ESPON

EUROPEAN UNION

Co-financed by the European Regional Development Fund

Inspire Policy Making with Territorial Evidence

5th Just Transition Platform meeting

10-12 May 2022

Circular Economy: opportunities for JTF regions

ESPON **CIRCTER** project

Content

1. The ESPON programme
2. The CIRCTER & SPIN-OFF projects
3. A territorial approach to the circular economy
4. Monitoring the circular economy at the regional level
5. Take-aways and policy recommendations

1

Who are we?


ESPON
EUROPEAN UNION
Co-financed by the European Regional Development Fund
Inspire
Policy Making
by Territorial
Evidence
espon.eu

ESPON 2020 in a nutshell

32 member and partner states (EU, EFTA, UK)

around **300 stakeholders actively involved** and more than **5000 researchers and policy makers in contact** with ESPON the past 6 years

50 million budget

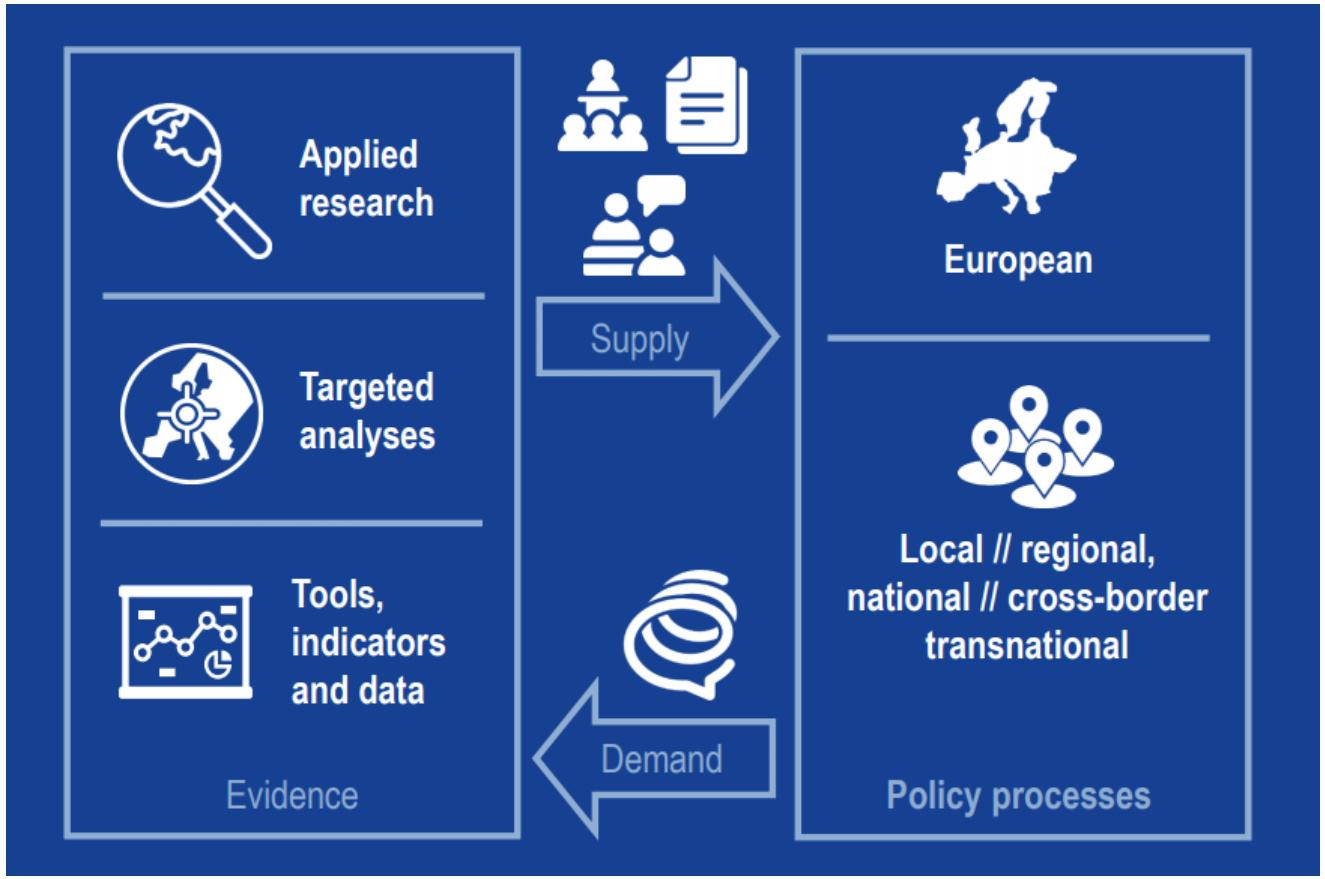
Around 80 territorial studies and 80 policy and thematic papers

Territorial **evidence**, maps & data

Scenarios and territorial visions

Territorial insights and policy briefs

What ESPON does for you …



ESPON research topics

Financial instruments	Circular economy	Green infrastructure	Youth unemployment	Geographical specificities
Territorial Reference Framework	Technological transformation	Shrinking rural regions	Interregional relations	Sustainable urbanisation
Natural disasters	Quality of life	Migration and refugees	SMEs	Territorial evidence support
Cultural Heritage	Maritime spatial planning	Big data and territorial development	TIA for cross-border cooperation	Urban-rural connectivity
Port city regeneration	Population ageing	Collaborative circular economy	ESPON Database	TIA
Macro-regional monitoring	Big data and housing	Functional urban areas	Localising SDGs	Employment

2

Overview of the CIRCTER & SPIN-OFF projects

CIRCTER – Circular Economy and Territorial Consequences

Supported by the ESPON Programme (October 2017 to May 2019)

CIRCTER team:

tecnalia Inspiring Business

ACR+ KnowlEdge Srl prognos technopolis|group| Wuppertal Institut

CIRCTER aims to provide guidance for the **promotion of circular economies at sub-national territorial levels**

The SPIN-OFF initiatives

- Additional case studies for
  1. **Grand Duchy of Luxembourg**
  2. **cross-border Scandinavian area**
  3. **Switzerland and Liechtenstein** regions

- These case studies aim to
  1. **increase and better adapt CIRCTER's evidence** to specific territorial contexts
  2. **support the definition of policies** and territorial developments towards circular systems.

CIRCTER & SPIN-OFF key policy questions

- #1 What does the circular economy mean from a **territorial perspective?**
- #2 What do **material and waste patterns look like in European regions and cities** and how have they changed over the past 10 years?
- #3 What is the **potential for implementing the circular economy** in European regions and cities?
- #4 **What kind of common policy and actions** can be implemented to promote a transition to circular economy across different types of European regions and cities?

3

Key policy question #1:
What does the circular economy mean from a territorial perspective?

A territorial approach to the circular economy

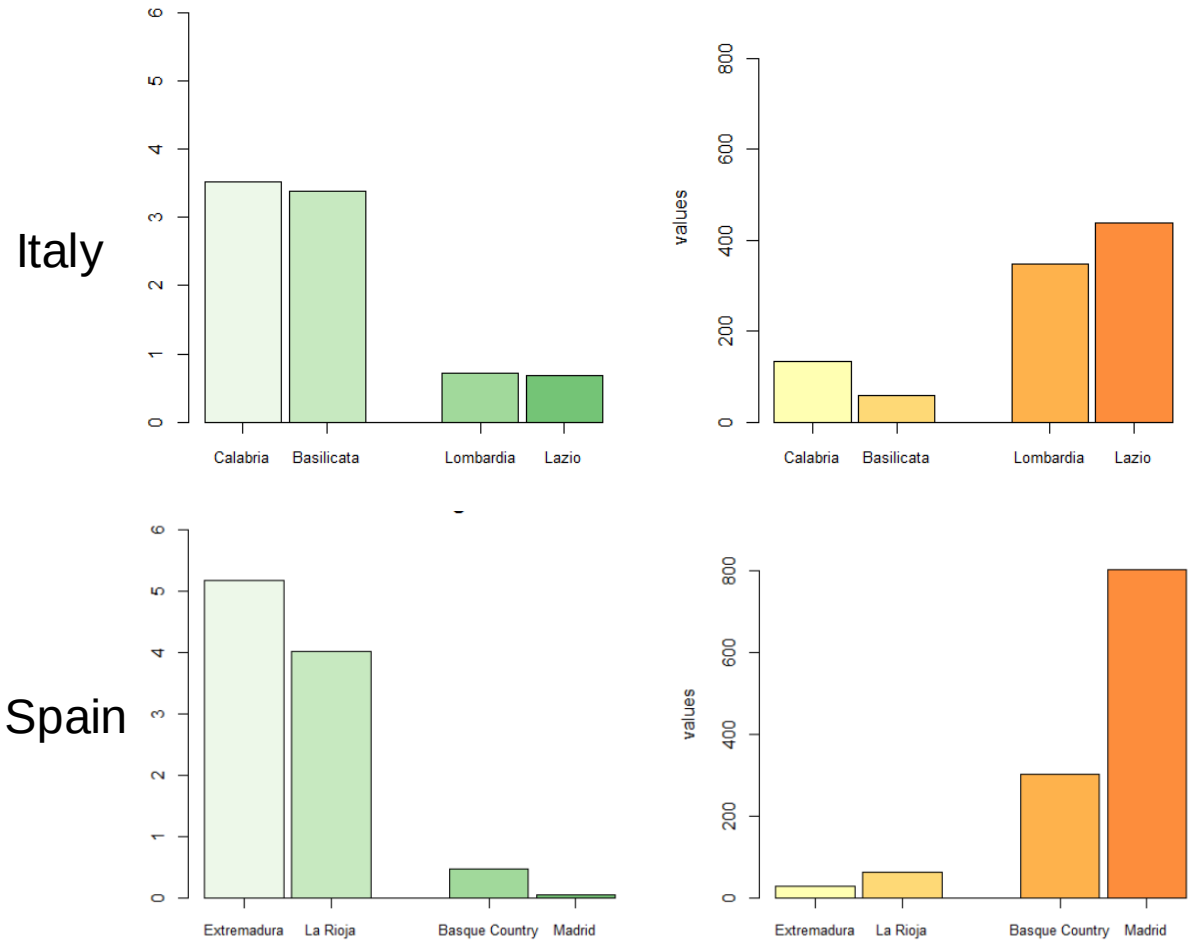
> *Towards a territorial definition of a circular economy: exploring the role of territorial factors in closed-loop systems*, European Planning Studies, https://doi.org/10.1080/09654313.2020.1867511

> *Improving the understanding of circular economy potential at territorial level using systems thinking*, Sustainable Production and Consumption, Volume 27, https://doi.org/10.1016/j.spc.2020.10.028.

Why does a territorial perspective matter?

- National statistics diverge from the multifaceted territorial contexts that local authorities have to deal with.
- CE solutions have an obvious spatial expression.
- A specific area has a specific territorial configuration or key assets installed.
- **The adoption of a territorial perspective and the early recognition of local enabling factors is key for the design of successful place-based CE strategies**

An example of territorial heterogeneity across European regions



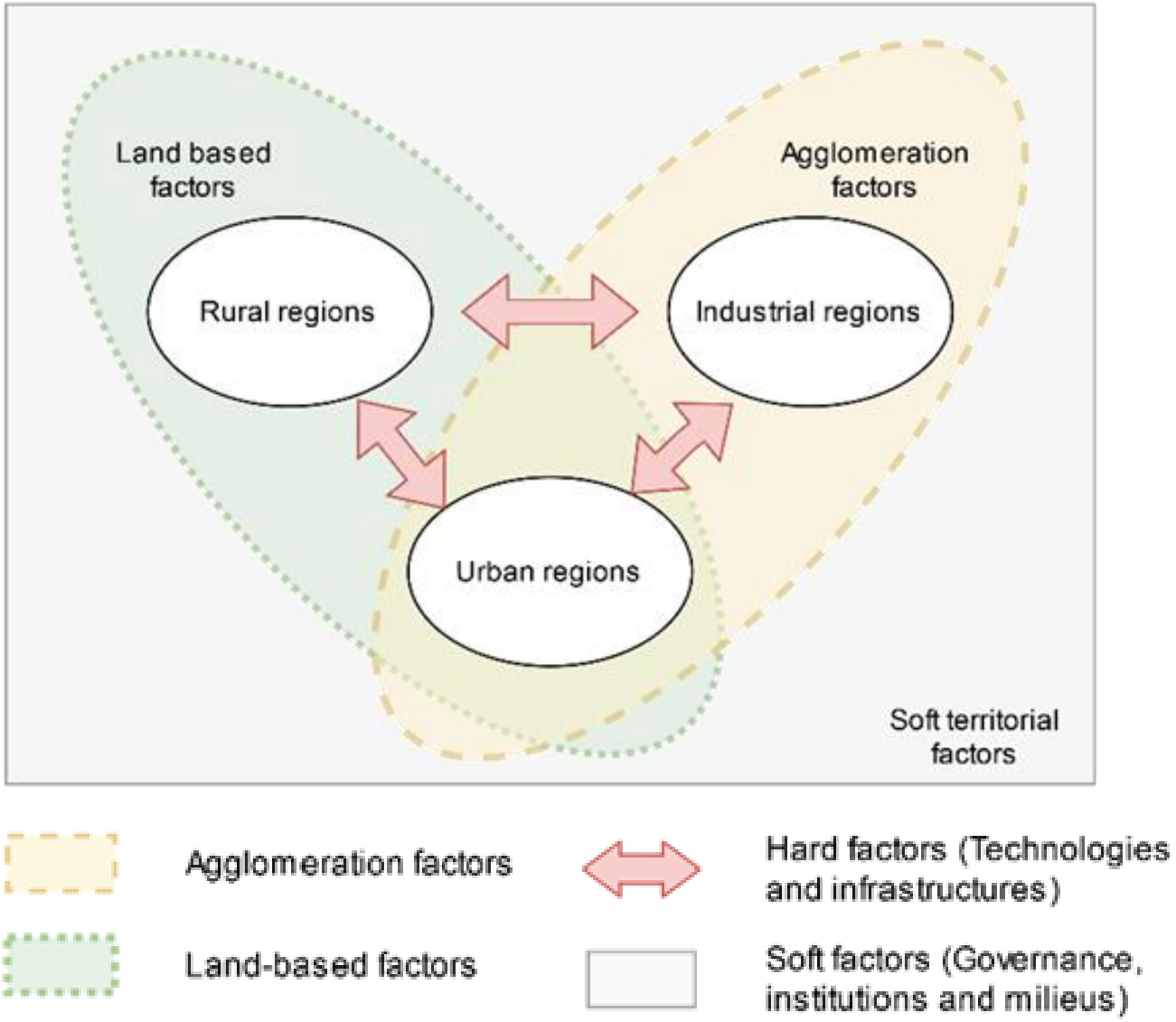
Agriculture specialisation index (1 = EU average)

Population density (Hab/Km2)

A territorial definition of the circular economy

The CIRCTER project identified **six territorial factors** conditioning progress to a circular economy:

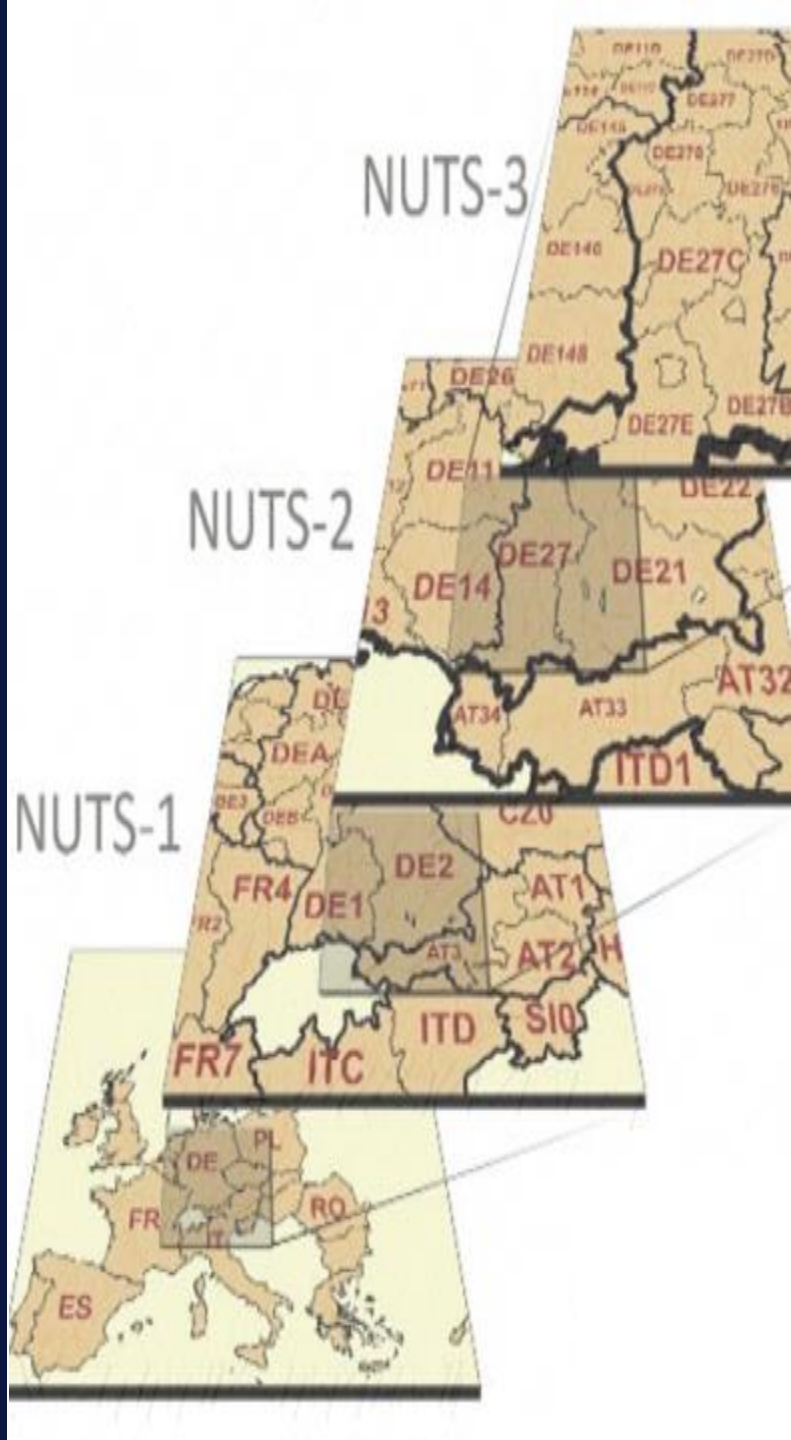
1) **Land-based resources**
2) **Agglomeration factors**
3) **Accessibility**
4) **Knowledge and awareness**
5) **Technology**
6) **Governance and institutional arrangements**



4

Key policy question #2:
What do material and waste patterns look like in European regions and cities and how have they changed over the past 10 years?

Monitoring the circular economy at the regional level



CIRCTER contribution to the EU CE monitoring framework

EU Monitoring framework (at EU and national level)

PRODUCTION AND CONSUMPTION

- EU 'self-sufficiency' for raw materials (Aggregated EU-level data only)
- Generation of municipal waste per capita
- Generation of waste excluding major mineral wastes per GDP unit
- Generation of waste excluding major mineral wastes per domestic material consumption

WASTE MANAGEMENT

- Recycling rate of municipal waste
- Recycling rate of all waste excluding major mineral waste (just 3 years available)
- Recycling rate of packaging waste by type of packaging
- Recycling rate of e-waste (low data coverage)
- Recycling of bio-waste (composted/digested municipal waste (in mass unit) over the total population (in number)
- Recovery rate of construction and demolition mineral waste (data for 2010 only)

SECONDARY RAW MATERIALS

- Contribution of recycled materials to raw materials demand- End-of-life recycling input rates (data for 2016 only)
- Circular material use rate (data for 2010 only)
- Trade in recyclable raw materials (Imports from EU, import from non-EU, export…)

COMPETITIVENESS AND INNOVATION

- Private investments, jobs and gross value added related to circular economy sectors
- Patents related to recycling and secondary raw materials

CIRCTER regional (NUTS 2) indicators

PRODUCTION AND CONSUMPTION

- MATERIAL FLOWS

- Domestic Material Consumption (DMC)
  - Biomass consumption
  - Metal Ores consumption
  - Non-metallic minerals consumption
- Domestic Extraction

- WASTE GENERATION

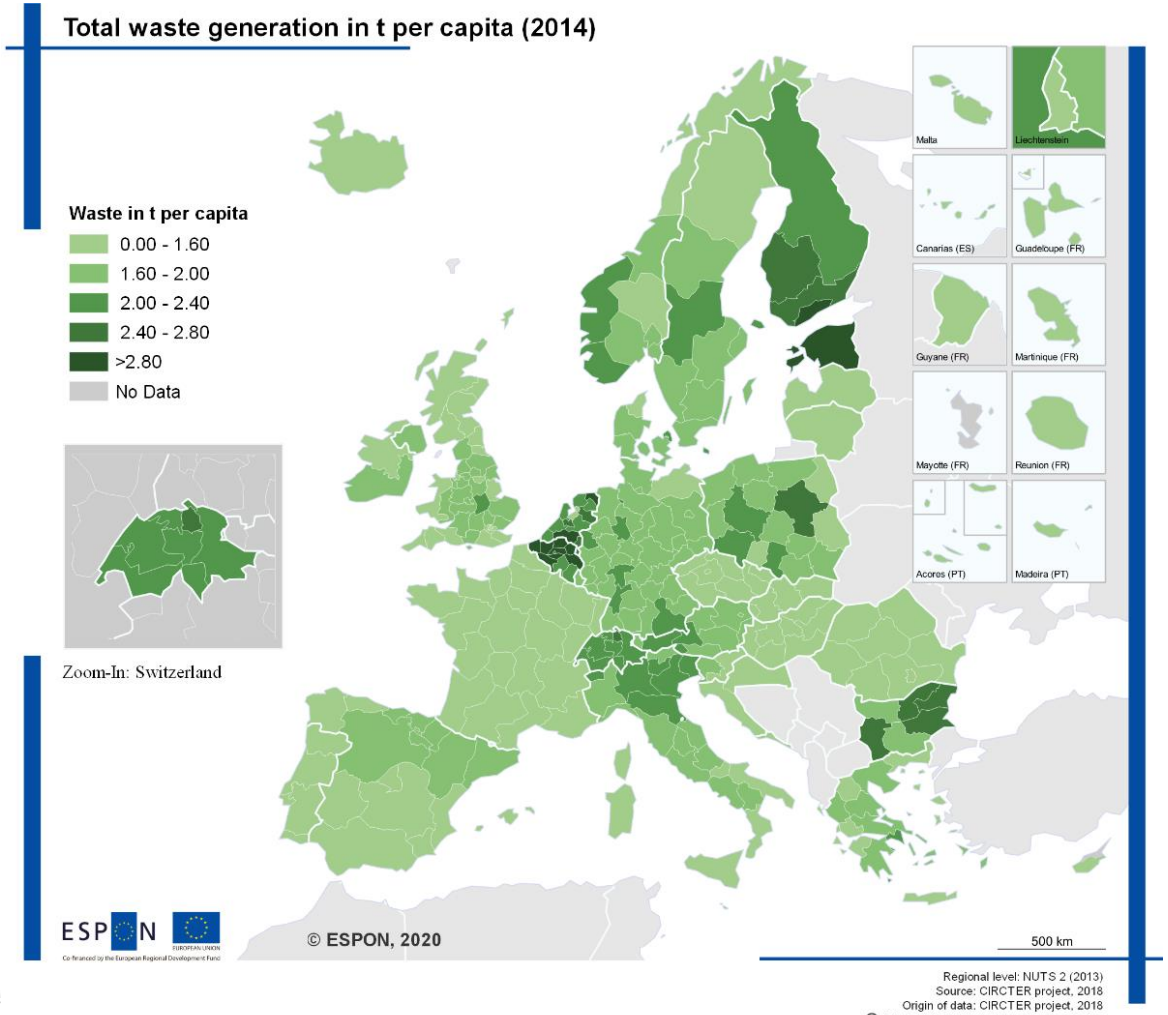
- Total waste generation (excluding major mineral waste)
- Construction and demolition waste
- Plastic waste
- WEEE (Electrical and electronic equipment waste)
- Food waste

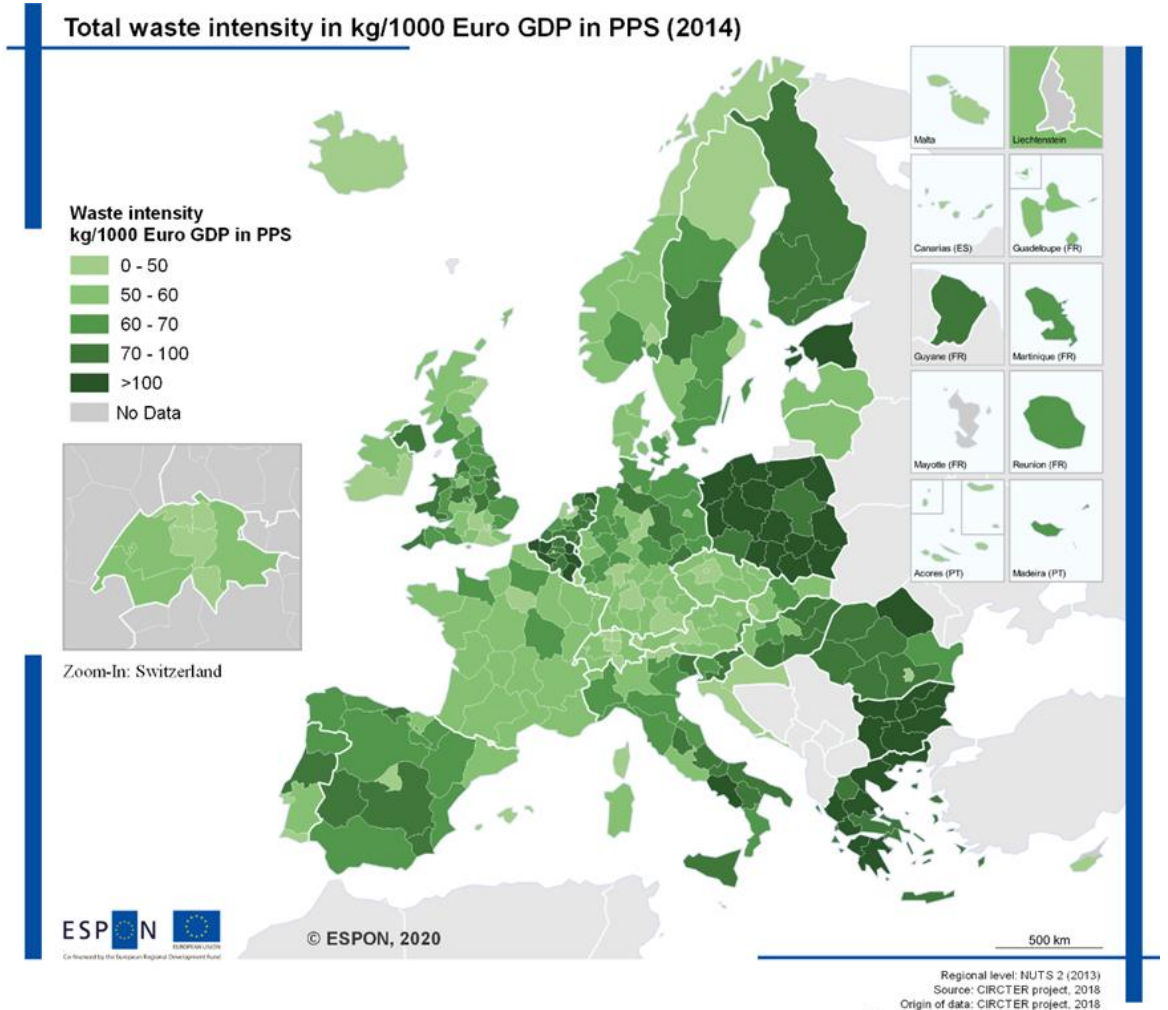
COMPETITIVENESS AND INNOVATION

- Turnover/employment generated by material providers
- Turnover/employment generated by technology providers
- Turnover/employment generated by Circular Business Models

Waste generation vs Waste intensity (R) per capita (L)

The Swiss case

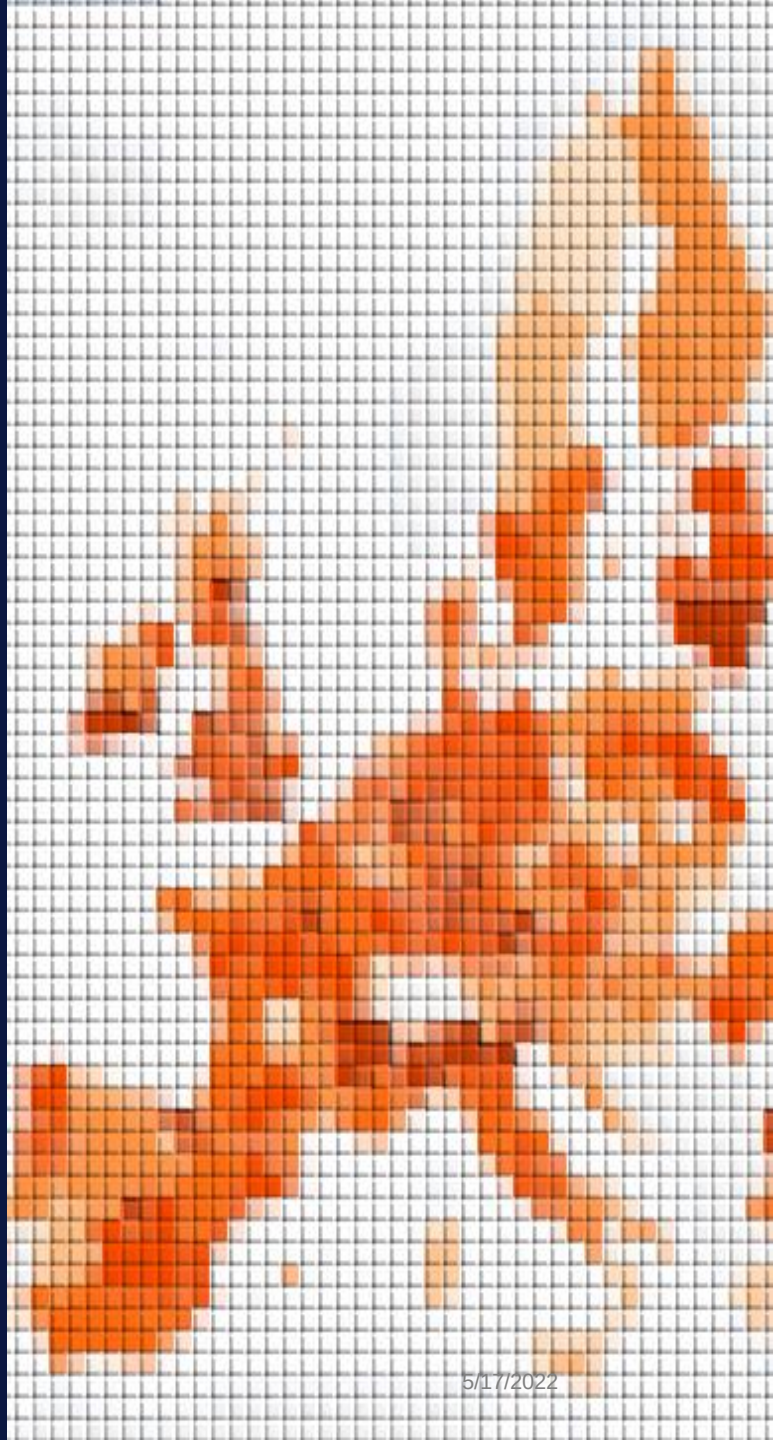




5

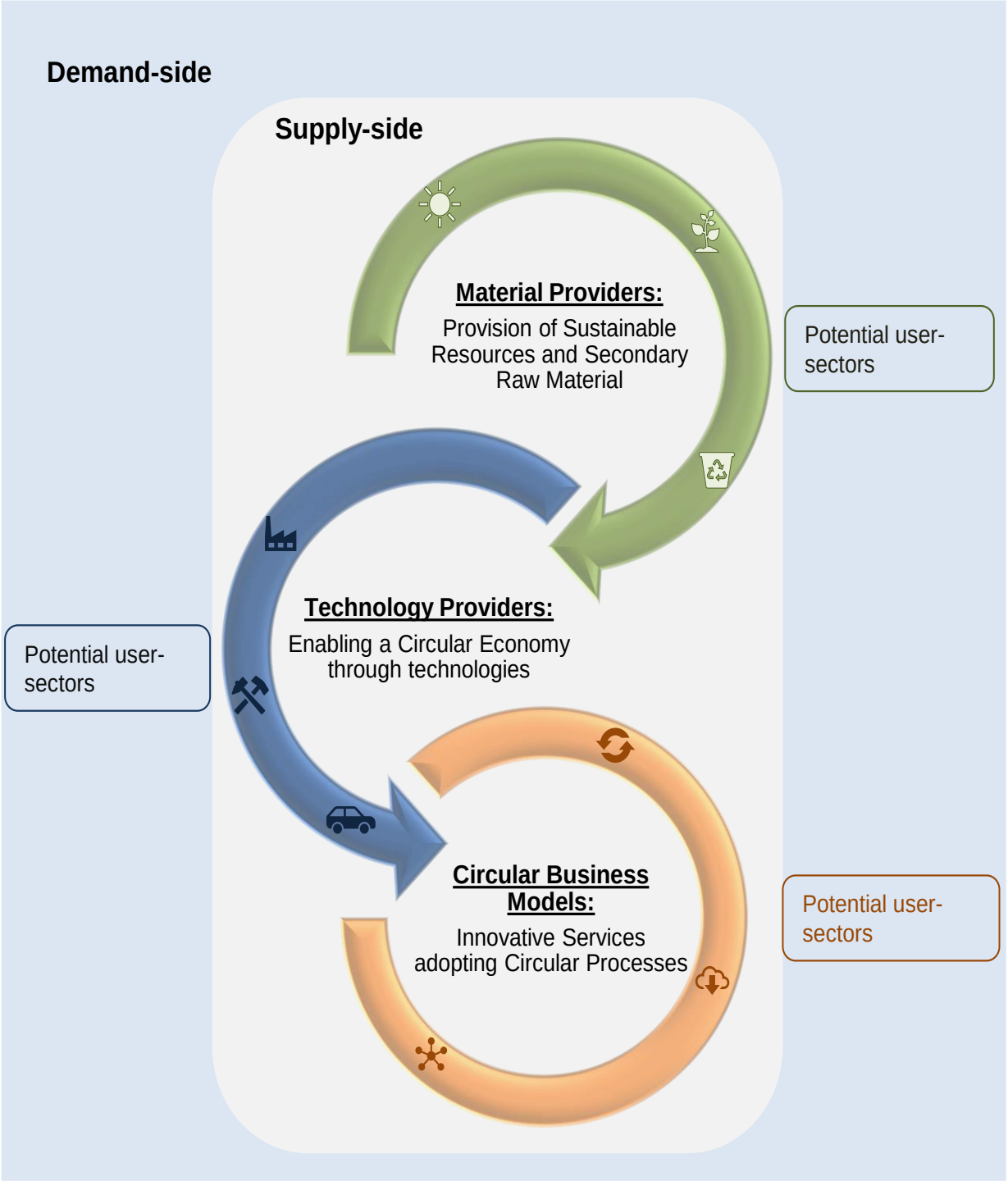
Key policy question #3:
What is the potential for implementing the circular economy in European regions and cities?

The potential for implementing the circular economy in European regions and cities

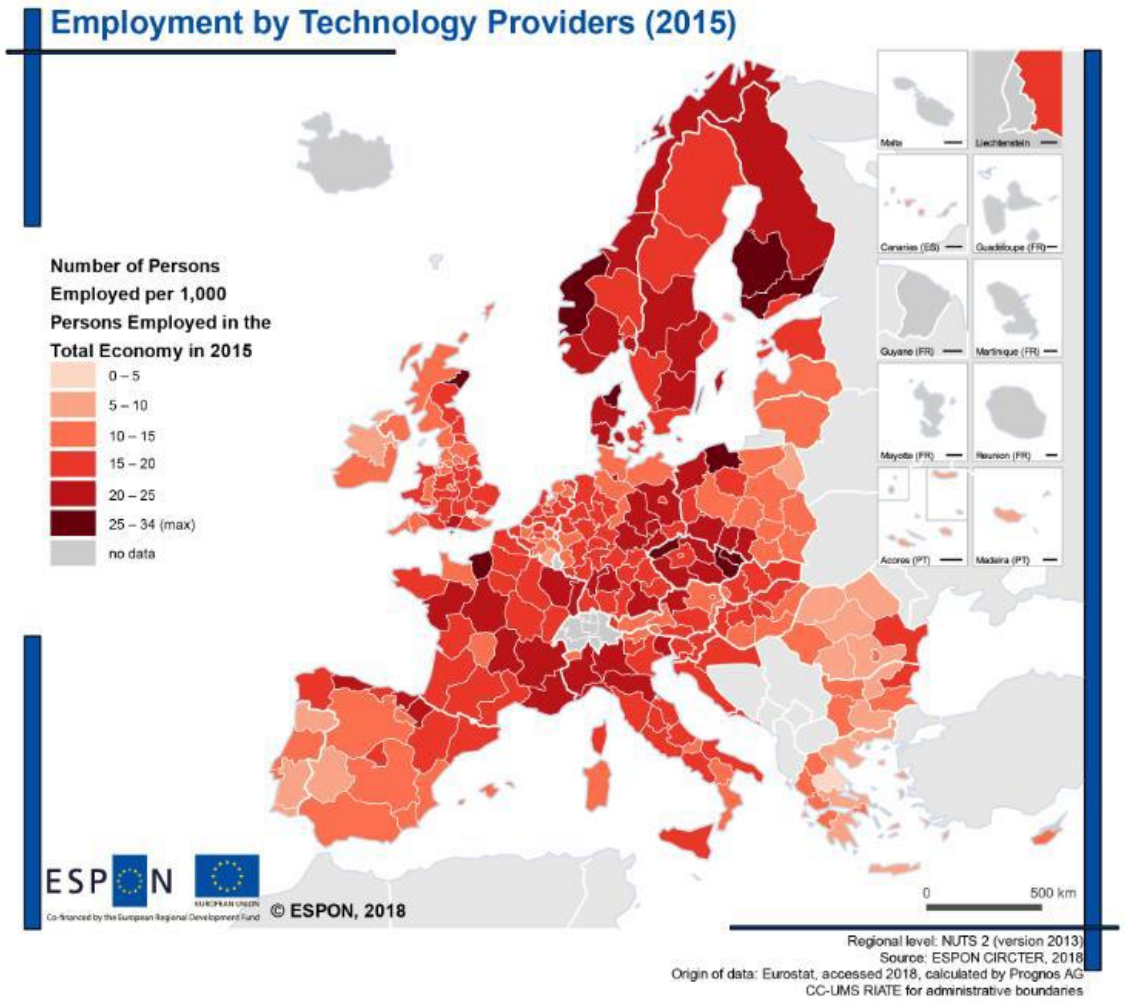


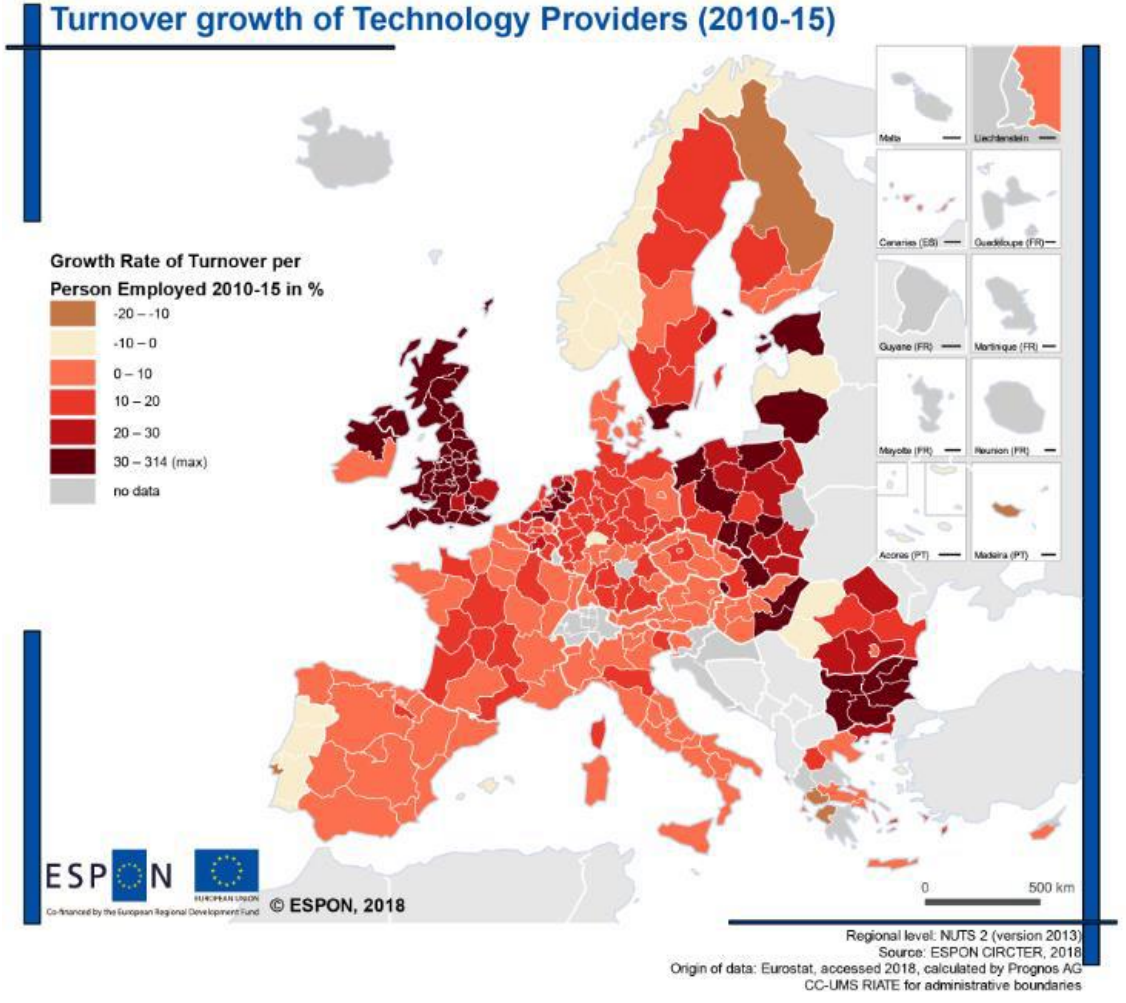
The CIRCTER circular economy model

- The circular economy model has a supply-side and demand-side.
- Demand side:
  - The users of a CE
- Supply side:
  - CE Material Providers
  - CE Technology Providers
  - Circular Business Models



CE Technology Providers
Employment (L) vs Turnover growth (R)





6

Key policy question #4:

What kind of common policy and actions can be implemented to promote a transition to circular economy across different types of European regions and cities?

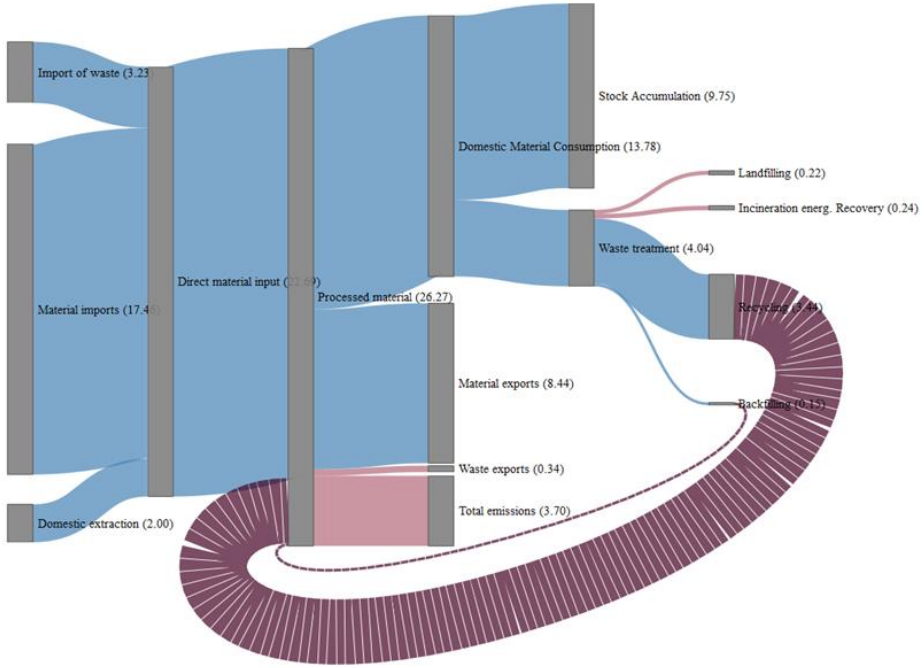
Take-aways and policy recommendations

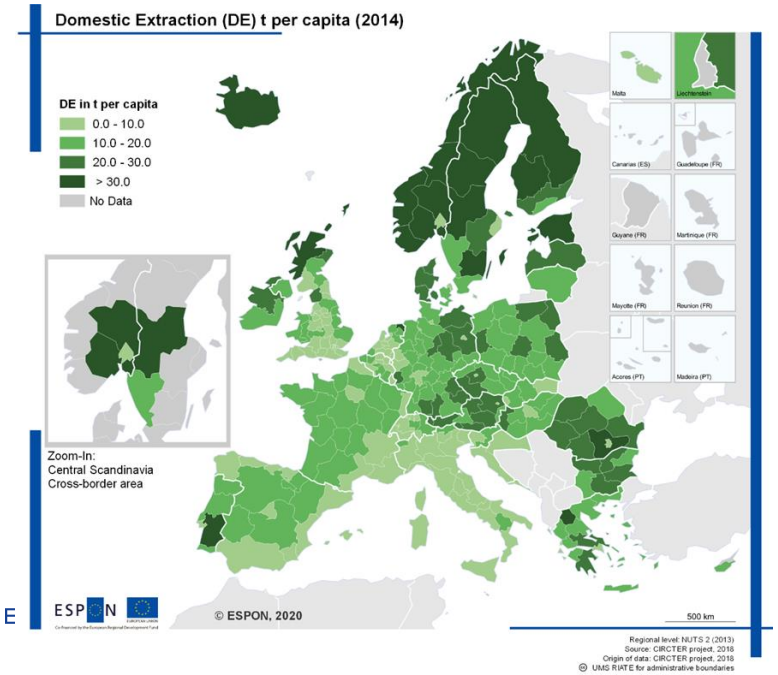
Key take-aways

- The circular economy is relevant for all types of regions. Local conditions guide how this can be materialised:
  - **Larger urban areas**: Companies operating Circular Business Models (CBM) benefit from a certain critical mass and from proximity to material and technology providers
  - **Rural regions**: Circular bioeconomy could benefit from opportunities which revitalizes rural economies.
  - **Industrial areas** are suitable for several circular economy strategies:
    - industrial symbiosis for territories where a diverse industrial ecosystem is already in place
    - schemes to product remanufacturing for territories where the products are originally manufactured
  - **Industrial regions in decline** may find opportunities in the emerging markets of secondary raw materials

Increase resilience of local economies

- A circular system can increase the resilience of domestic economies
- Considering circular principles:
  - Use existing renewable bio-resources,
  - Treat organic waste, co-products and by-products as resources for the bioeconomy





- Territories <u>with</u> natural assets and resources:
  - **Use your natural assets** and resources as a major asset and strive for a circular bioeconomy
- Territories <u>not</u> rich in natural resource:
  - **Reclaim secondary raw materials** from spent products, buildings and waste to reduce the risks of the global supply chain

The CIRCTER policy guide: structure

1. Why circular economy?

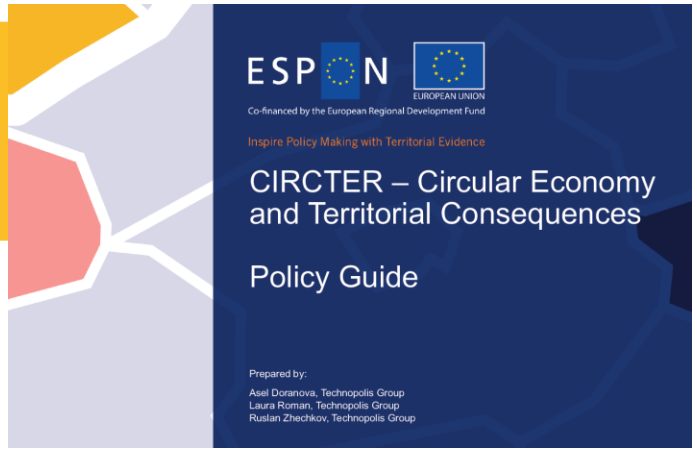
- concept
- definition
- elements

2. Towards a CE policy package in your territory

- assessment of the local context
- adopting the right policy strategy and targets
- set out the governance process
- building framework condition via tailored policy package

3. Useful resources

- existing studies
- guides, manuals, tools
- online resources



ESPON

EUROPEAN UNION

Co-financed by the European Regional Development Fund

Inspire Policy Making with Territorial Evidence

espon.eu

// More information:

https://www.espon.eu/circular-economy

Marjan van Herwijnen, ESPON EGTC

marjan.vanherwijnen@espon.eu

Center for Circular Economy

Circular Economy: opportunities for JFT

Digital JFT Platform Meeting
May 11, 2022

Thomas Mueller-Kirschbaum
Chief Scientist
Circular Valley Foundation
thomas.mk@circular-valley.org

Executive Summary

Why do we need a Circular Valley?

Emissions resulting from our current "linear economy" pose a major threat to the environment and to us – we need a place to cooperate on circular solutions to reduce emissions and close cycles

Why is the Rhine-Ruhr region ideal?

The Rhine-Ruhr region in Germany in a unique way combines industries in need of solutions with already existing solution providers and a broad scientific landscape; plus, it is a cosmopolitan region with a rich industrial tradition

How we work?

The development of the region towards the "Circular Valley" was started with an Accelerator for Circular Economy topics that will attract talent from all over the world - in particular from regions which need a sustainable transition - to work with companies from the region and beyond. And afterwards spread the sustainable solutions back into the regions with high needs.

Circular Valley

Five key reasons why the Circular Valley is at the Rhine / Ruhr metropolitan area

1 Access to companies needing solutions

2 Established and new ‘circular’ companies

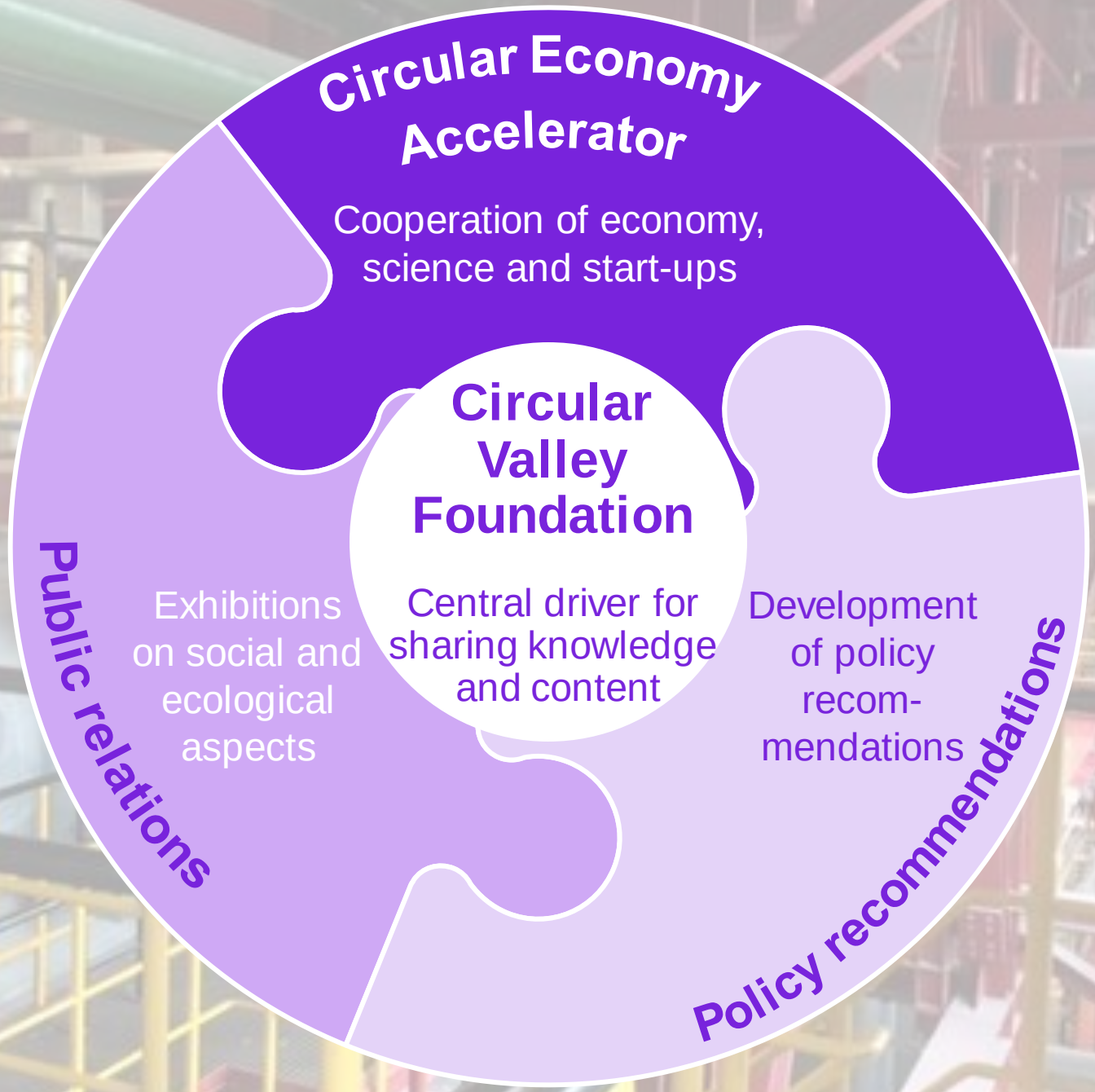
3 Attractive Science Landscape

4 Very cosmopolitan, huge cultural offerings

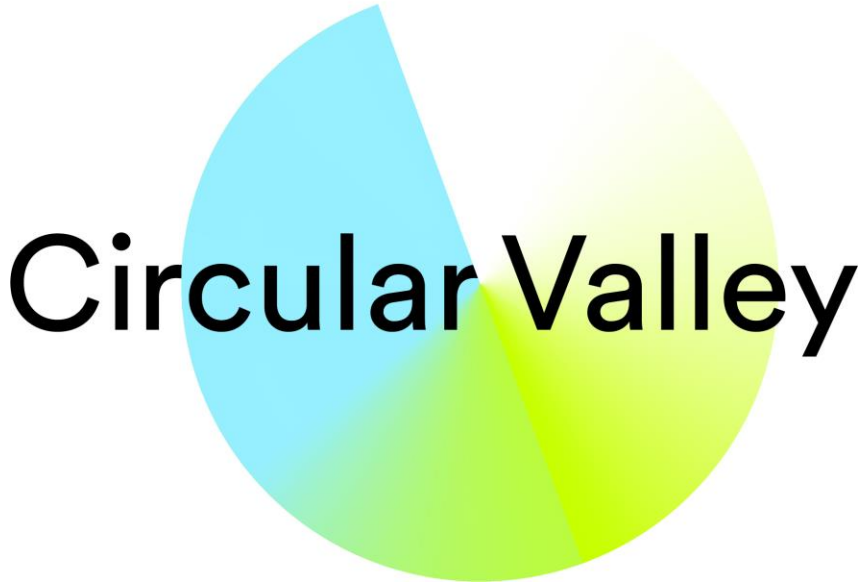
5 Rich history, that lives to the present day

Circular Valley

Circular Valley Foundation orchestrates the key activities



Circular Valley



THANK YOU!
HAPPY TO ANSWER YOUR QUESTIONS

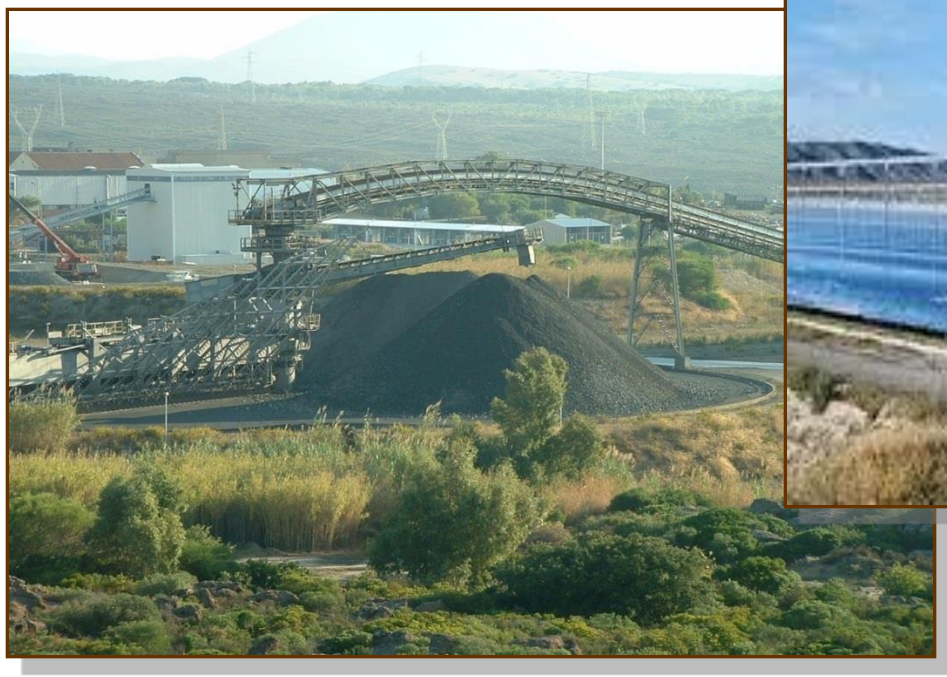
Thomas Mueller-Kirschbaum
thomas.mk@circular-valley.de

CARBOSULCIS SPA
Socio Unico

REGIONE AUTONOMA DELLA SARDEGNA

CARBOSULCIS from coal to green economy

Circular Economy: The smart reuse of mining sites



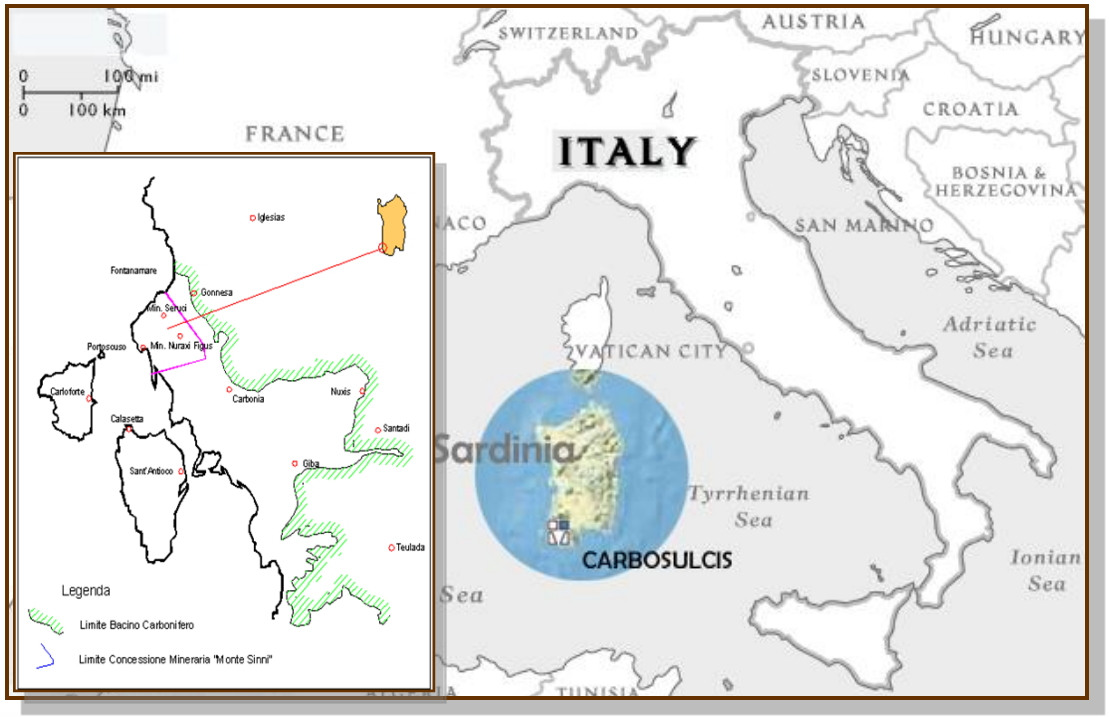
Doc. Francesco Lippi - Chief Executive
Doc. Eng. Fabrizio Pisanu – R&D

Just Transition Platform (JTP) Meeting – 11 May 2022

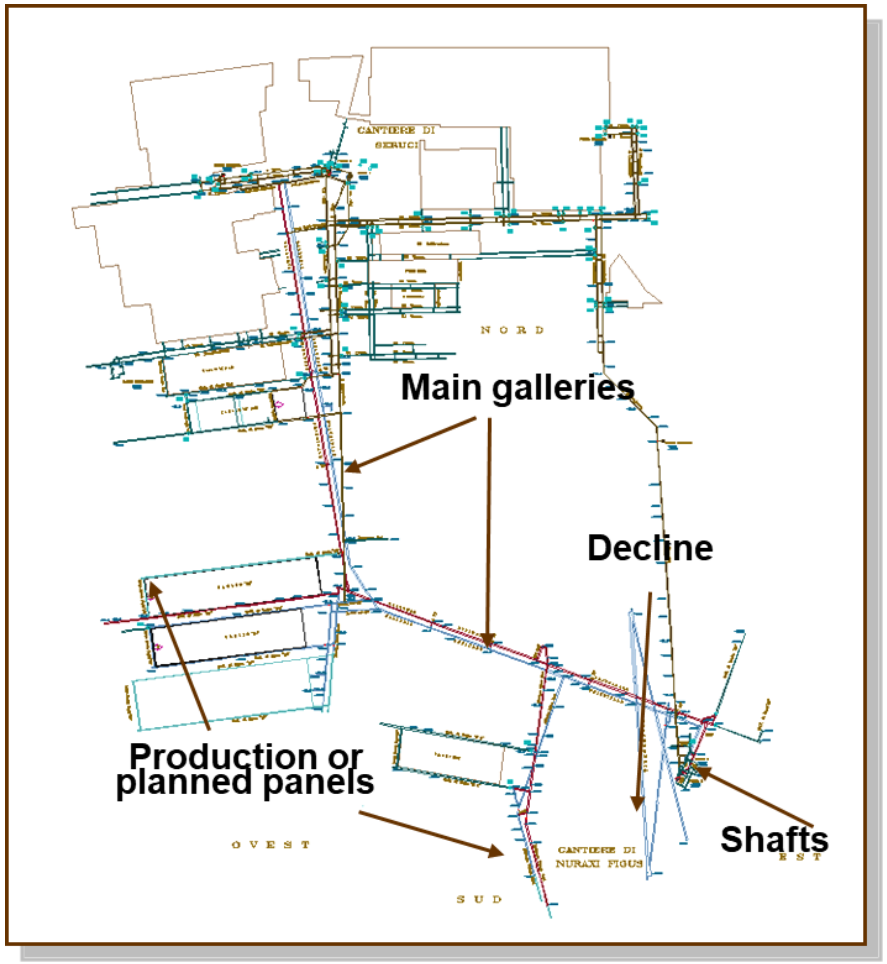
The Italian Coal Mining Company

Carbosulcis S.p.A. is a coal mining company based in SW Sardinia, Italy, managed by the Sardinian Autonomous Government since 1996, and now carrying out the Closure Plan, issued according to the European regulation 787/2010.

- ✓ The Company holds the "Monte Sinni" coal mining Concession
- ✓ It has been the only coal mine in Italy since mid 20th century
- ✓ Coal exploitation finished in December 2018
- ✓ The Sulcis Eocenic coal basin, worth of about 1 billion tons of sub-bituminous coal reserves, placed over a 400 km² area both in-shore and off-shore.



The Underground Coal Mine



Underground coal mine lay-out

- ✓ The production facilities are settled on a 200 Ha (2.000.000 m^2) surface site
- ✓ The amount of underground coal reserves in the mine concession is over 60 M tons
- ✓ More than 30 km of galleries have been tunneled underground (about 15 km are main galleries).
- ✓ Mine depth is between 350 and 500 m under the ground (400 m below the sea level)
- ✓ The connection between surface and underground takes place by four shafts and a 3 km long decline.

New mission of the Company & Industrial Plan

The new assumptions:

The mine is not as coal production site anymore, but a new green energy source, a place hosting advanced technologies for new industrial and economic life, respecting and sustaining the environment.

The mine is not a handicap, but an opportunity for the territory and the comunity to create innovation and developent.

The mine becomes the instrument, worth of hundred million euros, to build a contamination technology platform for companies, start-up and any stakeholder involved in Circular Economy.

Industrial Plan

Objectives & Instruments

- ✓ Closure Plan and the environmental recovery by end 2026
- ✓ Employment Safeguard
- ✓ Cultural and material heritage of the coal mine: infrastructures and the facilities in the underground and surface of the coal mine site
- ✓ Technologic Pole passing through research and innovation
- ✓ **Just Transition Fund**

Platform Sulcis 2050 and the Projects

The Carbosulcis site becomes a Pole of technology consisting of some of the excellences of the new circular economies :

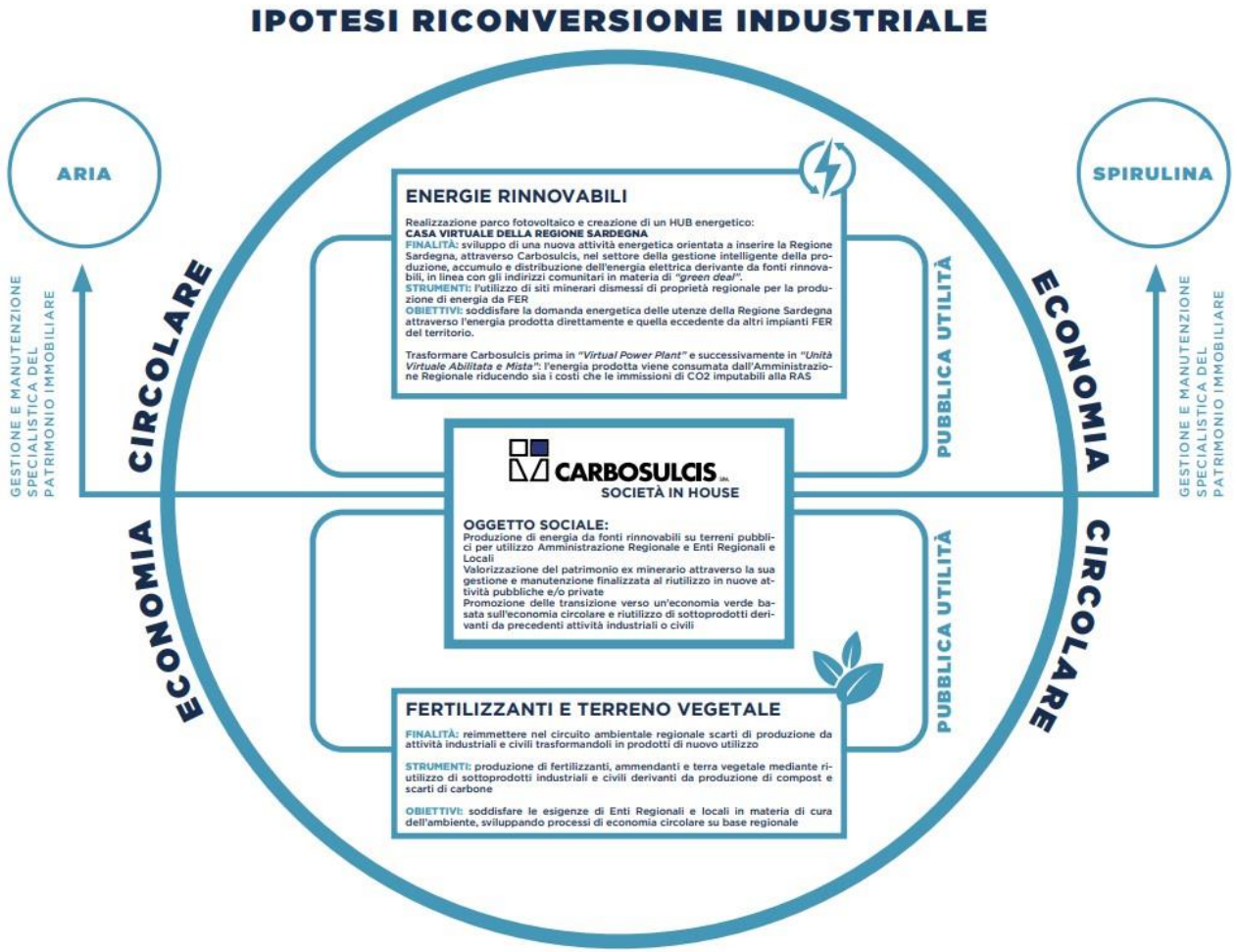
- Green energy
- Scientific base research development
- Environmental safe and innovative industrial processes
- Pharmacy and medical innovation
- Superfood production

Free surfaces, galleries, buildings, facilities, plants, frameworks, once belonging to the coal mine, today are available to achieve the Platform Sulcis 2050.

The Projects

- Energy Hub – Production & Storage
- Aria – Base research & Medical diagnostics
- Environmental fertilizers and depolluters – FeDE
- Spirulina Alga production
- High formation and training

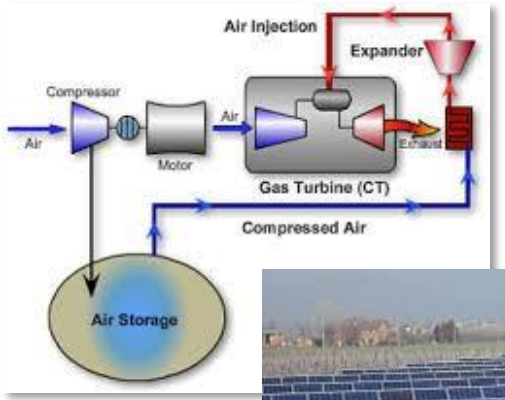
A Circular Economy Exemple

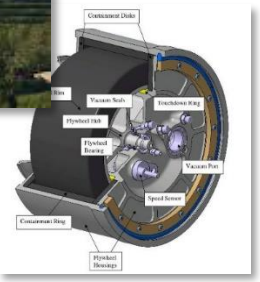


Energy Hub

Surface Production:

- ✓ 20 MWp photovoltaic plant
- ✓ 13 MWp windturbine
- ✓ 10 MW electrochemical storage
- ✓ 58 GWh per year, green energy production
- ✓ CO_2 reduction (up to 13.500 ton/year)
- ✓ Smart grids for energy management and optimization.



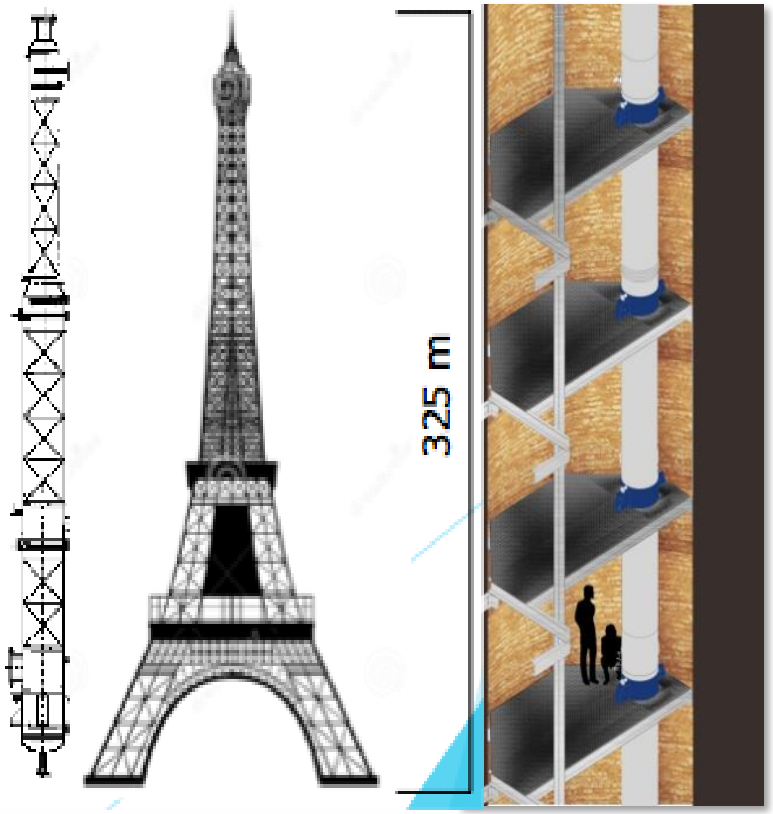


Underground Storage:

- ✓ Adiabatic Compressed Air Energy Storage Technology
- ✓ 400 m covered galleries
- ✓ Thermal recovery and storage in gas compression
- ✓ Thermal release in gas expansion
- ✓ 20 MWp power available from air storage units (scalable up to 100 MWp)
- ✓ 60 MWh max potential energy storage (scalable up to 300 MWh per load cicle)
- ✓ Flywheel technology for quick and intense energy response.

ARIA Project

ARIA Project *(Agreement RAS – INFN 18.3.2016)*: Cryogenic distillation column for stable isotopes production: ^{40}Ar to address the Dark Side project experimentation and ^{15}N, ^{13}C, ^{18}O for potential scientific and commercial purposes



Basic Idea

- ✓ Exploit height of coal mine shafts to host cryogenic distillation columns of undeprecedented height for special isotopic separation processes
- ✓ Unique, patented construction method and process allows strong reduction of driving costs for special isotopes production (energy costs)
- ✓ Strong cooperation with Italy and US research centers and Universities
- ✓ Argon isotopes central for the discovery of dark matter
- ✓ Rare isotopes of carbon, nitrogen, and oxygen absolutely crucial for proteomics and advanced medical diagnostics
- ✓ Production of bare isotopes to be followed by secondary transformation of isotopes in tens/hundreds of special molecules by startups co-located in same district

ARIA Project

Pilot plant at Nuraxi Figus site

Carbosulcis Resources and Assets:

- ✓ Professional workforce (engineers and technicians for project design, project approvals, maintenance, etc.);
- ✓ Special underground facilities:
  - ✓ 350 m deep shaft to host the column
  - ✓ Achieving over 3,000 continuous distillation stage column thanks to height of mine shafts available
  - ✓ 3 additional mine shafts available for futher utilization and industrial upgrade
- ✓ Special above ground facilities:
  - ✓ On-surface testing of the pilot plant (24 m high) in the «Laveria» building thanks to special overhead crane;
  - ✓ Office space, laboratory space for secondary transformation of isotopes

Environmental fertilizers and depolluters - FeDE

Coal Leaching: Fertilizer production according to the European Patent n. PCT/IT2009/000290 entiteld "Process of Desulphurization of Low-Medium Rank Coal "

Resources and Assets:

- ✓ Experimentation in the pilot plant and company lab
- ✓ 120.000 ton of feeding plant coal (<120µm)
- ✓ Synergy with main organic compost producer (up to 10.000 ton/year)

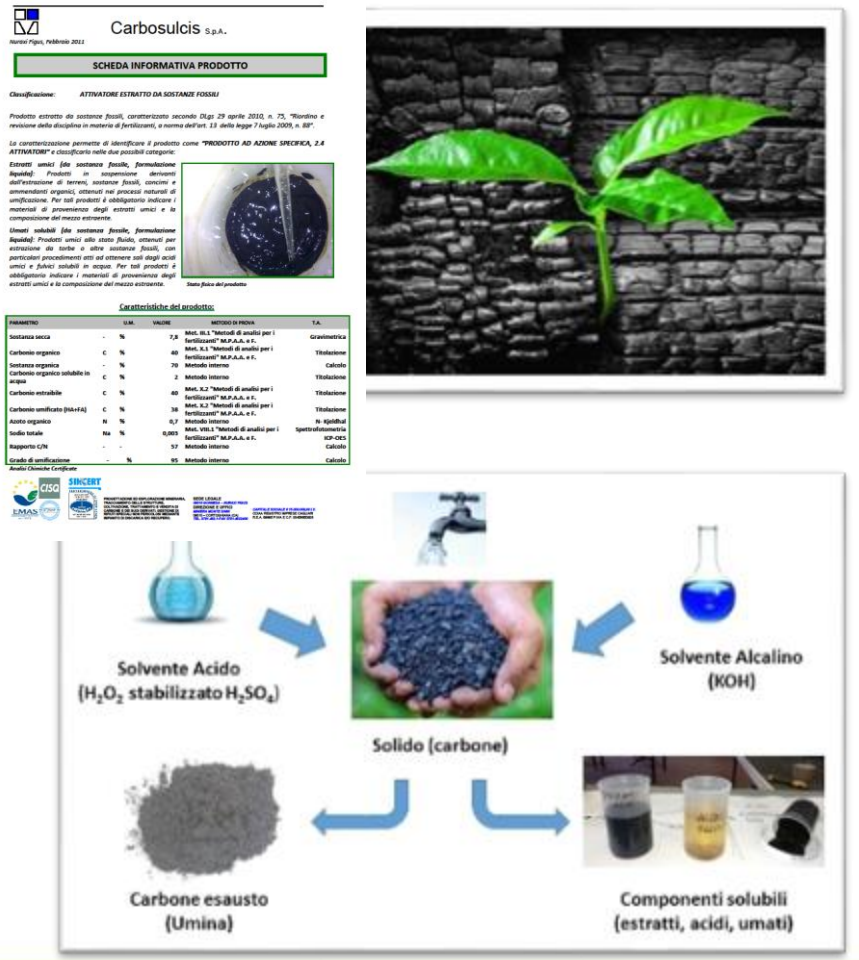
Application:

- ✓ Up-grade and up-scale of the plant (5.500 ton/y new product)
- ✓ Optimization and improvement of the production process with and without the mix with compost:
  - reliability of the process,
  - quality of the product.

Environmental fertilizers and depolluters - FeDE

Objective:

- ✓ Exploitation and depletion of the thin coal waste pond
- ✓ Fulfillment of a circular economy model: Carbosulcis by-products of coal and Technocasic organic compost for a new high value outcome
- ✓ Create a regional supply chain with producers and utilizers
- ✓ Wide utilization for soil feeding and environmental depollution.



Spirulina Alga Production

From a patented process co-owned by Carbosulcis and Fondazione Aria

Carbosulcis Resources and Assets:

- ✓ Large surfaces (several hectares of brown fields) available to host algaes production plants
- ✓ Geothermal energy from underground (warm 40°C water) available at rate of 3.000 m^3/day of water extracted from from underground mine
- ✓ Excellent solar irradiation, amongst the most continuous and substantial in Italy

Objectives:

- ✓ Production of high quality Spirulina alga, in special photobioreactors making use of proprietary technology;
- ✓ Development of controlled quality production plans to serve nutraceutical and pharmaceutical markets with products rated for highes-quality market segment;
- ✓ Additional and unique added values is strong commonality with Aria project:
  - ✓ Cultivation of spirulina is first necessary step for encapsulation of ^{13}C in organic molecules
  - ✓ From there, move forward to possible production of tens/hundreds of special molecules tagged with ^{13}C for proteomics and advanced medical diagnostics

Predicted Outcomes

Projects overall financial need 210 M€

- 156 M€ by the JTF
- 54 M€ by other financial mechanisms

Outcomes

- Creation of the Platform Sulcis 2050 as a long lasting perspective
- Relaunch of the Sulcis Iglesiente economy and employment
- Positive occupational perspectives
  - ✓ maintenence of the Carbosulcis workforce (current 110 units)
  - ✓ increase of the direct employment up to 302 units at operating speed
  - ✓ 1240 new workers between direct and indirect employment in the Sulcis Iglesiente by 2030
  - ✓ 17 new companies or enterprises in the Sulcis Iglesiente by 2030.

Thanks for your attention!

Site: Miniera Monte Sinni
09010 Gonnesa (SU) - Italy

WebSite: www.carbosulcis.eu
Email: segreteriagenerale@carbosulcis.eu

Tel.: 07814922503