EUROPEAN CLUSTER
COLLABORATION PLATFORM

Clusters meet Regions' event "Clusters as drivers of regional innovation eco-systems" – the case of Romania

Input paper

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Executive Summary

The following paper presents observations on the Romanian cluster landscape and outlines some key considerations for the future development of the region. These considerations may pose some open strategic questions, which can be addressed in the workshops of the "Clusters meets Regions" event. The following key takeaways are summarised below:

Context: Economic profile of Romania

- The Agri-Food and Textile ecosystems play a significant role in **Romania's economy**, showing regionally-relevant specialisation in various regions across the country, with other important ecosystems that exhibit specialisation in Mobility-Transport, Electronics. Additionally, the capital region of Bucharest-Ilfov further specialises in the Digital and Aerospace & Defense ecosystems. Given its diverse sectoral composition and specialisation, Romania's economy presents a diverse range of prospects in various sectors that can be leveraged to bolster regional growth through the support of economic and cluster structures
- In the 2023 **European Innovation Scoreboard**, Romania is classified as an "Emerging Innovator", showing noticeable improvements in indicators regarding attractive research systems, use of information technologies as well as digitalization. In the 2022 Regional Competitiveness Index, Romania's overall score falls below the EU average, with significant variations in performance among Romanian regions. Notably, the region of Bucharest-Ilfov stands out for its relatively high performance, particularly for higher education and lifelong learning, the labour market, as well as market size.

Clusters in Romania and their importance for regional economic development

- With **62 cluster organisations** registered on the ECCP, Romania has a relatively dense cluster landscape that extends across all its regions. It covers 13 out of 14 EU industrial ecosystems, with particular strengths in **Digital, Tourism, Renewable Energy** and **Health**.
- Empirical insights from the European Cluster Panorama 2021 and Ketels & Protsiv (2021) prove how clusters can have a striking impact on economic growth and innovative business activity within regions.

Cross-border cooperation and the involvement of Romanian clusters in European networks and support initiatives

- In the **2014-2020 period**, 14 Romanian clusters participated in 17 ESCP projects. More specifically, 7 have participated or are participating in 8 ESCPs for Going International (ESCP-4i) projects, 7 participated in as many ESCPs for Excellence (ESCP-4x) projects, and two participated in 2 ESCP for Smart Specialisation (ESCP-S3) projects. Three Romanian cluster organisations participated in six Innosup-1 projects, while only 1 participated in the Euroclusters initiative.
- In the **2021-2027 period**, one cluster organisation from Romania participates in the DREAM Eurocluster.

Smart Specialisation in Romania

- Cluster organisations (can) play an important role in the design and implementation of Smart Specialisation Strategies (S3). In the national Romanian innovation strategy, cluster organisations are regarded as a key tool to support (regional) innovation ecosystems.
- The national Romanian Innovation Strategy 2021-2027 identifies **7 priority areas**. These priority areas are "Bioeconomy", "Digital Economy & Space Technologies", "Energy & mobility", "Advanced manufacturing", "Advanced functional materials", "Environment & eco-technologies" and "Health".

01

Context: Economic profile of Romania

1. Context: Economic profile of Romania

Romania, strategically located in Southeast Europe, takes a pivotal position at the intersection of Eastern and Western Europe. To the east, Romania's coastline on the Black Sea ensures access to maritime trade routes. This strategic location places Romania at the crossroads of vital trade pathways, connecting Central and Eastern Europe, affording the country significant trade advantages and access to crucial transportation routes. Romania is further divided into eight NUTS-2 planning regions, namely North-West (RO11), North-East (RO12), South-East (RO21), Centre (RO22), South-Muntenia (RO31), South-West Oltenia (RO41), Bucharest-Ilfov (RO32), West (RO42). As of 2022, Romania's population stands at approximately 19,1 million, making it the sixth-largest EU27 Member State by population.[1] The largest region by population is North-East, which includes the host city Iași, boasting a population of 3,220,000. Following closely are the regions of South-Muntenia with a population of 2,850,000 and North-West, with a population of 2,520,000. The capital region of Bucharest-Ilfov boasts a population of 2,270,000, making it the sixth-largest region by population.[2] When looking at the population density and urbanisation rates of each Romanian region, the urban-rural divide is apparent, with Bucharest-Ilfov representing a highly urbanised region with an urbanisation rate of 95% (See Table 1 in the Annex).[3] In contrast, other Romanian regions lean more towards rural, with urbanisation rates and population densities below the EU average.

This section will provide a concise economic overview of Romania, encompassing key aspects such as the macroeconomic profile, employment and regional specialisation, as well as its innovation and regional competitiveness performances. Thus, it aims to furnish the necessary context and insights pertaining to Romania's cluster landscape.

Macroeconomic profile of Romania

In 2022, Romania's total **GDP** market prices amounted to €285,9 billion.[4] Romania's real GDP growth rates over the past decade reveal a mix of economic trends and fluctuations. As shown in Figure 1, between 2011 and 2013, the country experienced a period of subdued growth, with real GDP growth rates hovering around or below 0.05%, reflecting economic challenges and global uncertainties. The pivotal year was 2014, marking a noteworthy upturn with a real GDP growth rate of 4.1%, which initiated a more robust economic trajectory. Subsequent years, namely 2015 and 2016, demonstrated stability and steady growth with rates of 3.2% and 2.9%, respectively, signifying a period of consolidation and recovery. In 2017, Romania experienced a remarkable surge with a real GDP growth rate of 8.2%, suggesting improved economic policies and investments. This growth momentum was sustained in 2018 and 2019 with rates of 6.0% and 3.9%, indicating economic stability and attractiveness for investment. However, 2020 posed a significant challenge with a contraction of -3.7%,

[1] Eurostat (2023): Population on 1 January. Available under: https://ec.europa.eu/eurostat/databrowser/view/TPS00001__custom_7998238/default/table?lang=en (last accessed 20.10.2023).

[2] Eurostat (2023): Population on 1 January by age group, sex and NUTS 3 region. Available under: https://ec.europa.eu/eurostat/databrowser/view/TGS00096__custom_7998258/default/table?lang=en (last accessed 20.10.2023).

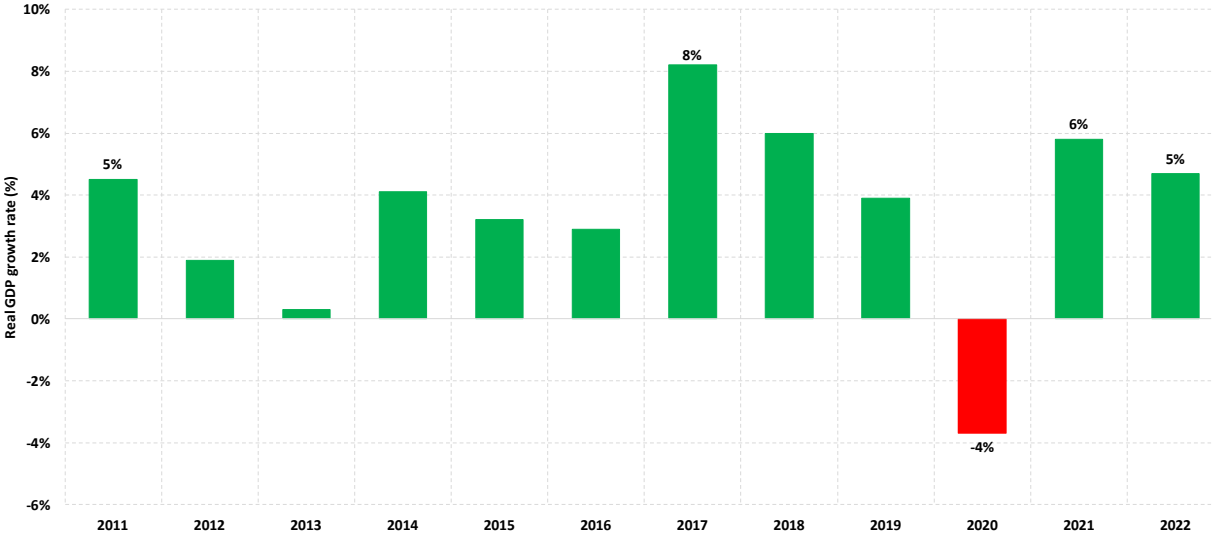
[3] See European Commission (2023): Regional Innovation Scoreboard 2023 Regional profiles Romania.

[4] Eurostat (2023): GDP and main components (output, expenditure and income). Available under https://ec.europa.eu/eurostat/databrowser/view/nama_10_gdp/default/table?lang=en (last access 20.10.2023).

attributed to the global pandemic's impact. Romania rebounded in 2021 with a growth rate of 5.8% and continued its positive trajectory into 2022 with a rate of 4.7%, highlighting the country's resilience and recovery, and positioning it for further growth and development in the coming years.

In 2021, the Romanian economy boasted a per-capita GDP (PPS, EU27 from 2020) of €24,000, which placed the country below the EU27 average of €32,400 and ranked it twenty-second in the EU27. However, in this regard, it is important to acknowledge significant regional disparities across the eight regions of Romania. The capital region of South-West stands out with a comparatively higher GDP per capita (PPS, EU27 from 2020) of €53,900, well surpassing the national average and as well as the European average. This distinction can be attributed to the region's robust services sector, particularly in the digital services industry. In contrast, the other regions exhibit a wider range of GDP per capita, spanning from €15,800 to €24,300, with the region of North-East exhibiting the lowest GDP per capita.[5] These disparities between the capital region and the more rural regions are partially influenced by the predominant economic activities of those regions, with a prominent focus on agriculture and manufacturing. The differences in the sectoral composition are highlighted in the next subchapter.

Figure 1: Romania's real GDP growth rate 2011-2021 (in %)



Source: ECCP (2023), own elaboration based on Eurostat.

Moreover, Romania's strategic geographic location in Southeast Europe, particularly its access to the Black Sea and its connectivity with neighbouring European countries, plays a pivotal role in shaping its **trade capacity**. The nation's advantageous position facilitates both imports and exports, thereby influencing its trade balance. As of the latest available data in 2022, Romania reported imports of goods and services amounting to €126.077 billion, and exports of goods and services reaching €91.973 billion, reflecting a balance of negative €34.104 billion.[6] Romania's integration into the single market is evident, with 72.2% of its exports being intra-EU, demonstrating the significance of European Union member states as key trading partners. Similarly, 70.9% of Romania's imports

[5] Eurostat (2023): Gross domestic product (GDP) at current market prices by NUTS 2 regions. Available under: https://ec.europa.eu/eurostat/databrowser/view/nama_10r_2gdp/default/table?lang=en

[6] Eurostat (2023): Intra and Extra-EU trade by Member State and by product group. Available under: https://ec.europa.eu/eurostat/databrowser/view/EXT_LT_INTRATRD/default/table?lang=en&category=ext_go.ext_go_agg

originate from other EU member states, indicating strong economic ties within the European Union.[7] Given the strong economic ties with Russia and Ukraine, the Romanian economy has been affected by the Russian war against Ukraine, and will even be even more increasingly reliant on trade with the EU27 trade as well as other trading partners.

Employment and Regional Sector and Ecosystem Specialisation in Romania

In Romania, the service sector accounts for 46.2% of total employment, which is lower than the EU27 average of 63.7%. Conversely, traditional sectors like Agriculture & Mining (18.5%) and the Manufacturing sector (18.9%) wield substantial influence over the Romanian labour market, surpassing the corresponding EU average (See Table 1 in the Annex).[8] It is worth highlighting that these sectors exhibit a more pronounced presence in the less densely populated regions, particularly outside the capital region of Bucharest-Ilfov. Within these regions, the share of employment in Agriculture & Mining and Manufacturing surpasses both the national and EU27 averages. The Agriculture & Mining sector attains remarkable prominence in regions such as South-East, South-West Oltenia, and North-East, with the latter recording a notable 38.1% share. In contrast, Manufacturing plays a pivotal role in regions like West (35.9%), Center (28.8%), and North-West (22.5%). On the other hand, the capital region is a more service-driven economy, with the service sector making up almost three-fourths (74.8%) of total employment.[9]

As part of its Industrial Strategy (March 2020), the European Commission has selected **14 industrial ecosystems** that are particularly relevant in Europe and encompass all players operating in a value chain.[10] The classification of the 14 industrial ecosystems has been calculated by aggregating NACE 2-digit activities, following the methodology established by the European Commission.[11] In Romania, the Agri-Food ecosystem holds the largest proportion of employment compared to all other ecosystems, accounting for 28.2% of employment across the ecosystems. This prominence is highlighted by its substantial share in contrast to the EU27 average, which stands at 8.5%. The high employment share in this ecosystem can be attributed to the significant number of individuals engaged in activities related to "Crop and animal production, hunting and related service activities", which makes up the largest sector in the Romania economy, as shown in Figure 2. Following the Agri-Food ecosystem are Retail and Construction, both of which are slightly smaller than the EU27 average. Other ecosystems that demonstrate a higher concentration of employment compared to the EU27 average include Mobility – Transport - Automotive, Textile, and Aerospace & Defence. The high share of the ecosystem Mobility – Transport – Automotive, making it the fourth-largest ecosystem by employment is mainly reflected by the sector Manufacture of motor vehicles, trailers and semi-trailers, which is included in the top 10 largest sectors in the country by employment. The Textile ecosystem has a significantly higher share of employment across the industrial ecosystems, due to its prominent manufacture of wearing apparel sector.

[7] Own calculation based on Eurostat (2023): Intra and Extra-EU trade by Member State and by product group. Available under: https://ec.europa.eu/eurostat/databrowser/view/EXT_LT_INTRATRD/default/table?lang=en&category=ext_go.ext_go_agg

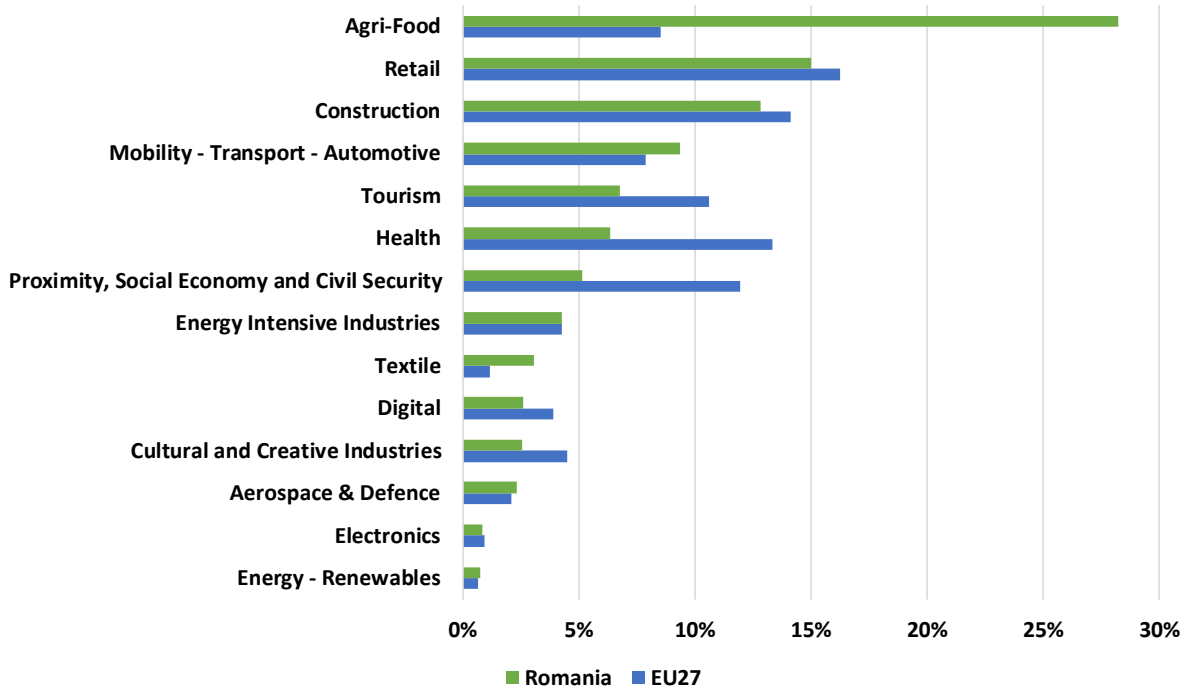
[8] See European Commission (2023): Regional Innovation Scoreboard 2023 Regional profiles Romania.

[9] ibid.

[10] See here for more information https://clustercollaboration.eu/in-focus/industrial-ecosystems (last accessed 24.07.2023).

[11] See European Commission (2021): Annual Single Market Report, SWD (2021), available online https://commission.europa.eu/system/files/2021-05/swd-annual-single-market-report-2021_en.pdf (last accessed 24.07.2023).

Figure 2: Employment across the industrial ecosystems in Romania and the EU27, in 2020



Source: ECCP (2023), own elaboration based on data from Eurostat.

To analyse specialisation in Romania, this paper examines the country's regionally relevant sectoral and ecosystem nodes.[12] Across all regions, there is a total of **77 regionally relevant sectoral nodes**, encompassing 29 sectors, while there is a total of **24 regionally relevant ecosystem nodes observed**, distributed across six industrial ecosystems.[13] Notably, the sector "Manufacture of wearing apparel" exhibits a node in every region, indicating its widespread presence and significance. This can also be reflected in the Textile ecosystem specialisation node present in six regions. Moreover, The Agri-Food ecosystem exhibits a specialisation node in six out of the eight Romanian regions. In these regions, connections can be drawn to sectors such as "Crop and animal production" and "Manufacture of food products", both of which display sectoral specialisation nodes in seven and three regions, respectively. This specialisation is further evident in Romania's overall strength in this particular industrial ecosystem, as depicted in Figure 2. In the capital region of Bucharest-Ilfov, the identified nodes suggest specialisation in the services sector, specifically in areas such as telecommunications, computer programming and wholesale trade. For this region two ecosystems can be identified, both of which are exclusive to the capital region, namely Digital and Aerospace & Defence. These ecosystems align with the region's sectoral specialisations, highlighting the distinct economic strengths and focus areas of this specific region.

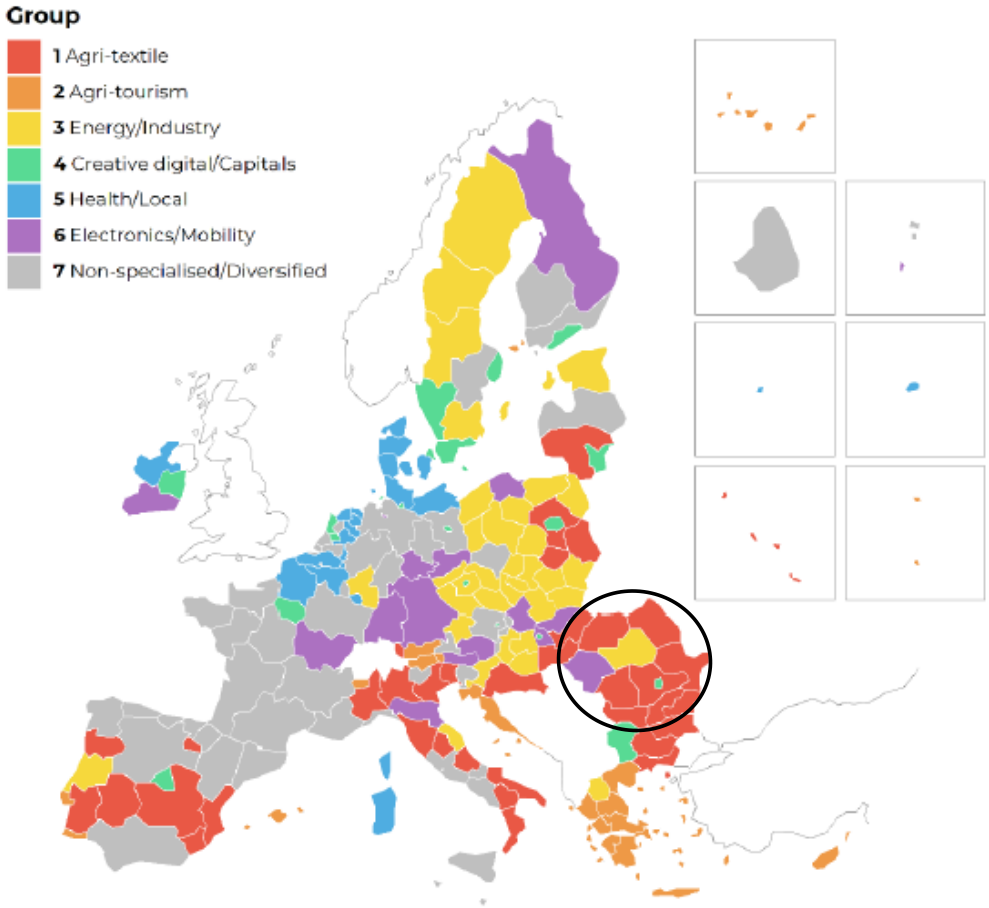
Drawing on the European Cluster Panorama 2021, visual representations of industrial ecosystem specialisations in various regions are provided. This can enhance one's understanding of cluster organisation concentration on the basis of specific typologies as well as gain an outlook of how these vary across regions and countries. As

[12] Specialisation can be measured through Location Quotients (LQ) that reflect the relative specialisation of an activity in a region compared to the EU average. If the LQ for a given activity-region combination is above 1.5, it is considered a specialisation node and if the activity accounts for at least 1 % of total employment in the region, it is considered regionally relevant.

[13] An overview of the regionally relevant sectoral and ecosystem nodes of Romania's regions can be found in the Annex, presented in Table 2 and Table 3, respectively.

depicted in Figure 3, the regions of Romania are categorized into four specialisation groups, aligning with the findings on sector and ecosystem specialisations. In Romania, six out of eight regions, including the North-East, fall under the Agri-Textile category, signifying their significant specialisation in the Agri-food and Textile ecosystems. Six out of eight regions in Romania, including the region of North-East are classified as **Agri-Textile**, indicating their high specialisation in the Agri-food and Textile ecosystems. Furthermore, the region of West classifies **as Electronics/Mobility**, which is line with its ecosystem specialisation nodes in Electronics and Mobility-Transport-Automotive , while the Region of Centre is classified as **Energy/Industry**. On the other hand, the capital region is classified as **Creative digital/Capitals**, highlighting its distinctive strength in the Digital ecosystem.

Figure 3: Regional typology based on industrial ecosystem specialisation



Source: European Cluster Panorama (2021).

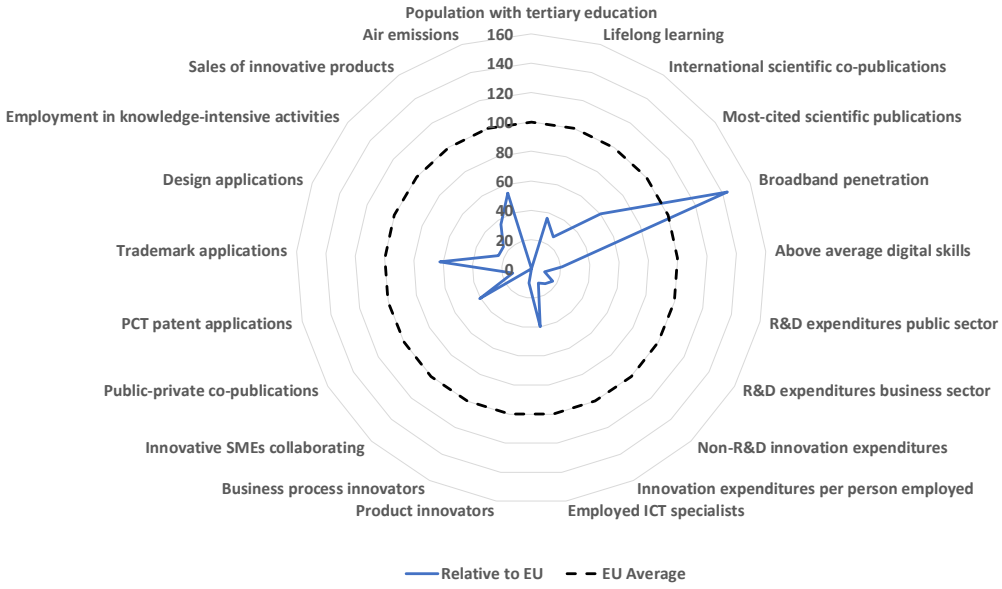
The analysis suggests that the **sectoral and ecosystem composition as well as specialisation in Romania's economy present a diverse range of prospects in various sectors** that can be leveraged to bolster regional growth through the support of economic and cluster structures. Said growth can be fostered through cross-border collaboration, in which clusters assume a pivotal role. The analysis further reveals that Romania encompasses a blend of traditional Agrifood and Textile ecosystems, alongside burgeoning strengths in Mobility, Energy-Renewables, Aerospace & Defense, and a predominant presence of the digital ecosystem, particularly concentrated within the capital region. These regionally relevant specialisation nodes are consistent with some of **Romania's Smart Specialisation areas** (See Chapter 4). These priority areas include Digital Economy and Space Technologies, Energy and mobility and Advanced manufacturing.

Innovation Performance of Romania

In the course of this paper, the economic performance of Romania will be investigated in the context of clusters and how these are organised. As a fundamental pillar of the assessment of the innovation levels, one can look at the level of innovativeness in Romania by employing information from the **European Innovation Scoreboard (EIS)**. The EIS is conducted annually to evaluate the research and innovation achievements of EU Member States and selected third countries, assisting them in recognizing areas of strength and weakness to improve their innovation performance. Member States are classified into four performance categories – Innovation Leaders, Strong Innovators, Moderate Innovators, and Emerging Innovators – based on their performance relative to the EU average.

Based on the most recent data from the EIS, Romania is classified as an **"Emerging Innovator"**[14] with a summary innovation index score of 33.1 relative to the EU average. This classification suggests that Romania's level of innovativeness falls below the EU average. Over the past few years, Romania's innovation performance has displayed a modest improvement, albeit at a slower rate compared to the EU27 average. Consequently, the gap in innovation performance between Romania and the EU average has widened. As shown in Figure 4, the lower innovation performance is evident when examining various indicators. Specifically, both R&D expenditures and non-R&D expenditures have underperformed relative to the EU average, with the latter experiencing a significant decrease in performance levels since 2016. While R&D expenditures in the public sector have decreased by -6.5 percentage points, R&D expenditure in the business sector has shown a positive trend, with a notable increase of 10 percentage points. Another striking finding from the EIS is the challenging environment for SMEs to engage in knowledge exchange, as illustrated by the indicator of innovative SMEs collaborating with others, which scores zero relative to the EU average.

Figure 4: Innovation performance of Romania in the 2023 European Innovation Scoreboard



Source: European Commission (2023): European Innovation Scoreboard 2023.

Nevertheless, there are positive indicators that suggest **room for improvement**, as highlighted by the EIS. There has been growth in various indicators, including public-private co-publications, international scientific co-

[14] The classification "Emerging innovator" implies that the region is found between 0% and 70% of the EU average.

publications, and most cited publications. This implies a growing presence in global research and innovation networks. Additionally, performance in trademark and design applications has steadily increased over time, reflecting a maturing entrepreneurial landscape.

In the dimensions of digitalisation and the use of information technology, Romania is making progress. Broadband penetration, in particular, exceeds the EU average with a score of 143.3. Indicators related to enterprises providing ICT training and employed ICT specialists have also displayed improvements over the past seven years. These promising developments indicate a commitment to harnessing the potential of digital technologies and enhancing the nation's innovative capacity.

Regional competitiveness level of Romania

This section examines the regional competitiveness of Romania based on the **Regional Competitiveness Index (RCI)**. The RCI evaluates competitiveness across EU regions in three dimensions: the Basic Sub-Index, the Efficiency Sub-Index, and the Innovation Sub-Index. The findings aim to provide insights into Romania's performance in these areas and identify opportunities for improvement.

Romania's overall average score in the RCI stands at 56.4, which places it below the EU average. However, it's important to note that there are considerable variations in performance among Romanian regions. The capital region of Bucharest-Ilfov stands out with a commendable score of 93.7, just slightly below the EU average, thus qualifying it as a more developed region. Conversely, other Romanian regions are designated as less developed regions, falling below the national average, with scores ranging from 46.1 to 57.8, with the North-East region scoring 47.0. Notably, the regions of North-east and South-East are regarded as the least developed regions in the EU27 Member States based on the RCI.

When examining the sub-indexes of the different dimensions of the RCI, variations on the country's average can be observed. The efficiency sub-index emerges as the highest-scoring dimension, largely propelled by the remarkable performance of the capital region. With a score of 102.3, this region slightly surpasses the EU average. This achievement can be attributed to the region's strong performance in higher education and lifelong learning, the labour market, as well as market size.

On the other hand, the country average for the innovation sub-index stands at 33.1, below the EU average. Once again, the discrepancy between the capital region of Bucharest-Ilfov and the more rural regions is evident, with the former displaying remarkable performance in the innovation pillar, outperforming the EU average. In contrast, other regions in Romania face challenges in matching the national average in terms of innovation.

The North-East region consistently underperforms the country average across all sub-indexes, shedding light on the challenges this region faces concerning regional competitiveness. In particular, in the pillars of market size, technological readiness, and innovation, this region falls within the category of the lowest-performing regions in the country. These findings underscore the need for targeted efforts to bolster competitiveness in these less-developed regions and promote overall economic growth and innovation throughout Romania.

02

Clusters in Romania & their importance for regional economic

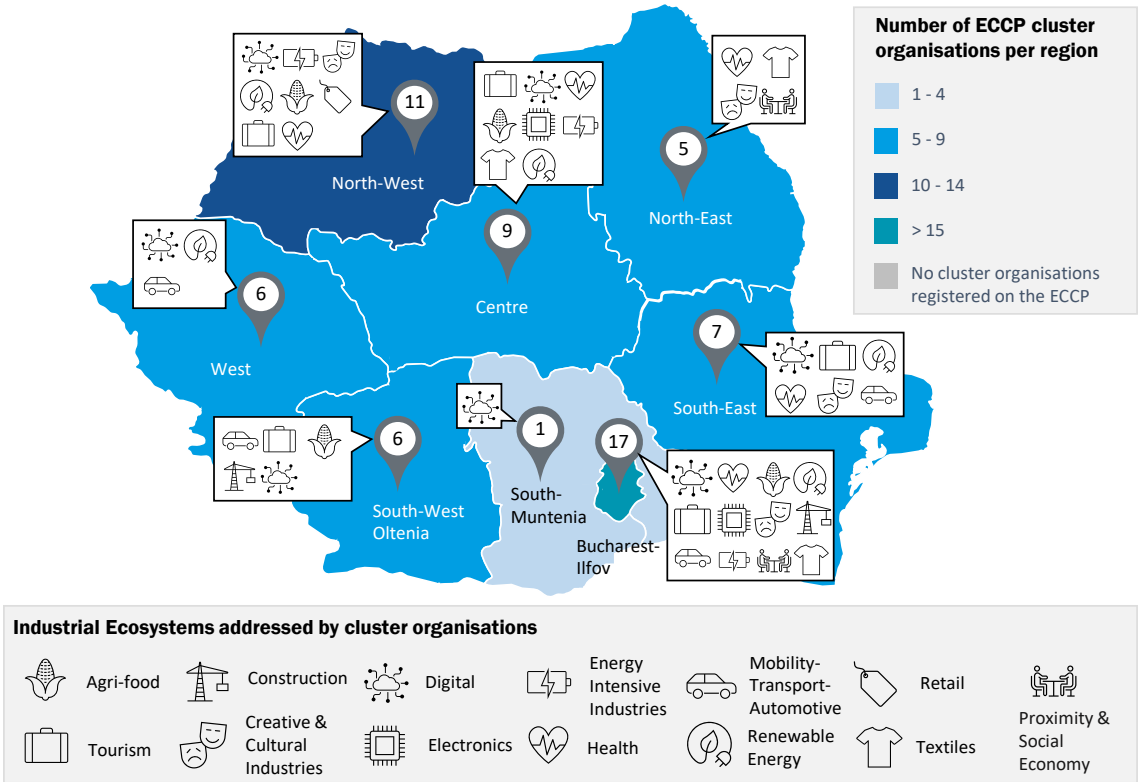
2. Clusters in Romania and their importance for regional economic development

The involvement of clusters in regional economic governance, policy design and implementation at the regional level is of central importance for regional economic development. This chapter will provide an overview of the cluster landscape in Romania and the policy framework under which cluster organisations are operating in the region.

Clusters in Romania

The European Cluster Collaboration Platform serves as a one-stop-shop for cluster organisations at the European level. Therefore, the number of registered cluster organisations and other innovation actors in Romania on the ECCP gives the first impression of the intensity of organisation in regional industrial networks. Out of the total 1,148 registered EU-27 cluster organisations on the ECCP, there are **62 cluster organisations from Romania** as a whole and 5 from the North-Eastern region around Iași. Figure 5 displays the geographical distribution of the cluster organisations across the country. The capital region of Bucharest-Ilfov is hosting the highest number of cluster organisations, followed by the North-West and the Centre. The rest is rather equally distributed across the remaining regions.

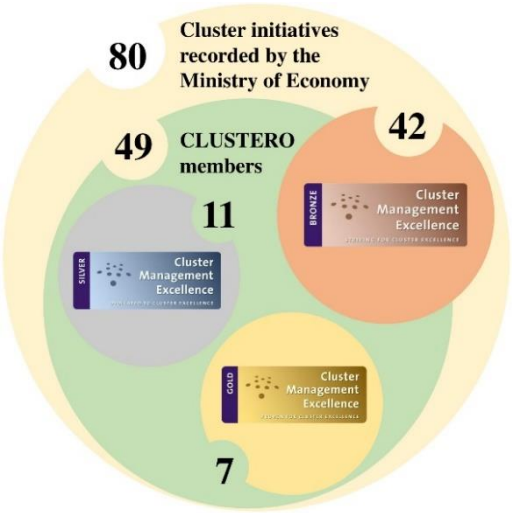
Figure 5: Overview of ECCP-registered cluster organisations as well as their regional and sectoral distribution across Romania



Source: ECCP (2023). Own elaboration based on https://reporting.clustercollaboration.eu/all (last access 24.10.2023). A full overview of all ECCP-registered cluster organisations is provided in Table 4 in the Annex.

The cluster organisations in Romania can be related to **13 out of 14 different EU industrial ecosystems**[15] (see also Table 4 in the Annex). The strongest industrial ecosystem is Digital, represented by 17 cluster organisations, followed by Tourism with 9 as well as Renewable Energy and Health with 8 cluster organisations each. In the mid-field with 6-7 cluster organisations each, there are Agri-food, Creative 6 Cultural Industries, Energy Intensive Industries, and Mobility-Transport-Automotive. Finally, Electronics is represented by 4, Textile and Construction by 3, Proximity & Social Economy by 2, and Retail by one cluster organisation(s).

Figure 6: Numbers of Romanian cluster initiatives and cluster excellence labels



Source: CLUSTERO

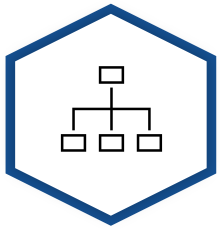
Out of the 80 cluster initiatives recorded by the Ministry of Economy at the national level, CLUSTERO, the national cluster association of Romania, presents 49 cluster organisations as its members[16] as well as six regional and six thematic cluster consortia (or meta-clusters).[17] **The regional meta-clusters** are grouped as the North-Eastern, Lower Danube (South-East), Bucharest-Ilfov, Wallachia (South), Northern Transylvania (North-West), and Transylvania (Centre) cluster consortia. The **thematic meta-clusters** encompass the Noatex (Textiles and fashion), Wood and Furniture, Agrofood, Medro (Healthcare), IT, and Inter-Bio (ecological agrifood) cluster consortia. At the **regional level**, the Regional Development Agency North-East lists 17 clusters for the North-East Region.[18]

Romanian clusters rank high in **excellence of cluster management** with 7 gold, 11 silver and 42 bronze labelled clusters according to the ESCA Methodology.

As shown in Figure 7 below, the majority of ECCP-registered cluster organisations in Romania are mostly **small** in size as 47 out of the 62 Romanian cluster organisations have between 1 and 5 employees. This share of cluster organisations with between 1 and 5 employees is above the EU average. Regarding the **member structure** of Romanian cluster organisations with profiles on the ECCP, a similar picture emerges since the vast majority of cluster organisations are rather small. Here, 43 out of the 62 ECCP-registered Romanian cluster organisations (70%) have up to 50 cluster members, which is double the EU average (35%). In addition to that, cluster organisation in Romania seek collaboration primarily in the areas of partnering for projects (30 cluster organisations), internationalisation (29), and digitalisation (24).

[15] see European industrial strategy. Available under: https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/european-industrial-strategy_en (last access 24.10.2023).
[16] See http://clustero.eu/members/ (last access 24.10.2023).
[17] See http://clustero.eu/cluster-consortia/ (last access 24.10.2023).
[18] See the presentation held at an event to promote clusters in February 2022: https://www.adrnordest.ro/wp-content/uploads/2022/02/1.-Prezentare-clustere_Ovidiu-Savu_-3.02.2022.pdf (last access 25.10.2023).

Figure 7: Overview of organisation, structure, and thematic orientation of ECCP-registered cluster organisations in Romania



Organisation

- Majority of cluster organisations (47) rather small with 1-5 employees (76%; ØEU: 55%)
- 12 middle-sized cluster organisations with 6-10 employees (19%; ØEU: 16%)
- One cluster organisations in the 11-20 employees bracket (2%; ØEU: 6%)

Member structure

- Vast majority of cluster organisations (43) rather small with up to 50 members (70%; ØEU: 35%)
- 17 cluster organisations with 51-100 members (27%; ØEU: 26%).
- Two larger cluster organisations with 101-150 members (3%; ØEU: 13%).

Thematic orientation

- Cluster organisations in Romania can be related to 13 different EU industrial ecosystems
- Collaboration particularly sought in partnering for projects (30), internationalisation (29), and digitalisation (24)

Source: ECCP (2023)

The importance of clusters for regional economic competitiveness

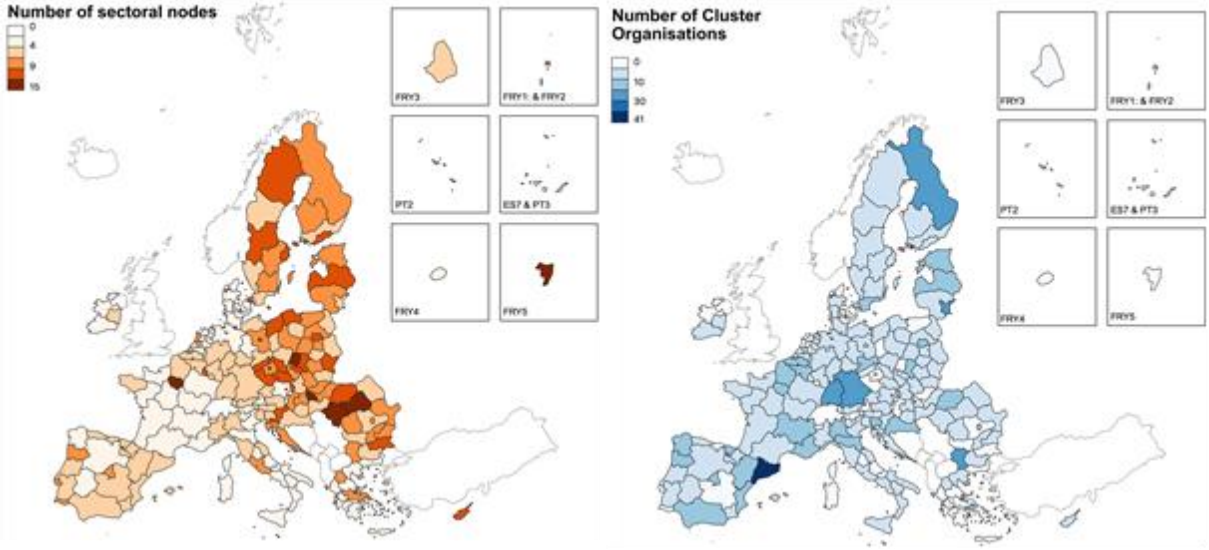
The European Cluster Panorama Report (2021) examines the relationship between clusters and regional competitiveness. The stand-out findings of this report showcase how the presence of cluster organisations is positively correlated with economic indicators such as GDP per capita, labour productivity, as well as business R&D expenditure. While public R&D expenditure is merely positively correlated with industry-relevant nodes[19], it does indicate how regions could earn greater public support, when certain industries have a local significance. Particularly indicators of R&D expenditures are key in measuring economic performance concerning innovation.

Figure 8 below shows how industries in Romania form for a clearly above-average number of region-relevant specialisation nodes[20] (in particular for the Centre, West, and North-West regions), but a rather average number of cluster organisations, in comparison to other European regions.

[19] From the European Cluster Panorama Report (2021): Industry-relevant specialisation nodes: When the region is specialised in the sector (or industrial ecosystem) and regional employment in the sector is relevant in the EU context (industry employment share > 1%).

[20] From the European Cluster Panorama Report (2021): Region-relevant specialisation nodes: When the region is specialised in the sector and the employment share of that sector is relevant for the region (regional employment share > 1%).

Figure 8: Distribution of region-relevant sector specialisation nodes and cluster organisations in EU-27



Source: ECCP (2023), own contribution based on Eurostat and ECCP data.

Next to clusters having an enabling and facilitating effect on economic performance and growth, other studies have provided complementary information on the impact clusters can have. For example, Ketels & Protsiv (2021)[21] provide a thorough account of the positive relationship between cluster presence and industry-level wages across European regions. Key takeaways emphasise how particular clusters relate to sector-specific industries, as opposed to the mere "concentration of economic activity in a specific field" (p. 217). On top of that, the data showcases how the influence and strength of clusters have an independent relationship with economic outcomes. Their findings suggest how the degree and nature of competitiveness within clusters must be understood on a location-to-location basis. This further reflects on what they refer to as the "business environment quality" that can have striking knock-on effects on wage levels. Most importantly, Ketels and Protsiv delineate how "cluster strength" has a unique impact on "wages and prosperity".

A visual depiction that highlights this trend can be found in Figure 13 in the Annex. For Romania, the statistical data and analysis of Ketels and Protsiv show an average cluster portfolio strength (share of payroll accounted for by strong clusters) and an average cluster mix (bias towards cluster categories with higher wages), whereby the Southern regions tend to show stronger results than the Northern ones.

Cluster policy in Romania

The remainder of this chapter will, first, look at the policy context for cluster development at the national as well as the regional level and, second, evaluate the success of cluster policy in strengthening regional economic development.[22]

The **Romanian cluster policy** was created in 2009 as **part of the national industrial policy**. There is no dedicated and explicit cluster policy, but clusters as a concept are an integral part of the wider national industrial policy.

[21] 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 access 06.03.2023).

[22] This section draws on the ECCP country factsheet Romania (2022). Available at: https://clustercollaboration.eu/in-focus/policy-acceleration/country-factsheets-on-cluster-policies-and-programmes (last access 25.10.2023).

However, the current support targeted to cluster development under the industrial policy is rather unclear as it does not set any specific objectives or initiatives in this sense. Although the policy has never been formally interrupted or terminated, actual support (either financial or through technical assistance) has been inconsistent over the years. Where financial support has been provided, it has been through EU funds channelled through various national programmes, but discontinuously, i.e. in some years and not in others. The policy's main role has been to disseminate the cluster concept at the national and regional level and help clusters get involved in various European projects.[23]

Regional economic development programmes are run by the 8 Regional Development Agencies (RDA). Importantly, they are in charge of the regional **Smart Specialisation Strategy** RIS3 and coordinate the process with companies, universities, R&D centres, public administration and civil society.[24] The RDAs are actively promoting the establishment and operation of clusters in the framework of the RIS3.[25] Furthermore, through the agencies clusters were able to take part in the development of the **regional development plan**.[26] In the case of the North-East region, clusters will be able to benefit more from the plan's funding instruments and are recognised as a key actors for regional development. The **medical imaging cluster IMAGO-MOL** in the North-East region can be highlighted as an example of how **clusters can support the digital transition in specific sectors**, in this case, the health sector.[27]

Regarding **monitoring and evaluation**, the Romanian Cluster Association ClusteRo published a report on the situation of Romanian clusters in 2020.[28] One of the main weaknesses of the cluster landscape and implicitly of the cluster policy has been the lack of coherent support. Even though the Ministry of Economy is the main actor responsible for cluster policy as an integral part of the industrial policy, structural funds have been made available only through ERDF interventions of the 'Operational Programme for Competitiveness 2014 - 2020'. Also, the calls dedicated to clusters did not meet their actual needs. The results of the report show overall sub-optimal support which can pose a risk to the cluster landscape in the medium and long term. Despite the lack of support, cluster organisations have continued to develop throughout the years, showing relevant increases in all analysed indicators (turnover, no. of enterprises, no. of employees, RDI expenditures and exports).

In **conclusion**, Romania shows a developing cluster landscape that is present across the whole country. Clusters receive support mostly through EU-funded programmes and within the framework of Smart Specialisation Strategies and could benefit from more dedicated cluster support policies and programmes. The EU Cluster Panorama Report (2021) in connection with Ketels & Protsiv (2021) further makes the case for cluster organisations as a proven method to stimulate long-term growth and innovative activity on a regional level.

[23] For a list of the European projects and consortia up to March 2018, see https://clustercollaboration.eu/sites/default/files/news_attachment/4_oana_rujan_0.pdf (last access 25.10.2023).
[24] See https://www.adrnordest.ro/ce-oferim/specializare-inteligenta/ (last access 25.10.2023).
[25] See, for example, an event from February 2022: https://www.adrnordest.ro/eveniment-constituirea-si-functionarea-clusterelor-03-februarie-2022/ (last access 25.10.2023).
[26] See https://www.adrnordest.ro/ce-oferim/planificare-si-programare-regionala/ (last access 25.10.2023).
[27] For a case study into the story of the IMAGO-MOL cluster and the support by the Regional Development Agency, including interviews with the main actors, see https://clustercollaboration.eu/content/imago-mol-cluster-nord-est-romania (last access 25.10.2023). See also: https://www.euronews.com/next/2021/03/12/smart-solution-how-business-clusters-drive-innovation (last access 25.10.2023).
[28] ClusteRo (2020): Situația clusterelor din România. Available at: http://clustero.eu/wp-content/uploads/2020/04/situatia-clusterelor-din-romania-aprilie-2020.pdf (last access 25.10.2023).

03

Cross-border cooperation & the involvement of Romanian clusters in European networks & support initiatives

3. Cross-border cooperation and the involvement of Romanian clusters in European networks and support initiatives

Findings from the Evaluation Study of and Potential Follow-Up to Cluster Initiatives under COSME, H2020 and FPI of the European Commission (2021) show that cross-border cooperation is perceived by innovation stakeholders as a highly relevant activity for clusters to support sustainable growth and resilience-building of their SME members.[29] To gain an overview of the existing cross-border cooperation of Romanian clusters, a closer look will be taken in this chapter on their involvement in European support initiatives, with a focus on the **2014-2020** funding period as well as the Joint Cluster Initiatives (Euroclusters) for Europe's recovery of the **2021-2027 funding period**[30] (see Figure 6).

Involvement of Romanian cluster organisations in the European Strategic Cluster Partnerships (ESCP)

In the 2014-2020 funding period, one relevant EU support initiative to increase cross-border cooperation of EU cluster organisations and other intermediary organisations was the European Strategic Cluster Partnership (ESCP) initiative funded under the EU Programme for the Competitiveness of Enterprises and Small and Medium-sized Enterprises (COSME). The ESCP initiative established partnerships of European clusters and intermediary organisations from the different EU Member States or associated countries. Those partnerships focused on three different thematic areas which were internationalisation (ESCP for Going International), cluster excellence (ESCP for Excellence) and smart specialisation (ESCP for Smart Specialisation).[31]

Figure 9 - Overview of the participation of Romanian cluster organisations in the ESCP and Innosup initiatives

Source: ECCP (2023)

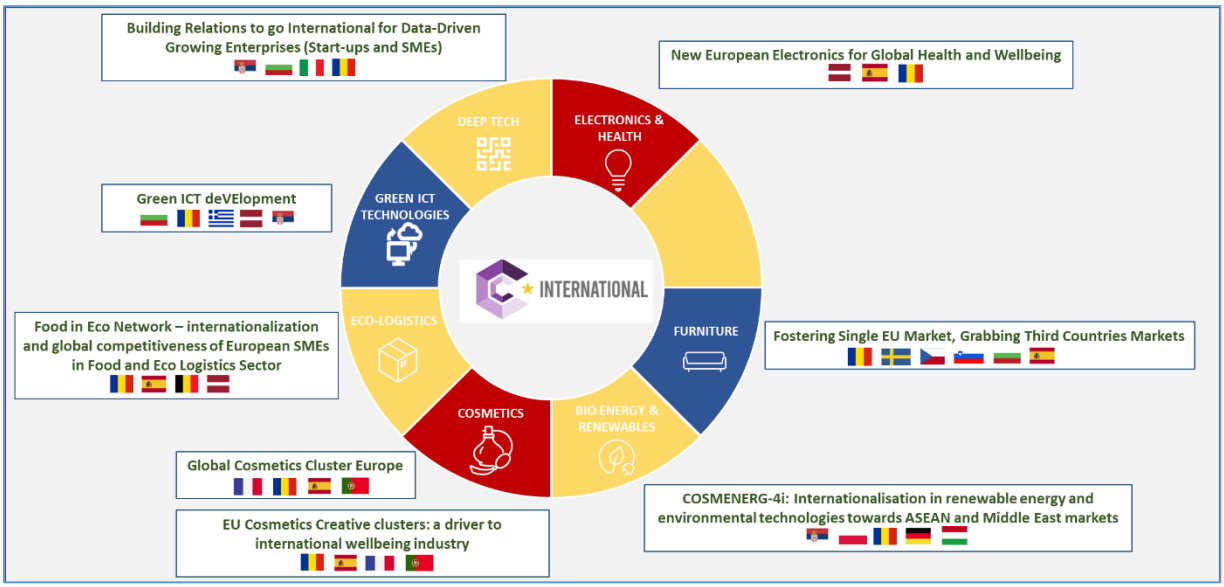
[29] Prognos et al. (2021): Evaluation Study of & Potential Follow-Up to Cluster Initiatives under COSME, H2020 & FPI (DG GROW, Unit D2 - Industrial Forum, alliances, clusters). Study on behalf of the European Commission. Available under: https://op.europa.eu/en/publication-detail/-/publication/a2c3e9e1-3deb-11ec-89db-01aa75ed71a1/language-en/format-PDF/source-241039860 (last access on 10.01.2023).

[30] For more information on the Euroclusters see: https://eismea.ec.europa.eu/funding-opportunities/calls-proposals/joint-cluster-initiatives-euroclusters-europes-recovery_en (last access on 10.01.2023).

[31] For more information on the European Cluster Partnerships see: https://clustercollaboration.eu/eu-cluster-partnerships (last access 13.01.2023).

Figure 8 gives an overview of the 14 clusters and the 17 projects in which they have or are participating. Some have participated in more than one ESCP project, which explains the discrepancy between the number of clusters and the number of projects. More specifically, 7 clusters have participated or are participating in 8 ESCPs for Going International (ESCP-4i) projects, 7 organisations participated in as many ESCPs for Excellence (ESCP-4x) projects, and two participated in 2 ESCP for Smart Specialisation (ESCP-S3) projects. As regards the ESCP-4i projects, their thematic focus (see Figure 9) was diverse, encompassing green energy, food & logistics, cosmetics, electronics, health and sustainable ICT developments. In contrast, the seven ESCP4x projects spanned the following sectors: textiles, transportation, automotive, land machine, and lighting. Finally, the ESCP-S3 projects were in the fields of textiles and agri-food.

Figure 10 - Overview of the participation of Romanian Clusters in the ESCP-4



Source: ECCP (2023)

Involvement of Romanian cluster organisations in the INNOSUP-1 initiative

Apart from the ESCPs, the INNOSUP-1 initiative "Cluster facilitated projects for new value chains" funded under the EU programme Horizon 2020 was a relevant EU support initiative that addressed the challenge to develop new cross-sectoral industrial value chains in Europe through European cooperation of cluster organisations and other relevant intermediaries.[32] The INNOSUP-1 initiative aimed at boosting the cross-sectoral and cross-border cooperation in consortia of European cluster organisations and other relevant innovation intermediaries.[33] An innovative approach of the INNOSUP-1 initiative was that it consisted of the so-called cascade funding approach, meaning that cluster organisations served as intermediaries to support their SME members through different support instruments like direct financial support or capacity-building training. Findings from the Evaluation Study of and Potential Follow-Up to Cluster Initiatives under COSME, H2020 and FPI of the European Commission (2021) confirm that the transnational component of the cluster initiatives was perceived by beneficiaries as an EU added value with high mutual learning effects for cluster organisations and the supported SMEs.

[32] For more information on the ESCPs and the INNOSUP-1 initiative see: https://clustercollaboration.eu/eu-cluster-partnerships (last access 04.02.2022).

[33] European Commission (2020): Study on the effectiveness of public innovation support for SMEs in Europe . Annex E, INNOSUP evaluations. Available under: https://op.europa.eu/en/publication-detail/-/publication/888d351a-9d97-11eb-b85c-01aa75ed71a1/language-en (last access 10.01.2023).

In total, three Romanian cluster organisations participated in five Innosup-1 projects. More specifically:

- The North-west regional development agency participated in:
    - The "*Circularize Value Chains across European Regional Innovation Strategies*" project, which sought to develop new circular (cradle to cradle) value chains, disrupting traditional linear (cradle to waste) business models by means of cross-fertilization with Design Thinking experts and Circular Disruptors.
    - The MIND4MACHINES project, where, **in partnership with the cluster organisation IPA SA**, it sought to provide the cross-sectoral and cross-border support needed by manufacturing SMEs to test and adopt the latest digital technologies for transformation towards smarter, greener, and more resource-efficient manufacturing, aligned with the latest EU policies.
    - The Neptune project, which aimed to develop new cross-sectoral and cross-border industrial value-chains, in particular for SMEs, to foster the development of Blue Growth industries.
- The Cluj IT cluster participated in:
    - The UFO project, which supported 65 European SMEs in the development of innovative products and services by integrating new technology solutions in Small Flying Objects (SFOs).
    - The Galatea project, which is a follow up to the Neptune project and seeks to develop new value chains supporting innovative SMEs to foster the development of Blue Growth key industries by favouring the integration of technologies and know-how from aerospace and ICT sectors to the following domains: ports, ships, shipyards and maritime surveillance.

Involvement of Romanian clusters in the Eurocluster initiative

With regards to 2021-2027, the European Commission has launched the implementation of the EU Industrial Strategy. In this context, so-called Euroclusters are funded under the Single Market Programme. The Eurocluster initiative aims at supporting cross-sectoral, cross-regional European industry clusters cooperating with other economic stakeholders such as companies or business organisations. **One cluster organisation from Romania, namely the Cluj ICT cluster, participated in the DREAM project,** which is a partnership of 4 European clusters through which a cascade funding mechanism for innovation vouchers will be put in place so as to support the 35 SMEs in their transition to the digital economy.

04

Smart Specialisation in Romania

4. Smart Specialisation in Romania

Cluster organisations (can) play an important role in the design and implementation of Smart Specialisation Strategies (S3) since in both concepts, the promotion of economic growth and competitiveness through regional proximity are key elements. Box 1 provides some good practices of cluster involvement in S3 from other European regions and especially in the Entrepreneurial Discovery Process[34] (EDP). Against this background, this chapter focuses on Smart Specialisation in Romania.

The S3 of Romania

A key starting point for the analysis is the National Strategy for Research, Innovation and Smart Specialisation 2022-2027.[35] This innovation strategy was developed by the Romanian Ministry of Research, Innovation and Digitisation and was published in 2022. Cluster organisations play a key role in the National Strategy for Research, Innovation and Smart Specialisation 2022-2027. For instance, cluster organisations are mentioned as key support tools for SMEs in their integration into global value chains. Moreover, supporting cluster organisations and similar networks to increase the capacity for collaboration and internationalisation thereby supporting regional innovation ecosystems is regarded as a priority in the Romanian national innovation strategy.

Figure 11: Priority areas of the national Romanian S3

Source: ECCP (2023), own elaboration based on the National Strategy for Research, Innovation and Smart Specialisation 2022-2027 of Romania

The Romanian National Strategy for Research, Innovation and Smart Specialisation 2022-2027 identifies seven priority areas which are summarised in Figure 11. These priority areas address a wide range of topics ranging from “Bioeconomy” over “Advanced manufacturing” to “Digital Economy & Space Technologies”.

[34] The entrepreneurial discovery is an interactive and inclusive process in which the relevant actors identify new and potential activities and inform the government. The government assesses this information and empowers those actors most capable of realising the potential. See https://s3platform.jrc.ec.europa.eu/edp (last access 18.07.2023)

[35] see here https://www.mcid.gov.ro/wp-content/uploads/2022/12/strategia-na-ional-de-cercetare-inovare-i-specializare-inteligent-2022-2027.pdf (last access 19.10.2023)

Box 1: Good practices of cluster involvement in S3

Good practices of cluster involvement in S3

Berlin/Brandenburg – Cluster 'Master Plans':
In Berlin/Brandenburg cluster organisations developed 'Master Plans' for priority areas in which specific objectives and actions for implementation were laid out. Thereby, an important element of these 'Master Plans' is the highly participatory and consultative process in which the various stakeholders are involved and can postulate their opinions on the priorities.

Lombardy - Technology clusters and biannual work programmes:
While priority areas are defined in a rather generic manner in the strategy, Lombardy has foreseen biannual Work Programmes that structure priorities into macro-themes and macro-themes into development themes. The establishment of these biannual work programmes is the result of a continuous Entrepreneurial Discovery Process (EDP) to identify more specific domains of the priorities. Thereby especially technology cluster organisations played a crucial role in the S3 process and were involved in identifying areas for further development and the further refinement of the priority areas in biannual Work Programmes.

Slovenia - Strategic Research and Innovation Partnerships and the role of clusters (SRIPs):
In Slovenia, lasting partnerships between different types of stakeholders were created to implement the S3 through action plans. Cluster organisations can get involved in this process and these Strategic Research and Innovation Partnerships (SRIPs). There, priority areas are implemented through one SRIP per priority area and constitute long-term partnerships between different actors such as the business communities, research organisations, and the state.

Bibliography

ClusteRo (2020): Situația clusterelor din România. Available at: http://clustero.eu/wp-content/uploads/2020/04/situatia-clusterelor-din-romania-aprilie-2020.pdf (last access 25.10.2023).

ECCP (2021): European Cluster Panorama Report 2021. Available under: https://clustercollaboration.eu/sites/default/files/2021-12/European_Cluster_Panorama_Report_0.pdf (last accessed 25.10.2023)

ECCP (2022): Country factsheet Romania. Available at: https://clustercollaboration.eu/in-focus/policy-acceleration/country-factsheets-on-cluster-policies-and-programmes (last access 25.10.2023).

ECCP (2023): IMAGO-MOL Cluster, Nord-Est, Romania – Digital Transition and Resilience in Romania's Health Sector. Available at: https://clustercollaboration.eu/content/imago-mol-cluster-nord-est-romania (last access 25.10.2023).

European Commission (2023): European Innovation Scoreboard 2023 Country profile Romania. Available under: https://ec.europa.eu/assets/rtd/eis/2023/ec_rtd_eis-country-profile-ro.pdf (last accessed 22.10.2023).

European Commission (2020): Study on the effectiveness of public innovation support for SMEs in Europe . Annex E, INNOSUP evaluations. Available under: https://op.europa.eu/en/publication-detail/-/publication/888d351a-9d97-11eb-b85c-01aa75ed71a1/language-en (last access 25.10.2023).

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 25.10.2023)

Prognos /CSIL (2021): Study on prioritisation in Smart Specialisation Strategies in the EU. Study on behalf of the European Commission. Available under: https://ec.europa.eu/regional_policy/en/information/publications/studies/2021/study-on-prioritisation-in-smart-specialisation-strategies-in-the-eu (last access on 25.10.2023)

Prognos /CSIL (2022): Analysis of key parameters of smart specialisation strategies (S3). Study on behalf of the European Commission. Available under: https://op.europa.eu/en/publication-detail/-/publication/3026007b-8be2-11ed-999b-01aa75ed71a1/language-en/format-PDF/source-279324673 (last access on 25.10.2023)

Prognos et al. (2021): Evaluation Study of & Potential Follow-Up to Cluster Initiatives under COSME, H2020 & FPI (DG GROW, Unit D2 - Industrial Forum, alliances, clusters). Study on behalf of the European Commission. Available under: https://op.europa.eu/en/publication-detail/-/publication/a2c3e9e1-3deb-11ec-89db-01aa75ed71a1/language-en/format-PDF/source-241039860 (last access on 25.10.2023).

Annex

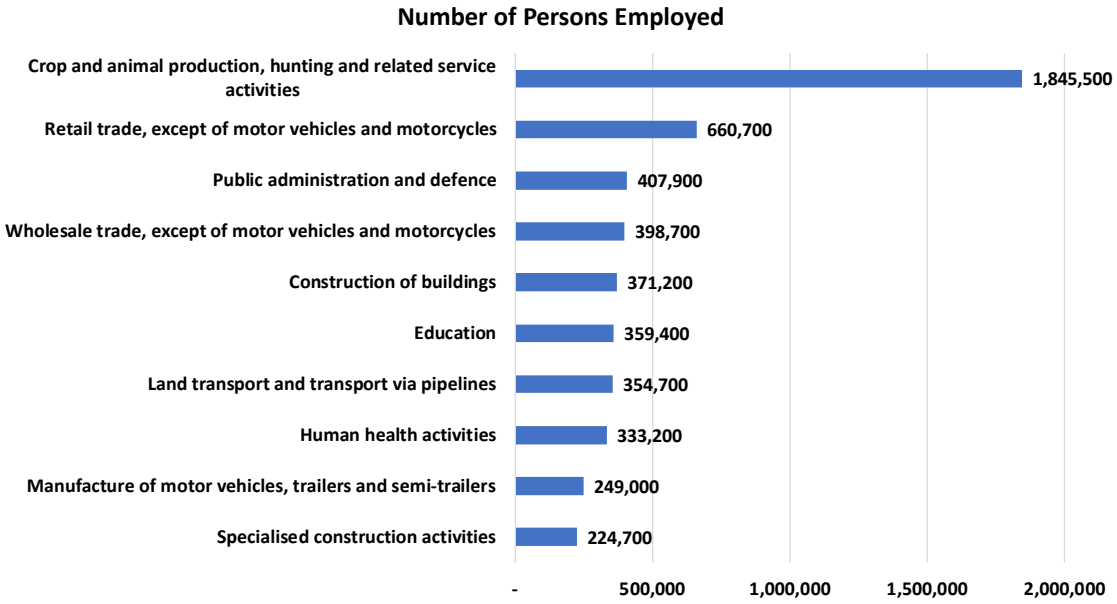
Regional Innovation Scoreboard

Table 1: Key socio-economic and sectoral indicators of Romania, the EU as well as the regions North-East (RO21) and Bucharest-Ilfov (RO32)

	RO	EU	RO21	RO32
GDP per capita (PPS)	24,000	32,400	15,800	53,900
GDP per capita growth (PPS)	6.7	2.5	8.0	5.9
Population density	81	106	86	1,290
Urbanisation	62.1	75.8	52.3	95.9
Population size (000s)	19,200	447,210	3,160	2,330
Share of employment in:				
Agriculture & Mining (A-B)	18.5	4.4	38.1	0.9
Manufacturing (C)	18.9	16.4	11.4	18.9
Utilities & Construction (D-F)	11.4	8.3	13.0	11.4
Services (G-N)	46.2	63.7	34.7	46.2
Public administration (O-U)	5.1	7.2	2.8	5.1
Average number of employed persons per enterprise	8.0	5.1	4.1	5.4

Source: European Commission (2023): Regional Innovation Scoreboard 2023.

Figure 12: Top 10 sectors in terms of persons employed, in 2020



Source: ECCP (2023), own elaboration based on Eurostat.

Table 2: Number of regionally relevant sectoral nodes and Top 5 nodes by region (NACE) in Romania (2020)

Region	# of nodes	Node 1	Node 2	Node 3	Node 4	Node 5
RO11: North-West (Romania)	11	C15 - Manuf. of leather products	C31 - Manuf. of furniture	A01 - Crop & animal production	C14 - Manuf. of wearing apparel	F41 - Construction of buildings
RO12: Centre (Romania)	15	C15 - Manuf. of leather products	C29 - Manuf. of motor vehicles & trailers	C14 - Manuf. of wearing apparel	C16 - Manuf. of wood products	C13 – Manuf. of textiles
RO21: North-East (Romania)	5	A01 - Crop & animal production	A02 - Forestry & logging	C14 - Manuf. of wearing apparel	F41 - Construction of buildings	F42 – Civil engineering
RO22: South-East (Romania)	8	C30 - Manuf. of other transport equipment	C14 - Manuf. of wearing apparel	A01 - Crop & animal production	C24 – Manuf. of basic metals	F42 – Civil engineering
RO31: South-Muntenia	7	A01 - Crop & animal production	C14 - Manuf. of wearing apparel	C29 - Manuf. of motor vehicles & trailers	F41 - Construction of buildings	H49 – Land transport & transport via pipelines
RO32: Bucharest-Ilfov	9	N80 - Security, investigation activities	J61 - Telecommunications	F41 - Construction of buildings	J62 – Computer programming, consultancy & related activities	E38 - Waste activities
RO41: South-West Oltenia	8	B05 - Mining of coal & lignite	A01 - Crop & animal production	D35 - Electricity, gas & steam	C14 - Manuf. of wearing apparel	C29 - Manuf. of motor vehicles & trailers
RO42: West (Romania)	14	C29 - Manuf. of motor vehicles & trailers	C15 - Manuf. of leather products	C26 - Manuf. of electronic & optical products	C13 – Manuf. of textiles	C14 - Manuf. of wearing apparel

Source: ECCP (2023), own elaboration based on data from Eurostat.

Table 3: Regionally relevant ecosystem nodes in Romania (2020)

Region	# of ecosystem nodes	Node 1	Node 2	Node 3	Node 4	Node 5
RO11: North-West (Romania)	3	Textile	Agri-Food	Energy-renewables	-	-
RO12: Centre (Romania)	4	Textile	Agri-Food	Mobility-Transport-Automotive	Energy-renewables	-
RO21: North-East (Romania)	2	Agri-Food	Textile	-	-	-
RO22: South-East (Romania)	3	Agri-Food	Textile	Aeroespace & Defense	-	-
RO31: South-Muntenia	2	Agri-Food	Textile			-
RO32: Bucharest-Ilfov	2	Digital	Aeroespace & Defense	-	-	-
RO41: South-West Oltenia	2	Agri-Food	Textile	-	-	-
RO42: West (Romania)	6	Textile	Electronics	Mobility-Transport-Automotive	Energy-renewables	Aeroespace & Defense

Source: ECCP (2023), own elaboration based on data from Eurostat.

List of cluster organisations in Romania

Table 4: Overview of cluster organisations in Romania and their addressed EU industrial ecosystems

N°	Cluster organisation	Industrial Ecosystem
1	**Oltenia Tourism Competitiveness Pole - Innovation and Tradition in Tourism TurOlt InoTT**	Tourism
2	**AGROFOOD REGIONAL INOVATIVE CLUSTER**	Agri-food
3	**AGROPRO Oltenia Cluster**	Agri-food
4	**AgroTransilvania Cluster**	Agri-food
5	**Asociatia Cluster Pro-nZEB**	Construction
6	**Asociatia LifeTech City**	Health,Digital
7	**ASTRICO NORD-EST TEXTILE CLUSTER**	Textile

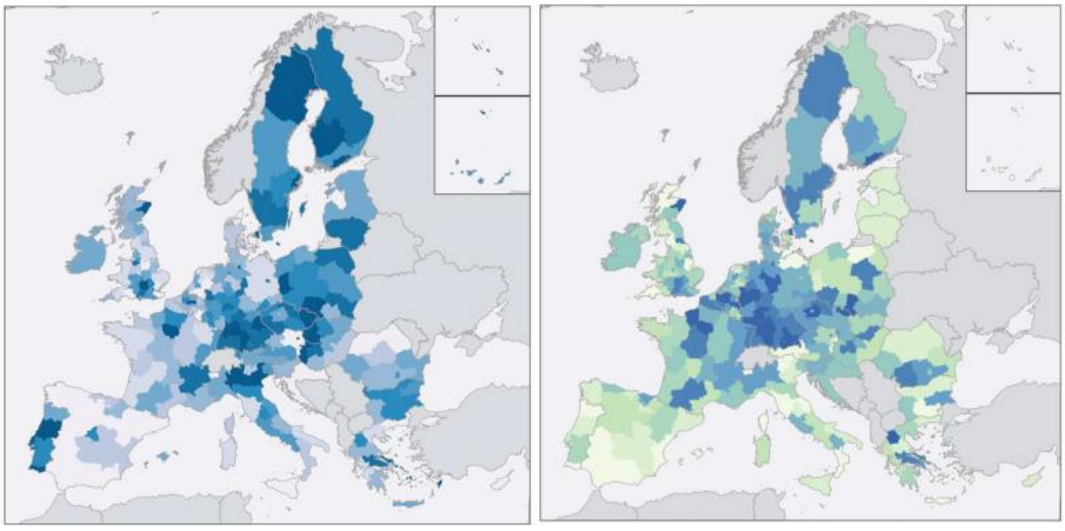
8	**AUTOMOTIVEST Cluster**	Mobility-Transport-Automotive
9	**Banat Software Cluster by ARIES-TM**	Digital
10	**Bio Danubius Regional Cluster**	Tourism
11	**BIODANUBIUS**	Agri-food,Tourism,Mobility-Transport-Automotive,Renewable Energy,Creative & Cultural Industries,Proximity & Social Economy
12	**bioROne**	Health
13	**CANEPARO**	Renewable Energy
14	**Cloudimpuls**	Digital
15	**Cluster for Distributed Research Infrastructure for Future Materials, Applications and Technology**	Electronics
16	**CONSTRUCT CLUSTER OLTENIA ASSOCIATION**	Construction
17	**Control & IT Cluster**	Digital
18	**Danube Engineering Hub**	Digital
19	**DANUBE FURNITURE CLUSTER**	Energy Intensive Industries
20	**DISCOVER TRANSYLVANIA'S REACHES CLUSTER**	Tourism
21	**Electronic Innovation Cluster (ELINCLUS)**	Electronics
22	**ETREC Cluster - Electro-Technical Regional Cluster**	Electronics
23	**Green Solutions Low Danube**	Renewable Energy
24	**Health Romania The Medical Cluster**	Health
25	**ICONIC Cluster**	Creative & Cultural Industries
26	**ICT Oltenia Cluster**	Digital
27	**ICT Regional Cluster**	Digital
28	**IND-AGRO-POL**	Agri-food
29	**Innovation and Technology Cluster**	Digital
30	**INNOVATIVE CLUSTER FOR HEALTH**	Health
31	**INOMAR Cluster**	Tourism
32	**IT&C Cluster "Lower Danube"**	Digital
33	**North-East Innovative Regional Cluster for Structural and Molecular Imaging (IMAGO-MOL)**	Health
34	**PRO WOOD Regional Wood Cluster**	Energy Intensive Industries
35	**ROHEALTH- The Health and Bioeconomy Cluster**	Health
36	**Romanian New Materials Cluster**	Energy Intensive Industries
37	**ROMANIAN RIVER TRANSPORT CLUSTER**	Mobility-Transport-Automotive
38	**Romanian Textile Concept**	Textile
39	**Smart Alliance Cluster**	Digital
40	**South-West Oltenia Automotive Competitiveness Pole**	Mobility-Transport-Automotive
41	**START INOVARE**	Digital
42	**Strategic Innovative Cluster for Mechatronics Smart Specialization Domain - «MECHATREC»**	Electronics
43	**Technology Enabled Construction Cluster - TEC**	Construction
44	**The Danube Delta Cluster (Clusterul Delta Dunarii)**	Tourism
45	**The Romanian Sustainable Energy Cluster - ROSENC**	Renewable Energy
46	**Transilvania Creative Industries Cluster**	Creative & Cultural Industries

47	**Transilvania LifeStyle**	Agri-food,Creative & Cultural Industries,Retail
48	**Transylvania Energy Cluster**	Energy Intensive Industries
49	**Transylvania Lands Cluster**	Tourism
50	**Transylvania Regional Balneological Tourism Cluster**	Tourism
51	**Transylvania Textile & Fashion Cluster**	Textile
52	**Transylvanian Furniture Cluster - legally represented by Hygia Consult**	Energy Intensive Industries
53	**Urban Logistic Cluster Association**	Mobility-Transport-Automotive
54	**3R Green Cluster**	Digital,Renewable Energy
55	**Alaturi de Voi Romania Foundation (ADV Romania) / Accelerator of Social Enterprises Cluster**	Proximity & Social Economy
56	**Cluj IT Cluster**	Digital
57	**ECO-INNOVATION CLUSTER FOR SUSTAINABLE ENVIRONMENT**	Renewable Energy
58	**Green Energy Romanian Innovative Biomass Cluster**	Renewable Energy
59	**Green Technology CLUSTER**	Agri-food,Creative & Cultural Industries,Digital,Mobility-Transport-Automotive,Renewable Energy,Tourism,Health,Energy Intensive Industries
60	**Open Hub Creative Cluster**	Creative & Cultural Industries,Digital
61	**ROVEST Cluster**	Digital
62	**Transilvania IT Cluster**	Digital,Health

Source: ECCP (2023), data as of 24.10.2023.

Indicators of cluster strength

Figure 13: Indicators of cluster strength: cluster portfolio strength (share of payroll accounted for by strong clusters) (left) and cluster mix (right)



Source: Ketels & Protsiv (2021): Cluster presence and economic performance: a new look based on European data. Note: Colours refer to deciles of the corresponding variables such that darker colours indicate higher values.

Overview of the industrial ecosystems

Figure 14: EU industrial ecosystems based on the European industrial strategy

14 industrial ecosystems are: aerospace and defence, agri-food, construction, cultural and creative industries, digital, electronics, energy intensive industries, energy-renewables, health, mobility – transport – automotive, proximity, social economy and civil security, retail, textile and tourism

Source: European Commission: https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/european-industrial-strategy_en (last access 19.04.2023).