



Welcome

Participatory workshop on transition experiences in coal regions: finding a basis for better targeted exchanges between coal regions

Platform for Coal Regions in Transition

#CoalRegionsEU

Energy



Climate-KIC is supported by the  
EIT, a body of the European Union



ALMA MATER STUDIORUM  
UNIVERSITÀ DI BOLOGNA

# Clustering Regions With Similar Contexts

Matteo Mura

Department of Management, University of Bologna

Brussels | July 15, 2019

## KEY QUESTIONS

- Which are the EU high carbon-intensive regions?
- How to assess industrial sustainability transition?
  - A process that leads to fewer industrial CO2 emissions AND greater wealth

Adapted from: UNEP – International Resource Panel (2017)

## AIMS

- To map EU carbon-intensive hotspots
- Identify groups of regions with similar sustainability transition pathways

➤ **Today's focus on: EU COAL REGIONS**

## 1 - DATASET DEVELOPMENT

- **CO2 Data from Industry** (*EU-Emissions Trading System*)
  - **Socio-Economic Data** (*Eurostat*)
    - ✓ GDP; Population; Digital development; Education; Wealth
- Different levels of analysis: State, Region, Province
- Eurostat NUTS 0-1-2-3 classification

## 1 - DATASET DEVELOPMENT

- **CO2 Data from Industry** (*EU-Emission Trading System*)
- **Socio-Economic Data** (*Eurostat*)
  - ✓ GDP; Population; Digital development; Education; Wealth
- Different levels of analysis: State, Region, Province
  - Eurostat NUTS 0-1-2-3 classification

## 2 – INTERACTIVE WEB-BASED TOOL FOR DATA ANALYSIS AND VISUALISATION

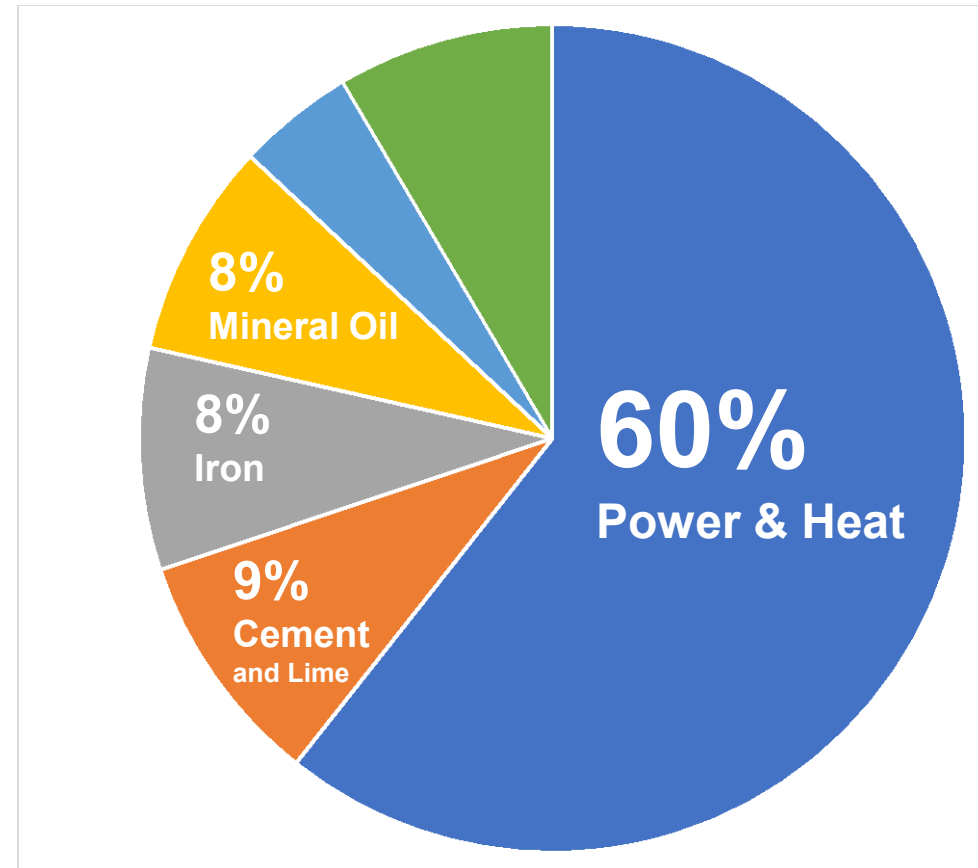


---

# RESULTS

## Industrial Sectors

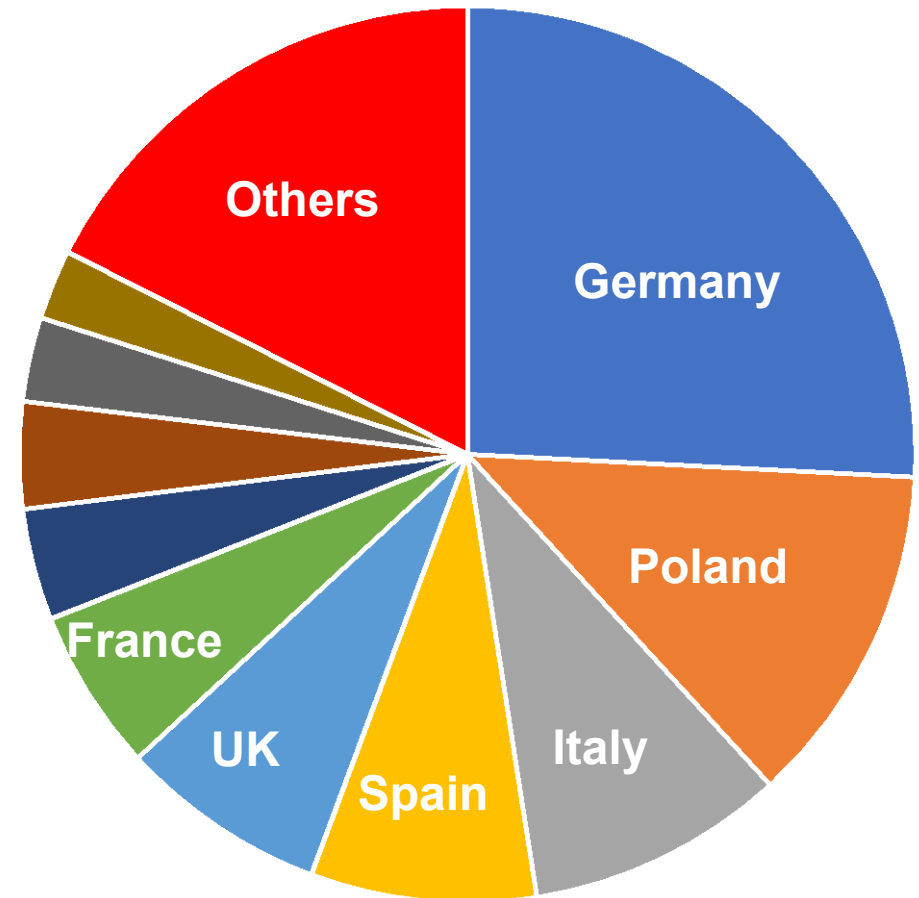
Industry	CO2 (T) 2017	%
Power and heat	924.567.035	60,6%
Cement and Lime	140.406.808	9,2%
Iron and steel	132.036.852	8,7%
Mineral oil	128.226.951	8,4%
Combustion	69.865.052	4,6%
Others	129.330.881	8,5%
<b>Total</b>	<b>1.524.433.579</b>	<b>100,0%</b>



## Countries

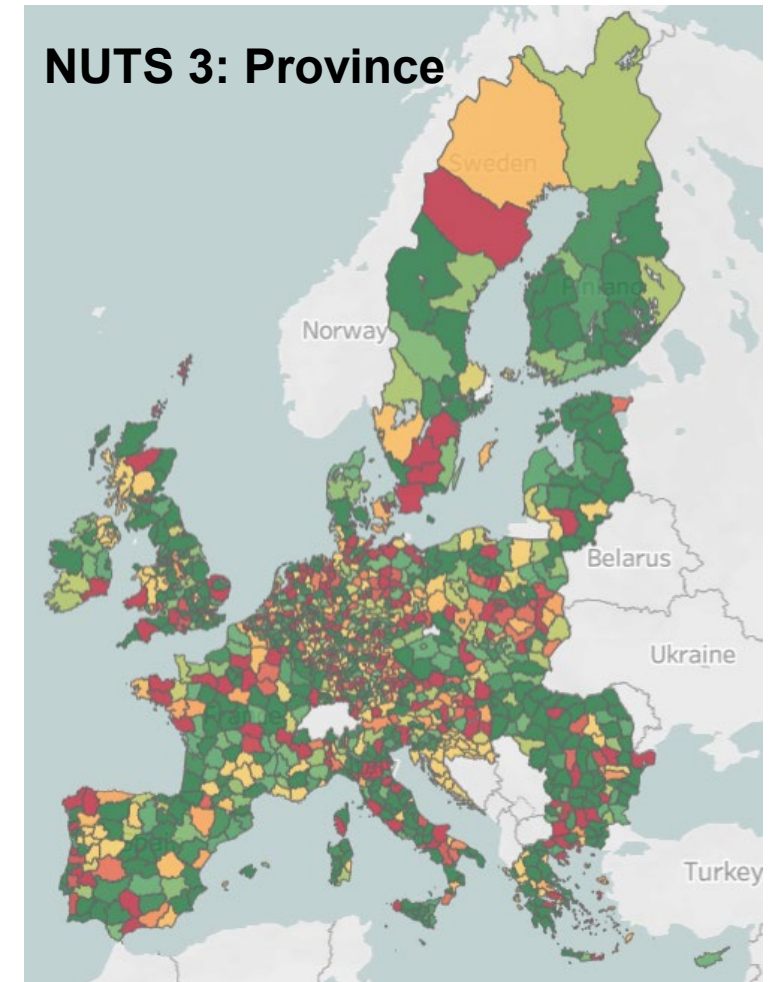
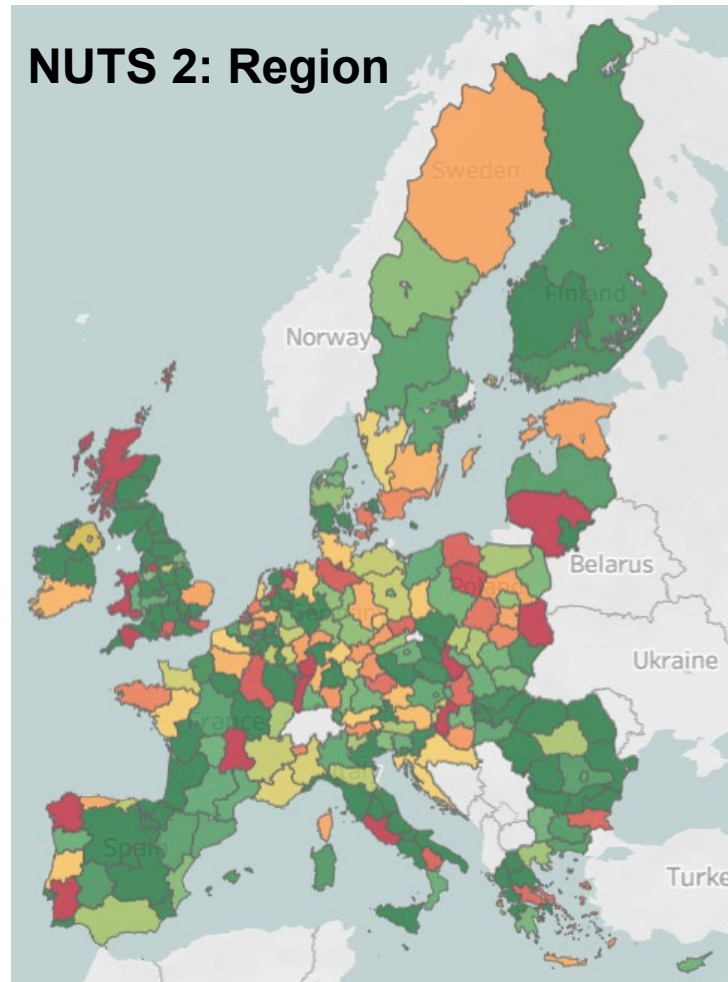
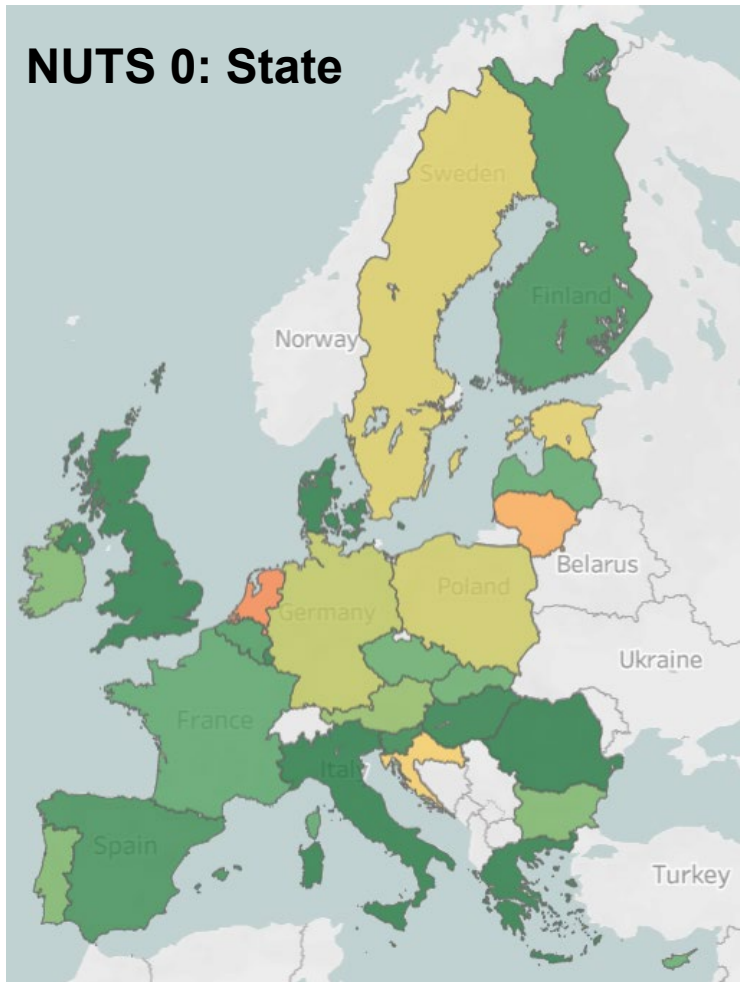
Country	CO2 2017 (T)	%
Germany	393.487.829	25,8%
Poland	188.813.353	12,4%
Italy	142.206.063	9,3%
Spain	124.001.357	8,1%
United Kingdom	114.247.531	7,5%
France	89.365.062	5,9%
Czech Republic	61.370.979	4,0%
Netherlands	58.714.581	3,9%
Greece	46.333.586	3,0%
Romania	38.399.613	2,5%
Others	267.493.625	17,5%
<b>Total</b>	<b>1.524.433.579</b>	<b>100,0%</b>

63%





# CO2 Emissions: %Variation 2008-2016





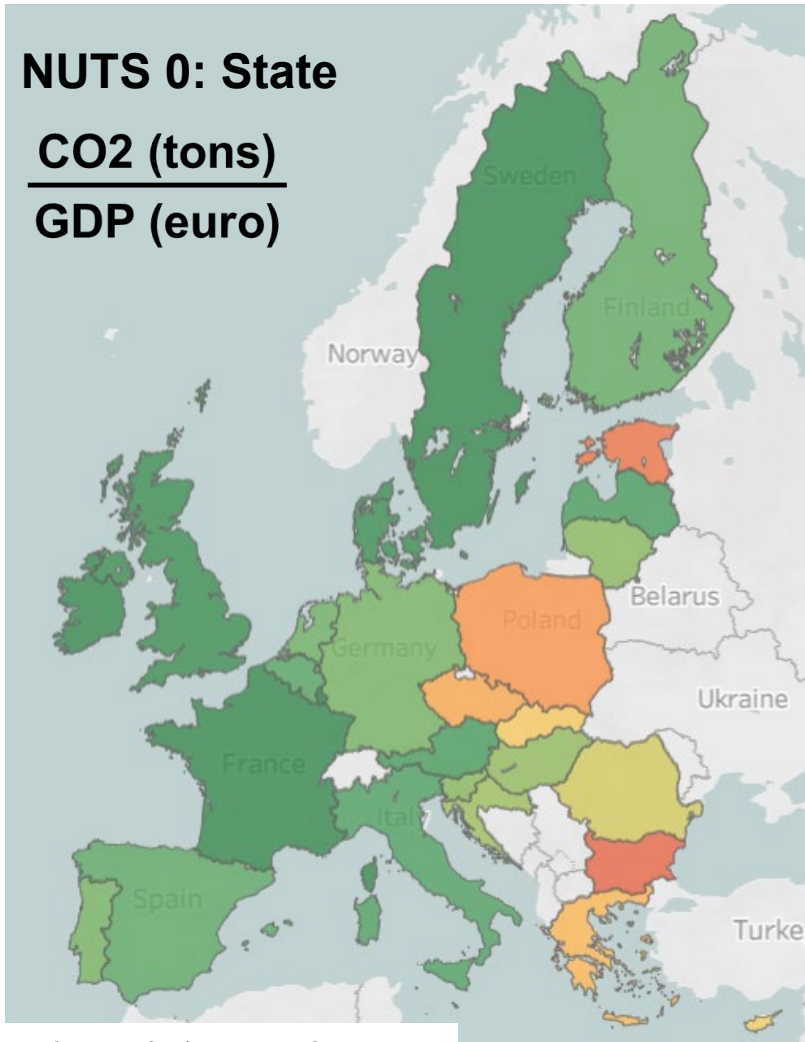
# Carbon Emission Intensity 2016

$$\text{Carbon Emission Intensity} = \frac{\text{CO2 (tons)}}{\text{GDP (euro)}}$$

→ So far this metric has been mostly applied to states

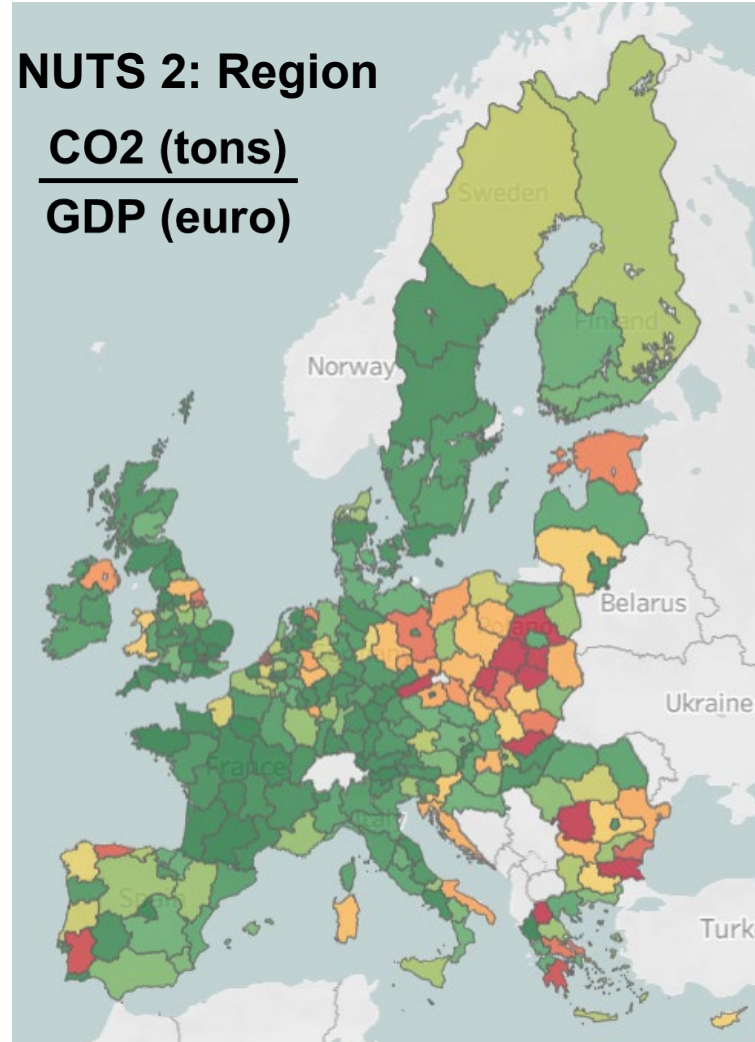
## NUTS 0: State

CO2 (tons)  
GDP (euro)



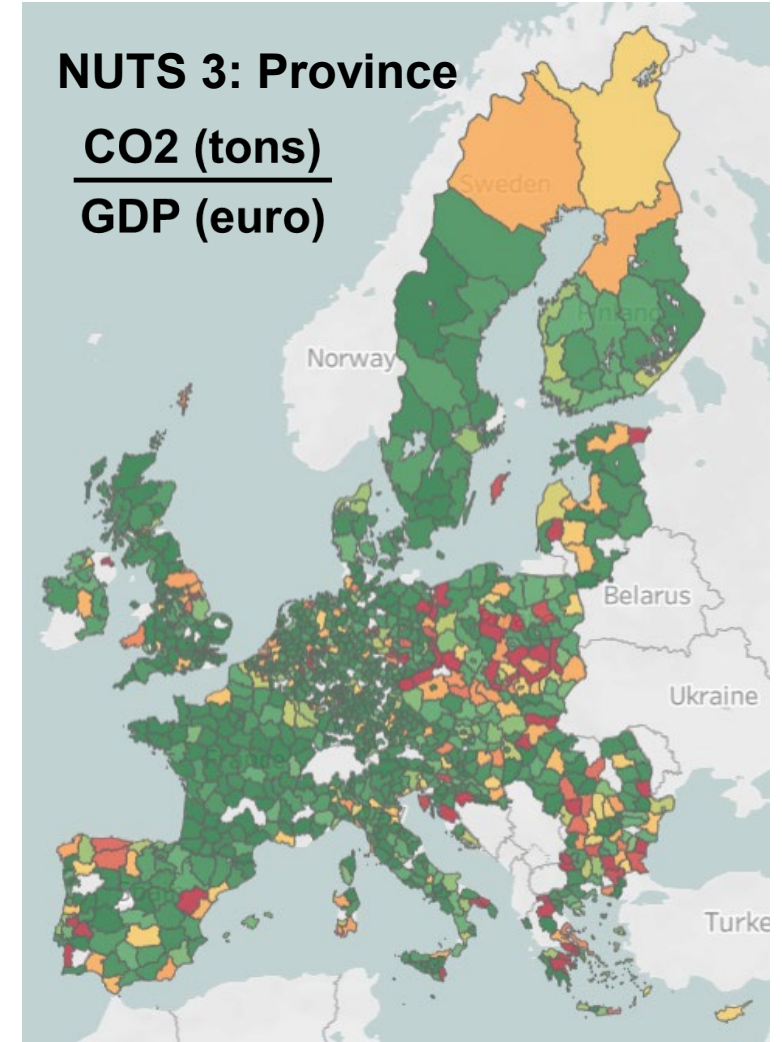
## NUTS 2: Region

CO2 (tons)  
GDP (euro)



## NUTS 3: Province

CO2 (tons)  
GDP (euro)



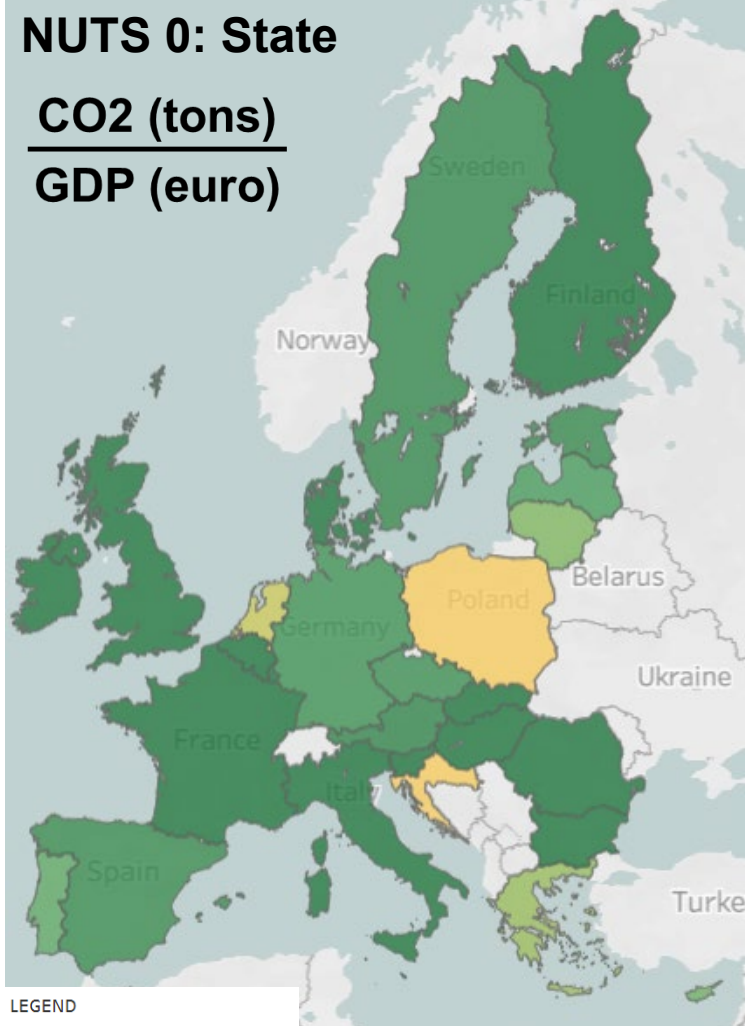
Carbon Emission Intensity



# Carbon Emission Intensity Variation 2008-2016

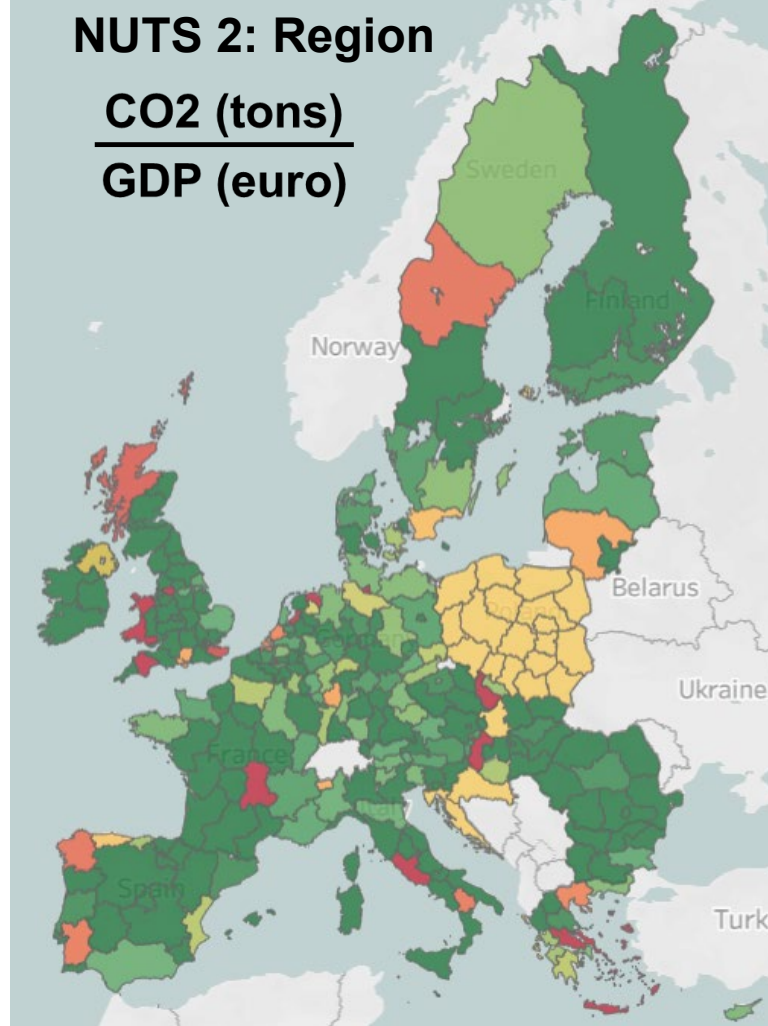
## NUTS 0: State

CO2 (tons)  
GDP (euro)



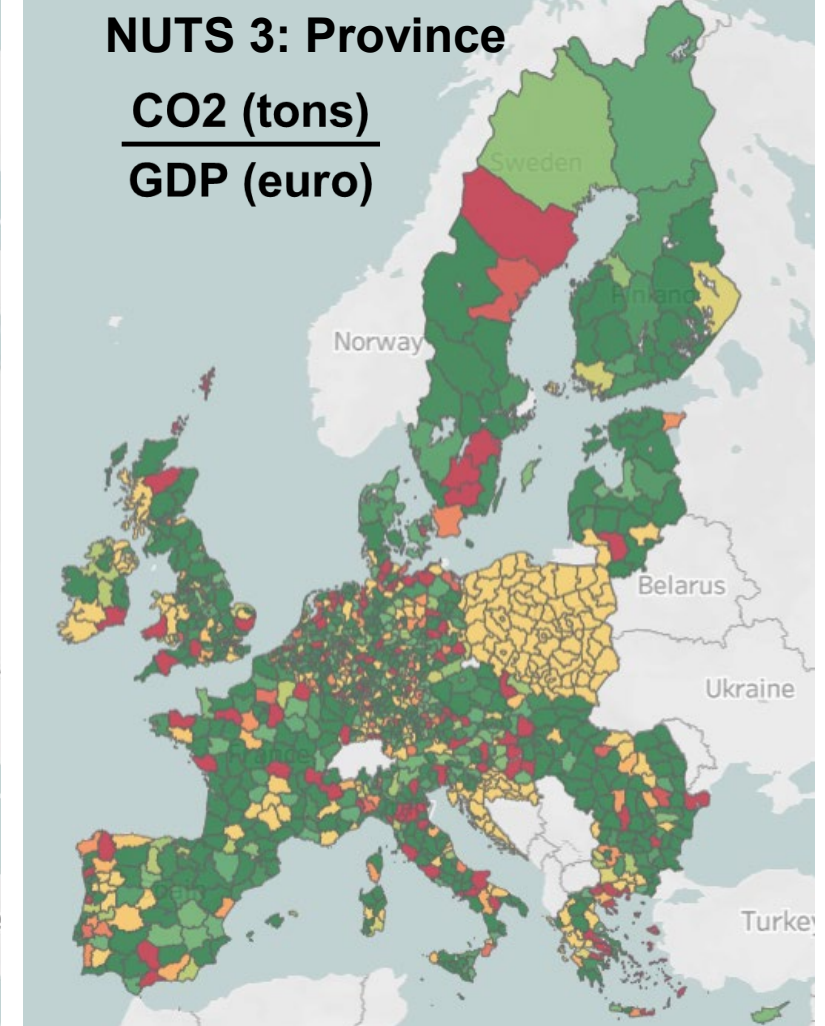
## NUTS 2: Region

CO2 (tons)  
GDP (euro)

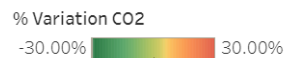


## NUTS 3: Province

CO2 (tons)  
GDP (euro)



LEGEND





---

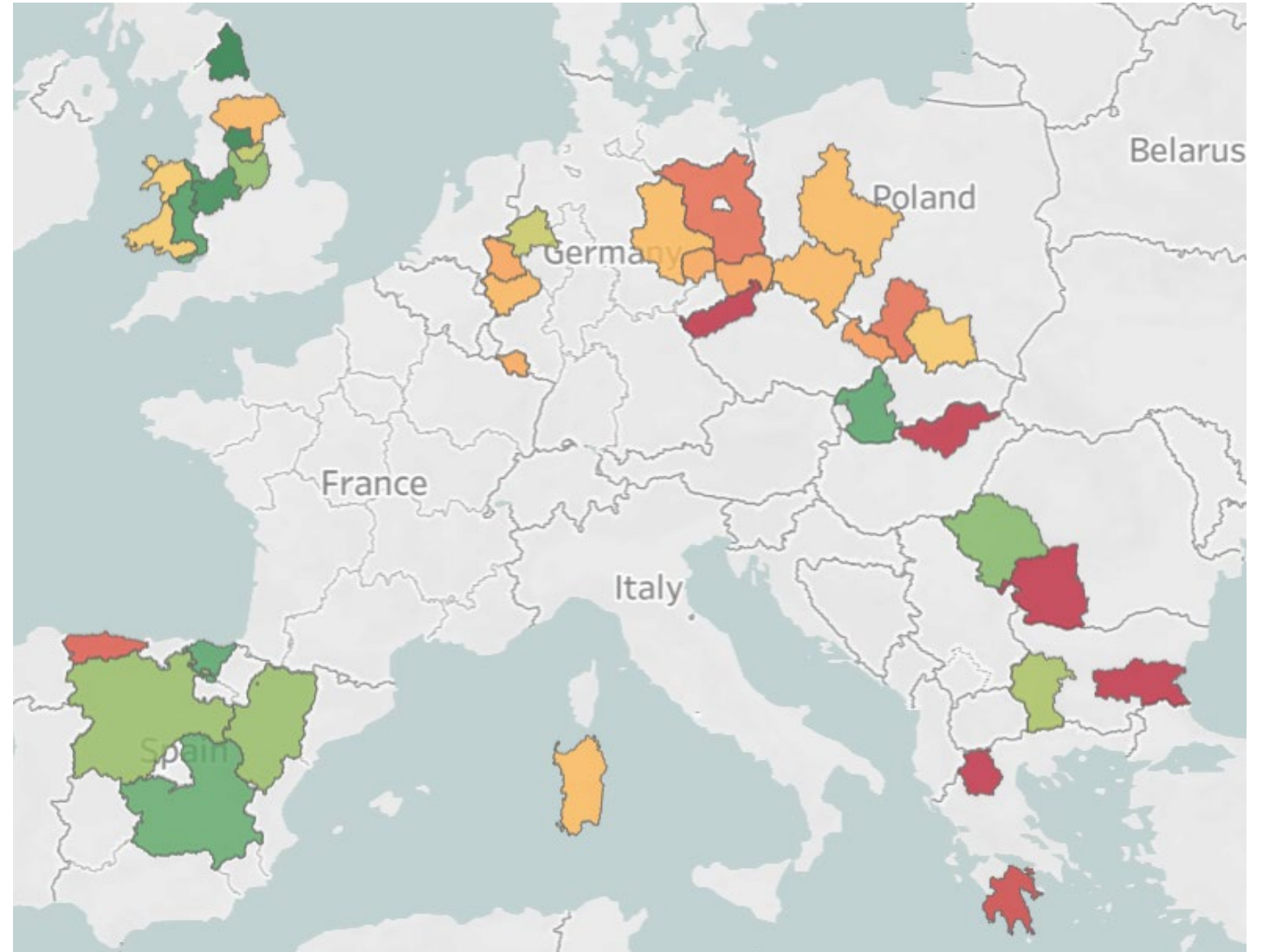
# FOCUS ON COAL REGIONS

# Carbon Emission Intensity 2016 of Coal Regions

$$\text{Carbon Emission Intensity} = \frac{\text{CO}_2 \text{ (tons)}}{\text{GDP (euro)}}$$

## LEGEND

Carbon Emission Intensity



# Carbon Emission Intensity Variation 2008-2016

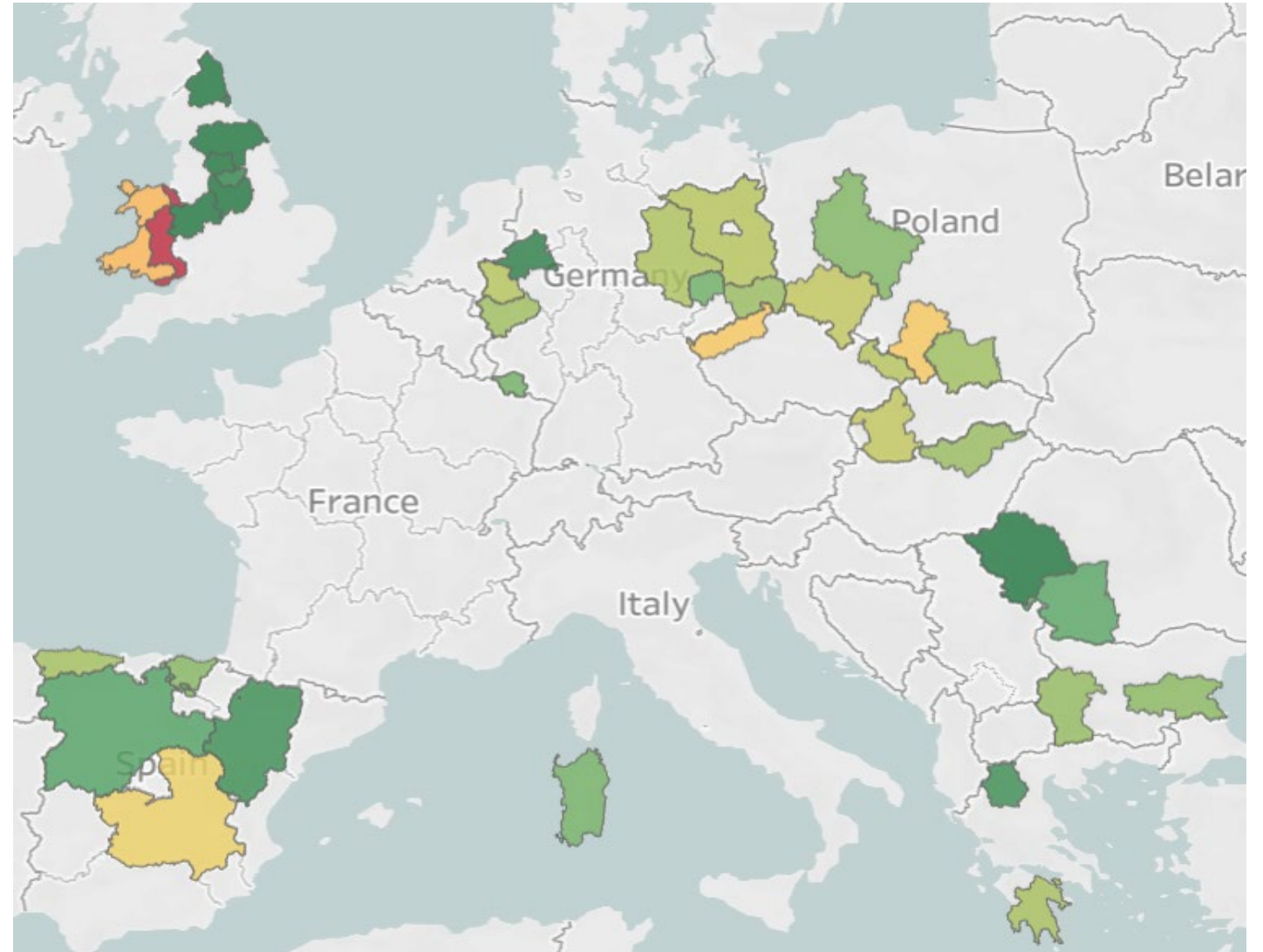
$$\text{Carbon Emission Intensity} = \frac{\text{CO}_2 \text{ (tons)}}{\text{GDP (euro)}}$$

→ Variation 2008-2016

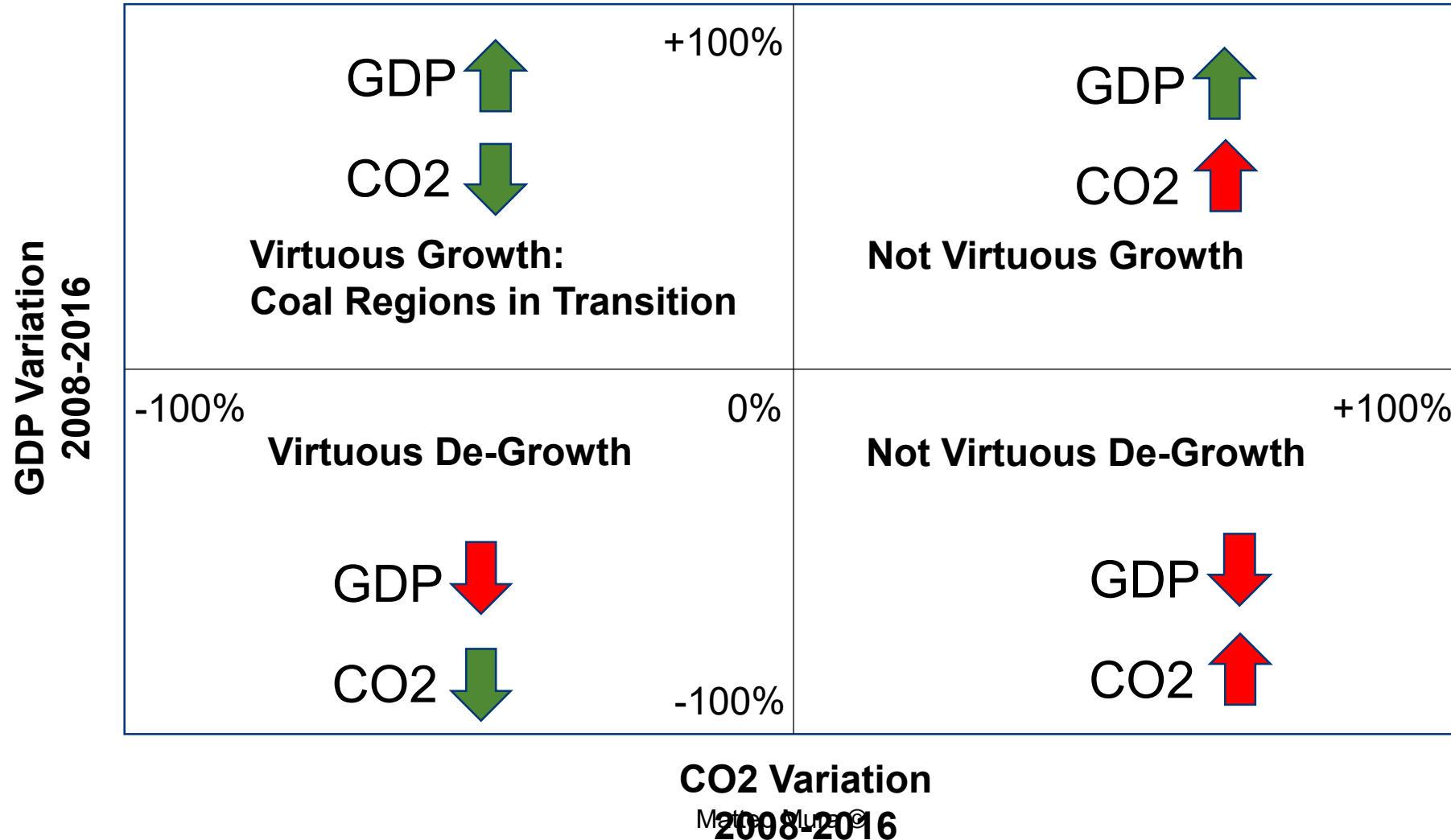
LEGEND

Carbon Emission Intensity (% V...

-30.00%  30.00%

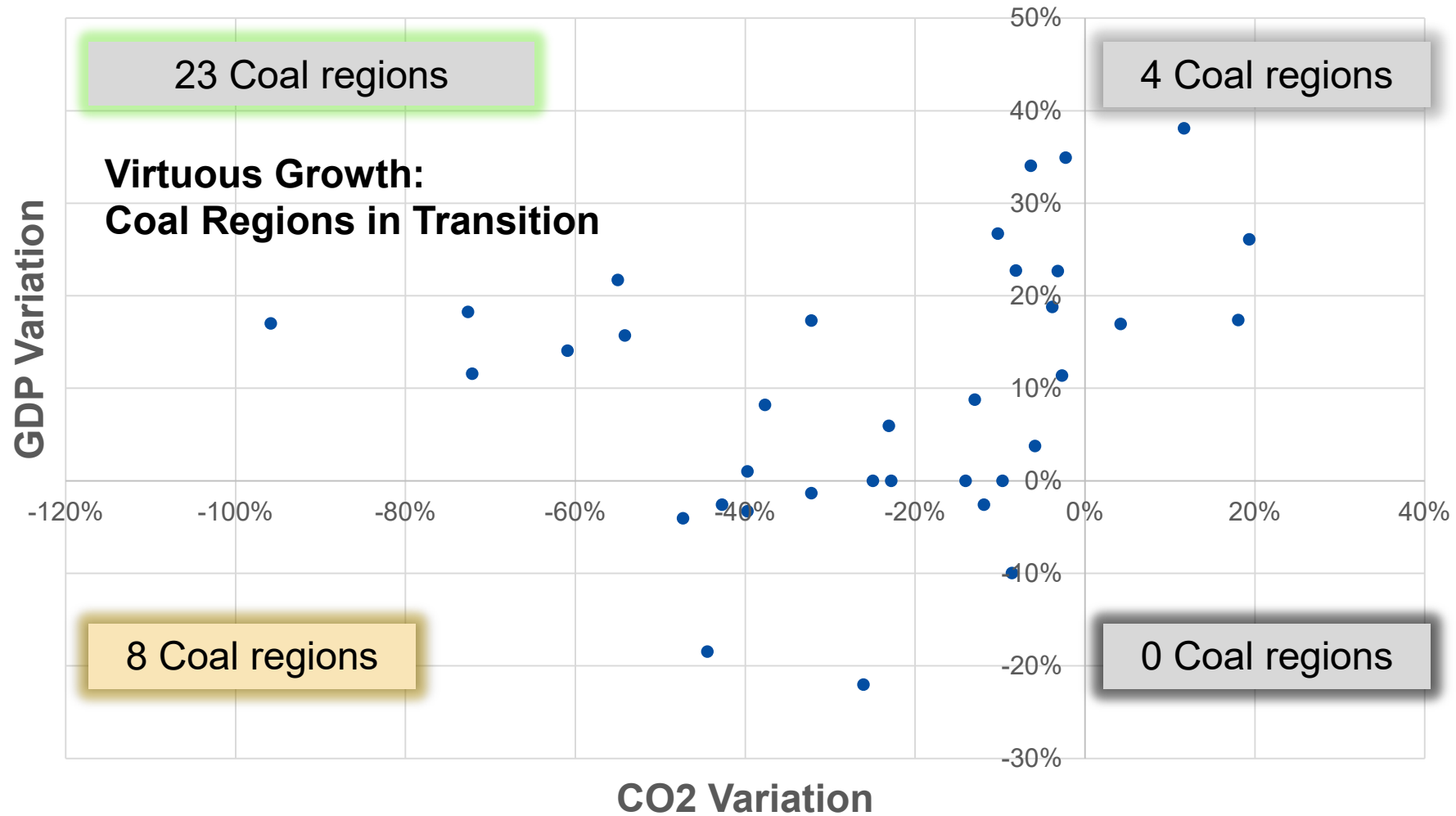


# Grouping Coal Regions

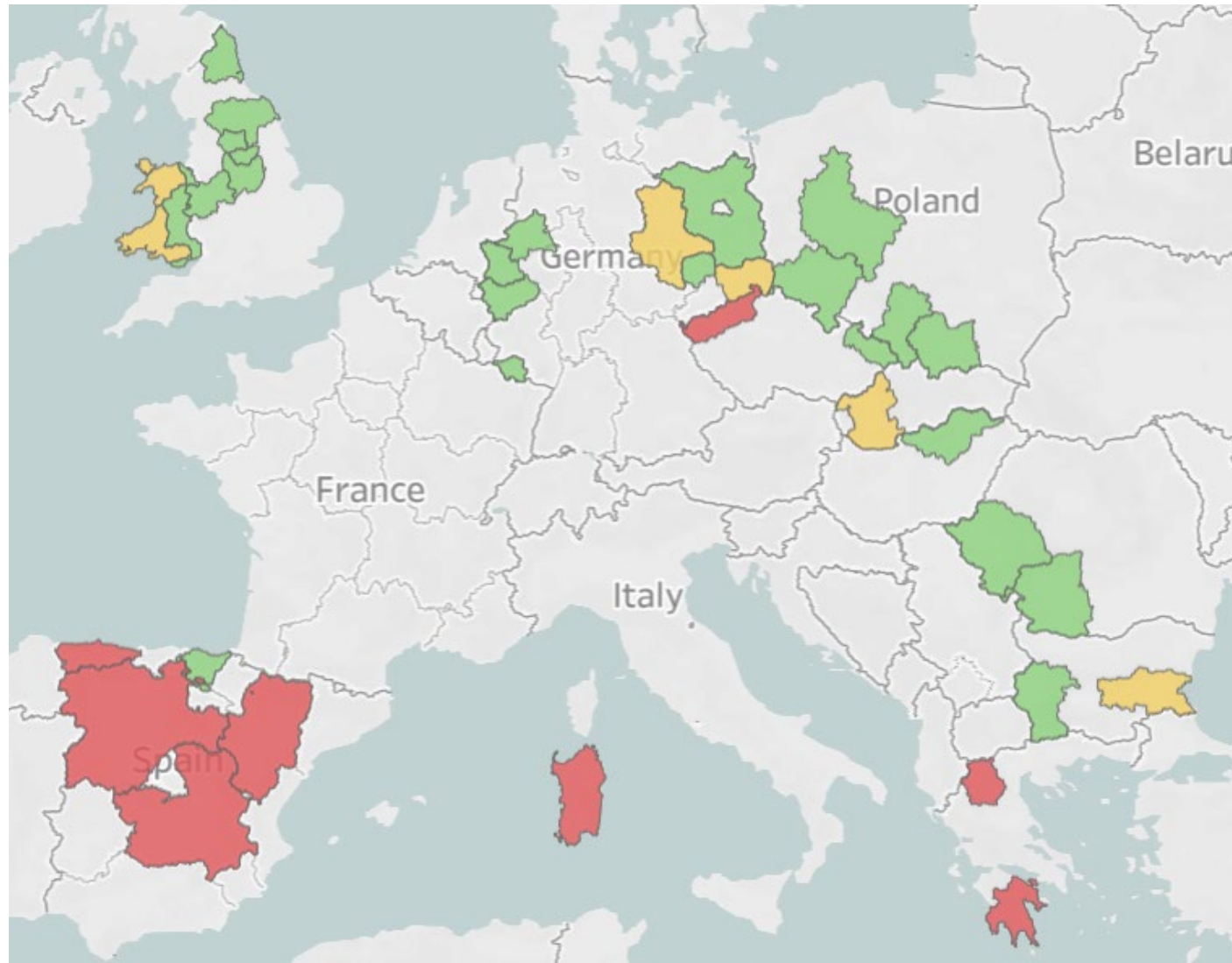




# Grouping Coal Regions







# Grouping Coal Regions

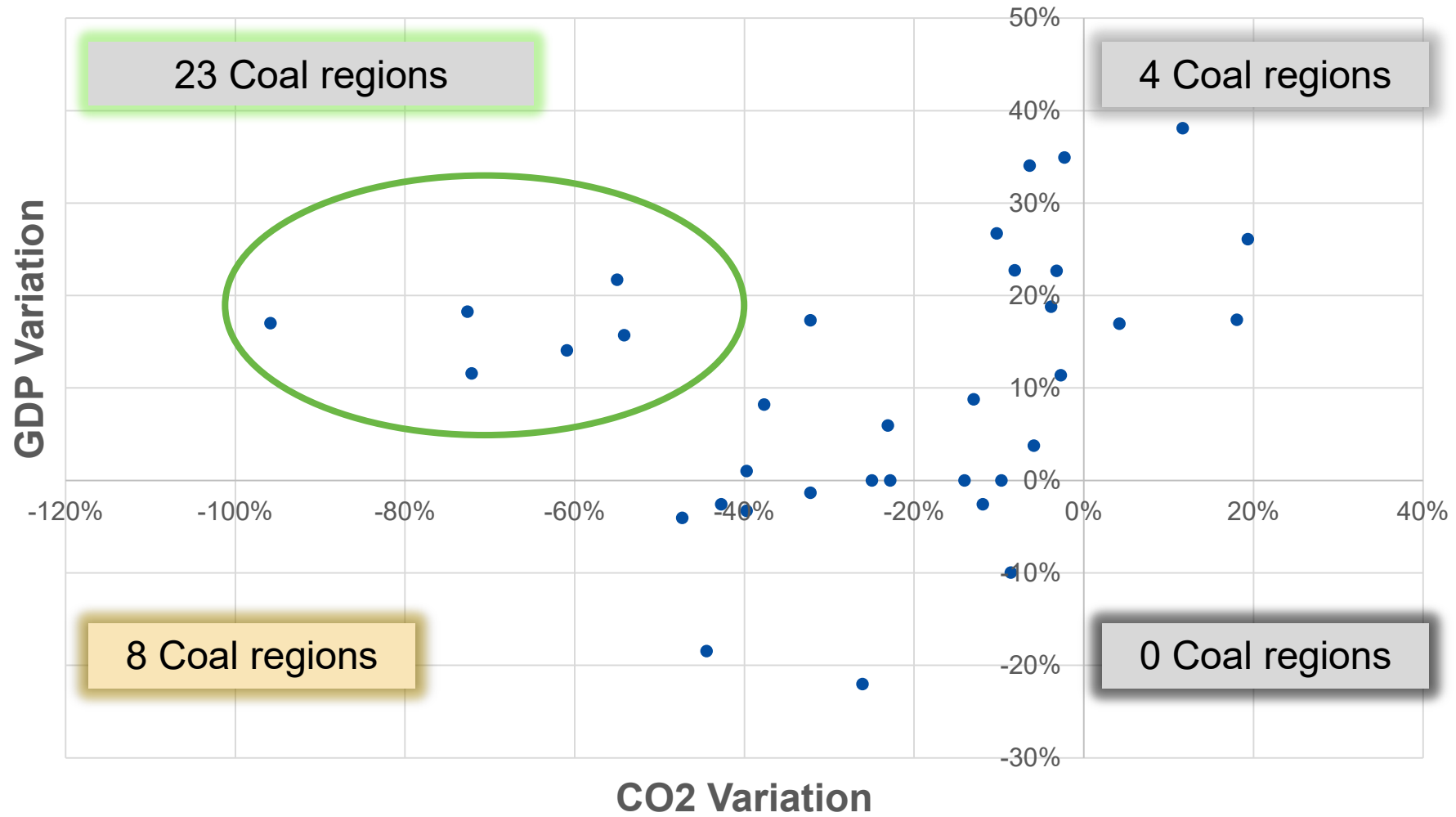


## LEGEND

### Cluster

-  Not Available
-  Not Virtuous Growth
-  Virtuous De-Growth
-  Virtuous Growth

# Grouping Coal Regions



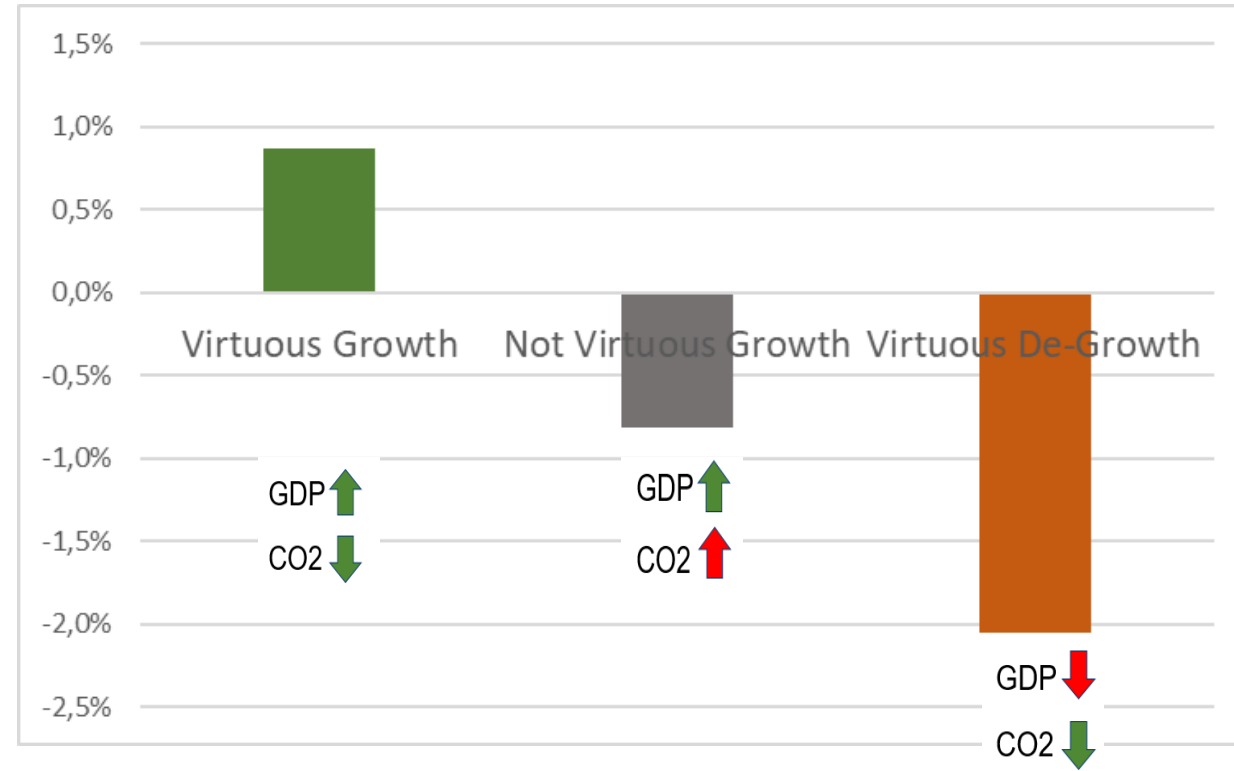
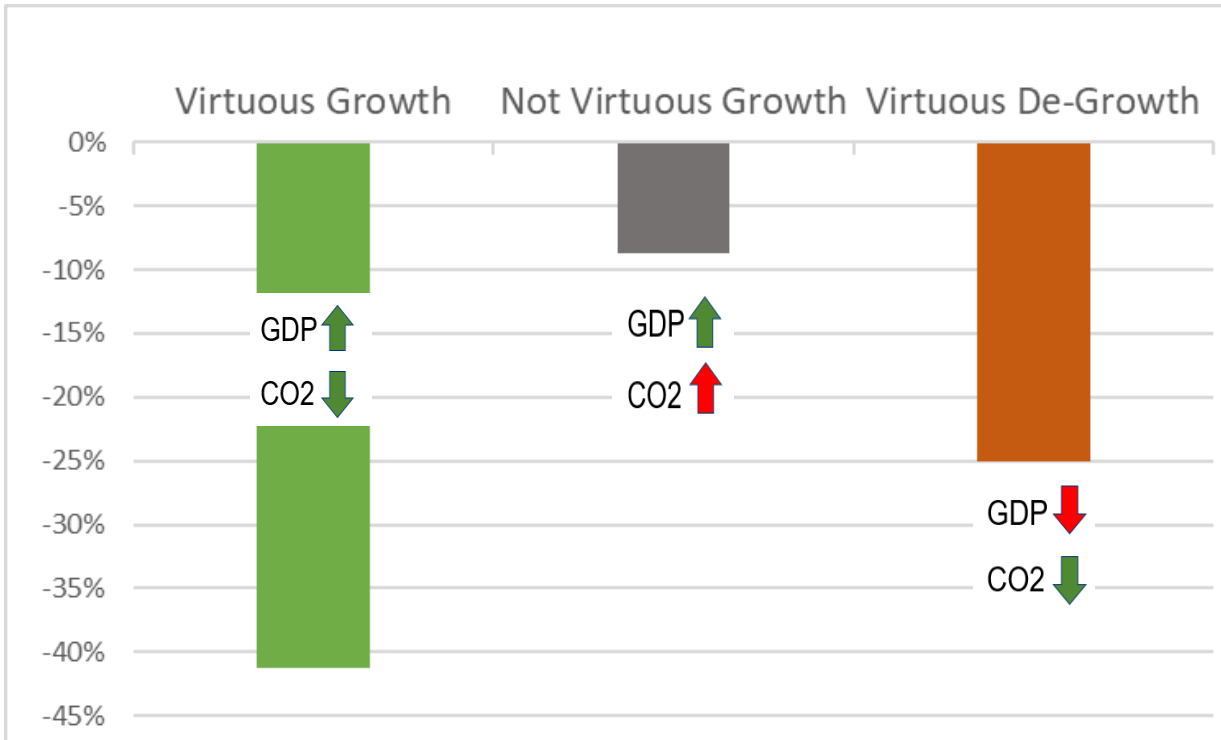


# Grouping Coal Regions

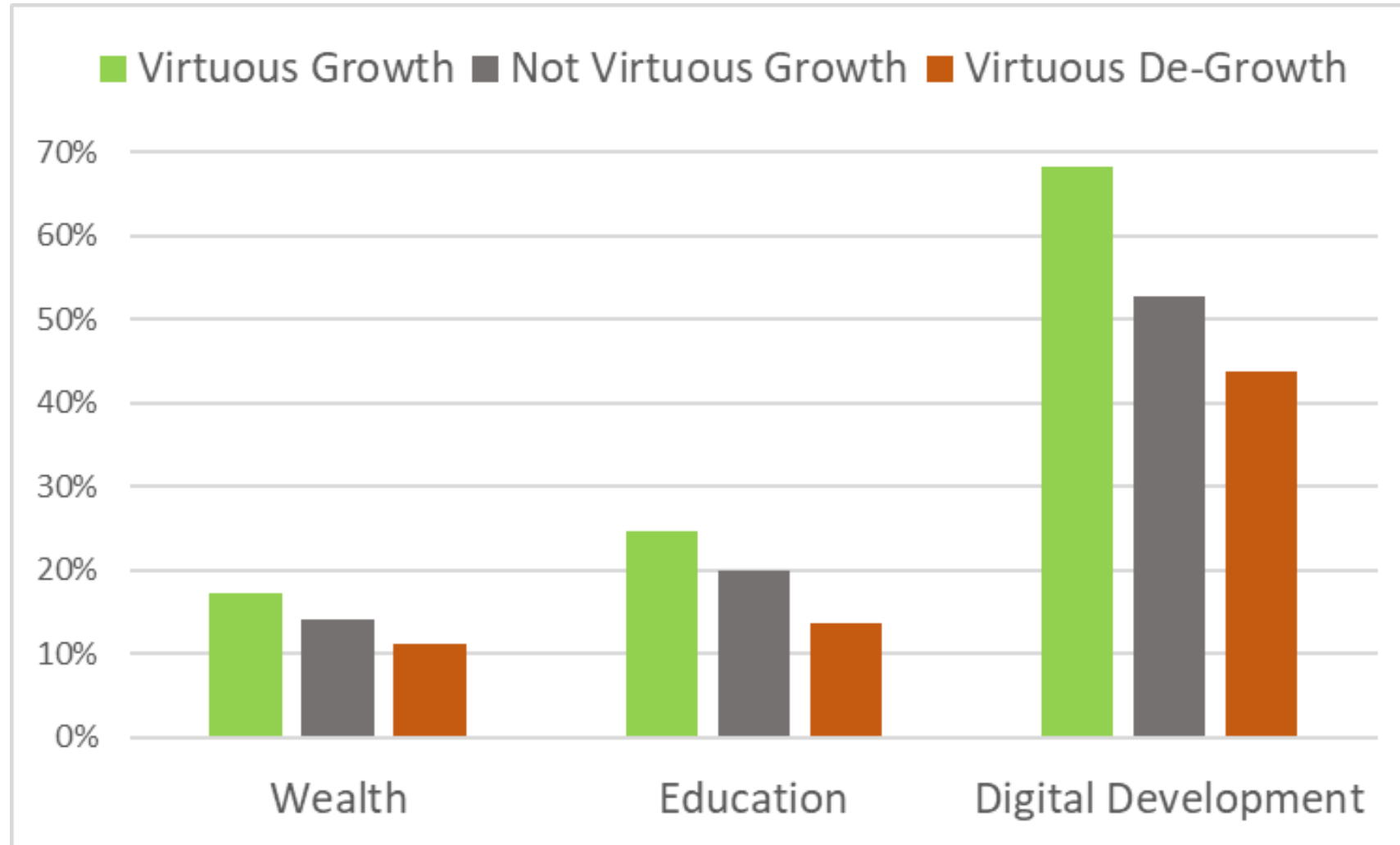
UKE4	West Yorkshire
UKF1	Derbyshire and Nottinghamshire
UKG2	Shropshire and Staffordshire
UKL2	East Wales
RO42	Vest
UKC2	Northumberland and Tyne and Wear
UKE2	North Yorkshire

## CARBON EMISSION INTENSITY 2008-2016

## POPULATION 2012-2016



# Socio Economic Indicators



# Conclusions

- Our results show different groups of regions with similar transition pathways
- Sustainability transition regions show higher socio-economic indicators compared to other regions (e.g. Population, Wealth, Education, Digital Development)
- Digital development and education may play a critical role in supporting transition



# Web-Based Application

<https://tabsoft.co/2xTyCuN>





Matteo Mura

*Department of Management  
University of Bologna*

matteo.mura@unibo.it