

EUROPEAN CLUSTER Collaboration platform

Clusters meet Regions' event "Twin transition through innovation - the role of clusters in the development towards a climate-neutral and digital industrial region" – the case of North Rhine-Westphalia

Input paper





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Contents

Ex	ecutive Summary	5
1.	Context: Economic profile of North Rhine-Westphalia	8
2. reg	Clusters in North Rhine-Westphalia and their importance for gional economic development1	5
3. We	Cross-border cooperation and the involvement of North Rhine- estphalian clusters in European networks and support initiatives2	23
4.	Smart Specialisation in North Rhine-Westphalia2	8
Bik	oliography	51
An	nex3	3





Figures

Figure 1: Real GDP growth rate in North Rhine-Westphalia from 2011 to 2022 (in %)	9
Figure 2: Employment across the industrial ecosystems for North Rhine-Westphalia, Germany and the	he EU27 (in
2020)	10
Figure 3: Innovation performance of North Rhine-Westphalia in the 2023 Regional Innovation Scoreb	oard 12
Figure 4: Overview of North Rhine-Westphalian ECCP-registered and state-level cluster organisation	s as well as
the distribution of ECCP-registered cluster organisations across the German federal states	15
Figure 5: Overview of organisation, structure, and thematic orientation of ECCP-registered cluster or	ganisations
in North Rhine-Westphalia	18
Figure 6: Distribution of region-relevant sector specialisation nodes and cluster organisations in EU27	7 19
Figure 7: Overview of EU support initiatives in the funding period 2014-2020 and 2021-2027	
Figure 8: Priority areas of the S3 North Rhine-Westphalia 2021-2027	28
Figure 9: Survey results - Competences of cluster organisations in North Rhine-Westphalia to the pr	iority areas
	30
Figure 10: Survey results – priority areas according to future significance for NRW clusters	30
Figure 11: Top 10 sectors by employment in North Rhine-Westphalia (in 2020)	33
Figure 12: Regional typology based on industrial ecosystem specialisation	33
Figure 13: Performance of individual administrative districts in North Rhine-Westphalia (NRW) comp	ared to the
EU27 average in selected areas (2023)	
Figure 14: Performance of the five administrative districts in North Rhine-Westphalia in th	e Regional
Competitiveness Index	35
Figure 15: Overview of the regional distribution of cluster organisations and networks in North Rhine-	Westphalia
	38
Figure 16: Indicators of cluster strength: cluster portfolio strength (share of payroll accounted fo	r by strong
clusters) (left) and cluster mix (right)	38
Figure 17: EU industrial ecosystems based on the European industrial strategy	39

Tables

Table 1: Overview of cluster organisations in North Rhine-Westphalia registered on the ECCP and their addre	essed
EU industrial ecosystems	36
Table 2: Overview of cluster organisations in North Rhine-Westphalia registered in the regional cluster net	work
NRW.innovativ	36





Executive Summary

The following paper presents observations on the cluster landscape in North Rhine-Westphalia and outlines some key considerations for the future development of the state. 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 North Rhine-Westphalia

- North Rhine-Westphalia is a pivotal player in the German economy, making up around 20% of the nation's GDP and ranking as the second-largest federal state in Germany with regard to exports. The services industry accounts for roughly 40% of overall employment in the state, whereas its manufacturing sector, at 19.3%, surpasses the EU27 average. The region's substantial industrial presence is highlighted, which is also mirrored in the sector specialisation nodes significant to the region. However, the analysis shows that the state boasts a diverse ecosystem landscape, offering various opportunities that can strengthen the region's growth through the backing of economic and cluster structures.
- The **Regional Innovation Scoreboard 2023** categorises North Rhine-Westphalia as a "**Strong Innovator**". Overall, the state presents notable strengths in its institutional structure and research and development landscape. However, North Rhine-Westphalia's innovation ecosystem still exhibits some well-known weaknesses, such as relatively low R&D expenditures in the business sector and a limited number of patents. Additionally, there is room for improvement in addressing the disparities present across the regions.

Clusters in North Rhine-Westphalia and their importance for regional economic development

- North Rhine-Westphalia has **27 state-level clusters** ("Landescluster"), with 12 registered cluster organisations on the ECCP. Together, they cover 10 out of the 14 EU Industrial Ecosystems. In particular, there are strengths within the **Digital ecosystem**, as well as in traditional heavy industry & manufacturing ecosystems, including Energy Intensive Industries, Electronics, and Mobility-Transport-Automotive.
- Empirical insights from the European Cluster Panorama 2021 and Ketels & Protsiv (2021) demonstrate how clusters can have a significant impact on economic growth and innovative business activity within regions. The study also shows a high cluster portfolio strength (share of payroll accounted for by strong clusters) and an above-average cluster mix (positive bias towards cluster categories with higher wages) in North Rhine-Westphalia.

Cross-border cooperation and the involvement of North Rhine-Westphalian clusters in European networks and support initiatives

- Interregional cooperation supports the exchange of cross-sectoral & interdisciplinary knowledge across innovation ecosystems and thus forms the basis for radical innovations and disruptive technologies.
- One cluster organisation from North Rhine-Westphalia, Food-Processing Initiative e.V, participated in two ESCP projects focusing on internationalisation (ESCP-4i) and smart specialisation (ESCP-S3). The organisation participated in the projects FoodPackLab – which brought together partners from the photonics, packaging and food industries – and Connsensys, which sought to link partners from the food and electronics value chains with relevant research organisations.
- Food Processing Initiative e.V. also participated in the INNOSUP-1 initiative through the project "Valueadded Innovation in fooD chAins" (VIDA). The project targeted the growth and innovation potential of SMEs





in European food chains by bringing together four different sectors (food, energy, water and key enabling technologies) and supporting them through specific capacity building measures.

• Furthermore, clusters from North Rhine-Westphalia have participated in I3 funded programmes and INTERREG programmes. The I3 project has a focus on the innovative digital solutions to challenges in the food processing sector, while the INTERREG projects focus on strengthening research, technological development, and innovation in the German-Dutch border region.

Smart Specialisation in North Rhine-Westphalia

- Cluster organisations (can) play an important role in the design and implementation of Smart Specialisation Strategies (S3). In North Rhine-Westphalia, cluster organisations are actively involved in the development and monitoring of the S3.
- The Regional Innovation Strategy 2021-2027 of North Rhine-Westphalia identifies 7 priority areas. These
 priority areas are "Innovative Materials & Intelligent Production", "Connected Mobility & Logistics",
 "Environmental & Circular Economy", "Energy & Innovative Construction", "Innovative medicine, health &
 life science", "Culture, Media & Creative Industries, Innovative Services" and "Key Technologies of the Future
 & ICT".



01

Context: Economic profile of North Rhine-Westphalia





1. Context: Economic profile of North Rhine-Westphalia

The State of North Rhine-Westphalia (in German: Nordrhein-Westfalen, NRW) is located in Western Germany, sharing a border with Belgium and the Netherlands. The strategic location enables the state to trade with its western neighbours which are the main trading partner in import and export of the state. in addition, the Rhine River flowing through the state is one of the most used inland waterways worldwide and connects a handful of major European economies. The state's population of 17.9 million¹ as of 2022, accounts for 21% of Germany's total population of 83 million², positioning it as the most populous state within the nation and inhabits the largest labour force in Germany with a workforce of 9,7 million³. Spanning an area of 34.112 km², North Rhine-Westphalia holds the distinction of being the most densely populated county in Germany. The state can be further divided into five administrative districts ("Regierungsbezirke") at the NUTS2 level, namely Düsseldorf (DEA1), Köln (DEA2), Münster (DEA3), Detmold (DEA4) and Arnsberg (DEA5). This section will provide a concise socio-economic overview of North Rhine-Westphalia, encompassing key aspects such as its macroeconomic profile and sectoral specialisation, as well as it's innovation and regional competitiveness performances.

Macroeconomic profile of North Rhine-Westphalia

As of 2021, the region's economy boasted a **per-capita GDP (PPS) of €37,100**, which placed the country above the EU average of €32.400 but below the German average of €39,000.⁴ It accumulated in 2021 a GDP of roughly €729 billion as it can be seen in Figure 1, which accounts for roughly 20% of the German GDP (€3.617 billion).⁵ The regional GDP of North Rhine-Westphalia had constant economic growth for the last 10 years with 2020 being the only exception, in which the economy shrank by 1,9% but surpassed the pre-crisis level one year later due to the strong growth in 2021 (5,6%). During the years from 2011-2021, average economic growth was around 2,5%. Despite the challenges posed by the effects following the COVID-19 pandemic, the region's economy has remained relatively resilient and was able to emerge after the global supply chain eased, given the government's implemented policies. Overall, North Rhine-Westphalia's sustained economic growth over the years is a testament to its resilience and adaptability in the face of global challenges.

https://www-genesis.destatis.de/genesis/online?operation=table&code=12211-

² Eurostat (2023): Population on 1 January. Available under.

https://ec.europa.eu/eurostat/databrowser/view/tps00001/default/table?lang=en%20 (last access 04.10.2023). ³ Statistische Ämter der Länder (2022). Volkswirtschaftliche Gesamtrechnung. Available under.

https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.statistikportal.de%2Fsites%2Fdefault%2Ffiles%2 F2023-03%2Fvgrdl r1b1 bs2022 0.xlsx&wdOrigin=BROWSELINK (last access 04.10.2023).

https://ec.europa.eu/eurostat/databrowser/view/nama_10_gdp/default/table?lang=en%20 (last access 04.10.2023).



¹ DESTATIS (2023): Population by state. Available under.

 $[\]underline{1003\&bypass=true\&levelindex=1\&levelid=1696409525327 \# abreadcrumb} \ (last access 04.10.2023).$

⁴ Eurostat (2023): Gross domestic product (GDP) at current market prices by NUTS2 regions. Available under <u>https://ec.europa.eu/eurostat/databrowser/view/NAMA_10R_2GDP_custom_7751336/default/table?lang=en</u> (last access 09.10.2023).

⁵ Eurostat (2023): GDP and main components (output, expenditure and income). Available under.





Figure 1: Real GDP growth rate in North Rhine-Westphalia from 2011 to 2022 (in %)

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

The geography of North Rhine-Westphalia, with the Rhine River passing through the state and a shared border with Netherlands and Belgium is enhancing the regions trade. The state exported €232 billion in 2022, making it the 2nd largest exporter in Germany while the imports were €317 billion⁶, making it the largest German importer. The neighbouring countries of Netherlands and Belgium were among the top 3 trading partner in 2023.

North Rhine-Westphalia sector specialisations and employment levels

When examining the **employment distribution** across various industries in North Rhine-Westphalia in 2022, it becomes evident that the state's economic landscape is characterized by its diverse industry composition. According to Eurostat data⁷, North Rhine-Westphalia features a noteworthy employment structure, with the highest share of its workforce employed in the services sector, accounting for 39.8% of employment. This is slightly higher than the national level in Germany, which stands at 38.8%, and is in line with the EU27 average of 40.63%. In contrast, the industrial sector (excluding construction) plays a substantial role in North Rhine-Westphalia's economy, with 19.3% of the workforce engaged in this sector. While this is lower than the German national average of 20.7%, it still surpasses the EU27 average of 17.7%. This shows that North Rhine-Westphalia still has a substantial industrial presence. The construction sector in North Rhine-Westphalia employs 5.7% of the workforce, which is slightly lower than the German and EU27 averages, demonstrating a relatively smaller presence in the regional economy. Furthermore, the public administration sector plays a significant role in North Rhine-Westphalia, employing 34.4% of the workforce, surpassing both the German national average of 33.0% and the EU27-2020 average of 30.9%. The relative importance of the Services sector and Public Administration is reflected when looking at the key economic sectors in North Rhine-Westphalia in terms of employment. Notably, the sector categorized as "Retail trade, excluding motor vehicles and motorcycles" emerges as the

⁷ Eurostat (2023): Employment by sex, age, economic activity and NUTS 2 regions (NACE Rev. 2) (1 000). Available under: <u>https://ec.europa.eu/eurostat/databrowser/view/LFST_R_LFE2EN2_custom_7625645/default/table?lang=en</u> (last access 04.10.2023).



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⁶ OEC (2023). Regional Profile: North Rhine-Westphalia. Available under.

https://oec.world/en/profile/subnational_deu/north-rhine-westphalia (last access 04.10.2023).



largest employer, with approximately 809,700 people employed. This substantial number underscores its important role in the regional economy, particularly when compared to the EU27 average of 8.0% and the national average of 8.5%. Furthermore, Sectors related to Public Administration prominently feature among the top ten sectors in terms of employment. Human health activities constitute 7.2% of the workforce, while Public Administration and defense make up 6.8%, and education accounts for 6.6%. A comprehensive breakdown of the key economic sectors in North Rhine-Westphalia in terms of employment is presented in Figure 11 of the Annex.

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. The classification of the 14 industrial ecosystems has been calculated by aggregating NACE 2-digit activities, following the methodology established by the European Commission. As shown by the Figure below, the Retail ecosystem comprises the largest employment share across all ecosystems in the North Rhine-Westphalia, with 17.9%. Connections can be drawn to sectors such as Retail trade and Wholesale trade that are among the top ten sectors by employment. The relative importance of this ecosystem is shown by its higher share compared to the EU27 (16.2%) and national average (15.3%). This is followed by the Health ecosystem at 16.0% across all ecosystems (compared to 13.3% at the EU27 level and 15.8% at the national level) and Proximity, Social Economy and Civil Security at 13.5%. Other ecosystems that demonstrate a higher concentration of employment compared to the EU27 average include Energy Intensive Industries, Digital, Aerospace & Defence, Electronics and Energy – Renewables.



Figure 2: Employment across the industrial ecosystems for North Rhine-Westphalia, Germany and the EU27 (in 2020)

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





To analyse specialisation in North Rhine-Westphalia, this paper examines the country's regionally relevant sectoral and ecosystem nodes.⁸ There is a total of **six regionally relevant sectoral nodes**, while no **regionally relevant ecosystem nodes** can be identified. Four of the six nodes are in sectors pertaining to manufacture, namely manufacture of basic metals, manufacture of chemicals and chemical products, manufacture of machinery and equipment as well as manufacture of electrical equipment. The specialisation in those sectors indicates that NRW has a **distinct advantage and competency in manufacturing-related activities**. The analysis also shows that, while it exhibits a noteworthy industrial presence that is reflected in the sectoral specialisation nodes of the region, North Rhine-Westphalia possesses a **more diversified ecosystem landscape**. This is also visually represented in Figure 12 in the Annex. Given the region's diversity in industrial ecosystems, cross-border cooperation can be effective in fostering further development in the region, with clusters playing a significant role in this process. The forthcoming chapters will delve into how this aligns with the existing cluster networks and cross-border initiatives in the North Rhine-Westphalia region.

Regional innovation Performance of North Rhine-Westphalia

This paper aims to examine the economic performance of the State of North Rine-Westphalia with a specific focus on clusters and how these are organised. To provide a comprehensive overview of North Rhine-Westphalia's innovation landscape and assess its level of innovativeness, data from **Regional Innovation Scoreboard (RIS)** is analysed. The RIS framework is structured into the following four categories "Framework Conditions", "Investments", "Innovation Activities" and "Impacts".

With a population-weighted average score of 123.1, just below the threshold of 125 required for achieving "Innovation Leader" status, **North Rhine-Westphalia can be classified as a "Strong Innovator"**, as shown in Figure 3.⁹ Relative to the EU27 average, the State of North Rhine-Westphalia demonstrates relatively high scores in the innovators "product innovators", "business process innovators", as well as "employment innovative enterprises", underscoring its strengths in institutional setup and R&D landscape. The state also exhibits high levels of "international scientific co-publication" and "public-private co-publications", highlighting active participation in international research collaborations. On the other hand, relative weaknesses can be found in indicators related to innovation and R&D expenditures, as these indicators exhibit scores below the EU average. This is especially noticeable in the context of R&D spending in both the private and public sectors, as well as in innovation expenditure per employed person.

Given the availability of the RIS at the NUTS2 level, it allows to shed light onto the innovation performance of the different regions of North Rhine-Westphalia and examine for disparities across regions (See Figure 13 in the Annex). **The administrative district of Köln emerges as the strongest innovator within the region** and is ranked as an "Innovation Leader". In addition, the administrative district is ranked the 5th most innovative NUTS-2 region in Germany and is among the top 20 most innovative regions in Europe (ranked 19). Düsseldorf, Detmold, and Arnsberg, on the other hand, are classified as "Strong Innovators", while Münster in the only region classified as a "Moderate Innovator". The administrative districts exhibit a favourable positioning, particularly in the areas

⁹ Given that the data provided by the Regional Innovation Scoreboard is only available at the NUTS-2 level, the innovation performance levels for the German federal states have been computed using the population-weighted average of the respective NUTS-2 regions.



⁸ 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.



of business process and product innovation as well as employment in innovative enterprises when compared to the EU27 average. Nevertheless, regional disparities persist, notably concerning research and development expenditures in the public sector, the number of international scientific publications, and collaborative innovation indicators, where the district of Köln exhibits high scores relative to the other districts.



Figure 3: Innovation performance of North Rhine-Westphalia in the 2023 Regional Innovation Scoreboard

Source: ECCP (2023), own elaboration based on the Regional Innovation Scoreboard 2023.

Regional competitiveness level of North Rhine-Westphalia

To conclude the chapter on the region's economic profile, the regional competitiveness of North Rhine-Westphalia is examined based on the **Regional Competitiveness Index**. This index measures key aspects of competitiveness among regions across the EU in three dimensions: the Basic Sub-Index, the Efficiency Sub-Index and the Innovation Sub-Index. The findings aim to provide insights into North Rhine-Westphalia's performance in these areas and identify opportunities for improvement. It is worth noting that, akin to the Regional Innovation Scoreboard, the Regional Competitiveness Index is computed exclusively at the NUTS2 regional level. Therefore, there isn't an overarching index value for North Rhine-Westphalia. Instead, the values are scrutinized within the five administrative districts. For a detailed breakdown of the regions' performances across various indicators and dimensions of the Regional Competitiveness Index, it can be referred to Figure 14 in the Annex.

The overall regional competitiveness score of the five NUTS2 regions in North Rhine-Westphalia spans a range from 111.2 to 128.6 relative to the EU average, signalling that all regions outperform the EU average and can be classified as more developed regions. Notably, the regions of Köln and Düsseldorf stand out with index values of 128.3 and 128.6, respectively, thus being ranked 17 and 16 in the EU, respectively. Meanwhile, the other regions, namely Münster and Arnsberg, achieve slightly lower scores but still surpass the national average. In contrast, the Northwestern region of Detmold exhibits the lowest score, marginally below the national average.

The superior regional competitiveness of Köln and Düsseldorf relative to the remaining administrative districts is reflected in the scores of the sub-indexes. Notably, the efficiency sub-index stands out for both regions in





comparison to the other regions and the national and EU averages. This relative strength is primarily driven by their substantial market size, with Düsseldorf and Köln achieving pillar scores of 270.2 and 230.2, respectively. Overall, all districts in North Rhine-Westphalia show values for market size, exceeding the country average (155.3), with the exception of the region of Detmold (138.1), underscoring the significance of market size for the EU economy.

In terms of the innovation sub-index, a similar picture is discernible, with all regions exhibiting scores above the EU average, but disparities across regions. The regions of Cologne and Düsseldorf exhibits scores above the country average, while the other regions are slightly below the country average, with Detmold exhibiting the lowest score at 103.7. The most significant disparities are observed in the business sophistication pillar, while the regions demonstrate relatively high scores in the innovation pillar.



02

Clusters in North Rhine-Westphalia & their importance for regional economic development



EUROPEAN CLUSTER Collaboration Platform

Strengthening the European economy through collaboration



2. Clusters in North Rhine-Westphalia and their importance for regional economic development

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

Cluster organisations in North Rhine-Westphalia

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 North Rhine-Westphalia on the ECCP gives the first impression on the intensity of organisation in regional industrial networks. Out of the total 1,149 registered EU-27 cluster organisations on the ECCP, there are 128 cluster organisations from Germany as a whole and **12 cluster organisations from North Rhine-Westphalia**.





Source: ECCP (2023). Own elaboration based on <u>https://reporting.clustercollaboration.eu/all</u> (last access 09.10.2023). A detailed overview of the North Rhine-Westphalian clusters is provided in Table 1 in the Annex. **15**





Figure 4 displays the **geographical distribution of ECCP-registered cluster organisations** across Germany as well as statewide active clusters and networks in North Rhine-Westphalia. The map shows **32 cluster organisations overall**: 12 ECCP-registered cluster organisations and 27 statewide active clusters and networks. Seven of the statewide active clusters and networks are registered on the ECCP.¹⁰ Looking at the geographical distribution within North Rhine-Westphalia, Düsseldorf, the state capital, shows the highest concentration of cluster organisations (13), followed by the Ruhr area and Aachen (5 each). There are three cluster organisations respectively in the Cologne-Bonn area and in East Westphalia (Ostwestfalen-Lippe). The cities of Solingen and Wuppertal in the Berg country (Bergisches Land) host one cluster each, just like the city of Lüdenscheid to the East. Based on the registered cluster organizations on the ECCP, the North Rhine-Westphalian cluster landscape is medium-sized in comparison with other German federal states. It falls between Saxony, which has 17 cluster organizations, and Brandenburg/Lower Saxony, which has seven cluster organizations.

There are two national-level cluster programmes supporting flagship clusters throughout Germany.¹¹ One of these programmes is the Spitzencluster programme, established by the Federal Ministry of Economy and Climate, with two Spitzencluster in North Rhine-Westphalia. **SPIN** (Spitzencluster for Industrial Innovation) concentrates on developing technologies, processes, and products for CO₂-neutral industrial and energy systems, using insights from the energy sector, energy-intensive industry, and science.¹² The second Spitzencluster, **it's OWL**, is a technological network located in the eastern area of North Rhine-Westphalia. It links businesses, research institutions and organizations to devise solutions for SMEs' digital and ecological transformation.¹³

There are also two Future Clusters in North Rhine-Westphalia, and a second flagship cluster program at the national level, administered by the Federal Ministry of Education and Research. NeuroSys, headquartered in Aachen, is a Zukunftscluster harnessing a wide range of transdisciplinary expertise, including physicists, material and neuroscientists, engineers, computer scientists, economists, sociologists, and philosophers. It aims to create innovative hardware for artificial intelligence (AI) applications and position the Aachen region as a leading global player in this field. The initiative leverages the foremost research institutions of RWTH Aachen University, the Research Centre Jülich, and the NRW State Institute AMO (Institute for Nanotechnology).¹⁴ The second comprises the Zukunftscluster Wasserstoff (Hydrogen), whose aim is to consolidate existing expertise in hydrogen technology from diverse stakeholders in and around Aachen, to develop solutions for the complete hydrogen lifecycle – from production to storage, distribution, and utilization.¹⁵

Additionally, at the regional level, cluster networking is executed via the **competence centre NRW.innovativ**. It was lauched by the North Rhine-Westphalian Ministry of Economy, Industry, Climate Protection and Energy, and connects important actors and stakeholders in the North Rhine-Westphalian innovation landscape with each other and across Europe. Thus, it acts as a catalyst for knowledge transfer and innovation potential in general. An interactive map provided by NRW.innovativ offers further insights into the innovation ecosystem overall, including 60 cluster organisations, 5 digital hubs, 67 research institutes, and 71 higher education institutions at



¹⁰ For a map of the Landescluster, see also Figure 15 in the Annex.

¹¹ More details on policies and programmes supporting cluster development on the national as well as the regional level below.

¹² See <u>https://www.spin.ruhr/</u> (last access 12.10.2023).

¹³ See <u>https://www.its-owl.com/home/</u> (last access 12.10.2023).

¹⁴ See <u>https://www.neurosys.info/en</u> (last access 12.10.2023).

¹⁵ See <u>https://h2-cluster.de/</u> (last access 12.10.2023).

¹⁶



the regional and sub-regional level.¹⁶ Further details can be found in Figure 15 of the Annex, which displays a map of the 27 state-level cluster organisations and networks currently registered by NRW.innovativ in North Rhine-Westphalia, a number that increases to 60 when considering all local clusters and networks.¹⁷ The state clusters can be linked to the **seven innovation fields outlined in North Rhine-Westphalia's Innovation Strategy**:¹⁸

- 1. Innovative materials and intelligent production (10 cluster organisations)
- 2. Networked mobility and logistics (6 cluster organisations)
- 3. Environmental and circular economy (4 cluster organisations)
- 4. Energy and innovative construction (3 cluster organisations)
- 5. Innovative medicine, health, and life science (3 cluster organisations)
- 6. Culture, media and creative industries and innovative services (1 cluster organisation)
- 7. Key technologies of the future, ICT (16 cluster organisations)

The cluster organisations in North Rhine-Westphalia can be related to **ten out of 14 EU industrial ecosystems**¹⁹ (see Figure 4 and Table 1 in the Annex). The **most prevalent industrial ecosystem is Digital** with 13 cluster organisations, followed by Energy Intensive Industries with eight cluster organisations. Electronics and Mobility-Transport-Automotive are represented by six cluster organisations each. Health accounts for four, Agri-food and Renewable Energy for three cluster organisations each. Finally, Construction is present by two cluster organisations while both Cultural and Creative Industries and Aerospace & Defence account for one cluster organisation. To summarise, besides Digital, NRW's most robust industrial ecosystems are clustered around its longstanding specialisations in heavy industry and manufacturing.

The cluster landscape in NRW presents significant potential for the **"twin transition."**²⁰ With 13 clusters included in the digital industrial ecosystem, a variety of capacities and expertise are offered to support the **digital transition**. This ranges from clusters that specialise in technology-related topics such as 5G.NRW, NMWP.NRW (NanoMicroMaterialsPhotonics), QuantumTechnology.NRW or Blockchain.NRW to clusters that provide local support to companies across the board, such as Logistics.NRW, Digital.secure.NRW (for cyber security) or the Leading-Edge Cluster (Spitzencluster) it's OWL.

The green transition is also very prominent in the cluster ecosystem. In particular, the competence network Green Economy.NRW acts as a hub for decarbonisation and environmental protection across sectors and ecosystems. In addition, the NRW.Energy4Climate state agency can be seen as another relevant actor in the

¹⁷ For an interactive and searchable version including contact details of each cluster organisation, see https://nrwinnovativ.de/en/stakeholders/#innovationskarte (11.10.2023).Slight mismatches in the number of cluster organisations can occur due to the most recent updates.

¹⁸ A comprehensive index of all regional cluster organizations and their corresponding areas of innovation is available in Table 2 of the Annex. Source: Ministerium für Wirtschaft, Innovation, Digitalisierung und Energie des Landes Nordrhein-Westfalen (2021): Regionale Innovationsstrategie des Landes Nordrhein-Westfalen. Available under: <u>https://www.wirtschaft.nrw/sites/default/files/documents/21-</u>

 ²⁰ See <u>https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/twin-green-digital-transition-how-sustainable-digital-technologies-could-enable-carbon-neutral-eu-2022-06-29_en</u> (last access 16.10.2023).
 17



¹⁶ See <u>https://nrwinnovativ.de/en/stakeholders/#innovationskarte</u> (last access 11.10.2023). See also the last Cluster Panorama NRW report: <u>https://nrwinnovativ.de/wp-</u>

content/uploads/2022/07/220707_MWIDE_PDF_Cluster_Panorama.pdf (last access 11.10.2023).

<u>0924_mwide_broschuere_regionale_innovationsstrategie_des_landes_nrw-web2.pdf</u> (last access 11.10.2023). ¹⁹ See European industrial strategy. Available under: <u>https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/european-industrial-strategy_en</u> (last access 11.10.2023)



ecosystem, actively contributing to decarbonisation efforts in the energy, mobility/transport and building ecosystems. The Hydrogen Future Cluster orchestrates a large group of actors working on a net-zero industrial energy supply based on hydrogen. Moreover, also other traditional clusters also play an important role in the green transformation in North Rhine-Westphalia, such as the Leading-Edge Cluster Industrial Innovations (SPIN), which drives efforts to decarbonise energy-intensive industries in general, and Chemie.NRW, which supports the development of sustainable solutions for the chemical industry in particular.

Figure 5 demonstrates that North Rhine-Westphalian cluster organisations registered on the ECCP have **significantly higher numbers of staff than average**. This is also evident in their **strong membership structure**, where even 50% of cluster organisations have 150 or more members, in contrast to less than 25% across the EU. There is a clear focus on **collaboration** in technology scouting and project partnering, as well as in digitalisation and resource efficiency/circular economy. However, it is important to note that a significant proportion of North Rhine-Westphalian cluster organizations are not registered on the ECCP.

Two golden and four silver **Cluster Excellence Labels** have been awarded to ECCP-registered cluster organisations in North Rhine-Westphalia. The Cluster Panorama NRW 2022 indicates that from 2012 to 2022, a total of 23 Cluster Excellence Labels were awarded to all clusters throughout the state.²¹

Figure 5: Overview of organisation, structure, and thematic orientation of ECCP-registered cluster organisations in North Rhine-Westphalia



Organisation

- Less then half of cluster organisations are small with 1-5 employees (5 cluster organisations or 42%; ØEU: 65%)
- 4 middle-sized cluster organisations with 6-10 employees (33%; ØEU: 20%)
- 2 cluster organisations in the 11-20 employees bracket (17%; ØEU: 4%) and one with over 30 employees.

Source: ECCP (2023).



Member structure

- One quarter of cluster organisations with 51-100 members (3 CO or 25%; ØEU: 27%) - no CO with under 51 members.
- Another quarter of cluster organisations with 101-150 members (3 CO or 25%; ØEU: 14%).
- Two cluster organisations each with 151-200, 201-300, and 301-500 members (COs with 150+ members: 50%; ØEU: 23%).



Thematic orientation

- ECCP-registered cluster organisations in North Rhine-Westphalia can be related to six different EU industrial ecosystems
- Collaboration particularly sought in technology scouting (7), partnering for projects (5), and digitalisation (4) as well as resource efficiency and circular economy (4)

²¹ Ministerium für Wirtschaft, Innovation, Digitalisierung und Energie des Landes Nordrhein-Westfalen (2022): Cluster-Panorama NRW. Kurzversion. Available under: <u>https://nrwinnovativ.de/wp-</u> <u>content/uploads/2022/07/220707_MWIDE_PDF_Cluster_Panorama.pdf</u> (last access 11.10.2023).



18



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 nodes²², 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 6 below shows that industries in North Rhine-Westphalia form for an average number of regionally relevant sectoral specialisation nodes²³ and an average number of cluster organisations, in comparison to other European regions.



Figure 6: Distribution of region-relevant sector specialisation nodes and cluster organisations in EU27

Source: Own elaboration based on ECCP (2023) and Eurostat (2023) 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) 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 has 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 & Protsiv delineate how "cluster strength" has a unique impact on "wages and prosperity".

²³ 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%). 19



²² 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%).



A visual depiction that highlights this trend can be found in Figure 16 in the Annex. In the context of North Rhine-Westphalia, the statistical data and analysis of Ketels and Protsiv show a high cluster portfolio strength (share of payroll accounted for by strong clusters) and an above-average cluster mix (bias towards cluster categories with higher wages).

Policies and programmes supporting cluster development

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

On the **national level**, the two main cluster policy programs in Germany are the "go-cluster programme" and the "Zukunftscluster-Initiative" (Clusters4Future). Go-cluster was launched in 2012 as a successor programme to "competence networks Germany". It focuses on cluster excellence and supports cluster management organisations in further developing their innovation clusters through consultation, networking, labelling and project funding.²⁴ The other programme, "Zukunftscluster-Initiative", has a specific focus on German regions with strong research activities and aims to develop regional innovation networks on the basis of outstanding foundational research that later become "future clusters".²⁵

On the **regional and local level**, cluster policies are well-established in North Rhine-Westphalia. In the past, cluster support was already part of the "Ziel-2 Programme" from 2000-2006 and 2007-2013.²⁶ The 2007-2013 programme changed the previous discretionary approach to funding to a competitive one. Kiese and Kahl (2017) found that this benefitted universities and research organisations, while the private sector and notably smaller companies only obtained a smaller part of the total funding. Currently, the main policy instrument that builds the policy framework for cluster support in NRW is the S3 strategy ("Regionale Innovationsstrategie 2021-2027"), successor to the previous version "Regionale Innovationsstrategie 2014-2020". The current strategy highlights the importance of technology transfers from the public sector (universities, research institutes) to the private sector (especially SMEs).²⁷ It also encourages collaboration, through regional networks as well as international cluster partnerships.

In terms of **evaluation**, one can refer to the annual innovation report, the "Innovationsbericht Nordrhein-Westfalen"²⁸. The 2022 edition of this report showed that there are many well-functioning clusters in North

0924 mwide broschuere regionale innovationsstrategie des landes nrw-web2.pdf (last access 10.10.2023)

https://www.innovationsbericht.nrw/site/assets/files/1/innovationsbericht_nrw_2022_langfassung.pdf (last access 31.10.2023)



20

²⁴ Bundesministerium f
ür Wirtschaft und Klimaschutz (2023): Programm "go-cluster". Available under: <u>https://www.clusterplattform.de/CLUSTER/Navigation/DE/Clusterpolitik/Bund/go-cluster/go-cluster.html</u> (last access 10.10.2023).

 ²⁵ Bundesministerium für Forschung und Bildung (n. y.): Die Ziele der Zukunftscluster-Initiative. Available under: <u>https://www.clusters4future.de/foerderinitiative/ziele-der-zukunftscluster-initiative</u> (last access 10.10.2023).
 ²⁶ Butenhoff, F. (2007) Die Clusterpolitik der nordrhein-westfälischen Landesregierung. Available under: <u>https://www.hs-</u>

niederrhein.de/fileadmin/dateien/Institute und Kompetenzzentren/NIERS/Vortraege 2007 Clusterpolitik.pdf (last access 10.10.2023).

²⁷ Ministerium für Wirtschaft, Innovation, Digitalisierung und Energie des Landes Nordrhein-Westfalen (2021): Regionale Innovationsstrategie des Landes Nordrhein-Westfalen. Available under: <u>https://www.wirtschaft.nrw/sites/default/files/documents/21-</u>

²⁸ Ministerium für Wirtschaft, Innovation, Digitalisierung und Energie des Landes Nordrhein-Westfalen (2022): Innovationsbericht Nordrhein-Westfalen. Available under:



Rhine-Westphalia for many different industries that work on a broad basis of businesses and institutes, but also highlighted areas for improvement, particularly in terms of enhancing ecosystem coordination and cost-effectiveness. Moreover, it recommends stronger coordination of state funding with national and European support programmes for clusters. Additionally, a 2020 evaluation study of the cluster "NanoMicroMaterialsPhotonics.NRW" conducted by Hansmeier and Stahlecker from the Fraunhofer Institute ISI found that the cluster has been successful in the continuation of its work since 2015 and "contributes directly to the technology, innovation and economic policy agenda of North Rhine-Westphalia."²⁹

In conclusion, North Rhine-Westphalia hosts a **highly professionalised landscape of cluster organisations** that is supported by a long-standing cluster development policy. 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.

²⁹ Hansmeier, H.; Stahlecker, T. (2020): Evaluation study of the Cluster NanoMicroMaterialsPhotonics.NRW (NMWP). Available under: <u>https://www.isi.fraunhofer.de/en/competence-center/politik-gesellschaft/projekte/nrw_evalu_landescluster.html</u> (last access 10.10.2023).



03

Cross-border cooperation & the involvement of North Rhine-Westphalian clusters in European networks & support initiatives

EUROPEAN CLUSTER Collaboration Platform



3. Cross-border cooperation and the involvement of North Rhine-Westphalian 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.³⁰ To gain an overview of the existing cross-border cooperation of North Rhine Westphalian clusters, a closer look will be taken in this chapter on the involvement of regional cluster organisations in European support initiatives with a focus on the **2014-2020** funding period (see Figure 7).

Involvement of North Rhine-Westphalian 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 Mediumsized 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 Only one cluster organisation from North Rhine-Westphalia, namely Food-Processing Initiative e.V., participated in the ESCP initiatives. More specifically, it participated:

- In the ESCP-4i project Photonics-Packaging Partnership for Food Innovation (FoodPackLab), which sought to foster synergies between photonics, packaging, and food industries so as to favour the industries' adaptation to today's challenges.
- In the ESCP-S3 project Connecting smart sensor systems for the food industry (Connsensys), whose overall
 objective is to set up a platform, with a joint cluster partnership strategy, implementation roadmap and
 interregional investment projects, between food- and electronic/ICT organisations and relevant research
 and technology organisations, so as to lower the barriers for food companies to access the newest smart
 sensor systems, and to enable the Internet of Things (IoT) transition of the food industry.

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





³⁰ 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).



Figure 7: Overview of EU support initiatives in the funding period 2014-2020 and 2021-2027

2014-2020 funding period



Involvement of North Rhine-Westphalian 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.

The same cluster organisation that participated in the ESCP, namely Food Processing Initiative e.V., participated in the INNOSUP-1 initiative under the project Value-added Innovation in fooD chAins (VIDA). The project targeted the growth and innovation potential of SMEs in European food chains by bringing together four different sectors (food, energy, water and key enabling technologies) and supporting them through various support and capacity building measures (mentoring, knowledge exchange, innovation vouchers). In a consortium with partners from the Netherlands, Spain, Italy, Czech Republic and Denmark, the Food Processing Initiative worked on the creation of new industrial value chains in the aforementioned sectors. The project ran from April 2018 to March 2021 with a total budget of around € 5 million.

Involvement of North Rhine-Westphalian cluster organisations in INTERREG projects

Another important programme of interregional cooperation is INTERREG. It is the EU's flagship scheme for cooperation across borders and assists local, regional and national governments in policymaking for regional development issues.³⁴ INTERREG is about cooperation between communities, regions and countries in the EU



³² For more information on the ESCPs and the INNOSUP-1 initiative see: <u>https://clustercollaboration.eu/eu-cluster-</u> 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-9d97-11ebb85c-01aa75ed71a1/language-en (last access 10.01.2023).

³⁴ For more information on INTERREG see: <u>https://www.interregeurope.eu/</u> (last accessed 12.10.2023).



and covers the following topics: Smarter Europe, Greener Europe, More connected Europe, More Social Europe, Europe closer to citizens and Better regional governance. Public institutions and private non-profit organisations from all 27 EU member states plus Norway and Switzerland are eligible to participate in the programme, which is co-funded by the European Union and has a budget of €379 million from the European Regional Development Fund (ERDF) for the period from 2021-2027. The EU and the 29 programme partner states provide up to 80 percent of the funds (70 % for private non-profit organisations) for the projects, which have a duration of four years.

Several North Rhine-Westphalian clusters have been participating in different editions of the INTERREG programme. The FPI – Food Processing Initiative e.V. was part of the project **FOOD2020**, which was split in two phases: phase I ran from July 2015 to December 2018 while phase II ran from July 2018 to June 2022. Phase II had a budget of €4.5 million and a total of 8 partner organisations from Germany and the Netherlands.³⁵ It supported 309 businesses, 156 of them SMEs, and focused on strengthening research, technological development and innovation in the German-Dutch border region with topics such as food security, sustainable food, healthy food and social innovations.

A project of the current 2021-2027 INTERREG VI programme is the **Realise-Bio** project, led by the North Rhine-Westphalian cluster organisation CLIB, which is focused on biotechnology and circular economy. The goal of the project is to make circular bioeconomy and circular economy in general become a reality in the border region between Germany and the Netherlands. Realise-Bio supports 8 model projects in realising their concepts about using biogenic raw materials in a circular way. The project started in 2023 as a successor to the Circular-Bio project and will run until 2025 with a budget of ≤ 3.4 million.³⁶

Another 2021-2027 INTERREG VI project under North Rhine-Westphalian leadership is **H2-Enabler** (Simulation and Prototyping for the cost-efficient production of metal Bipolar Plates in Fuel Cells). NMWP Management GmbH, who manages the cluster organisation NMWP.NRW (NanoMicroMaterialsPhotonic.NRW), acts as the lead partner for the German-Dutch project which focuses on hydrogen and fuel cells for converting hydrogen into electrical energy.³⁷ This should be achieved by rethinking the production of metallic bipolar plates (BPP), an important integrated part of a fuel cell, using hot forming and enabling its dissemination. This production method contrasts the established manufacturing processes in the cold state which are not suitable for providing the quantities required in the future at low costs. As part of the project, a laboratory system is to be set up based on a simulation, with which the forming of the BPP is carried out at elevated temperatures (hot forming at temperatures until 1000°C). Based on the lab scale results obtained, the project also aims to design a corresponding scale-up concept and to show future perspectives for the Interreg program area as part of road mapping. H2-enabler started in June 2023 and will end in February 2026 with a total budget of close to ξ 1.2 million (ξ 475.000 of it are EU funding).

³⁷ For more information on H2-Enabler see: https://keep.eu/projects/28242/Simulation-and-Prototyping-f-EN/ (last accessed 16.10.2023).



25

³⁵ For more information on the FOOD2020 phase II project see the project brochure available under: <u>https://www.giqs.org/food2020-broschuere/</u> (last accessed 12.10.2023).

³⁶ For more information on Realise-Bio see: <u>https://realise-bio.com/</u> (last accessed 12.10.2013).



Involvement of North Rhine-Westphalian cluster organisations in I3 projects

The Interregional Innovation Investments (I3 partnerships) is a funding instrument under the European Regional Development Fund (ERDF) 2021-2027 programming period that provides advisory and financial support through the European Innovation Council and SMEs Executive Agency (EISMEA).³⁸ Its goal is to assist interregional innovation projects during their mature phases in commercialisation and up-scaling by providing them with the tools to overcome regulatory and other barriers and bring their project to investment level. For the 2021 programming period, there are €570 million available (up to €10 million per project) and EU contribution covers 70 percent for all beneficiaries and cost categories.

HIGHFIVE (enHancing dIgital and Green growtH in the Food processing industry via Interregional innoVation invEstments), one of the projects supported by the I3 instrument, includes two actors from North Rhine-Westphalia: FPI – Food Processing Initiative e.V. and rbk group. HIGHFIVE aims to foster, enable and facilitate SME targeted and interregional investment actions to implement or bring to the market innovative digital solutions to concrete challenges of the food processing companies and thus contributing to the Farm-to-Fork strategy.³⁹ The two thematic priorities are sensors to monitor real time critical control parameters as well as sensor integration and implementation. The project has a consortium that includes 39 regions from 9 European countries. The budget is split: & 1.6 million as tangible (implementation projects and voucher projects) and & 1.2 million as non-tangible company support.

³⁹ For more information on HIGHFIVE see: <u>https://highfive.ss4af.com/</u> (last accessed 12.10.2023).



26

³⁸ For more information on I3 see: <u>https://eismea.ec.europa.eu/programmes/interregional-innovation-investments-i3-instrument_en</u> (last accessed 12.10.2023).

04

Smart Specialisation in North Rhine-Westphalia



Strengthening the European economy through collaboration

4. Smart Specialisation in North Rhine-Westphalia

Cluster organisations (can) play an important role in the design and implementation of Smart Specialisation Strategies (S3) since in both concepts, the facilitation 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 (EDP)⁴⁰. Against this background, this chapter focuses on Smart Specialisation in North Rhine-Westphalia.

S3 of North Rhine-Westphalia

A key starting point for the analysis of Smart Specialisation in North Rhine-Westphalia is the Regional Innovation Strategy 2021-2027 of North Rhine-Westphalia which was published in 2021.⁴¹ Cluster organisations and similar networks played a central role in the development of the Regional Innovation Strategy 2021-2027 of North Rhine-Westphalia. For instance, cluster organisations were involved in the identification of the priority areas of the Regional Innovation Strategy 2021-2027 of North Rhine-Westphalia. Moreover, the Regional Innovation Strategy 2021-2027 of North Rhine-Westphalia. Moreover, the Regional Innovation Strategy 2021-2027 of North Rhine-Westphalia. Moreover, the Regional Innovation Strategy 2021-2027 of North Rhine-Westphalia is structured in six fields of action and underlying instruments that should be applied to reach the goals of the strategy. One of these six fields of actions is "Intensify networking" and focuses on the instruments of clusters, competence centres and innovation networks, the exchange of knowledge between business and practice, and networking beyond the state borders into neighbouring federal states and European regions. In addition, cluster organisations are actively included in the EDP to monitor the progress of the strategy and to make adaptations if necessary. This process is orchestrated by the meta-cluster NRW.innovativ.⁴²

Figure 8: Priority areas of the S3 North Rhine-Westphalia 2021-2027

Priority areas of North-Rhine Westphalia

- 1. Innovative Materials & Intelligent Production
- 2. Connected Mobility & Logistics
- 3. Environmental & Circular Economy
- 4. Energy & Innovative Construction
- 5. Innovative medicine, health & life science
- 6. Culture, Media & Creative Industries, Innovative Services
- 7. Key Technologies of the Future & ICT

Source: ECCP (2023). Own adaptations based on the Regional Innovation Strategy 2021-2027 of North Rhine-Westphalia

The Regional Innovation Strategy 2021-2027 of North Rhine-Westphalia identifies seven priority areas which are displayed in Figure 8. These priority areas address a wide range of topics ranging from "Innovative Materials & Intelligent Production" over "Environmental & Circular Economy" to "Innovative medicine, health & life science". Moreover, the priority area "Key Technologies of the Future & ICT" is regarded as a cross-sectional field that should provide stimulus for the other priority areas of the Regional Innovation Strategy 2021-2027 of North Rhine-Westphalia.

⁴⁰ 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 on 12.09.2023)
⁴¹ https://s3platform.jrc.ec.europa.eu/edp (last access on 12.09.2023)

<u>0924_mwide_broschuere_regionale_innovationsstrategie_des_landes_nrw-web2.pdf</u> (last access on 12.09.2023) ⁴² <u>https://nrwinnovativ.de/en/</u> (last access on 12.09.2023)

Box 1: 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.

Competencies and involvement of NRW cluster organisations in Smart Specialisation

In the following, insights from an online survey conducted by NRW.innovativ with cluster organisations in North Rhine-Westphalia regarding their perception of the S3 priority areas are shown. The results of this survey show that the priority areas coincide with the thematic orientations of the cluster organisation in North Rhine-Westphalia (see Figure 9). Depending on the priority area, the cluster organisations in North Rhine-Westphalia assign their competences more or less strongly to a certain innovation field. As Figure 9 shows, the majority of cluster organisations in North Rhine-Westphalia state that they have very good competences in the innovation field "Innovative Materials & Intelligent Production" followed by "Environmental & Circular Economy" and "Connected Mobility & Logistics".

Figure 9: Survey results - Competences of cluster organisations in North Rhine-Westphalia to the priority areas



Contribution of competencies of NRW cluster organisations to priority areas

Source: ECCP (2023). Own adaptations based on a survey conducted by NRW.innovativ in 2022.

The results of the survey further show that all priority will be of increasing or constant importance in the coming years (see Figure 10). Moreover, it is shown that the cluster organisations are especially expecting an increasing relevance of topics related to the Green and Digital Transition. In this regard, the priority area of the North Rhine-Westphalia S3 2021-2027 "Environmental & Circular Economy" is of increasing importance for 12 out of 15 clusters. Another priority area of the North Rhine-Westphalia S3 2021-2027 that will be of increasing importance for the majority of cluster organisation in North Rhine-Westphalia in the coming years is the priority area "Connected Mobility & Logistics" followed by "Energy & Innovative Construction".

Figure 10: Survey results – priority areas according to future significance for NRW clusters



Future importance of priority areas for NRW cluster organisations

■ of increasing importance ■ of constant importance ■ of decreasing importance ■ not relevant n=15

Source: ECCP (2023). Own adaptations based on a survey conducted by NRW.innovativ in 2022.

Bibliography

Bundesministerium für Wirtschaft und Klimaschutz (2023): Programm "go-cluster". Available under: <u>https://www.clusterplattform.de/CLUSTER/Navigation/DE/Clusterpolitik/Bund/go-cluster/go-cluster.html</u> (last access 10.10.2023).

Bundesministerium für Forschung und Bildung (n. y.): Die Ziele der Zukunftscluster-Initiative. Available under: <u>https://www.clusters4future.de/foerderinitiative/ziele-der-zukunftscluster-initiative</u> (last access 10.10.2023).

Butenhoff, F. (2007): Die Clusterpolitik der nordrhein-westfälischen Landesregierung. Available under: <u>https://www.hs-</u>

niederrhein.de/fileadmin/dateien/Institute und Kompetenzzentren/NIERS/Vortraege 2007 Clusterpolitik.pdf (last access 10.10.2023).

ECCP(2021):EuropeanClusterPanoramaReport2021.Availableunder:<a href="https://clustercollaboration.eu/sites/default/files/2021-12/European ClusterPanoramaReport0.pdf(lastaccess29.09.2023)

European Commission (2023): Regional Innovation Scoreboard 2023 Country profile Germany. Available at: <u>https://ec.europa.eu/assets/rtd/ris/2023/ec_rtd_ris-regional-profiles-germany.pdf</u> (last access 11.10.2023).

European Commission (2020): Study on the effectiveness of public innovation support for SMEs in Europe . Annex E, INNOSUP evaluations. Available under: <u>https://op.europa.eu/en/publication-detail/-/publication/888d351a-9d97-11eb-b85c-01aa75ed71a1/language-en</u> (last access 29.09.2023).

Eurostat (2023). Gross domestic product (GDP) at current market prices by NUTS 3 regions. Available under: <u>https://ec.europa.eu/eurostat/databrowser/view/NAMA 10R 3GDP custom 7667002/default/table?lang=e n</u> (last access 04.10.2023).

Hansmeier, H.; Stahlecker, T. (2020):Evaluation study of the Cluster NanoMicroMaterialsPhotonics.NRW(NMWP).Availableunder:https://www.isi.fraunhofer.de/en/competence-center/politik-gesellschaft/projekte/nrw evalu landescluster.html (last access 10.10.2023).

Ketels, C. & Protsiv, S. (2021): Cluster presence and economic performance: a new look based on European data,RegionalStudies,55:2,208-220,DOI:10.1080/00343404.2020.1792435.Availableat:https://www.tandfonline.com/doi/full/10.1080/00343404.2020.1792435(last access 29.09.2023).

Kiese, M. and Kahl, J. (2017): Competitive funding in North Rhine-Westphalia: Advantages and drawbacks of a novel delivery system for cluster policies, Competitiveness Review, 27:5, 495-515, DOI: 10.1108/CR-09-2016-0062. Available at: <u>https://www.emerald.com/insight/content/doi/10.1108/CR-09-2016-0062/full/html</u> (last access 17.10.2023).

Ministerium für Wirtschaft, Innovation, Digitalisierung und Energie des Landes Nordrhein-Westfalen (2021): Regionale Innovationsstrategie des Landes Nordrhein-Westfalen. Available under: <u>https://www.wirtschaft.nrw/sites/default/files/documents/21-</u>

<u>0924_mwide_broschuere_regionale_innovationsstrategie_des_landes_nrw-web2.pdf</u> (last access 10.10.2023).

Ministerium für Wirtschaft, Innovation, Digitalisierung und Energie des Landes Nordrhein-Westfalen (2022):InnovationsberichtNordrhein-Westfalen.Availableunder:https://www.innovationsbericht.nrw/site/assets/files/1/innovationsbericht_nrw_2022_langfassung.pdf(lastaccess 31.10.2023)

Ministerium für Wirtschaft, Innovation, Digitalisierung und Energie des Landes Nordrhein-Westfalen (2022):Cluster-PanoramaNRW.Kurzversion.Availableunder:https://nrwinnovativ.de/wp-content/uploads/2022/07/220707MWIDE PDF Cluster Panorama.pdf

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: <u>https://op.europa.eu/en/publication-detail/-/publication/a2c3e9e1-3deb-11ec-89db-01aa75ed71a1/language-en/format-PDF/source-241039860</u> (last access 29.09.2023).

Annex



Figure 11: Top 10 sectors by employment in North Rhine-Westphalia (in 2020)

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





Source: ECCP (2021): European Cluster Panorama.

Figure 13: Performance of individual administrative districts in North Rhine-Westphalia (NRW) compared to the EU27 average in selected areas (2023)



ECCP (2023), own elaboration based on the Regional Innovation Scoreboard 2023

Figure 14: Performance of the five administrative districts in North Rhine-Westphalia in the Regional Competitiveness Index



EU Regional Competitiveness Index 2.0 - 2022 edition

Source: European Commission (2023): Regional Competitiveness Index 2.0 – 2022 edition. Available from: <u>https://ec.europa.eu/regional_policy/assets/regional-competitiveness/index.html#/</u> (last access on 06.10.2023)

Table 1: Overview of cluster organisations in North Rhine-Westphalia registered on the ECCP and their	
addressed EU industrial ecosystems	

N°	Cluster organisation	Industrial Ecosystems	Website
1	CLIB - Cluster Industrial Biotechnology	Agri-food	www.clib-cluster.de
2	Nano Micro Materials Photonics. NRW	Electronics, Digital	nmwp.nrw.de/
3	Food-Processing Initiative e.V.	Agri-food	www.foodprocessing.de
4	InnoZent OWL e.V.	Electronics	www.innozentowl.de
5	it's OWL Clustermanagement GmbH	Digital	www.its-owl.com/home/
6	IVAM Microtechnology Network	Digital, Electronics, Health	www.ivam.com
7	Kunststoff-Institut Lüdenscheid	Energy Intensive Industries	www.kunststoff-institut.de/
8	REGINA e.V.	Digital	www.regina.ac
9	Smart Logistics Cluster	Digital, Mobility- Transport-Automotive	<u>www.fir.rwth-</u> aachen.de/en/about- us/smart-logistics-cluster/
10	Medizin.NRW	Health	www.medizin.nrw/
11	KI.NRW	Digital, Health	<u>www.ki.nrw/</u>
12	Kunststoffland NRW e.V.	Energy Intensive Industries	www.kunststoffland-nrw.de/

Source: ECCP (2023), data as of 09.10.2023.

 Table 2: Overview of cluster organisations in North Rhine-Westphalia registered in the regional cluster

 network NRW.innovativ

N°	Cluster organisation	Innovation fields	Industrial Ecosystems	Website
1	5G.nrw	Technology	Digital	https://5g.nrw/
2	AeroSpace.NRW	Production, Technology	Aerospace & Defense	https://aerospace.nrw/
3	automotiveland.nrw	Mobility	Mobility- Transport- Automotive	https://www.automotiveland.nrw/
4	BIM-Cluster-NRW e.V.	Technology	Construction	https://bim-cluster-nrw.de/
5	BIO.NRW	Health, Technology, Environment	Health, Energy Intensive Industries	https://bio.nrw.de/
6	Blockchain.NRW	Technology	Digital	https://blockchain.nrw/
7	Blockchain-Europe.nrw	Technology	Digital	https://blockchain-europe.nrw/
8	Chemie.NRW c/o Verband der Chemischen Industrie	Production, Technology, Environment	Energy Intensive Industries	https://www.vci.de/nrw/der- verband/chemie-nrw/seiten.jsp
9	Cluster industrielle Biotechnologie e.V.	Health, Technology	Health	https://www.clib-cluster.de/de/
10	Cluster Medizin.NRW c/o DLR Projektträger	Health	Health	https://www.medizin.nrw/
11	Creative.NRW c/o Colabor e.V.	Creative	Cultural and Creative Industries	https://www.creative.nrw.de/
12	Digital.sicher.NRW - Kompetenzzentrum für Cybersicherheit in der Wirtschaft	Technology	Digital	https://www.digital-sicher.nrw/
13	Foodhub-NRW	Production	Agri-food	https://foodhub-nrw.de/
14	Food-Processing Initiative e.V.	Production	Agri-food	https://www.foodprocessing.de
15	Innocam.nrw	Mobility	Mobility- Transport- Automotive	https://www.innocam.nrw/

16	Kompetenznetzwerk Umweltwirtschaft.NRW	Environment	Agri-food, Mobility- Transport- Automotive, Energy Intensive Industries	<u>https://www.knuw.nrw</u>
17	Kompetenzplattform Künstliche Intelligenz (KI.NRW), c/o Fraunhofer IAIR	Technology	Digital	https://www.ki.nrw
18	Kunststoffland NRW e.V.	Production	Energy Intensive Industries	https://www.kunststoffland-nrw.de
19	Logistik.NRW Kompetenznetzwerk c/o LOG- IT Club e.V.	Mobility, Technology	Mobility- Transport- Automotive, Digital	https://www.logit-club.de
20	NMWP.NRW Cluster NanoMikroWerkstoffePhotonik	Production, Technology	Digital, Electronics	http://nmwp.nrw.de/
21	NRW.Energy4Climate	Energy, Mobility, Environment	Renewable Energy, Mobility- Transport- Automotive, Energy Intensive Industries, Construction	https://www.energy4climate.nrw/en/
22	Produktion.NRW	Production	Energy Intensive Industries, Electronics	https://produktionnrw.org/
23	Quantentechnologie.NRW	Production, Technology	Digital, Electronics	<u>http://qt.nrw.de/</u>
24	Spitzencluster Industrielle Innovationen (SPIN)	Production, Technology, Energy	Renewable Energy, Energy Intensive Industries	https://www.spin.ruhr/
25	Spitzencluster it's OWL	Production, Mobility, Technology	Digital	https://www.its-owl.de/home
26	Zukunftscluster NeuroSys	Technology	Electronics, Digital	https://www.neurosys.info/en
27	Zukunftscluster Wasserstoff	Energy, Mobility	Renewable Energy	https://h2-cluster.de/

Source: NRW.innovativ (2023).



Figure 15: Overview of the regional distribution of cluster organisations and networks in North Rhine-Westphalia

Source: NRW.innovativ (2023).





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.



Figure 17: 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: <u>https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/european-industrial-strategy en</u> (last access 19.04.2023).