EUROPEAN CLUSTER COLLABORATION PLATFORM

European Cluster Panorama Report 2024

An initiative of the European Union

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Executive Summary

This executive summary presents a synthesis of the most significant findings from the **European Cluster Panorama Report 2024**. The European Cluster Panorama Report provides a comprehensive overview of the European cluster landscape, the footprint of EU27 cluster organisations in the European Single Market, and trends in cluster policy across Europe. This report places particular emphasis on **novel examinations of the role of cluster organisations and cluster policies for industrial competitiveness, regional transition processes, and resilience building**.

The European cluster landscape:

- The European Cluster Collaboration Platform (ECCP) currently profiles approximately **1,200 cluster organisations in the EU27**. There has been a notable increase in the number of cluster organisations over the past 15 years, particularly in the EU13 Member States. Nearly 60% of the cluster organisations in the EU27 have been established since 2010.
- **Cluster organisations in the EU27 gather a diverse range of stakeholders**. **Small and medium-sized enterprises** (SMEs) represent the most prevalent cluster member type across all Member States. In the EU27, 83% of all members of EU cluster organisations are SMEs.
- Cluster organisations in the EU27 **actively support the twin transition and enhance the competitiveness and resilience of their members**. The majority of cluster organisations support collaboration activities, internationalisation and up- and reskilling of the workforce, as well as providing best practices or dedicated digital training.

European cluster organisations as shapers of the single market:

- **EU27 cluster organisations are well placed to address issues related to the Twin Transition and building resilience since they operate in all industrial ecosystems**. It is particularly noteworthy that the Digital and Energy-Renewables ecosystems constitute a significant proportion of the cluster landscape in the EU27 (45% in total, with 27% in the Digital sector and 18% in Renewable Energy), which serves to underscore the pivotal role of cluster organisations as drivers in the EU's twin transition.
- Significant developments are especially visible in the **industrial ecosystems "Digital", "Renewable Energy" and "Health"**. These ecosystems are characterised by remarkable increases in employment and/or GVA and the number of cluster organisations (Digital: employment growth 24% & GVA growth 48% between 2014-2021; 160 cluster organisations; Renewable Energy: GVA growth of 27%; 110 cluster organisations with an increase of more than 70 since 2021; Health: employment growth of 14% and GVA growth of 27% with around 100 cluster organisations and an increase of 50 since 2021).
- **A positive correlation has been identified between the prevalence of clusters and a number of key indicators of industrial competitiveness**. This encompasses a range of factors, including human resources in science and technology-related roles, the proportion of the workforce employed in technology and knowledge-intensive sectors, the level of business R&D investment, the number of patents filed, and a variety of economic outcomes, such as GDP and productivity.
- The results of the new empirical investigations indicate a significant positive correlation between cluster presence and various aspects of the Green and Digital Transition. These include the proportion of employed green or digital specialists, the number of digital patents, and the share of ICT in gross value added. This implies that **regions with a higher cluster presence are better prepared for the Twin Transition**.

- It is notable that **regions with clusters in the Mobility-Transport-Automotive (MTA) ecosystems perform better in relation to the transition challenges of this ecosystem** than regions with the MTA industrial ecosystems but without clusters in relation to the transition challenges of this ecosystem. Cluster organisations can therefore be relevant instruments in addressing the challenges of transition processes.

Cluster policy and key transition challenges in Europe:

- Across the EU Member States, clusters are supported by either specific cluster policies or broader and sectoral economic policies. However, **dedicated cluster policies are more focused on a comprehensive support system for clusters than broad and sectoral policies**. While the latter often have as an objective the support of new cluster initiatives, demonstrating their role in the initial development of cluster landscapes, dedicated cluster policies are important to support the development and maturing of clusters.
- **The funding for cluster programmes is derived from a combination of sources**, including EU, national and regional funding. They may be included in European Regional Development Fund Operational Programmes at national and regional levels or the Single Market Programme at EU level. In such instances, grant members have access to earmarked funding streams. Alternatively, they may combine different sources across regional and national levels of governance.
- **Cluster policies play a pivotal role in enabling clusters to act as integrators of diverse industrial and research actors, facilitating transformative change and addressing wider economic challenges.** This is achieved in two ways. Firstly, clusters facilitate collaboration between cluster members, collectively addressing challenges. Secondly, cluster organisations serve as institutional interfaces that can link their industrial ecosystems to broader policy efforts across different policy fields. These include innovation and start-ups, upskilling and reskilling, internationalisation, the green and digital transition, and resilience and economic security. Cluster policies should take this dual role of clusters into account.

Conclusions & business-policy implications:

- Although cluster organisations are active throughout all EU Member States, only half of the Member States have developed dedicated cluster policies to support their activities. The development of such **dedicated cluster policies** throughout the EU is crucial to further enhancing the contribution of cluster organisations to industrial competitiveness and transition processes.
- It is imperative that **cluster policy is integrated into the respective industrial EU, national, and regional policy context**. This integration can simultaneously create synergies with adjacent policies, such as Smart Specialisation, training initiatives, internationalisation strategies, or start-up programmes. Therefore, a **transformative policy framework** is required, comprising an integrated set of strategies, policies, and programmes, with the aim of establishing more modular forms of support schemes. Cluster organisations are ideally placed to assume a pivotal role within this framework.
- **Cluster organisations and the implementation of dedicated cluster policies are of significant importance in the further development and improvement of numerous areas of the European Single Market**. These include the facilitation of economic resilience and market integration, the de-risking of operations and the nearshoring of activities, the support of SMEs in their internationalisation efforts and cross-border projects.

01

Introduction

1. Introduction

Major geopolitical and geoeconomic changes have occurred since the last European Cluster Panorama Report was published in 2021.[1] Economic and value creation structures are undergoing a profound transformation that has not been seen for many decades. While the repercussions of the COVID-19 pandemic are still being felt, new issues are constantly emerging, creating complex and multi-faceted challenges. The consequences of disruptive technological developments, of accelerating climate change, and enormous geopolitical uncertainties are creating vast challenges across almost all areas of the economy. At the same time, the pace of disruptive technological developments has increased dramatically, particularly in the context of digital technologies, where advances in artificial intelligence (AI) technologies have impacted many areas of our daily lives and businesses.[2] Under the conditions of pandemic, war, geoeconomic competition, inequalities and uneven development, place-based industrial policy has recently been on the rise and is increasing the international competition to attract investment and economic activity.[3] In this context, it is crucial to strengthen the competitiveness of the European Union.[4]

Against this background, the **European Cluster Panorama Report 2024** examines the specific role of clusters and cluster organisations as key actors in the European industrial innovation ecosystem and the relevance of cluster policies in the European Union to drive transformation processes and to further strengthen competitiveness and resilience. The report provides an up-to-date assessment of the European cluster landscape, examines the role of clusters for industrial competitiveness, productivity, and transition processes; outlines key findings and policy trends of cluster policies and programmes across Europe; and shows how dedicated cluster policies can support the transition challenges of regions in the EU27. A new feature of this Panorama is an assessment of the role of clusters and cluster policy to industrial competitiveness as well as a specific assessment of the contribution of clusters to regional transition processes.

This report is based on data provided by cluster actors registered on the **European Cluster Collaboration Platform** (ECCP), information collected for the **Cluster Policy Country Factsheets**,[5] and secondary data. These data sources are also used to conduct a correlation analysis to deepen the understanding of the relationships between cluster presence and industrial competitiveness and transition processes. Furthermore, the ECCP has been continuously developed since the European Cluster Panorama Report 2021. This includes, among others, changes in the profiles of the registered cluster actors and the information they provide. This report is the first to provide information on these updated profiles.

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[1] ECCP (2024): European Cluster Panorama 2021. Available online: https://clustercollaboration.eu/sites/default/files/2021-12/European_Cluster_Panorama_Report_0.pdf (last access 20.03.2024)
[2] EIB (2023): Digitalisation in Europe 2022-2023. Available online: https://www.eib.org/en/press/all/2023-203-digitalisation-in-the-european-union-progress-challenges-and-future-opportunities (last access 26.03.2024)
[3] Muro, M. et al. (2022): Breaking down an $80 billion surge in place-based industrial policy. Brookings Institution. 15.12.2022. Available online: https://www.brookings.edu/articles/breaking-down-an-80-billion-surge-in-place-based-industrial-policy/ (last access 23.04.2024)
[4] Letta, E. (2024): Much more than a market. Empowering the Single Market to deliver a sustainable future and prosperity for all EU Citizens. Available online: https://www.consilium.europa.eu/media/ny3j24sm/much-more-than-a-market-report-by-enrico-letta.pdf (last access 23.04.2024)
[5] https://clustercollaboration.eu/in-focus/policy-acceleration/country-factsheets-on-cluster-policies-and-programmes

The remainder of the European Cluster Panorama Report 2024 is organised into the following chapters:

2. The European cluster landscape

In Chapter 2, a general overview of the different cluster actors that are profiled on the ECCP is first provided. Following that, the characteristics of cluster organisations in the EU27 are examined to assess the maturity of the European cluster ecosystem. The last pillar of this chapter illustrates the specific services provided by EU27 cluster organisations that support the Twin Transition as well as resilience-building of their members.

3. European cluster organisations as shapers of the Single Market

Chapter 3 examines the important role of cluster organisations for regions across the EU. As an introduction, the economic activity of EU27 cluster organisations, the composition of the economy in the EU27, as well as the footprint of cluster organisations in the European economy are analysed. The other sections of this Chapter provide insights into the relationship between cluster presence and industrial competitiveness. Special attention is also paid to the role of clusters in the dynamics of industrial transition processes.

4. Cluster policy and key transition challenges in Europe

The fourth chapter presents the main findings and policy trends of cluster policies and programmes across Europe, based on the latest insights from the cluster policy factsheets. This chapter focuses on the relevance of cluster policies for supporting the Twin Transition, as well as issues of socio-economic resilience and economic security across the regions in the EU.

5. Conclusions & implications

The last chapter draws conclusions and outlines the implications for the future of the European cluster landscape.

02

The European cluster landscape

2. The European cluster landscape

Overview of key findings

- There are around **1,200 cluster organisations in the EU27** that are profiled on the ECCP. There has been strong growth in the number of cluster organisations over the last 15 years (particularly in the EU13 Member States). Almost 60% of the cluster organisations in the EU27 have been founded since 2010.
- Although the membership structure of cluster organisations varies across the EU27, **the EU27 cluster organisations gather a large number of different stakeholders**. SMEs (83% of all members of cluster organisations) are the most prevalent cluster member type across all Member States.
- Cluster organisations in the EU27 provide a variety of different services that **support the Twin Transition and enhance the competitiveness and resilience** of their members. The majority of cluster organisations support collaboration activities, notably between business and research and internationalisation, up- & reskilling of the workforce, and provide best practices or dedicated digital training.

This chapter provides a concise overview of the cluster landscape in the EU27. It begins with a general overview of the different cluster actors that are profiled on the ECCP. It then focuses on ECCP-registered cluster organisations in the EU27 Member States, which are assessed in terms of their structural characteristics. The last section outlines the services of EU27 cluster organisations that support the Twin Transition as well as resilience building.

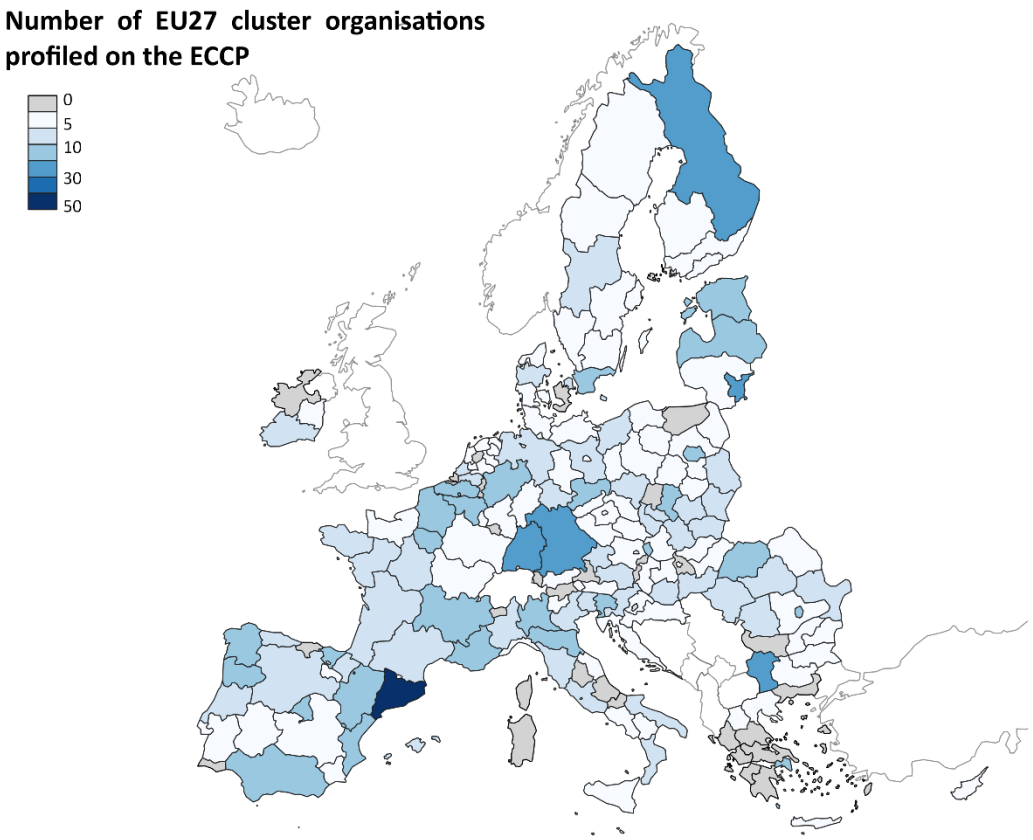
2.1 The European cluster ecosystem cluster

This section gives a general overview of the different cluster actors that are profiled on the ECCP focusing especially on cluster organisations in the EU27 and their structures. This serves as a stocktaking of the European cluster ecosystem and its maturity.

Cluster organisations are the key actors in the European economy, facilitating collaboration, networking, and knowledge sharing between diverse innovation stakeholders. The ECCP currently boasts almost 1,200 cluster organisations from EU27 Member States. It increased by 124 members since the publication of the European Cluster Panorama 2021.[6] Figure 1 illustrates the regional distribution of EU27 cluster organisations. In general, cluster organisations are present throughout the EU27. However, there are some regions where they are particularly well represented and matured e.g., Catalonia, Lombardy, Bavaria, Upper Silesia, and countries e.g. France, Germany, Italy, or Denmark.

[6] ECCP (2024): European Cluster Panorama 2021. Available online: https://clustercollaboration.eu/sites/default/files/2021-12/European_Cluster_Panorama_Report_0.pdf (last access 20.03.2024)

Figure 1: Regional distribution of EU27 cluster organisations

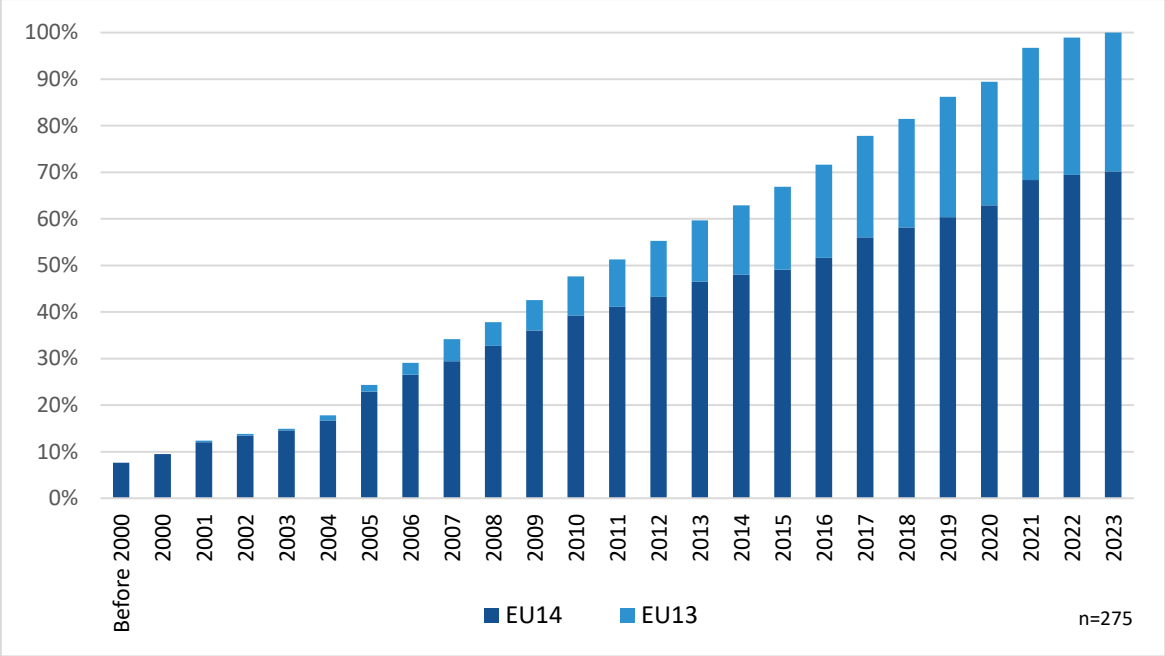


Source: Data extracted from ECCP Platform on 21/12/2023. Note: Includes all cluster organisations with profiles on the ECCP. Table 1 in the Annex provides a detailed overview of the ECCP Profiles by Actor Type and Country.

The development of cluster organisations can be seen as a competitiveness policy instrument whose origins can be traced back to the 1990s.[7] Consequently, the date of creation of cluster organisations provides a first indication of the maturity of clusters and thus of the cluster ecosystem in the EU27. Figure 2 shows the evolution of the stock of EU27 cluster organisations over time. Overall, there has been a **significant increase in the development of cluster organisations over the last decade**. More than 40% of the EU27 cluster organisations registered in the ECCP were created before 2010, mainly between 2000 and 2009. This indicates a long tradition of cluster organisations in the innovation ecosystems of the EU27. However, this is only the case for cluster organisations in EU14 Member States.[8] In the EU13 Member States[9], cluster organisations have been created relatively recently, with a strong increase over the last 15 years.

[7] Ketels, Christian H.M (2011): Clusters and Competitiveness: Porter's Contribution. Chap. 10 in Competition, Competitive Advantage, and Clusters: The Ideas of Michael Porter, Oxford University Press.
[8] EU14 includes Member States that have joined the EU before 2004. These are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden
[9] EU13 includes Member States that have joined the EU since 2004. These are Bulgaria, Croatia, Cyprus, Czechia, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia

Figure 2: Development of the stock of EU27 Cluster organisations over time, by EU14 and EU13 Member States



Source: Data extracted from ECCP Platform on 21/12/2023. Note: EU14 includes Member States that have joined the EU before 2004. These are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden. EU13 includes Member States that have joined the EU since 2004. These are Bulgaria, Croatia, Cyprus, Czechia, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia.

Cluster organisations comprise a **diverse range of entities** (members of cluster organisations), including large firms, SMEs, start-ups, research organisations, incubators/accelerators, technology centres, public or policy institutions, NGOs, and civil society bodies. Consequently, each member can be part of one or several cluster organisations. The ECCP profiles approximately 4,900 cluster organisation members across the EU27.

There exist geographical or sectorial networks of clusters which are collaborative networks between clusters from different countries (cross-border, across Europe or even international), operating under one brand. These networks account for 47 profiles on the ECCP. Seats of the majority of these cluster networks are located in Belgium (11), France (8) and Spain (7). **National associations** from the EU27 that represent either all or a part of all cluster organisations in a specific country have 21 profiles on the ECCP. In many cases, there is one national association in an EU Member State.

On top of this, there are EU projects which aim at stimulating the creation of partnerships between cluster organisations and/or other cluster actors such as Euroclusters financed by the Single Market Programme in 2021-2027. Overall, there have been 220 partnerships located in the EU27 and supported financially by the EU in the last decade. Out of this, 30 Joint Cluster Initiatives (Euroclusters)[10] in 2021-27 and the various European Strategic Cluster Partnerships (ESCP) such as the ESCP for Excellence[11], ESCP for Going International,[12] and the ESCP for

[10] https://clustercollaboration.eu/euroclusters (last access 14.03.2024)
[11] https://clustercollaboration.eu/eu-cluster-partnerships/escp-4x (last access 14.03.2024)
[12] https://clustercollaboration.eu/eu-cluster-partnerships/escp-4i (last access 14.03.2024)

smart specialisation investments[13] financed in the 2014-2020 period are included under this category. The greatest number of these European cluster partnerships have been coordinated from Spain (56), France (56), and Italy (34).

2.2 Characteristics of EU27 cluster organisations

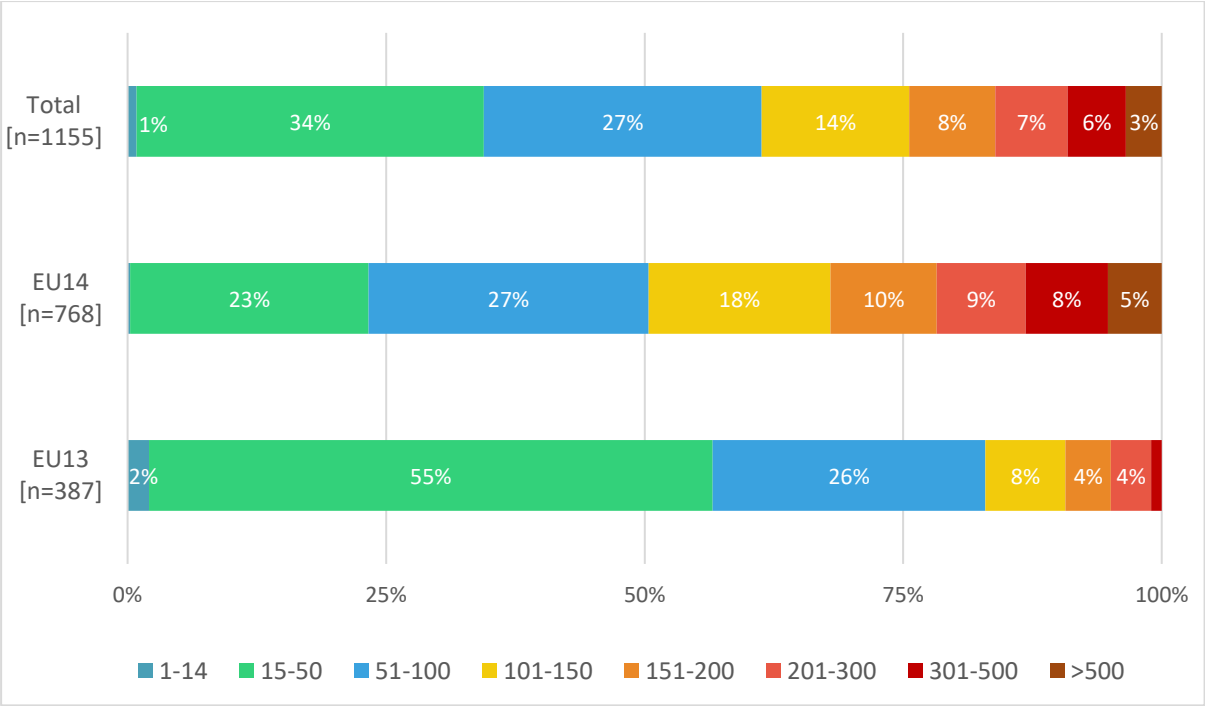
This section presents a detailed examination of the cluster ecosystem in the EU27 Member States. It analyses the structural elements of cluster organisations in the EU27, including their size, membership structure and economic activity. This information is essential for assessing the maturity and capacity of the ecosystem.

The **membership structure of EU27 cluster organisations** is analysed to understand the importance of critical mass and the co-location of related industries for clusters. The membership structures of cluster organisations provide an initial indication of the maturity and capacities of cluster organisations in the EU27. This analysis reveals a diverse range of cluster membership sizes across the EU27:

A total of 61% of cluster organisations in the EU27 have less than 101 members. 14% have between 101 and 150 members, 8% have between 151 and 200 members, and 7% have between 201 and 300 members. Approximately 9% of cluster organisations have more than 300 members. On average, EU27 cluster organisations have around 145 members. However, there is considerable variation in the size of cluster organisations across the EU27. Figure 3 indicates that cluster organisations in EU13 Member States tend to have smaller size profiles compared to EU14 Member States.[14] For instance, France and Germany are the countries with the highest shares of cluster organisations with more than 300 members. In other Member States, such as the Czech Republic, Lithuania, Bulgaria, Greece, or Romania, the majority of cluster organisations have less than 101 members (please refer to Table 2 in the Annex for further details).

[13] https://clustercollaboration.eu/eu-cluster-partnerships/escp-s3 (last access 14.03.2024)
[14] EU14 includes Member States that have joined the EU before 2004 and EU13 includes Member States that have joined the EU since 2004)

Figure 3: Cluster organisations registered on the ECCP, by share of members and EU14/EU13 Member States



Source: Data extracted from ECCP Platform on 21/12/2023, summary data provided in Table 2 in the Annex. Note: EU14 includes Member States that have joined the EU before 2004. These are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden. EU13 includes Member States that have joined the EU since 2004. These are Bulgaria, Croatia, Cyprus, Czechia, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia.

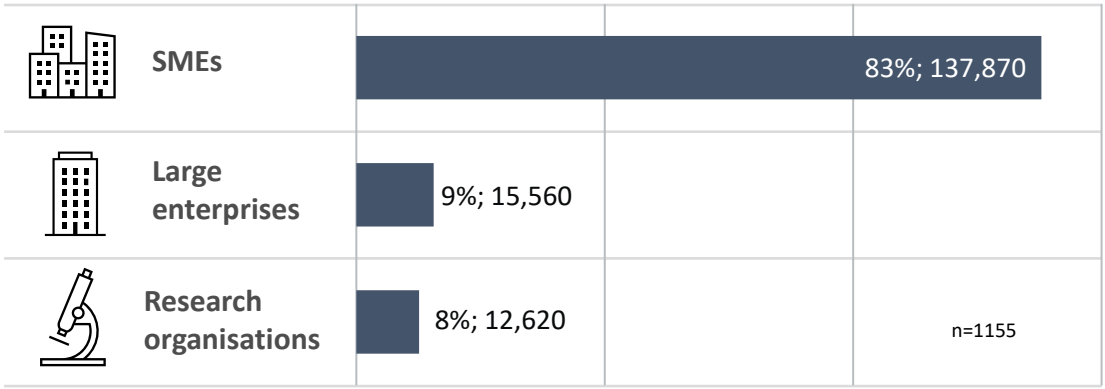
SMEs are considered as the backbone of the European economy since they are the most prevalent enterprises in the EU.[15] Against this background, the member structure of cluster organisations in the EU27 is scrutinised in the following (see Figure 4). EU27 cluster organisations can **provide access to a large number of different stakeholders in the economy and innovation ecosystems** as these cluster organisations represent around 166,050 cluster members**.** Thus, most of those cluster members are SMEs (83%), followed by large enterprises (9%) and research organisations (8%). However, there are considerable variations in the composition of the cluster member structure across the EU27 Member States (see also Table 3 in the Annex). Here, SMEs are the most prevalent cluster member type across all member States with shares ranging from 66% in Ireland to 92% in Cyprus. The 100% SME members in Malta are the result of one cluster organisation. Large enterprises are most prevalent in Irish cluster organisations (24%), while least prevalent among cluster organisations in Cyprus (2%) and Germany (4%). Cluster organisations in Greece (18%), Slovenia (16%) and Romania (14%) are characterised by the highest shares of research organisations among their members.

The majority of cluster organisations are operating in the industrial ecosystems "Digital", "Renewable Energy" and "Health" (see Chapter 3.1 for further details). It is notable that the majority of cluster members operating in the industrial ecosystems "Digital“, and "Health" are SMEs, which is not surprising given the key role played by SMEs (and in particular start-ups) in the ecosystem "Digital". In contrast, the industrial ecosystem "Renewable Energy" has a relatively lower proportion of SMEs and a higher proportion of large enterprises. This can at least

[15] https://single-market-economy.ec.europa.eu/smes_en (last access 16.04.2024)

partially be explained by relatively high entry barriers and the comparably high required capital investments for production in these ecosystems.

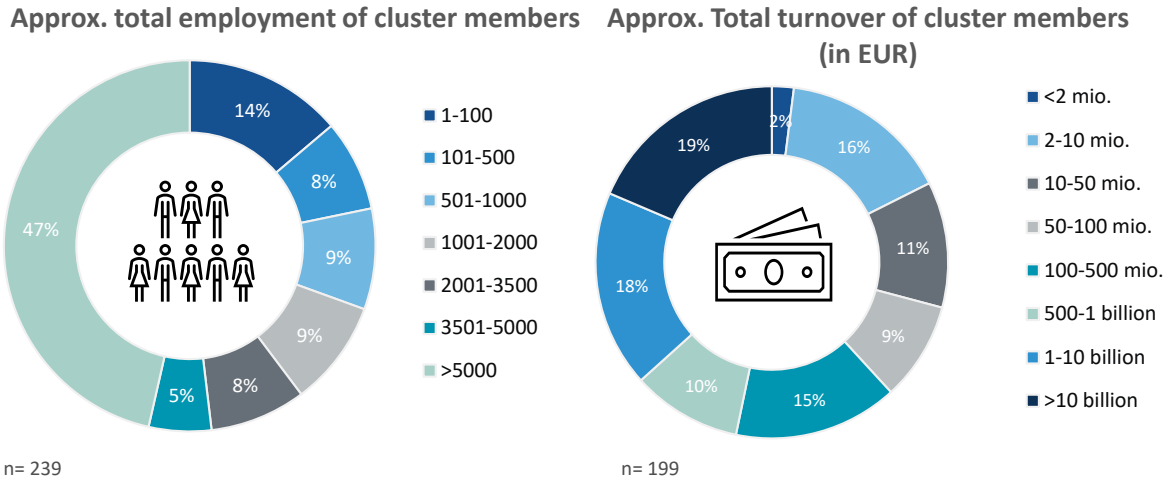
Figure 4: Overview of member structure of EU27 cluster organisations, by type of member



Source: Data extracted from ECCP Platform on 21/12/2023. Table 3 in the Annex provides a detailed overview of the member structure by EU Member State

Further complementing the assessment of cluster members, the approximative total **employment** as well as the **turnover** of cluster members is examined in the following (see Figure 5). Regarding employment, a heterogenous picture emerges. Here, the total employment of cluster members of around 33% of the cluster organisations in the EU27 is below 1000 employees. At the same time amounts the total employment of cluster members of 43% of cluster organisations to more than 5000 employees. This structure is also reflected in the approximative total turnover of the cluster members of cluster organisations in the EU27. The total turnover of 39% of these cluster members of cluster organisations is below €50 million. Simultaneously, the total turnover of around 36% of the cluster members of cluster organisations in the EU27 is above €1 billion. The latter are mostly related to cluster organisations in France and Germany, which also tend to be larger in size (see also Figure 3).

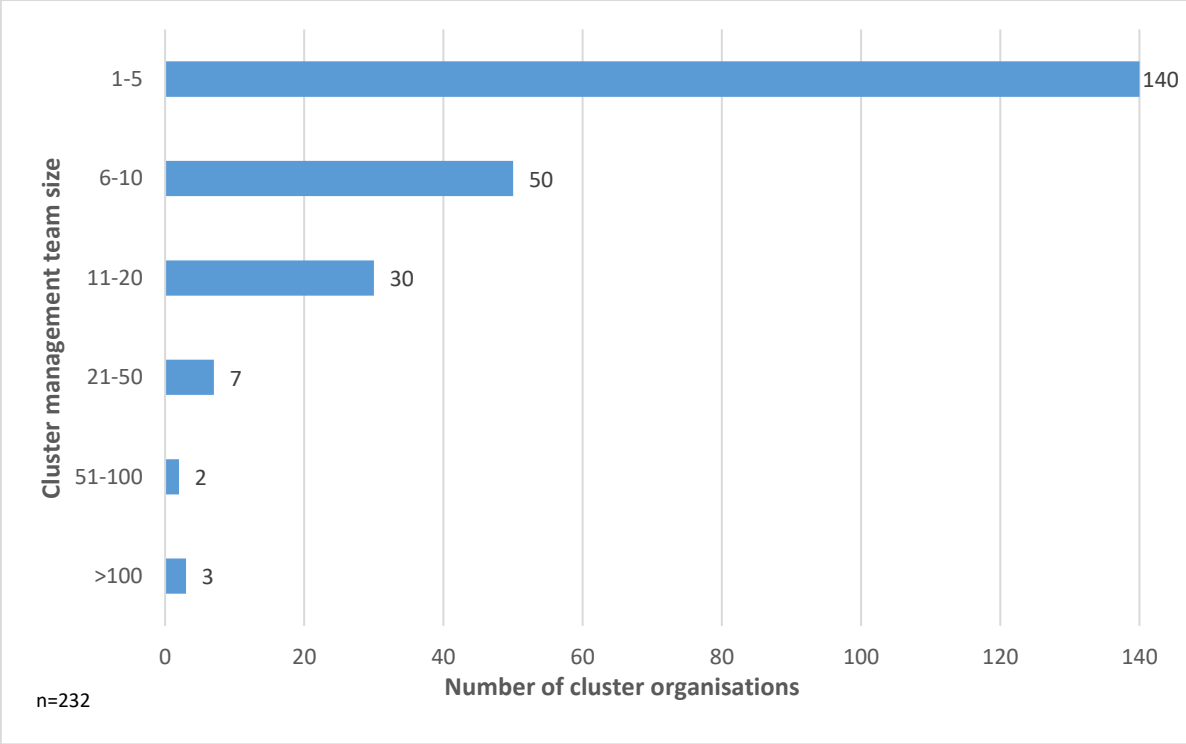
Figure 5: Approximative total employment (left) and turnover (right) of cluster members



Source: Data extracted from ECCP Platform on 21/12/2023. Note: only updated profiles are shown

The management team of a cluster organisation can be seen as a success factor for the contribution of cluster organisations to transformation processes.[16] A larger management team provides stronger administrative capacity, which can further contribute to the number of cluster members. Here a similar pattern emerges to the number of member organisations, as the majority of cluster organisations (60%) have between one and five employees, and 22% of cluster organisations have between six and ten employees (see Figure 6). Around 5% of cluster organisations employ more than 20 people. Some countries differ significantly from the EU average, e.g. in France only 27% of cluster organisations have 1-5 management staff (EU: 60%), in Germany the share is higher at 42% but still well below the EU average. In countries such as the Czech Republic and Poland, on the other hand, most cluster organisations have between 1 and 5 management staff (81% and 77% respectively); in neither country are there any cluster organisations with more than 20 management staff.

Figure 6: Cluster management team size of EU27 cluster organisations



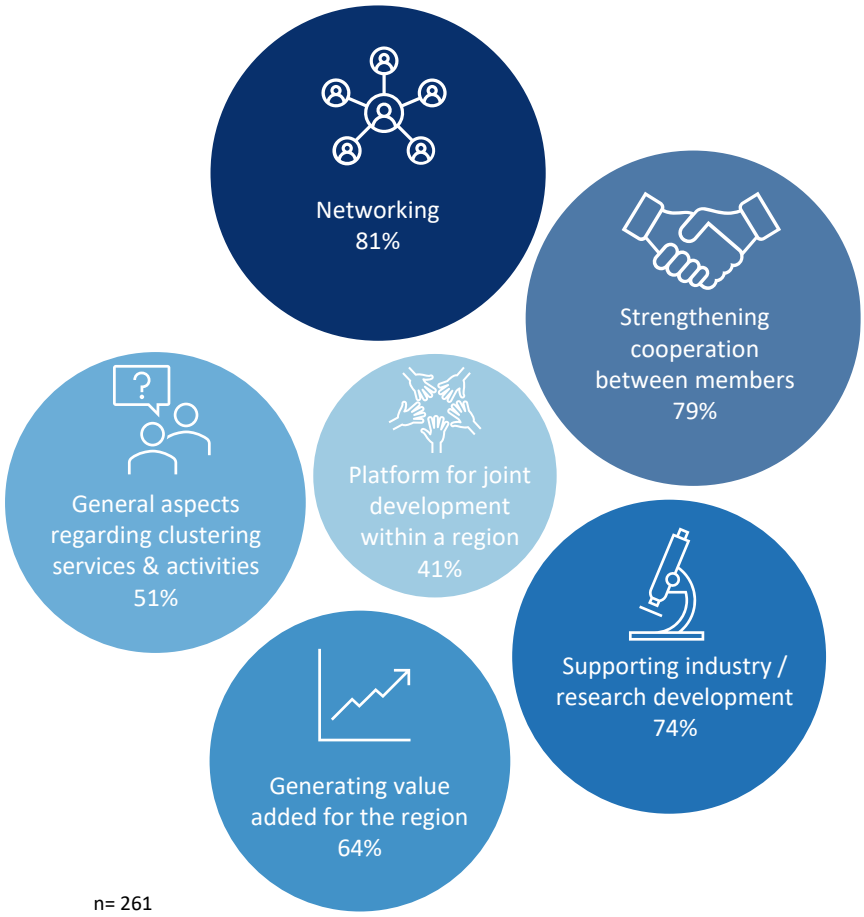
Source: Data extracted from ECCP Platform on 21/12/2023, summary data provided in Table 4 in the Annex. Note: only updated profiles are shown.

[16] Provadis School of International Management and Technology (2019): Creating Clusters of Change. Available online: https://clustercollaboration.eu/sites/default/files/eu_initiatives/manual-creating_clusters_of_change.pdf (last access 16.04.2024)

2.3 Services of cluster organisations for a green, digital & resilient Europe

This section sheds light on the specific services of cluster organisations in the EU27 that address the Twin Transition as well as resilience building. To start with, Figure 7 shows the mission objectives of cluster organisations in the EU27. This is relevant as it reflects the key activities of cluster organisations as intermediaries in the innovation ecosystem, through which they **facilitate innovation activities and strengthen competitiveness and hence in the long run economic** resilience. Here, especially three mission objectives stand out by the number of cluster organisations that have selected these objectives. These are "Networking", "Strengthening cooperation between members" and "Supporting industry/research development". For around 65% of cluster organisations in the EU27 "Generating value added for the region" is also among their mission objectives, followed by "General aspects regarding clustering services and activities" and "Platform for joint development within a region".

Figure 7: Mission objectives of cluster organisations in the EU27

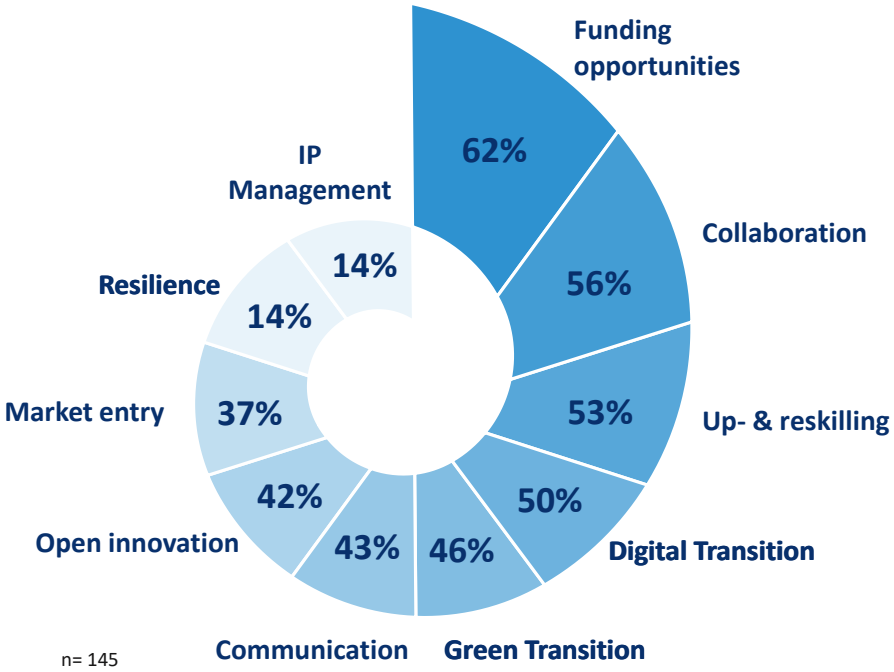


Source: Data extracted from ECCP Platform on 21/12/2023. Note: Cluster organisations can select multiple items

These mission objectives of the cluster organisations are complemented by the general training services that are offered by the EU27 cluster organisations registered on the ECCP. The following Figure 8 gives an overview of these training services offered by cluster organisations. Here, the three training services that are provided by many of the cluster organisations in the EU27 are "Funding opportunities", "Collaboration" and "Upskilling /reskilling workforce". This shows that **cluster organisations do not only directly support innovation activities but also support enabling the workforce to adapt to changing requirements** which is crucial in addressing

transition challenges successfully. As indicated in the figure below, training services related to the Digital transition" and "Green transition" are also frequently provided services by EU27 cluster organisations. This will be deepened in the following sub-sections.

Figure 8: Training services offered by EU27 cluster organisations

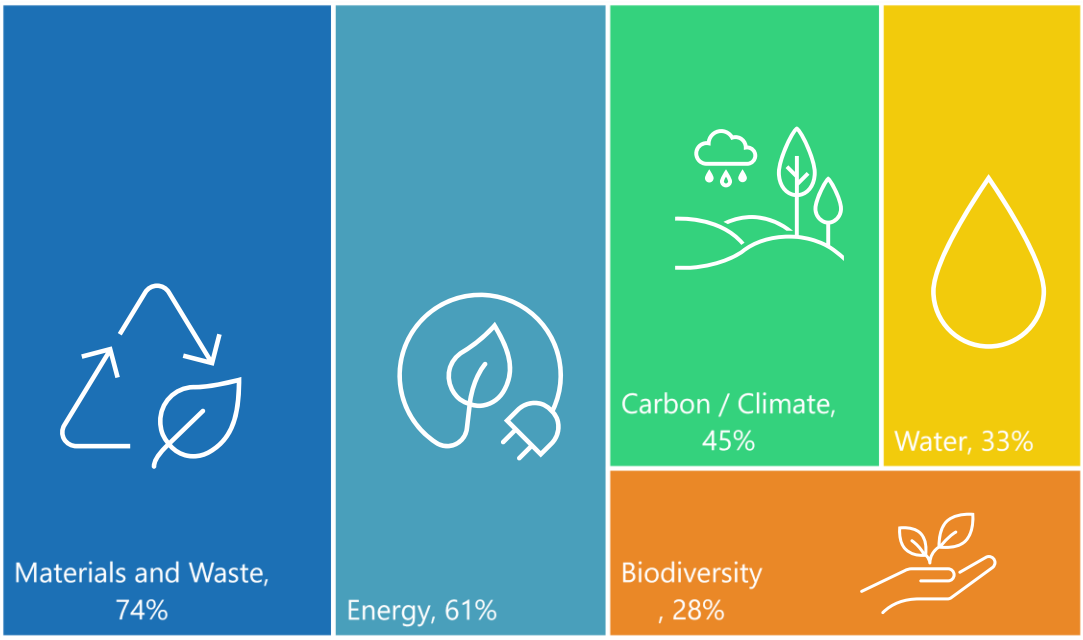


Source: Data extracted from ECCP Platform on 21/12/2023. Note: One cluster organisation can provide multiple training services. Only updated profiles are shown

Green

As shown above, cluster organisations are also **providing dedicated support services that address the Green Transition**. To complement this, Figure 9 informs about the Resource efficiency expertise of cluster organisations. As illustrated in the following figure the majority of EU27 cluster organisations have resource efficiency expertise around "Materials and Waste" followed by "Energy" and "Carbon/ Climate". Resource efficiency expertise in "Water" and in "Biodiversity" is also by EU27 cluster organisations.

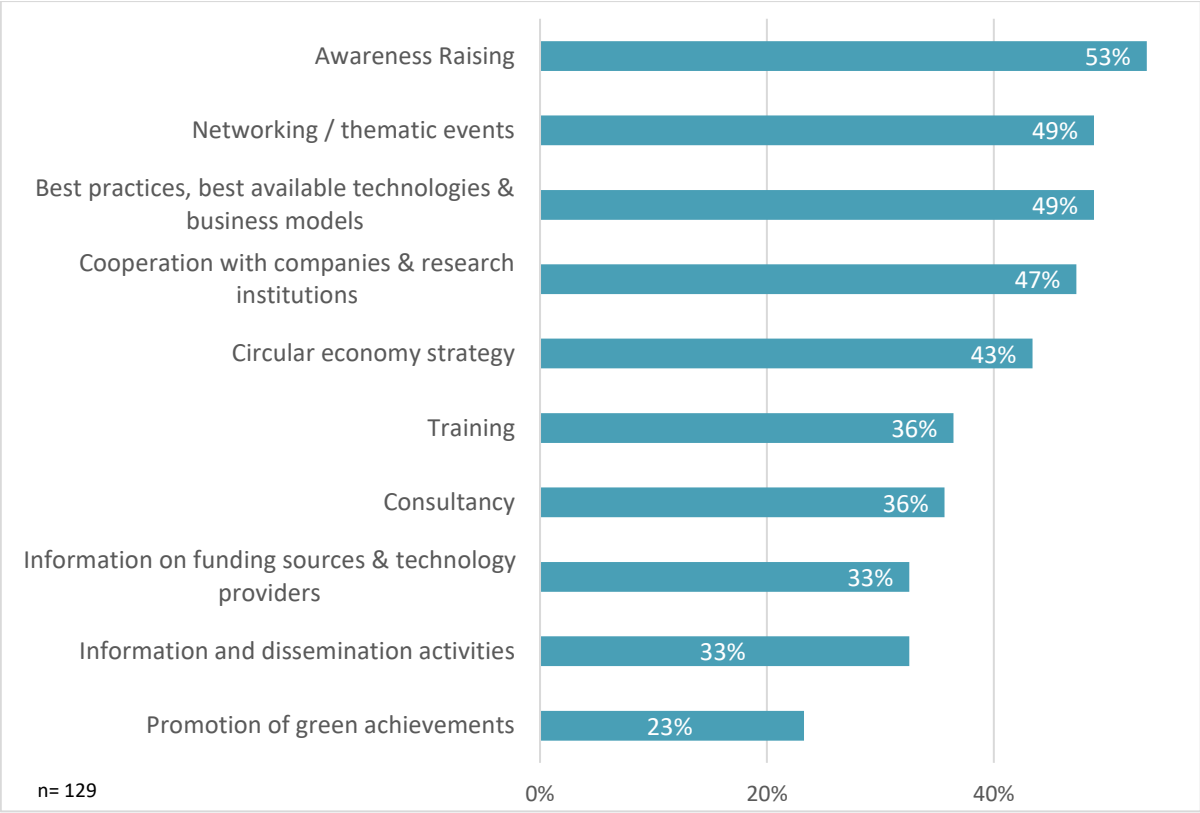
Figure 9: Resource efficiency expertise of cluster organisations



Source: Data extracted from ECCP Platform on 21/12/2023. Note: one cluster organisation can have expertise in multiple areas. Only updated profiles are shown

This expertise is used by EU27 cluster organisations to offer a range of resource efficiency support services. Overall, the **EU27 cluster organisations are addressing the Green Transition through various measures**: from awareness raising over connecting relevant stakeholders to sharing best practices. The top 10 resource efficiency support by the number of cluster organisations are illustrated in Figure 10. Here, the majority of cluster organisations provide services in the area of "Awareness Raising". Among the most relevant resource efficiency support services provided by cluster organisations are also "Networking/thematic events" and "Best practices, best available technologies, and business models".

Figure 10: Top 10 resource efficiency support services provided by cluster organisations

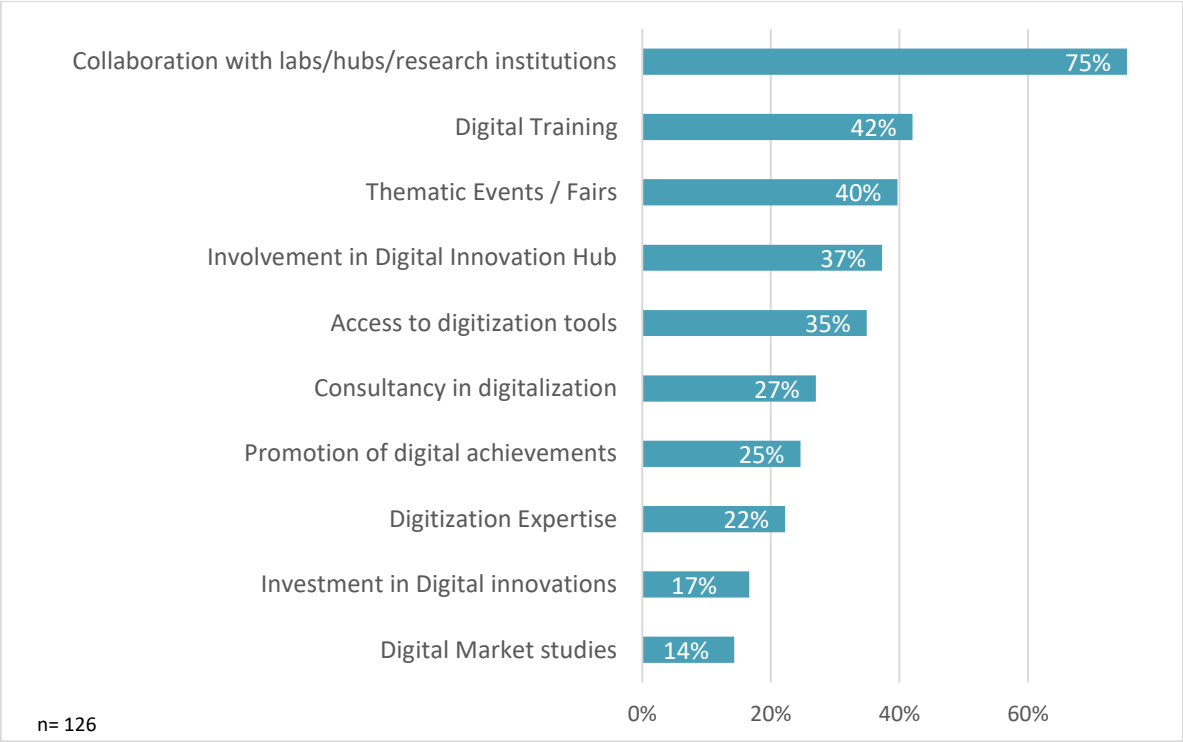


Source: Data extracted from ECCP Platform on 21/12/2023. Note: one cluster organisation can provide multiple services. Only updated profiles are shown.

Digital

In addition to the green transition, the **digital transition, and in particular support for digitalisation**, is a focus of many cluster organisations in the EU27. Figure 11 shows the digitalisation support services provided by EU27 cluster organisations. Overall, cluster organisations provide a wide variety of services to support the digitalisation of their members. Most cluster organisations have expertise in working with labs/hubs or research institutes to support digitalisation activities of their members. The types of collaboration can range from research activities, shared facilities and equipment, student projects, or teaching and learning. This is followed by 'digital training' and 'thematic events/fairs'. The areas where EU27 cluster organisations are least likely to provide services in support of digitalisation are 'Digital market studies' and 'Investing in digital innovation'.

Figure 11: Digitalisation support services provided by EU27 cluster organisations



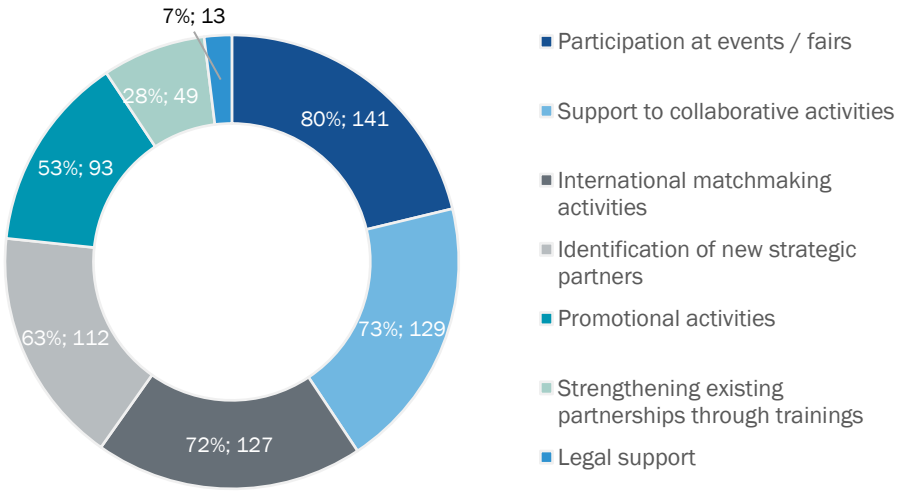
Source: Data extracted from ECCP Platform on 21/12/2023. Note: one cluster organisation can have multiple fields of digitalisation expertise. Only updated profiles are shown.

Internationalisation

As a last pillar, the support services of EU27 cluster organisations for internationalisation of their cluster members are examined. Support for **internationalisation is key, especially for SMEs as it can contribute to their level of competitiveness**.[17] The following Figure 12 provides an overview of the support services for internationalisation provided by cluster organisations in the EU27. Cluster organisations in the ECCP support the internationalisation efforts of their members in numerous ways out of which the participation at events/fairs, support to collaborative activities, and international matchmaking activities are thereby the most prevalent internationalisation support services provided by EU27 cluster organisations. The identification of new strategic partners and promotional activities are also prevalent internationalisation support services.

[17] Kubíčková et al. (2016): The Internationalisation of Small and Medium-Sized Enterprises as a Path to Competitiveness. In: Huber, P., Nerudová, D., Rozmahel, P. (eds) Competitiveness, Social Inclusion and Sustainability in a Diverse European Union.

Figure 12: Support services for internationalisation provided by EU27 cluster organisations



n= 177

Source: Data extracted from ECCP Platform on 21/12/2023. Note: one cluster organisation can provide multiple fields of internationalisation services. Only updated profiles are shown

Overall, the previous analysis has shown that **European cluster organisations are addressing many key areas of European interest since they are supporting their cluster members in adapting to the Twin Transition as well as in increasing their competitiveness and resilience**. The following Chapter will deepen this assessment by first providing an assessment of the economic footprint of EU27 cluster organisations in the European Single Market and second, by providing qualitative and quantitative evidence for clusters as drivers of industrial competitiveness and their role in industrial transformation processes.

03

European cluster organisations as shapers of the single market

3. European clusters as shapers of the Single Market

Overview of key findings

- EU27 cluster organisations are operating in all **industrial ecosystems** and are therefore well placed to address issues related to the Twin Transition and building economic resilience. Particularly noteworthy are the **Digital and Energy-Renewables ecosystems**, which constitute a **significant share of the cluster landscape in the EU27**, underscoring the pivotal role of cluster organisations as drivers in the EU's Twin Transition.
- Significant developments are especially visible in the **industrial ecosystems "Digital", "Renewable Energy" and "Health"**. These ecosystems are characterised by remarkable increases in employment and/or GVA and the number of cluster organisations.
- There is a **positive relationship between the presence of clusters and various aspects and dimensions of industrial competitiveness.** This concerns especially human resources and employment, business R&D, patenting activities and economic outcomes such as GDP and productivity.
- **Significant positive links exist between cluster presence and aspects of the Green and Digital Transition**, implying that regions with higher cluster presence are better prepared for the Twin Transition.
- Novel data for the Mobility-Transport-Automotive ecosystems shows that regions with clusters in the Mobility-Transport-Automotive ecosystems are better equipped for the transition challenges of this ecosystem. This further underline that **cluster organisations are relevant instruments to address the challenges of transition processes**.

This chapter has the objective of outlining the important role of clusters in the European Single Market, their role for industrial competitiveness & productivity and especially the importance of clusters for transition processes.

3.1 European cluster organisations in EU industrial ecosystems

In the pursuit of a comprehensive understanding of the European Single Market and the role of cluster organisations, this section explores the nexus between the economic composition and the cluster landscape within the framework of the EU industrial ecosystems. As part of its Industrial Strategy (March 2020), the European Commission has identified **14 industrial ecosystems**, which comprehensively cover the European Single Market.[18] These ecosystems encompass diverse stakeholders, from businesses to research institutions, operating within interconnected value chains.[19] Hence, examining industrial ecosystems is vital for understanding the economic composition of the European Single Market.[20] This section first provides insights in which EU industrial ecosystems the EU27 cluster organisations are active. Subsequently, it examines the

[18] For a definition of the 14 industrial ecosystem fiches, please refer to European Commission (2021): Annual Single Market Report, SWD (2021).
[19] See European Commission (2020): A New Industrial Strategy for Europe, COM (2020).
[20] For more information on the classification of the Industrial Ecosystems, please refer to the methodology part in the Annex.

economic composition of the European Single Market alongside the economic impact of the EU27 cluster organisations.

In terms of economic activity, it is notable that EU27 cluster organisations are active across all 14 EU industrial ecosystems, with some ecosystems distinguished by a higher number of cluster organisations. Specifically, the **majority of EU27 cluster organisations are active in the "Digital" and "Renewable Energy" industrial ecosystems** (see Figure 13). This prevalence of cluster organisations within the "Digital" ecosystem can be attributed to the rapidly evolving nature of digital technologies and the essential collaborative networks that foster innovation and growth. Similarly, nearly 20% of EU27 cluster organisations support the Renewable Energy ecosystem, emphasising the strategic importance of collaboration and knowledge sharing in advancing renewable energy technologies and supporting the EU's climate-neutral ambitions. This demonstrates the relevance and competencies of EU27 cluster organisations in supporting the Twin Transition. Other ecosystems with significant cluster organisation presence include "Health", "Agri-food", and "Mobility-Transport-Automotive". On the other hand, the "Retail" and "Proximity & Social Economy" ecosystems exhibit the fewest cluster organisations within the EU27. When assessing the **development of cluster organisations by industrial ecosystem over time** by comparing these numbers with the European Cluster Panorama 2021[21], one can see that the "Digital" ecosystem has remained the most prevalent of all ecosystems. Likewise, the ecosystems "Agri-food" and "Health" continue to be characterised by large shares of cluster organisations operating in those industrial ecosystems. Although previously lagging the "Agri-food" and "Health" ecosystems, the **Renewable Energy ecosystem has seen significant growth in cluster organisation activity since 2021**. This further underlines the increasing relevance of the green transition for the European cluster landscape.

[21] ECCP (2021): European Cluster Panorama 2021. Available online: https://clustercollaboration.eu/sites/default/files/2021-12/European_Cluster_Panorama_Report_0.pdf (last access 20.03.2024)

Figure 13: EU27 cluster organisations, by industrial ecosystems

n= 603

Source: Data extracted from ECCP Platform on 21/12/2023. Note: cluster organisations can operate in multiple industrial ecosystems

Having assessed the alignment of EU27 cluster organisations across the industrial ecosystems and their change over time, the focus now shifts to the economic composition within the framework of the industrial ecosystems within the EU27. To provide a comprehensive overview, it is looked at employment — represented by the number of persons employed — and gross value added at basic prices (GVA) are examined, illustrating the economic contributions of each ecosystem. Generally, as of 2021, the **total employment in the EU27 stands at roughly 210 million**[22], as of 2021, while the **overall GVA of the EU27 amounts to approximately EUR 13 trillion**[23]**.** Within the array of industrial ecosystems, "Retail", "Health" and "Construction" distinguish themselves in terms of both employment and GVA (see Figure 14). The "Retail" ecosystem, being the largest, employs about 29.8 million people, accounting for roughly 16% of total employment across the ecosystems, closely followed by "Construction" and "Health", each contributing about 14%. In terms of GVA, a similar pattern is discernible, with those three ecosystems ranking highest. The manufacturing sector is represented across multiple ecosystems in

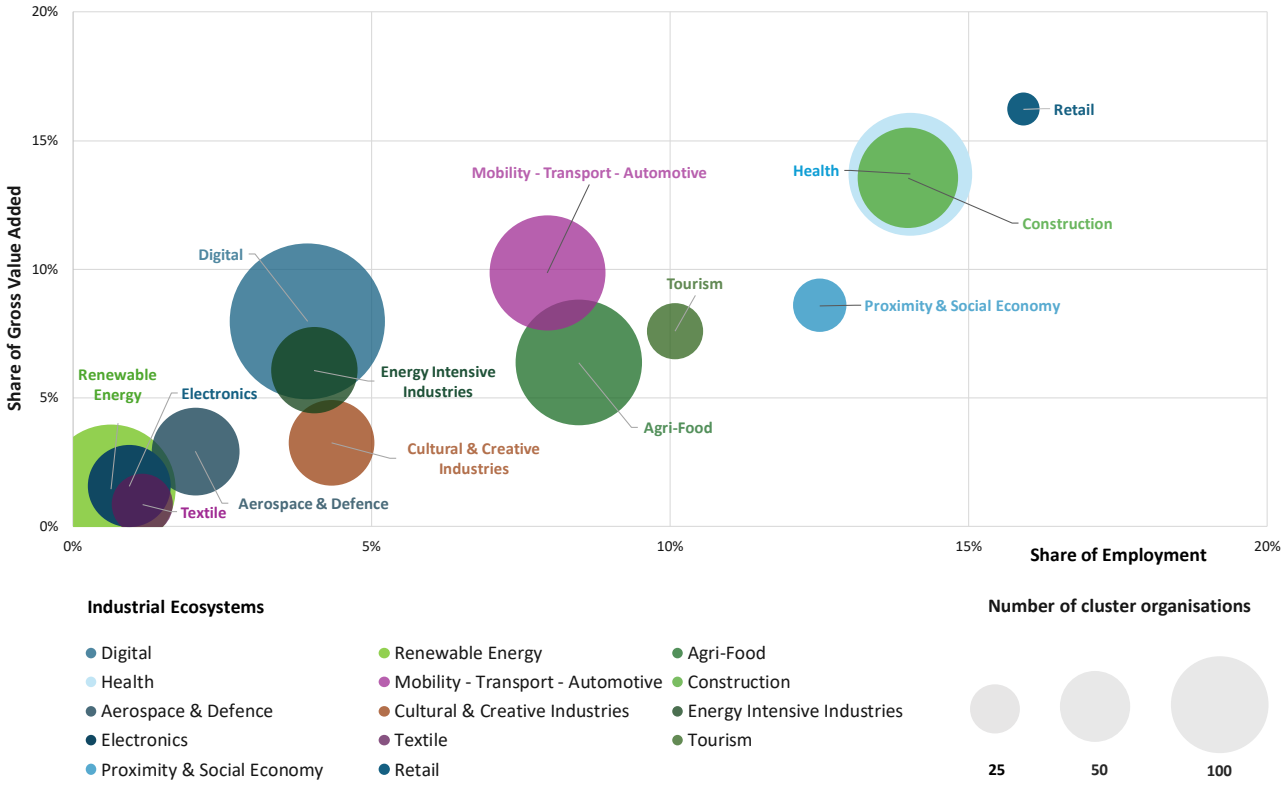
[22] Eurostat (2024): National accounts employment data by industry (up to NACE A*64): Available under: https://ec.europa.eu/eurostat/web/products-datasets/-/nama_10_a64_e (last access 23.04.2024).
[23] Eurostat (2024): National accounts aggregated by industry (up to NACE A*64). Available under: https://ec.europa.eu/eurostat/web/products-datasets/-/nama_10_a64 (last access 23.04.2024).

the EU27, including "Agri-food", "Energy Intensive Industries", "Electronics", and "Textile". The former ecosystem comprises approximately 8.5% of the total employment across all ecosystems, while the Energy Intensive Industries account for about 4% of total employment. As the European Union advances its agenda towards a sustainable and technologically integrated future, the "Digital" and "Energy Renewables" ecosystems stand at the forefront of this transformation. These sectors are pivotal to Twin Transition, which emphasises a shift towards green energy solutions and enhanced digital capabilities. The "Digital" ecosystem encompasses 4% employment across the industrial ecosystems and GVA of roughly 8%. The "Renewable Energy" ecosystem is considerably smaller, encompassing only 0.6% of employment and 1.4% of GVA.

In assessing the **economic dynamics of the industrial ecosystems from 2014 to 2021**, notable shifts in employment and gross value added (GVA) are observed, reflecting the evolving priorities and advancements within the EU market.[24] Of all industrial ecosystems, the Digital ecosystem exhibited the most remarkable growth, with employment and GVA surging by 24% and 48% respectively (See Figure 26 in the Annex). According to the EMI report for the digital ecosystem, the substantial growth in this ecosystem is largely attributed to an increased digital adoption necessitated by the COVID-19 pandemic, which increased the reliance on digital infrastructure. Further, strategic policies such as the EU's Digital Decade initiative, which sets forth comprehensive objectives to enhance digital skills, infrastructure, and business by 2030, have significantly contributed to bolstering the sector's influence and output in the EU economy.[25] The "Health" ecosystem also experienced considerable growth, with a 14% increase in employment and a 27% rise in GVA. This growth is largely driven by increased investments in healthcare infrastructure, coupled with a surge in demand due to an aging population and broader adoption of digital health technologies that enhance service delivery and efficiency.[26] In the "Renewable Energy" ecosystem, a similar rise in GVA, at 27%, is observable, although employment has only increased modestly by 5%. This can be attributed to significant advancements in energy efficiency and technology within this ecosystem as well as the increased use and adoption of renewable energies.[27] In some ecosystems, while employment has decreased over time, changes in GVA over time have been positive. This is particularly evident in the "Textile" and "Agri-food" ecosystem, with employment dropping by 11% and 6%, respectively. In addition to the challenges posed by the COVID-19 pandemic, attributed to increased automation and technological integration affecting employment in both ecosystems. Additionally, offshoring in the textile sector and the scaling of agricultural operations contribute to these trends by optimising efficiency and reducing the dependency on traditional labour-intensive practices.[28]

[24] A chart illustrating the changes in employment and GVA over time can be found in Figure 25 of the Annex.
[25] European Commission (2023): Monitoring the twin transition of industrial ecosystems – Digital Industrial Ecosystem, available online https://monitor-industrial-ecosystems.ec.europa.eu/sites/default/files/2023-12/EMI%20Digital%20industrial%20ecosystem.pdf (last access 17.04.2024).
[26] European Commission (2023): Monitoring the twin transition of industrial ecosystems – Health, available online https://monitor-industrial-ecosystems.ec.europa.eu/sites/default/files/2023-12/EMI%20Health%20industrial%20ecosystem%20report.pdf (last access 17.04.2024).
[27] European Commission (2023): Monitoring the twin transition of industrial ecosystems – Energy - Renewables, available online https://monitor-industrial-ecosystems.ec.europa.eu/sites/default/files/2023-12/EMI%20Renewable%20industral%20ecosystem%20report.pdf (last access 17.04.2024).
[28] European Commission (2023): Monitoring the twin transition of industrial ecosystems – Agri-food, available online https://monitor-industrial-ecosystems.ec.europa.eu/sites/default/files/2023-12/EMI%20Agrifood%20industrial%20ecosystem%20report.pdf (last access 17.04.2024).; European Commission (2023): Monitoring the twin transition of industrial ecosystems – Textiles, available online https://monitor-industrial-ecosystems.ec.europa.eu/sites/default/files/2024-01/EMI%20Textiles%20industrial%20ecosystem%20report.pdf (last access 17.04.2024).

Figure 14: Share of employment & GVA in the 14 industrial ecosystems and the number of cluster organisations (2021)



Source: ECCP (2024), based on data from Eurostat and ECCP profile data extracted from ECCP Platform on 21/12/2023. Note: cluster organisations can operate in multiple industrial ecosystems. Bubble sizes indicate the number of cluster organisations in the respective industrial ecosystem.

The distribution of cluster organisations across the 14 industrial ecosystems does not proportionally reflect the economic contributions in terms of employment or GVA (see Figure 14). Notably, the "Digital" and "Renewable Energy" ecosystems demonstrate a significant concentration of cluster organisations, underlining their strategic emphasis within the EU's economic framework. However, these sectors have comparatively modest shares of employment and GVA. This apparent discrepancy can be attributed to the nature of the activities within these clusters, which are often highly specialised, knowledge-intensive, and do not necessarily require large-scale employment to create substantial economic value. Furthermore, collaboration among a diverse range of stakeholders, including SMEs, large enterprises, academic institution, and research organisations is instrumental in fostering innovation through the integration of advanced technologies and expertise, which in turn is pivotal for the growth of these ecosystems. Hence, cluster organisations can serve as important catalysts for amplifying the adoption of new technologies and for contributing to the ecosystem's dynamic growth. Conversely, some ecosystems, despite having a large share in employment and GVA, have a relatively small number of cluster organisations. For instance, the "Retail" ecosystem accounts for the highest employment and GVA but is associated only with around 1% of the EU27 cluster organisations. This is partly due to the sector's dispersed structure and the competitive nature of retail businesses, along with a limited emphasis on collaborative initiatives between private firms, research organisations, and universities, which together constrain the development of cluster organisations. Similarly, the "Proximity & Social Economy" ecosystem shows high GVA and employment but a comparatively low cluster presence, likely due to the sectors' localised and community-focused nature, where informal networks often outpace formal cluster structures.

Overall, this examination has revealed that the majority of EU27 cluster organisations are active throughout all industrial ecosystems, particularly those directly linked to the Twin Transition. The distribution of cluster organisations of EU27 cluster organisations does not proportionally reflect the economic composition of the EU Single Market. This can be explained by the fact that a few activities underlying some of the EU industrial ecosystems are less relevant to the concept of industrial competitiveness and clusters. This exploration is important, especially as we delve into understanding clusters as not just components of the economic landscape but as dynamic drivers of industrial competitiveness and productivity. The next subchapter aims to bridge this gap by detecting relationships between cluster presence and relevant industrial competitiveness indicators, which encapsulate factors crucial for industrial competitiveness and productivity.

3.2 Clusters as drivers of industrial competitiveness & productivity

This section aims at detecting relationships between cluster presence and relevant industrial competitiveness indicators that capture factors related to industrial competitiveness, productivity, innovation, and entrepreneurship. To that end, a correlation analysis explores significant underlying relationships between these variables.

To capture different aspects of industrial competitiveness, **24 indicators** were selected and grouped into **four dimensions** (see Table 8 in the Annex for a full overview):

1. Economic returns
2. Innovation potential
3. Firm behaviour
4. Business environment

This is to account for different levels of analysis for the indicators and builds upon the **Competitiveness Framework developed by the European Cluster Observatory**[29] (see also Figure 27 in the Annex). The indicators of "Business environment" and "Firm behaviour" can be considered as competitiveness drivers that have an inter-dependent relationship by influencing each other and determine the "Innovation potential" indicators. The "Innovation potential" indicators on the other hand are important to achieve the "Economic returns" indicators which refer to rather overall goals. Moreover, emphasis has been placed on selecting indicators that capture factors of the green and digital transition for each dimension (highlighted in Figure 27 in the Annex with icons). These dedicated indicators for capturing aspects of the green and digital transition will be examined in more detail in Section 3.3.

The results of the correlation analysis demonstrate a **positive and significant correlation between cluster presence and various competitiveness indicators** across the four dimensions. The results of the correlation analysis are displayed in Figure 15, which also accounts for the dimensions' different levels and relations. The presence of clusters is measured by the number of ECCP registered cluster organisations as well as an agglomeration measurement for industrial clusters[30]. Overall, the results are consistent with findings presented in prior reports. [31]

[29] Franco, S., Murciego, A. & Wilson, J. (2011): Business Environment Secondary Data Report. European Cluster Observatory
[30] Industry clusters refer to regions that are highly specialised in a specific sector, with employment in the sector playing a significant role in the EU context. These industry clusters are determined by a location quotient greater than 1.5 and an EU-wide employment share higher than 1%.
[31] ECCP (2022): Summary report on cluster policies and programmes across Europe and priority third countries. Available online: https://clustercollaboration.eu/sites/default/files/sites/default/files/editor/ECCP_Summary%20report%20cluster%20policies_2022_finalv2.pdf (last access 27.03.2024)

Figure 15: Relationship of clusters and industrial competitiveness, correlation results

Dimension	Indicator	Cluster organisations	Industry clusters
Economic returns	GDP per capita	+	
	Employment rate	+	+
	Employment in tech & knowledge sectors	+	+ +
	Apparent labour productivity	+	
	% of ICT in GVA	+	+ +
	Air emissions in Industry		+ +
Innovation potential	PCT patents per capita	+	+
	Digital Patents		+
	Green Patents		−
Firm behaviour	Business R&D invest	+ +	+
	Employed ICT specialists	+ +	+ +
Business environment	Birth of enterprises		+
	Human resources in science & technology	+	+
	Individuals with above average digital skills		−

Correlation legend: − Weak negative + Weak positive + + Positive

Source: ECCP (2024). Cluster organisation data based on information from 1,156 cluster organisations in the EU27 extracted from ECCP Platform on 21/12/23. Note: only significant correlation results shown in the figure, the underlying correlation tables are provided in Table 5 and Table 6 in the Annex. The symbols in the table indicate Pearson correlation coefficients that are significant at 95% level. Correlations include coefficients >=0.3, weak correlations include coefficients >=0.1. Green fields indicate a positive relationship and red a negative relationship. The indicator for air emissions in industry is coloured red because, although there is a positive correlation, the association is negative (higher air emissions where clusters are present).

To start with the "**Business environment**", significant and positive relationships are found for the presence of clusters and human resources in science and technology. Such a positive and significant relationship implies that the number of cluster organisations in a region goes along with more human resources in science and technology and more enterprises being founded. The significant positive relationships found for cluster presence and the employment rate as well as employment in tech and knowledge sectors (in the "Economic returns" dimension), highlight the overall **relationship between cluster presence with human resources and employment**. These

findings are supported by other research which points to higher employment rates in clusters[32] and the attraction of high-skilled workers[33] through clusters. In addition, a positive relationship between industry clusters and the birth of enterprises is found which is key for industrial and regional competitiveness.[34] This is complemented by other studies[35], which find a positive impact of clusters on entrepreneurship and start-up activity. This is relevant since start-ups usually play a key role in disruptive innovation and their application (especially in the context of digital innovation) and as such are important elements for transition processes.[36]

Next to that, the presence of clusters is also positively linked with various indicators across the dimensions "Firm behaviour", "Innovation potential" and "Economic returns". A relatively strong relationship is found between cluster organisations and the **expenditure for business R&D**. This is further supported by evidence from Germany, where strong positive relationships are also found between the presence of cluster organisations and R&D expenditures in the case of the German energy innovation clusters.[37] This is highly relevant since business R&D has positive effects on the resilience of firms and is important for generating innovations. Building on this thought and the positive relationship between cluster presence and business R&D expenditure, in the dimension **'Innovation potential'** there are positive links between cluster presence and general patenting activity (as an indicator for innovation output), as evidenced by the patents per capita. This finding is further supported by the literature which finds stronger patenting growth rates in industries located in strong clusters.[38]

Finally, **many significant positive relations are found between the presence of clusters and the dimension "Economic returns".** In addition to the positive correlations with the employment-related indicators outlined above, this concerns GDP per capita, which is positively correlated with the presence of cluster organisations. The literature does as well find a positive link between clusters and GDP[39] and outlines the influence of clusters on the growth of regional GDP.[40] Moreover, a significant positive relationship is also found for the presence of cluster organisations and labour productivity which further underlines the important role of cluster organisations

[32] Porter, M. E. et al. (2014): Clusters, convergence, and economic performance. In Research Policy, vol.43 (10). Available online: https://www.sciencedirect.com/science/article/abs/pii/S0048733314001048 (last access 26.03.2024); Lambert et al. (2017): The impact of growth and innovation clusters on unemployment in US metro regions. Available online https://www.sciencedirect.com/science/article/pii/S1757780223002974 (last access 27.03.2024)
[33] Hsu, M.-S et al. (2014): "The impact of industrial clusters on human resource and firms' performance", Journal of Modelling in Management, vol. 9 (2). Available online: https://www.emerald.com/insight/content/doi/10.1108/JM2-11-2012-0038/full/html (last access 27.03.2024)
[34] Wilson et al. (2022): Evidencing the benefits of cluster policies: towards a generalised framework of effects. Available online: https://link.springer.com/article/10.1007/s11077-022-09460-8 (last access 23.04.2024)
[35] Porter et al. (2010): Clusters and Entrepreneurship. Available online: https://www.hbs.edu/ris/Publication%20Files/Clusters-and-Entrepreneurship---SSRN-id1689084_549e39ca-b09a-47d2-b81a-73c77745cb27.pdf (last access 27.03.2024)
[36] Feng et al. (2022): Disruptive Innovation Path of Start-Ups in the Digital Context: The Perspective of Dynamic Capabilities. Available online: https://www.mdpi.com/2071-1050/14/19/12839 (last access 27.03.2024)
[37] Singh et al. (2023): Keeping track of cleantech development using innovation clusters and member's website data: Evidence from leading energy clusters in Germany. Available online https://publica-rest.fraunhofer.de/server/api/core/bitstreams/8d097ea0-fda8-46e7-9f64-6d57f80eb057/content (last access 27.03.2024)
[38] Porter, M. E. et al. (2014): Clusters, convergence, and economic performance. In Research Policy, vol.43 (10). Available online: https://www.sciencedirect.com/science/article/abs/pii/S0048733314001048 (last access 26.03.2024);
[39] Ketels, C. (2003): The Development of the cluster concept—Present experiences and further developments. Available online: https://cluster.hse.ru/mirror/pubs/share/212158643 (last access 07.06.2024)
[40] Jeleskovic & Loeber (2023): How industrial clusters influence the growth of the regional GDP: A spatial-approach. Available online: https://ideas.repec.org/p/arx/papers/2401.10261.html (last access 13.06.2024)

for industrial competitiveness in the EU. In this context, one can also mention the findings by Ketels and Protsiv (2021)[41] who point out the positive effect of cluster presence on economic outcomes and find a positive relationship between cluster presence and industry-level wages across European regions. To illustrate these findings, Box 3 in Chapter 4 showcases the Catalonian cluster policy, which has reinforced the competitiveness of firms that are involved in cluster organisations.

The prior analysis has underlined that the presence of clusters is linked to many different factors of industrial competitiveness. **Foreign Direct Investments (FDI)** is an important aspect of this since FDI itself can directly increase firm competitiveness, but FDI is at the same time an indication of the attractiveness and competitiveness of a region.[42] As such, clusters provide foreign investors access to a skilled labour force, knowledge, specialised suppliers and existing value chains.43 Against this relevance of FDI, some recent examples of FDI in clusters are presented in Figure 16 below.

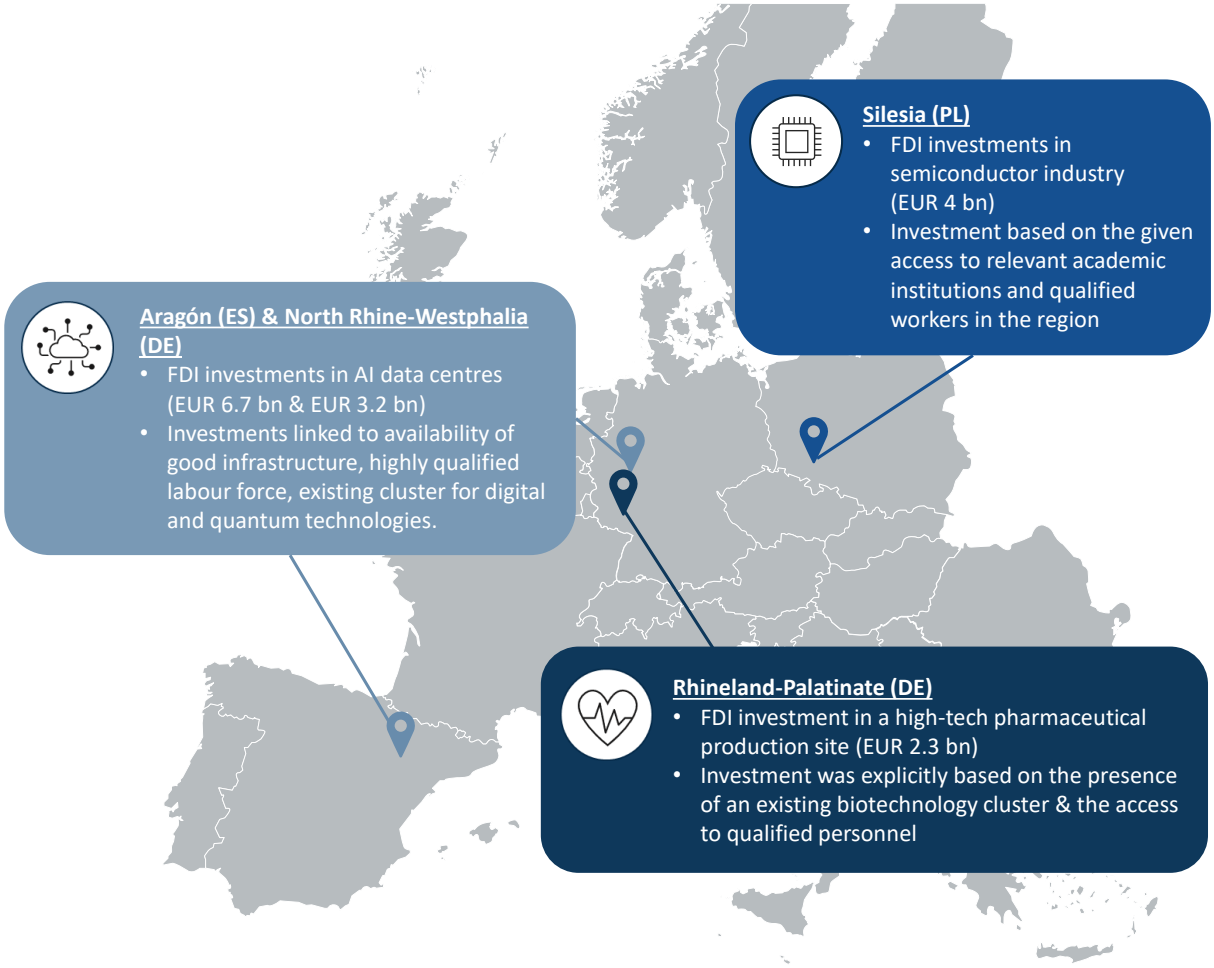
Overall, this section has shown that there is a **positive relationship between cluster presence and various aspects of industrial competitiveness**. This is found for human resources and employment, business R&D, patenting activities and different economic outcomes (such as GDP and productivity). The following Section 3.3 will complement this assessment and further investigate the role of cluster organisations in regional transition processes.

[41] Ketels, C. & Protsiv, S. (2021): Cluster presence and economic performance: a new look based on European data, Regional Studies, 55:2, 208-220, DOI: 10.1080/00343404.2020.1792435. Available at: https://www.tandfonline.com/doi/full/10.1080/00343404.2020.1792435 (last accessed 16.04.2024)

[42] https://single-market-scoreboard.ec.europa.eu/integration_market_openness/foreign-direct-investments-fdi_en (last access 13.06.2024)

[43] see https://www.investmentmonitor.ai/features/fdi-drivers-clusters-and-the-power-of-community/?cf-view and https://www.fdiintelligence.com/content/news/busting-the-cluster-myths-21295 (last access 13.06.2024)

Figure 16: Clusters and Foreign Direct Investments



Source: ECCP (2024). Further information on the FDI investments can be found here: Aragón, North Rhine-Westphalia, Silesia, Rhineland-Palatinate

3.3 Clusters and the dynamics of industrial transition processes

Recent discussions call for rethinking the role of cluster organisations in innovation policies as clusters are increasingly regarded as important agents for change in transition processes.[44] Cluster organisations play an important role in the innovation ecosystem as intermediaries, facilitating and accelerating innovation processes. They can therefore be seen as **catalysts of transformation processes** related to the Twin Transition. In addition, cluster organisations are well placed to help address transition challenges resulting from unforeseen changes in

[44] Asheim & Haus-Reve (2023): The role of clusters in addressing societal challenges in European regions. in European regions, European Planning Studies. Available online: https://www.tandfonline.com/doi/full/10.1080/09654313.2023.2273317?scroll=top&needAccess=true (last access 18.03.2024)

the geoeconomic environment.[45] Against this background and to complement the prior assessment of clusters as drivers of industrial competitiveness and productivity (Section 0), this section provides first an examination of cluster presence and the capabilities of regions in the EU to address the Twin Transition. Second, this section provides an excursus on the role of cluster organisations in the specific transition processes of the industrial ecosystem "Mobility-Transport-Automotive".

To examine the link between cluster presence and the capabilities of regions in the EU to address the Twin Transition, **indicators that capture factors of the green and digital transition** will be examined closely. Special attention will be paid to two indicators that assess the green and digital readiness of the different regions across the EU27. These indicators stem from a recent study that examines the readiness of EU regions to benefit from the opportunities as well as the readiness to address the specific challenges of the Twin Transition.[46] Thereby, different indicators are used to assess the readiness of the regions. These include, for instance, digital indicators on internet access, lifelong learning, and labour market efficiency. For green readiness, indicators for the number of road vehicles, greenhouse gas emissions, and CO2 intensity are used.[47]

The examination reveals a **significant positive link between cluster organisations and many factors of the Twin Transition** (see Figure 17). This positive link is especially clear for the presence of clusters and the readiness for the green and digital transition. Here, a **stronger relationship is found between cluster presence and the readiness for the digital transition**. This implies that regions with higher cluster presence are better prepared for the Twin Transition.

[45] Asheim & Haus-Reve (2023): The role of clusters in addressing societal challenges in European regions. in European regions, European Planning Studies. Available online: https://www.tandfonline.com/doi/full/10.1080/09654313.2023.2273317?scroll=top&needAccess=true (last access 18.03.2024)

[46] Bertelsmann Stiftung & wiiw (2023): The Future of EU Cohesion - Effects of the Twin Transition on Disparities across European Regions. Available online: https://www.bertelsmann-stiftung.de/en/our-projects/europes-economy/project-news/the-future-of-cohesion (last access 19.03.2024)

[47] Bertelsmann Stiftung & wiiw (2023): The Future of EU Cohesion - Effects of the Twin Transition on Disparities across European Regions. Available online: https://www.bertelsmann-stiftung.de/en/our-projects/europes-economy/project-news/the-future-of-cohesion (last access 19.03.2024)

Figure 17: Relationship of clusters and readiness for the Twin Transition, correlation results

Transition	Indicator	Cluster organisations	Industry clusters
Digital	Digital Readiness	++	++
	% of ICT in GVA	+	++
	Digital Patents		+
	Employed ICT specialists	++	++
	Individuals with above average digital skills		−
Green	Green Readiness	+	+
	Air emissions in Industry		++
	Green Patents		−

Correlation legend: − Weak negative + Weak positive ++ Positive

Source: ECCP (2024). Cluster organisation data based on information from 1,156 cluster organisations in the EU27 extracted from ECCP Platform on 21/12/23, sources of indicators provided in Table 8 in the Annex. Data for green and digital readiness from Bertelsmann Stiftung & wiiw (2023), underlying correlation table provided in Table 6 in the Annex.
Note: The symbols in the table indicate Pearson correlation coefficients that are significant at 95% level. Correlations include coefficients >=0.3, weak correlations include coefficients >=0.1. Green indicates a positive relationship with better competitiveness results and red a negative relationship. The indicator for air emissions in industry is coloured red because, although there is a positive correlation, the association is negative (higher air emissions where clusters are present).

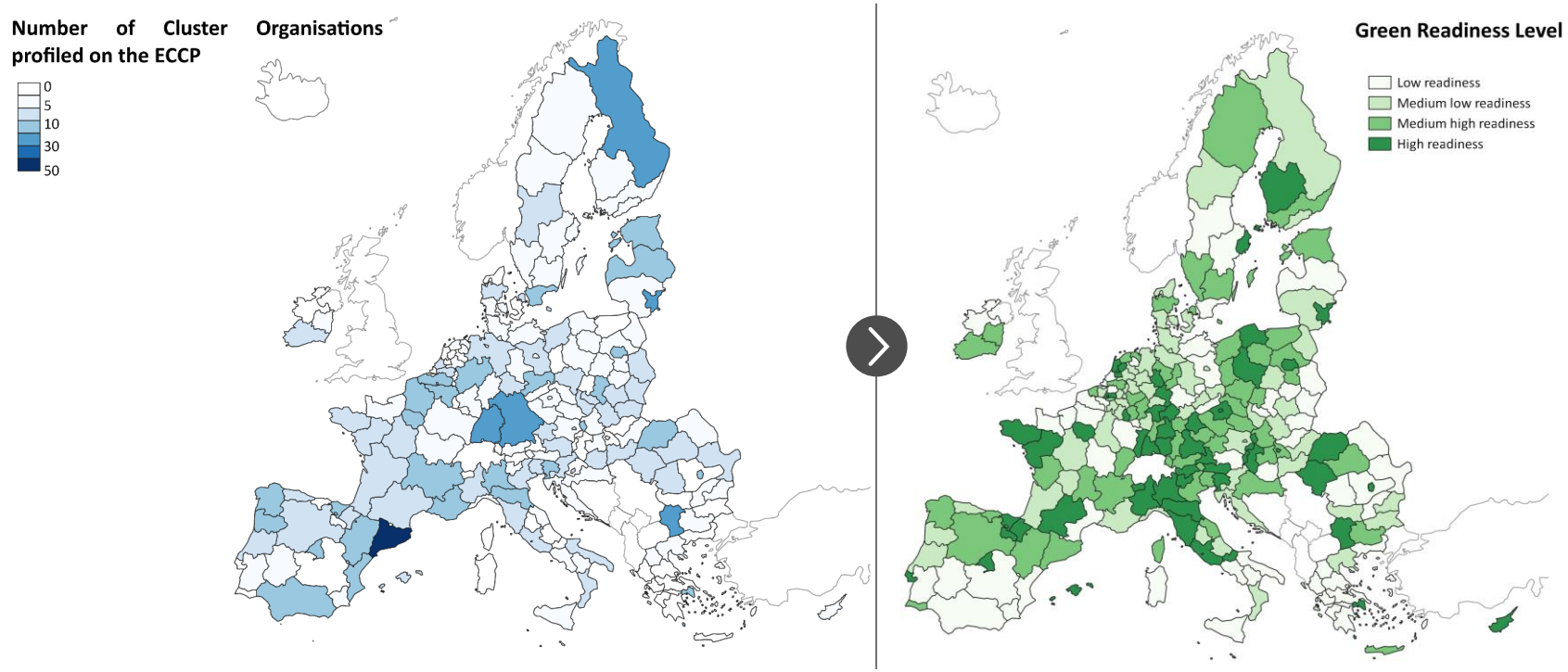
The stronger relationship between cluster presence and the readiness for the digital transition compared to the green transition can be explained by the fact that the challenges connected to the green transition vary to a greater extent depending on the industry.[48] This is illustrated in greater detail by the additional indicators, where the presence of cluster organisations is positively linked to the share of ICT in GVA and the employed ICT specialists across the regions. When considering the industry clusters, a positive correlation is observed between the share of ICT patents and this type of cluster presence. However, the number of industry clusters demonstrates a negative correlation between the share of individuals with above-average digital skills in the regions and the share of green patents. These findings could point to effects of path dependency in established

[48] Bertelsmann Stiftung (2024): Regional disparities in transformation - Empirical evidence and implications for regional policy. Available online in German: https://www.bertelsmann-stiftung.de/de/publikationen/publikation/did/regionale-disparitaeten-in-der-transformation (last access 28.03.2024)

industrial clusters where industry-specific skills prevail over general digital skills. Likewise, green patenting might be driven by specific clusters but distributed quite unevenly. Moreover, it is also found that industry clusters are positively related to higher levels of air emissions. This implies a negative effect of cluster presence on the environment. This can at least partially be explained since more relevant industries in each region are likely to increase air emissions in that region. Yet, it further underlines the relevance of the green transition.

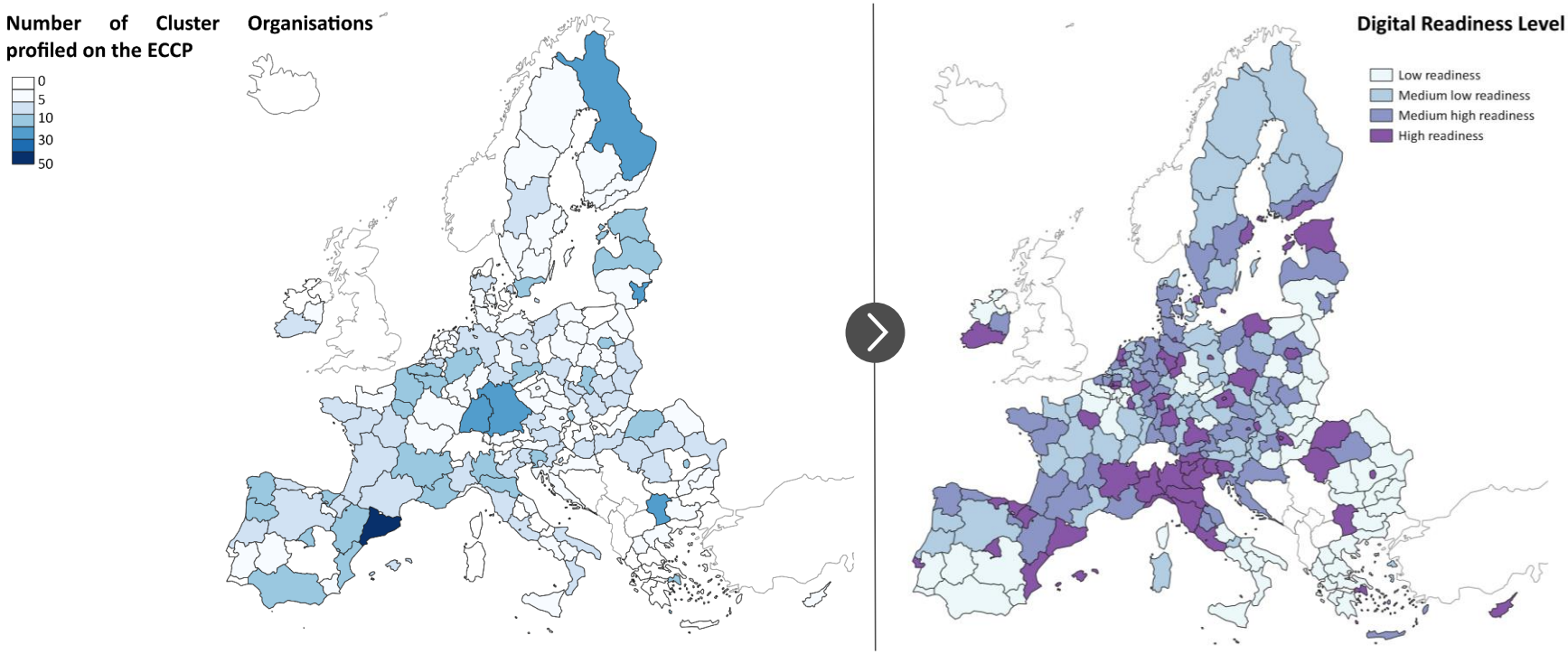
The **relationship between the number of cluster organisations and the green readiness level as well as the digital readiness level** are also further illustrated below. The figure for the presence of cluster organisations and the green readiness level (Figure 18) shows, for instance, high levels of green readiness in many regions across Germany (e.g., Bavaria), France (e.g., Île-de-France), Italy (e.g., Lombardy), Romania (e.g., North-West) or Spain (e.g., Catalonia). These regions are also characterised by a relatively high number of cluster organisations. Likewise, many regions with a high digital readiness level (Figure 18) are also characterised by a high level of cluster presence. This includes, for instance, regions in the Baltics (Estonia, the capital region of Vilnius in Lithuania), South-West Bulgaria or the capital region in Warsaw.

Figure 18: Green readiness level (right) and number of cluster organisations (left) across EU27 regions



Source: ECCP (2024), Cluster organisation data based on information from 1,156 cluster organisation in the EU27 extracted from ECCP Platform on 21/12/23, data for green readiness from Bertelsmann Stiftung & wiiw (2023).

Figure 19: Digital readiness level (right) and number of cluster organisations (left) across EU27 regions



Source: ECCP (2024), Cluster organisation data based on information from 1,156 cluster organisation in the EU27 extracted from ECCP Platform on 21/12/23, data for green readiness from Bertelsmann Stiftung & wiiw (2023).

Excursus: Cluster presence & regional transformation in the case of the industrial ecosystem "Mobility-Transport-Automotive"

To gain further insight into the relationship between cluster presence and regional transformation processes, the role of cluster organisations in the **industrial ecosystem "Mobility-Transport-Automotive"** will be examined as an excursus. The rationale for focusing on this industrial ecosystem is twofold. Firstly, it is heavily affected by both the green and digital transitions.[49] Secondly, value chains in this industrial ecosystem have been particularly affected by supply chain disruptions due to the COVID-19 pandemic and Russia's full-scale invasion of Ukraine in 2022.[50] In the following section, the relationship between cluster presence and mobility tech startups and invested venture capital in the Mobility-Transport-Automotive industrial ecosystem will be examined. The rationale for this focus is that start-ups and related funding contribute to a rejuvenation of the corporate landscape and thus to the adaptation of the economic structure to changing global conditions. Start-up activities, both from universities and research institutions as well as in the wider corporate landscape, can also act as a kind of transmission belt to transfer ideas, knowledge, and technology into economic and social valorisation. Furthermore, a positive correlation between the presence of clusters and the emergence of new businesses has been previously identified (see Section 3.2).

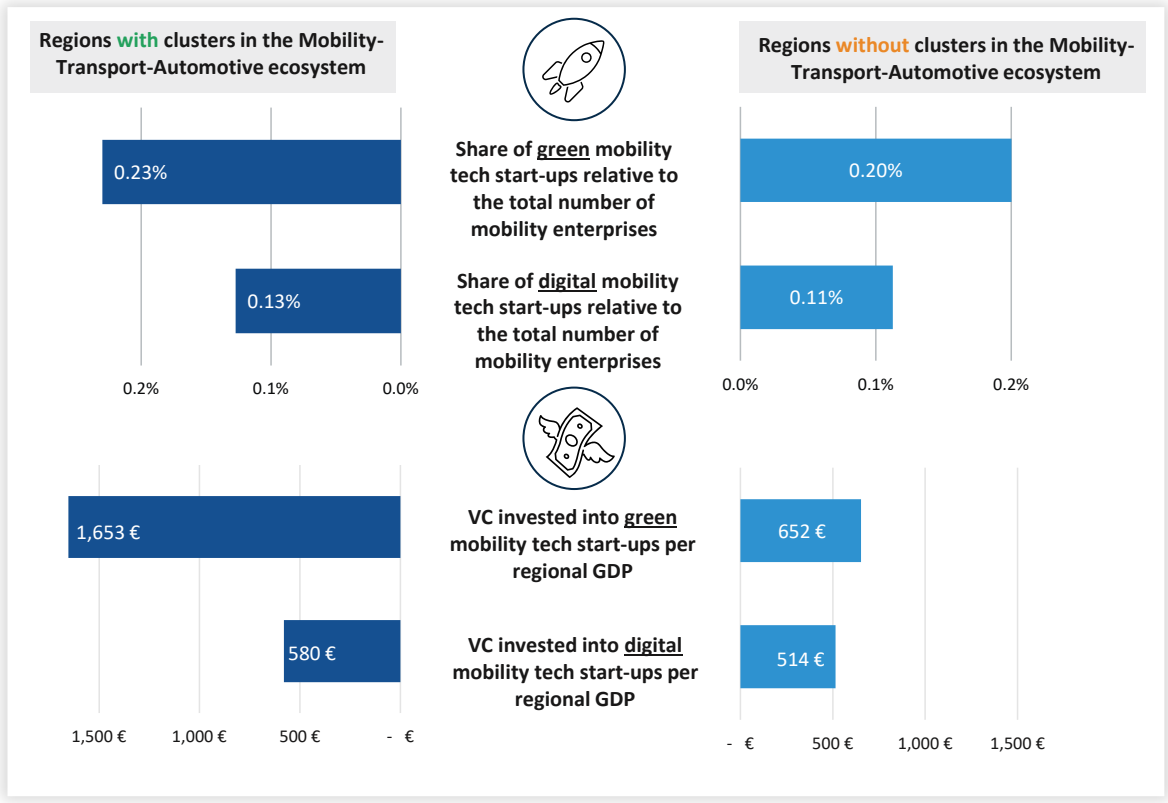
The examination of the data reveals that **regions with cluster organisations in the Mobility-Transport-Automotive ecosystem tend to have higher shares of green as well as digital technology start-ups**. Figure 20 compares the average share of mobility tech start-ups in regions with and without cluster organisations in the Mobility-Transport-Automotive industrial ecosystem. It can be observed that regions with cluster organisations in the Mobility-Transport-Automotive ecosystem have on average, a share of 0.23 of green start-ups and a share of 0.13 of digital start-ups relative to the total number of mobility enterprises in the respective regions. Conversely, regions without cluster organisations in the Mobility-Transport-Automotive ecosystem exhibit an average share of 0.20% of green start-ups and an average share of 0.11% of digital start-ups relative to the total number of mobility enterprises.

An even stronger difference emerges for the venture capital invested into the green and digital mobility tech start-ups. Here, **regions with cluster organisations in the Mobility-Transport-Automotive ecosystem are characterised by higher venture capital investments into green and digital mobility tech start-ups.** This is especially true for green mobility tech start-ups. More specifically, regions with cluster organisations in the Mobility-Transport-Automotive ecosystem have on average, around 1,650€ invested venture capital relative to regional GDP. In contrast, regions without such cluster organisations have on average, around 652€ invested in venture capital relative to regional GDP. For the capital investments into digital mobility tech start-ups, regions with cluster organisations operating in the Mobility-Transport-Automotive ecosystem are characterised by higher venture capital investments (580€) compared to regions without such cluster organisations (514€).

[49] European Commission (2023): Monitoring the twin transition of industrial ecosystems – Mobility, Transport and Automotive. Available online: https://monitor-industrial-ecosystems.ec.europa.eu/industrial-ecosystems/mobility-transport-automotive (last access 19.03.2024)

[50] see https://www.acea.auto/publication/economic-and-market-report-state-of-the-eu-auto-industry-full-year-2022/; https://www.dw.com/en/ukraine-war-german-auto-industry-alarmed-over-lack-of-raw-materials/a-61327012 and https://www.reuters.com/business/autos-transportation/europes-carmakers-scramble-replace-ukrainian-auto-parts-2022-03-14/ (last access 19.03.2024)

Figure 20: Comparison of average share of mobility tech start-ups and average share of invested venture capital (VC) in regions with (left) and without cluster organisations in the Mobility-Transport-Automotive industrial ecosystem



Source ECCP (2024), own elaborations. Cluster organisation data based on information from cluster organisation in the EU27 extracted from ECCP Platform on 21/12/23. Start-up and venture capital provided by the Monitor of Industrial Ecosystem. Start-up and venture capital data based on Crunchbase, Net Zero Insights and Eurostat. Note: Share of mobility tech startups compared to the total number of mobility enterprises; volume of venture capital investments into digital and green startups is shown per EUR of regional GDP 2017-2023. To account for distortion in the data, the highest and lowest outliers have been removed from the analysis.

This Chapter underlines that **cluster organisations can be relevant institutional support structures in addressing the challenges of transition processes**. Since cluster policy and their alignment with transformation challenges are a key factor for cluster organisations' successful operations, the following Chapter will assess cluster policies in the EU and their role in tackling economic policy challenges.

04

Cluster policy and key transition challenges in Europe

4. Cluster policy and key transition challenges in Europe

Overview of key findings

- Across the EU member states, clusters are supported either by specific cluster policies or by broader and sectoral economic policies. However, **dedicated cluster policies are more focused on a comprehensive support scheme for clusters than broad and sectoral policies.** So, while the latter often include the support of new cluster initiatives as an objective, showing their role in the initial development of cluster landscapes, dedicated cluster policies are important to support the development and maturing of clusters.
- **Funding for cluster programmes comes from a mix of sources** including national and regional funding as well as ERDF funds. They can be part of an ERDF operational programme, grant members access to earmarked funding streams or combine different sources across regional and national levels of governance.
- **Cluster polices play an important role in supporting clusters' ability to serve as networks and platforms for transformative change** to tackle broader economic challenges in two ways. First, clusters organise and facilitate collaboration among cluster members to cooperatively deal with challenges. Second, cluster organisations serve as institutional interfaces that can link their industrial ecosystems to broader policy efforts across different policy fields such as innovation & startups, upskilling/reskilling, internationalisation, the green and digital transition, and resilience & economic security. Cluster policies should take this double role of clusters into account.

This chapter gives an overview of the main findings and policy trends of cluster policies and programmes across Europe as well as cluster policy developments in selected third countries in 2023. It draws on the findings of the ECCP country factsheets. Throughout the chapter, some selected examples of good practices sourced from the ECCP Policy Toolkit will be highlighted. Moreover, an overview of cluster policy support initiatives at the EU level of the 2021-2027 funding period as well as the relevance of clusters in other EU programmes and initiatives such as the European Regional Development Fund and the National Resilience Plans will be outlined.

4.1 Diversity and evolution of cluster policy approaches

This first section will give a general overview through which types of policies cluster support is channelled, what their objectives are, and within which time horizon they operate. Additionally, some examples of how cluster policies developed over time will be highlighted.

Cluster support comes in different forms and at different levels of governance. Among 45 cluster-relevant policies and programmes analysed in EU27 countries for the 2023 edition of the ECCP policy factsheets, there were 17 national cluster policies, 8 regional cluster policies, 17 broad policies, and 3 sectoral policies. Looking at the country level, the Member States can be roughly distinguished into **two main groups**. One that employs cluster policies at the national and/or regional levels and one that relies on broad or sectoral economic policies to support cluster development.

- 14 Member States employed a **dedicated cluster policy**. This is a policy or programme that explicitly targets cluster development as its main goal like France's *pôles de compétitivité* (competitiveness

clusters), Germany's *go-cluster*, Denmark's *Innovationskraft* (innovation power) or Poland's *Krajowy Klaster Kluczowy* (National Key Cluster; see Box 2) programmes. They aim to consolidate a certain number of leading clusters in key industries to position them strategically in global markets. A similar concept stands behind the *Superclusters* (now: Global Innovation Clusters) launched by Canada to integrate five leading industrial ecosystems across the entire country.[51] There are also dedicated cluster programmes operating at the regional level, often in countries which also have national cluster programmes. A prominent example is Catalonia's cluster programme operating for more than three decades by now (see Box 3). This coexistence, however, does not necessarily imply a strong linkage between both levels, as multi-level cluster policies are inherently difficult to construct and manage as the case examples of Poland and Finland show (Box 2 and Box 5).

- Where there is no dedicated cluster policy, **broad or sectoral policies** can fill in and support the networking of SMEs and research organisations, the development of innovation ecosystems and other elements of smart specialisation. As we will see below, they often even do support the creation of cluster organisations. These policies can take on different forms such as Finland's *Innovative Cities and Communities* programme focusing on university cities (see Box 5 below), Sweden's *National strategy for sustainable regional development*, Romania's *industrial policy* focusing on the industrial sector, or Bulgaria's broader *National Development Programme 2030*.

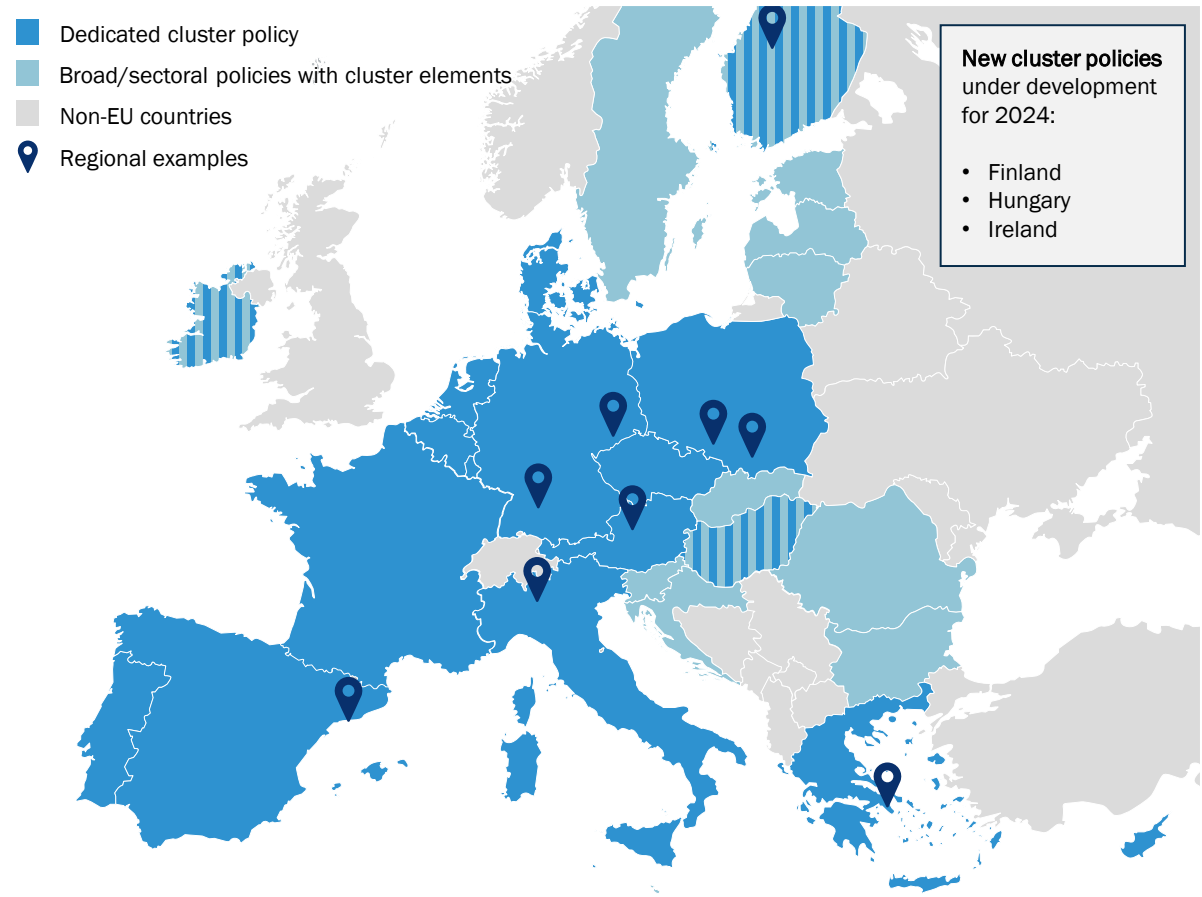
Box 1: EU-level cluster support

The European Cluster Collaboration Platform (ECCP) is the European Commission's online hub for cluster organisations, policy makers and other stakeholders to network, find project partners and exchange knowledge on how to improve their cluster activities. It offers matchmaking events, information on funding opportunities, training for cluster managers, best practices for cluster activities to help cluster members address their key challenges, such as value chain management, attracting and developing a skilled workforce, digitalisation of their products and business models, and the green transition. A special emphasis lies on interregional, transnational project collaboration and cross-clustering.

From 1st September 2022, 30 Euroclusters have been launched to implement the EU Industrial Strategy. Euroclusters are cross-sectoral, interdisciplinary and trans-European strategic initiatives of industry clusters and other economic actors such as research organisations, companies, etc. €42 million from the Single Market Programme have been allocated to this first wave of Euroclusters, composed of 171 partners, covering 23 different countries (22 EU Member States) and all 14 industrial ecosystems. The Euroclusters regularly launch Financial Support for Third Parties (FSTP) calls. A call for a second wave of Euroclusters is currently underway.

[51] See the ECCP input paper for an extended analysis of the Canadian approach: https://clustercollaboration.eu/sites/default/files/document-store/ECCP_3rdcountry_Canada_FINAL_0.pdf (last access 30.03.2024).

Figure 21: Cluster policies across the European Union

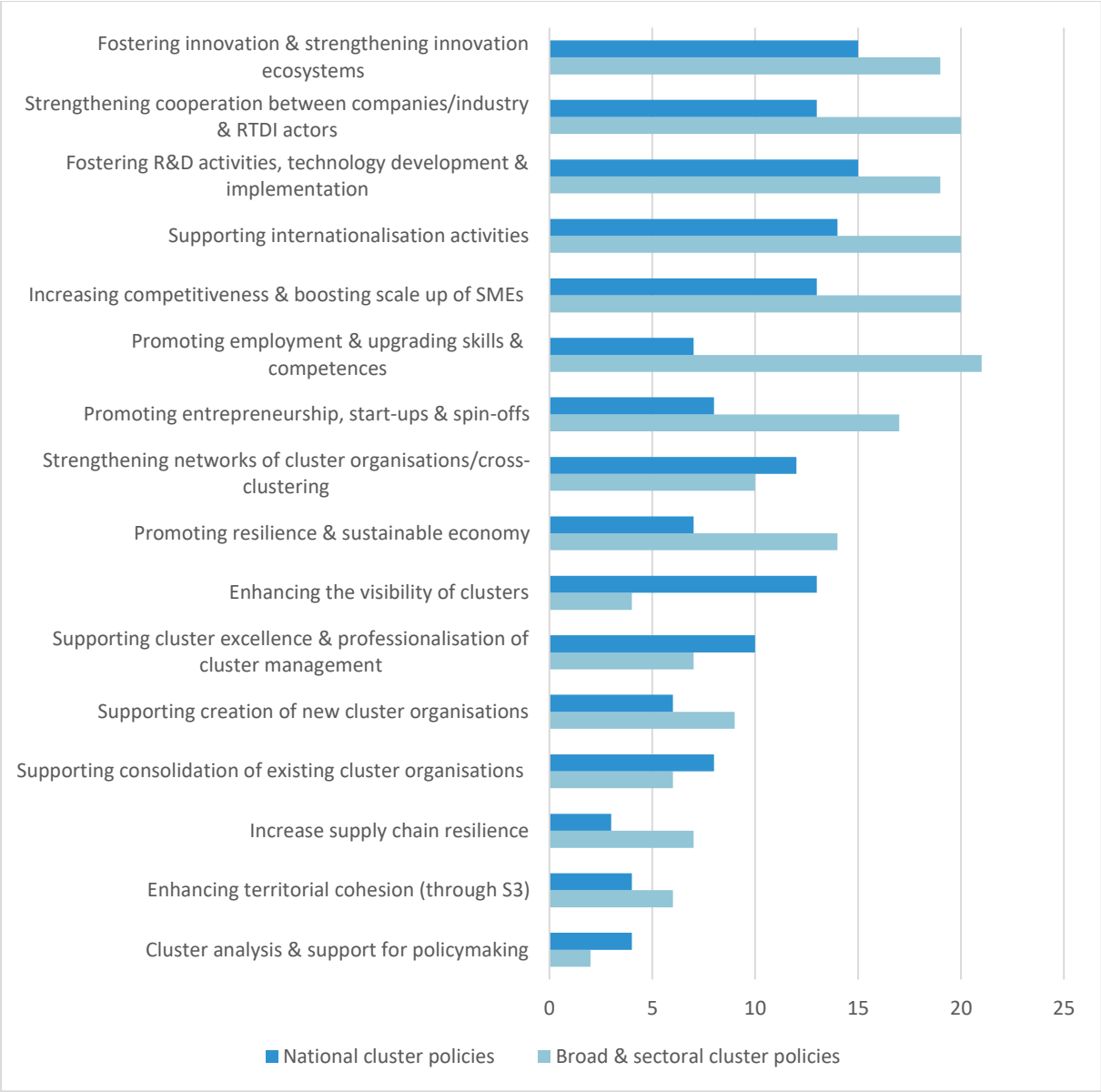


Source: ECCP (2024), based on information gathered through desk research and validation by National Authorities.

Geographically, countries with and without a dedicated cluster policy are unevenly distributed across the European Union.

- **Dedicated cluster policies cover most countries in Southern** (France, Italy, Spain, Portugal, Greece, Cyprus) **and Central Europe** (the Netherlands, Belgium, Luxembourg, Germany, Poland, Czechia, Austria). Denmark is the only Nordic country in the EU that employs a dedicated national cluster policy. Belgium is a special case where cluster policy is a competence of the regions and employed by all regions – Flanders, Wallonia and Brussels.
- **Countries that do not have a dedicated cluster policy** in place but rather support cluster development through broader economic policies are concentrated mostly on the **Nordic and Baltic regions** (Sweden, Finland, Estonia, Latvia, Lithuania) and **South-Eastern Europe** (Slovakia, Slovenia, Croatia, Hungary, Romania, Bulgaria) plus Ireland and Malta. Romania, in addition to its broad smart specialisation approach, has also a sectoral policy and supports industrial clusters through its industrial policy.

Figure 22: Policy objectives by policy type



Source: ECCP (2024).

Regarding the specific **policy objectives** of EU27 cluster-related policies, the overall picture shows that across different policy types, objectives related to SMEs, business-research relations, internationalisation, R&D, and innovation ecosystems closely followed by upskilling/reskilling and entrepreneurship/startups are prevalent. Only then, the first cluster-specific objectives are listed. As one should expect, national cluster policies are significantly more focused on cluster-specific objectives than broad and sectoral policies. There are, however, striking internal differences. National cluster policies are decidedly more focused on enhancing the visibility of clusters, networking of cluster organisations/cross-clustering, supporting cluster excellence and – though to a lesser extent – the consolidation of existing cluster organisations as well as cluster analysis and support for policymaking. Yet, more broad policies than national cluster policies indicate the objective of creating new cluster organisations. A possible explanation could be that dedicated national cluster policies are usually designed to support an already existing cluster landscape. By contrast, broad policies can pave the way for the creation of

the first cluster initiatives, after which a national cluster policy might become a more viable policy option to support the emerging cluster landscape.

When it comes to the **continuity of cluster policies**, there is a clear pattern in the EU27. Where there is a dedicated cluster policy, it has been established at least 10 years ago. There are only few exceptions. One is Cyprus, which has introduced a funding scheme for Development of Competitiveness Clusters 2024 – 2033 in 2024. This policy is conceived as a strategic initiative for the development of clusters that foster cooperation between SMEs, large companies, research organisations, centres of excellence, public bodies and consumers. Finland and Ireland are currently working on dedicated national cluster policies, based on some partially cluster-based initiatives (for further information on Finland see Box 5). Finally, Hungary has recently developed its national cluster strategy, which is used to help transformation efforts of SMEs, especially in the field of digital transformation. Overall, however, this means that there has been a certain halt in the developing of dedicated cluster policies within the European Union over the last decade.

The continuity of cluster policies is usually structured by cycles of policy-making – **policies are regularly evaluated, changed, and relaunched.** In this way, cluster policies can develop along the needs of beneficiaries and consider the evolution of contextual factors. Some policies are aligned with the EU's 7-year budget cycles, while others rather follow national legislative periods. Policy ruptures are rare. More commonly, policies are continued in follow-up programmes following the cycle of the EU Multiannual Financial Framework like cluster organisations supported in Poland and Romania or the go-cluster programme following the competence networks programme in Germany. Another option has been chosen in France, where the Pôles de compétitivité programme is reviewed regularly and relaunched in consecutive "phases" with an adapted policy focus. As Baden-Württemberg shows, the development of a cluster programme can follow stages of cluster development itself with the first phase mapping or creating cluster initiatives, followed by phases focusing on their professionalisation, integration with other regional actors and capacities to tackle transformative change (see Box 4).

To conclude, many EU Member States employ dedicated cluster policies at the national and regional levels. The coordination between the levels of governance is not necessarily clearly regulated and can be problematic, especially where responsibility for programmes is dispersed among many different actors. Ways of dealing with the integration of levels of governance can differ between regionalised approaches as in Poland where regions are responsible for new cluster initiatives with the national level taking over as clusters mature and more centralised approaches like in Denmark, where clusters and smart specialisation strategies are increasingly consolidated at the national level. Beyond dedicated cluster policies, broader policy approaches can nurture the development of local innovation ecosystems and the creation of clusters which can later give rise to more dedicated cluster policy initiatives.

Box 2: Poland's multi-level cluster policy

Poland represents an exemplary case for a cluster policy that incorporates both the national and the regional levels of governance. Clusters are classified into three categories[52]:

1. **Emerging Clusters** are at an early stage of development but with a minimum of 18 months of operation and 20 members. They operate mainly locally and can receive support for capacity building from regional-level programmes.
2. **Developing Clusters/Regional Key Clusters** have been active at least two years, have at least 35 members and show growth potential, but have not yet obtained the status of a National Key Cluster. Cluster support can come from the regional as well as the national level.
3. **National Key Clusters** have been operating for at least three years, have more than 50 members, and have successfully met the criteria set out in the regulations of the National Key Clusters competition.

The National Key Clusters (Polish: Krajowy Klaster Kluczowy - KKK) programme is Poland's dedicated national-level cluster support programme. The competition to receive the status of a KKK is held every three years. A central goal for the KKK is to create international recognisability. It was supported by the Internationalisation of Key National Clusters programme from 2014-2023[53], which was funded through the Smart Growth Operational Programme financed by the ERDF. In general, the status of a KKK does not come with funding as such but gives clusters access to specific funding opportunities, usually through ERDF OPs. In the new funding period, clusters receive support through the European Funds for Modern Economy 2021-2027 programme including support for the coordinators of the National Key Clusters to build and improve competencies of cooperation between clusters from different Polish regions specifically in digital transition, circular and low carbon economy, modern education, internationalisation, innovation capabilities and enhance their offer to members of clusters across the country.[54]

While the National Key Clusters are Poland's top-level national programme, more local and emerging clusters rely on regional funding sources. Regional clusters are developed in concord with regional smart specialisation strategies as well as regional innovation strategies.[55] Not all Polish regions offer dedicated funding for cluster initiatives. Two positive examples come from the neighbouring regions of Silesia and Lesser Poland, which together form the Southern macro-region.[56] Both regions support cluster development through their

[52] Antonowicz, M. (2024): Presentation held at the Cluster Talks on 21 February 2024. Polish Agency for Enterprise Development (PARP). Recording available at: https://www.youtube.com/watch?v=9KMpfYNwH-w (last access: 30.03.2024).
[53] OECD (2021): Internationalisation of Key National Clusters. STIP Compass. Available at: https://stip.oecd.org/stip/interactive-dashboards/policy-initiatives/2021%2Fdata%2FpolicyInitiatives%2F5361 (last access 30.03.2024).
[54] Ministry of Development Funds and Regional Policy (2022): European Funds for the Modern Economy 2021-2027. Available under: https://www.poir.gov.pl/strony/o-programie/fe-dla-nowoczesnej-gospodarki/zalozenia-programu-feng/ (last access 30.03.2024).
[55] Horzela, A.; Olko, S. (2021): The Role of Cluster Policy in Shaping Regional Competitiveness: The Case of Poland. European Research Studies Journal, 24:4, 444-463. Available at: https://ersj.eu/journal/2599 (last access 30.03.2024).
[56] For a more comprehensive analysis of both regions, see the respective ECCP Clusters meet Regions input papers. Available at: https://clustercollaboration.eu/sites/default/files/document-store/ECCP22_Input%20paper_CmR_Silesia_Final_0.pdf (Silesia) and https://clustercollaboration.eu/sites/default/files/document-store/ECCP_CMR_IP_Krak%C3%B3w_0.pdf (Lesser Poland; last access 30.03.2024).

respective regional innovation and development strategies. In the example of Lesser Poland, this is institutionally framed by the regional development agency MARR (Małopolska Agencja Rozwoju Regionalnego), which is involved in the operation of the Business in Małopolska Centre and the Krakow Technology Park, thereby offering an integrated system of services to investors and exporters. According to the latest available cluster benchmarking report from 2022, clusters from the Southern macro-region, score highest when it comes to resources and processes.[57]

To conclude, Poland shows a relatively mature cluster policy that has developed since 2004 and operates across national and regional levels of governance from local emergent clusters via regional developing clusters (or Regional Key Clusters) to the leading National Key Clusters. However, sub-national support depends on the regions, which do not always run support programmes for clusters. Also, studies showed that the coordination between the regional and the national level should be improved.[58] The increasing support for supra-regional clusters in the post-2020 cluster policy approach could help to smooth out the transition between regional and national cluster support.

Source: ECCP (2024).

4.2 Instruments and funding to support cluster development

This section focuses on the practicalities of cluster policy, including dedicated budgets for implementing cluster policies, the beneficiaries, and types of financial and technical support instruments.

A key aspect of cluster policy are the allocated budgets from public funds. Unfortunately, the data availability on allocated financial resources varies significantly across the EU27 Member States. As a result, the following outlines the **national/regional budgets** of selected cluster policies across the European Union:

The German **Cluster4Future programme**[59] is a national cluster policy with a focus on research and innovation. The Programme has an overall budget of up to 650 Mio. EUR, funded by the Federal Ministry of Education and Research of Germany. There were Calls for funding in 2019 and 2020, if a cluster is selected as a future cluster, there are three implementation phases, each being three years long. The implementation phases are intended to successively establish sustainable cluster structures and visibly increase the application orientation of the funded research and development projects. As the implementation phases progress, the average self-financed share of the funding increases from 20% to 35% and up to 50%.

The internationalisation of the Polish **Key National Cluster Policy Programme (KKK)** (see also Box 2) includes calls where clusters have the chance to apply for funding and is dedicated to organisations that have the status of Key National Clusters in order to financially support a dedicated cluster policy at the national level (KKK). The purpose of financing is the development and introduction to foreign markets of products and services offered by National Key Clusters and their members and thus supporting the export potential of Polish clusters. Clusters can receive co-financing for certain activities that enhance such international cooperation. The total funding is

[57] PARP (2023): Benchmarking clusters in Poland – 2022 edition. Available at: https://www.parp.gov.pl/storage/publications/pdf/Raport-oglny---PL_20230519.pdf (last access 30.03.2024).
[58] Kuberska, D.; Mackiewicz, M. (2022): Cluster Policy in Poland – Failures and Opportunities, sustainability, 14:3. Available under: https://www.mdpi.com/2071-1050/14/3/1262 (last access 30.03.2024).
[59] https://www.clusters4future.de/ (last access 02.04.2024)

around 33.25 Mio. EUR with national and EU funds being the source of funding. Participants can receive a maximum of EUR 1.8 million (PLN 8 million), which means that at least 20% of self-financing the total cost of the project is required.

The **Catalonia Cluster Programme** (see also Box 3) is a regional cluster policy which is divided into two calls, IRC (Competitiveness Reinforcement Initiatives) and NON. IRC is only for the clusters of the programme, however, NON is open to all companies in Catalonia. The budget for 2021-2023 between the two calls: the budget for IRC is 1.8 Mio. EUR, for the NON it is 3 Mio. EUR. Each funding period is three years. Overall, there are 27 clusters that include more than 2,700 companies. The policy is part of the Agency for the Competitiveness of the Company (ACCIÓ) which is attached to the Ministry of Business and Labour of the Generalitat (Government) of Catalonia. Catalonia was one of the pioneer territories at an international level in designing and implementing initiatives for improvement of competitiveness using clusters with three decades of experience.

The Polish and German share similarities in terms of the own contribution of clusters which need to self-finance to a certain percentage. A key difference between Germany and Spain is the length of the programme where the German programme consists of three implementation phases of three years whereas in Spain the funding period is always three years. Also, the budget of the German Cluster programme is up to 650 Mio. EUR is by far the highest. In all three examples, clusters can apply for all funding via calls for applications. The Catalonia Cluster Programme is a regional cluster policy whereas the German does not have a regional focus and Polish concentrate on clusters at national level.

Moreover, the **Cohesion Policy Programmes in 2021-2027 can also constitute a relevant source of cluster policy funding.** Based on an analysis of the ERDF Operational Programmes (OPs) it is found that in 24 of the EU27 Member States clusters receive support through Cohesion Policy Programmes in 2021-2027. The examination of the ERDF OPs reveals three different modes in which Cohesion Policy funding is used for cluster policies. These are presented in the following:

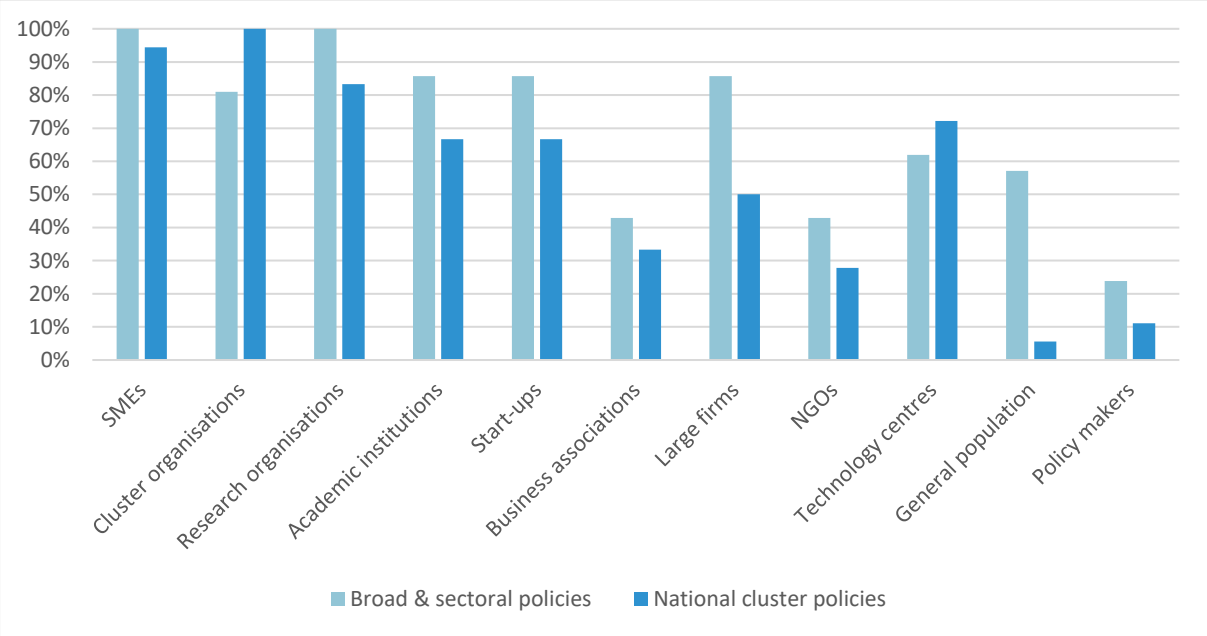
- **Separate support from Cohesion Policy:** this mode refers to cases where an existing dedicated cluster policy and support for cluster organisations from the ERDF OPs are not explicitly linked. This is, for instance, the case in the Netherlands. The Netherlands has a dedicated national cluster policy[60] in place. At the same time, support for clusters is also provided through the ERDF OPs of three regions: North, East and South Netherlands. The programmes differ greatly in their budget the programme for North Netherlands has more than twice the budget (20 Mio. EUR) of the South Netherlands programme (9.2 Mio. EUR). The national cluster policy in the Netherlands is not explicitly linked to the cohesion Operational Programs as relying very much on its national budget.
- **Cohesion Policy-based cluster policy:** in this case, the ERDF Operational Programmes are exclusively used for the support of cluster organisations. An example of this mode is the Croatian cluster policy which is part of the Integrated Territorial Programme OP and supports cluster development with 10 Mio. EUR as part of its regional development strategy through Regional Industrial Transition Plans. The support comes from investment grants to build or upgrade cluster organisations or by operational grants for training and internationalisations support for cluster members.
- **Integration of Cohesion Policy into a dedicated cluster policy**: support from the ERDF OP is linked to an existing dedicated cluster policy. An example for this is Portugal where the ERDF OP "COMPETE 2030"

[60] see https://www.topsectoren.nl/ (last access 02.04.2024)

supports and provides funding to the dedicated cluster policy "Competitiveness Clusters". Moreover, in Portugal, six out of seven regional ERDF OPs support cluster organisations and the support is closely linked with Smart Specialisation areas, innovation, and internationalisation of SMEs.

Focusing on the **beneficiaries of cluster policies** in the EU, Figure 23 shows that **SMEs, cluster organisations and research organisations are the most targeted group of beneficiaries** by cluster policies in the EU27 Member States. Less targeted beneficiary types across all policies are the general population, business associations, NGOs and policymakers. Overall, national cluster policies tend to focus on SMEs, cluster organisations, start-up centres, academic institutions, and technology centres. In contrast, broad and sectoral policies, with a few exceptions, support the widest range of beneficiaries. However, the broad and sectoral policies tend to target cluster organisations to a lesser extent which further underlines the relevance of developing dedicated cluster policies.

Figure 23: Beneficiaries of cluster support in the EU27, by policy type



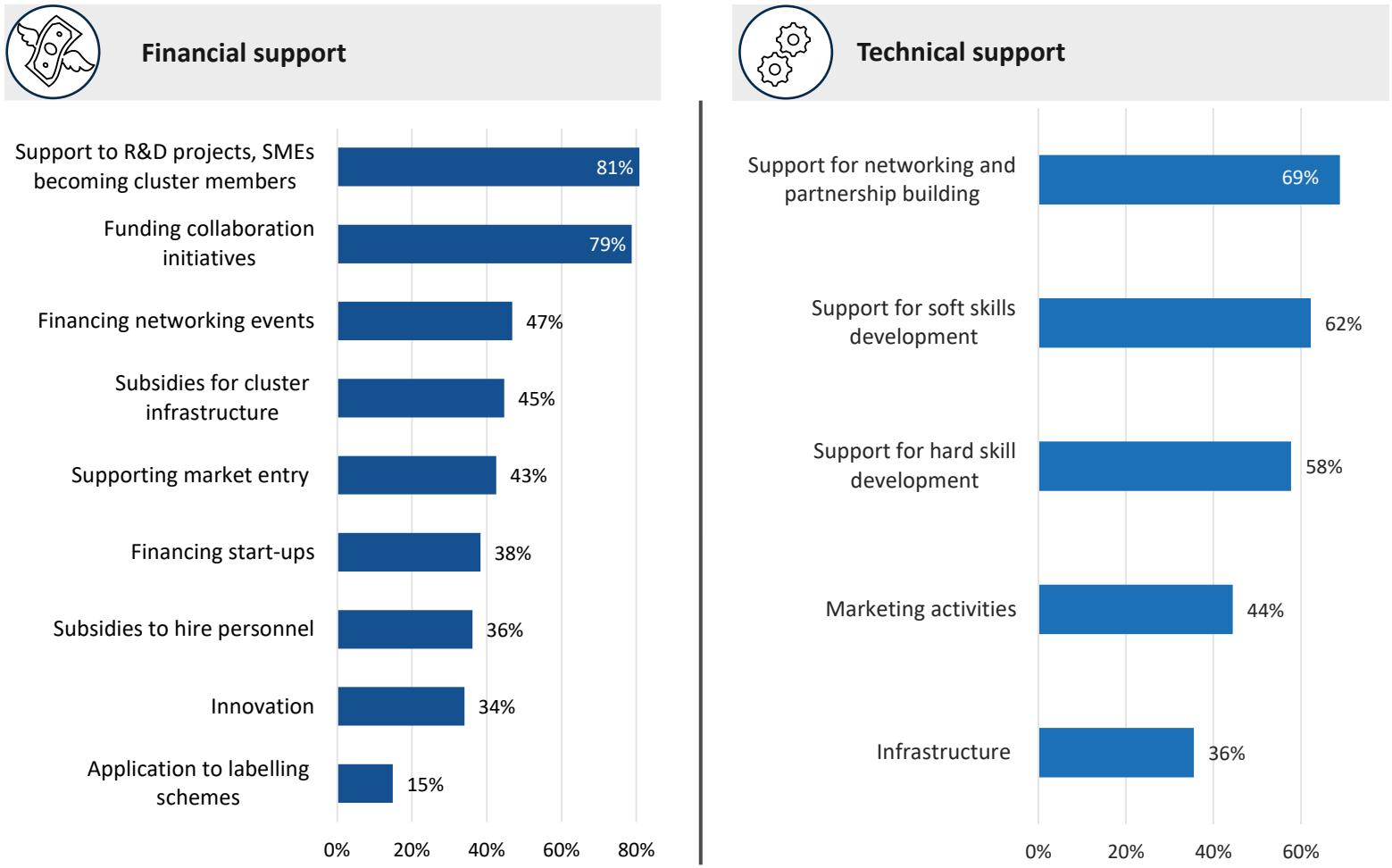
Source: ECCP (2024). Based on information gathered through desk research and validation by National Authorities

Finally, the specific support provided through the EU27 cluster policies is examined, thereby differentiating by financial and technical support (see Figure 24). This figure shows the percentage of all policies at hand that are providing financial and technical support for a certain group of instruments. Overall, most **financial support is provided for supporting R&D projects and funding collaboration initiatives**. A further examination of the data shows that **national cluster policies tend to offer more financial support to cluster organisations** than broad & sectoral policies which where cluster members are main beneficiaries and though supporting cluster ecosystem, it is not so visible and clear which highlights the importance of these dedicated programmes for the cluster ecosystem to be targeted thematically and geographically in the EU.

In terms of the technical support provided by EU27 cluster policies across all policies, the most common technical support is provided for **networking and partnership building as well as soft skills development and hard skills development** offered to broadly to all business support organisations Opposed to financial support, the broad & sectoral policies tend to provide more technical support than the national cluster policies which are more

targeted and have specific objectives (e.g. net zero technologies) . This may indicate that for dedicated cluster policies, financial support to finance concrete projects and stimulate investments is more important than technical support to build horizontal competencies.

Figure 24: Financial (left) and technical (right) support provided by EU27 policies



Source: ECCP (2024). Based on information gathered through desk research and validation by National Authorities

4.3 Clusters policies' role in tackling broader economic policy challenges

This third section surveys the role of clusters in tackling a range of central economic policy challenges identified, among others through the European Semester Reports 2023[61] and the broader debate about the future of the Single Market and European competitiveness.[62] These include strengthening innovation ecosystems, skill development, internationalisation and interregional cooperation, the twin transition to a green and digital economy as well as issues of socio-economic resilience and economic security. This section draws on the ECCP factsheets in their latest iteration[63], the ECCP Cluster Solutions Library and the ECCP Policy Toolkit complemented by national reports and the academic and policy literature.

Innovation ecosystem development, start-up support and technology diffusion through clusters

Although Europe has many world-class companies, on average they are performing less well than their counterparts in the USA and other global competitors when it comes to R&D spending and technological competitiveness.[64] As venture capital investment in European start-ups declines[65], R&D intensity stagnates[66] in comparison to the USA, Japan, and China, and technology adoption remains sluggish[67], there is an urgent need to improve Europe's innovation performance. Next to regulatory improvements, this requires concrete action in the innovation ecosystems.

One of the foremost purposes of cluster development has been the strengthening of innovation ecosystems. According to Porter, "**clusters play a vital role in a company's ongoing ability to innovate**."[68] He argues that

[61] https://economy-finance.ec.europa.eu/publications/2023-european-semester-country-reports_en (last access 02.04.2024).
[62] Letta, E. (2024): Much more than a market. Empowering the Single Market to deliver a sustainable future and prosperity for all EU citizens. Available at: https://www.consilium.europa.eu/media/ny3j24sm/much-more-than-a-market-report-by-enrico-letta.pdf (last access 23.04.2024) and Draghi, M. (2024): Radical change is what is needed. Speech held at the High-level Conference on the European Pillar of Social Rights. Available at: https://geopolitique.eu/en/2024/04/16/radical-change-is-what-is-needed/ (last access 23.04.2024).
[63] The data for the newest release of the ECCP factsheets was gathered in Q4 2023.
[64] McKinsey & Company (2022): Securing Europe's competitiveness: Addressing its technology gap. Available at: https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/securing-europes-competitiveness-addressing-its-technology-gap (last access 02.04.2024).
[65] Science Business (2023): As investment falls, EU innovation policy needs a 'massive overhaul', says start-up association. Martin Greenacre, 30.11.2023. Available at: https://sciencebusiness.net/news/start-ups/investment-falls-eu-innovation-policy-needs-massive-overhaul-says-start-association (last access 02.04.2024).
[66] Science Business (2023): EU R&D intensity falls in 2022 - despite increased spending. 07.12.2023. Available at: https://sciencebusiness.net/news-byte/horizon-europe/eu-rd-intensity-falls-2022-despite-increased-spending (last access 02.04.2024).
[67] Hoffmann, M.; Nurski, L. (2021): What is holding back artificial intelligence adoption in Europe? Bruegel Policy Brief. Available at: https://www.bruegel.org/policy-brief/what-holding-back-artificial-intelligence-adoption-europe (last access 02.04.2024).
[68] Porter, M. (1998): Clusters and the New Economics of Competition. Harvard Business Review Nov-Dec 1998. https://hbr.org/1998/11/clusters-and-the-new-economics-of-competition (last access 02.04.2024).

clusters give companies better access to markets and "sophisticated buyers" and learn from others about technology and business model trends. Lower coordination costs mean also that cluster companies are more flexible in sourcing inputs enhancing their ability to experiment and innovate. Such an environment is also fertile ground for start-ups as they can more easily find the skills, inputs, and buyers to develop and sell their products. Here, venture clienting, where large enterprises strategically contract start-ups for innovative inputs, is gaining ground in recent years.[69] Overlapping clusters or 'cross-clustering' can create highly novel innovation opportunities combining inputs and ideas from different fields. Further research has shown that cluster support can be an effective driver of business R&D expenditure (see also Section 3.2).[70] The effectiveness of clusters is, however, dependent on other socio-economic conditions given in a specific region.[71] Furthermore, being embedded in a cluster with other high-performing firms, research institutions and universities helps firms to continuously get a higher return on their R&D activity in terms of innovation output.[72]

Evidence from EU Member States' cluster policies (see Chapters 3.1 and 3.2) shows their broad support for R&D projects, innovation ecosystems, and the commercialisation of new products but also the transfer of state-of-the-art technology to cluster members. The top-3 policy objectives of cluster-related policies are focused on R&D and innovation (see Figure 22) and the most used type of financial support instrument is focused on R&D projects (see Figure 24). Examples for policy tools to support innovation activities through clusters include the following:

- **Germany's "ZIM" (Zentrales Innovationsprogramm Mittelstand or Central Innovation Programme for SME's)** is the country's largest innovation programme for SMEs and funds company networks and their R&D projects. In each, at least six German SMEs partner up and install a management team for the network. The networks can also include research institutions and expand to international partners. The ZIM is a good example for a cluster-oriented innovation programme that helps to overcome the fragmentation of the innovation landscape and create new network links and innovation projects.[73]
- The **Technology Centre programme is a joint initiative between Enterprise Ireland and IDA Ireland**. It allows Irish companies and multinationals to work together on market-focused R&D projects in collaboration with research institutions. Its aim is to provide companies with the research expertise of Irish Higher Education institutions to generate innovative technologies. As industry-led R&D collaborations, they can harness the strengths of Ireland's universities for product-oriented innovation. An advantage of the programme is its approach to link multinationals with local enterprises and research institutions to integrate local clusters with global innovation networks.[74]

[69] Siota, J.; Alunni, A.; Riveros-Chacón, P.; Wilson, M.; Karlsson Dinnetz, M. (2020): Corporate Venturing: Insights for European leaders in government, university and industry. JRC119084/EUR 30060 EN. Available at: https://publications.jrc.ec.europa.eu/repository/handle/JRC119084 (last access 02.04.2024).
[70] Ben Hassine, H.; Mathieu, C. (2020): R&D crowding out or R&D leverage effects. An evaluation of the French cluster-oriented technology policy. Available online: https://www.sciencedirect.com/science/article/abs/pii/S004016251831727X (last access 02.04.2024).
[71] Rodríguez-Pose, A.; Comptour, F. (2011): Do clusters generate greater innovation and growth? An analysis of European regions. The Professional Geographer, 64:2. Available at: https://www.tandfonline.com/doi/abs/10.1080/00330124.2011.583591 (last access 02.04.2024).
[72] Turkina, E.; Oreshkin, N.; Kali, R. (2019): Regional innovation clusters and firm innovation performance: an interactionist approach. Regional Studies, 53:8. Available at: https://www.tandfonline.com/doi/full/10.1080/00343404.2019.1566697 (last access 02.04.2024).
[73] ECCP Policy Toolkit: https://clustercollaboration.eu/content/zim-innovation-networks-including-transnational-activities (last access 02.04.2024).
[74] ECCP Policy Toolkit: https://clustercollaboration.eu/content/technology-centre-programme (last access: 02.04.2024).

- **France's Technology Transfer Acceleration Offices (SATT)** are 13 structures aimed to support organisations in the transfer of technology from research to the industry. They are part of the measures implemented for the "Investment for the Future" programme (PIA), whose objective is to close the innovation gap. The main beneficiaries are universities and research organisations (including cluster members) who receive support to valuate, market and license their technology and increase the Technology Readiness Levels. The SATTs are a good example for a measure aiming to unclog Europe's project pipeline from R&D to innovative commercialisation.[75]

On a strategic level, **clusters play an important role in the S3 process** as they unite all important quadruple helix actors.[76] As the example of the Finnish region of Lapland shows, developing an S3 strategy and a cluster programme can go hand in hand (see Box 5) and has the explicit goal of overcoming the limitations that come with such a constellation and enabling smaller upstream enterprises to market their innovations to a broader international audience. This example underlines the importance of multiplying relations and opportunities through cross-clustering and international cluster collaboration.

Box 3: Catalonia's long-standing regional cluster policy

A good example of **successful cluster policy** and its impact on **regional competitiveness** is the Spanish region of Catalonia as it can look back on a long history in cluster policy and has been active in this field for over 30 years. ACCÍO, the Catalan business competitiveness agency (Agència per la Competitivitat de l'Empresa) is responsible for managing the cluster policy of Catalonia.

Examining Catalonia's policies regarding clusters, a report from 2020 on the region's industrial ecosystems stressed that "Catalonia is a pioneering region and an international reference for cluster policies."[77] Catalonia benefits from a long-term and persistent commitment to cluster development through policy efforts, dating back to the early 1990s. This commitment often capitalises on existing local networks of SMEs and a tradition of partnerships between the public and private sectors at the industrial level.[78] Beginning in 1993, Catalonia's cluster policy pioneered a methodological emphasis on micro clusters. This approach underwent refinement after 2004 with a comprehensive mapping of the cluster landscape and the establishment of a range of

[75] ECCP Policy Toolkit: https://clustercollaboration.eu/content/technology-transfer-acceleration-offices-satt (last access 02.04.2024).
[76] Keller, M.; Reingruber, I.; Dermastia, M.; Bersier, J.; Meier zu Köcker, G. (2019): Implementing S3 with clusters – an innovation model for transformative activities. fteval 47. Available at: https://repository.fteval.at/id/eprint/408/ (last access 02.04.2024).
[77] Sydykova, M. (2020). European Entrepreneurial Regions – Regional ecosystem mapping: Region of Catalonia, European Commission/EASME. Available at: https://op.europa.eu/en/publication-detail/-/publication/2775dfa2ac57-11ea-bb7a-01aa75ed71a1 (last accessed 26.03.2024).
[78] Ahedo, M. (2006). Business Systems and Cluster Policies in the Basque Country and Catalonia (1990–2004), European Urban and Regional Studies, 13:1, 25-39. Available at: https://www.researchgate.net/publication/249668868_Business_Systems_and_Cluster_Policies_in_the_Basque_Country_and_Catalonia_1990-2004 (last accessed 26.03.2024).

support organisations, including the Observatory for Industrial Foresight (OPI) and ACCÍO, which serves as the executive agency for cluster policies in Catalonia.[79]
By 2023, Catalonia's cluster programme was providing support to 27 cluster organisations comprising more than 2,700 members, facilitating more than 100 collaborative projects annually.[80] ACCÍO performs impact assessments regularly that consistently revealed that **companies involved in these clusters outperformed their peers across various metrics, including revenue growth, job creation, export performance, and innovation. This underlines the clusters' positive influence on the industrial competitiveness of Catalonia.** On average, clusters consisted of over 100 members, comprising a blend of, among others, SMEs, large corporations, and technology centres while displaying increasing membership numbers. The majority of cluster organisations operated with an annual budget ranging from € 200,000 to 600,000. Approximately 40% of the funding originated from membership fees and grants provided by various public sector sources on regional, national, and EU level, while paid services accounted for the rest. A significant portion of the budget was allocated to staffing expenses. Cluster managers reported high satisfaction rates with the support offered by ACCÍO's cluster team.

At the programme level, the significance of clusters is evident. A 2022 evaluation conducted by ACCÍO reveals that businesses participating in the cluster programme generally perceive it as strongly beneficial.[81] An enhanced competitiveness through their involvement in a cluster is confirmed by 79% of the members. Additionally, more than 90% endorse participation in a cluster initiative and believe it creates value for the sector. Lastly, 85.5% of members report the establishment of beneficial contacts and/or alliances that resulted from their engagement in a cluster.

Source: ECCP (2024).

Upskilling, reskilling and the benefits of clusters for workforce development

As the European economy is facing **multiple grand challenges** through the green, digital, and demographic transitions, all of them have **heavy repercussions on the European workforce and their skillsets** upon which firms large and small rely. With the green and digital transitions changing labour market requirements rapidly and the demographic transition intensifying labour shortages across the board, the need for effective and well-targeted re- and upskilling efforts is urgent. Cluster structures offer a set of advantageous mechanisms that can help industrial ecosystems buffer the shocks and take appropriate countermeasures.

One of the main tenets of cluster theory is that **agglomeration effects in clusters are beneficial for the co-location of both specialised companies and skilled labour**. Skill clusters have important functions for both companies and workers. For employees, it reduces the risk of acquiring highly specialised education as they are

[79] Hernandéz, J.M., Pezzi, A.,Soy, A. (2010). Cluster and Competitiveness: the case of Catalonia (1993-2010), Papers d'Economia Industrial, n. 31 Barcelona, Available under: https://empresa.gencat.cat/web/.content/001departament/04-serveis/01publicacions/Empresa_Industria/papers_d_economia_industrial/documents/arxius/31_angles.pdf (last accessed 26.03.2024)
[80] Ketels, C. (2023). Three Decades of Cluster Policy in Catalonia: What's Next? Harvard Business School Teaching Note 724-424. Available under: https://hbsp.harvard.edu/product/724404-PDF-ENG (last accessed 26.03.2024).
[81] See the ECCP Clusters meet Regions input paper, available at: https://clustercollaboration.eu/sites/default/files/document-store/ECCP_Input%20paper_CmR_Catalonia_final.pdf (30.03.2024).

not reliant on one employer. Vice versa, companies benefit from a workforce that is ready to specialise and both sides profit from easier access to information on each other.[82] To further support these mutually beneficial co-location effects, cluster organisations can serve as intermediaries between firms and training institutions to co-organise tailor-made training programmes for their skill needs. Further, a cluster's visibility is an important factor in attracting the talent needed for highly specialised tasks.[83] In that, clusters can help companies to harness labour mobility to their advantage and profit from the knowledge transfer that comes with it.[84]

The analysis above (see Figure 22) has shown that **upskilling and reskilling are supported as a policy objective by around 75% of all cluster-related policies**. However, the topic is much more present in broad policies than in dedicated cluster policies. The latter are, of course, by nature more narrowly focused. Yet, skills are not a peripheral topic for clusters but one of their core ingredients. It is therefore important that cluster policies integrate the topic into their portfolio. This does not necessarily mean developing a full-fledged upskilling programme within a cluster programme but rather defining strategic goals and identifying partner organisations and other policies and programmes to interact with. The right mix depends on the specific regional constellation. Examples for cluster-related up- and reskilling practices include the following:

- The **Cluster Transport, Mobility and Logistics Berlin-Brandenburg** has been set up as an integral part of the regional innovation strategy and is actively used by public authorities to facilitate regional industrial transition. Since its establishment in 2011, the cluster contributed to significant employment and revenue growth in the region and initiated various R&I projects with a particular focus on digitalisation, electrification and upskilling. In this capacity, the Federal Ministry for Economic Affairs and Climate Action (BMWK) has tasked the cluster with the coordination of a project on industrial transformation in the automotive and supplier industry with a particular focus on de-carbonisation, digitalisation of production and upskilling.[85]
- In Wallonia, the **plastics cluster Plastiwin organises the participation of its members in the Upskills Wallonia project run by the Digital Agency**. It assists companies in translating their digital transformation plan into an HR plan to upgrade the skills of their employees and run the necessary analysis of skills availability and gaps as well as associated risks. In a next step, free training is provided to increase the resilience of companies and maintain the employability of workers.[86]

In **conclusion**, clusters as expressions of economic agglomerations and industrial co-location are the natural arena to tackle labour market challenges and skill shortages hands-on. Cluster members have the interest and the ability to assist with the design and implementation of training programmes and strategies to attract talent.

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[82] Iversen, T.; Soskice, D. (2019): Democracy and Prosperity: Reinventing Capitalism through a Turbulent Century. Princeton University Press, 190-191.
[83] Hsu, M.-S.; Lai, Y.-L.; Lin, F.-J. (2014): The impact of industrial clusters on human resource and firms' performance. Journal of Modelling in Management 9:2. Available online: https://www.emerald.com/insight/content/doi/10.1108/JM2-11-2012-0038/full/html (last access 02.04.2024).
[84] Bienkowska, D.; Lundmark, M.; Malmberg, A. (2011): Brain circulation and flexible adjustment labour mobility as a cluster advantage. Geografiska Annaler: Series B, Human Geography, 93:1. Available at: https://www.tandfonline.com/doi/abs/10.1111/j.1468-0467.2011.00359.x (last access 02.04.2024).
[85] ECCP Policy Toolkit: https://clustercollaboration.eu/content/industrial-transition-automotive-industry-berlinbrandenburg (last access 24.04.2024).
[86] https://clusters.wallonie.be/plastiwin/en/upskilling-and-reskilling (last access 24.04.2024).

These efforts should be linked to broader regional, national, and European policy action and services like the Harnessing Talent Platform.[87]

Cluster networks as corridors for internationalisation

Two recurring and interlinked themes in debates about the European Single Market are internal market integration and external global competitiveness.[88] Looking at the latter, the nature of global competition is changing, drifting away from the rules-based international trade framework of the previous decades and towards a more political, geoeconomic order.[89] Even in a more geoeconomic situation, protectionism is not the only option. By contrast, **strategic openness is an integral part of the EU's geoeconomic reference framework of Open Strategic Autonomy**.[90] With international competition and tensions rising, close collaboration with partners becomes even more important and **international cluster collaboration can open promising cross-border avenues**. A good example setting the diplomatic framework is the administrative arrangement on Cluster Cooperation concluded between the Canadian national innovation agency ISED and the EU's DG GROW with the goal to facilitate strategic business partnerships between European cluster actors and Canada's Global Innovation Clusters.[91]

Beyond diplomatic efforts, **many national and regional cluster policies include internationalisation support programmes as one of their core elements to enable European cluster members to internationalise their activities** and make use of international openness. As research has shown, cluster policies can significantly facilitate the internationalisation of firm activities.[92] Being part of a cluster lowers the barriers for firms to internationalise their business relations through common marketing to increase their visibility and brand and financial support for delegation journeys and matchmaking events. An important factor for success is the active development of international contacts supported by an internationalisation strategy and cluster managers with a clear mandate.[93] An example of a dedicated cluster internationalisation programme is the Polish National Key Clusters policy (see Box 2). The "Internationalisation of National Key Clusters" programme funded (until

[87] https://ec.europa.eu/regional_policy/policy/communities-and-networks/harnessing-talent-platform_en (last access 02.04.2024).
[88] See Letta, E. (2024): Much more than a market. Empowering the Single Market to deliver a sustainable future and prosperity for all EU citizens. Available at: https://www.consilium.europa.eu/media/ny3j24sm/much-more-than-a-market-report-by-enrico-letta.pdf (last access 23.04.2024) and Draghi, M. (2024): Radical change is what is needed. Speech held at the High-level Conference on the European Pillar of Social Rights. Available at: https://geopolitique.eu/en/2024/04/16/radical-change-is-what-is-needed/ (last access 23.04.2024).
[89] Roberts, A.; Moraes, H.; Ferguson, V. (2019): Toward a geoeconomic order. Journal of International Economic Law, 4, 655-676. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3389163 (last access 23.04.2024).
[90] Council of the European Union (2023): Open Strategic Autonomy for a competitive and resilient EU. Available at: https://spanish-presidency.consilium.europa.eu/en/programme/open-strategic-autonomy-spanish-presidency-eu-council-resilient-eu2030/ (last access 23.04.2024).
[91] ISED; DG GROW (2019). Administrative Arrangement on Cluster Cooperation. https://clustercollaboration.eu/sites/default/files/administrative_arrangement_can-eu_clusters_signed.pdf (last access 23.04.2024). See also the recent ECCP paper on cluster policy and collaboration opportunities in the EU and Canada, available at: https://clustercollaboration.eu/sites/default/files/document-store/ECCP_3rdcountry_Canada_FINAL_0.pdf (last access 23.04.2024).
[92] Pavelková, D. et al. (2016): Internationalisation of Cluster Organisations: Strategy, Policy and Competitiveness. Cambridge Scholars Publishing.
[93] Meier zu Köcker, G.; Müller, L.; Zombori, Z. (2011): European clusters go international. Networks and clusters as instruments for the initiation of international business cooperation. Institute for Innovation and Technology. Available at: https://www.iit-berlin.de/iit-docs/28c1b04a9c9f4294aa7a222aab31681f_European_Clusters_go_International.pdf (last access 23.04.2024).

December 2023) a range of activities including marketing, participation in economic missions and fairs, as well as training and access to foreign R&D infrastructure to help cluster members launch their products and services in foreign markets.[94]

Cross-border collaboration needs to be strengthened even more within the EU Single Market and active cluster cooperation must play its part here. The European Commission has launched several initiatives to further develop an integrated European cluster ecosystem. In this regard, **the Eurocluster programme is the current flagship initiative aiming to nurture pan-European meta-clusters** across the European industrial ecosystems to develop value chain interlinkages within the EU Single Market.[95]

Several examples of cluster networks that promote the process of internationalisation can be found in the ECCP toolkit. In the following, a few European examples will be presented, where the cluster aims to promote internationalisation:

- The **Go International Slovenia** aims to further strengthen the internationalisation of the Slovenian economy by helping companies to enter foreign and/or new markets as well as strengthening its presence in traditional markets. The programme provides a coordinated cooperation of all institutions and supports institutions of internalisation in Slovenia.[96]
- The **regional support programme for the internationalisation of clusters and networks** of the German state of **Baden-Württemberg** offers clusters funding for their internationalisation activities with the goal of strengthening the innovation capacity and competitiveness of clusters. The programme supports the development of internationalisation strategy, participation in internationalisation events, targeted market exploration visits of clusters or direct cooperation initiation activities with clusters outside Germany.[97]
- **Cluster Excellence Denmark (CED)** supports Danish cluster organisations to build a strong Danish and international profile with the goal of ensuring a well-functioning and strong cluster landscape in close collaboration with the rest of the business and innovation promotion system in Denmark and abroad. The primary target group of the CED are the 14 cluster organisations that have been appointed to handle the national cluster efforts 2021-2024. [98]

Internationalisation remains one of the core fields of activity for cluster organisations. This is reflected in the broad and multi-layered support offer that exists across Member States, regions, and the EU level. This support offers crucial assistance for firms to overcome barriers to foreign markets and European cross-border collaboration. In this vein, the ECCP is running a series of matchmaking events – both European and international – to support the networking between European cluster actors and their international partners.[99]

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[94] https://www.parp.gov.pl/component/grants/grants/Umi%C4%99dzynarodowienie%20Krajowych%20Klastr%C3%B3w%20Kluczowych (last access 23.04.2024).
[95] https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/smp-cosme-2021-cluster-01 (23.04.2024).
[96] ECCP Policy Toolkit: https://clustercollaboration.eu/content/go-international-slovenia (last access 22.04.2024).
[97] ECCP Policy Toolkit: https://clustercollaboration.eu/content/support-programme-internationalisation-clusters-and-networks (last access 22.04.2024).
[98] ECCP Policy Toolkit: https://clustercollaboration.eu/content/cluster-excellence-denmark-ced (last access 22.04.2024).
[99] For past and future ECCP matchmaking events, see: https://clustercollaboration.eu/event-calendar/matchmaking (last access 23.04.2024).

Clusters as catalysators of the Green & Digital Transition

The twin transition to an ecologically sustainable and digitalised economy requires fundamental changes and both fields have become critical to the general ability of the European economy to compete and grow. With China having pushed its green economy with heavy state support[100], and the US following suit under the Biden administration[101], there is an urgent need for Europe to step up its support. Similarly, in the digital economy, Europe is trailing behind US and Chinese big tech giants.[102] In particular, SMEs struggle with the transition to digitalised and green production methods. Here is where cluster policy can support the construction of the necessary innovation ecosystems and supply chain networks.

Socio-technological transitions require comprehensive coordination among a wide range of actors. Clusters can provide the institutional infrastructure for these coordination efforts in complex market environments like the energy sector.[103] More generally, studies show that clusters can play a vital role in the green transition of the economy through a large set of activities ranging from integrative measures like standard-setting, local value-chain building or cooperation with other clusters; to organising the access to resources, infrastructure, finance and information; to education and awareness building through workshops, knowledge sharing, campaigns and the promotion of green products and services.[104] Similarly, clusters have a positive impact on the development of Internet of Things (IoT) ecosystems where clusters provide support across four domains: organisational and market services; technical services facilitating knowledge sharing, creation, and spillover; application services oriented towards the development of application software; and further ancillary services. In general, actors organised in clusters then tend to show a higher digital maturity than those outside.[105]

Cluster policies across the EU show a high degree of support for the green and digital transitions. They promote the construction of circular industrial ecosystems, energy and resource efficiency along supply chains, green skills, and green innovation. When it comes to digitisation, cluster programmes facilitate the adoption of digital technologies in SMEs, the creation of digital innovation ecosystems and cross-sectoral Industry 4.0 development. Examples of concrete instruments and practices from the ECCP Policy Toolkit include:

- **GreenEvo – Green Technology Accelerator** is a programme of the Ministry of Climate and Environment prepared with a view to promoting Polish green technologies. It links the State Environmental Policy 2030 with SMEs to support them in sourcing the necessary knowledge and resources and liaise with

[100] Financial Times (2024): China's striking advances in green technology. Editorial board, 04.01.2024. Available at: https://www.ft.com/content/d90f4b4e-0ca7-49d2-8437-7d567f6edabf (last access 24.04.2024).
[101] Financial Times (2023): US green technology investment leaves Europe in the shade. Alice Hancock, 16.08.2023. Available at: https://www.ft.com/content/33ebbb0e-c7fb-448b-84b8-3c6cdfb05be4 (last access 24.04.2024).
[102] Euronews Business (2023): Why can't European tech firms compete with their US counterparts? Piero Cingari, 21.12.2023. Available at: https://www.euronews.com/business/2023/12/21/why-cant-european-tech-firms-compete-with-their-us-counterparts (last access 24.04.2024).
[103] McCauley, S.; Stephens, J. (2012): Green energy clusters and socio-technical transitions: analysis of a sustainable energy cluster for regional economic development in Central Massachusetts, USA. Sustainability Sciences, 7, 213-225. Available at: https://link.springer.com/article/10.1007/s11625-012-0164-6 (last access 16.04.2024).
[104] Lis, A. & Mackiewicz, M. (2023): The implementation of green transformation through clusters. Ecological Economics 209. Available online: https://www.sciencedirect.com/science/article/abs/pii/S0921800923001052 (last access 18.01.2024).
[105] Ławicka, M. (2022): Clusters as networking organisations supporting the digital development of companies. 26th International Conference on Knowledge-Based and Intelligent Information & Engineering Systems. Procedia Computer Science 207. Available at: https://www.sciencedirect.com/science/article/pii/S1877050922012662 (last access 05.03.2024).

international partners in the field of innovative green technologies and circular economy, including technology transfer. Thereby, it assists the key potential of clusters to support the green transition and build a successful green economy.[106]

- The Ostrobothnia Region is home to **EnergyVaasa, a strongly business-driven energy cluster** consisting of innovative technology providers for electricity grids, the maritime industry, renewable energy production, and energy efficiency. Close cooperation with its members, the Regional Council and the municipal development agency was the foundation for to design and implementation of Energy Technology and System Solutions for Renewable Energy Production as a priority area of the Ostrobothnian RIS3. This cooperative and business needs-oriented approach has laid the ground for innovative green and smart solutions that have been realised through joint projects and are now also being used for the purpose of a sustainable urban transformation in the city of Vaasa towards a carbon-neutral ecosystem.[107]
- The Czech **National Centre for Industry 4.0** is a technology-neutral and open academic-industry platform that connects innovation leaders, manufacturing and technology companies, universities, research and industry organisations with government and media. It offers a range of analysis, testing and consulting services, especially for SMEs and partners with cluster organisations and their members in the field of digitisation as well as with the Digital Innovation Hub of the Czech Institute of Informatics, Robotics, and Cybernetics Czech Technical University in Prague.[108]
- The **Nord-Est Regional Innovative Cluster for Structural and Molecular Imaging (IMAGO-MOL)** is the only medical imaging cluster in Romania and the EU. The cluster is significantly driven by research and focuses on enhancing cooperation between industry and academia in the ICT and health sector with the aim of providing high-quality healthcare services. IMAGO-MOL successfully lobbied the regional government to have eHealth and precision medicine become integral parts of the regional innovation strategy (RIS3 strategy), labelled as a sub-niche under the “catalyst area” health sector. The focus on these digital priority areas and the related digital transition of the sector contributed to the building of resilience, as the more individual design of the digital systems in the health sector has led to more economic robustness in the region.[109]

To conclude, the sweeping implications of the green and digital transitions and the transformative pressures they put on **Europe’s companies and industrial ecosystems require solid institutional infrastructures** to assist their adaptation and mastery of these dynamics. Clusters can provide this infrastructure of collaboration, mutual learning, and pooling of resources. They can also act as the point of contact linking their members and ecosystems to broader policy initiatives of the twin transition. The role of cluster policy is to support clusters in this dual task.

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[106] ECCP Policy Toolkit: https://clustercollaboration.eu/content/greenevo-green-technology-accelerator (last access 24.04.2024).
[107] ECCP Policy Toolkit: https://clustercollaboration.eu/content/digital-green-and-social-transition-ostrobothnia-region (last access 24.04.2024). See also the case study on Finland’s cluster support in Box 5 and the Cluster Solutions Library with more extensive coverage of the EnergyVaasa cluster in Ostrobothnia, available at: https://clustercollaboration.eu/content/energyvaasa-ostrobothnia-finland (last access 24.04.2024).
[108] ECCP Policy Toolkit: https://clustercollaboration.eu/content/national-centre-industry-40 (last access 24.04.2024).
[109] ECCP Policy Toolkit: https://clustercollaboration.eu/content/digital-transition-and-resilience-romanias-health-sector (last access 24.04.2024). The Cluster Solutions Library provides a more extensive coverage of the case of the IMAGO-MOL cluster, available at: https://clustercollaboration.eu/content/imago-mol-cluster-nord-est-romania (last access 24.04.2024).

Box 4: Baden-Württemberg's Cluster Agency

The case of the German region of Baden-Württemberg is a good example for a cluster policy that was incrementally adapted over time to better reflect the evolving role and needs of regional stakeholders and innovation intermediaries such as cluster organisations. Baden-Württemberg originally started its approach towards cluster policy in 2007 with a detailed recording of all the region's cluster organisations and networks. The collected data was used for the 2008 "Cluster Atlas", systematically informing about Baden-Württemberg's cluster landscape, with the latest edition being published in 2019. During the early years of the policy, clusters were financed directly and competition-based by the state government to establish a fundamental cluster infrastructure.[110]

This changed in 2014 with the establishment of the "ClusterAgentur Baden-Württemberg" (CA BW), a central coordinating agency funded by the state and ERDF funds to assist in managing cluster initiatives and statewide networks in the region. The focus included strategic development, requirements analysis, and the creation of new services for their members.[111] The CA BW professionalised Baden-Württemberg's cluster management as it signified a change from merely financial to comprehensive technical support by which it aimed to increase the innovation activities of SMEs. In 2018, the CA BW adapted its mission by transforming the agency into the ClusterAgentur Baden-Württemberg 2.0 specifically recognised cluster organisations as an instrument of regional innovation policy and aimed to develop its own regional development strategies in the context. One of the main goals was to increase cooperative innovation activities among SMEs and collaboration with cluster organisations overall.

The next step of the agency's evolution was its rebranding to its current state as "RegioClusterAgentur Baden-Württemberg" (RCA BW) in 2022. Since then, RCA BW supports not only cluster initiatives but also regional development agencies because both actors are key players for regional transformation. Thus, the RCA BW has a strong focus on regional transformation as well as business development and supports new models of coordination and cooperation such as transformational partnerships based on identified regional transformation processes. It is designed to strengthen the resilience of Baden-Württemberg's regions and increase transformational innovation activities of SMEs. In the field of business development, the RCA BW offers individual coaching, hands-on support and strategic dialogues for cluster organisations and networking initiatives, thereby acting as an innovation intermediary.

The challenge for Baden-Württemberg is to take existing regional structures and competencies, expose them to economic, political, technological, and social factors influencing regional transformation and thereby improve regional resilience, regional innovation capacity and regional competitiveness. An important tool of the RCA BW for analysing the status of Baden-Württemberg's regional transformation performance in the fields of smart production, green & social economy, green & smart mobility, social innovation, and life science is the RIT-Monitor. The RIT-Monitor analyses regional data sources such as R&I and general company data in the context of transformation topics as well as data regarding students and talent potential in transformation fields. The results allow the RCA BW and different regions of Baden-Württemberg to understand their state

[110] The case study is largely based on material kindly provided by the RegioClusterAgentur Baden-Württemberg.
[111] Ministry of Economic Affairs, Labour and Housing of the state of Baden-Württemberg (2019). Regional Cluster Atlas Baden-Württemberg. Available under: https://www.clusterportal-bw.de/fileadmin/media/Download/Downloads_Publikationen/Cluster-Atlas_2019_englisch.pdf (last access 18.04.2024).

of play regarding transformation topics. The regions can be compared in terms of their regional innovation and transformation challenges by using the RIT-Benchmark, a tool that allows regions to learn from each other through best practices regarding established governance structures for transformational partnerships.

The overall process of regional transformation agendas and activities resulting from these analyses is coordinated through several RegioBoards with members coming from intermediaries and cluster organisations in cooperation with expert boards and regular meetings with the Ministry of Economic Affairs and the RCA BW. The goal is to eventually form transformation alliances through cross-regional partnerships encompassing different stakeholders with a shared willingness to embrace the change in the context of transformation activities. The institutional structures created by the RCA BW could also be valuable for the design and implementation of Smart Specialisation Strategies.

Source: ECCP (2024).

Reinforcing resilience and economic security

Supply chain issues during the COVID-19 pandemic and after the start of the Russian full-scale war of aggression against Ukraine have laid bare the fragility of Europe's globalised networks of production and the need to refocus economic policy toward resilience and economic security.[112] Dealing with these geoeconomic vulnerabilities requires a broad range of measures including reshoring and reindustrialisation, supply chain diversification, resilient resource procurement and circular systems, as well as resilient energy infrastructure and planning. All these aspects of open strategic autonomy have implications for regional economies.[113] Clusters can serve as the institutional infrastructure to deal with this plethora of challenges.[114]

One important element of economic security is **supply chain resilience**. As firms are scrambling to rearrange supply chains and increase their resilience[115], clusters take a central position in the organisation of global value chains, linking local industrial agglomerations with multinational companies and supply chains.[116] They can coordinate supply chain diversification among all relevant local actors and facilitate new international and interregional cooperations. An effect of these efforts to increase supply chain resilience can result in **local**

[112] Tagliapietra, S.; Trasi, C. (2024): How should Europe think about economic security? Intereconomics, 59:2, 88-91. Available at: https://www.intereconomics.eu/contents/year/2024/number/2/article/how-should-europe-think-about-economic-security.html (last access 02.04.2024). Riekeles, G.; Świeboda, P. (2024): Europe's Make-or-Break Moment: Putting Economic Security at the Heart of the EU's 2024-2029 Strategic Agenda. EPC Framing Paper. Available at: https://epc.eu/en/Publications/Europes-make-or-break-moment-Putting-economic-security-at-the-heart~57d26c (last access 16.04.2024).

[113] Trippl, M.; Soete, L.; Kivimaa, P.; Schwaag Serger, S.; Koundouri, P.; Pontikakis, D. (2024): Addressing the regional dimension of open strategic autonomy and European green industrial policy: New perspectives and pathways for impact. European Commission/JRC. Available at: https://op.europa.eu/en/publication-detail/-/publication/82132096-e024-11ee-a5fe-01aa75ed71a1/language-en (last access 15.04.2024).

[114] Haus-Reve, S.; Asheim, B. T. (2023): The role of clusters in addressing societal challenges in European regions. European Planning Studies. Available at: https://www.tandfonline.com/doi/full/10.1080/09654313.2023.2273317 (last access 24.04.2024).

[115] Alicke, K.; Foster, T.; Hauck, K.; Trautwein, V. (2023): Tech and regionalization bolster supply chains, but complacency looms. McKinsey & Company. Available at: https://www.mckinsey.com/capabilities/operations/our-insights/tech-and-regionalization-bolster-supply-chains-but-complacency-looms (last access 22.04.2024).

[116] De Marchi, V.; Di Maria, E.; Gereffi, G. (eds., 2018): Local Clusters in Global Value Chains. Linking Actors and Territories Through Manufacturing and Innovation. Routledge Studies in Global Competition.

(re)industrialisation. Clusters can play a role in efforts to reshore and consolidate capacities in key technologies like semiconductors.[117] The regional factors that are linked to clusters can tip the balance for business decision-makers to reshore manufacturing capabilities.[118]

Evidence from the ECCP factsheets shows that many cluster policies have integrated resilience-related objectives and instruments, but – in comparison – less so than they have integrated elements of the green and digital transition. An example for the top-level integration of resilience is the goal of "economic sovereignty" in the 5th phase of the French Pôles de Compétitivité programme which is linked to the national investment plan France 2030.[119] Other examples for instruments and practices to enhance resilience and economic security through clusters include:

- The Flemish government, with the support of VIL, the Flanders Innovation Cluster on Logistics, established the **Logistics Resilience Task Force**. The objective of the task force was to support companies to adapt to the COVID-19 pandemic and to optimise their activities, possibly through digital technologies. The task force identified and monitored the needs of the entire logistics supply chain and provided targeted advice to companies in the logistics sector. The cluster VIL played an important role - it was appointed by the Flemish government to facilitate and coordinate this task force and to bring together all partners from the entire sector.[120]
- The French programme "**Territoires d'industrie**" is linked to cluster policy through the national investment plan France 2030. The goal is to support regions hit by deindustrialisation to regain industrial dynamic. The programme's governance structure brings together the state, industry and local authorities across national, regional and local levels of governance. The elected territories receive both financial and technical support to realise their projects. Currently, the programme is supporting 183 territories across the country in their reindustrialisation efforts in its "phase 2" running from 2023-2027.[121]

By way of conclusion, the crises of recent years have shown the value of diversified supply chains and industrial self-reliance. Clusters can help their members to endure external shocks and to reconfigure their business networks. As both regional and industrial institutions, they can link efforts of local reindustrialisation with business actors. **Overall, as catalysts of collaboration, clusters provide the necessary networks to navigate times of crisis and find new solutions. Cluster policy should recognise and reinforce clusters' function for resilience and economic security**.

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[117] Johnston, A.; Huggins, R. (2023): Europe's semiconductor industry at a crossroads: Industrial policy and regional clusters. European Urban and Regional Studies, 30:3, 207-213. Available at: https://journals.sagepub.com/doi/10.1177/09697764231165199 (last access 16.04.2024). Shivakumar, S.; Wessner, C., Howell, T. (2023): The Role of Industrial Clusters in Reshoring Semiconductor Manufacturing. Center for Strategic and International Studies CSIS. Available at: https://www.csis.org/analysis/role-industrial-clusters-reshoring-semiconductor-manufacturing (last access 05.03.2024).

[118] Pegoraro, D.; De Propris, L.; Chidlow, A. (2022): Regional factors enabling manufacturing reshoring strategies: A case study perspective. Journal of International Business Policy, 5, 112-133. Available at: https://link.springer.com/article/10.1057/s42214-021-00112-x (last access 16.04.2024).

[119] https://www.entreprises.gouv.fr/fr/la-politique-des-poles-de-competitivite (last access 24.04.2024).

[120] ECCP Policy Toolkit: https://clustercollaboration.eu/content/logistics-resilience-task-force (last access 24.04.2024).

[121] https://www.economie.gouv.fr/le-gouvernement-selectionne-183-nouveaux-territoires-dindustrie (last access 24.04.2024).

Box 5: Finland's national innovation ecosystems, regional development strategies, and the sustainability transition

Finland's cluster policy represents another form of integrating the national and regional levels.[122] The Finnish approach to clusters has been traditionally ecosystem-centred and focused on large enterprises as leading companies that organise their supply chain environment.[123] This approach has been updated in the current Growth Engines programme, where selected 'platform companies'

> "are expected to construct a globally strong ecosystem around them by mobilising an extensive network of companies of different sizes, including research organisations and public actors, to identify and achieve a common set of concrete business goals."[124]

These enterprise-driven networks are organised around a leading corporation and funded through 'challenge competitions'.[125] The second leg of the ecosystem-centred cluster policy of Finland are 'ecosystem agreements' that the government concludes with university towns "regarding the strategic allocation of public and private RDI funding to strengthen globally competitive ecosystems".[126] The ecosystem agreements are part of the Innovative Cities and Communities programme which is channelling ERDF funding into 16 selected urban areas.[127] Together, the Growth Engines and the Innovative Cities and Communities programmes share the "shift from the programme to the contractual mode of operations"[128] aiming to construct strong networks around leading corporations and universities to anchor and organise national innovation ecosystems.

While at least the Innovative Cities and Communities programme already has a distinct place-based focus, it remains a national-level policy. Yet, Finnish regions themselves also run a diverse set of policies and programmes that support the development of innovation ecosystems and clusters as shown by the two quite different regions of Ostrobothnia and Lapland.

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[122] This case example draws on the input paper prepared for the ECCP Clusters meet Regions event in Lapland. Available at: https://clustercollaboration.eu/sites/default/files/document-store/Clusters%20meet%20Regions%20event%20%E2%80%9CA%20sustainable%20approach%20to%20raw%20materials%E2%80%9D%20%E2%80%93%20the%20case%20of%20East%20and%20North%20Finland%20-%20Input%20Paper.pdf (last access 30.03.2024).

[123] Romanainen, J. (2001): The cluster approach in Finnish technology policy. In: Innovative Clusters: Drivers of National Innovation Systems, 377-388, Paris, OECD. Rouvinen, P. & Ylä-Anttila, P. (1999): Finnish cluster studies and new industrial policy making. In: Boosting Innovation: The Cluster Approach, 361-376, Paris, OECD.

[124] Sotarauta, M.; Kolehmainen, J.; Laasonen, V. (2022): Innovation Policy in Finland. Tampere University, Sente Working Papers 50/2022, p. 10. Available at: https://www.researchgate.net/profile/Markku-Sotarauta/publication/364789114_Innovation_Policy_in_Finland/links/635a780e8d4484154a3d9ae2/Innovation-Policy-in-Finland.pdf (last access 07.03.2023).

[125] https://www.businessfinland.fi/en/for-finnish-customers/services/funding/funding-for-leading-companies-and-ecosystems (last access 30.03.2024).

[126] https://tem.fi/en/ecosystem-agreements (last access 30.03.2024).

[127] https://tem.fi/en/-/boost-from-eu-funding-for-urban-innovation-agreements-and-area-innovation-networks (last access 30.03.2024).

[128] Sotarauta et al. (2022), p. 11.

- Ostrobothnia is one of the economically leading regions of Finland with a strong export-oriented industry.[129] Based on these strong foundations, its regional economic development approach centres on a participative Smart Specialisation Strategy (S3) process and the facilitation of network-building between large and small businesses, research institutions and municipalities. Through their thematic priority areas set in the S3, the region aims to harness their strong cooperative networks to tackle horizontal challenges of the green and digital transition. On a policy level, the city of Vaasa has concluded an ecosystem agreement with the Ministry of Economic Affairs and Employment (see above on the Innovative Cities and Communities programme). The Strategy for Innovation and Growth in Ostrobothnia 2022-2025 (S3) is the main programme of innovation support in the region. While it has no dedicated cluster policy approach, within the S3, the region follows the national level in referring rather to 'ecosystems' than clusters, which are positioned as key elements to engage stakeholders in the entrepreneurial discovery process and develop solutions for the green and digital transitions.
- Lapland differs markedly from Ostrobothnia. A peripheral region in the far north, it is sparsely populated, and its economy is focused on the raw materials sector, in particular mining and forestry. The region developed a cross-sectoral cluster programme, the Arctic Smartness Clusters[130] initiative, which developed six thematic clusters aligned with the region's S3. Those sectoral clusters were complemented by cross-cutting support programmes like the Arctic Smart Growth Project, and the Arctic Smart RDI-Excellence, and the Arctic Investment Platform. Furthermore, Lapland is part of the East and North Finland macro-region. Through the ELMO[131] project, funded as part of the European Commission's 'Regions in Industrial Transition' programme, it coordinates the supra-regional coordination and networking of S3, cluster initiatives, and innovation platforms across its seven-member regions. A common thread for these often very resource-dependent regional economies is to create new sustainable development paths

By way of conclusion, Finland's cluster support policies are focused on innovation ecosystems at different levels – regional, supra-regional, and national – but rarely put clusters front and centre. In general, regional strategies are closely linked to the S3 framework as the Ostrobothnia example shows. More peripheral regions like Lapland and the larger East and North Finland macro-region, however, use a more explicitly cluster-focused approach to master the transition challenges they are facing. On the national level, the lead firm and university town approaches connect value chain and place-based strategies to innovation ecosystems. Yet, the increasing complexity poses the challenge for Finnish policymakers to align the different policy initiatives across levels of governance according to a coherent strategy.[132] As of early 2024, the current policy mix is under review and a new dedicated national cluster policy is in the making.

Source: ECCP (2024).

[129] See the ECCP Cluster Solutions Library for the full case study: https://clustercollaboration.eu/content/energyvaasa-ostrobothnia-finland (last access 30.03.2024).
[130] https://arcticsmartness.eu/arctic-smartness-clusters/ (last access 30.03.2024).
[131] https://elmoenf.eu/about-elmo-project/ (last access 30.03.2024).
[132] Sotarauta et al. (2022), p. 12.

05

Conclusions & business-policy implications

5. Conclusions & business-policy implications

The European Cluster Panorama Report 2024 highlights the **relevance of cluster organisations and dedicated cluster policies** in supporting EU, national and regional transition processes, transnational, interregional and cross border collaboration, as well as industrial competitiveness and productivity. A concise summary of the **key takeaways** of this report are provided below, complemented by a short reflection of their implications.

Overall, a comprehensive picture of the European cluster landscape emerges, with many different clusters as geographic concentrations of companies and related actors and cluster organisations. EU27 cluster organisations act as key intermediaries, representing and connecting a wide range of important stakeholders, especially SMEs. They operate in all relevant areas of the European Single Market. In addition to this, European cluster organisations provide dedicated support services, actively helping their members to become more competitive and adapt to transition challenges. As a result, cluster organisations contribute to the economic and technological resilience of the European Single Market. This is confirmed by the positive correlation between the presence of clusters, industrial competitiveness, and readiness for the twin transition.

The main findings of the European Cluster Panorama Report 2024 provide the basis for the following **five policy implications** that are provided in Figure 25 and that are described below:

Figure 25: Overview of policy implications

Source: ECCP (2024).

1. Transformative industrial policy needs an integrated policy framework that links different strategies, policies and programmes leading to more modular forms of support schemes.

Clusters and cluster policy represent an essential component of the broader industrial strategy to enhance the European economy's capacity for innovation, digitalisation, sustainability, and competitiveness. However, they are not a panacea and cannot resolve all challenges by themselves. Rather, cluster policy should initially prioritise its core objective of fostering and directing the growth of clusters. Nevertheless, this is not the limit of its scope. As clusters form robust networks and provide an institutional infrastructure for policy engagement, cluster policy should proactively facilitate the modular integration of different support schemes. Clusters are integrators of different policies, notably industrial and research policies translating EU, national, regional and local strategic priorities into business reality. In the field of innovation, it could be beneficial for clusters and their members to combine more explicitly start-up, R&D, and innovation programmes at the level of their industrial ecosystem – especially as innovation ecosystems are transforming substantially through the green and digital transition. In the field of skills development, it could be advantageous for cluster organisations to intensify the participation of member companies in upskilling programmes, particularly in the field of Generative Artificial Intelligence (GenAI). The application of AI solutions will affect any industry and requires fast experimentation and adoption. In the field of green transition, it could be effective for cluster organisations to create synergies between its members' own sustainability efforts and the national government's sustainability strategy. Across these policy areas, cluster policy has a twofold set of objectives: firstly, to facilitate the development of clusters as networks and platforms; and secondly, to support them in fulfilling their "political" platform role by linking their members to relevant policy support in different areas.

2. Develop dedicated cluster policies to fully exploit the benefits of cluster organisations for economic competitiveness and transition processes.

The findings have shown that the presence of clusters is positively linked to many different aspects of industrial competitiveness and transition processes. Moreover, cluster organisations provide an increasingly important institutional infrastructure to implement the green and digital transitions for industrial ecosystems. However, only 14 out of the 27 EU Member States employ a dedicated cluster policy, despite cluster organisations being present across all EU 27 Member States. The development of a dedicated cluster policy and its alignment in an integrated policy framework, including with key European Commission priorities (such as economic resilience, economic competitiveness, and the Twin Transition) is essential to further enhance the significant role of cluster organisations to achieve these objectives.

3. Recognise cluster organisations as key stakeholders in the European Single Market, with the potential to enhance its efficiency.

This report has demonstrated that cluster organisations represent a significant number of diverse stakeholders. They have the ability to open up the vast pool of SMEs for international collaboration. This is relevant since many European SMEs need assistance to utilise the opportunities of the Single Market and enhance their cross-border activities.[133] Cluster organisations, in their intermediary role, can contribute to the efficiency of the Single Market by supporting SMEs in their internationalisation efforts and their access to cross-border projects. Transregional

[133] Letta, E. (2024): Much more than a market. Empowering the Single Market to deliver a sustainable future and prosperity for all EU Citizens. Available online: https://www.consilium.europa.eu/media/ny3j24sm/much-more-than-a-market-report-by-enrico-letta.pdf (last access 23.04.2024)

support instruments like Euroclusters and the I3 instrument[134] can further support the durable integration of (meta-)cluster structures at the European level and the consolidation of interregional project collaboration.

4. Support the economic resilience of the Single Market by facilitating de-risking and nearshoring efforts via clusters.

The impact of external shocks, such as the COVID-19 pandemic and dramatic changes in the geopolitical environment, has placed pressure on key supply chains in the EU's various industrial ecosystems. De-risking and reshoring activities are seen as important measures to increase the resilience of EU supply chains.[135] Cluster organisations are well placed to support these efforts, as they can identify new partners – within and beyond the Single Market – and thereby diversify and regionalise the supplier base.[136]

5. Smart Specialisation Strategies can further build links between regional development and cluster policy.

The concept of clusters and Smart Specialisation Strategies (S3) are closely related[137, 138,139], as the promotion of economic growth and competitiveness through regional proximity are key elements in both concepts. The analysis of cluster policies across the EU shows that cluster support is sometimes implemented directly through S3-guided programmes, and sometimes cluster organisations are only involved in the design of S3 processes. Smart Specialisation Strategies can be used to establish strategic links between cluster policy and regional development strategies.[140]

[134] https://ec.europa.eu/regional_policy/policy/themes/research-innovation/interregional-innovation-investments_en (last access 24.06.2024)

[135] Letta, E. (2024): Much more than a market. Empowering the Single Market to deliver a sustainable future and prosperity for all EU Citizens. Available online: https://www.consilium.europa.eu/media/ny3j24sm/much-more-than-a-market-report-by-enrico-letta.pdf (last access 23.04.2024)

[136] ECCP (2022): Report on the survey "Solutions to Supply Chain Disruptions in the EU". Available online: https://clustercollaboration.eu/sites/default/files/document-store/ECCP_SC_Disruptions_Report_final.pdf (last access 23.04.2024) and Asheim & Haus-Reve (2023): The role of clusters in addressing societal challenges in European regions. in European regions, European Planning Studies. Available online: https://www.tandfonline.com/doi/full/10.1080/09654313.2023.2273317?scroll=top&needAccess=true (last access 18.03.2024)

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[139] Smart guide to cluster policy - Publications Office of the EU (europa.eu)

[140] Asheim & Haus-Reve (2023): The role of clusters in addressing societal challenges in European regions. in European regions, European Planning Studies. Available online: https://www.tandfonline.com/doi/full/10.1080/09654313.2023.2273317 (last access 18.03.2024)

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Annex

The European cluster landscape

Table 1: ECCP Profiles by Actor Type and Country (all profiles)

	Cluster Organisations	Cluster Members	EUROCLUSTERS, European cluster partnerships & intiatives	Cluster Networks	National Cluster Associations	Policy Institutions	Resource Efficiency Providers	Training Providers
EU27	1,156	4,861	221	46	21	27	128	33
Austria	29	122	2	1	1	0	8	1
Belgium	46	104	15	11	0	8	8	3
Bulgaria	32	142	3	0	1	0	8	0
Croatia	15	18	1	0	0	0	2	0
Cyprus	3	11	0	0	0	0	3	1
Czech Republic	35	29	1	2	1	0	4	0
Denmark	21	75	4	0	1	0	1	2
Estonia	14	56	2	0	1	1	1	0
Finland	37	71	3	2	1	3	2	0
France	113	384	56	8	3	2	4	4
Germany	131	674	12	4	1	0	9	5
Greece	19	52	2	1	0	0	5	0
Hungary	28	114	2	0	2	0	4	1
Ireland	13	44	1	0	1	0	2	3
Italy	97	374	34	3	0	3	12	2
Latvia	14	148	1	0	1	0	1	0
Lithuania	29	189	5	0	1	0	5	2
Luxembourg	1	5	0	1	0	1	2	0
Malta	1	0	0	0	0	0	0	0
Netherlands	32	130	2	1	0	1	3	1
Poland	81	390	5	0	1	1	9	2
Portugal	26	151	5	0	1	2	5	1
Romania	64	391	3	2	1	3	8	0
Slovakia	28	65	0	0	1	0	2	0
Slovenia	120	115	4	1	0	0	5	0
Spain	185	892	56	7	1	2	13	4
Sweden	42	115	2	2	1	0	2	1

Source: Data extracted from ECCP Platform on 21/12/2023.

Table 2: Number of members of cluster organisations in the EU27

Country	1-14	15-50	51-100	101-150	151-200	201-300	301-500	>500	Grand Total
AT	0	1	7	7	4	5	5	0	**29**
BE	0	7	9	13	4	7	4	2	**46**
BG	0	26	4	0	0	2	0	0	**32**
CY	0	1	1	1	1	1	0	0	**5**
CZ	0	15	2	1	0	0	0	0	**18**
DE	0	31	35	19	8	9	12	8	**122**
DK	0	0	3	0	4	7	5	2	**21**
EE	1	8	3	1	0	1	0	0	**14**
ES	0	46	49	26	9	6	4	5	**145**
FI	1	8	6	13	6	6	9	4	**53**
FR	0	13	20	16	15	18	17	12	**111**
GR	0	13	6	0	0	0	0	0	**19**
HR	0	11	6	1	0	0	0	0	**18**
HU	0	21	4	0	0	0	0	0	**25**
IE	0	9	11	11	6	3	1	1	**42**
IT	0	16	25	13	7	3	1	3	**68**
LT	2	22	3	2	0	0	0	0	**29**
LV	0	7	4	0	1	0	0	0	**12**
LX	0	0	0	0	0	0	0	0	**0**
MA	0	1	1	0	0	2	0	0	**4**
NL	0	12	12	11	6	2	1	1	**45**
PL	0	22	31	8	9	2	1	0	**73**
PT	1	6	11	2	6	0	1	1	**28**
RO	3	43	14	2	0	0	0	0	**62**
SE	0	15	14	4	4	0	1	1	**39**
SI	0	19	25	11	5	7	2	0	**69**
SK	2	15	4	3	1	0	1	0	**26**
	10	**388**	**310**	**165**	**96**	**81**	**65**	**40**	**1155**

Source: Data extracted from ECCP Platform on 21/12/2023.

Table 3: Cluster organisation members in the EU27, by actor type and country

EU27 COUNTRY	Large firms		SMEs		Research Organisations		Total #
	#	%	#	%	#	%	
Austria	667	14%	3628	77%	432	9%	4727
Belgium	989	14%	5501	77%	621	9%	7111
Bulgaria	139	11%	1027	79%	129	10%	1295
Croatia	74	13%	416	70%	102	17%	592
Cyprus	10	2%	496	92%	31	6%	537
Czech Republic	177	17%	754	72%	115	11%	1046
Denmark	598	12%	4205	84%	217	4%	5020
Estonia	42	6%	612	88%	43	6%	697
Finland	358	11%	2513	79%	310	10%	3181
France	3349	14%	17425	73%	2956	12%	23730
Germany	2399	4%	52071	91%	2736	5%	57206
Greece	78	11%	508	71%	126	18%	712
Hungary	47	5%	820	87%	77	8%	944
Ireland	305	24%	828	66%	121	10%	1254
Italy	976	8%	10619	84%	1093	9%	12688
Latvia	83	9%	822	86%	55	6%	960
Lithuania	99	11%	722	78%	109	12%	930
Malta	0	0%	20	100%	0	0%	20
Netherlands	448	11%	3321	83%	238	6%	4007
Poland	643	11%	4826	80%	562	9%	6031
Portugal	294	9%	2650	81%	308	9%	3252
Romania	189	8%	1904	78%	342	14%	2435
Slovakia	105	14%	582	77%	66	9%	753
Slovenia	166	13%	920	71%	208	16%	1294
Spain	2827	13%	17265	80%	1444	7%	21536
Sweden	498	12%	3414	83%	183	4%	4095
EU 27	**15560**	**9%**	**137869**	**83%**	**12624**	**8%**	**166053**

Source: Data extracted from ECCP Platform on 21/12/2023

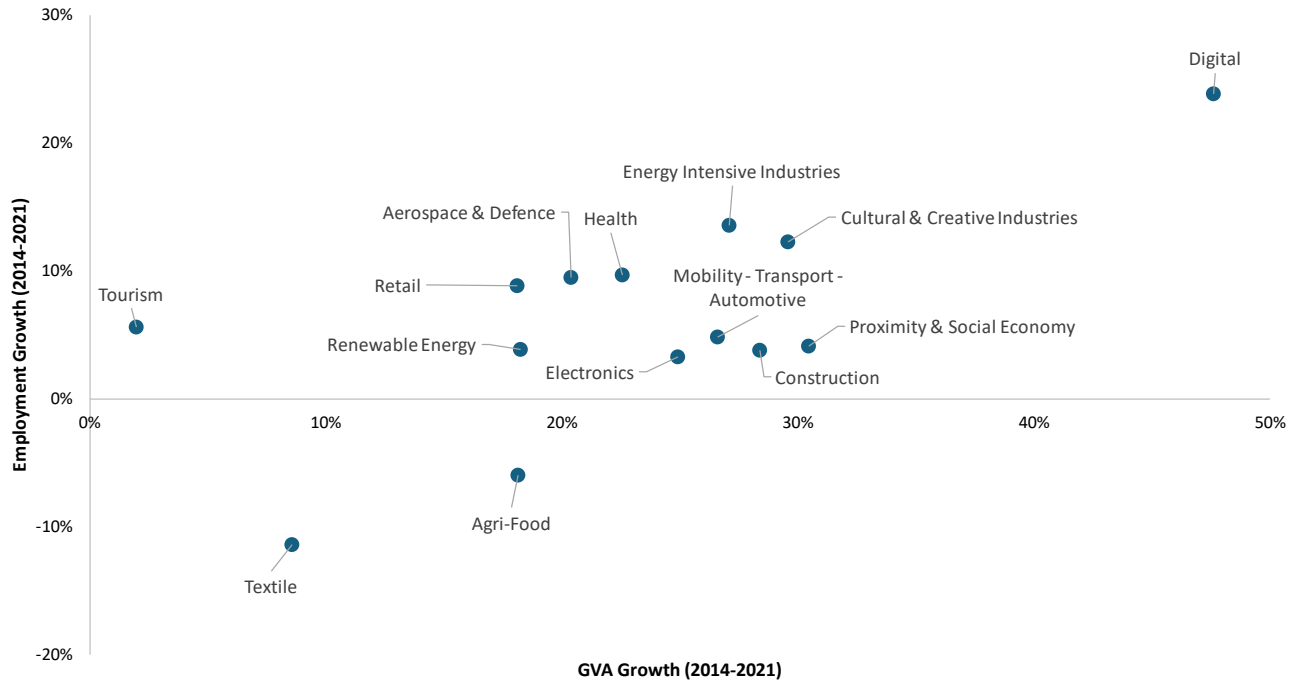
Table 4: Cluster management team size and number of members of cluster organisations

	1-5	6-10	11-20	21-50	51-100	>100	Grand Total
AT	5	3	2	0	0	0	10
BE	2	1	4	0	0	0	7
BG	4	0	0	1	0	0	5
CY	0	0	0	0	0	0	0
CZ	13	2	1	0	0	0	16
DE	8	6	4	0	0	0	18
DK	0	2	0	0	0	0	2
EE	3	0	0	0	0	0	3
ES	27	10	3	0	0	0	40
FI	8	2	1	0	0	0	11
FR	7	7	7	4	1	1	27
GR	2	0	1	0	0	0	3
HR	2	0	0	0	0	0	2
HU	3	0	0	0	1	0	4
IE	1	0	0	0	0	0	1
IT	17	7	1	2	0	0	27
LT	9	0	0	0	0	0	9
LV	1	1	0	0	0	0	2
LX	0	0	0	0	0	0	0
MA	0	0	0	0	0	0	0
NL	0	1	0	0	0	0	1
PL	10	1	2	0	0	1	14
PT	5	2	1	0	0	1	9
RO	4	3	0	0	0	0	7
SE	2	1	3	0	0	0	6
SI	2	0	0	0	0	0	2
SK	5	1	0	0	0	0	6
Grand Total	**140**	**50**	**30**	**7**	**2**	**3**	**232**

Source: Data extracted from ECCP Platform on 21/12/2023. Note: only updated profiles are shown.

European cluster organisations in EU industrial ecosystems

Figure 26: Change in Gross Value Added (GVA) and employment across the industrial ecosystems, 2014-2021



Source: ECCP (2024) based on data from Eurostat [nama_10_a64] and [nama_10_a64_e].

Figure 27: Overview of the framework of industrial competitiveness indicators

Source: ECCP (2024). Sources of industrial competitiveness indicators provided in Table 8 in the Annex

Table 5: Correlation table for presence of clusters and industrial competitiveness

Dimension	Industrial competitiveness indicators	Number of cluster organisations	Number of industry clusters
Business Environment	Survival rate of enterprises	-0.1277	-0.0862
	Birth of enterprises	0.1046	**0.1762**
	Human resources in science and technology	**0.1986**	**0.2519**
	Public R&D invest	0.1374	0.0772
Firm behaviour	Innovative SMEs collaborating with others	0.0589	-0.1124
	SMEs that introduced a business process innovations	-0.0638	-0.1083
	SMEs that introduced a product innovation	-0.0313	-0.0874
	Business R&D invest	**0.3670**	**0.2347**
Innovation potential	Public-private co-publications	0.0985	0.1323
	PCT patents per capita	**0.2089**	**0.1520**
	Sales of new-to-market and new-to-enterprise product innovations as percentage of total turnover	0.1350	-0.0413
Economic returns	Gross fixed capital formation	0.0483	-0.0786
	Apparent labour productivity	**0.1411**	0.0011
	Employment in tech and knowledge sectors	**0.2958**	**0.4096**
	Employment rate	**0.1456**	**0.1534**
	GDP per capita	**0.1519**	0.1132

*Source: ECCP (2024). Cluster organisation data based on information from 1,156 cluster organisation in the EU27 extracted from ECCP Platform on 21/12/23, Note: The numbers in **bold** indicate Pearson correlation coefficients that are significant at 95% level.*

Table 6: Correlation table for presence of clusters and readiness for the Green and Digital Transition

Dimension	Indicator	Number of cluster organisations	Number of industry clusters

Digital Transition	Digital Readiness	**0.3001**	**0.3611**
	Share of ICT in GVA	**0.2561**	**0.4970**
	ICT patents	0.1312	**0.211**
	Employed ICT specialists	**0.3222**	**0.4739**
	Individuals who have above basic overall digital skills	0.0538	**-0.1813**
Green Transition	Green readiness	**0.1732**	**0.2108**
	Air emissions in fine particulates (PM2.5) in Industry	0.0975	**0.3962**
	Green PCT patents	-0.0732	**-0.1420**
	Green Employment	0.0816	0.0315
	Number of recovery & recycling facilities	0.0087	0.0316

*Source: ECCP (2024). cluster organisation data based on information from 1,156 cluster organisation in the EU27 extracted from ECCP Platform on 21/12/23, Note: The numbers in **bold** indicate Pearson correlation coefficients that are significant at 95% level*

Methodology

The following chapter presents the methodological approach used for in this European Cluster Panorama 2024.

In the following, the methodology used to collect and analyse data in the main three chapters of the factsheet is explained in a more detailed manner.

1. EU cluster ecosystem
2. European cluster organisations as shapers of the single market
3. Cluster policy and key transition challenges in Europe

The European cluster landscape

The ECCP contains data on the characteristics of 8 different types of cluster actors that are able to profile themselves on the platform:

1. Cluster Organisations
2. Members of cluster organisations
3. European cluster partnerships and initiatives
4. National associations of clusters
5. Meta clusters and networks of clusters
6. Training providers
7. Resource Efficiency Support Providers
8. Policy or Public Institutions

This report builds upon the profile data collected through the ECCP on these cluster actors. The data that is used in this report for the EU cluster landscape was extracted from the ECCP Platform on 21/12/2023. In many parts of the reports only cluster organisations that have updated their profile according to the new profile registration process on the ECCP.

Classification of the 14 Industrial Ecosystems

Overall, 14 EU industrial ecosystems were introduced by the European Commission in 2020.2
Such industrial ecosystems encompass related industries and players in a value chain, and consist of the following:

Aerospace & Defence	Health
Agri-food	Mobility-Transport-Automotive
Construction	Proximity & Social Economy
Creative & Cultural Industries	Energy – Renewables
Digital	Retail
Electronics	Textile
Energy Intensive Industries	Tourism

Each of the 14 EU industrial ecosystems consists of multiple main economic activities, as reflected in the NACE rev.2 classification. Depending on its influence on a given industrial ecosystem, the sector at the 2-digit NACE level is assigned a certain weight. To obtain data on employment and GVA for each of the industrial ecosystems, the weights outlined in the European Commission Staff working paper have been applied to the collected data.3 As ecosystems are inclined to overlap, sectors at the 2-digit NACE level can flow into various ecosystems. Some sectors are identified as horizontal and thus affect all industrial

ecosystems. The following table presents the economic activities of each industrial ecosystem and their respective weights for employment and GVA.

Table 7: NACE 2.0 ecosystem weights

NACE	Weight	
	GVA	Emp.
Aerospace & Defence		
C25	0.077	0.090
C26	0.440	0.373
C27	0.240	0.156
C28	0.068	0.068
C30	0.680	0.504
C33	0.158	0.130
E36	0.017	0.017
E37	0.027	0.027
E38	0.027	0.027
E39	0.027	0.027
H51	0.090	0.093
H52	0.180	0.102
J61	0.070	0.070
M69	0.025	0.025
M70	0.025	0.025
M71	0.034	0.034
M72	0057	0.057
N77	0.027	0.027
N78	0.027	0.027
N80	1.000	1.000
Agri-food		
A01	1.000	1.000
A02	1.000	1.000
A03	1.000	1.000
C10	1.000	1.000
C11	1.000	1.000
C12	1.000	1.000
C25	0.066	0.066
C28	0.078	0.078
C33	0.118	0.118
E36	0.122	0.122
E37	0.095	0.095
E38	0.095	0.095
E39	0.095	0.095
M69	0.077	0.077
M70	0.077	0.077
M71	0.060	0.060
M72	0.072	0.072
N77	0.082	0.082
N78	0.082	0.082

NACE	Weight	
	GVA	Emp.
Construction		
C25	0.305	0.305
C28	0.195	0.198
C31	1.000	1.000
C33	0.155	0.155
E36	0.102	0.102
E37	0.137	0.137
E38	0.137	0.137
E39	0.137	0.137
F41	1.000	1.000
F42	1.000	1.000
F43	1.000	1.000
M69	0.115	0.115
M70	0.115	0.115
M71	1.000	0.115
M72	0.104	0.104
N77	0.129	0.129
N78	0.129	0.129
N81	1.000	1.000

NACE	Weight	
	GVA	Emp.
Cultural & Creative Industries		
C18	1.000	1.000
C25	0.009	0.009
C28	0.013	0.012
C32	0.080	0.112
C33	0.013	0.013
E36	0.025	0.025
E37	0.019	0.019
E38	0.019	0.019
E39	0.019	0.019
G47	0.010	0.015
J58	1.000	1.000
J59	1.000	1.000
J60	1.000	1.000
J62	0.004	0.005
J63	0.004	0.005
M69	0.028	0.028
M70	0.028	0.028
M71	0.170	0.214
M72	0.027	0.027
M73	1.000	1.000
M74	0.440	0.505
M75	0.640	0.420
N77	0.029	0.032
N78	0.028	0.028
P85	0.100	0.100
R90	0.800	0.800
R91	0.800	0.800
R92	0.800	0.800
S94	0.020	0.020
S95	0.260	0.325

NACE	Weight	
	GVA	Emp.
Digital		
C25	0.021	0.021
C26	0.290	0.211
C28	0.031	0.031
C33	0.032	0.033
E36	0.022	0.022
E37	0.028	0.028
E38	0.028	0.028
E39	0.028	0.028
J58	1.000	1.000
J61	0.970	0.988
J62	1.000	1.000
J63	1.000	1.000
M69	0.051	0.051
M70	0.051	0.051
M71	0.044	0.044
M72	0.069	0.069
N77	0.052	0.052
N78	0.052	0.052
S95	0.480	0.341
Electronics		
C25	0.020	0.020
C26	1.000	1.000
C28	0.123	0.123
C33	0.015	0.015
E36	0.007	0.007
E37	0.010	0.010
E38	0.010	0.010
E39	0.010	0.010
M69	0.012	0.012
M70	0.012	0.012
M71	0.015	0.015
M72	0.051	0.051
N77	0.013	0.013
N78	0.013	0.013

NACE	Weight	
	GVA	Emp.
Energy Intensive Industries		
C16	1.000	1.000
C17	1.000	1.000
C19	1.000	1.000
C20	1.000	1.000
C22	1.000	1.000
C23	1.000	1.000
C24	1.000	1.000
C25	0.036	0.036
C28	0.040	0.040
C33	0.047	0.047
E36	0.040	0.040
E37	0.086	0.086
E38	0.086	0.086
E39	0.086	0.086
M69	0.049	0.049
M70	0.049	0.049
M71	0.037	0.037
M72	0.031	0.031
N77	0.031	0.031
N78	0.031	0.031
Health		
C21	1.000	1.000
C25	0.052	0.052
C28	0.056	0.056
C32	1.000	1.000
C33	0.069	0.069
E36	0.111	0.111
E37	0.085	0.085
E38	0.085	0.085
E39	0.085	0.085
M69	0.088	0.088
M70	0.088	0.088
M71	0.076	0.076
M72	0.142	0.142
N77	0.100	0.100
N78	0.100	0.100
Q86	1.000	1.000
Q87	1.000	1.000
Q88	1.000	1.000

NACE	Weight	
	GVA	Emp.
Mobility-Transport-Automotive		
C25	0.236	0.236
C27	0.030	0.023
C28	0.278	0.278
C29	1.000	1.000
C30	0.320	0.496
C33	0.165	0.165
E36	0.058	0.058
E37	0.098	0.098
E38	0.098	0.098
E39	0.098	0.098
G45	1.000	1.000
H49	0.520	0.621
H50	0.780	0.704
H52	0.390	0.330
M69	0.086	0.086
M70	0.086	0.086
M71	0.093	0.093
M72	0.130	0.130
N77	0.086	0.086
N78	0.086	0.086
Retail		
C25	0.044	0.044
C28	0.057	0.057
C33	0.065	0.065
E36	0.074	0.074
E37	0.078	0.078
E38	0.078	0.078
E39	0.078	0.078
G46	1.000	1.000
G47	1.000	1.000
H53	1.000	1.000
M69	0.135	0.135
M70	0.135	0.135
M71	0.080	0.080
M72	0.081	0.081
N77	0.127	0.127
N78	0.127	0.127

NACE	Weight	
	GVA	Emp.
Proximity & Social Economy		
C25	0.024	0.024
C28	0.030	0.030
C33	0.036	0.036
E36	0.077	0.077
E37	0.054	0.054
E38	0.0534	0.054
E39	0.054	0.054
G47	0.160	0.155
I55	0.140	0.140
I56	0.140	0.140
L68	0.080	0.084
M69	0.057	0.057
M70	0.057	0.057
M71	0.044	0.044
M72	0.047	0.047
N77	0.061	0.061
N78	0.061	0.061
N81	0.280	0.221
N82	0.110	0.110
Q87	1.000	1.000
Q88	1.000	1.000
S95	1.000	1.000
S96	1.000	1.000
T97	1.000	1.000
T98	1.000	1.000
Renewable Energy		
C25	0.016	0.016
C27	0.380	0.380
C28	0.016	0.016
C33	0.016	0.016
D35	0.290	0.280
E36	0.011	0.011
E37	0.014	0.014
E38	0.014	0.014
E39	0.014	0.014
M69	0.010	0.010
M70	0.010	0.010
M71	0.012	0.012
M72	0.008	0.008
N77	0.008	0.008
N78	0.008	0.008

NACE	Weight	
	GVA	Emp.
Textile		
C13	1.000	1.0000
C14	1.000	1.0000
C15	1.000	1.0000
C25	0.009	0.009
C28	0.010	0.010
C33	0.010	0.010
E36	0.013	0.013
E37	0.014	0.014
E38	0.014	0.014
E39	0.014	0.014
M69	0.012	0.012
M70	0.012	0.012
M71	0.011	0.011
M72	0.012	0.012
N77	0.001	0.001
N78	0.001	0.001
Tourism		
C25	0.037	0.037
C28	0.050	0.050
C33	0.072	0.072
E36	0.105	0.105
E37	0.071	0.071
E38	0.071	0.071
E39	0.071	0.071
H49	0.450	0.372
H50	0.220	0.296
H51	0.910	0.910
I55	1.000	1.000
I56	1.000	1.000
M69	0.068	0.068
M70	0.068	0.068
M71	0.055	0.055
M72	0.048	0.048
N77	0.083	0.083
N78	0.083	0.083
N79	1.000	1.000
N82	1.000	1.000
R90	0.670	0.667
R91	0.670	0.667
R92	0.670	0.667
R93	1.000	1.000

Source: ECCP (2024) based on European Commission (2022): Annual Single Market Report, SWD (2022).

European cluster organisations as shapers of the single market

The following table provides an overview and description of the **24 industrial competitiveness indicators**. These indicators are used in a correlation analysis together with the number of cluster organisations as well as the number of industry clusters. Thereby, industry clusters indicate that the region is specialised in the sector (LQ > 1.5) and regional employment in the sector is relevant in the EU context (industry employment share > 1%).

Table 8: Overview and description of the industrial competitiveness indicators

Indicator group	Indicator	Description	Source
Economic returns	GDP per capita	This indicator informs about the Gross Domestic Product per capita (PPP). To account for fluctuations (e.g. due to the COVID-19 crisis), the average of the years 2018-2022 is used. Luxembourg's GDP per Capita is an outlier, performing well above the EU average. Eurostat explains this by the fact that a significant number of foreign residents is working in Luxembourg and hence contributing to Luxembourg's GDP. At the same time, these residents are not counted among Luxembourg's residents[141]. Due to this fact, Luxembourg's GDP per capita is not considered in this analysis.	Eurostat
	Employment rate	This indicator informs about the employment rate of a region and covers the age class 15 to 64 years. To account for fluctuations (e.g. due to the COVID-19 crisis), the average employment of the years 2018-2023 is used.	Eurostat
	Employment in tech and knowledge sectors	This indicator shows the share of employment in High-tech industries and knowledge-intensive services. Knowledge-intensive activities are defined, based on EU Labour Force Survey data, as all NACE Rev.2 industries at 2-digit level where at least 33% of employment has a higher education degree (ISCED 5-8)	Eurostat
	Apparent labour productivity	This indicator is calculated by dividing gross value income of a region by employment data. Hence, this indicator shows value added per person employed. To account for fluctuations (e.g. due to the COVID-19 crisis), the average of the years 2018-2022 is used. The labour productivity of Ireland is performing way above the other regions. This can be linked to the dominant role of multinational companies that offer jobs with high wage levels. At the same time, productivity spillovers from these foreign investments are limited.[142] Due to this structure, Ireland is not considered in this correlation of clusters with labour productivity.	Eurostat

[141] see https://ec.europa.eu/eurostat/statistics-explained/index.php?title=GDP_per_capita,_consumption_per_capita_and_price_level_indices#Relative_volumes_of_GDP_per_capita (last access 12.06.2024)

[142] International Monetary Fund (2023): Boom Without Disease? Impact of Multinational Enterprises in Ireland. Available online: https://www.elibrary.imf.org/view/journals/002/2023/412/article-A002-en.xml (last access 12.06.2024)

	Share of ICT in GVA	This indicator informs about the respective share of ICT in Gross Value Added relative to the total Gross Value Added. In other words, this indicator measures the value of goods and services produced that are related to the NACE sector "Information and communication"	Eurostat
	Gross fixed capital formation	This indicator shows Gross fixed capital formation as a percentage of GDP. Gross fixed capital formation consists of resident producers´ acquisitions, less disposals, of fixed tangible or intangible assets.	Eurostat
	Air emissions in fine particulates (PM2.5) in Industry	This indicator includes the Air emissions by fine particulate matter (PM2.5) in the Manufacturing sector in Tonnes divided by Value added in the Manufacturing sector. PM2.5 (particles with a diameter of 2.5 micrometres or less is considered by the WHO as the pollutant with the highest impact on human health.	Regional Innovation Scoreboard
Innovation potential	Public-private co-publications	This indicator covers the number of public-private co-authored research publications with both domestic and foreign collaborators. The definition of the "private sector" excludes the private medical and health sector. It captures public-private research linkages and active collaboration activities between business sector researchers and public sector researchers resulting in academic publications	Regional Innovation Scoreboard
	PCT patents per million population	This indicator informs about the number of patents between 2017-2021 per million inhabitants of a region.	EPO
	ICT patents	This indicator informs about the share of ICT patents relative to all patents between 2017-2021. The definition of ICT patents follows the OECD definition.	EPO
	Green PCT patents	This indicator informs about the share of green patents relative to all patents between 2017-2021. The definition of green patents follows the OECD definition. In the European Innovation Scoreboard Exploratory Report on environmental innovation[143] the indicator "development of environment-related technologies as a percentage share of all technologies" is discussed in the context of the Regional Innovation Scoreboard. However, since this indicator is based on patent data and the Green PCT Patents capture the green transition in a broader way and are better comparable to ICT patents the green PCT patent indicator is deemed as better suited.	EPO
	Sales of new-to-market and new-to-enterprise product innovations as	This indicator measures the turnover of new or significantly improved products and includes both products which are only new to the firm and products which are also new to the market. The indicator thus captures both the creation of state-of-the-art technologies (new to market products) and	Regional Innovation Scoreboard

[143] see https://ec.europa.eu/docsroom/documents/45664 (last access 10.05.2022)

	percentage of total turnover	the diffusion of these technologies (new to firm products)	
Firm behaviour	Business R&D invest	This indicator informs about the expenditure for Research & Development in the Business enterprise sector	Eurostat
	SMEs that introduced a business process innovations	SMEs that introduced a marketing or organisational innovation (percentage of SMEs). Many firms innovate not by improving new products but by improving their business processes. Business process innovations include process, marketing and organisational innovations	Regional Innovation Scoreboard
	SMEs that introduced a product innovation	Number of Small and medium-sized enterprises (SMEs) who introduced at least one product innovation. A product innovation is the market introduction of a new or significantly improved good or service with respect to its capabilities, user friendliness, components, or sub-system. Product innovation is a key ingredient to innovation as they can create new markers and improve competitiveness. Higher shares of product innovators reflect a higher level of innovation activities	Regional Innovation Scoreboard
	Innovative SMEs collaborating with others	This indicator shows the number of SMEs with innovation co-operation activities by total number of SMEs. Firms with co-operation activities are those that have had any co-operation agreements on innovation activities with other enterprises or institutions. Hence, this indicator measures the degree to which SMEs are involved in innovation co-operation. Complex innovations often depend on companies' ability to draw on diverse sources of information and knowledge, or to collaborate on the development of an innovation. The indicator measures the flow of knowledge between public research institutions and firms, and between firms and other firms. The indicator is limited to SMEs, because almost all large firms are involved in innovation co-operation	Regional Innovation Scoreboard
	Employed ICT specialists	Share of employment in ICT sectors relative to total employment. Defined as “Workers who have the ability to develop, operate and maintain ICT systems, and for whom ICT constitute the main part of their job". The indicator captures the use of Information technologies	Regional Innovation Scoreboard
	Green Employment	Share of employment the EU Industrial Ecosystem “Renewable Energy” relative to total employment. For the classification of employment in this Industrial Ecosystems, the NACE rev.2 classification that was	Own elaboration based on Eurostat / Labour Force Survey

		developed in the Annual Single Market Report 2021[144] will be used.	
Business Environment	Public R&D invest	This indicator informs about the expenditure for Research & Development in the public sector	Eurostat
	Human resources in science and technology	This indicator informs about the number of human resources in science and technology relative to the total population	Eurostat
	Birth of enterprises	This indicator informs about the births of enterprises in a given year and region. A birth occurs when an enterprise starts from scratch and actually starts activity. An enterprise creation can be considered an enterprise birth if new production factors, in particular new jobs, are created. If a dormant unit is reactivated within two years, this event is not considered a birth	Eurostat
	Survival rate of enterprises	This indicator shows the survival rate of enterprises (3 years). Survival occurs if an enterprise is active in terms of employment and/or turnover in the year of birth and the following year(s). In other words, it can be regarded as a success rate of newly funded enterprises.	Eurostat
	Individuals who have above basic overall digital skills	This indicator shows the number of individuals with above basic overall digital skills by the total number of individuals aged 16 to 74	Regional Innovation Scoreboard
	Number of recovery facilities	This indicator shows the number of energy & recycling recovery facilities. The existence of such facilities provides an essential foundation for approaches related to the Circular Economy	Eurostat

Source: ECCP (2024).

[144] European Commission (2021): Annual Single Market Report 2021. Commission Staff Working Document accompanying the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. See https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021SC0351