

European Cluster Observatory

Case Study

Framework conditions to support emerging industries and clusters in the area of circular economy

From recycling to product-service systems

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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 that is foremost aimed at European, national, regional and local policy-makers as well as cluster managers and representatives of SME intermediaries. It is an initiative of the Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW) of the European Commission that aims at promoting the development of more world-class clusters in Europe, notably with a view to fostering 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 in designing smart specialisation and cluster strategies to assist companies in developing new, globally competitive advantages in emerging industries through clusters, and in this way strengthen the role of cluster policies for the rejuvenation of Europe's industry as part of the Europe 2020 Strategy.

To support evidence-based policy-making and partnering, the European Cluster Observatory provides a 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 bi-annual **“European Cluster Panorama” (cluster mapping)** providing an update and enrichment of 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 of industrial transformations; identifying common interaction spaces; and providing a foresight analysis of 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;
- **showcase modern cluster policy practice through advisory support services to six selected model demonstrator regions**, including expert analysis, regional survey & benchmarking report, peer-review meeting, and policy briefings in support of emerging industries. The policy advice builds also upon the policy lessons from related initiatives in the area of emerging industries;
- bring together **Europe's cluster policy-makers and stakeholders at the European Cluster Conferences** 2014 and 2016 for a high-level cluster policy dialogue and policy learning, and facilitate exchange of information through these webpages, newsletters, videos, etc.

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

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Key findings at a glance

At present, actors from a wide-range of cluster initiatives are actively involved in the circular economy

66% of surveyed cluster organisations are involved in circular economy activities or planning to pursue such activities in one year. Actors engaged in or interested in the circular economy come from different types of clusters. Circular economy seems to be of high importance in sectors such as *Manufacturing of Machinery and Equipment, Manufacturing of Electric Equipment, Manufacturing of Transport Equipment, Professional Scientific and Technical Activities, Information and Communication and Agriculture*.

Circular economy connects clusters and has implications across the whole value chain

The case study highlights that a change from a linear make-use-dispose economy to a circular economy will have implications across the whole value chain – changing how value is captured and created by various actors and how it is flowing through the system. This also means that circular economy activities cut across clusters and can be a basis for new cluster reconfigurations. For each of the different circular economy activities the case study presents first insights into the changes each activity entails for the different steps of the value chain - starting from research and design to post-sales services.

All circular economy activities are considered important with ‘Business models for resource efficiency’ on the top

At present, all five circular economy activities are considered important, however, ‘Business models for resource efficiency’ stand out followed by ‘Recycling’, ‘Sustainable design’ and ‘Re-use’. Interestingly, ‘Repair and maintenance’ is considered as the least important. In the future, the most important circular economy activity is expected to relate to changing business models for resource efficiency.

Circular economy requires both intra- and cross-sectoral collaboration, but currently most co-operation takes place within clusters

Today, cooperation for circular economy activities occurs both in intra-sectoral as well as cross-sectorally. Most cooperation takes place, however, within clusters. Most active sectors are manufacturing, water supply, sewage, waste management and remediation activities, professional scientific and technical activities, agriculture and construction. Cooperation patterns in the near future are not expected to change significantly from today. However, some patterns of cross-sectoral collaboration could be identified based on the survey responses – mainly between *Agriculture and Water supply, Manufacturing and Scientific services as well as Water supply and Scientific services*.

Availability of knowledge and skills is considered the most important and regional collaboration and internationalisation as the least important framework condition

All six framework conditions such as demand, access to finance, regulation, entrepreneurship, education and collaboration were rated to of similar, relatively high importance for the emergence of circular economy activities. Among the framework conditions analysed for this case study the availability of knowledge and skills is the most important condition. Interestingly, regional collaboration and internationalisation is a framework condition that does not stand out compared to other framework conditions and has been rated the least as of great importance for circular economy activities. This might reflect that for an emerging sector like circular economy, the focus seems to be directed more internal capabilities than external connections first.

Introduction

This case study aims at analysing the characteristics of favourable innovation and entrepreneurship ecosystems for the development of emerging industries and clusters in the area of circular economy. 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 focus of the case study is to inquire the importance of selected circular economy activities in clusters and other emerging forms of industrial collaboration, including the role of framework conditions for the uptake of a circular economy model. The report will focus on selected activities associated with the circular economy model, notably sustainable design, repair and maintenance, re-use, remanufacturing, recycling as well as the emergence of business models enabling circular and efficient use of natural resources such as product sharing or leasing.

In this report clusters are understood as being “geographic concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries, and associated institutions in particular fields that compete but also cooperate” (Porter, 1998). A clear distinction is made between ‘clusters’ as the phenomenon and ‘cluster initiatives’ or ‘cluster organisations’ that represent deliberate, often politically driven, endeavours to support national and regional strongholds.

Emerging industries are considered as the establishment of an entirely new industrial value chain, or the radical reconfiguration of an existing one, driven by a disruptive idea (or convergence of ideas), leading to turning these ideas/opportunities into new products/services with higher added value (EFCEI, 2013). Emerging industries are often grown out of existing industries and can be both newly formed or re-formed industries that have been created by technological innovations, shifts in relative cost relationships, emergence of new consumer needs, or other economic and sociological changes that elevate a new product or service to the level of a potentially viable business opportunity (Porter, 1980).

It is well documented that innovation and entrepreneurship thrives in particular contexts and under particular framework conditions. Innovation and entrepreneurship are nurtured by interactions between actors with different resources and capabilities such as firms, users in downstream sectors, consumers, research organisations, investors, business support providers, public institutions, etc. Circular economy is in this context an especially interesting case. Extending productive life of natural resources – in other words, offering them longer or more useful lives in a form of products – requires adaptations or even radical reconfigurations in existing value chains, now catering mainly for a linear extract-use-dispose model. Besides changes in the value chain, new forms of collaboration between different actors across the value chain may become one of the characteristics of circular economy activities.

The case study also considers the role of framework conditions for the emergence of new industries and sectors related to circular economy. The study follows the methodology developed for the Regional Ecosystem Scoreboard¹ that identified five key regional framework conditions of regional business ecosystems, including entrepreneurial conditions, regional collaboration and international linkages, highly-skilled knowledge base, access to finance, demand conditions and regulation (European Commission 2015).

¹ http://ec.europa.eu/growth/smes/cluster/observatory/cluster-mapping-services/regional-ecosystem-scoreboard/index_en.htm

This study is intended to provide policy-makers with first insights into the characteristics of circular economy activities across Europe. It will highlight especially relevant framework conditions for circular economy which could be used to support the development of clusters in emerging industries. It also suggests a way forward in fostering circular economy as an emerging industry and thus, better implementation of regional smart specialisation strategies.

The key questions of this case study are the following:

- Which importance does the topic circular economy have for cluster managers and other regional actors?
- Which types of circular economy activities do regional actors undertake?
- What are the current cross-sectoral collaboration patterns in circular economy activities?
- What are future cross-sectoral collaboration patterns in circular economy activities?
- Which role do different framework conditions such as entrepreneurship, regulation or finance play for different circular economy activities?
- How can regional and cluster policy support the creation of a favourable business ecosystem and how it can stimulate the necessary cross-sectoral linkages?

The study was based on the literature review and survey. The survey was launched among business advisory service providers, notably cluster management organisations, across the 28 EU Member States and the EU Associated Countries. The survey was open for three weeks in September 2015. The survey questionnaire was designed following the conceptual model of the Regional Ecosystem Scoreboard and was based on an initial desk research on framework conditions that can be considered relevant for emerging sectors.

1. Cross-sectoral collaboration in circular economy

1.1 What is a circular economy?

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. The following paragraphs introduce activities selected for this case study.

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.²

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.³

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.⁴

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 match⁵. This is enabled by a dedicated product design that allows for an efficient remanufacturing process. An example for how remanufactur-

² See http://www.steelcase.com/products/office-chairs-stools/think/#features_smart

³ See <http://www.patagonia.com/us/worn-wear>

⁴ See <http://www.recycling-guide.org.uk/reuse.html>.

⁵ See <http://www.remanufacturing.org.uk/>

ing 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.⁶

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, ie 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 models. 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 is an option which allows the product owner to generate some income and provides the product user with cheaper access to the product.⁷

A focus of this study is on business models that enable circular economy activities described above and other approaches that contribute a more efficient and circular use of resources. Such business models often rely on delivering services (or functionality) rather than only direct sales of products to customers. These can include product sharing, renting or leasing, shared use (ranging from public laundrettes to shared labs or production facilities).

These types of activities have in common that in many cases they need the collaboration across different sectors as well as across different sections of the value chain. The following section presents possible implications of circular economy paradigm for value generation in product and service development as well as for collaboration patterns between actors.

1.2 Circular economy, value chain and cross-sectoral cooperation

The shift towards circular economy will have significant implications on how economic value is created and captured by various actors as well as on how it flows in the socio-economic system. An industrial value chain is understood here as the inter-connected system of actors and processes that creates the accumulated value of products and services offered to the end-users. Extending the productive life of natural resources – in other words, offering them longer or more useful lives in a form of products or

⁶ See <http://www.caterpillar.com/en/company/sustainability/remanufacturing.html>

⁷ See <http://www.wrap.org.uk/node/13052/#h>

services – requires adaptations or even radical reconfigurations in existing value chains, now catering mainly for a linear extract-use-dispose model based on short-lived products.

Additionally, the circular economy creates opportunities for developing innovative products and processes. These new business opportunities emerge at the interface of established businesses, new companies and entrepreneurs who realise untapped potential and opportunities emerging from the use of resources, which were previously considered to be waste. These new ventures often involve cross-sectoral collaborations. The shift towards circular economy can be illustrated and better understood by zooming in on specific material flows as well as by taking a more systemic look at entire regional ecosystems. Both perspectives are valuable and should inform one another.

Box 1. Use of coffee waste

The opportunities emerging from the cascade use of coffee waste can serve as an illustration of the former. In the linear model, coffee waste from coffee farms would often end up in landfills. Coffee waste, however, is a rich source of polysaccharides, proteins and minerals that makes it a substrate of high biotechnological and agricultural value. It can be used, for example, for the production of compounds with important applications in the food and pharmaceutical industries (Mussatto et al 2011) or it can be turned into a second-generation biofuel⁸. Coffee waste is already used as a substrate for growing mushrooms at inner-city production centers; any waste left over from growing the mushrooms is used as animal feed (Pauli 2010).

This example can serve as an illustration of the need for the cross-sectoral collaboration to fully exploit the value of such a natural resource. In this case the traditional sectors potentially benefiting from new opportunities range from agriculture (e.g. fertilisers, feedstock, substrat for growing mushrooms), food production due to the significant protein content (e.g. manufacture of flakes, breads, biscuits), chemical and pharmaceutical industry (e.g. coffee waste is rich in cellulose and hemicellulose) or energy (bio-fuels). Importantly, in order to be operational at scale, the model hinges on the capacity to collect coffee waste and, therefore, creates opportunities for service sector companies dealing with coordination and logistics of collecting coffee waste from both commercial establishments (e.g. cafes or restaurants) or directly from consumers.

The opportunities offered by more efficient and innovative use of resources in the circular economy have systemic implications for individual businesses as well as for entire economies. Circular economy business models influence entire value chains and research and innovation systems from research, development and design up to post-sales services. Figure 1 introduces selected examples of implications of circular economy activities on key business operations.

⁸ See <http://bio-bean.com/>

Box 2. Port of Rotterdam

A more systemic perspective on circular economy can be illustrated by an initiative aiming at transforming an entire industrial region into a circular economy eco-system. In 2012, the Port of Rotterdam Authority and Rabobank organised the 'Pathways to a Circular Economy' arguing that a circular economy would create great opportunities for the region and the Dutch economy.⁹ In 2014, the Port of Rotterdam, Rabobank Rotterdam, BIKKER & Company and Van Gansewinkel established the Circularity Center.¹⁰ The rationale behind this initiative is that Rotterdam as Europe's largest port and distribution hub can become the centre for recycling, take-back logistics and alternative resources and material flows. The ambition is that the economic activities linked to the port can have an impact not only on the Delta region but also on the entire country.

⁹ <https://www.rabobank.com/en/images/Pathways-to-a-circular-economy.pdf>

¹⁰ <https://www.portofrotterdam.com/en/news-and-press-releases/rotterdam-organisations-join-forces-in-circularity-center>

Figure 1: Possible implications of circular economy paradigm for value generation in product and service development

	Research, Development, Design (RDD)	Strategy, including business model	Human resources	Inbound logistics, including material sourcing	Manufacturing	Distribution and other outbound logistics	Marketing and sales	Post-sales services
Sustainable design	- RDD into sustainable product design - testing new materials to substitute currently used materials	- product durability (e.g. sharing, leasing), recyclability or cascade use (e.g. use of compostable biomaterials)	- hiring new staff with knowledge and competences allowing to capture CE potential - strategic partnerships with external partners, often from different sectors - training staff	- sustainable procurement	- adapting production lines to the use of new materials	- possible implications for transportation and storage (e.g. due to more compact designs and the use of lighter materials)	- advertising sustainably designed products (e.g. the use of labels) - focus on customer loyalty and customer service	- establishment of maintenance and repair services
Repair and maintenance	- R&D aiming at durability and reparability - design for durability and reparability	- focus on offering services rather than products (servicising)		- adapting procurement e.g. to focus on spare parts instead of complete products	- strict quality control	- logistics for repair and maintenance	- marketing 'functionality' of products rather than the products themselves	- extended producer's responsibility
Reuse	- design for reusability (e.g. by the use of durable materials and frugal design)	- focus on offering products that can be reused several times		- ensuring collection of products and materials	- strict quality control	- reverse use of distribution channels for good collection and distribution of used goods	- marketing the benefits of reusing products (based on the quality assurance)	- establishment of services distributing used products to new users
Remanufacturing	- design for remanufacturing (by e.g. modular design)	- integrating remanufacturing into the product portfolio as a standard offer		- establishing inbound logistics structures for taking back products to be remanufactured	- adapting production (e.g. production of components, adapted assembly lines)	- reverse use of distribution channels for product takeback	- marketing remanufacturing as a solution for specific (or all) target groups	- product takeback - adapted after sales services (related to maintenance and repair)
Recycling	- research into possibilities of cascading use of materials, often by-products or waste	- economic potential of recycled materials or turning own waste into commodity		- sustainable procurement including secondary materials	- use of secondary materials in production	- distribution channels to collect secondary materials (e.g. industrial symbiosis)	- marketing for a new paradigm of durability instead of throw-away products	- provision of information about disposal of products

Source: Technopolis Group

2. Survey results

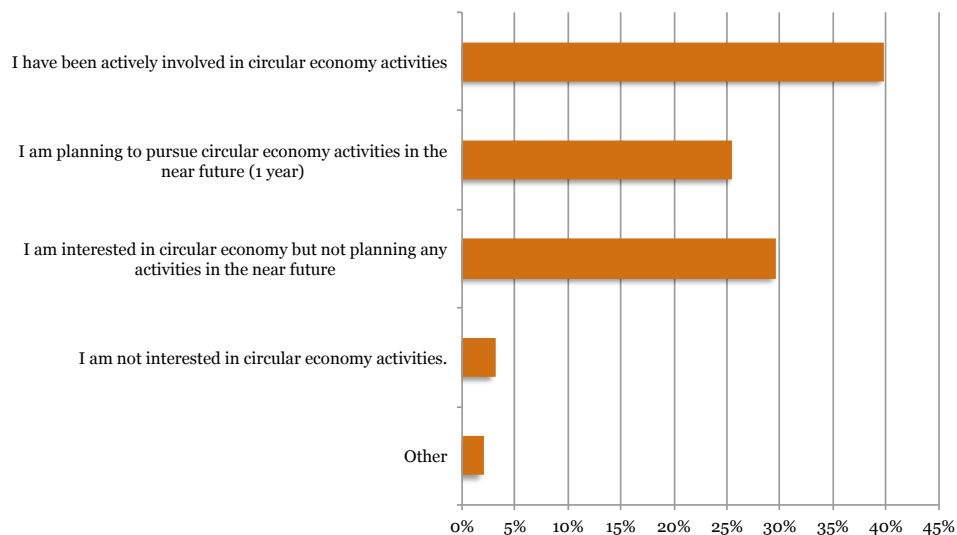
Circular economy is a relatively new topic for many European clusters and regional business intermediaries. There is only limited evidence available regarding the focus and extend of circular economy activities across European regions. In order to gain some insights into the relevance of circular economy, the case study included a survey addressed to different regional economic actors, such as cluster managers, regional development agencies, regional or central governments, industrial or business associations as well as industrial/science park management. The survey was conducted across 28 EU member states and EU Associated Countries in September 2015. 99 respondents across the EU responded to the survey. The survey was not addressed to stakeholders from a specific sector and reached out to stakeholders from different sectors. The detailed presentation of the respondents' profile is presented in Annex II.

2.1 Characteristics of circular economy activities

Cluster organisations and their members have a keen interest and involvement in circular economy activities

Nearly 40% of respondents are already engaged in circular economy activities (39%). 25% of surveyed stakeholders plan to get involved in the related activities in the near future. There is a large group among the survey respondents (29%) generally interested in the topic but not planning any activities within upcoming year. The results suggest a growing interest in the topic among cluster managers and other regional stakeholders.

Figure 2: Degree of involvement in circular economy activities



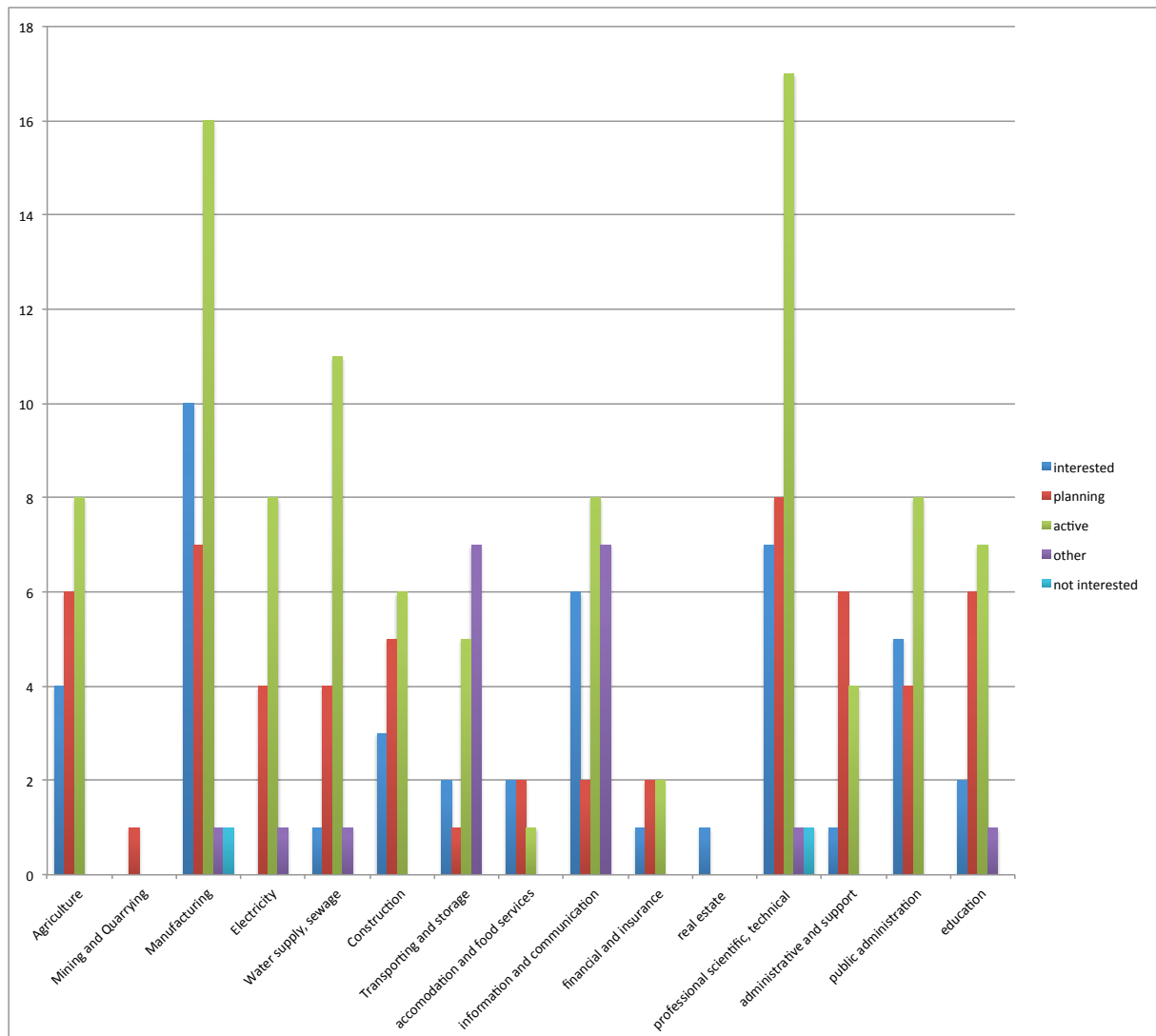
Source: Technopolis Group (N=98)

Considering the distribution of how the involvement in circular economy and the sector the respondents are active in, several patterns can be identified.

- Three sectors - namely manufacturing, water supply, sewerage, waste management and remediation activities and professional, scientific and technical activities - are the sectors most active in circular economy activities.

- There is a number of sectors in which respondents are planning to further engage in circular economy activities within a year, for instance, manufacturing and professional, scientific and technical activities.
- Similarly, interest in circular economy issues is especially high in manufacturing and professional, scientific and technical activities.

Figure 3: Involvement of respondents in circular economy activities and sector (in absolute numbers)

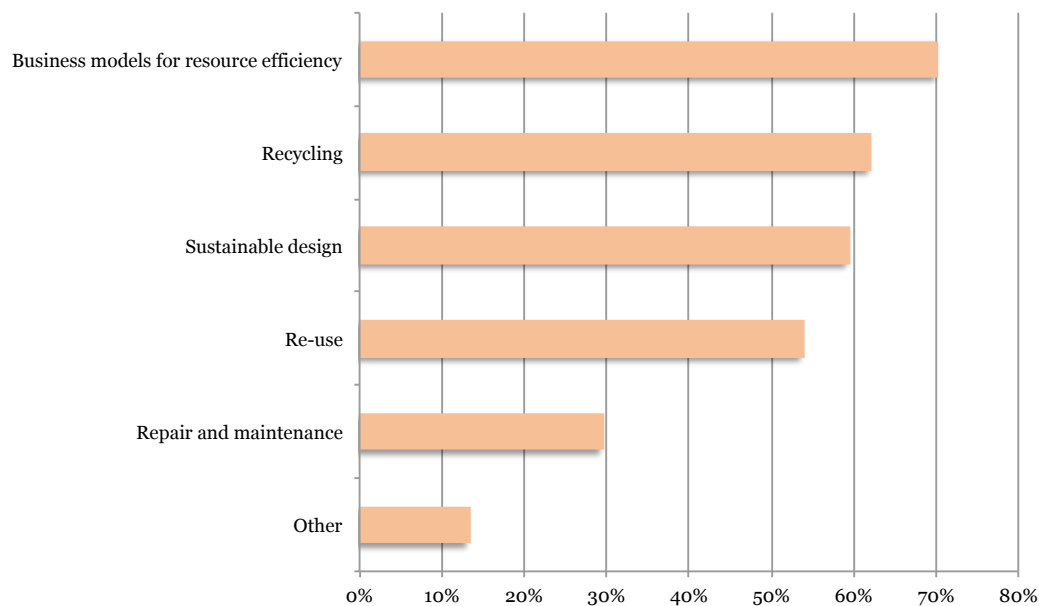


Source: Technopolis Group (N=98)

Cluster organisations are involved in diverse circular economy activities

The respondents are active all core circular economy activities covered by this study. They are involved in projects related to business models for resource efficiency (70%), recycling, sustainable design and re-use. Repair and maintenance activities are less of a focus but still indicated by a significant number of the surveyed stakeholdes (see Figure 7).

Figure 4: Involvement of respondents in circular economy activities



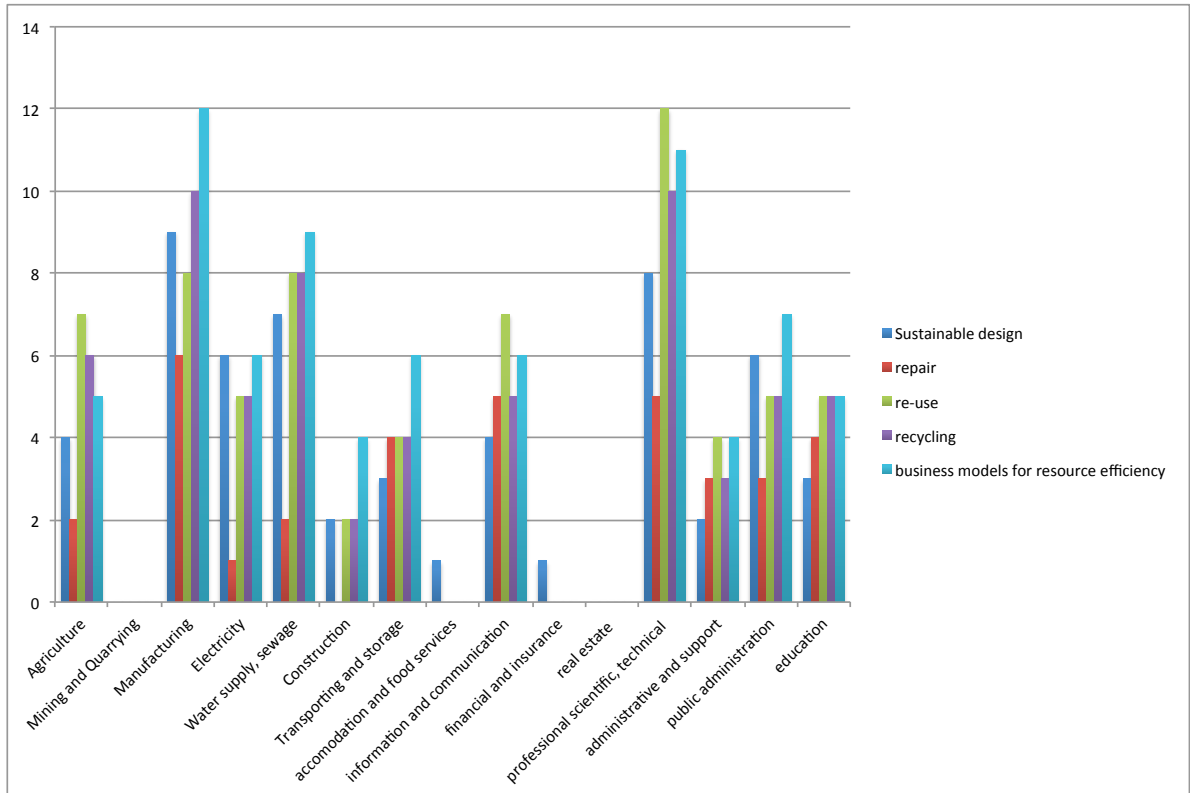
Source: Technopolis Group (N=37)

The surveyed cluster managers and regional stakeholders focus simultaneously on many different circular economy activities (see Figure 8). The picture differs depending on represented sectors. Stakeholders most active in working on **business models for resource efficiency**, for example, come from manufacturing, water supply, construction, transportation and storage, as well as public administration. **Re-use** is the most important activity for respondents from information and communication sector, professional, scientific and technical activities and agriculture. Respondents most active in the area of **sustainable design** represent manufacturing, water supply as well as professional, scientific and technical activities.

Overall, the circular economy activities the survey respondents are engaged in can be grouped into three major broad types:

- Technology-based circular economy activities, such as treatment of end-of-life batteries, repair and maintenance of products delivered to end users or development of recycling technologies;
- Consultancy and other support activities, for instance consultancy on environmental management systems, assistance to businesses in working with aspects of the circular economy or support in identifying cooperation partners;
- Strategic activities by the regional authorities and business advisory stakeholders, such as development of roadmaps or the financing and creation of business development initiatives.

Figure 5: Circular economy activity across sectors (absolute numbers)

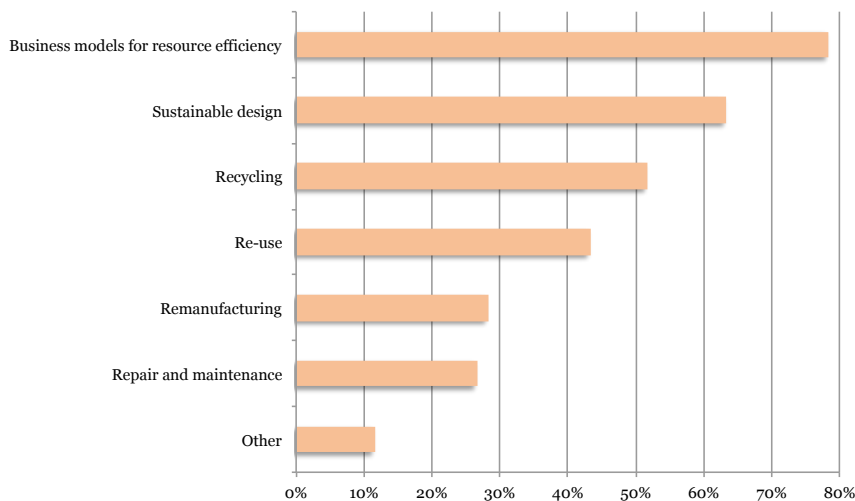


Source: Technopolis Group (N=98)

Business models for resource efficiency will be most important in the future

In terms of planned circular economy activities, survey respondents point to business models for resource efficiency (78%) sustainable design (63%) and recycling (52%). This is similar to the current focus, suggesting that respondents do not foresee major changes in their strategy towards circular economy in the short term (next one year).

Figure 6: Planned circular economy activities of respondents (as % share of total respondents)

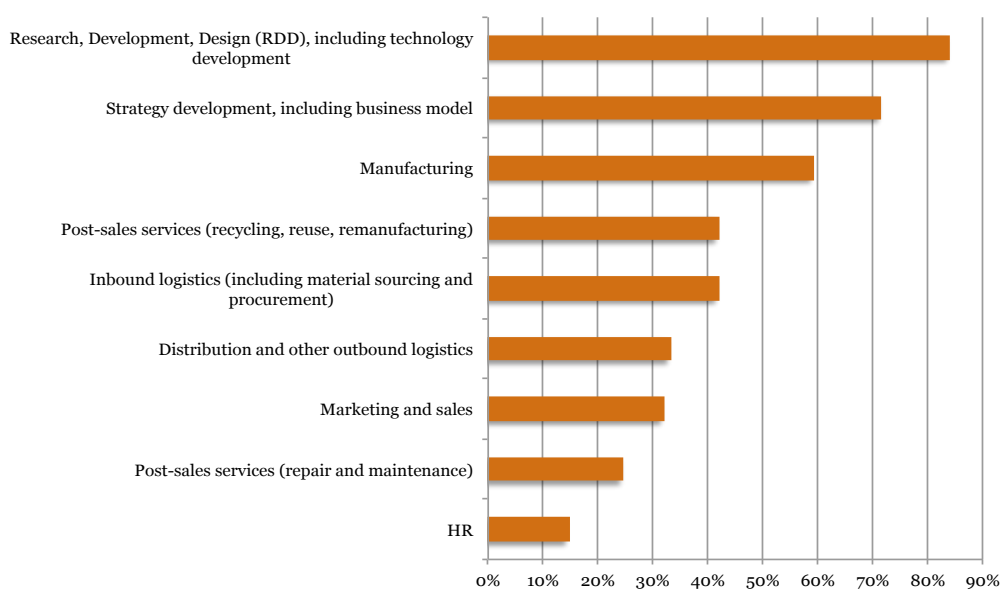


Source: Technopolis Group (N=60)

Circular economy is considered relevant for the core business activities

A large share of respondents considers circular economy activities especially relevant for their R&D (84%), business strategy, including business model (72%) and manufacturing process (59%). These elements are at the very core of the business operations of companies. On the other hand, the relatively lower relevance of marketing and sales and logistics reveals that cluster managers surveyed for this study are mainly concerned with the upstream technological applications of circular economy model (e.g. product design and material productivity in production). Their responses suggest a limited interest in redefining existing customer relationships and channels that are necessary for business models based on e.g. collaborative product use or remanufacturing.

Figure 7: Relevance of circular economy activities for the value chain



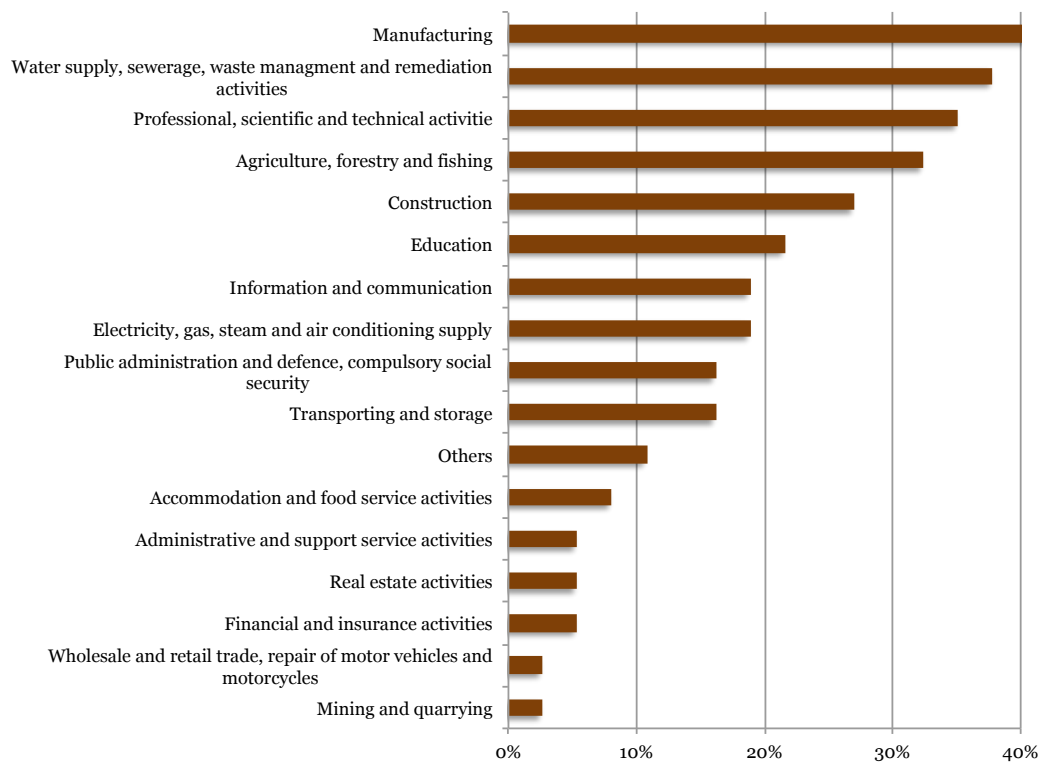
Source: Technopolis Group (N=81)

2.2 Cooperation patterns in the circular economy

Circular economy activities involve collaboration between many economic sectors

The highest number of respondents indicated that their circular economy activities include cooperation with manufacturing sector. Other sectors indicated by respondents included water supply, sewage, waste management and remediation activities, agriculture as well as professional, scientific and technical activities.

Figure 8: Present cooperation sectors of respondents (as % share of total respondents)



Source: Technopolis Group (N=37)

The survey analysis connected sectors of respondents with sectors indicated by them as collaboration partners (see Figure 12). A large number of respondents pointed to their own sector as partner, suggesting an important role of intra-sectoral collaborations. Many respondents indicated other sectors as key partners for circular economy projects. The most prominent cross-sectoral cooperation patterns included:

- Agriculture with water supply, sewage, waste management and remediation;
- Manufacturing with professional, scientific and technical activities;
- Water supply, sewage, waste management and remediation with professional, scientific and technical activities.

The findings suggest that the current cooperation focuses on enabling circular models *within* manufacturing, agriculture and water supply sectors. Clearly, collaboration within manufacturing will often imply collaboration *between* different manufacturing sectors. Importantly, most collaboration requires specific technical knowledge (as suggested by an important role of professional, scientific and technical activities), the use of enabling technologies (notably ICT) as well as education (see Figure 12).

As suggested by previously discussed findings, the scope of sectoral collaborations suggests a predominant focus on applying circular economy approaches mainly to the product development (e.g. design and production process). The rare indications of retail and financial services may mean that the surveyed cluster managers and regional economic stakeholders have not yet fully embraced circular economy approaches that require rethinking the whole value chain, including relationships with customers and revenue streams.

Figure 9: Present cooperation patterns (absolute numbers)¹¹

Sector	Agriculture	Mining and Quarrying	Manufacturing	Electricity	Water supply, sewage	Construction	Wholesale	Transporting and storage	Accommodation and food services	Information and communication	Financial and insurance	Real estate	Prof., scientific, technical activities	Admin. and support service activities	Public administration	Education
Agriculture	14	1	10	7	10	5	0	4	3	9	2	0	11	5	5	6
Mining and Quarrying	1	1	1	1	1	1	0	0	1	1	0	0	3	2	1	1
Manufacturing	9	1	19	5	8	6	0	7	3	9	2	0	13	7	6	7
Electricity	6	1	9	10	9	6	0	4	2	5	1	0	10	4	6	4
Water supply, sewage	10	1	10	10	14	8	0	6	2	8	1	0	16	5	7	6
Construction	4	1	10	9	9	9	0	2	2	4	1	0	7	5	7	2
Wholesale motor vehicles	2	0	2	2	2	0	0	2	1	3	1	0	4	2	3	3
Transporting and storage	5	0	6	4	4	3	0	11	1	5	1	0	8	3	3	5
Accommodation and food services	4	1	4	3	3	2	0	2	3	3	2	0	3	2	2	2
Information and communication	7	0	9	5	7	4	0	5	2	10	2	0	10	5	5	8
Financial and insurance	2	0	5	4	3	3	0	1	2	4	3	0	2	4	2	3
Real estate	1	0	3	4	3	4	0	1	1	1	1	0	1	1	1	1
Professional scientific, technical	8	0	10	5	8	3	0	5	2	9	3	0	14	5	3	8
Administrative and support	2	0	5	3	6	3	0	0	1	6	2	0	6	7	4	4
Public administration	2	0	5	4	6	2	0	2	0	5	1	0	7	4	4	4
Education	9	0	10	6	7	2	0	2	2	9	3	0	11	6	3	10

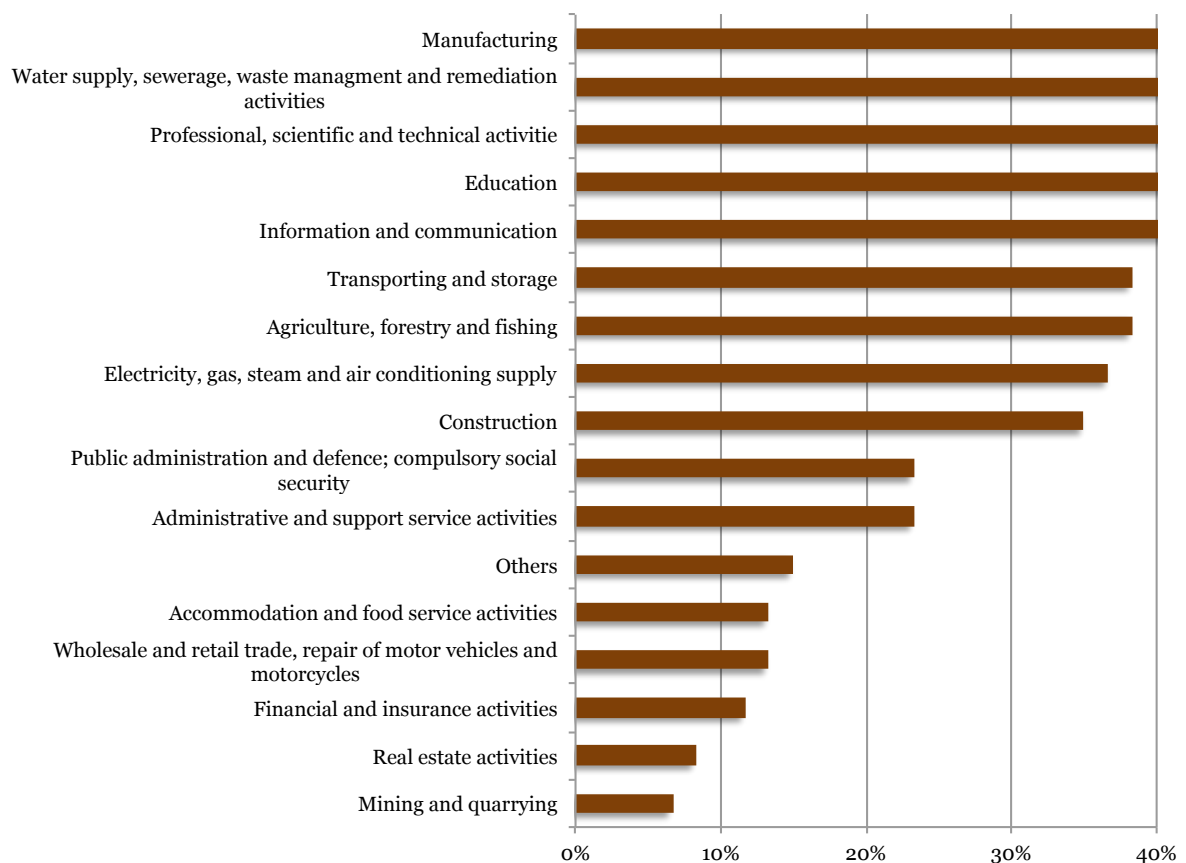
Source: Technopolis Group (N=37)

¹¹ A graphical representation of this matrix can be found in the Annex.

Cluster managers plan to diversify cross-sectoral collaboration in the near future

In the future, cluster managers and regional stakeholders plan to engage in collaboration with more sectors (see Figure 13). Compared to the current cooperations (see Figure 11), a number of sectors are likely to gain importance as cooperation partners, including notably water supply, sewage, waste management and remediation, professional, scientific and technical activities, education, information and communication as well as transport and storage.

Figure 10: Future cooperation sectors of respondents (in as % share of total respondents)



We have analysed cooperation pairings taking into account the sector of respondents (see Figure 14). The most prominent future cross-sectoral cooperations appear to be:

- Agriculture with water supply, sewage, waste management and remediation;
- Manufacturing with professional, scientific and technical activities as well as with water, construction and professional, scientific and technical activities.

The overall finding is that the respondents consider a diversified cooperation of increasing importance for advancing circular economy projects in the future.

Figure 11: Future cooperation patterns (absolute numbers)

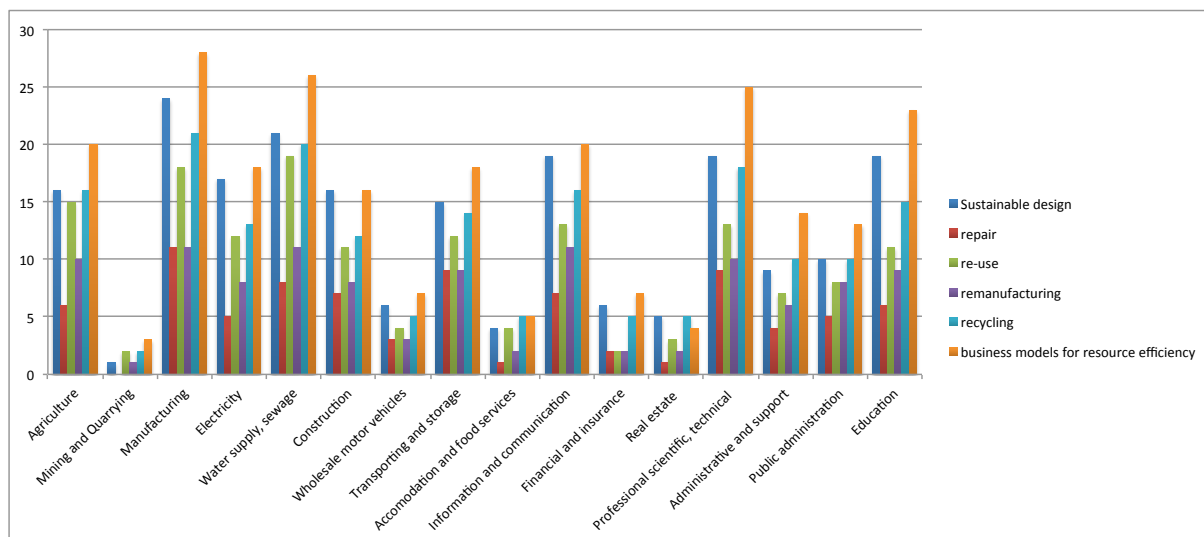
Sector	Agriculture	Mining and Quarrying	Manufacturing	Electricity	Water supply, sewage	Construction	Wholesale	Transporting and storage	Accommodation and food services	Information and communication	Financial and insurance	Real estate	Prof., scientific, technical activities	Admin. and support activities	Public administration	Education
Agriculture	14	1	10	7	10	5	0	4	3	9	2	0	11	5	5	6
Mining and Quarrying	1	1	1	1	1	1	0	0	1	1	0	0	3	2	1	1
Manufacturing	9	1	19	5	8	6	0	7	3	9	2	0	13	7	6	7
Electricity	6	1	9	10	9	6	0	4	2	5	1	0	10	4	6	4
Water supply, sewage	10	1	10	10	14	8	0	6	2	8	1	0	16	5	7	6
Construction	4	1	10	9	9	9	0	2	2	4	1	0	7	5	7	2
Wholesale motor vehicles	2	0	2	2	2	0	0	2	1	3	1	0	4	2	3	3
Transporting and storage	5	0	6	4	4	3	0	11	1	5	1	0	8	3	3	5
Accommodation and food services	4	1	4	3	3	2	0	2	3	3	2	0	3	2	2	2
Information and communication	7	0	9	5	7	4	0	5	2	10	2	0	10	5	5	8
Financial and insurance	2	0	5	4	3	3	0	1	2	4	3	0	2	4	2	3
Real estate	1	0	3	4	3	4	0	1	1	1	1	0	1	1	1	1
Professional scientific, technical	8	0	10	5	8	3	0	5	2	9	3	0	14	5	3	8
Administrative and support	2	0	5	3	6	3	0	0	1	6	2	0	6	7	4	4
Public administration	2	0	5	4	6	2	0	2	0	5	1	0	7	4	4	4
Education	9	0	10	6	7	2	0	2	2	9	3	0	11	6	3	10

Source: Technopolis Group (N=60)

The focus on business models will increase in the future across sectors

The survey suggests an increased focus on business models for resource efficiency across all sectors (see Figure 15) compared to the current focus on circular economy activities (see Figure 8). With regard to the other activities, no strong differences between the sectors can be made out, conveying a relatively homogeneous picture.

Figure 12: Planned activities (absolute numbers)



Source: Technopolis Group (N=97)

2.3 General framework conditions – drivers and barriers

The Regional Ecosystem Scoreboard identified five key regional framework conditions for the evolution of regional business ecosystems, the creation of new enterprises and the growth of existing business activities:

- **Entrepreneurial conditions:** Entrepreneurship is considered a central element for regional ecosystems and the development of new industries as well as the transformation of existing industries. Conditions favouring entrepreneurship include an entrepreneurial culture, infrastructures (broadband etc), trust between market actors.
- **Regional collaboration and international linkages:** knowledge transfer both within in the region as well as global ties ensure that new ideas and knowledge are shared and disseminated and are also able to avoid lock-ins. Examples could be collaboration platforms between circular economy actors or internationalisation activities.
- **Highly-skilled knowledge base:** A sufficient supply with qualified human resources is an important input for the emergence of new industries.
- **Access to finance:** Favourable financing and funding conditions are an important element for the creation and forstering of emerging and existing industries. This includes for instance the seed and venture capital, public funding, private sec-tor investment.
- **Demand conditions:** Mechanisms that create demand for innovations through an altering of the behaviour of market actors (consumers and producers). Examples are as customer readiness, existene of labels, proximity to public procurement or presence of information campaigns.

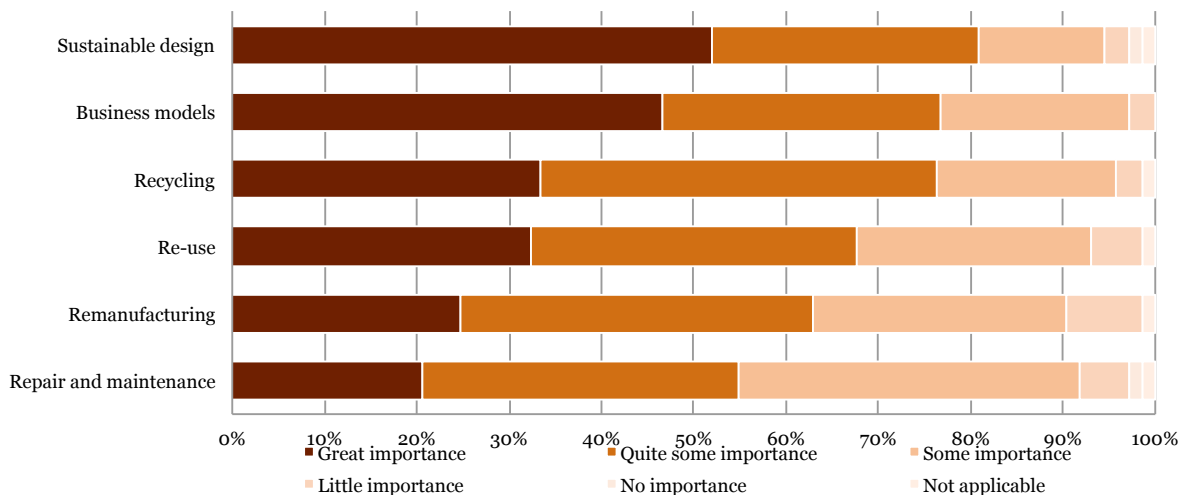
- Regulation: The quality and adequacy of regulation influences greatly if and how new industries emerge and if and how existing industries develop.

The following section summarises those framework conditions that have been given the greatest weight by the survey respondents. While framework conditions per se can be considered to be of importance for survey respondents, some (minor) differences can be made out with regard to the overall importance as well as regarding specific circular economy activities.

1. Demand conditions

The majority of survey respondents across all circular economy activities consider demand conditions as a factor of great or quite some importance. For sustainable design and business models for resource efficiency demand conditions seem to play a relatively more important role than for the other activities. For repair and maintenance, the importance is considered to be lowest in comparison. This is an interesting result as one might expect that for this activity demand conditions are rather important as there is – for instance in comparison to business models - a more direct link between the activity itself and (customer) demand.

Figure 13: Importance of demand conditions (as a % share of total respondents)

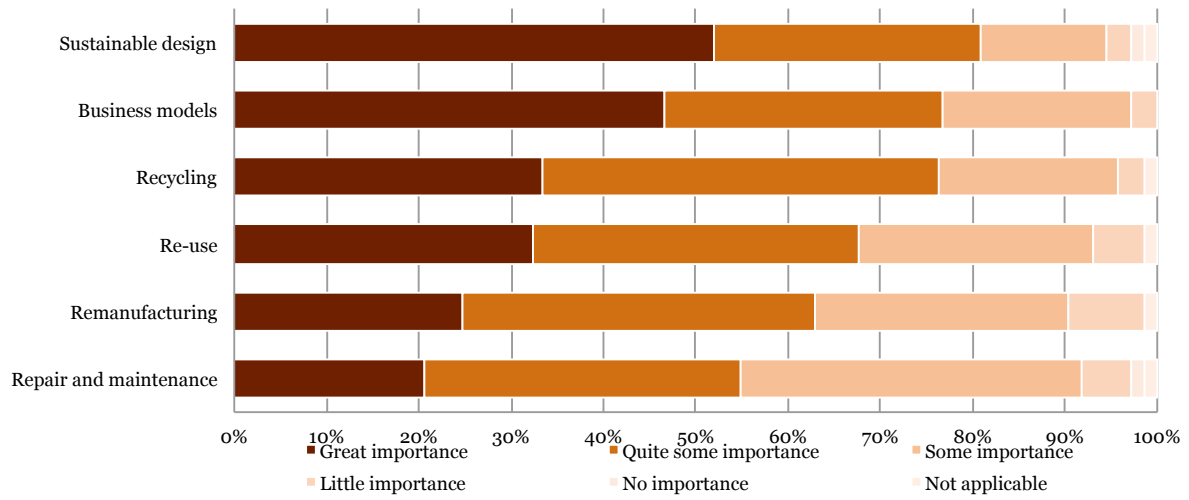


Source: Technopolis Group (N=73)

2. Regulations

Presence of good and adequate regulations is a framework condition that a majority of respondents considers important. Some differences can be made out with regard to the different circular economy activities. Again, sustainable design and business models are the activities for which regulation is considered to be of greatest importance. For remanufacturing and repair and maintenance it is considered less important in comparison. This might be considered surprising because regulatory factors such as the lack of tolerance corridors for standards for instance concerning material or product characteristics was mentioned in an interview as barrier to the emergence of a circular economy.

Figure 14: Importance of regulations (as a % share of total respondents)

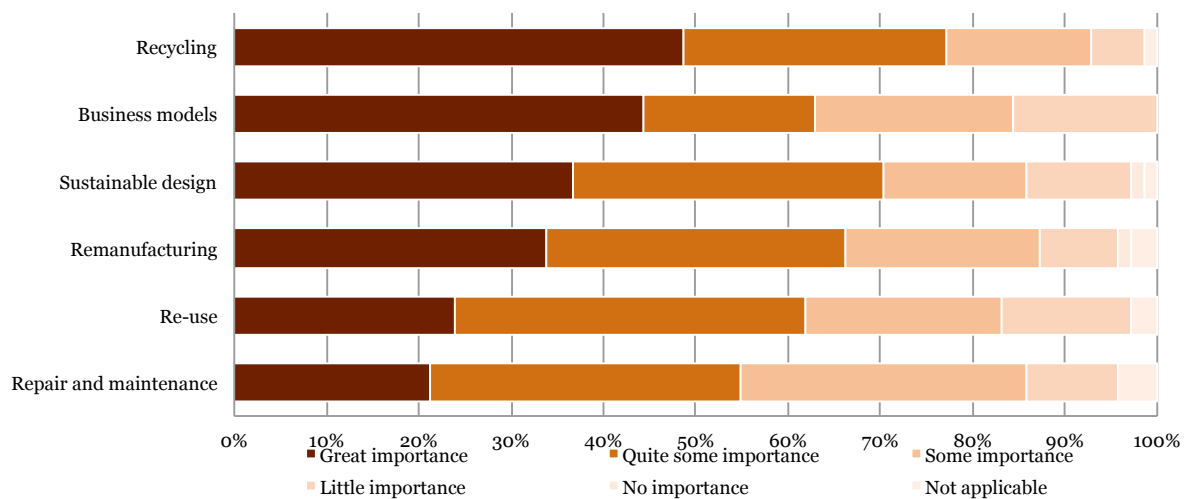


Source: Technopolis Group (N=74)

3. Access to finance

Access to finance is of similar importance to survey respondents as the other framework conditions. However, concerning the activities a new pattern emerges. While finance is considered to be of importance for all circular economy activities, the graph shows that for recycling it has the highest relevance. This might be explained by the fact that especially for recycling large investments in infrastructure are necessary for which financing has to be obtained.

Figure 15: Importance of access to finance (as a % share of total respondents)



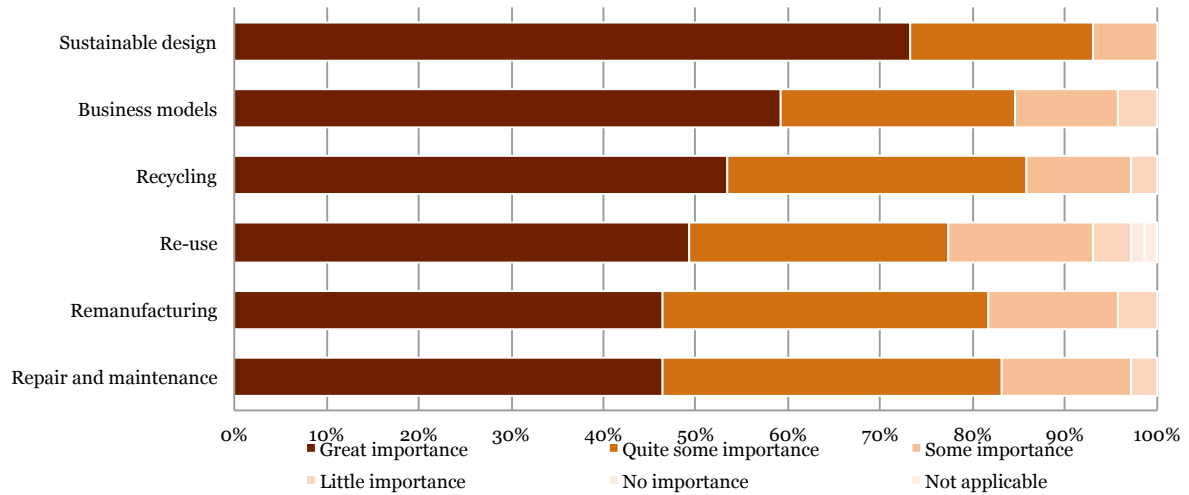
Source: Technopolis Group (N=71)

4. Knowledge and skills base

The knowledge and skills base is the framework condition that is considered of greatest importance of all conditions by survey respondents. For all six activities the knowledge and skills base 75% or more of all respondents assign this topic 'great' or 'quite some' importance. This shows that for circular

economy in general and across all activities the knowledge base seems to be the most critical and central issue. This might be due to the fact that circular economy activities require new combinations of skillsets, which at present might not be easily available on the labour market.

Figure 16: Importance of the knowledge and skills base (as a % share of total respondents)

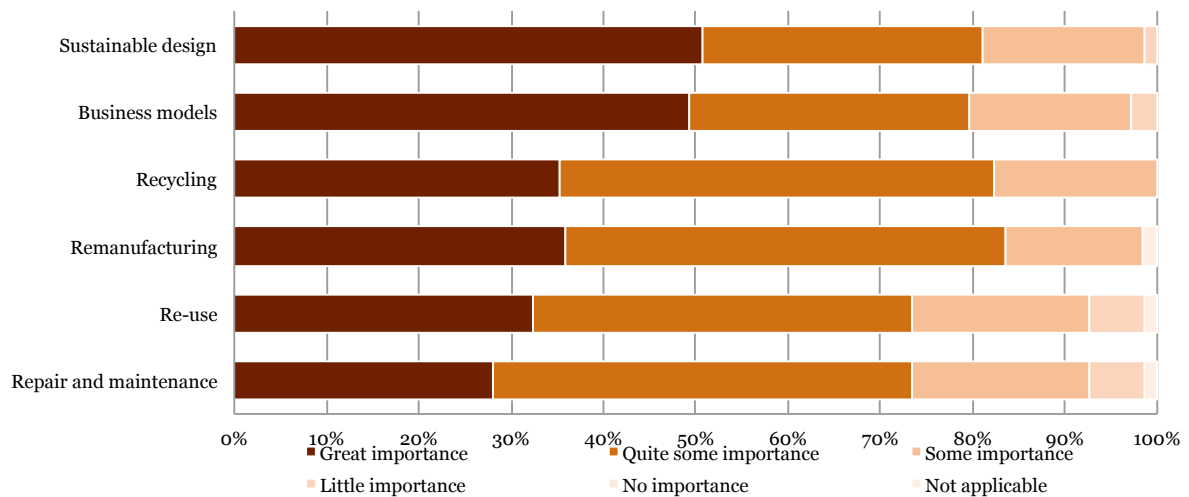


Source: Technopolis Group (N=71)

5. Collaboration and internationalisation

Regional collaboration and internationalisation is a framework condition that does not stand out compared to other framework conditions. Regarding specific activities of the circular economy, this factor is again considered to be most important for sustainable design and business models for resource efficiency. For the remaining activities this factor is considered to be of similar, but lesser importance. From this one might conclude that for an emerging sector like circular economy, the focus seems to be directed more inwards than outwards. This is also reflected by the geographical focus that the surveyed cluster managers report: around 75% of the clusters focuses on the region or nation.

Figure 17: Importance of collaboration and internationalisation (as a % share of total respondents)

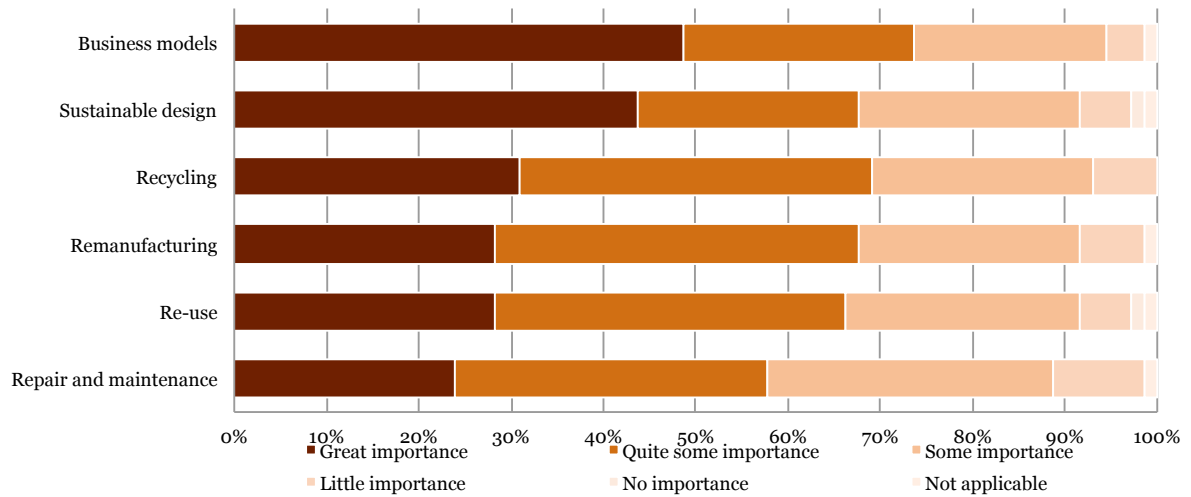


Source: Technopolis Group (N=69)

6. Entrepreneurial conditions

The survey shows that entrepreneurial conditions were in comparison not considered to be a very crucial framework condition by survey respondents. As for previous framework conditions, it is considered to be most important for business models and sustainable design and of (generally) lesser but similar importance for the remaining activities.

Figure 18: Importance of entrepreneurial conditions (as a % share of total respondents)



Source: Technopolis Group (N=72)

3. Policy recommendations to cluster organisations

Raise awareness and promote alternative business models of circular economy

The findings from the survey reveal a limited understanding of business opportunities offered by circular economy model by cluster managers and regional authorities. The current activities of cluster organisations and regional stakeholders focus mainly on the product and technology development. There is a limited attention to business model innovation implying alternative approaches to product ownership or value chain reconfiguration involving customers.

Therefore, the role of regional policy-makers as well as cluster managers is to encourage a more systemic understanding of alternatives provided by the circular economy business models for their specific context. Cluster organisations can actively pursue and share information on business models, explaining the business cases behind various alternatives and facilitate strategic discussion on which models are most relevant for their members.

Assess specific potential and implications of circular economy for your context

One of the prominent findings from the survey was the need for specific expertise and knowledge for advancing circular economy. Cluster organisations are well placed to initiate in-depth diagnostic studies assessing business potential for circular economy in their regional ecosystem. One of the key aspects of such studies would be to find synergies between these potentials and specialisation areas in which clusters and regions excel.

For example, clusters facilitating contacts between product design, advanced materials and manufacturing are well placed to invest in researching and testing substituting primary with secondary materials or focusing attention on durable designs. On the other hand, cluster with a strong presence of both manufacturing and service sectors, such as logistics, can become test beds for product-service systems such as product sharing models or remanufacturing.

Experiment, collaborate and demonstrate: clusters as circular economy living labs

Clusters and other forms of economic agglomerations (industrial districts or logistical centres such as ports) emerge as attractive testbeds for demonstrating and scaling up of circular economy business models. As illustrated on the example of Rotterdam, economic agglomerations can become frontrunners in advancing new models and systemic innovations. Cluster organisations could become catalysts of such initiatives by providing a strategic platform for designing and implementing business models involving business and actors from various sectors.

Embrace circular economy into regional innovation and smart specialisation strategy

The case of circular economy can be further advanced by an inclusion to the regional strategy. Many regional Smart Specialisation strategies already include circular economy and resource efficiency topics but there is a need for a more integrated and systemic approach to tap into the potential of the new model (Walendowski et al 2014). Cluster organisations along with its members should become active partners of regional authorities in further advancing more ambitious circular economy projects.

Adapt the framework conditions for scaling up and diffusion of new business models

The case study suggested that for many cluster organisations consider circular economy and resource efficiency among their main priorities. However, as long as the incentive structures within policy and economy are set towards a linear economy model, the full benefits of changing business models towards resource efficiency cannot be reaped. Policy actors at all levels have a role in adapting incentive in the regulatory and policy framework to foster circular economy.

While many regulatory barriers or gaps in policy frameworks can be resolved on the European (e.g. end of waste criteria) and national level (e.g. fiscal framework), regional and local levels have powerful

policy instruments at their disposal, notably public procurement and spatial planning. Cluster organisations could have a key role in co-designing these measures with regional authorities as well as in facilitating an innovative response to pre-commercial or innovation procurement.

The analysis of the framework conditions based on the survey also highlighted the importance of skills and qualifications for the circular economy. Possible measures at the regional level include the introduction of dedicated study programmes at higher education institutions, mutual learning across businesses, vocational training as well as the integration of circular economy aspects into existing vocational education and training as well as study programmes. Cluster organisations can both benefit from these activities as well as provide training and business education on the circular economy.

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Annex I: Survey questionnaire



This work is part of a service contract for the Enterprise and Industry Directorate-General of the European Commission. 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, as well as the information included in it, do not necessarily reflect the opinion or position of the European Commission.

European Cluster Observatory: survey on factors that influence the development of emerging industries in the area of circular economy

Section 1: Introduction

The European Cluster Observatory is a single access point for statistical information, analysis and mapping of clusters and cluster policy in Europe. It is an initiative of the Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW) of the European Commission that aims at promoting the development of more world-class clusters in Europe, notably with a view to fostering competitiveness and entrepreneurship in emerging industries and facilitating SMEs' access to clusters and internationalisation activities through clusters.

Technopolis Group as the member of the European Cluster Observatory consortium is preparing a **case study on factors that can influence the development of emerging industries in the area of circular economy**. This survey focuses on selected activities associated with circular economy model, including:

- 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 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.
- 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. 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.
- Re-use: is understood as an operation by which products or components that are not waste are used again for the same purpose they were originally designed. In other words, the product is used repeatedly in the same form .
- 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.
- Recycling: refers to any operation by which waste materials are reprocessed into products or materials. 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.
- Business models: describes 'the rationale of how an organisation creates, delivers, and captures economic, social, and other forms of values'. The components of business models typically include: value proposition, 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.

Within this task we are undertaking a survey among cluster organisations, regional governments, regional development agencies and other actors across the 28 EU Member States and the EU Associated Countries. The aim of this survey is as follows:

1. to identify circular economy activities across Europe;
2. to identify cross-sectoral collaborations in circular economy related areas that European clusters engage in;
3. to determine those cluster-specific framework conditions that foster cross-sectoral innovation and entrepreneurship in emerging industries related to the circular economy.

If your organisation is currently engaged in any of the emerging industries related to the circular economy or is planning to do so in the future, we would be very grateful if you filled out this survey by **18th September 2015**. The survey will take no more than 20 minutes of your time.

All answers and comments will be treated as strictly confidential and non-attributable. The survey results will be reported in aggregate and anonymous form. Your answers will be saved only when you click on the "Done" button at the end of the survey. If you have any questions or comments about the survey please do not hesitate to [contact us](#).

We thank you very much in advance for your contribution to the study!

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Section 2: General Information

* 1. Name of your organisation:

* 2. Type of organisation:

- Regional development agency
- Regional government
- Cluster organisation/management
- Industrial park management
- Industrial or business association
- Other (please specify)

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Section 3: Focus and Characteristics of the Organisation

3. In what year was your organisation created?

4. Please indicate the number of members in your organisation:

- Less than 25
- 26-50
- 51-100
- 101-150
- 151-200
- More than 200

5. To your best knowledge, what percentage of your members are engaged in the circular economy activities?

- 0%
- <10%
- 10%-25%
- 26%-50%
- 51%-75%
- 76%-100%

Please provide comments, if any:

6. What percentage of your members are start-ups (or spin-offs) entering circular economy related emerging industry(ies)?

- 0%
- <10%
- 10%-25%
- 26%-50%
- 51%-75%
- 76%-100%

Please provide comments, if any:

7. If you represent a cluster organisation: What has been the main driving force behind the creation of the organisation?

- Spontaneous cluster: genesis is based on a spontaneous agglomeration of key enabling factors without direct commitment of public actors
- Policy-driven clusters: formation is a consequence of active efforts and policies of governmental agencies aimed at cluster development

Please provide comments, if any:

8. Please indicate what best represents the geographical scope of the members of your organisation:

- Regional
- National
- European
- Worldwide

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Section 3: Focus and Characteristics of the Organisation

9. In what year was your organisation created?

10. Please indicate the number of members in your organisation:

- Less than 25
- 26-50
- 51-100
- 101-150
- 151-200
- More than 200

11. To your best knowledge, what percentage of your members are engaged in the circular economy activities?

- 0%
- <10%
- 10%-25%
- 26%-50%
- 51%-75%
- 76%-100%

Please provide comments, if any:

12. What percentage of your members are start-ups (or spin-offs) entering circular economy related emerging industry(ies)?

- 0%
- <10%
- 10%-25%
- 26%-50%
- 51%-75%
- 76%-100%

Please provide comments, if any:

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Section 3: Focus and Characteristics of the Organisation

* 13. Country where your organisation is based:

14. Region where your organisation is based (if applicable):

15. Your position:

16. Which sector(s) is your organisation active in? *(multiple answers are allowed)*

- Agriculture, forestry and fishing
- Mining and quarrying
- Manufacturing
- Electricity, gas, steam and air conditioning supply
- Water supply; sewerage; waste management and remediation activities
- Construction
- Wholesale and retail trade; repair of motor vehicles and motorcycles
- Transporting and storage
- Accommodation and food service activities
- Information and communication
- Financial and insurance activities
- Real estate activities
- Professional, scientific and technical activities
- Administrative and support service activities
- Public administration and defence; compulsory social security
- Education
- Other(s) (please specify)

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Section 3.1: Focus and Characteristics of the Organisation

17. Please specify the type of manufacturing! (*multiple answers are allowed*)

- Manufacture of food products
- Manufacture of beverages
- Manufacture of tobacco products
- Manufacture of textiles
- Manufacture of wearing apparel
- Manufacture of leather and related products
- Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
- Manufacture of paper and paper products
- Printing and reproduction of recorded media
- Manufacture of coke and refined petroleum product
- Manufacture of chemicals and chemical products
- Manufacture of basic pharmaceutical products and pharmaceutical preparations
- Manufacture of rubber and plastic products
- Manufacture of other non-metallic mineral products
- Casting of metals
- Manufacture of computer, electronic and optical products
- Manufacture of electrical equipment
- Manufacture of machinery and equipment n.e.c.
- Manufacture of motor vehicles, trailers and semi-trailers
- Manufacture of other non-metallic mineral products
- Manufacture of other transport equipment
- Manufacture of furniture
- Other manufacturing
- Repair and installation of machinery and equipment
- Other (please specify)

* 18. What is your level of involvement with circular economy activities?

- I have been actively involved in circular economy activities
- I am planning to pursue circular economy activities in the near future (1 year)
- I am interested in circular economy but not planning any activities in the near future
- I am not interested in circular economy activities.
- Other (please specify)

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Section 4.1: Focus on Circular Economy Activities

19. Please select circular economy activity your organisation is active in (*multiple answers are allowed*):

- Sustainable design
- Repair and maintenance
- Re-use
- Recycling
- Re-use
- Business models for resource efficiency
- Other (please specify)

20. Please briefly describe the circular economy activities conducted in your organisation:

21. At present, which sectors do you typically cooperate with to implement your Circular Economy activities? (*multiple answers are allowed*)

- Agriculture, forestry and fishing
- Mining and quarrying
- Manufacturing
- Electricity, gas, steam and air conditioning supply
- Water supply; sewerage; waste management and remediation activities
- Construction
- Wholesale and retail trade; repair of motor vehicles and motorcycles
- Transporting and storage
- Accommodation and food service activities
- Information and communication
- Financial and insurance activities
- Real estate activities
- Professional, scientific and technical activities
- Administrative and support service activities
- Public administration and defence; compulsory social security
- Education
- Other(s) (please specify)

European Cluster Observatory: survey on factors that influence the development of emerging industries in the area of circular economy

Section 4.2: Focus on Circular Economy Activities

22. Please specify the type of manufacturing! (*multiple answers are allowed*)

- Manufacture of food products
- Manufacture of beverages
- Manufacture of tobacco products
- Manufacture of textiles
- Manufacture of wearing apparel
- Manufacture of leather and related products
- Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
- Manufacture of paper and paper products
- Printing and reproduction of recorded media
- Manufacture of coke and refined petroleum product
- Manufacture of chemicals and chemical products
- Manufacture of basic pharmaceutical products and pharmaceutical preparations
- Manufacture of rubber and plastic products
- Manufacture of other non-metallic mineral products
- Casting of metals
- Manufacture of computer, electronic and optical products
- Manufacture of electrical equipment
- Manufacture of machinery and equipment n.e.c.
- Manufacture of motor vehicles, trailers and semi-trailers
- Manufacture of other non-metallic mineral products
- Manufacture of other transport equipment
- Manufacture of furniture
- Other manufacturing
- Repair and installation of machinery and equipment
- Other (please specify)

23. Please select circular economy activity your organisation will get active in the future: *(multiple answers are allowed)*

- Sustainable design
- Repair and maintenance
- Re-use
- Remanufacturing
- Recycling
- Business models for resource efficiency
- Other (please specify)

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Section 4.4: Focus on Circular Economy Activities

24. In the future, which sectors do you plan to cooperate with concerning your circular economy activities?
(multiple answers are allowed)

- Agriculture, forestry and fishing
- Mining and quarrying
- Manufacturing
- Electricity, gas, steam and air conditioning supply
- Water supply; sewerage; waste management and remediation activities
- Construction
- Wholesale and retail trade; repair of motor vehicles and motorcycles
- Transporting and storage
- Accommodation and food service activities
- Information and communication
- Financial and insurance activities
- Real estate activities
- Professional, scientific and technical activities
- Administrative and support service activities
- Public administration and defence; compulsory social security
- Education
- Other(s) (please specify)

European Cluster Observatory: survey on factors that influence the development of emerging industries in the area of circular economy

Section 4.5: Focus on Circular Economy Activities

25. Please specify the type of manufacturing! (*multiple answers are allowed*)

- Manufacture of food products
- Manufacture of beverages
- Manufacture of tobacco products
- Manufacture of textiles
- Manufacture of wearing apparel
- Manufacture of leather and related products
- Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
- Manufacture of paper and paper products
- Printing and reproduction of recorded media
- Manufacture of coke and refined petroleum product
- Manufacture of chemicals and chemical products
- Manufacture of basic pharmaceutical products and pharmaceutical preparations
- Manufacture of rubber and plastic products
- Manufacture of other non-metallic mineral products
- Casting of metals
- Manufacture of computer, electronic and optical products
- Manufacture of electrical equipment
- Manufacture of machinery and equipment n.e.c.
- Manufacture of motor vehicles, trailers and semi-trailers
- Manufacture of other non-metallic mineral products
- Manufacture of other transport equipment
- Manufacture of furniture
- Other manufacturing
- Repair and installation of machinery and equipment
- Other (please specify)

26. In your view, what emerging business and technology trends related to the circular economy will be the most relevant for the future development of your cluster/region?

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Section 4.7: Focus on Circular Economy Activities

27. In your view, which parts of the value chain are circular economy activity/ies relevant for?

- Strategy development, including business model
- Research, Development, Design (RDD), including technology development
- Inbound logistics (including material sourcing and procurement)
- Manufacturing
- Distribution and other outbound logistics
- Marketing and sales
- HR
- Post-sales services (repair and maintenance)
- Post-sales services (recycling, reuse, remanufacturing)

28. Please list the top three incentives that, in your opinion, promote innovation and entrepreneurship in the emerging circular economy related industries:

Incentive 1	<input type="text"/>
Incentive 2	<input type="text"/>
Incentive 3	<input type="text"/>

29. Please list three the most important barriers for clustering and accelerating business activities in the emerging circular economy related industries:

Barrier 1

Barrier 2

Barrier 3

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Section 5: Identification of Framework Conditions

With regard to the activities of the circular economy and related industries: **Please rate the degree of importance of the cluster-specific factors** listed below that can foster business creation, entrepreneurship and innovation in emerging circular economy related industries

If you think there are other industry-specific aspects that are important to recognise, please note them in the comment fields below.

30. Demand conditions, such as customer readiness, existence of labels, proximity to public procurement, information campaigns

	Great importance	Quite some importance	Some importance	Little importance	No importance	Not applicable
Sustainable design	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Repair and maintenance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Re-use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Remanufacturing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recycling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Business models	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

31. Regulatory factors such as existence of legislative norms and their implementation and enforcement, IPR

	Great importance	Quite some importance	Some importance	Little importance	No importance	Not applicable
Sustainable design	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Repair and maintenance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Re-use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Remanufacturing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recycling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Business models	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

32. Access to finance, such as seed and venture capital, public funding, private sector investment

	Great importance	Quite some importance	Some importance	Little importance	No importance	Not applicable
Sustainable design	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Repair and maintenance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Re-use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Remanufacturing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recycling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Business models	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

33. Knowledge & skills base, such as availability of competent staff

	Great importance	Quite some importance	Some importance	Little importance	No importance	Not applicable
Sustainable design	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Repair and maintenance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Re-use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Remanufacturing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recycling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Business models	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

34. Knowledge transfer, such as collaboration platforms between circular economy actors, internationalisation

	Great importance	Quite some importance	Some importance	Little importance	No importance	Not applicable
Sustainable design	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Repair and maintenance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Re-use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Remanufacturing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recycling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Business models	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

35. Conditions for Entrepreneurship, such as entrepreneurial culture, infrastructures (broadband etc)

	Great importance	Quite some importance	Some importance	Little importance	No importance	Not applicable
Sustainable design	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Repair and maintenance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Re-use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Remanufacturing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recycling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Business models	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

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Section 6: Recommendations for Cluster Policy Makers

36. In your view, what can national/regional policy makers do to support the clustering of innovative and growth oriented companies and promote the development of emerging industries in the area of circular economy?

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Section 7: Business Case Examples

In the scope of this case study we are collecting interesting examples of business cases of new emerging start-ups and industry transformations that disrupt the traditional value chains and offer new opportunities in circular economy industries.

* 37. Please indicate if you are willing to share information on successful business cases from the experiences of your cluster/organisation and agree that this information may be included in the case study:

Yes, I would like to share information on successful business cases

No, I do not want to share such information

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Section 7: Business Case Examples

38. Please briefly describe the company(ies) example(s):

39. Please provide an URL with a website for further information about the example:

40. Would you agree to be contacted for further details on the company example(s)?

No

Yes, please contact me through this E-Mail address:

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Thank you for your participation!

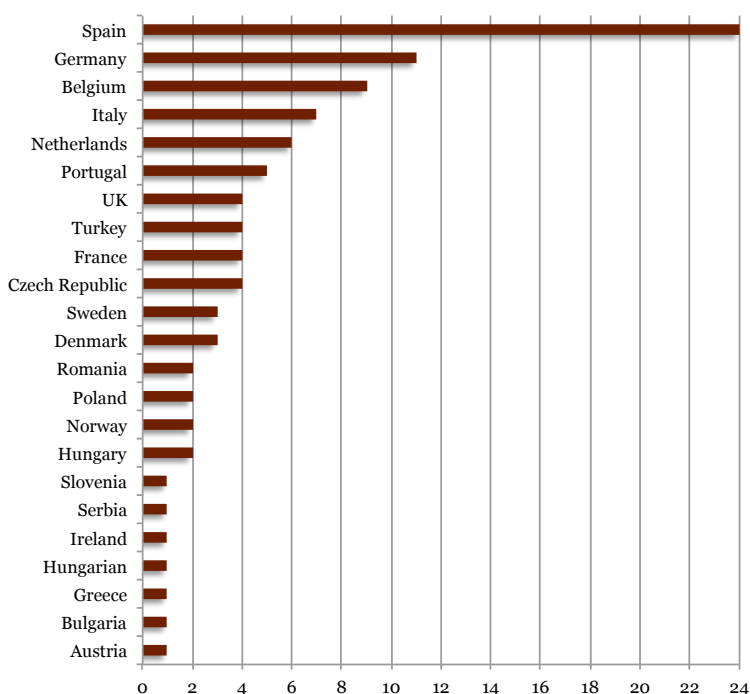
Annex II: Additional material

3.1 Profile of survey respondents

In order to provide first insights on the organisations engaged with or interested in circular economy activities, the information provided by the respondents of the online survey was analysed and is presented in the following.¹²

Economic and environmental pressures to use natural resources or materials more efficiently are felt all across Europe. Therefore, it is not surprising, that the topic of circular economy attracted survey respondents from all over Europe, across around 70 different regions. However, around 80% of respondents are based in EU-15 countries. Seven percent of respondents come from associated countries and the remaining 13% from EU-13 countries.

Figure 19: Survey country coverage



This geographical representation of respondents does not necessarily imply that in the EU-13 and associated countries there is generally less engagement with or interest in circular economy activities but it can point to countries where the topic seems to be more prominently discussed within business contexts than in others.

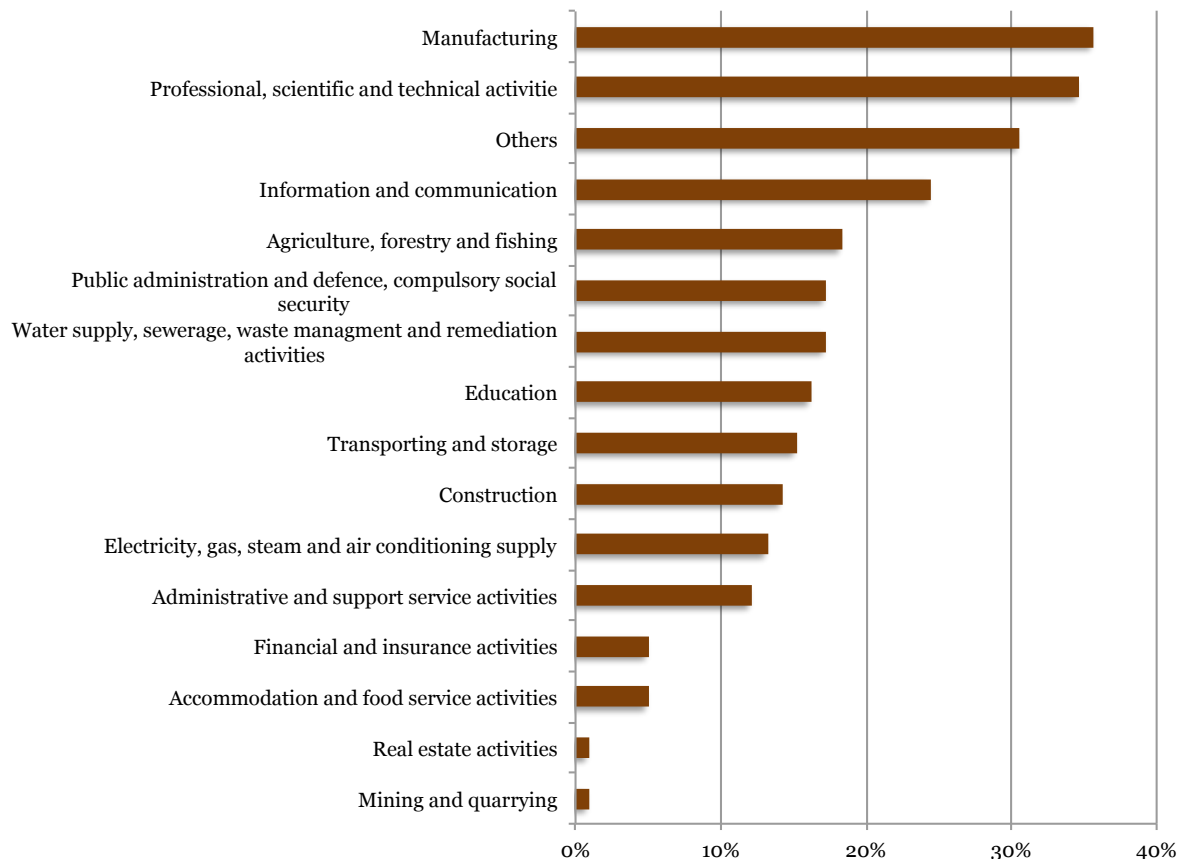
Sectoral profile of respondents

The survey showed that actors engaged with or interested in circular economy activities come from a variety of sectors. Most prominently featured are manufacturing, professional, scientific and technical

¹² It has to be noted that the survey addressed all potential respondents and no sampling strategies directed towards representativeness of countries or sectors were put in place. This was chosen deliberately in order to be able to identify both geographic as well as sectoral 'hotspots'.

activities, information and communication and agriculture. Fewer respondents came from typical service sectors such as financial and insurance activities and real estate.

Figure 20: Industry focus of survey respondents (as % share of total respondents)



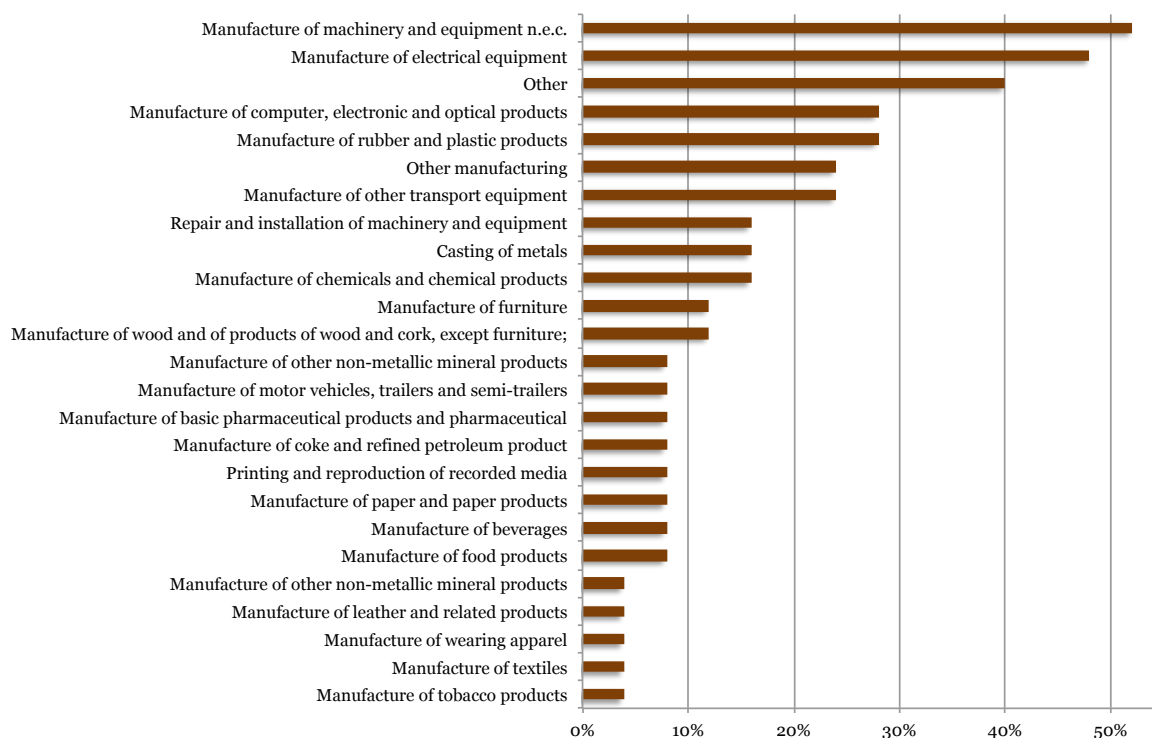
Source: Technopolis Group (N=98)

The most prominent sector manufacturing sectors represented by the respondents included: machinery and equipment, electrical equipment, computer, electronic and optical products, rubber and plastic products and other transport equipment. For each of those sectors, more than 20% of respondents are active in circular economy. Some respondents were active in more than one manufacturing sector.



This work is part of a service contract for the Enterprise and Industry Directorate-General of the European Commission. 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, as well as the information included in it, do not necessarily reflect the opinion or position of the European Commission.

Figure 21: Industry focus of survey respondents (as % share of total respondents)



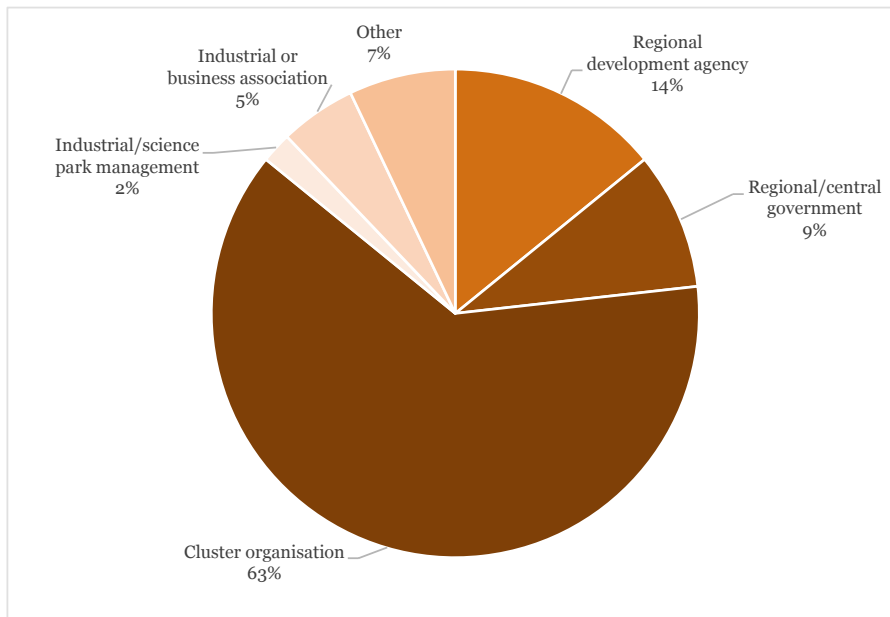
Source: Technopolis Group (N=25)¹³

Emerging circular economy activities develop within different organisational structures

The online survey was conducted among cluster managers as well as among regional development agencies and regional and central governments, industrial or science park managements and industrial or business associations. Our results show that a broad variety of actors were active in circular economy activities. However, the majority of survey respondents represented cluster organisations (63%). Besides the cluster organisations, regional development agencies and regional or central governments constituted almost one quarter of respondents (23%).

¹³ The relatively high share of the category 'other' and 'other manufacturing' stems from the fact that survey respondents indicated their specific area of activity, such as agricultural equipment, industrial automation or compressed air energy storage systems rather than relating to the overarching category.

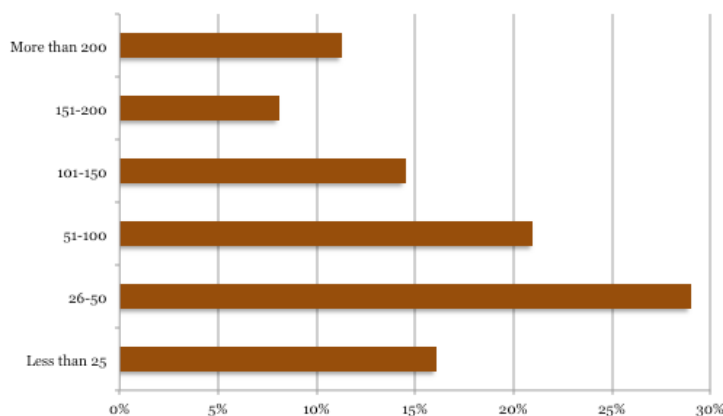
Figure 22: Distribution of organisations dealing with circular economy



Circular economy is mainly relevant for younger and smaller cluster organisations

Firstly, a large share (around 75% or 43 organisations) of the surveyed cluster organisations engaged or interested in circular economy were created after 2005. Within this group, however, the majority of cluster organisations were created between 2005 and 2009 (28 out of 43 cluster organisations). This finding is in line with the general development of cluster policy, which started to gain momentum in the around the mid-2000s. Secondly, the surveyed cluster organisations are relatively small clusters: around two thirds of the clusters have less than 100 members.

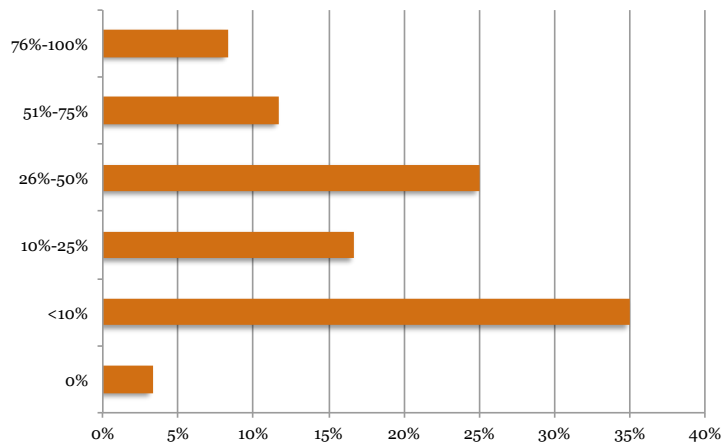
Figure 23: Number of cluster members



Thirdly, the share of cluster members that is active in circular economy activities differs. In around 1/3 of the cases less than 10 % of the members are actively engaged in circular economy activities. How-

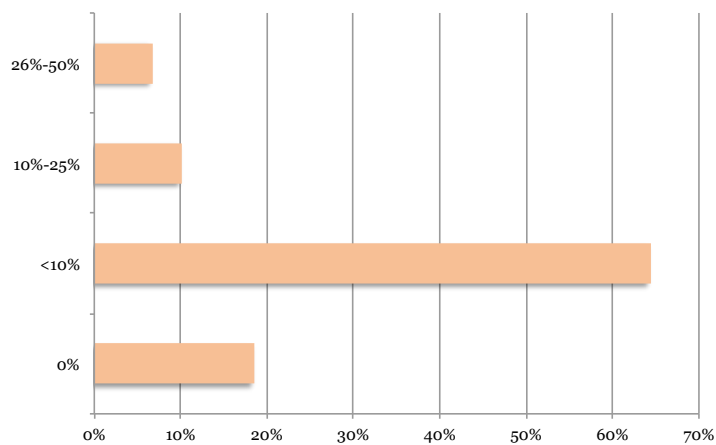
ever, in 25% of cluster organisations up to half of their members are active in circular economy activities.

Figure 24: Share of cluster members active in circular economy activities



46% of the cluster organisations surveyed show a strong regional (as opposed to national (31%), european (13%) or worldwide (10%)) focus. In the survey, no significant start-up participation could be identified in the clusters – in around 84% of clusters less than 10% of members were start-ups in the area of circular economy.

Figure 25: Share of start-ups with regard to circular economy in the clusters



3.2 Present and future cooperation patterns

Figure 26: Present cooperation patterns

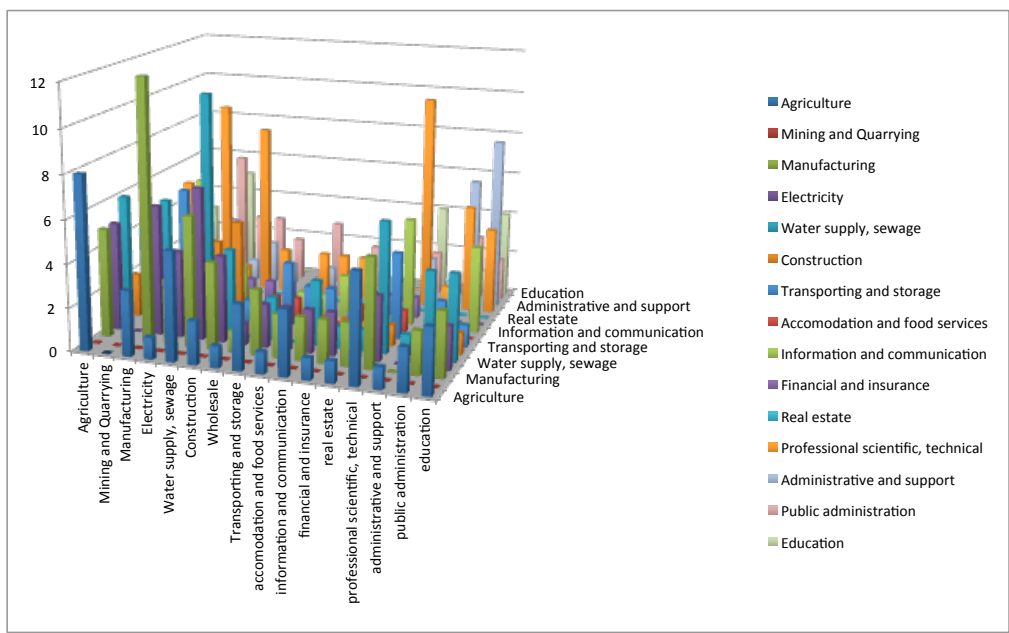
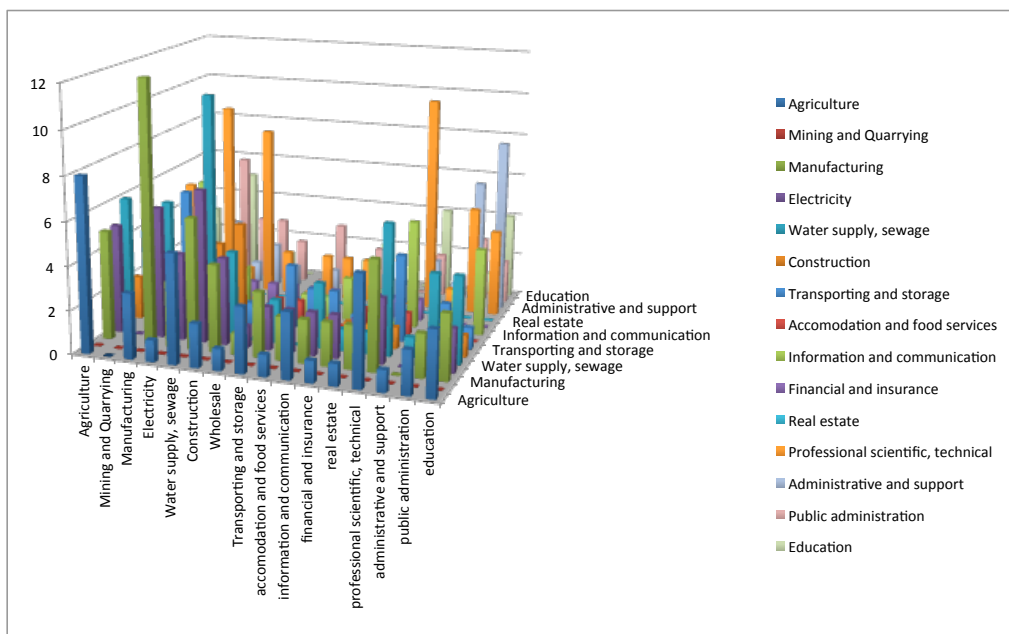


Figure 27: Future cooperation patterns



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

<http://ec.europa.eu/enterprise/initiatives/cluster/observatory/>