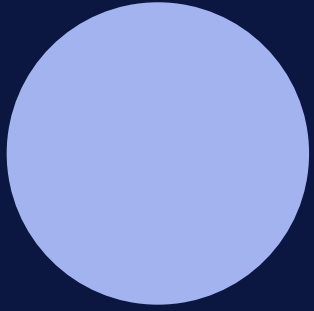


# // On step forward in the Circular Economy assessment: producing regional evidence

(Circular Economy, regional data, territorial analysis)

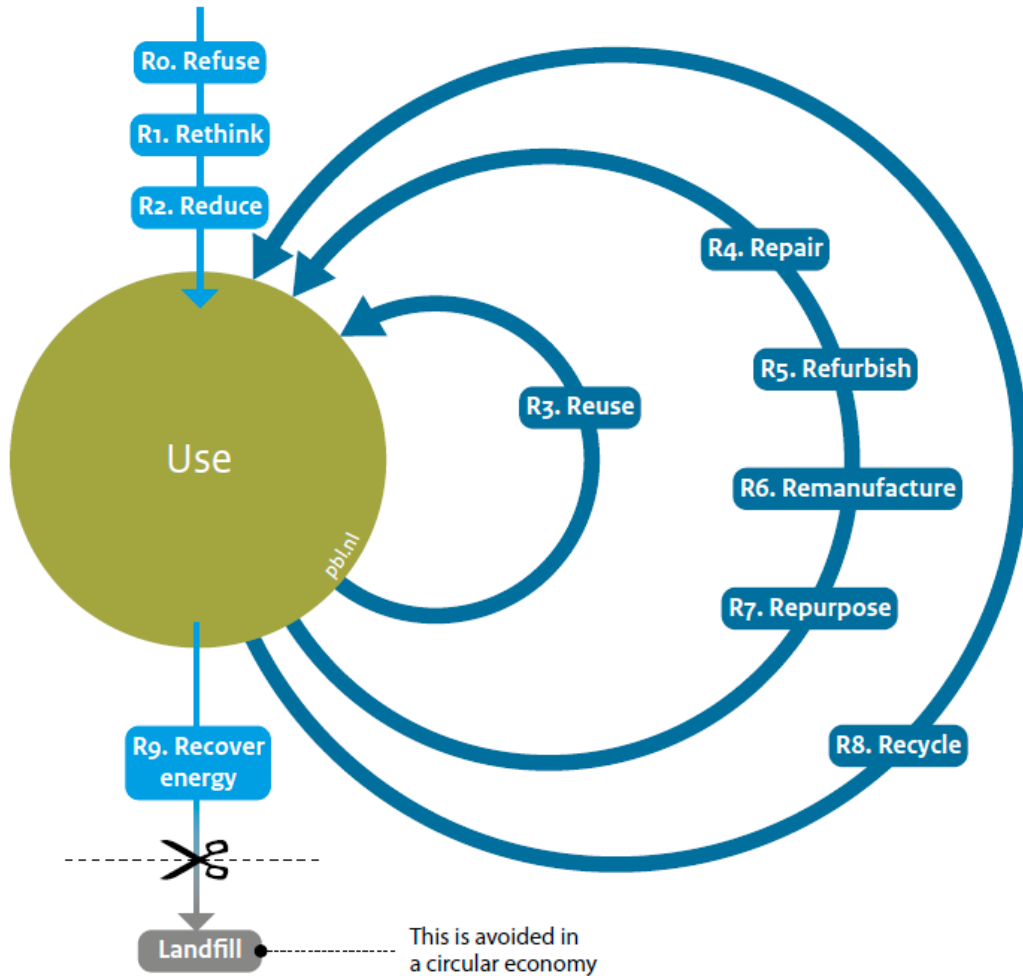


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# An introduction to the Circular Economy



*“A sustainable development initiative with the objective of **reducing** the societal production-consumption systems' linear material and energy **throughput flows** by applying materials cycles, renewable and cascade-type energy flows to the linear system.*

*The circular economy promotes **high value material cycles** alongside more traditional recycling and develops **systems' approaches** to the cooperation of producers, consumers and other societal actors in sustainable development work” (Korhonen et al. 2018)*

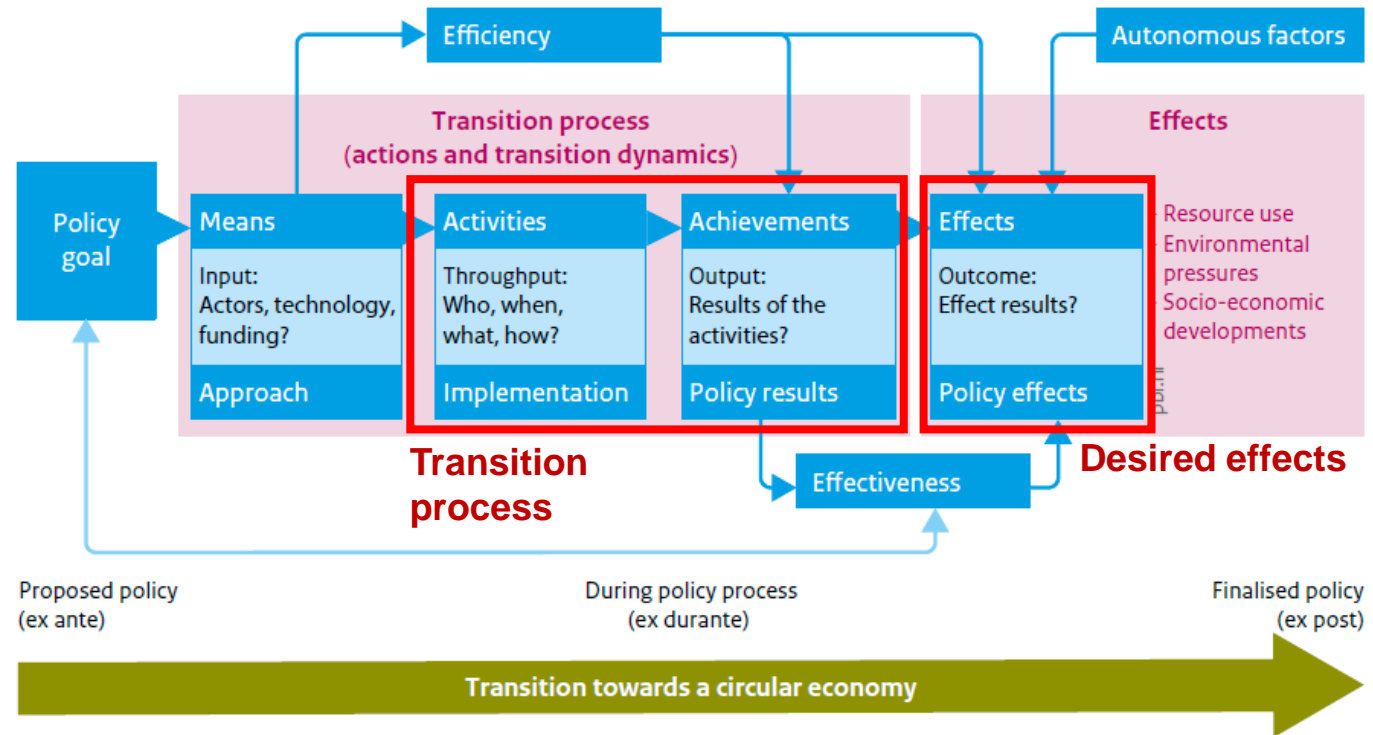
# Measuring the Circular Economy: the monitoring frameworks

A **sound conceptual framework** that differentiate between the **causal forces** (e.g. circular economy drivers and transition processes), and their **effects** (i.e. the final environmental and economic outcomes) is needed

Perhaps the most advanced framework is the one developed in the **Netherlands** (figure on the right).

However, **most of figures** provided by monitoring frameworks **are based on an highly aggregated level** (Member State), preventing therefore the analysis of CE from a territorial perspective.

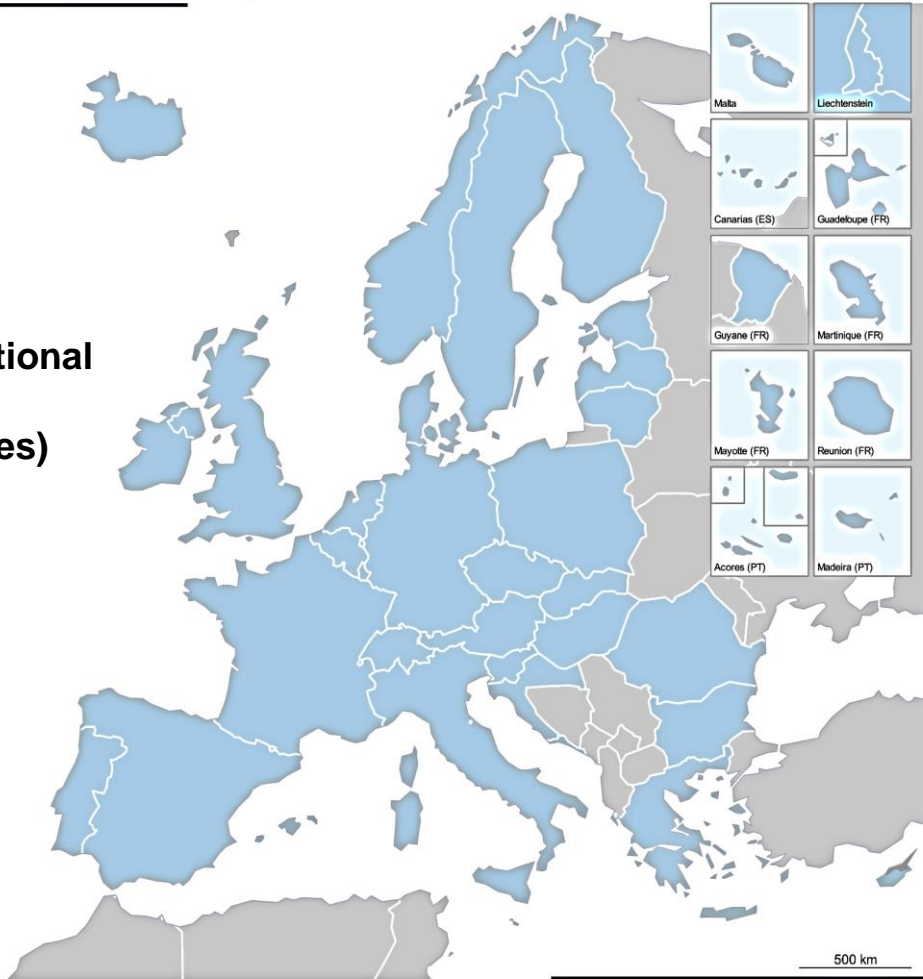
Policy assessment framework for measuring the progress of the transition towards a circular economy



Source: Netherlands Court of Audit 2005; adaptation by PBL

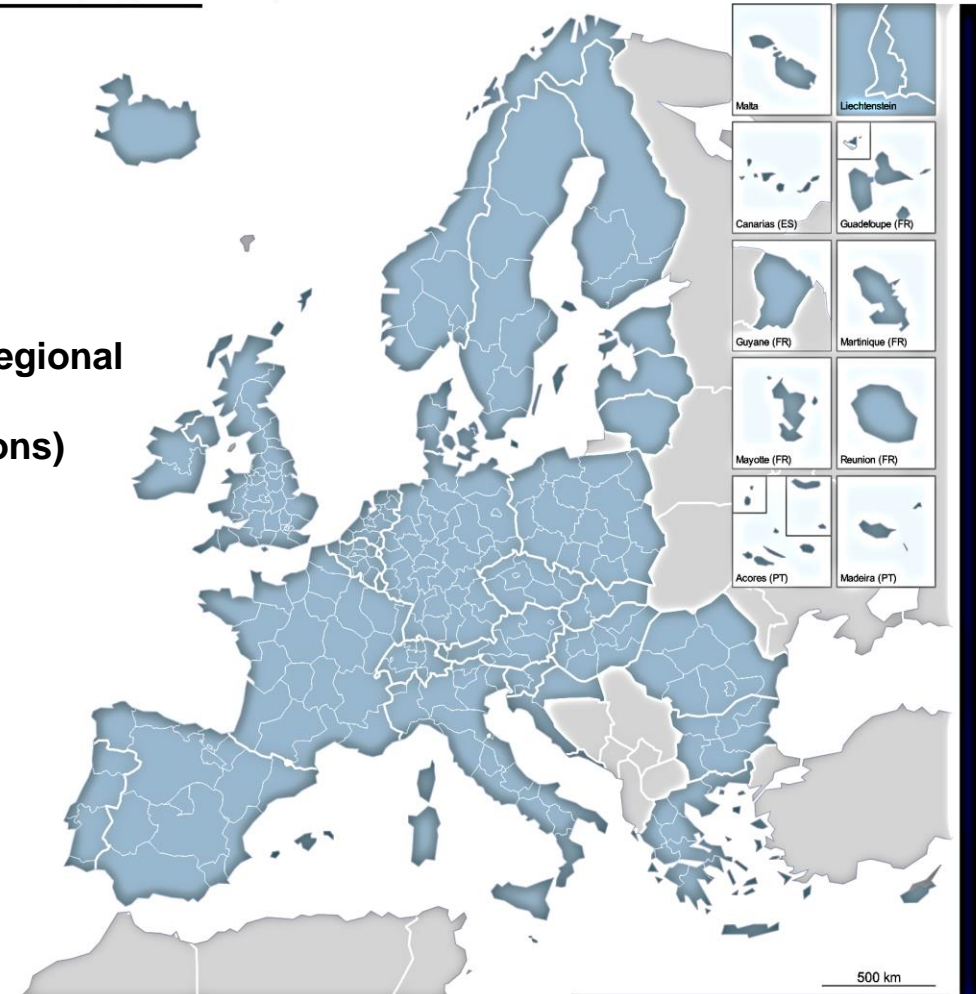
# Aim of the research: from national to regional data

Europe by NUTS 0 (National level)



Europe by National Level  
(40 Countries)

Europe by NUTS 2 (Regional level)



Europe by Regional Level  
(331 regions)



# Regionalising circular economy indicators: variables overview

## Target variables (indicators):

### Material flows

1. Domestic Material Consumption
2. Biomass Consumption
3. Metal ores Consumption
4. Mineral construction Consumption
5. Domestic Extraction

### Waste

6. Total waste
7. Total waste by household
8. Food waste
9. WEEE
10. Construction waste
11. Plastic waste
12. Waste by agriculture
13. Waste by mining and quarrying
14. Waste by manufacturing

## Explicative variables:

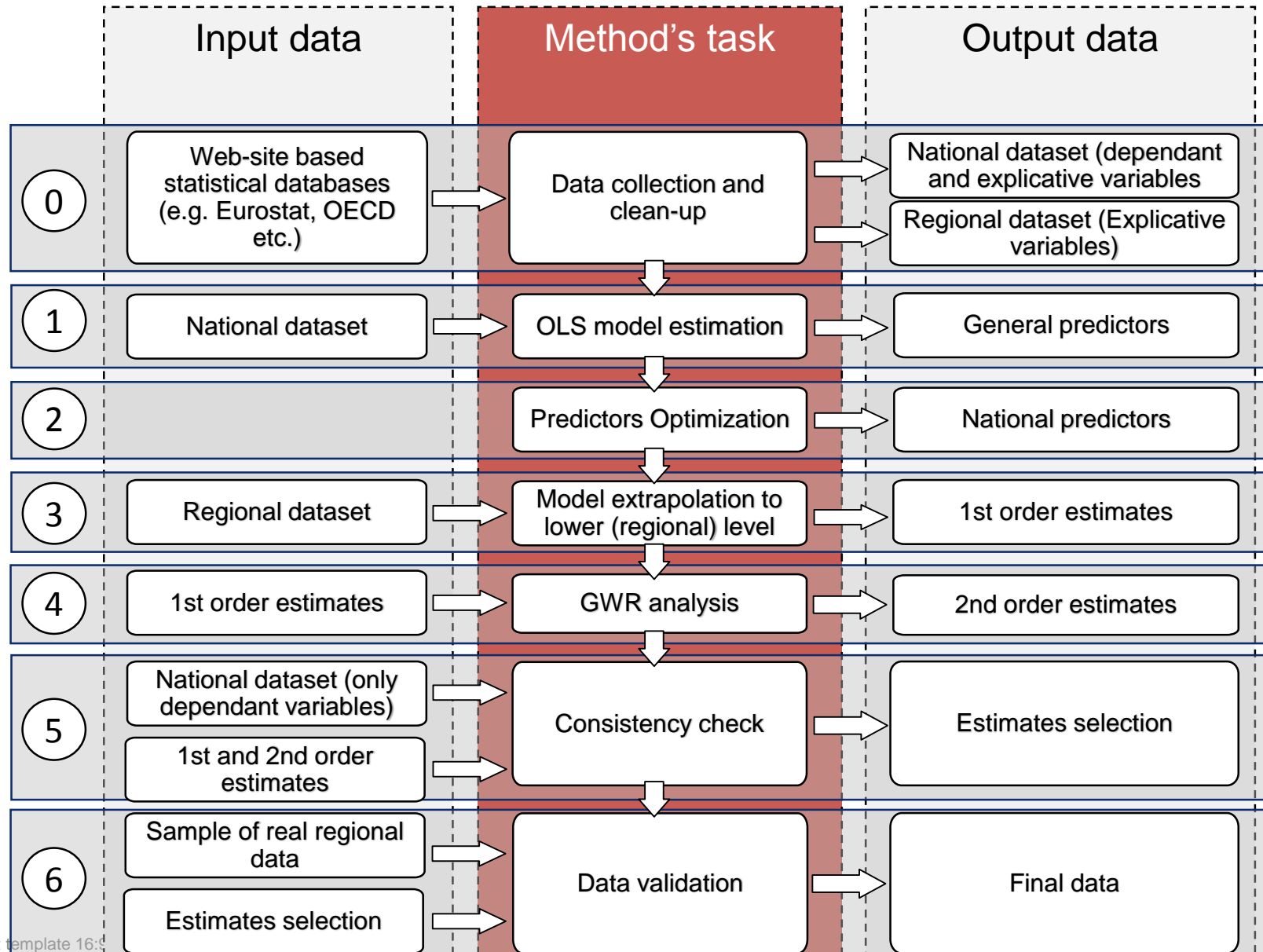
### Socio economic variables

1. Population
2. Gross Domestic Product (GDP)
3. Gross Value Added (GVA) (specified for Agriculture, Industrial, Manufacturing, Construction)
4. Gross Fixed Capital Formation (GFCF) (specified for Agriculture, Industrial, Manufacturing, Construction)
5. Income
6. Employment (specified for Agriculture, Industrial and Construction)
7. Municipal waste

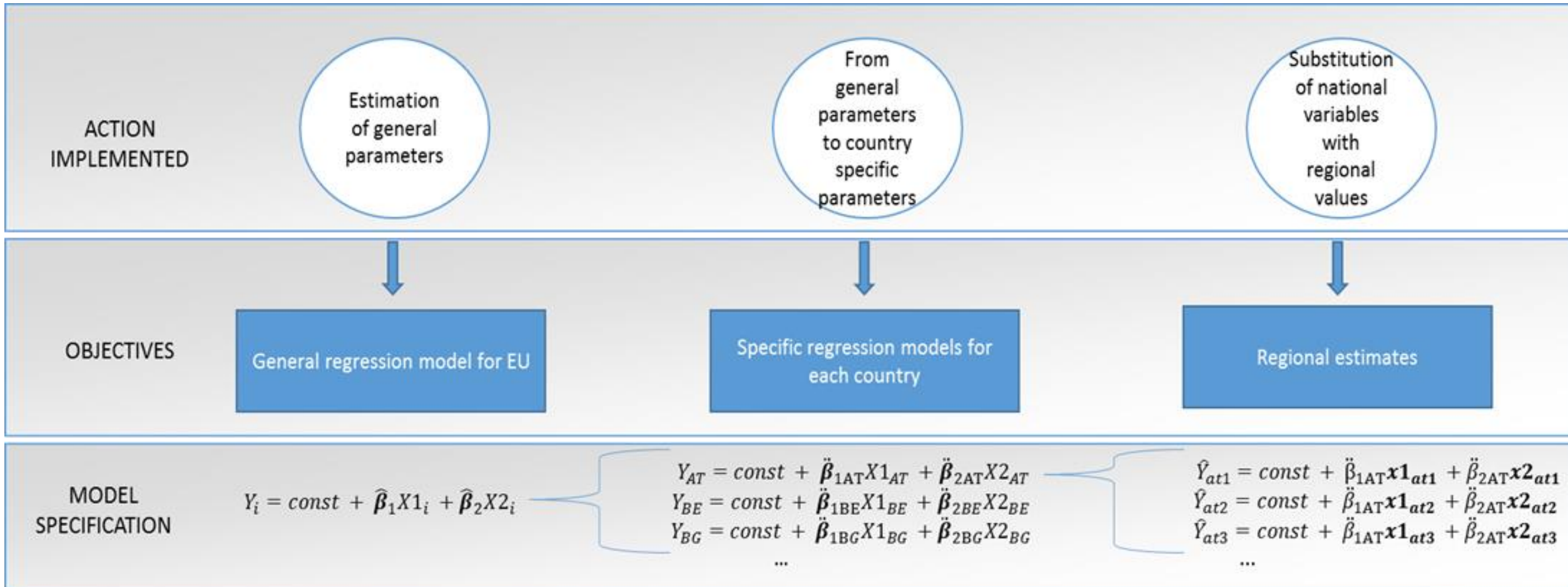
### Territorial variables

1. Population density (and its inverse land per hab.)
2. Total employment
3. Total land
4. Land use (specified for Agriculture, Forestry, Fishing, Industry, Mining etc.)
5. Location quotients (for each class of GVA, GFCF and Land Use)
6. EU geographic regions (Northern, Southern, Eastern, Western)

# The sequential flow of the downscaling methodology



# The econometric approach behind the downscaling methodology

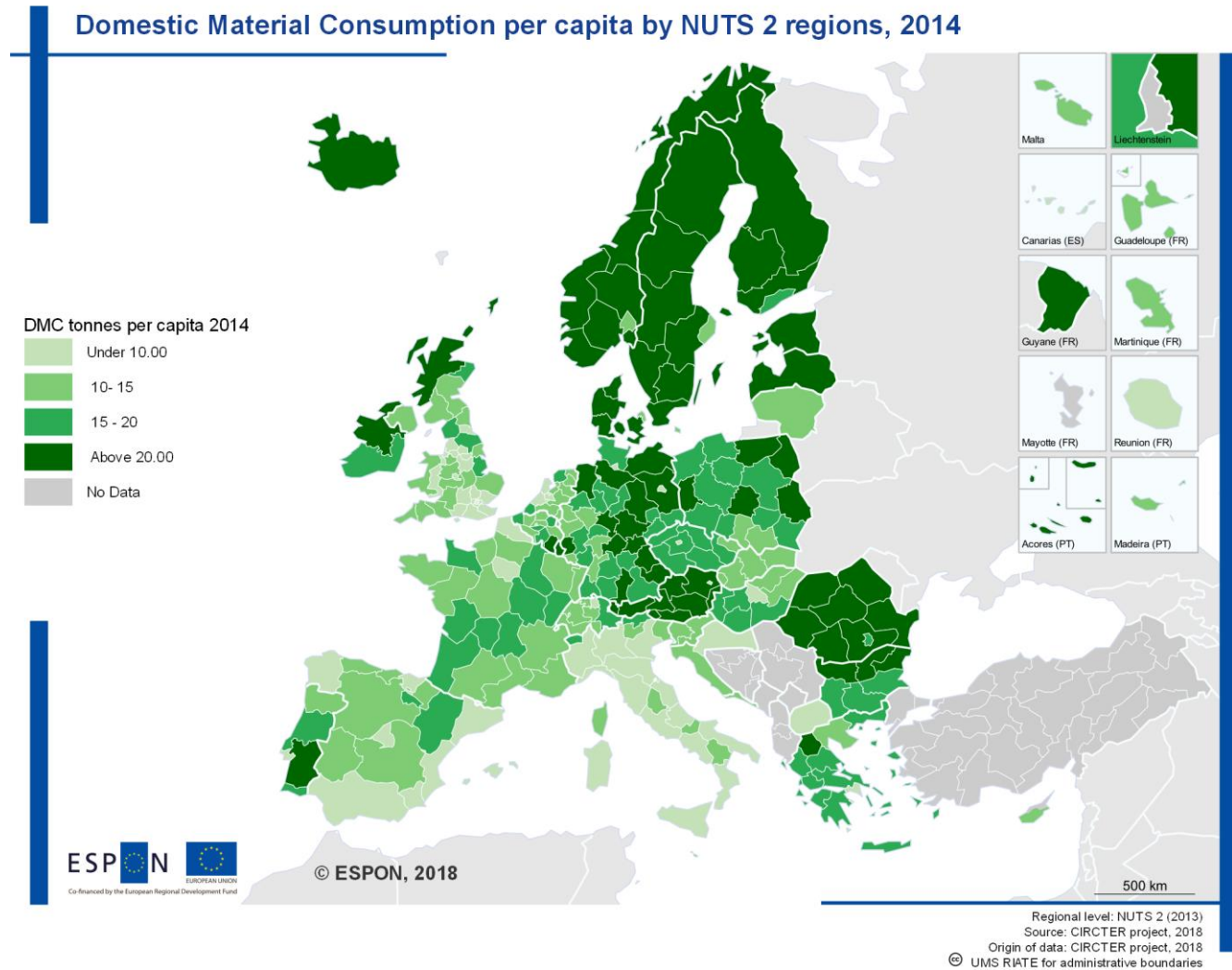




# Known methodological limitations

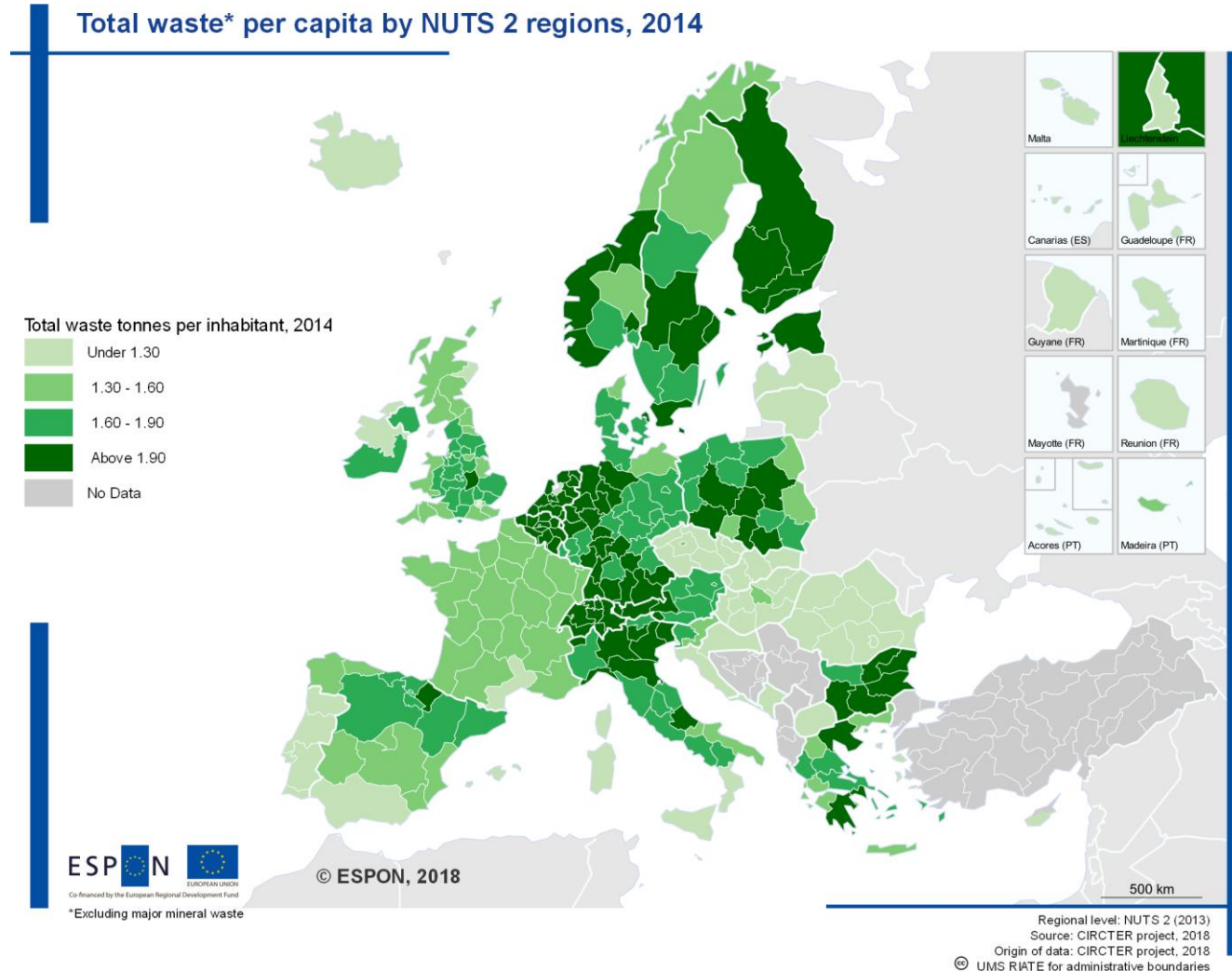
- **Top-down approach:** impossibility to define a set of estimated parameters that soundly and simultaneously describe the economic structure of all the 331 EU regions considered;
- **Quality of original data** (i.e. the reference national values, particularly for waste statistics)
- **Regional interflows** of material and waste within and between countries are only partially addressed by spatial effects. Hence, regions characterised by high trade levels (e.g. regions with large logistic hubs, ports, etc.) are more subject to deviations from reality.

# Primary results (1:2) : Domestic Material Consumption per capita



- **Urban agglomerations** and strong **tertiary specialisation** are the main drivers leading the economy **dematerialisation**;
- **Peripheral regions**, (e.g. Eastern regions, Southern Portugal, Scotland etc.) most specialised in material intensity sectors present higher figures per capita. Similarly, **interior regions** favoured by stronger service and financial sector result better-off.

# Primary results (2:2): Total Waste generation



- The overall amount of waste generated is largely related to the **population and economic size** of a given territory.
- Regions in which both factors concur, usually present highest figures in waste generation per capita.
- However, it seems that unharmonized data collection systems and methodologies across countries still exist (see e.g. the cases of France, Portugal and Romania vs Germany or Bulgaria)

# Wrap-up and conclusion

- Transitioning towards a circular economy entails a **systemic transformation**;
- Increasing the **availability of regional data** is crucial for the development of effective **place-based policies**;
- The existent CE monitoring frameworks provide only aggregated data at European and national levels, offering **no information whatsoever on the diversity of conditions at sub-national scales**;
- We developed a **recursive sequential downscaling method** that makes use of generally available socioeconomic and territorial information to disaggregate national material and waste data down to the regional level;
- We **regionalised up to 9 indicators**, 5 of them belonging to material flows consumption, and 4 to waste categories;
- The method proved to be especially **suitable for high-aggregated indicators** (i.e. Domestic Material Consumption and Total Waste Generation), whilst it decreases performance for more specific indicators (e.g. metal-ores consumption);
- Findings confirm that in the absence of substantial local data, **the method may offer a way of analysing and monitoring territorial patterns**;



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# Thank you

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