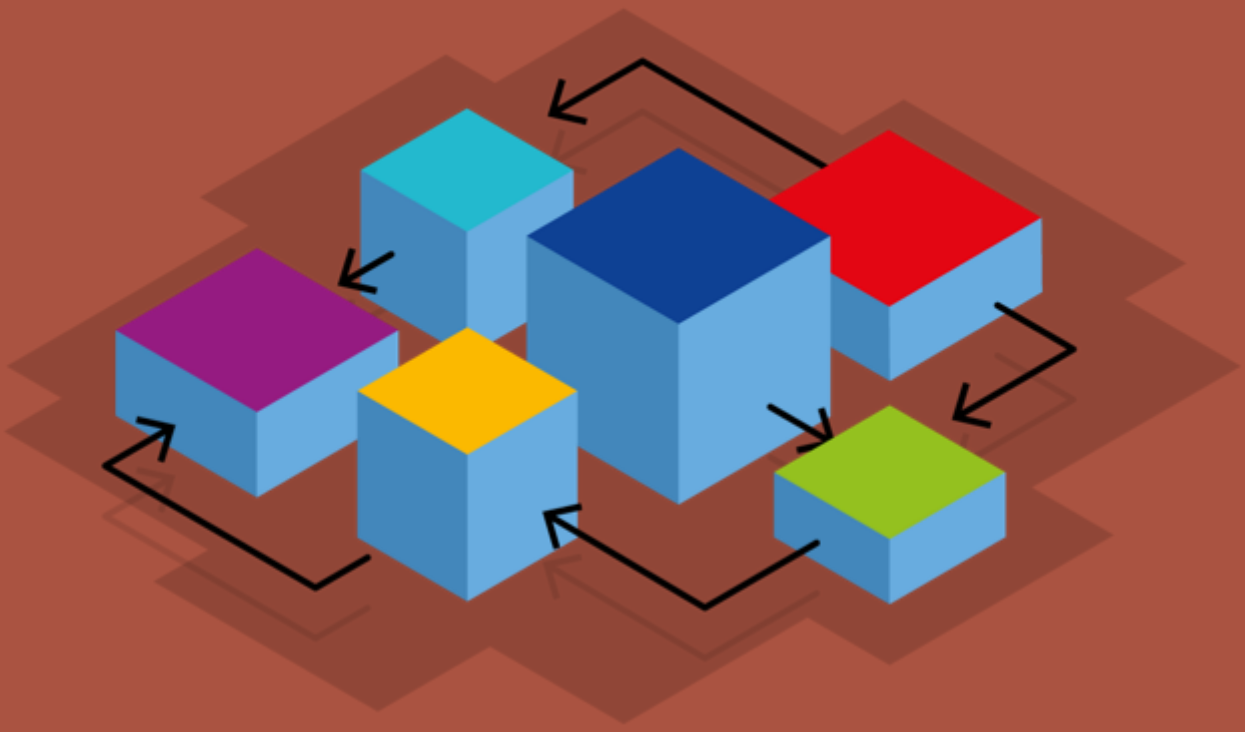
European Commission



European Cluster Observatory

REPORT

Priority Sector Report: Circular Economy

Prepared by:

Christian Ketels and Sergiy Protsiv

Center for Strategy and Competitiveness Stockholm School of Economics

February 2017

Internal Market, Industry, Entrepreneurship and SMEs

European Cluster Observatory in Brief

The European Cluster Observatory is a single access point for statistical information, analysis and mapping of clusters and cluster policy in Europe. It is primarily aimed at European, national, regional and local policy-makers and cluster managers and representatives of SME intermediaries. It is an initiative run by the 'Clusters, Social Economy and Entrepreneurship' unit of the European Commission's Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs and aims to promote the development of more world-class clusters in Europe, notably with a view to promoting competitiveness and entrepreneurship in emerging industries and facilitating SMEs' access to clusters and internationalisation activities through clusters.

The ultimate objective is to help Member States and regions to design smart specialisation and cluster strategies that will help companies to develop new, globally competitive advantages in emerging industries through clusters, and in this way to strengthen the role of cluster policies in boosting Europe's industry as part of the Europe 2020 Strategy.

In order to support evidence-based policy-making and partnering, the European Cluster Observatory provides an EU-wide comparative cluster mapping with sectoral and cross-sectoral statistical analysis of the geographical concentration of economic activities and performance. The European Cluster Observatory provides the following services:

- **a biannual 'European Cluster Panorama' (cluster mapping)** providing an update of and extension to the statistical mapping of clusters in Europe, including for ten related sectors (i.e. cross-sectoral) and a correlation analysis with key competitiveness indicators;
- **a 'European Cluster Trends' report** analysing cross-sectoral clustering trends, cluster internationalisation and global mega trends in industrial transformation; identifying common interaction spaces; and providing a forecast for industrial and cluster opportunities;
- **a 'Regional Ecosystem Scoreboard'** setting out strengths and weaknesses of regional and national ecosystems for clusters, and identifying cluster-specific framework conditions for three cross-sectoral collaboration areas;
- **a 'European Stress Test for Cluster Policy',** including a self-assessment tool accompanied by policy guidance for developing cluster policies in support of emerging industries;
- **a showcase of modern cluster policy practice, provided in the form of advisory support services to six selected model demonstrator regions**. The services offered include expert analysis, regional survey and benchmarking reports, peer review meetings and policy briefings in support of emerging industries. The policy advice also builds on the policy lessons from related initiatives in the area of emerging industries;
- **the European Cluster Conferences** 2014 and 2016, which bring together **Europe's cluster policy-makers and stakeholders** for a high-level cluster policy dialogue and policy learning, and facilitate exchange of information through, e.g. webpages, newsletters and videos.

More information about the European Cluster Observatory is available at the EU cluster portal at: http://ec.europa.eu/growth/smes/cluster/observatory/.

This work has been carried out under a service contract for the European Commission's Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. It is financed under the Competitiveness and Innovation Framework programme (CIP) which aims to encourage the competitiveness of European enterprises. The views expressed in this document and the information included in it do not necessarily reflect the opinion or position of the European Commission.

Table of Contents

1. Introduction

Environmental industries encompass all economic activities that reduce environmental pressures of human activity. This is expected to result from the more efficient use of natural resources and from reducing harmful emissions across the whole lifecycle of goods and services. The sector is one of the key thematic orientations of applications and selected cluster projects for new industrial value chains (INNOSUP-1) under Horizon2020 and of the thematic priorities of regional smart specialisation strategies.

Environmental industries include a range of products, services, technologies and processes serving many different economic sectors. On the one hand, environmental industries include traditional economic sectors (e.g. renewable energy production). On the other hand, the area includes services, technologies and processes that can serve - or create value for - any industrial sector (e.g. material and energy efficiency services can be applied in any manufacturing sector). The latter means that environmental industries rely on cross-sectoral collaboration. The area is characterised by high interdisciplinarity and high growth potential as raw material costs are rising and consumer and regulatory demands increasingly shift towards more sustainable products.

The main sub-sectors include Renewable energy; Material and energy efficiency; Waste management; Re-use, recycling and remanufacturing; Repair and maintenance; Sharing economy, including renting and leasing; Environmental services, including environmental engineering; Water; and Environmental protection.

Circular economy is “an industrial system that is restorative or regenerative by intention and design. It replaces the end-of-life concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models” (Ellen McArthur Foundation 2012). The business case of the model is based on ‘keeping natural resources in the economy for as long as possible while retaining their economic value and technical properties’ (O’Brien et al 2014).

Circular economy model can be implemented through diverse activities and business models. This report will focus on sustainable design, re-use, remanufacturing, recycling, repair and maintenance as well as the emergence of new business models enabling a more efficient use of products such as sharing, leasing or renting.

Sustainable design is a design that aims at satisfying user’s needs with the most efficient use of resources throughout the product’s lifecycle (including manufacturing, use and end-of-life). Depending on the specific needs to be met (or services to be delivered) and the lifecycle assessment of resource use, the design may give a preference to the extension of life span of products (durability and reparability), using secondary materials, ensuring low-energy consumption during the use phase, etc. One example for a sustainable design is the design of an office chair by Steelcase which is 99% recyclable and made from up to 44% of recycled contents. It can be disassembled within 5 minutes and repair and upgrade is easy.

Repair and maintenance are activities taking place during the use phase of product that aim at prolonging its life span. Repair is defined as a correction of a specified fault in a product or component and returning it to satisfactory working condition (Gray and Charter 2007).

Maintenance has a wider scope and is defined as a series of activities carried out in the use phase of the product ‘to prolong system availability’. Maintenance includes installation, repairs and servicing,

cleaning, diagnostics (on-site and remote), technical support (documentation and personal) as well as courtesy replacement of product whilst product is being repaired as well as cleaning (Evans 2013).

While repair and maintenance is comparably common in investment goods such as machinery or electronic equipment it is less common for consumer products like clothing. An example is the outdoor clothing company Patagonia that offer repairs to worn or damaged clothes at a dedicated facility with 45 full-time staff.

Re-use is an operation by which products or components that are not waste are used again for the same purpose they were originally designed (EU Waste Framework Directive). In other words, the product is used repeatedly in the same form rather than being reprocessed as in the case of recycling (Sheldon 2006). A common example is the repeated use of carrier bags for shopping or as bin bags.

Remanufacturing is a manufacturing activity applied to an end-of-life product or component in order to return it to like-new or better performance with a warranty to match. This is enabled by a dedicated product design that allows for an efficient remanufacturing process. An example for how remanufacturing is done is provided by Caterpillar that produces among others construction and mining equipment. Caterpillar has a specific product line called “Reman” in which products at the end of their life are returned to a Reman facility and disassembled to the smallest part. After cleaning and inspection accepted components are converted in to production ready material by using salvage techniques such as resurfacing, sleeving, machining and balancing.

Recycling refers to any operation by which waste materials are reprocessed into products or materials (EU Waste Framework Directive). Direct recycling is an operation by which materials are reprocessed to be put to the same general purpose whereas indirect recycling implies that the reprocessed materials are used for a different purpose (Sheldon 2006). Recycling might be the best known circular economy activity with existing national systems to recycle for instance cardboard, newspaper and magazines, plastic, aluminum, batteries or light bulbs.

Business model is a broader concept that describes ‘the rationale of how an organisation creates, delivers, and captures economic, social, and other forms of values’ (Osterwalder et al 2010). The components of business models typically include: value proposition, i.e. the value that a business delivers to its customers), decisions on customer segmentation; products and services and associated with value to offer; strategic partners; key resources to create, and channels to deliver, value; and underlying cost structure and revenue streams to ensure the financial viability of the business. A number of different options for business models focused on circular economy and resource efficiency can be identified. This includes product-service systems, hire and leasing or collaborative consumption mod-els. An example for product service systems is Xerox selling ‘print services’ instead of printers. Printers are designed to be remanufactured and to reduce waste in operation. Examples for hiring and leasing are Spotify or Love Film, which provide on-demand delivery of music or movies via the Internet. Collaborative consumption is mostly facilitated by online platforms. Collaborative consumption between businesses is an option which allows the product owner to generate some income and provides the product user with cheaper access to the product.

Operationalizing the circular economy for quantitative analysis is difficult. A key challenge is that a significant part of the circular economy idea refers to *how* specific industries should operate, not to *who* they are in general. The official data collected by the European Cluster Observatory[1], based on NACE industry classifications, does not allow us to make this distinction. The circular economy is, for example, a highly relevant idea to the automotive industry, applying to how cars are designed, pro-

[1] *See the European Cluster Panorama 2016 and related documents for more details on data and methodology: http://ec.europa.eu/growth/smes/cluster/observatory/cluster-mapping-services/cluster-panorama_en*

duced, used, and recycled. But including all industries in the automotive cluster category in the definition of circular economy would clearly be misleading.

Even more narrow definitions, for example including all car rental companies because they enable shared use of cars, is not informative for policy makers. In dialogue with the European Commission services we have instead focused on various repair and maintenance services, where capital goods are covered by section 33.1, vehicles under 45.2, and other goods under section 95. In addition, we capture recycling using codes 38.32 “Recovery of sorted materials” and 46.77 “Wholesale of waste and scrap”, while re-use is covered by industry 47.79 “Retail sale of second-hand goods in stores”. See the appendix for the full set of codes.

In contrast to the cluster categories and the emerging industries covered in other reports by the European Cluster Observatory this definition of the Circular Economy includes also a number of ‘local industries’. Local industries do not compete across regions and are present essentially everywhere in line with the overall level of economic activity. While these local industries account for the majority of all jobs, it is the traded industries that are the true engines of prosperity dynamics. For measuring the size of the Circular Economy, however, it is important to include the relevant industries despite their local nature.

When interpreting the data on the presence of industries included in this definition of the Circular Economy, one has to recognize the implications of including local industries: less competitive regions tend to have lower employment in traded industries, which will make their relative employment in local industries, including those related to the Circular Economy, appear higher. And less competitive regions will tend to have higher numbers of employees, but lower levels of productivity in any given industry. A relatively high level of employment in the Circular Economy does thus not automatically signal progress on moving towards a Circular Economy. In overall competitive regions with high levels of prosperity it will, while in lagging regions it is more likely to reflect the weakness of the overall economy.

2. Overview

Circular Economy is a large sector comprising nearly 2% of the total European employment. More than 10% of these employees were added since 2008 (while the overall Employment growth was just 5%) reflecting continued move towards service-oriented sectors. The wages are substantially lower than the European average and have remained stagnant in the recent years.

Table 1: Basic Facts on Circular Economy

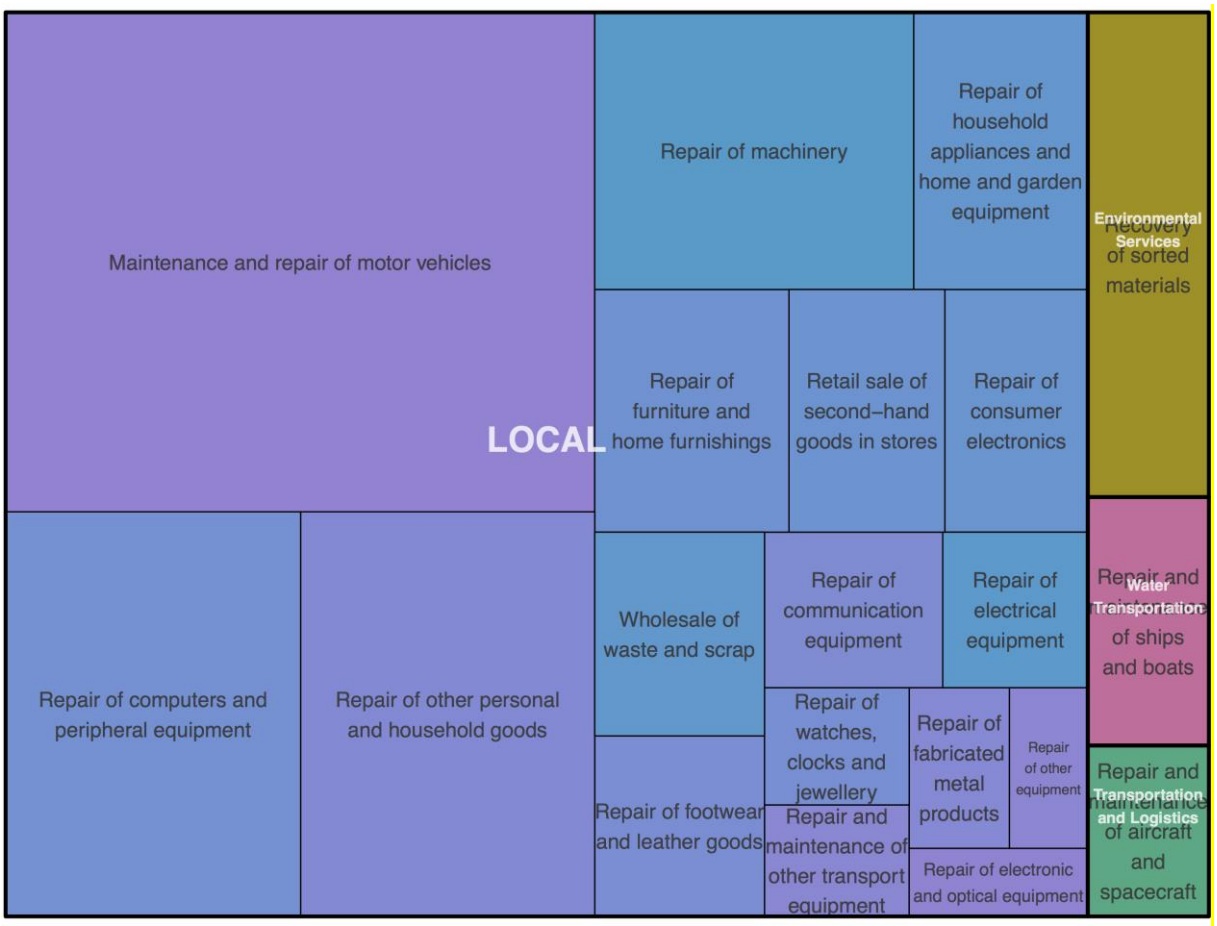
Indicator	Level in 2014	Change since 2008	Share of overall economy
Employment	4 935 384	10.28%	1.92%
Establishments	1 130 030	3.70%	2.13%
Average Wage	26 135	0.37%	81.70%
Gazelle Employment	49 287	N/A	1.29%

While Circular Economy has somewhat smaller firms (with 4.4 people per establishment compared to 4.8 in the overall economy), it does not necessarily stem from higher entrepreneurship rates as the share of gazelle employment is about two thirds compared to the economy as a whole.

3. Composition

The Circular Economy sector consists primarily of local industries which cover more than 90% of the sector's employment. The remaining employees come from Environmental Services, Water Transportation, and Transportation and Logistics cluster categories, which cover recovery of sorted materials and specialised repair operations respectively.

Figure 1: Circular Economy industry composition[2]



Overall, the majority of employees (90%) are engaged in repair and maintenance-related activities, predominantly of vehicles and consumer goods. Since repair services often require minimum turnaround time, this results in the spatial distribution that closely tracks the distribution of consumers. Thus, we do not expect to find very pronounced concentrations of Circular Economy industries, at least given the way they can be measured using industry statistics.

[2] *The size of the different boxes is proportional to industry employment*

In terms of occupational composition, Circular Economy industries have a much larger share of craft-related professions at the expense of all others. The share of “Craft, Trade, Operators, Assemblers” is 58% which is nearly triple the share of craft-related occupations in the overall employment. Specific occupations dealing with repair of machinery, electronics, and general consumer goods are overrepresented by 6.5, 5.5, and 5.5 times respectively.

Table 2: Occupational profile of employment in Circular Economy

Occupation	Employment	Employment share	Overall employment share
Craft, Trade, Operators, Assemblers	2 595 100	58.2%	21.7%
Metal, Machinery and Related Trades Workers	1 115 900	25.0%	3.9%
Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers	635 600	14.3%	2.6%
Electrical and Electronic Trades Workers	387 500	8.7%	1.6%
Other	456 200	10.2%	13.7%
Officials, Managers, Professionals, Technicians	1 150 300	25.8%	43.9%
Science and Engineering Associate Professionals	338 000	7.6%	3.6%
Other	812 300	18.2%	40.4%
Service, Sales, Elementary	438 300	9.8%	25.4%
Clerks	272 200	6.1%	9.0%

4. Current Patterns

The strong regions in Circular Economy industries are spread rather evenly across Europe with the largest concentrations in France, Italy, and Poland. This further reinforces the fact that most relevant industries are more local in nature and are thus spread rather evenly with population. One also needs to be aware that the strong national patterns (i.e. discontinuities across national borders) could reflect the differences in the ways the industries are defined in different countries and not pure cluster strength.

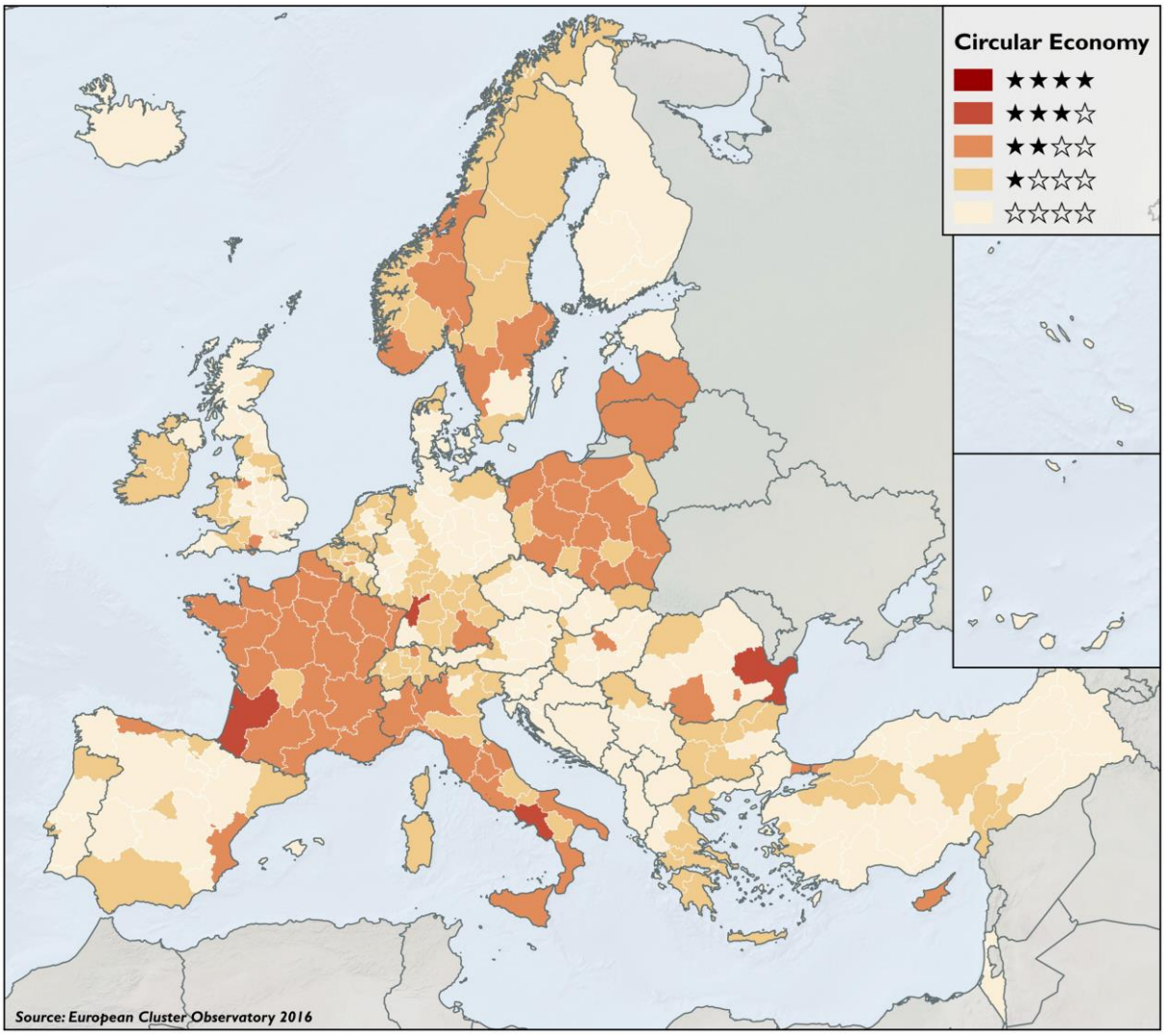
Table 3: Europe's top locations[3] in Circular Economy

#	Re-gion	Region Name	Largest City	Employ-ment	LQ	Avg. Wage, PPP	Annual Growth	Ga-zelle Empl. Share	Star s
1	FR61	Aquitaine	Bordeaux	77 003	3.47	38 945	15.9%	0.2%	3
2	RO22	Sud-Est	Constanta	24 242	1.29	9 613	-3.8%	3.9%	3
3	DE12	Karlsruhe	Karlsruhe	36 120	1.28	23 909	N/A	0.1%	3
4	ITF3	Campania	Naples	35 736	1.23	22 438	5.53%	4.0%	3

The degree to which the industries are evenly spread is confirmed when analyzing the top clusters in the sector: only four of them have 3 stars and all but one have location quotient below 1.3. This low value of specialization suggests that the basic ingredients of the Circular Economy are present in most regions in Europe. It could also mean that we cannot capture some of the more innovative applications using industry-level data.

[3] *We sort locations here and in all following sections by the number of stars, followed by LQ*

Figure 2: Leading regions in Circular Economy



The composition of the top clusters is very often a mix of scientific professionals and repair-oriented craftsmen. In particular, Karlsruhe in Germany and several regions in France (Montpellier, Amiens, Besacon, Orléans) have “Science and Engineering Professionals” or “Science and Engineering Associate Professionals” among the top-3 occupations. On the other hand, the most common crafts-related professions are “Metal, Machinery and Related Trades Workers” and “Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers” largely dealing with maintenance of capital and consumer goods respectively.

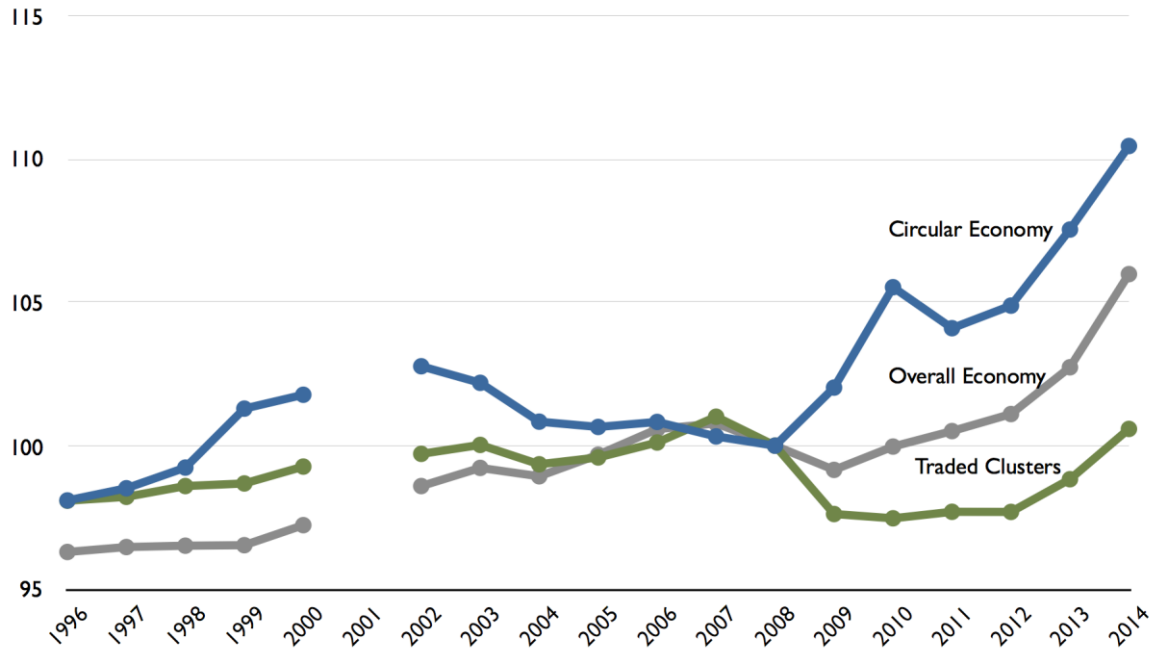
Table 4: Strategic profiles of top locations in Circular Economy

Region	Region Name	Largest City	Top 3 Occupations
FR61	Aquitaine	Bordeaux	75 Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers 52 Sales Workers 72 Metal, Machinery and Related Trades Workers
RO22	Sud-Est	Constanta	72 Metal, Machinery and Related Trades Workers 93 Labourers in Mining, Construction, Manufacturing and Transport 31 Science and Engineering Associate Professionals
DE12	Karlsruhe	Karlsruhe	74 Electrical and Electronic Trades Workers 72 Metal, Machinery and Related Trades Workers 21 Science and Engineering Professionals
ITF3	Campania	Naples	74 Electrical and Electronic Trades Workers 75 Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers 72 Metal, Machinery and Related Trades Workers
FR53	Poitou-Charentes	Poitiers	75 Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers 93 Labourers in Mining, Construction, Manufacturing and Transport 72 Metal, Machinery and Related Trades Workers
FR25	Basse-Normandie	Caen	75 Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers 52 Sales Workers 72 Metal, Machinery and Related Trades Workers
FR81	Languedoc-Roussillon	Montpellier	31 Science and Engineering Associate Professionals 21 Science and Engineering Professionals 52 Sales Workers
FR22	Picardie	Amiens	75 Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers 21 Science and Engineering Professionals 51 Personal Services Workers
FR43	Franche-Comté	Besançon	75 Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers 31 Science and Engineering Associate Professionals 35 Information and Communications Technicians
FR24	Centre	Orléans	75 Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers 73 Handicraft and Printing Workers 31 Science and Engineering Associate Professionals

5. Evolution

While the dynamics of the Circular Economy prior to crisis was similar to the economy as a whole, it bounced back much faster and stronger since 2008. The total employment in the industries comprising the Circular Economy is up more than 10% compared to 2008, while the overall economy only gained half as much.

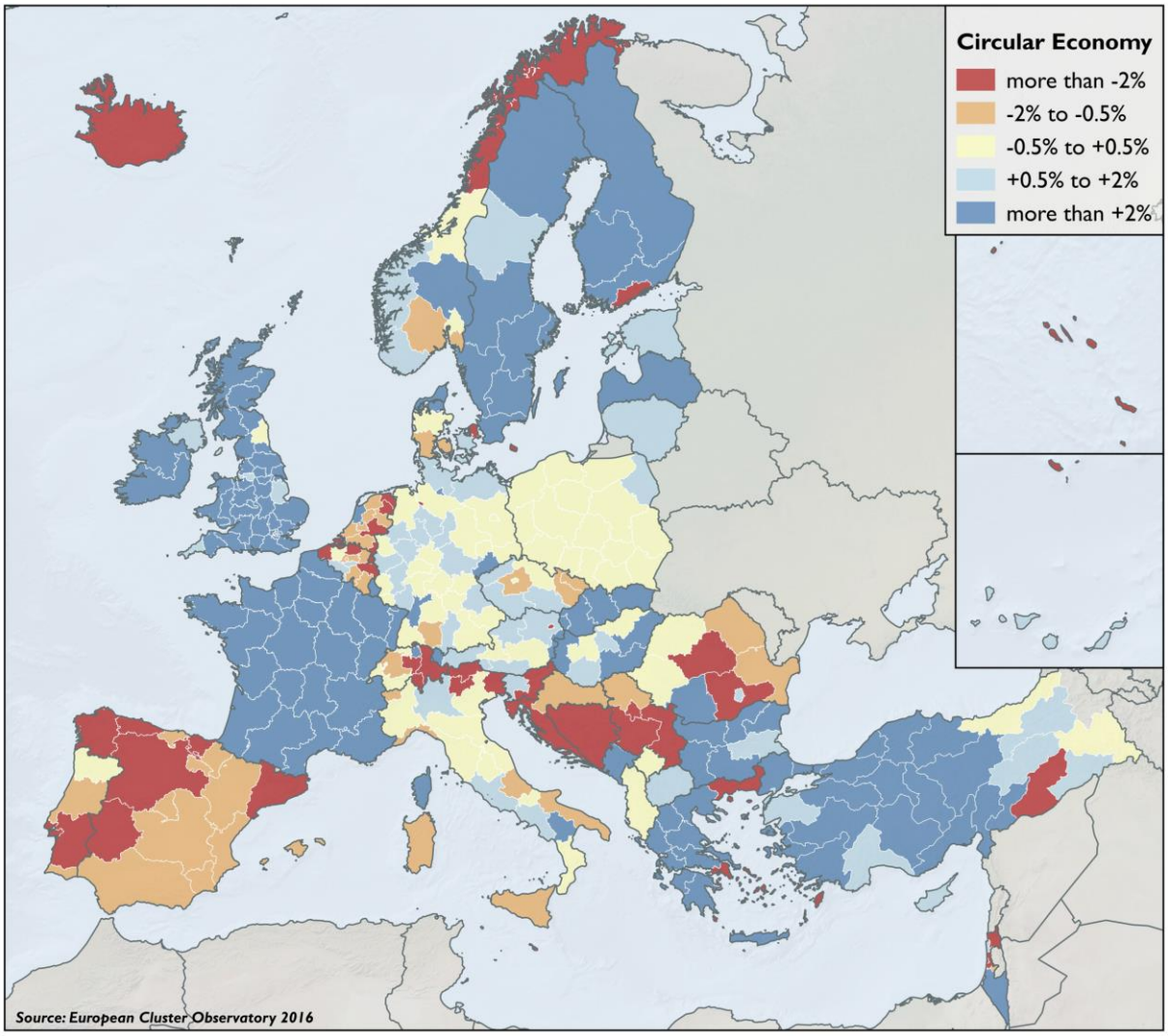
Figure 3: Employment over time, 1996-2014 (2008=100)



Note that there is a break in time series in 2008: all data prior to this date was sourced from the dataset in prior version of the European Cluster Observatory and adjusted to be compatible with the current dataset.

As discussed extensively in the European Cluster Panorama and elsewhere, local industries (largely comprising relatively lower-skilled services) have performed better since the recession and the Circular Economy industries largely belong to this category. While the resilience of these sectors is noteworthy, local industries require traded industries that they can support for a balanced and sustainable development. This remains the key question on the future of the industrial composition in Europe.

Figure 4: Annual Growth in Circular Economy (2008-14)

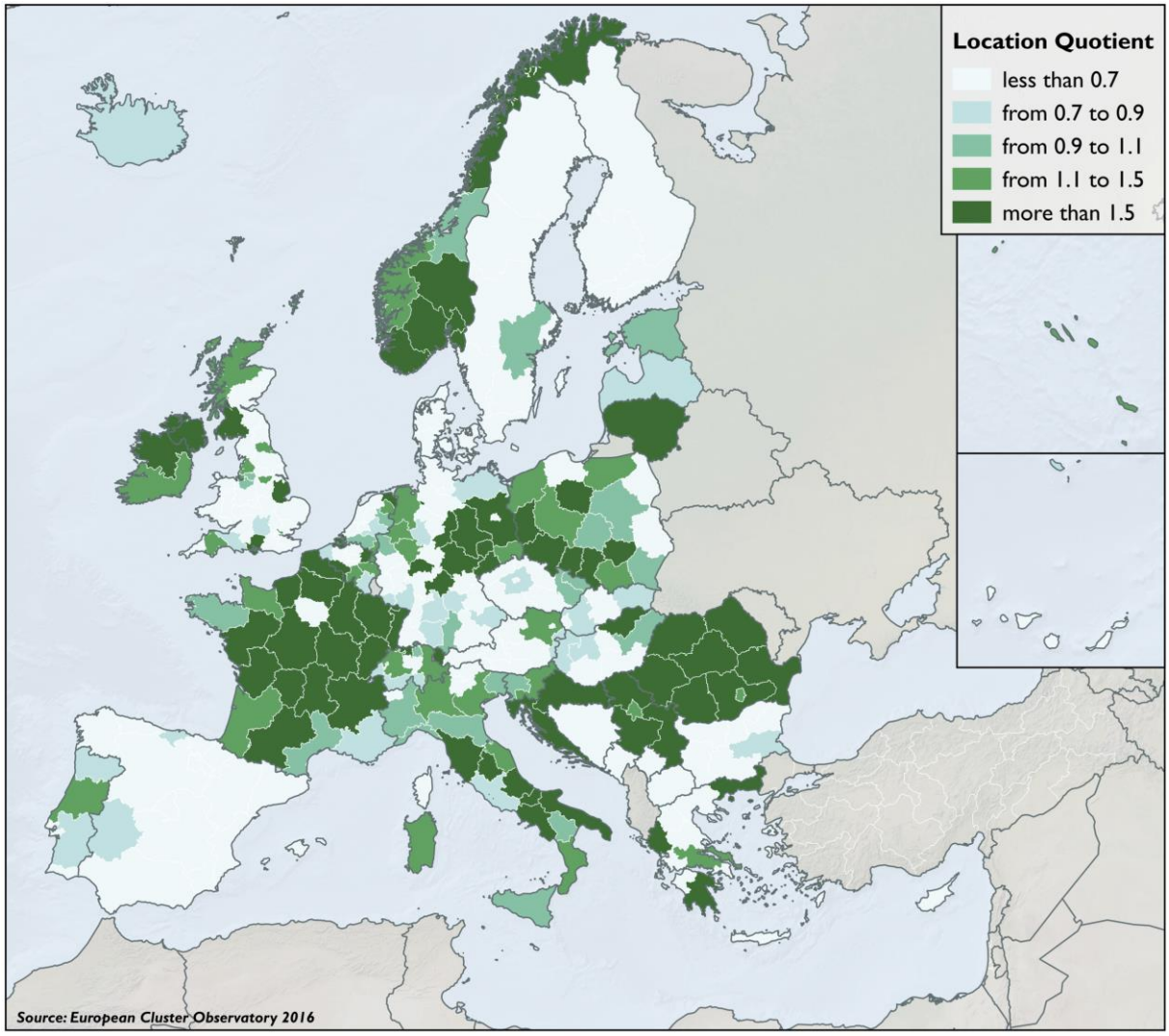


Comparing the growth pattern across Europe (Figure 4), there are similarly strong national patterns as in the leading clusters map in Figure 2. Most countries appear to be either uniformly growing (e.g. France, UK, Sweden), uniformly declining (Spain, Portugal, West Balkan states), or uniformly standing till (Germany, Poland). Only Belgium, Italy, Netherlands, Norway, and Switzerland have substantial intra-country variation. This suggests that the outcomes in the Circular Economy sector are to a large degree driven by national factors, such as the overall business conditions and unemployment. An important factor could also be difference in how growth is measured across countries[4], however the general cross-border similarity of results across multiple datasets (e.g. Spain and Portugal, Belgium and Netherlands) suggest that this effect is likely relatively minor.

[4] *Measurement error could be stronger when analyzing the relative patterns instead of levels, since small deviations could be greatly amplified.*

6. Sub-cluster Profile: Environmental Services

Figure 5: Regions most specialised in Environmental Services



7. Selected Cluster Initiatives in Circular Economy

Advanced cluster policies conducive to successfully implement regional innovation strategies do not only provide funding to cluster initiatives or cluster organisations but rather offer a broad set of policy choices to support the entire framework conditions of the actors in given regions. Such a policy approach aims to improve cluster-specific business environments that provide optimal conditions for companies in related industries to raise their productivity and innovation. Creating platforms for collective action within clusters through cluster organisations can help companies from different sectors to innovate better and exploit their business opportunities. Cluster organisations can in turn also be a major partner for the government to design and implement effective policies for upgrading cluster-specific business environments. However, strong cluster organisations are necessary, managing their cluster in an excellent manner and being able not only to take up but to proactively influence the regional social and economic development, fully integrated in all relevant communities, the policy making, the industrial, the academic, and other relevant ones.

Being awarded with a quality label of the European Cluster Excellence Initiative is a justification for strengths. In the following sector-related cluster initiatives are listed where the cluster organisation is holding such a label. Furthermore, two of the GOLD-labelled cluster initiatives are shortly described to give an idea of their set-up and interesting activities and their effects.

Cluster Management Excellence Label GOLD – Proven for Cluster Excellence

Name	Country	www
ArchEnerg Cluster	Hungary	http://www.archenerg.eu/index.php/en/
Axelera	France	http://www.axelera.org
Bau.Energie.Umwelt Cluster Niederösterreich (ecoplus. Niederösterreichs Wirtschaftsagentur GmbH)	Austria	http://www.ecoplus.at/de/ecoplus/cluster-niederoesterreich/bau-energie-umwelt
CLEAN - Connecting Danish Cleantech	Denmark	http://www.cleancluster.dk
Cluster Habitat Sustentável	Portugal	http://www.centrohabitat.net
CREA Hydro & Energy	Czech Republic	http://www.creacz.com
Gate 21	Denmark	http://www.gate21.dk
Green Tech Cluster Styria	Austria	http://www.greentech.at/
Kunststoff-Cluster	Austria	http://www.kunststoff-cluster.at/

Cluster Management Excellence Label SILVER – Dedicated to Cluster Excellence

Name	Country	www
BioEconomy Cluster	Germany	http://www.bioeconomy.de
Cluster Forst und Holz	Germany	http://www.cluster-forstholzbayern.de
EnergieRegion Nürnberg e. V.	Germany	http://www.energieregion.de/
Green Energy - Romanian Innovative Biomass Cluster	Romania	http://www.greenenergycluster.ro
RosenC - The Romanian Sustainable Energy Cluster	Romania	http://www.rosenc.ro
Trägerverein Umwelttechnologie-Cluster Bayern e. V.	Germany	http://www.umweltcluster.net

Green Tech Cluster Styria - global hotspot for new green technologies

GREEN TECH CLUSTER	**Website**	www.greentech.at/
	Established	2005
	Cluster participants (2017)	Industry 175, R&D 20, Others 5
	Region	Styria, Austria
	Cluster Manager	Bernhard Puttinger

The Green Tech Cluster is instrumental in the green innovation and consequent growth of 200 companies and research institutions. Situated in Styria, the green heart of Austria, it forms a hotspot for green technology with 20 global leaders within an hour's drive. Companies located here grow almost twice as fast as world market averages and have been creating more than 1,000 jobs per year since the establishment of the cluster in 2005. The cluster provides support for R&D project development, assessment of technology trends and market opportunities and establishing global contacts.

With the “Strategy 2015-2020”, the cluster is placing the focus for growth on green innovation. In the key strategic areas of Green Energy (especially biomass, hydro and solar), Green Building, and Green Resources (recycling), the cluster aims to launch 100 new innovation projects over 5 years and to actively drive the development of this business location. With 50 projects in 2 years the cluster is well on track.

Based around the three “I”s of Innovate, Internationalise, Initiate, the cluster supports companies with R&D project development, the concise Technology-Radar magazine, open innovation tools and the Green Tech Innovators Club with free space for new ideas. The Green Tech Cluster furthermore is proactive in the alliance of 15 global clusters in the ICN International Cleantech Network (www.internationalcleantechnetwork.com) and provides “services like home” and personal access to international markets. Tailored ideas and contacts complete the portfolio of cluster support services.

Industrial innovation projects are successfully developed, like the Science Tower Graz as World’s 1st energy glass tower with new PV-technology. The Green Tech Cluster helped to establish the cooperation between the companies involved in this flagship project. Furthermore the cluster is also coordinating the process towards a testbed for new energy and smart city technologies with world’s largest solar district heating (Big Solar Graz, Smart City Tech Lab).

Styria is home to Samsung SDI Battery Systems production site for e-cars. Recycling of such batteries is a crucial task and therefore, the cluster co-initiated the R&D-project BAT-SAFE. It is working on reducing the risks and impacts of lithium-batteries in waste management systems.

Overall the cluster has repeatedly been ranked the World's no. 1 environmental technology cluster.

AXELERA – cluster for the chemical and environmental sectors serving Lyon & Rhône-Alpes

AXELERA driver for sustainable growth	**Website**	www.AXELERA.org
	Established	2005
	Cluster participants (2016)	Industry 260, R&D 70, Others 58
	Region	Lyon & Rhône-Alpes, France
	Cluster Manager	Jean-Manuel Mas

AXELERA is one of the 68 labelled competitiveness clusters (pôles de compétitivité) in France. The aim of these competitiveness clusters is to build on synergies and innovative, collaborative projects in order to give their members – firms, R&D organisations, intermediaries - the chance to become first in their fields, both in France and abroad, about chemical and environmental matters.

AXELERA projects focus on R&D, innovation, and business development initiatives targeting five strategic research areas:

- Renewable raw materials
- Eco-efficient factories
- Chemicals and materials for manufacturing industries
- Recycling and recyclability
- Preservation and restoration of natural and urban areas

The French government ranked AXELERA one of the country's best-performing clusters in a 2012 nationwide evaluation. As of end 2016, AXELERA had certified:

- 286 R&D projects, funded for a total of € 360 million (total budget € 800 million)
- a total of seven company location/relocation projects and technical facilities
- six technology platforms, including the Axel'One chemical and environmental platform

In particular the "Axel'one collaborative innovation platform" is a very successful activity. Being unique in France it was initiated in 2009 to give stakeholders across the chemical and environmental sectors a new way to advance their R&D strategies. It became a legal entity as an innovation hub in 2011.

Axel'One offers services across the Greater Lyon area through partnerships: Each Axel'One lab is backed by one of the founding partners' existing R&D facilities. These facilities operate independently. However, each contributes expertise in specific technologies to an innovation ecosystem that benefits all users:

- The Axel'One Campus, located on the LyonTech-la Doua campus in Villeurbanne, will be dedicated to small-scale lab experimentation and basic research. It is planned to open in 2017.
- The Innovative Processes lab (PPI), located in Solaize, opened in January 2013, offers facilities for scaling-up technologies and processes for industrial rollout and is backed by the IFP Energies nouvelles R&D centre.
- The Innovative Materials lab (PMI), located in Saint-Fons, opened in February 2014, as well offers facilities for scaling-up technologies and processes for industrial rollout and is backed by the Solvay R&D centre.

The facilities are financed as a PPP-model. During the last years investors have put € 48 million into the three centres. About 75 % of the areas in the facilities are dedicated to process equipment on pilot level. All users of the respective facility (mainly collaborative R&D projects and about 25 % of SMEs) share this equipment. More than 130 researchers work on different projects. Aside members of AXELERA also partners from other clusters (Techtera, Plastipolis, Trimatec) collaborate with these facilities.

Appendix: Industry Definition

Industry Code	Industry Name
33.11	Repair of fabricated metal products
33.12	Repair of machinery
33.13	Repair of electronic and optical equipment
33.14	Repair of electrical equipment
33.15	Repair and maintenance of ships and boats
33.16	Repair and maintenance of aircraft and spacecraft
33.17	Repair and maintenance of other transport equipment
33.19	Repair of other equipment
38.32	Recovery of sorted materials
45.20	Maintenance and repair of motor vehicles
46.77	Wholesale of waste and scrap
47.79	Retail sale of second-hand goods in stores
95.11	Repair of computers and peripheral equipment
95.12	Repair of communication equipment
95.21	Repair of consumer electronics
95.22	Repair of household appliances and home and garden equipment
95.23	Repair of footwear and leather goods
95.24	Repair of furniture and home furnishings
95.25	Repair of watches, clocks and jewellery
95.29	Repair of other personal and household goods

For further information, please consult the European Cluster Observatory Website:

http://ec.europa.eu/growth/smes/cluster/observatory/

This work has been carried out under a service contract for the European Commission's Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. It is financed under the Competitiveness and Innovation Framework programme (CIP) which aims to encourage the competitiveness of European enterprises. The views expressed in this document and the information included in it do not necessarily reflect the opinion or position of the European Commission.