

Accounting for the Social dimension in planning the transition

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Energy transition and equity



Paris, 2015



Paris, 2018

Energy transition and economic recovery

COMMENT · 02 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



Site workers help assemble a turbine in Michigan. Photo: Credit: Jonathan Sobotnik

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 13%, owing to supply-chain and financing problems. Manufacturers face unpredictable 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, illustrate the geopolitical stakes of the energy transition.

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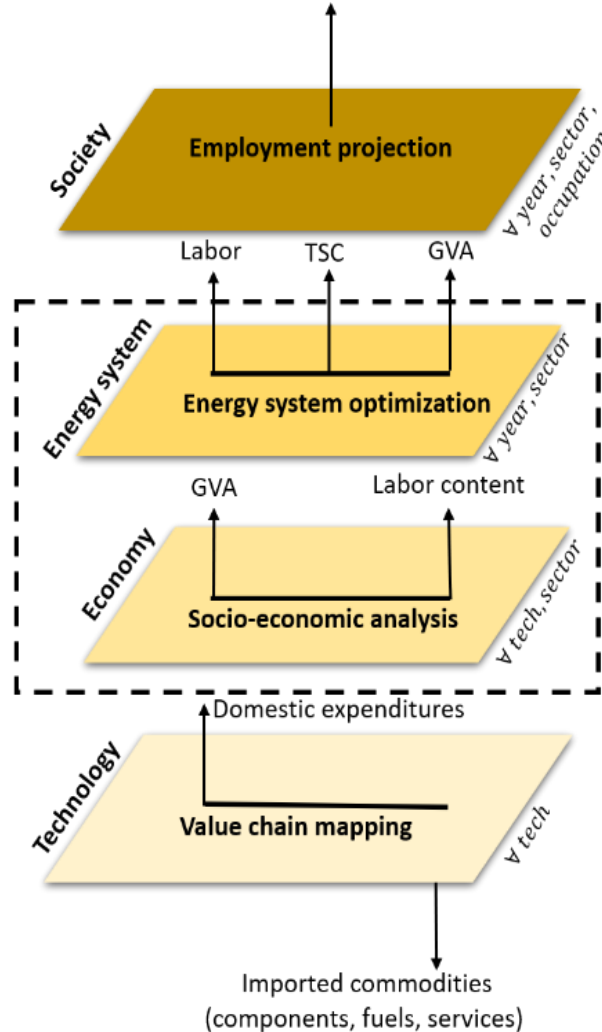
How to win public support for a global carbon tax

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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

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

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

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



Jobs and Economic Development Impact (JEDI)

Socio-economic analysis

Investment analysis

Sector disaggregation

Impact analysis

OECD Database

Socio-economic indicators

- GVA
- Employment rate
- Household income
- Labor share of GVA
- Wages
- I/O tables

Requirements matrix

$$A_{i,j} = \begin{bmatrix} A_{i,i} & A_{i,j} \\ A_{j,i} & A_{j,j} \end{bmatrix}$$

$$L_{i,j} = (I - A_{i,j})^{-1}$$



Sector disaggregation



JEDI model

Direct impact

$$VA_{c,i,t} = Output_{i,t} * \%VA_{c,i}$$

$$Jobs_{c,i} = \sum_t (VA_{c,i,t} * \%Labor_{c,i}) / Wages_{c,i}$$

Indirect impact

$$Ind_VA_{c,i,t} = VA_{c,i,t} * \sum_j L_{i,j}$$

$$Ind_Jobs_{c,i} = Jobs_{c,i} * \sum_j L_{i,j}$$

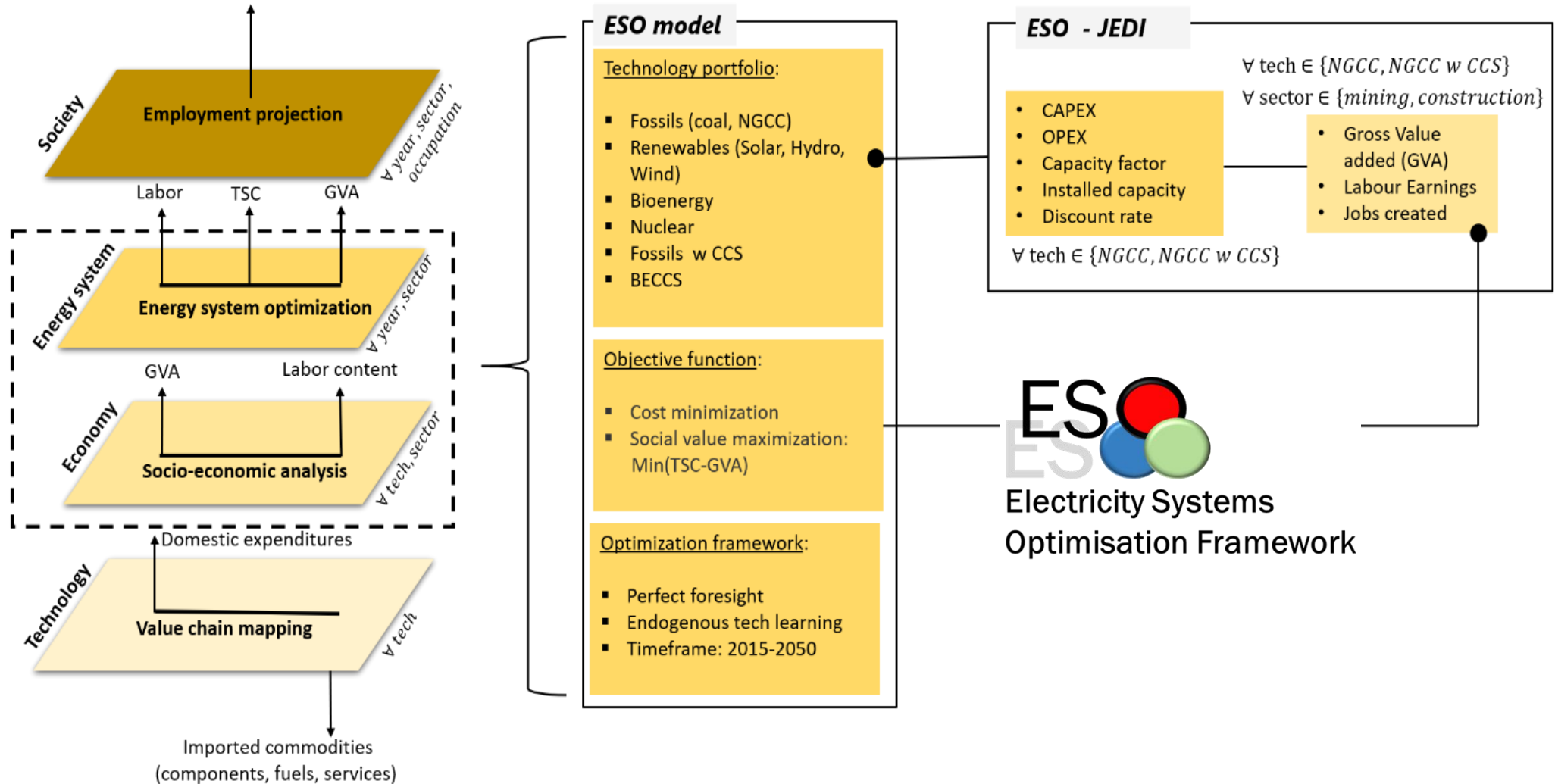


Two illustrative case studies

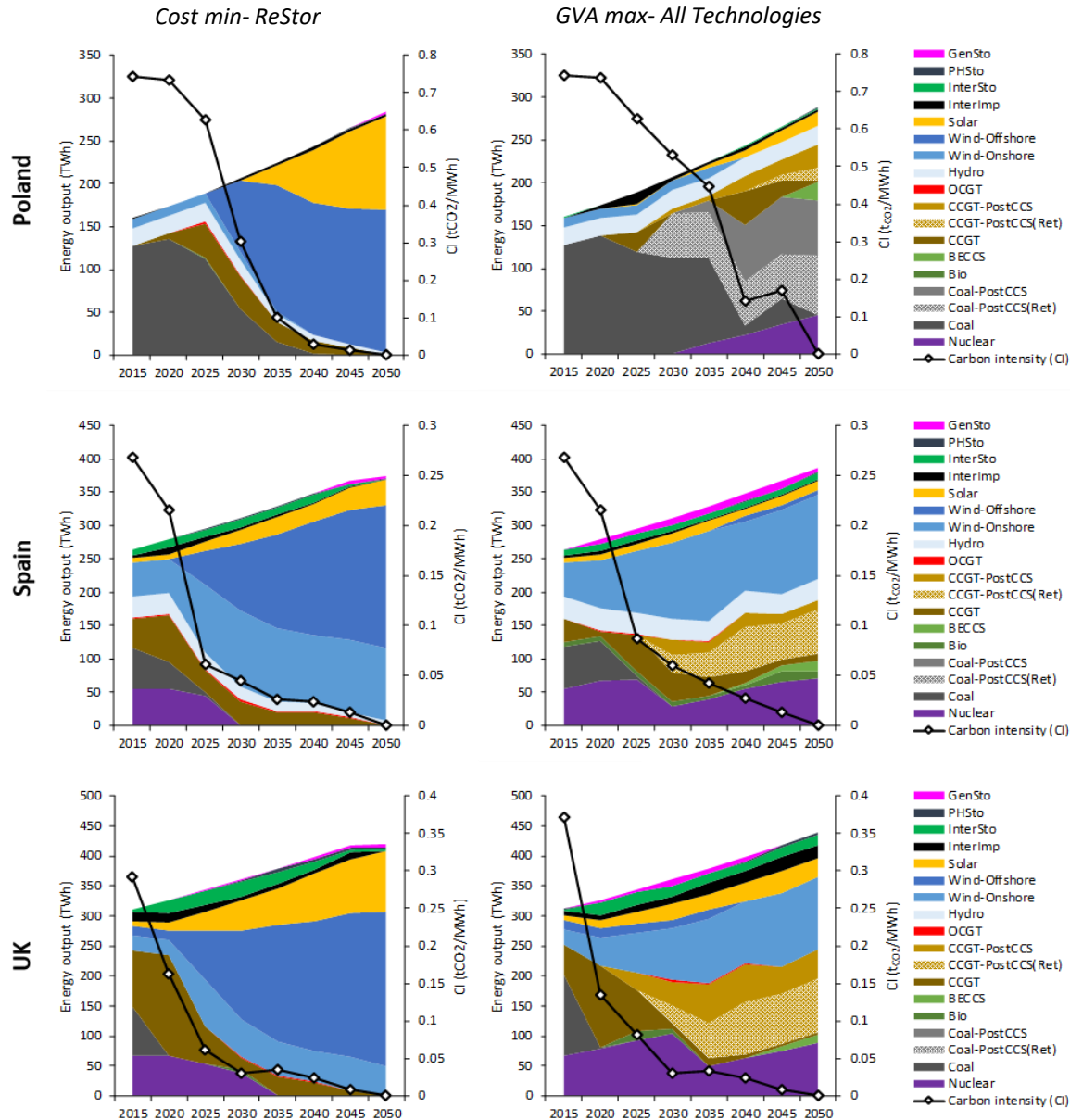
1. Switch from focusing on “least cost” to “value maximising” transitions
2. Directing green-investments to maximize social value

ESO - JEDI framework

Socio-economic impacts of energy transition



Creating value with the transition



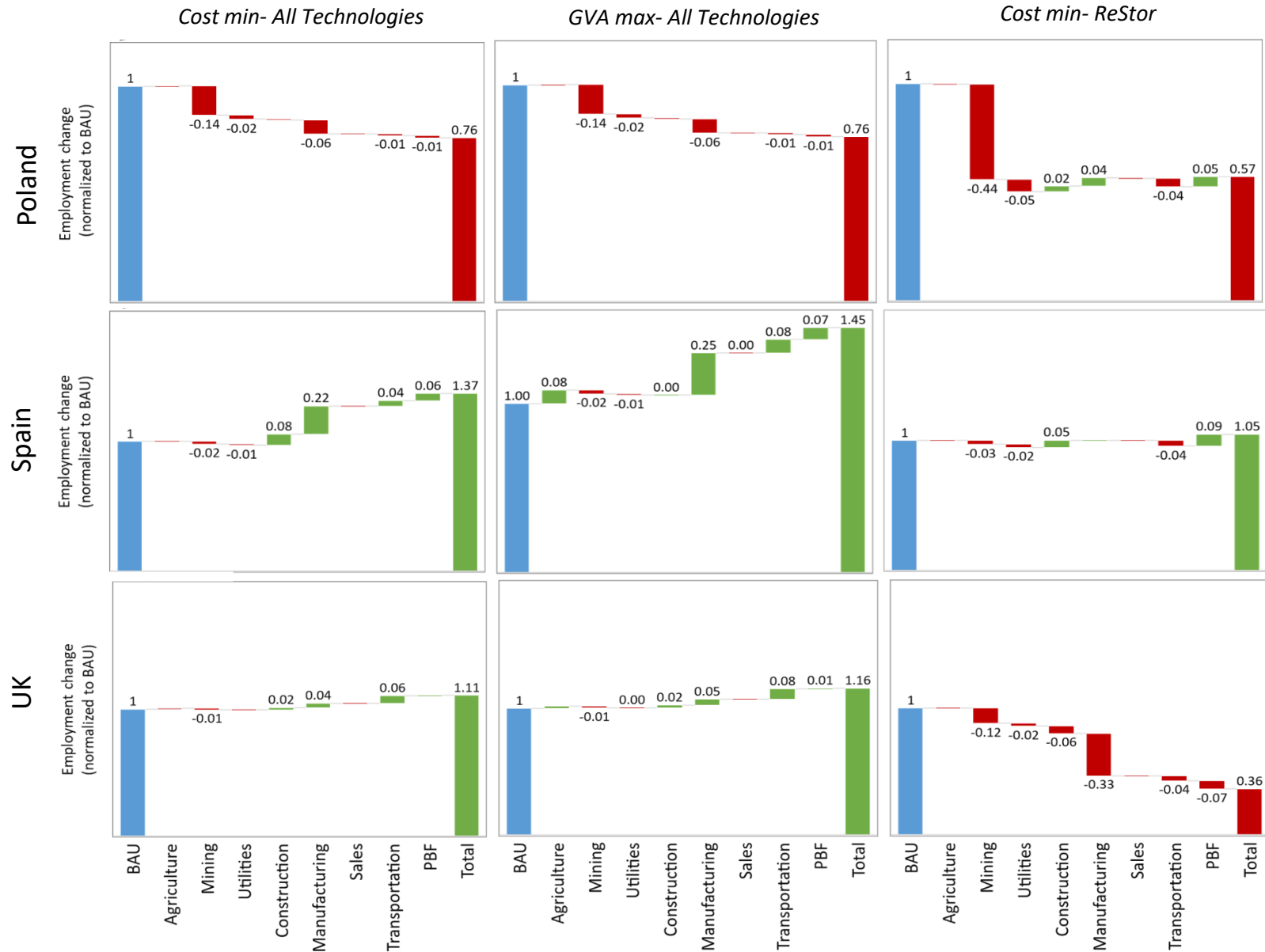
The equity scenario favours a **more diverse** energy generation mix within each country with shares of local resources varying according to the services provided to the system.

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.

Socio-economic impacts of the transition



UK decarbonization challenge

- Regional inequalities and productivity issues are an inherent part of the UK's industrial decarbonisation challenge.
- Cost minimization approaches (in the modelling community) and cost benefit analysis (in policy making) have been widely used to shape carbon mitigation pathways in the energy and industrial sectors.
- By neglecting wider socio-economic impacts of low carbon transitions, both these approaches may intensify regional imbalances.

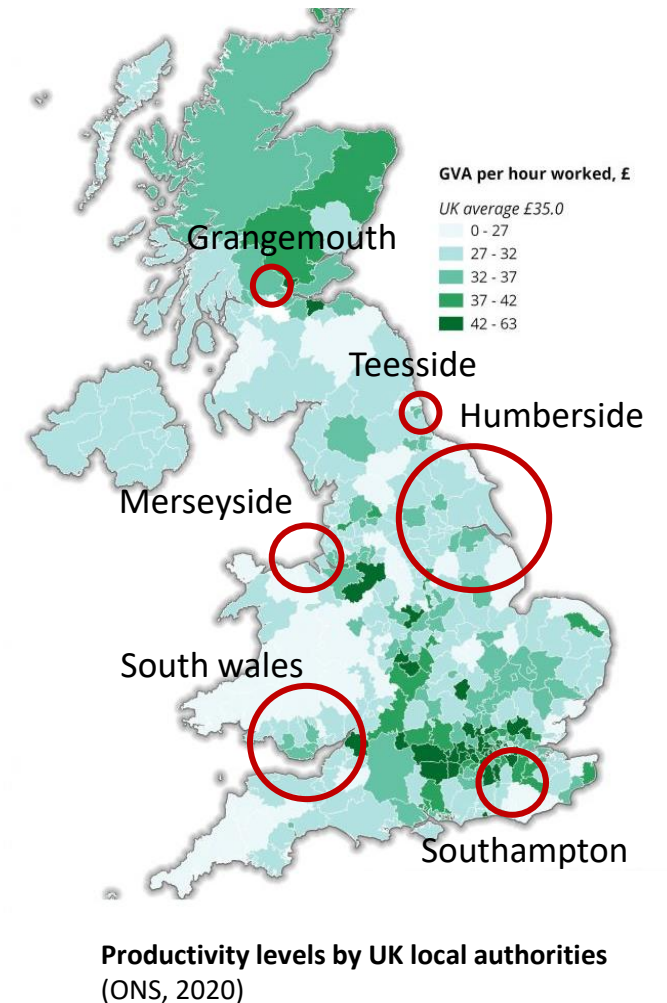
UK decarbonization challenge: Where to start?

The recently announced green investments plan aim at creating high skilled jobs and levelling up the economy

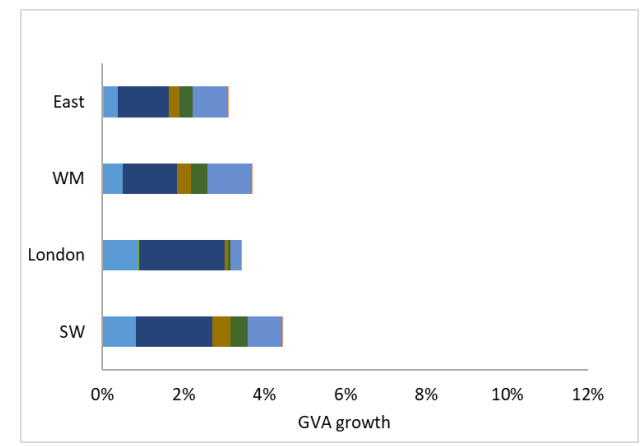
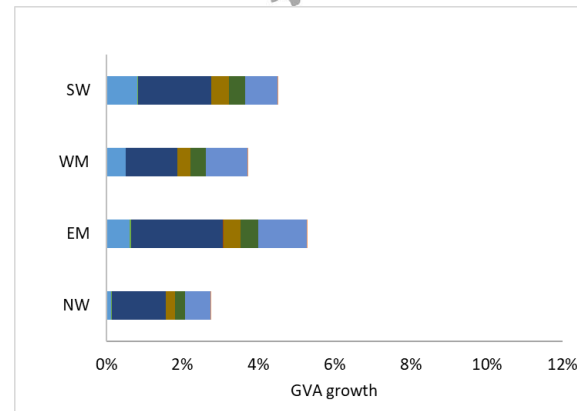
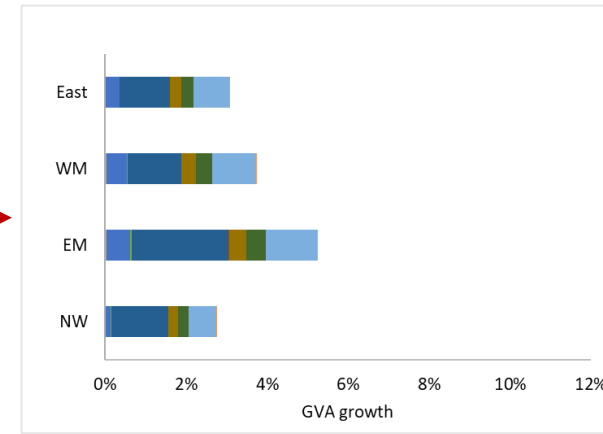
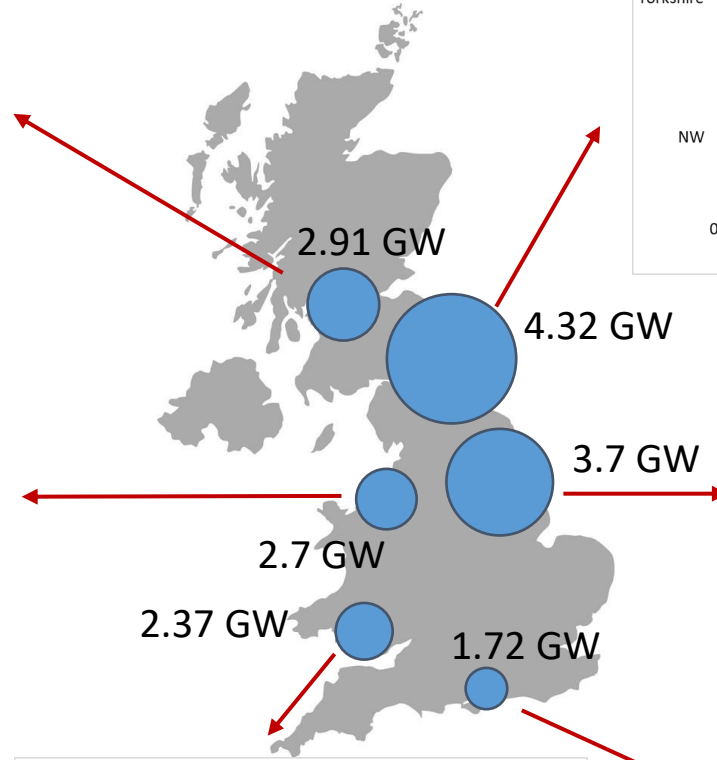
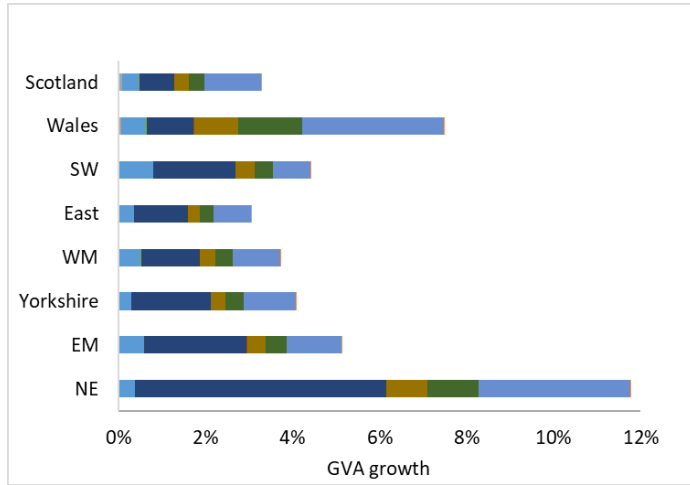
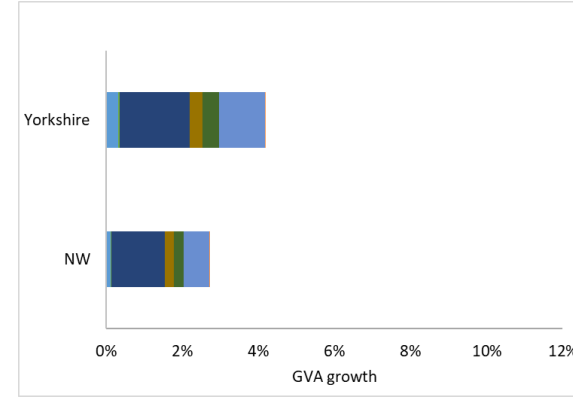
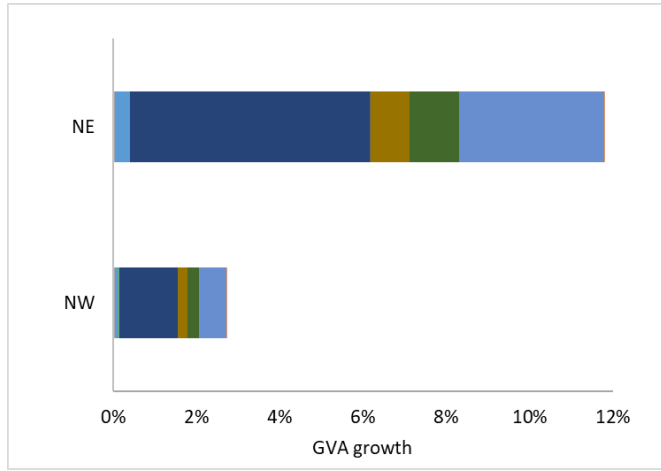
JEDI-Regio, accounts for the spatial layout of UK economy:

- Turnover and GVA of each sector at NUTS1 level
- Regional labour force composition
- Volumes and values of inter-regional trade in goods and service

Socio economic impacts of investing in SMR-H₂ within different industrial clusters that account for regional interdependencies



Ripple effects across the UK economy



- Mining and Extraction
- Utilities
- Chemicals products
- Electrical and machinery
- Maintenance
- Other Manufacturing
- Sales
- Transportation
- ICT
- R&D
- Administrative activities
- Other Industries

Some conclusions

- Copycat energy transition pathways will not work, as countries will follow their own transitions
- Value chain mapping that identify regional 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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