

Addressing the socio-economic disparities of net zero transition

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Energy transition and equity



Paris, 2015



Paris, 2018

Energy transition and economic recovery

COMMENT • 10 SEPTEMBER 2020

Protect global supply chains for low-carbon technologies

The COVID-19 economic crash threatens the international trade networks that make clean energy cheap – abandoning them puts the climate at risk.

Andreas Goldthau & Kirsten Westphal



Solar panels being produced at a factory in Ningbo, China. Credit: Shutterstock

COVID-19's effects have caused global supply chains to buckle and break. Of the many sectors affected, one is particularly worrying – low-carbon energy. Closed borders, closed factories and shortages of components are slowing the deployment of wind turbines, solar panels and electric vehicles worldwide, with little time left to avert dangerous climate change.

This year's growth in renewable electricity capacity is expected to fall short of last year's figure by 15%, owing to supply chain and financing problems. Manufacturers face unprecedented times. In April, two of the world's largest turbine producers, Vestas, based in Aarhus, Denmark, and Siemens Gamesa in Zamudio, Spain, announced the economic uncertainties were so great that they could not guide investors on how they would perform in 2020.

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Analysis of past recoveries shows a low-carbon reboot matters more for climate than does the brief emissions crash.

Ryan Hanna, Yangyang Xu & David G. Victor



Government support for wind farms, such as this one in Texas, could help to create thousands of green jobs after the pandemic. Credit: Brandon Thibodeaux/NYT/Redux/eyeview

The most precipitous contraction of the global economy in a century has seen carbon emissions plummet. By the end of this year, emissions are likely to be 8% less than in 2019¹ – the largest annual percentage drop since the Second World War (see go.nature.com/3gej8th).

To avert a global recession, governments are injecting trillions of dollars into stimulating their economies. The International Monetary Fund anticipates

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Model and manage the changing geopolitics of energy

Transitioning to a low-carbon world will create new rivalries, winners and losers, argue Andreas Goldthau, Kirsten Westphal and colleagues.

Morgan Bazilian, Michael Bradshaw, Andreas Goldthau & Kirsten Westphal



Solar panels decorate the desert in Dubai. Credit: Ashraf Mohammad Mohammad Alamra/Reuters

Energy is at the root of many political ructions. President Donald Trump's intention to pull the United States out of the Paris climate agreement in 2020, the European Union's restrictive policies against importing Chinese photovoltaic cells and the political hostility towards the school strikes over climate change in Germany are all attempts to shift the global

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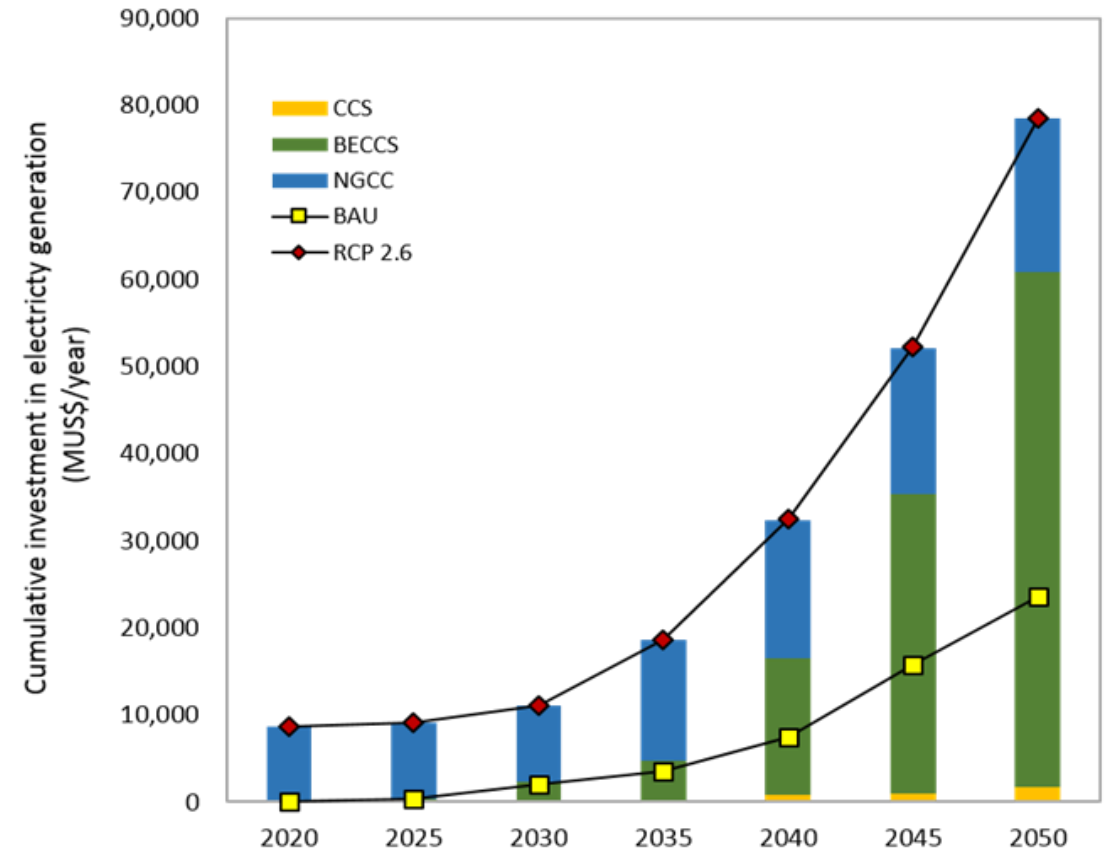
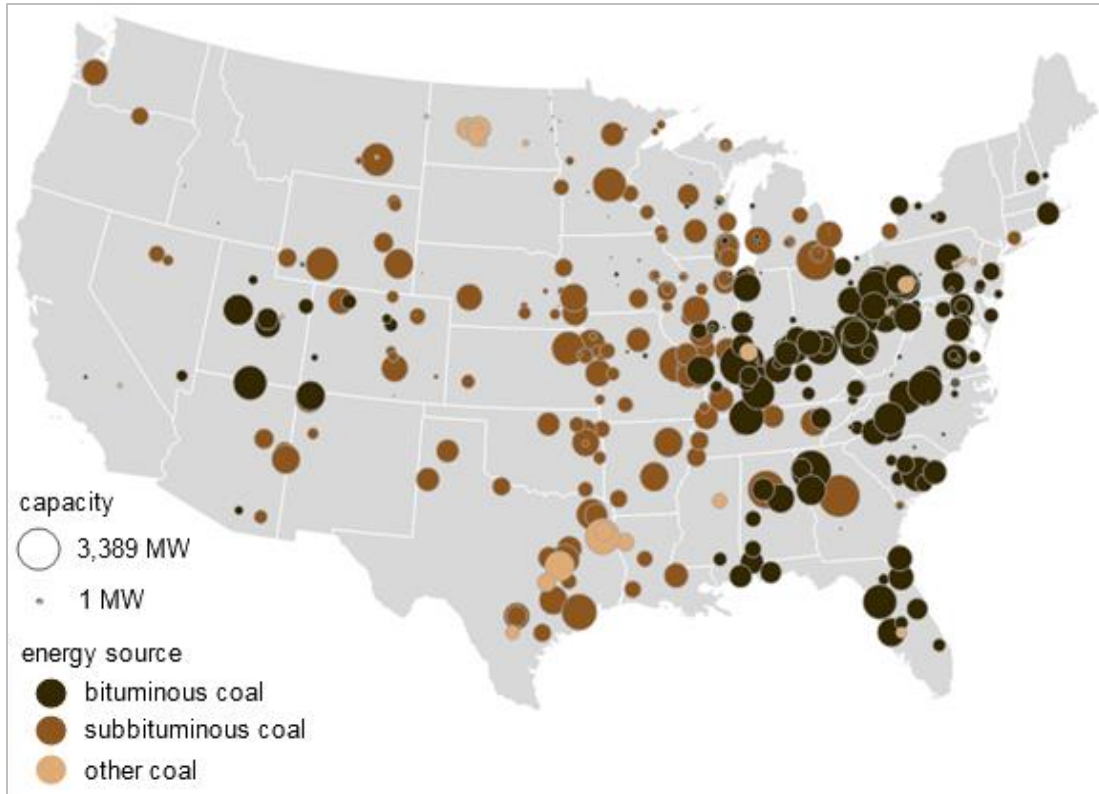


Global warming will happen faster than we think



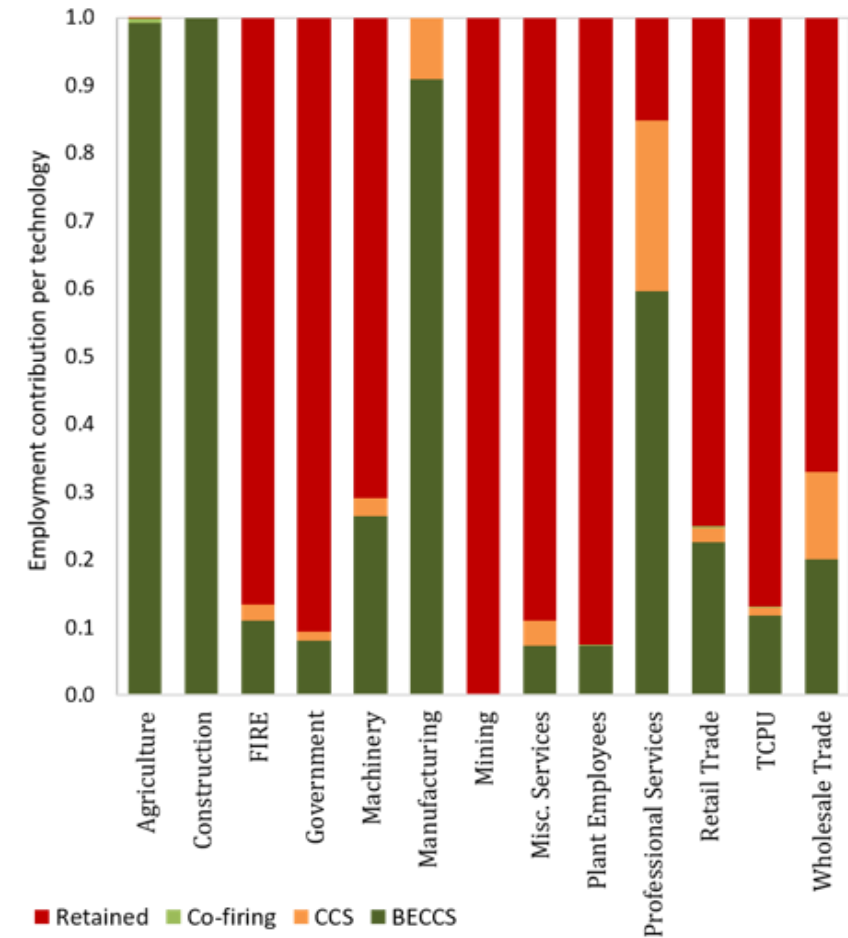
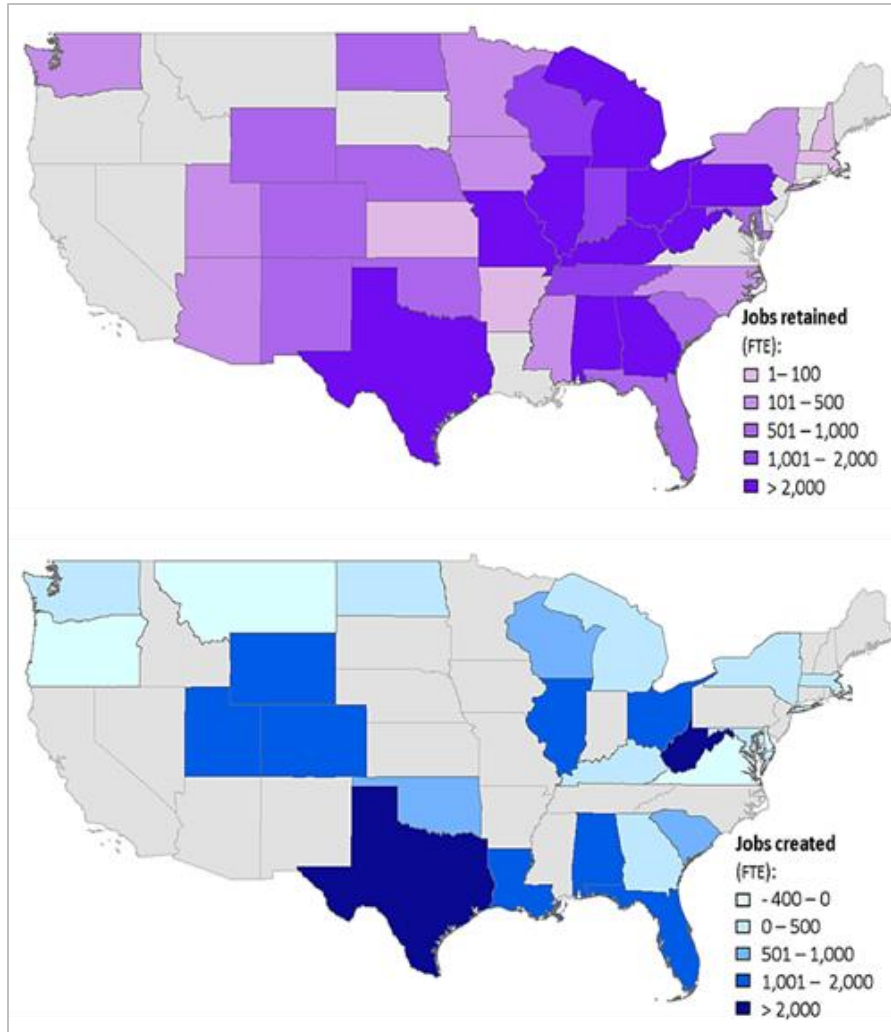
Reducing the US coal emissions is costly...

Distribution of US coal plants. Source: IEA, 2018

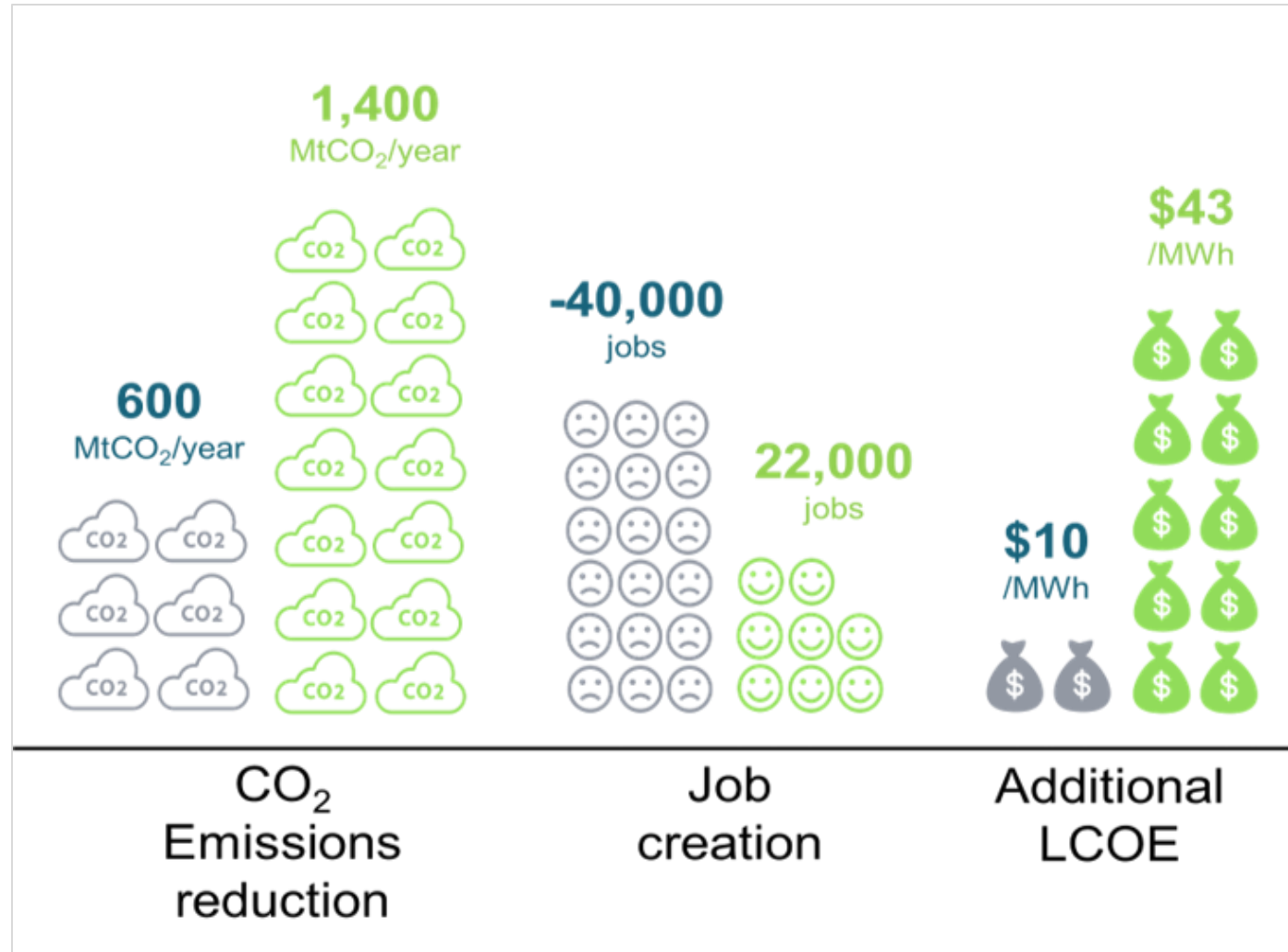


The rapid ramp-up of BECCS from 2030 doubles the cost of electricity in 2050: from an average value of 36.7 US\$/MWh to 80 US\$/MWh.
The 2-degree target costs 76,700 MUS\$ to the coal sector.

...and will bring uneven regional economic opportunities

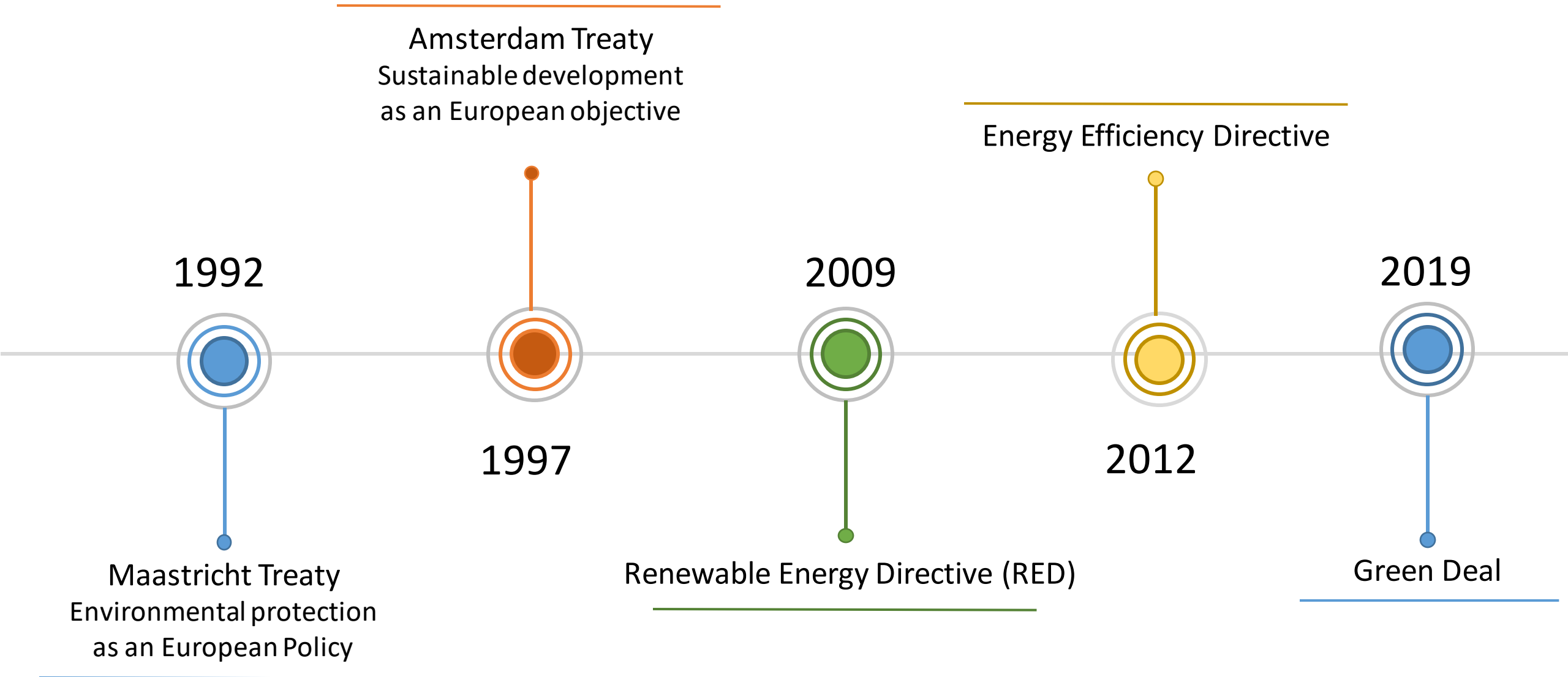


Reducing US coal emissions can boost employment

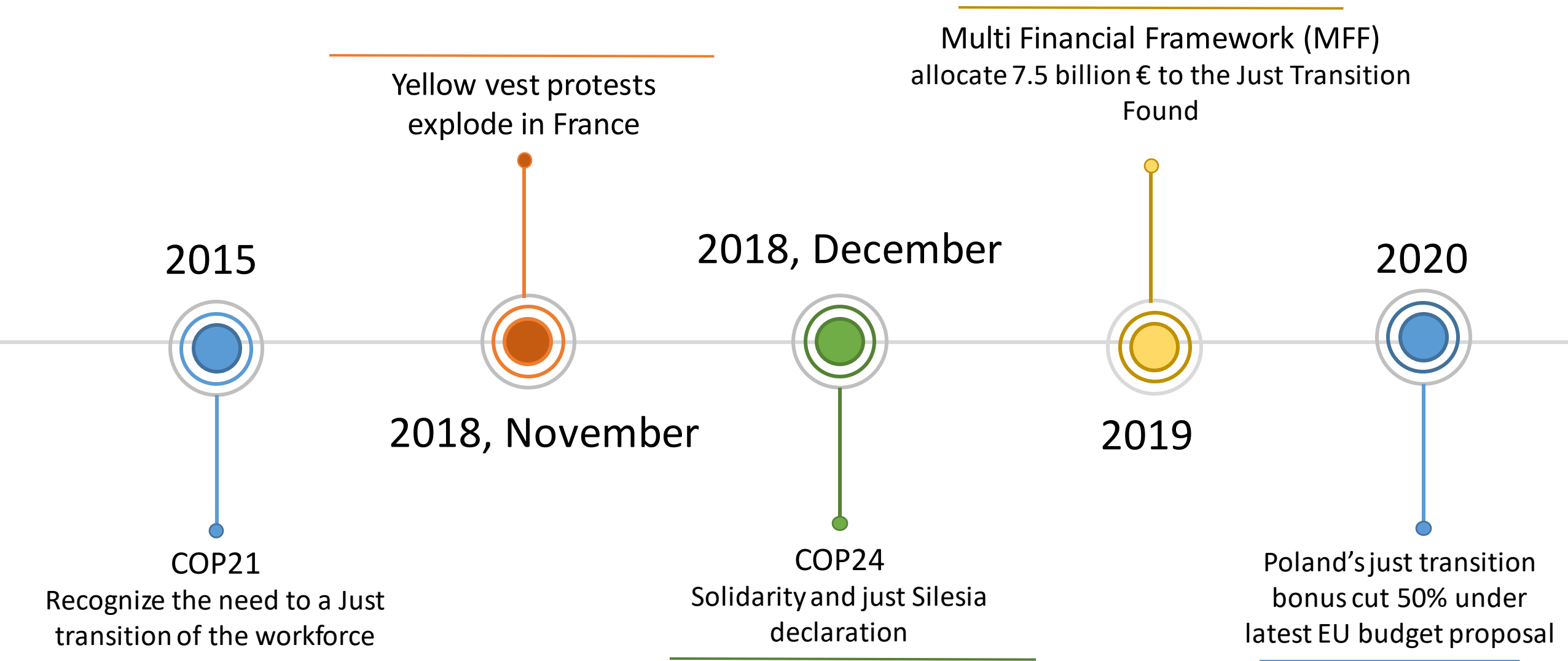


Socially equitable energy transition

A brief history of environmental protection...

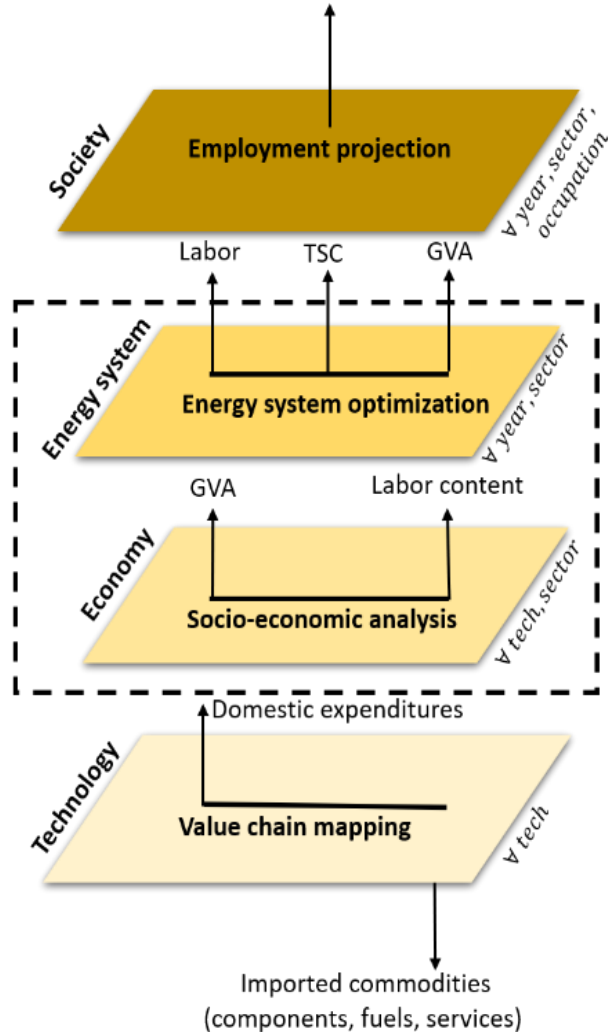


... and the Just transition narrative



ESO - JEDI framework

Socio-economic impacts of energy transition



ESO model

Technology portfolio:

- Fossils (coal, NGCC)
- Renewables (Solar, Hydro, Wind)
- Bioenergy
- Nuclear
- Fossils w CCS
- BECCS

Objective function:

- Cost minimization
- Social value maximization: $\text{Min}(\text{TSC} - \text{GVA})$

Optimization framework:

- Perfect foresight
- Endogenous tech learning
- Timeframe: 2015-2050

ESO - JEDI

- CAPEX
- OPEX
- Capacity factor
- Installed capacity
- Discount rate

$\forall \text{ tech} \in \{\text{NGCC}, \text{NGCC w CCS}\}$

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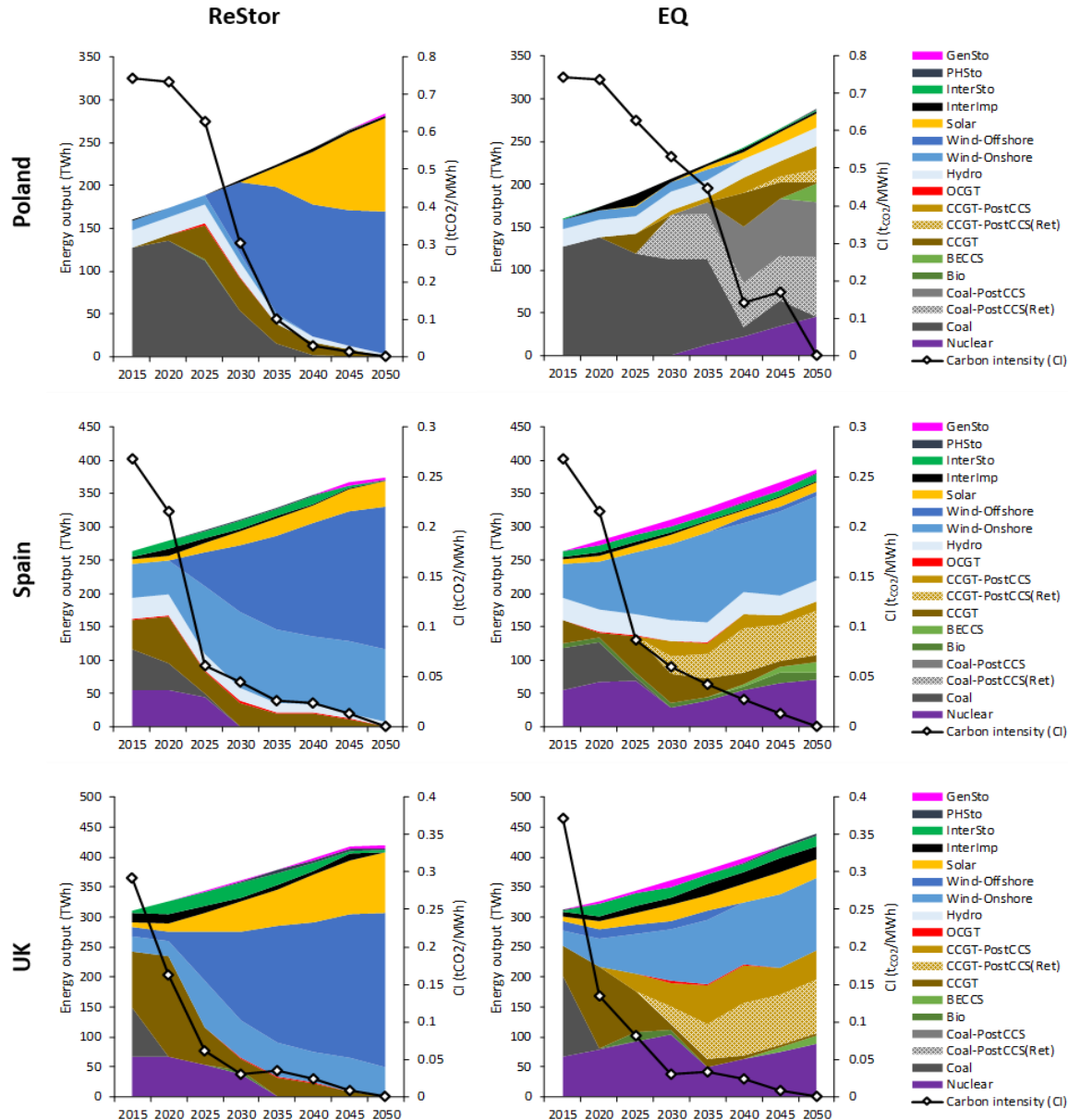
$\forall \text{ sector} \in \{\text{mining, construction}\}$

- Gross Value added (GVA)
- Labour Earnings
- Jobs created



Electricity Systems
Optimisation Framework

Creating value with the transition



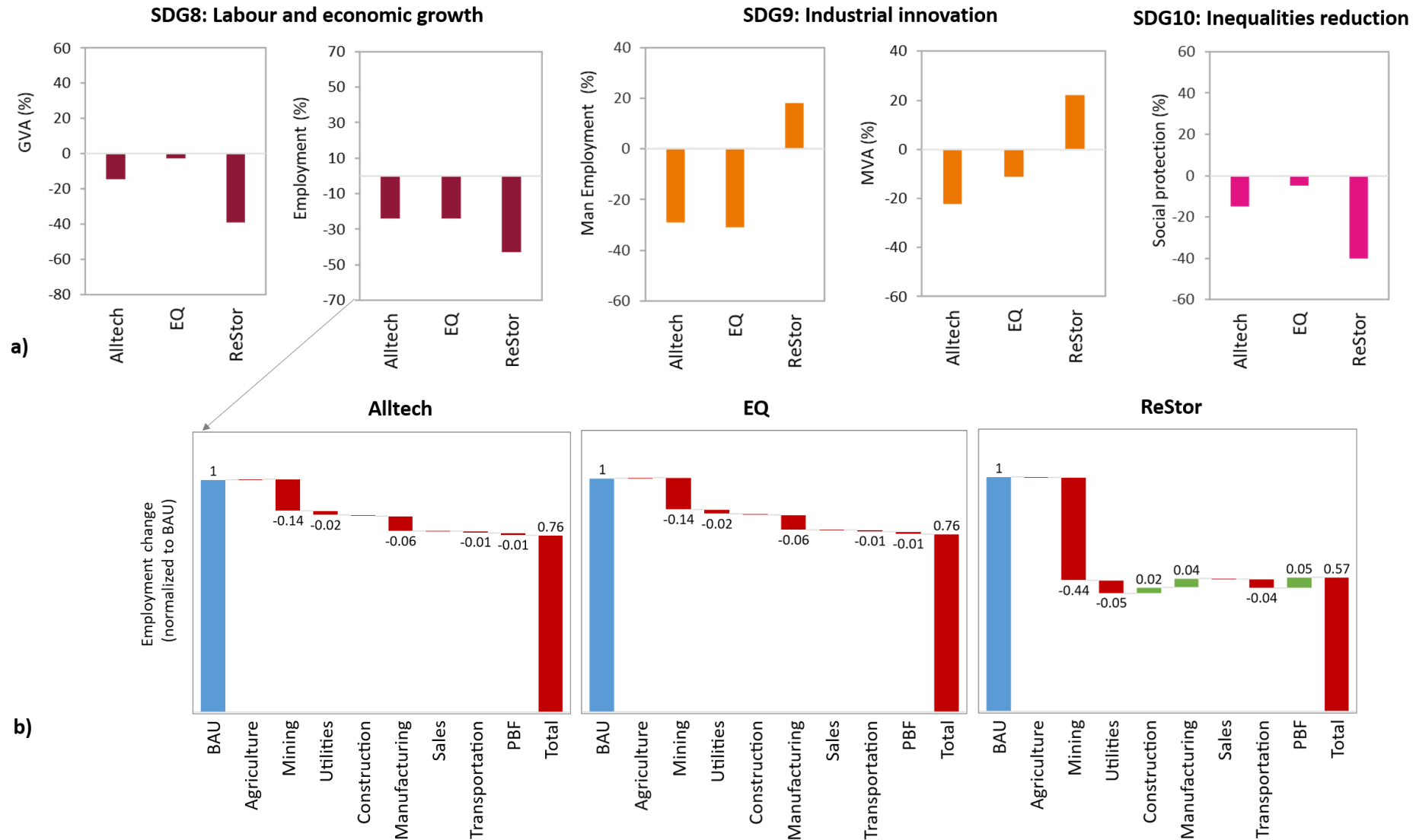
The equity scenario favours a **more diverse** energy generation mix within each country with shares of local resources varying according to the services provided to the system.

Poland: domestic abated coal supply more than 50% of the power output.

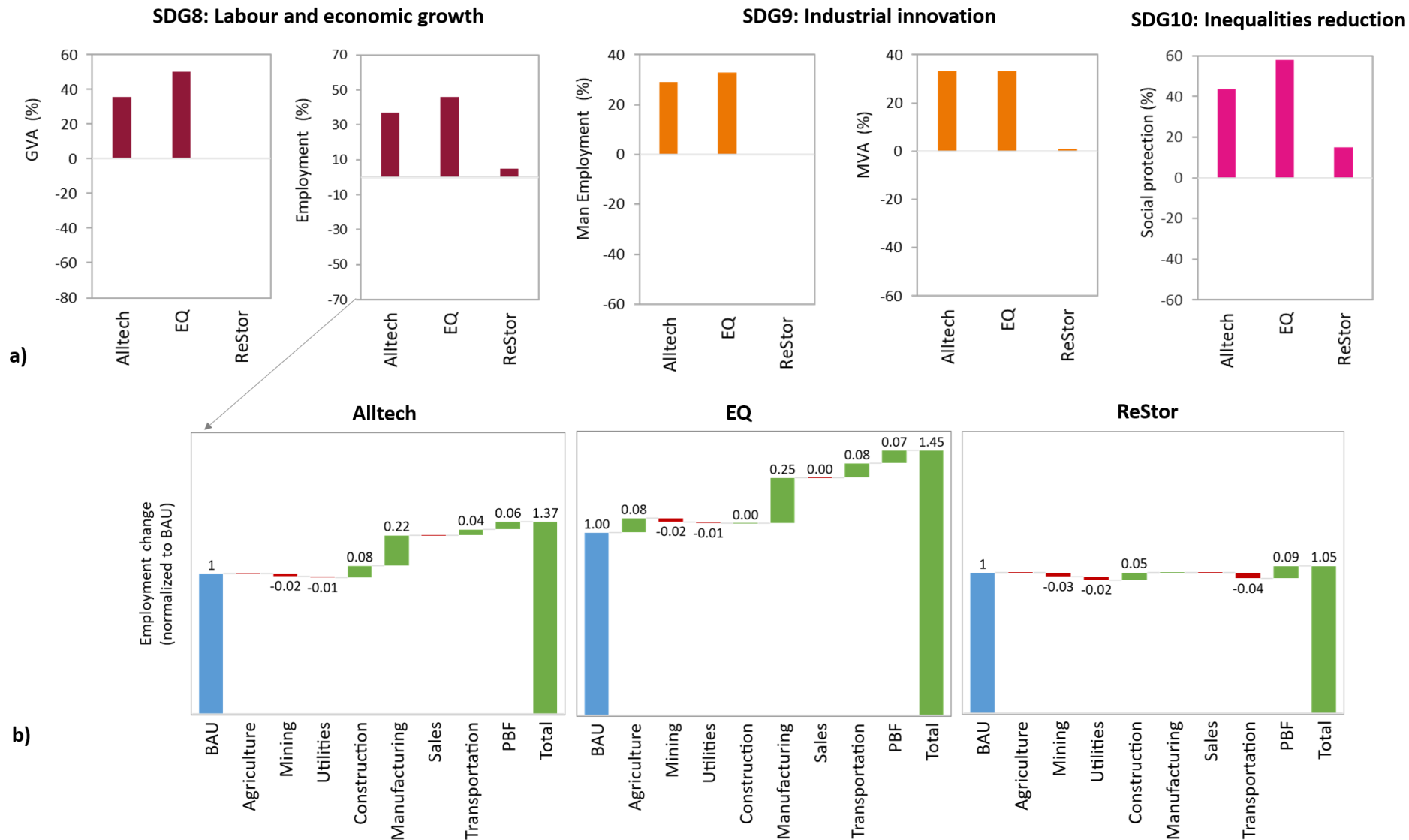
Spain: nuclear provides more than 70 MWh of power output in 2050 to minimize the use of imported natural gas

The UK: can utilize its CCGT-CCS capacity to provide low-carbon firm capacity to the system while boosting its manufacture and mining sectors.

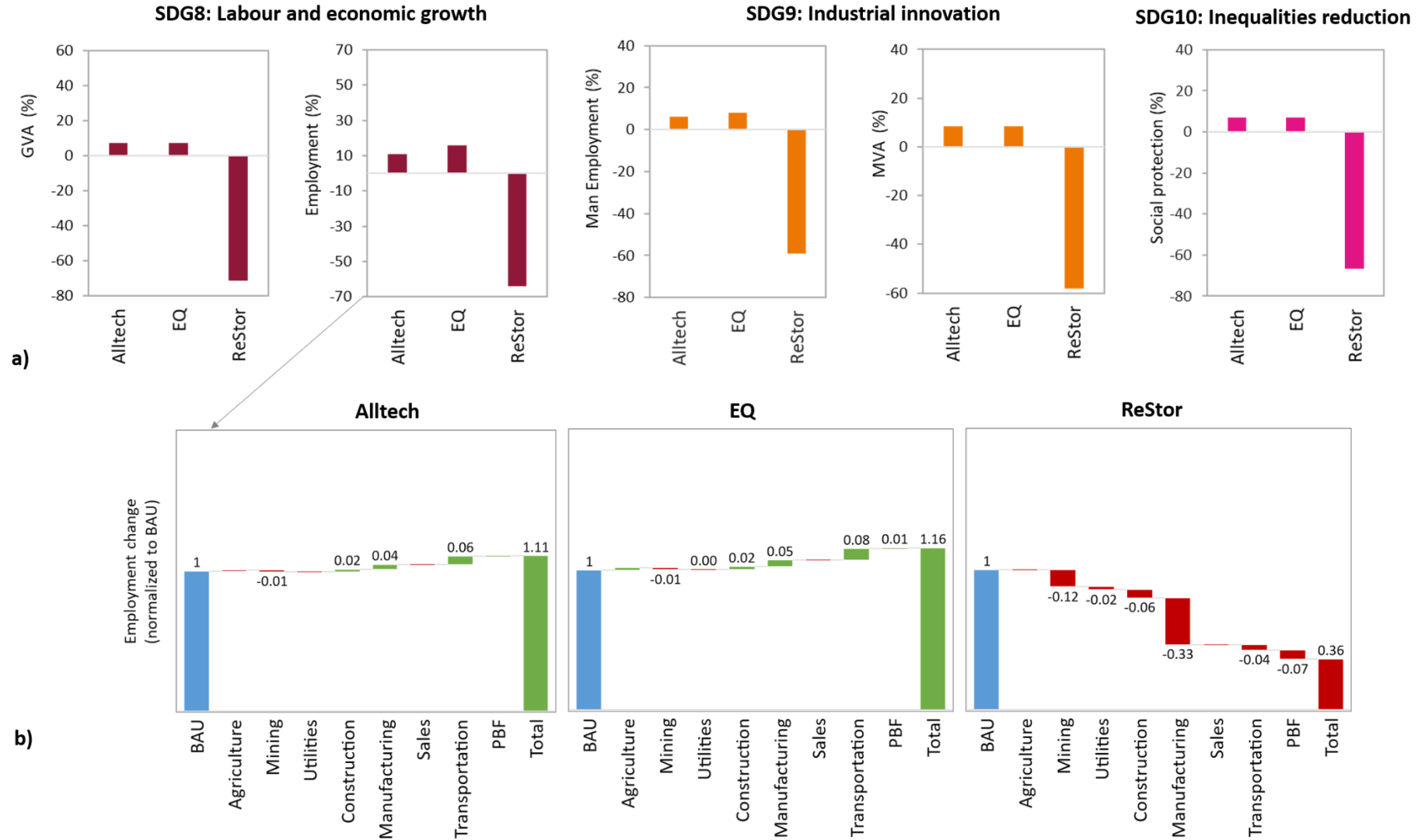
Trade-offs with SDGs goals: Poland



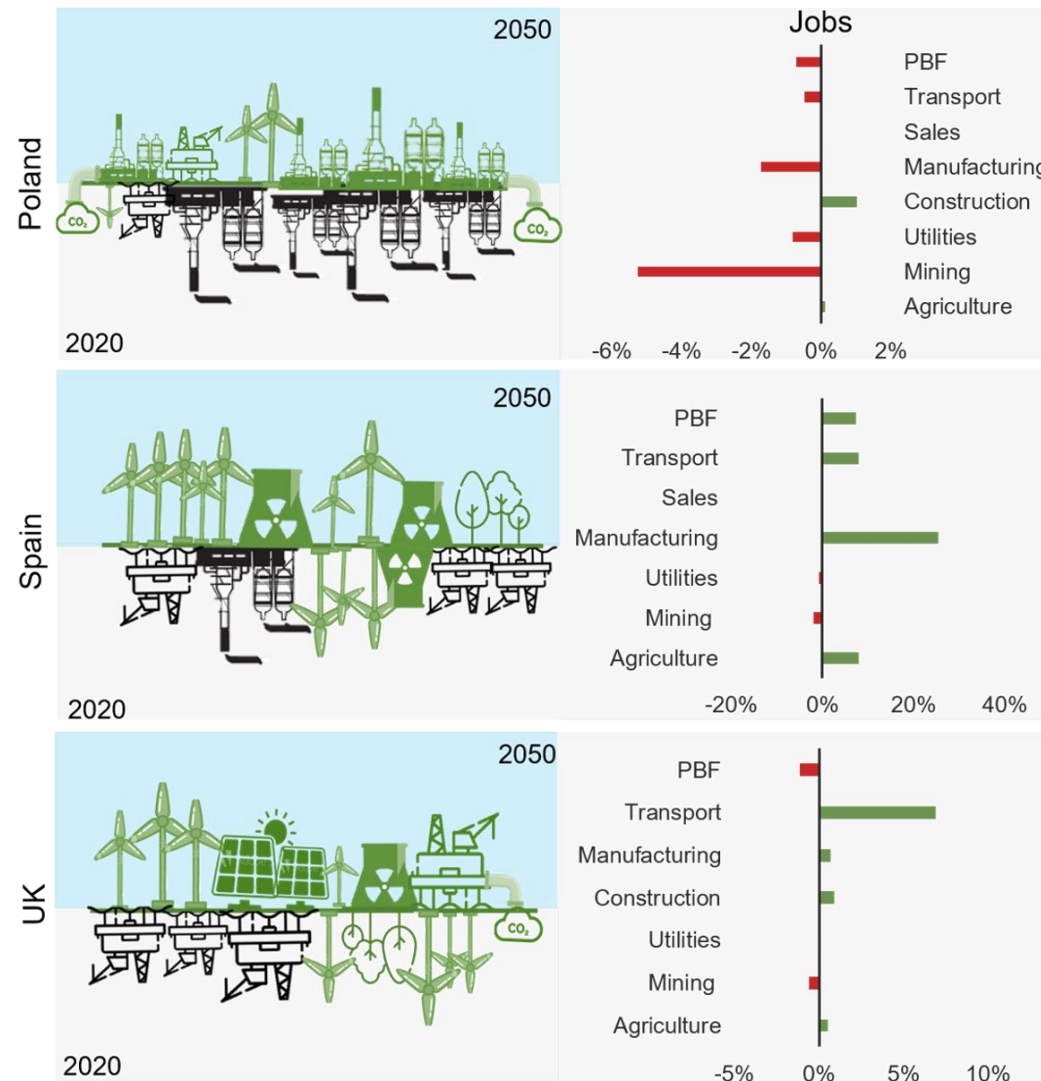
Trade-offs with SDGS goals: Spain



Trade-offs with SDGs goals: the UK



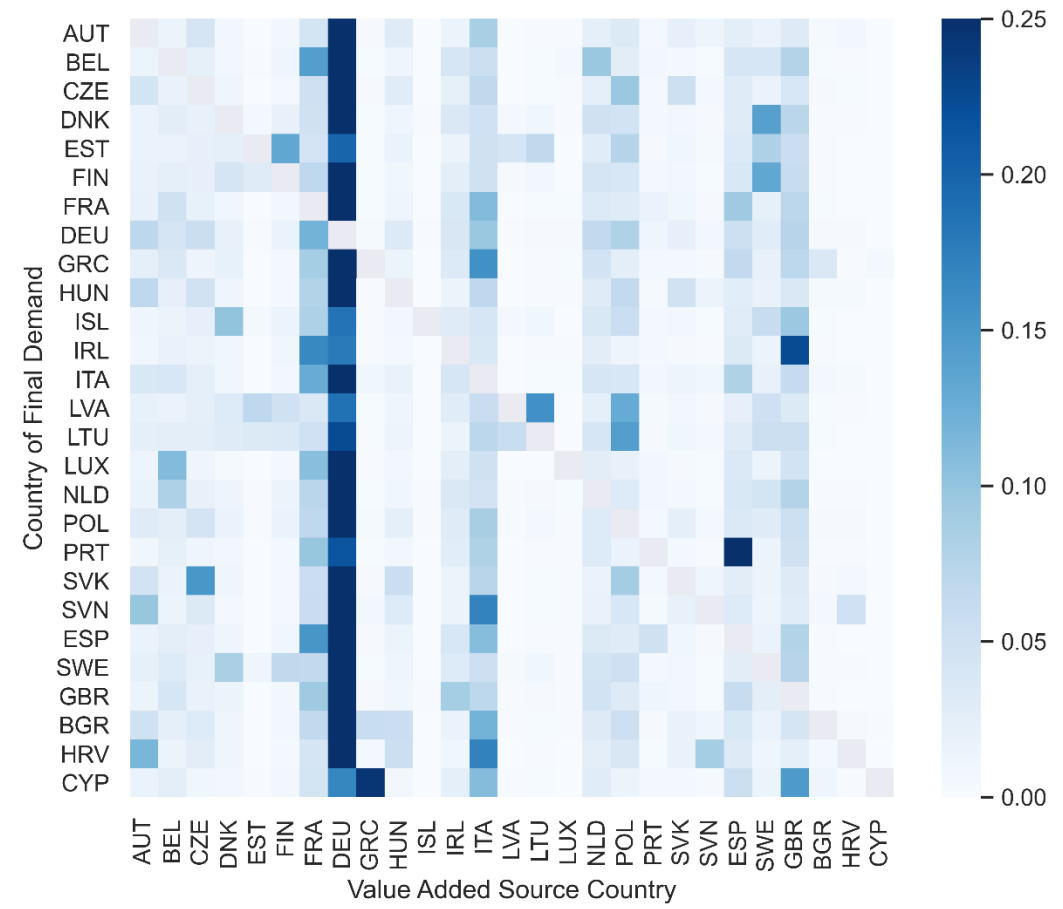
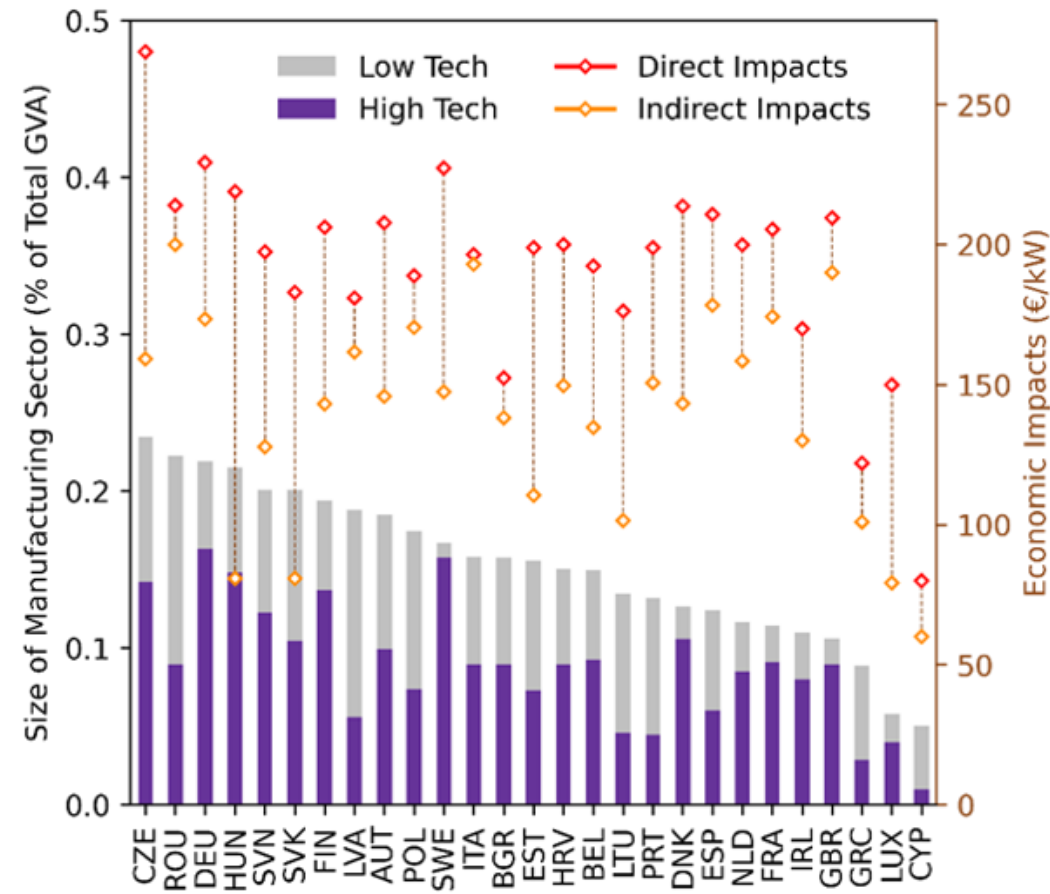
Socially equitable energy systems transition



Levelling up regional inequalities *via* low-carbon investments

- Green policies aiming at decarbonizing the energy system may well exacerbate economic inequalities. These effects are seldomly recognised in spatially aggregated, top-down and techno-economic decarbonization strategies.
- We present a spatial economic framework that quantifies the socio-economic benefits of low carbon investments while accounting for region-specific factors, such as the industrial specialization of regions, their relative size, and their economic interdependencies.
- We conduct a thought experiment which uses low carbon hydrogen as an archetypal investment for decarbonizing the energy intensive industries in Europe and in the UK and demonstrate that interregional economic interdependencies drive the indirect effects of low carbon investment.

The uneven economic impacts of hydrogen investments



Some conclusions

- Green policies aiming at decarbonizing the energy system may well exacerbate economic inequalities. These effects are seldomly recognised in spatially aggregated, top-down and techno-economic decarbonization strategies.
- We present a spatial economic framework that quantifies the socio-economic benefits of low carbon investments while accounting for region-specific factors, such as the industrial specialization of regions, their relative size, and their economic interdependencies.
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Some conclusions

- Green policies are likely to create winners and losers, with local factors dictating the relative size of economic benefits generated by low carbon investments.
- Value chain mapping identifying strengths and connection between sectors and places is key
- This can deliver a technically feasible, financially viable, and socially equitable net zero transition

Questions?

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