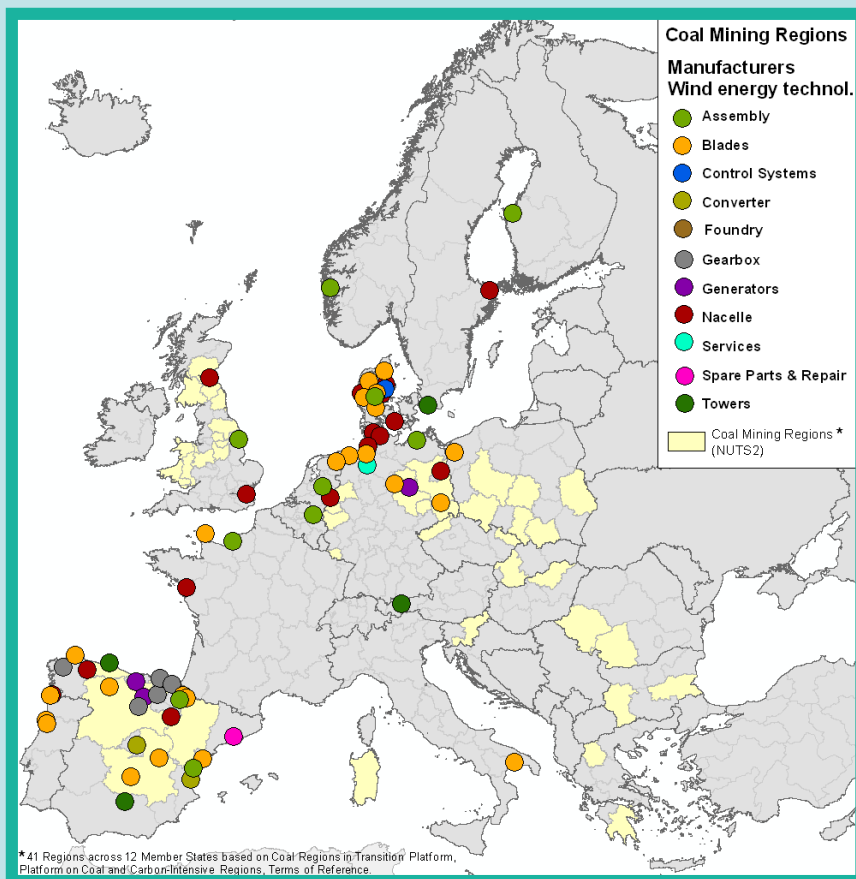


As Pontes (ES) Hydro power plant project on rivers Eume and Meidelo

- Open pit (18 km perimeter -205 m deep)
- Planned capacity: 300 - 600 MW

Sources: Google Earth; EU Smart Cities Information System, <https://smartcities-infosystem.eu/scis-projects/demo-sites/remining-lowex-site-heerlen#REMINING-LOWEX-Site-Heerlen--field-cp-image-gallery>

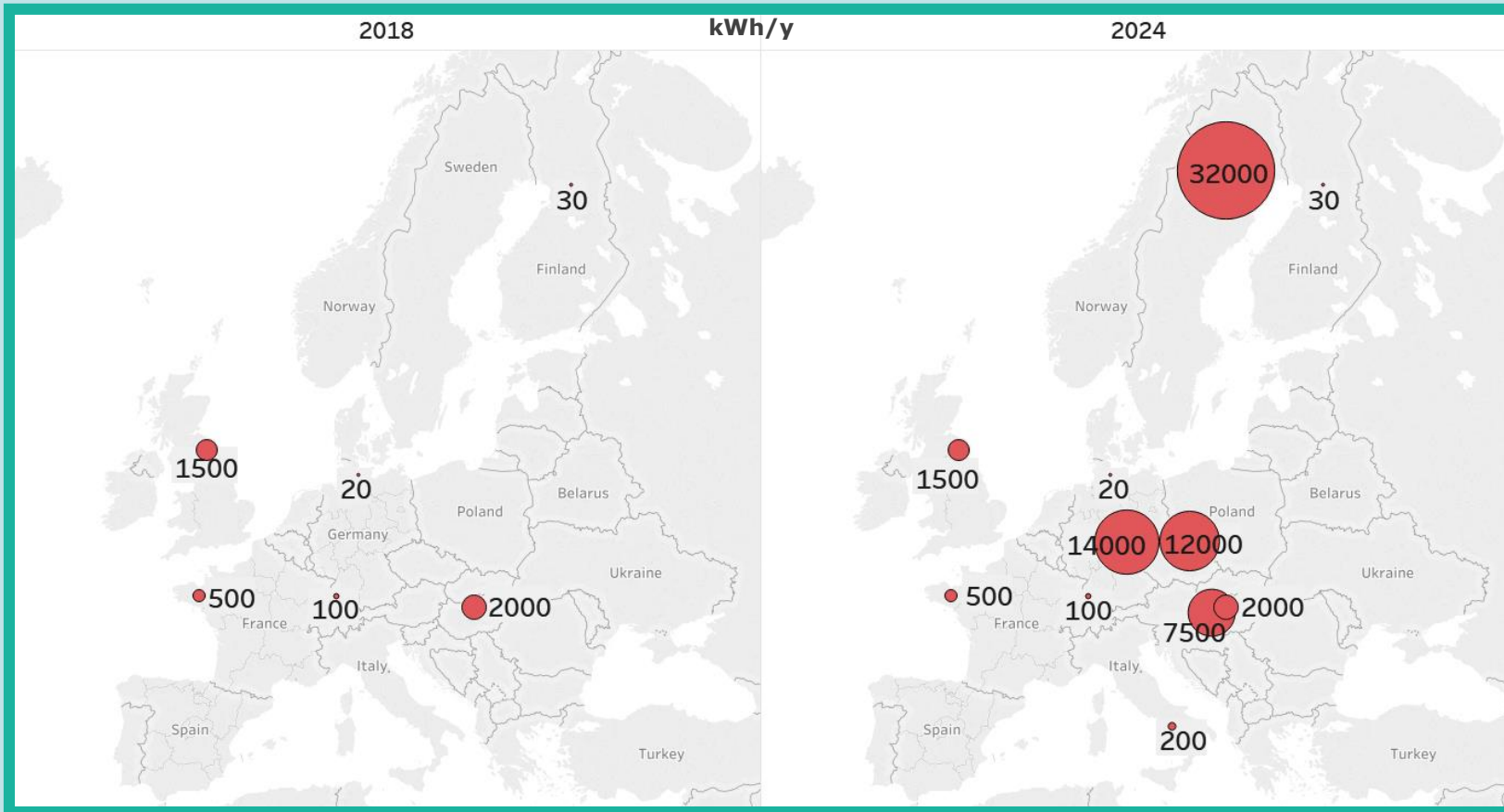
Renewable manufacturing as a source for growth and jobs



- Most European OEMs have located their manufacturing facilities in the main wind markets.
- The highest number of manufacturing facilities is associated with blade manufacturing, followed by nacelle manufacturing and the assembly of wind turbine components.
- 9 out of the 41 coal regions have manufacturing facilities of wind turbine components installed.

Source: JRC

Batteries manufacturing as a source for growth and jobs

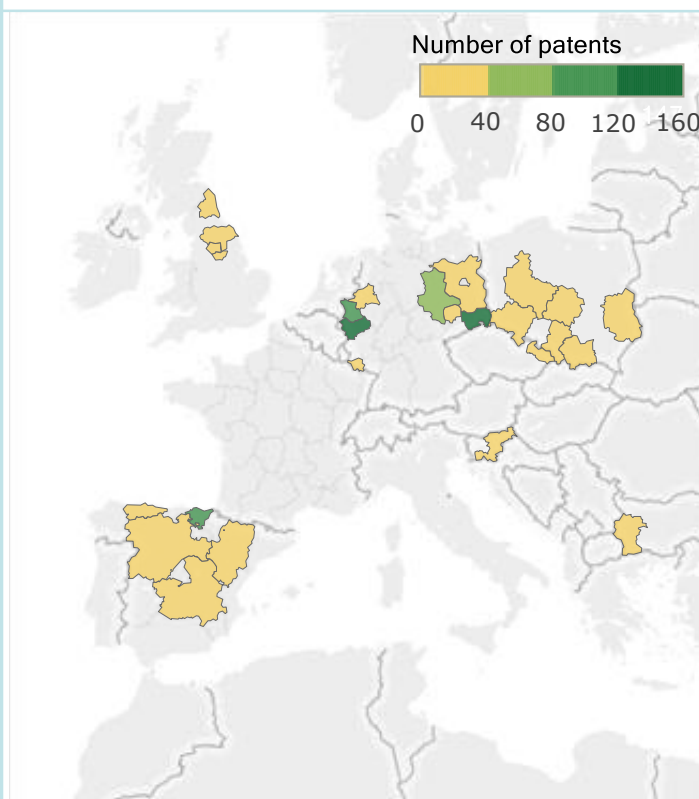


- Expected evolution of Li-ion cell manufacturing capacity for mobility and stationary storage applications in the EU
- Associated with the deployment of RES electricity generation and electric vehicles
- Currently announced plans in HU, FR, DE, FI, IT, SE and PL

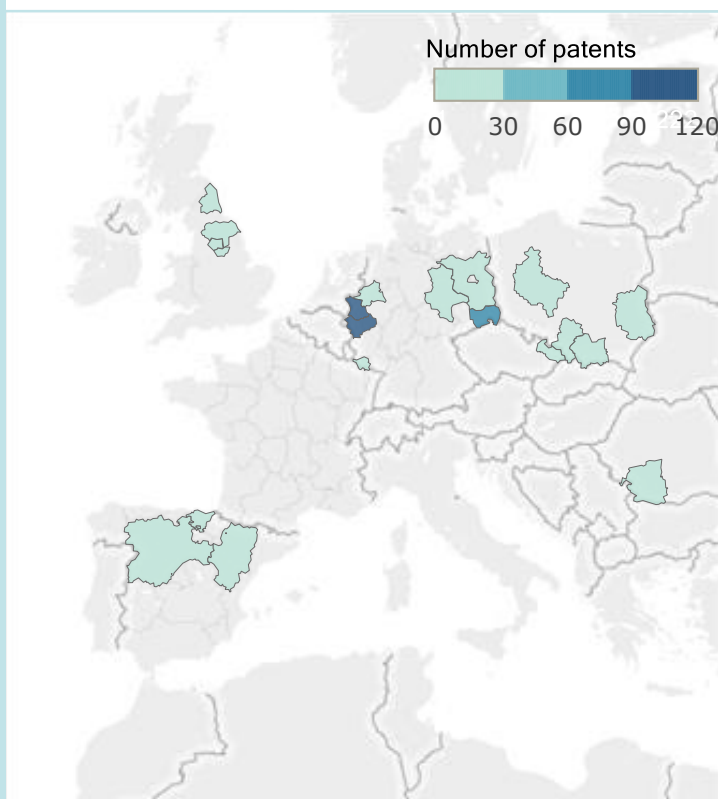
Source: JRC forthcoming report. Tsiropoulos I., Tarvydas. D., Lebedeva N. 2018. Li-ion batteries for mobility and stationary storage applications. Scenarios for costs and market growth

Coal regions hold significant innovation potential

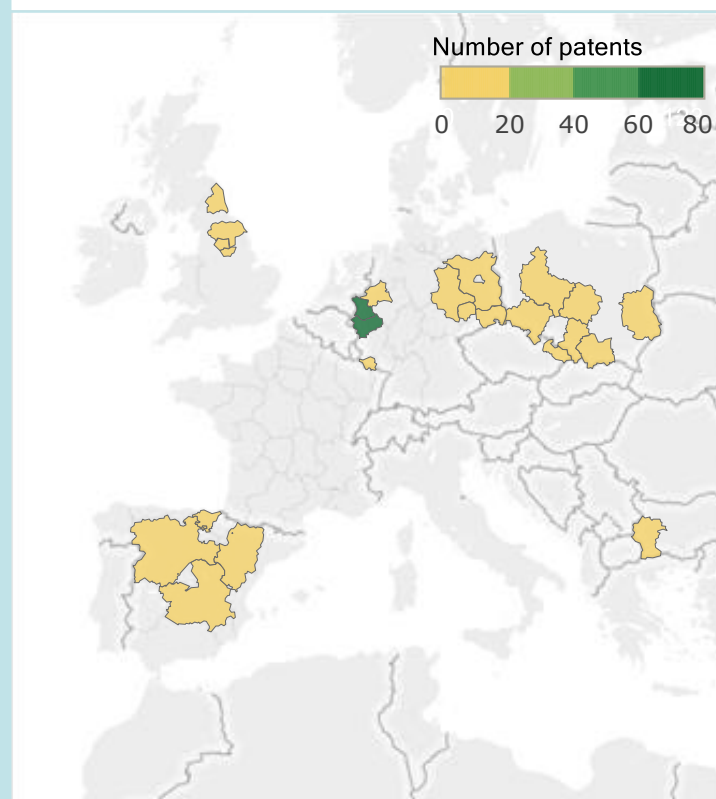
Patents in Renewables.
2010-2014



Patents in batteries and e-mobility.
2010-2014



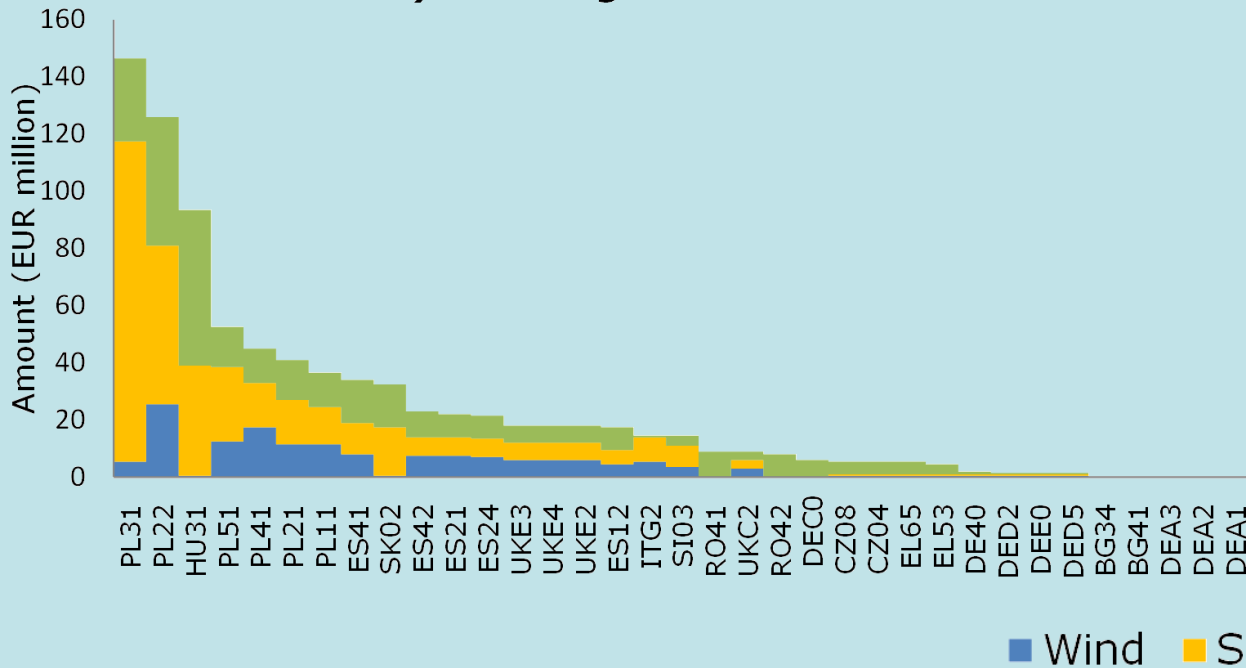
Patents in biofuels.
2010-2014



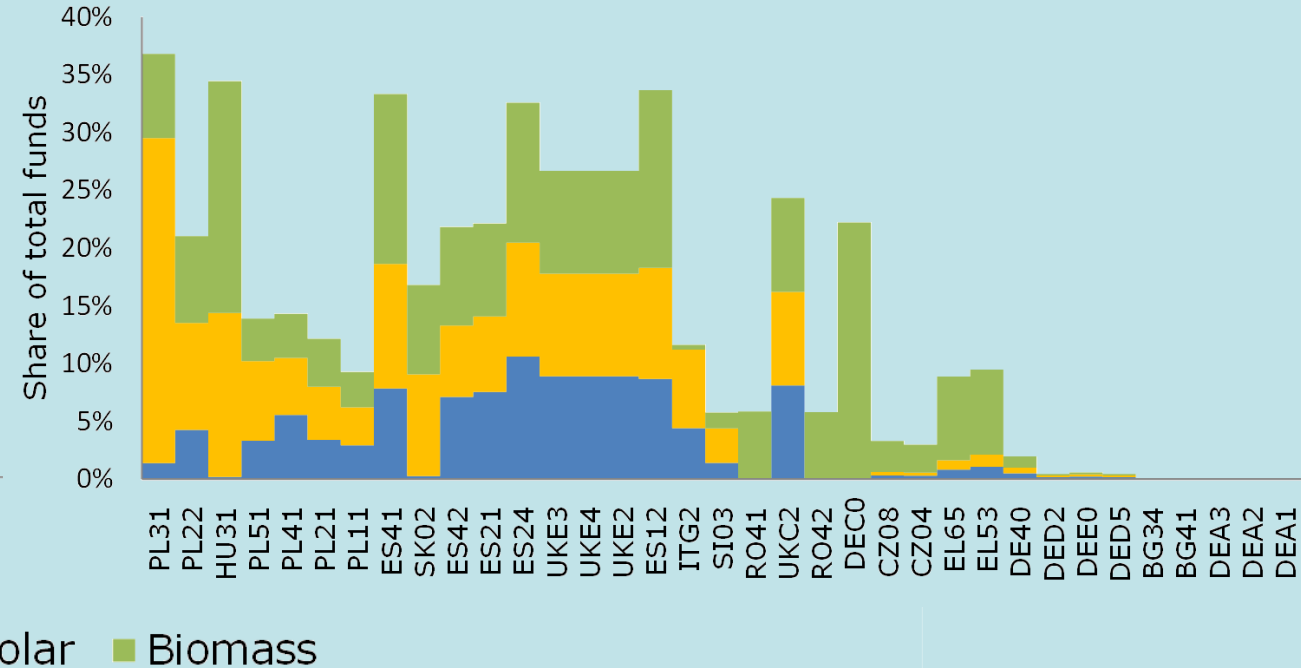
Source: Energy R&I financing and patenting trends in the EU. JRC Science for Policy Report, 2017

RES deployment is a source of economic growth

European Structural and Investment Funds 2014-2020). Coal regions in transition



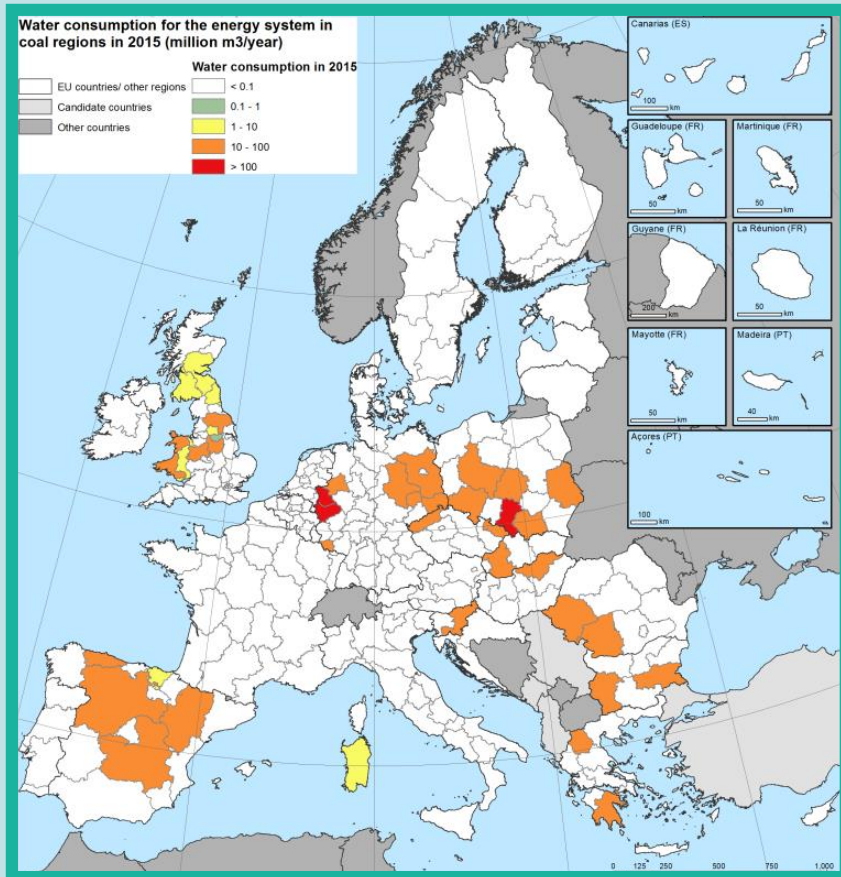
European Structural and Investment Funds 2014-2020). Coal regions in transition



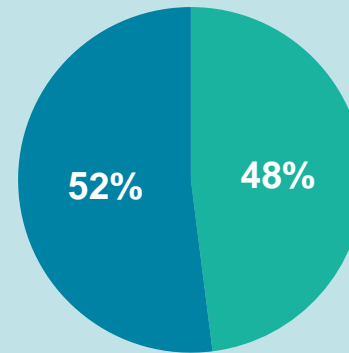
10% of the total ESIF funds in CRiT was allocated to energy topics

Source: ESIF-viewer tool. Visualising planned investments. JRC, 2017

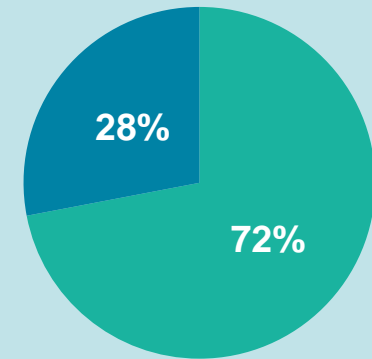
Positive environmental impacts of the energy transition: the case of fresh water



Fresh water for energy in EU28



Fresh water for coal power plants



1.8 billion m³ of fresh water consumed in 2015
mainly in coal mines and coal power plants

The use of renewables will reduce water footprint!

Source: JRC

Key messages

- The reconversion of coal mine sites for renewable energy production reduce decommissioning costs, contribute to energy security and provide economic value and jobs to post-mining communities.
- The development of such projects benefits from the availability of infrastructure, land, skills and industrial heritage.
- Solutions need to be decided on a case-by-case basis to ensure suitability to local conditions.
- Close cooperation between companies, regulators, investors, land-use planners and local communities is essential to identify the most sustainable uses and maximize social and economic development.



Thank you

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