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CLUSTERS IN SLOVAKIA

An Overview of Certification, Its Past, Present, and Future

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Foreword

In the European Union, there are currently over 3,000 cluster organizations, whose members employ more than 50 million workers, with every fourth job being linked to a cluster organization. Cluster organizations (for simplicity, we'll use the not entirely accurate term "clusters" going forward) are associations of competitive yet cooperating legal entities, including academic and research institutions, local governments, and civil society. Today, they are considered an effective form of supporting innovation in small and medium-sized enterprises, as well as the development of the regions in which they operate. According to available data, the productivity of business entities involved in clusters is 25% higher than the average¹.

In Slovakia, clusters are also an integral and significant part of the economy. Due to their complex structure, extensive experience, expertise, and the know-how of their members, they can efficiently and coordinatedly share their personnel, professional, and infrastructural capacities. These experiences and the established structure make them well-suited for coordinating and managing projects in applied research, as well as participating in initiatives aimed at increasing the economic performance of regions and addressing social issues such as the outflow of young people to metropolitan areas or abroad.

The potential of Slovak cluster organizations is not sufficiently understood at the national level, despite support from the Ministry of Economy of the Slovak Republic, the Slovak Innovation and Energy Agency (SIEA), participation in international projects, and the promotion of the importance of clusters. On the other hand, when compared to many other countries and regions, Slovakia and its best clusters can serve as a model for others.

In this publication, we aim to provide current data and facts about the life and development of cluster organizations. The data presented in the publication is anonymized and based on certification reports available to the collective authors. This basis allows for an objective assessment or at least an indication of where our clusters stand in European comparison and what steps need to be taken to support and ensure their further development and growth. In addition to the analytical evaluation of the state of the cluster ecosystem, the publication also includes the opinions of the people behind the clusters – cluster managers and other stakeholders who have been and continue to be involved in building the Slovak cluster ecosystem.

¹ European Commission (2021): European Expert Group on Clusters – Recommendation Report. Brussels: EC Directorate General for Internal Market, Industry, Entrepreneurship and SMEs, ISBN 978-92-76-30280-3

The History of the Clusters and Their Support in Slovakia

The first cluster in Slovakia was established in 2004 when the BITERAP cluster was founded, with a thematic focus on current and future technological trends in the context of bioeconomy. BITERAP, as a partner, collaborates with the National Forestry Centre and the Slovak Centre for Digital Innovations, offering cooperation on national and European topics in the aforementioned field. The primary goals of the association include expanding and strengthening the region in the digital and green transformation, as well as advancing in the field of biotechnology. The cluster has 16 members, including companies such as FineSoft, ALVIOM, Intersoft, and others. The academic background is represented by the Faculty of Informatics and Information Technologies at the Slovak University of Technology in Bratislava and the Economic University in Bratislava. BITERAP confirmed its pioneering role in 2014 when it received an international bronze certificate from the European Secretariat for Cluster Analysis (ESCA), making it one of the first clusters in Slovakia to undergo this assessment. It achieved bronze recertification in 2018 and 2021.

The systematic and active support for creating conditions for the development of clusters in Slovakia began in 2011, associated with the first international projects in which the Slovak Innovation and Energy Agency (SIEA) actively participated (CENTRAMO, ClusterCOOP, and ACE – Achieving Cluster Excellence).

Insights gained from these projects, along with a thorough analysis of existing international literature, have been translated into several publications. To date, the publication “*Cluster Policy in the Conditions of Slovakia*”² can be considered the most comprehensive analysis of the benefits of cluster existence.

Currently, there are 35 active industrial clusters in Slovakia. The growing interest in networking actors in the innovation ecosystem based on the triple- or quadruple-helix model is evident from the fact that 30% of cluster organizations are less than 3 years old. Slovak clusters represent a significant economic force, bringing together companies and organizations with over 100,000 employees and a total annual turnover of nearly EUR 23 billion³. In the ESCA evaluation, 18 clusters currently hold valid bronze ratings, one has a silver rating⁴, and one has a gold rating. Compared to neighboring countries (V4 + Austria), Slovakia has the highest number of valid bronze certificates (contributed to by support within the national project inovujme.sk from 2017 to 2023). In addition to the afore-

2 Balog, M. (2015): Klastrová politika v podmienkach Slovenska. Analýzy a štúdie SIEA, 99 p., ISBN: 978-80-88823-61.

3 <https://www.inovujme.sk/sk/slovensky-klastrovy-monitor>

4 Borza, V. – Magulová, R. (2022): ESCA Certification in Slovakia. INNO INDUSTRY online study visit Slovakia. <https://www.npc.sk>.

mentioned BITERAP cluster, other clusters certified by 2017 included Cluster AT+R, IT Valley Košice, and Slovak Plastic Cluster in 2013. Later in 2014, Z@IT, and the Electro-technical Cluster – Western Slovakia.

The support for the development of the cluster ecosystem, however, has not been and is not solely tied to certification or performance assessment. Since 2013, the Ministry of Economy of the Slovak Republic has regularly announced calls for the support of clusters, whether they are starting or already developed. Between 2013 and 2022, there were seven calls for submitting applications to grant subsidies for the support of industrial cluster organizations from the state budget.

During the programming period 2014-2023, two calls from the European Structural and Investment Funds to support business networking (2020) were successfully advocated. Twenty-one clusters received grants.

As mentioned earlier, many Slovak clusters can be qualitatively compared with foreign ones, as evidenced by their participation in consortia applying for project funding from European sources. Slovak clusters primarily engage in Interreg programs, but also in the highly competitive Horizon program. For example, the Bioeconomy cluster participates in up to six Horizon Europe projects and one COSME project. Their key themes include supporting the implementation of innovative management models to achieve progress in bioeconomy management, strengthening the knowledge and innovation system in health and safety on European farms, international development of innovative European healthy

ClusterCOOP

2011 – 2014

The goal of the ClusterCOOP project was to create and enhance conditions for mutual cooperation among clusters in Central and Eastern European countries. The project aimed to assist cluster organizations in better utilizing their innovation capacities and increasing their competitiveness, enabling them to collaborate effectively in the long term and improve their position in the Central European region and the European Economic Area.

Participating countries included Hungary, Czech Republic, Slovakia, Germany, Italy, Slovenia, and Poland.

Project outputs in the form of recommendations included:

- Promoting interregional cooperation, internationalization, and cross-border collaboration through new effective measures.
- Encouraging collaboration among regional clusters in emerging and new industries, urging member states to identify specific gaps in European value chains concerning the development and deployment of Key Enabling Technologies (KET).
- Removing obstacles to the development of opportunities for Emerging Industry at the EU level.
- Supporting the development of a credible networking culture through effective measures at the EU level.

foods, sustainable biological raw materials, and solutions in global markets.

The Slovak Plastic Cluster (SPK) is involved in two COSME projects, one project in the Erasmus+ program, and one in the Interreg program, focusing mainly on education, support for cross-sector collaboration in the textile industry, and internationalization (strengthening collaboration between member companies and the USA, Canada, Israel, and India).

Similarly, Košice IT Valley has been involved in several international projects within Interreg, the Digital Europe Programme, and the Košice 2.0 project. Projects within Interreg have brought valuable outputs. For example, CHAIN REACTIONS mainly assisted small and medium-sized enterprises in overcoming operational pressure and capacity shortages regarding innovation, as well as stronger integration into emerging multinational and global value chains. The goal of the CYBER project was to enhance the competitiveness of European companies in the field of cybersecurity by creating synergies between European smart regions in the field of cybersecurity. On the other hand, the Košice 2.0 project created a creative ecosystem involving various groups (local government, population, business sector) to support innovative and experimental projects in sustainable urban development to an extent that cities would not typically be able to fund under normal circumstances. Košice became the first city in Slovakia to succeed in the Urban Innovative Action call.

In addition to their direct participation, clusters also engaged as associated partners or stakeholders in projects implementing cluster policies in the field, such as ClusterFY and INNO INDUSTRY, part of the Interreg Europe program. As part of the ClusterFY project, an Action Plan to support clusters in Slovakia was developed and implemented, aiming to improve innovative policy tools, focusing on enhancing the “Scheme for Supporting Industrial Cluster Organizations” from 2014.

CENTRAMO

2011 – 2012

The goal of the CENTRAMO project (Cluster Excellence Network for Training and Mobility) was to enhance the quality of cluster management within networks in participating countries.

Partner countries included Hungary, the Czech Republic, Slovakia, Poland, Croatia, and Turkey.

Project Outputs:

- Training of experts for cluster benchmarking
- Cluster management training
- Training materials
- Benchmarking of a total of 60 clusters and the opportunity to join the “European Cluster Managers Club
- Organizing study visits for cluster managers abroad

One of the most significant contributions of the ClusterFY project was the establishment of the Cluster Stakeholder Working Group (CSWG) with wide spectre of stakeholders. This group collaborates on the preparation of methodological and other positional documents and continues its activities even after the completion of the ClusterFY project. Besides regular quarterly meetings, it has also created a separate working group for applied research to draw attention to the untapped potential of clusters in the field of science, research, and innovation.

The national project inovujme.sk provided a significant impulse for supporting the development of the cluster ecosystem. It not only secured funding for cluster certifications but also continued the work of the Cluster Stakeholder Working Group (CSWG). Additionally, it provided a web space for a new element aimed at increasing the visibility of clusters externally and facilitating communication among clusters – the Slovak Cluster Monitor. This platform regularly publishes news and event invitations organized by clusters, as well as professional publications and presentations from events.

Successes in building the cluster ecosystem include long term securing resources within the new national project inovujme2.sk to create conditions for mutual exchange of experiences among Slovak and foreign clusters through annual national cluster conferences organized by SIEA, strategic advisory and mentoring services.

Achieving Cluster Excellence (ACE)

2014 – 2016

The aim of the project was to strengthen the level of cluster management through international benchmarking of clusters applying for the bronze certificate of “cluster excellence,” training experts, and identifying the most suitable candidates for the “Gold label” recognition from clusters in individual participant countries and regions. This creates an opportunity for the best clusters to obtain a prestigious certificate recognized throughout the European Union.

Partner countries: Italy, Spain, Hungary, and Slovakia

Outcomes:

- International benchmarking of 6 Slovak clusters, training of experts in the field of cluster management.
- Identification of the most suitable candidates for the “Gold label” recognition from partner countries and regions (Košice IT Valley, first-time recipient of the gold excellence badge).
- Organization of an international conference titled “Pre-Gold Meeting” in Brussels, organized by SIEA.
- Closer cooperation of clusters with the ECCP (European Cluster Collaboration Platform).

The first conference took place in Košice on March 29, 2023. Coordinated by the Union of Slovak Clusters (UKS), it was dedicated to representatives of domestic clusters and companies. It highlighted the functional national and international assessment of cluster development and previous cluster cooperation in Slovakia. Presentations and discussions addressed the results of the seven-year effort by SIEA in this area, implemented within the national project inovujme.sk. This project focused, among other things, on supporting and building a strong and resilient cluster ecosystem.

Delegates agreed that during the mentioned period, the number of registered cluster organizations had grown to over 30 active ones. The quality of cluster management increased, and there was an increased interest in participating in international projects. Clusters themselves positively evaluated the mutual cooperation between SIEA, UKS, the Ministry of Economy of the SR, and other institutions in creating supportive tools (schemes/calls), building networks, and establishing a system of regular meetings to address current challenges. Participants also discussed the future direction of industrial clusters, their significance for regional economic development, state support tools, and the direct participation of clusters in addressing societal challenges such as digitization, support for the green economy and renewable resources, and economic recovery in the post-pandemic period.



Fig. 1: Graphic Design of the 1st National Cluster Conference

The 1st National Cluster Conference preceded the international event “Clusters Meet Regions,” dedicated to cooperation with Ukrainian clusters, held on March 29–30, 2023, in Košice under the auspices of the European Cluster Collaboration Platform, with SIEA being the main organizer. The conference’s highlights included speeches by two prime ministers – the host country’s Prime Minister, Mr. Eduard Heger, spoke in person, while the Prime Minister of Ukraine addressed the audience through a video link due to the state of war.

Both domestic and foreign delegates focused on presenting opportunities for cooperation and integration of Ukrainian clusters and businesses into EU value chains. Since many Ukrainian and European businesses lost their supplier-customer relationships and markets due

to the war conflict, participants supported the idea of establishing new economic partnerships and strengthening collaboration between individual companies. Additionally, they addressed the need for revitalizing disrupted relationships and improving market diversification.

Speakers from European institutions, Ukraine, Slovakia, Poland, other neighboring countries, as well as international organizations, dedicated their presentations and panel inputs to specific steps for addressing the mentioned issues and future international cooperation. During the event, SIEA received several requests and suggestions for organizing roundtable discussions and mutual meetings with Ukrainian clusters and associations.



Fig. 2: Graphic Design of the Clusters Meet Regions Conference



Fig. 3: Prime Minister of the Government of the Slovak Republic, Mr. Eduard Heger



Fig. 4: The Event Team of SIEA

From left to right: Viktor Sucha, Tatiana Vogelová, Artur Šturmankin, Zuzana Slezáková, Vladimír Janeček, Branislav Šulgan, Michal Mühl, Tomáš Varadínek, Vladimír Borza, Peter Balcerčík, Michal Kubalák, Zuzana Valentová, Kristína Poláková, Slávka Kočanová, Nikola Kottferová, Juraj Tury a Ľubomír Lacúch.



Fig. 5: Ms. Renata Magulova, Deputy Director General



Fig. 6: Participants of the Clusters Meet Regions Event

The year 2023 is not only marked by the completion of the first phase of the inovujme.sk program and the hosting of the inaugural national cluster conference, but it also witnessed the full implementation of the performance assessment of cluster organizations. Additionally, the Cluster Development Strategy for the years 2023–2028 was formulated, emerging as a pivotal document for creating a strategic framework – establishing the vision, goals, and measures for the long-term development of clusters and cluster organizations in the Slovak Republic to support the enhancement of the country’s innovation performance. This document fills a void in this area, as no similar strategy had been prepared and implemented in Slovakia before. The objective of the new strategy is to shift from quantitative goals (having as many clusters or certified clusters regardless of performance) to qualitative goals (having more excellent clusters at the silver and gold ESCA certificate levels). Support for cluster organizations will simultaneously reflect their current performance assessed within the national evaluation. The essential part of the strategy is to continue working on improving operating conditions for all clusters that aspire to bring new development impulses and innovations to their members, regions, and Slovakia.

All these activities, significantly supported by the national project inovujme.sk project, have contributed to Slovakia's acceptance on the international (European) cluster scene. In addition to the Union of Slovak Clusters's active participation in the European Cluster Collaboration Platform's activities, SIEA's active involvement as Slovakia's representative in the European Commission's working group added significant impetus to how clusters are perceived within the EC, aiding in improving the understanding of clusters in Slovakia⁵. Similarly, the positive reception of the ClusterFY and InnoIndustry projects led to SIEA being invited to a peer review in Lahti, Finland, as part of the Interreg Policy Learning Platform, which provides expert assistance based on experiences gained from the implementation of Interreg Europe projects.



Fig. 7: Round Table Discussion on the Role of Clusters in the Innovation Process. COINTT 2022

5 European Commission (2021): European Expert Group on Clusters – Recommendation Report. Brussels: EC Directorate General for Internal Market, Industry, Entrepreneurship and SMEs. ISBN 978-92-76-30280-3

Standardization of Clusters/Certification Approaches in Europe and Slovakia

Certification within the European Union is exclusively conducted by the European Secretariat for Cluster Analysis (ESCA), operating within VDI/VDE Innovation + Technik GmbH in Germany. Established in 2011 as part of the VDI/VDE – IT organization to perform cluster analyses, certification activities, and training for benchmarking experts, ESCA developed its own methodology and approach for cluster assessment. This methodology was integrated into the activities of the European Cluster Initiative, funded by the European Commission. ESCA also serves as an advisory body to the European Commission.

According to ESCA, the development of a cluster depends on the management, composition, and interaction among its participants, as well as the quality of cluster management. Cluster mapping is, therefore, a necessary condition for maintaining the competitiveness of the cluster and is based on the assumption that the benefits, or the identification and elimination of potential shortcomings, need to be evaluated in a certain way. Properly set evaluation can identify and subsequently address deficiencies related to its management, thereby enhancing the quality of its leadership⁶.

Clusters that hold ESCA certificates are included in the European cluster database, have easier access to international projects and contacts throughout Europe, and their market reputation is enhanced. The ESCA certificate is a prerequisite for a certain cluster quality and carries similar weight to the certification of companies according to ISO standards.

6 Bobovnický, A. – Borza, V. – Duman, P. – Vavrđová, A. (2018a): Medzinárodná certifikácia klastrov na Slovensku. Vydav. SIEA, 34 p., ISBN: 978-80-88823-70-4.

**The Acceleration of
Cluster Certifications in
Slovakia with the Support
of the National Project
inovujme.sk**

A significant impetus for the development of the cluster ecosystem was the national project inovujme.sk. After its approval by the Monitoring Committee of the OP VaI in the summer of 2016, activities related to all three sub-activities began. Sub-activity 3 aimed to support the certification of clusters in Slovakia. The first round of certifications took place in 2019 after managing the entire public procurement process. The first 11 clusters obtained a bronze certificate, and based on the results' analysis, initial proposals were made to set goals for grant support, which was planned within the OP VaI for 2020. The results summarized in the certification report, describing strengths and weaknesses of cluster organizations, served to establish target indicators for grant provision.

The preparation of the call acted as an impetus, and even less active clusters began to get involved. In 2020, another 9 cluster organizations were already certified. It was also possible to recertify the only gold cluster in Slovakia so far – the IT Valley Košice Cluster. By then, we had 21 certified cluster organizations that participated in the grant call and obtained funding for their further development.

In hindsight, the question arises whether the possibility of obtaining a grant contributed to too rapid growth in the number of clusters in Slovakia. To answer this, a brief look at whether all the clusters certified in 2019 and 2020 are developing their activities and participating in the Cluster Mornings at SIEA may be sufficient. Out of 21 certified clusters, we are consistently in contact with 20, so there is no reason to underestimate the importance of the national project inovujme.sk. The inovujme.sk project is not the only activity that contributed to the unexpected growth in interest in networking. It was a synergistic effect of several factors: economic development, issues with availability of skilled labor force, pressure to increase the cooperation between companies and the academic community, the need to address the education system for practical needs, and more.

In the following years, there was an emergence or transformation of existing civic associations into interest associations of legal entities, allowing them to automatically apply for ESCA certification. In 2023, there are 35 active clusters registered in Slovakia.

In the period before the start of the national project, the main source of support for clusters was the Ministry of Economy, which managed to provide assistance through the de minimis aid scheme from budgetary resources. Later, it was the OP R&I at the Ministry of Economy, which implemented the first call for cluster development financing in 2020. This was complemented by the activities of the Slovak Innovation and Energy Agency

(SIEA) and the Slovak Business Agency (SBA) in the implementation of international projects focused on clusters, further activating the cluster ecosystem. The Union of Slovak Clusters played an indispensable role in the entire system, representing Slovakia in ECCP (European Cluster Collaboration Platform) and serving as a conduit for transferring trends and initiatives from the EC (European Commission) and EU levels to Slovakia and cluster organizations.

With the support of the inovujme.sk project, the certification and recertification of clusters were conducted over four years, totaling 38 certification processes (see *Table 1*), funded by the project. Certification and recertification processes continued in the following years, namely in 2022 (1) and 2023 (6), but clusters covered the costs from their own funds.

Cluster certification clearly demonstrated that the right initiative can create conditions and interest among companies for networking, which, in turn, fosters competitiveness and economic growth.

The entire certification process and national assessment are mapped by the Slovak Cluster Monitor. This is a valuable source of information about the cluster ecosystem as a whole, allowing for targeted direction of various support tools in the future to contribute to increasing the innovation and managerial performance of clusters.

International cluster certification has also become a tool and requirement for obtaining financial support for the development of their own activities.

Union of Slovak Clusters (UKS)

Established in 2010 as an interest association of legal entities based in Nitra. It is the sole organization representing clusters in Slovakia and currently has 18 members. UKS contributes to the creation of a quality and competitive business environment, especially in the field of innovation, through close collaboration with regional self-government, the academic sphere, research and development organizations, and business practices.

The objectives of UKS include:

- Support for the creation and development of cluster policy in Slovakia.
- Strengthening research, product development, innovation, and technology transfer.
- Enhancing all education systems in the interest areas of member clusters.
- Supporting the exchange of information at the national and international levels in the field of innovation.
- Involvement in international partnerships within projects related to education, development, research, and knowledge transfer.
- Active participation in the Cluster Stakeholder Working Group (CSWG).

We operated on the assumption that a small, open economy like Slovakia necessarily needs to increase its export performance for economic growth in a hyper-competitive environment⁷, and this is contingent upon innovation performance. Therefore, it is essential to support the best performers who can serve as role models for others.

For these reasons, in 2022, the Ministry of Economy of the Slovak Republic (MH SR) commissioned development and approved a methodology for assessing clusters at the national level, prepared by SIEA. This methodology has become part of the De Minimis Aid Scheme to support cluster organizations from the state budget for emerging clusters in the development stage, as well as for providing grants from the ERDF.

The goal of this methodology is to complement ESCA certification with performance indicators. This approach will better define the relationship between the objectives of OP Slovakia, the Recovery and Resilience Plan, and the ability of individual clusters (in terms of performance) to achieve the set goals. As mentioned earlier, the national methodology is intended to complement ESCA assessment. ESCA certification will continue to be a tool for improving management processes for clusters. Obtaining the ESCA certificate will be positively assessed within the national cluster performance evaluation.

Table 1: Number of Clusters that Obtained Certification in the Years 2018–2021

ESCA certificate	2018	2019	2020	2021	Total
Bronze	4	11	9	11	35
Silver	0	0	0	1	1
Gold	1	0	1	0	2
Total	5	11	10	12	38

7 d'Aveni, R.: Managing the Dynamics of Strategic Maneuvering. The Free Press, 1994

**National Cluster
Performance Assessment
(NCPA). Philosophy,
Criteria, and Comparison
with ESCA**

Because we hinted at some aspects of the NCPA in previous sections, we find it necessary to provide the reader with more details at this point. NCPA represents a comprehensive system for evaluating the performance of clusters operating in Slovakia. Unlike the international ESCA assessment, NCPA evaluates not only the quality of cluster management but also focuses on its activities and results. SIEA has been conducting this assessment since May 2022, based on the authorization of the Ministry of Economy of the Slovak Republic. The philosophy and criteria of NCPA were developed in collaboration with the CSWG.

The evaluation is provided free of charge to each applicant (cluster) at two-year intervals. The goal is to assess the performance of clusters and classify them based on the obtained scoring into one of three basic groups:

- Moderately Advanced Cluster
- Advanced Cluster
- Matured Cluster

Only industrial clusters registered as associations of legal entities are included in the national support system for clusters and the corresponding evaluation. The assessment does not apply to chambers, associations, civic associations, and other organizations, even if they deal with industry and innovation.

NCPA was created not only to replace the obligation of ESCA certification in domestic support schemes but also to identify the status and progress of clusters in Slovakia and set conditions and tools for supporting their development. From the obtained data, SIEA maps the development and changes in the cluster ecosystem and sets conditions and tools for supporting its development.

However, the significance of ESCA certification remains, as the expanded criteria of NCPE consider whether clusters have a valid ESCA certification and the type of excellence degree obtained (bronze/silver/gold). A more specific comparison of the two cluster assessment methodologies is presented in the publication ESCA vs NCPA⁸.

NCPA is a two-stage process. In the first step, the cluster undergoes an exclusion evaluation of basic criteria, and if it fails to meet any of these criteria, it cannot proceed to the

8 Borza, V. – Magulová, R. – Ružičková (2022): KLASTRE – DVA MODELY HODNOTENIA. Certifikácia vs. Národné hodnotenie výkonnosti klastrov. Zborník prezentácií a abstraktov úspešných inovácií. Národný energetický klaster NEK, ISBN 978-80-973571-3-9, pp. 334 - 341.

second evaluation phase. For the assessment of basic criteria, the cluster substantiates its structure and composition, submitting articles of association, social contract, or founding charter, as well as a strategy. Based on the submitted materials, evaluators then assess whether the cluster:

- Meets the cluster definition – A cluster is considered a network of companies and research institutions (including universities) with a thematic focus, regional concentration, institutional organization, and cluster manager leadership. The cluster may also include other actors, such as public agencies.
- Has in its articles of association/social contract/founding charter the anchoring of supporting and/or implementing innovations, enhancing competitiveness, or export activities as one of the main activities.
- Has an adopted strategy for the cluster organization, including a clearly defined focus, goals, management, financial sustainability (with a plan for at least two years), and thematic focus on a specific domain of smart specialization.
- Has at least one person engaged in activities on behalf of the cluster employed for a minimum of 20% workload (equivalent to full-time employment) or performing these activities in the form of a contribution from a cluster member or in another form (e.g., management service provision).

After meeting the basic exclusion criteria, the cluster can undergo the second-stage assessment, which is based on the formal submission of all required materials, performance criteria evaluation within the extended criteria of cluster performance, and meeting the minimum scoring quota. A total of 21 extended performance criteria are divided into four evaluation groups – Cluster Structure, Communication and Activities (Internal and External), Innovation Focused Activities, and International Activities. The level of meeting the extended criteria classifies the cluster assessment into three outcome categories.

ClusterFY Interreg Europe

2017 – 2022

The goal of the ClusterFY project was to create conditions for the integration of clusters at the regional, national, and international levels and contribute to increasing the potential of their value chains, enhancing the ability to commercialize knowledge, and generating revolutionary innovative solutions – especially in the priority areas of smart specialization in Slovakia.

Partner countries: Lithuania (MITA), Netherlands (SNN), Sweden (Hudiksvalls Kommun), Poland (PARP), Romania (SM RDA), Spain (UCLM), Slovakia (SIEA), and Greece (CERTH).

Outputs:

“Action Plan to Support Slovak Clusters” and an analysis of the impact of the COVID-19 pandemic on the cluster ecosystem.

Cluster Structure – Evaluation of the cluster’s ability to function in the short and long term. The Cluster Structure criteria group should lead to answering the following questions:

- How long has the cluster existed?
- From what members (companies, public administration organizations, educational institutions, research and development institutions) does the cluster consist?
- What personal, spatial, and technical capacities does the cluster have
- Can the cluster effectively manage its activities?
- What level does the cluster achieve within the ESCA assessment?

Communication and Activities (Internal & External) – orientation towards cluster communication with its members as well as the external environment. Both forms of communication are considered crucial cluster activities, so these criteria are evaluated with a high emphasis on quality. In the case of the Communication and Activities group, the following questions should be addressed:

- How do cluster members communicate with each other? Is there a common communication platform or formalized internal communication?
- How often and in what forms do cluster members meet? Are cluster member meetings formalized, i.e., defined in the cluster’s founding documents?
- What professional events does the cluster organize for the external environment?
- In what ways does the cluster communicate with the external environment? Does it primarily use the web, social networks, or other forms of communication?
- What events focused on collaboration, innovation, and education do cluster members attend?

Innovation Focused Activities – the area of innovative activities is among the most important performance areas for clusters. However, many clusters in Slovakia are not pro-innovation oriented. The third group of Innovation Activities aims to answer these questions:

- What results does the cluster achieve in terms of research, development, and innovation? This includes research and development cooperation, solving complex research and development projects, or the final application of the results of such projects in practice.
- Does the cluster engage in activities related to the application of intellectual property? If so, in what form?

- Do the cluster and its members participate in project activities in the field of research, development, and innovation? If so, is it more about project partnerships or project leadership?
- Does the cluster have its research and development and innovation base?
- Are active cluster members involved in addressing public policies in the field of research, development, and innovation?

International Activities – within the last group of questions, we evaluate the ability of groups to internationalize and export, as well as their members. Clusters try to answer these questions:

- Does the cluster or its members engage in international project activities in an area other than research, development, and innovation, either as a coordinator or partner?
- Does the cluster or its members participate in international activities and solutions related to smart specialization domains?
- What is the overall export potential of the cluster?

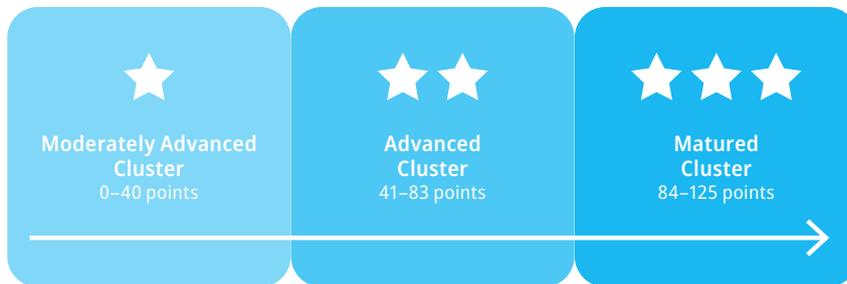


Fig. 8: Categories of the National Cluster Performance Assessment

Financial Support Tools for Clusters Are Closely Linked to Certification and Performance Evaluation

Financial support for clusters represents a crucial element in fostering and developing cluster initiatives. Clusters, groups of similarly oriented businesses and institutions in a specific area or industry, have the potential to increase productivity, competitiveness, and innovation. However, without adequate financial support, their success may be limited.

Financial support for clusters is essential not only for promoting regional cooperation but also for harnessing the full potential of existing clusters and fostering the creation of new ones. EU countries employ various tools to support cluster development in industries they consider strategically beneficial for the future of their economies.

Subsidies from the state budget, provided by the Ministry of Economy of the Slovak Republic with occasional breaks since 2013, enable the streamlining of mutual cooperation, the development of expert activities, the creation of strategic materials and technological maps, and the better presentation of industrial cluster organizations domestically and internationally. The current scheme allows for subsidies ranging from 10,000 to 75,000 euros, with organizations contributing only 15% of the co-financing. Applicants for subsidies in calls announced since 2022 must undergo the National Cluster Evaluation conducted by the Slovak Innovation and Energy Agency before submitting their applications. It can be noted that the short time frame for project implementation (a few months) and the subsidy amount do not allow for the execution of more demanding activities. Nevertheless, this support has assisted and continues to assist clusters in covering at least part of the costs they would otherwise have to bear from their own resources.

Table 2: Overview of Calls for Cluster Support Subsidies from the State Budget

Year	Budget (EUR)	No. of applications	No. of approved projects	Total value (EUR)
2013	200,000	/	6	160,569.96
2014	113,000	/	7	127,527.00
2015	130,000	12	7	130,000.00
2016	245,000	10	7	242,200.00
2018	300,000	5	5	155,580.25
2019	150,000	7	6	150,000.00
2022	250,000	9	7	234,263.49

Within the Operational Program Integrated Infrastructure, two calls for grant applications were announced in 2020 to support clusters. These calls focused on providing non-repayable financial contributions to promote business networking. One was directed

at the Bratislava region (OPII-MH/DP/2020/10.3-29), and the other covered the remaining regions of Slovakia (OPII-MH/DP/2020/9.5-28). In these calls, clusters had the opportunity to obtain financial resources to cover the costs of cluster management, services related to cluster organization activities, expenses associated with participation in domestic and international promotional and educational events, and other eligible expenses. The financial support ranged from 50,000 to 200,000 euros, with a maximum aid intensity of 85%. Applicants were required to hold at least a bronze certificate according to the assessment of the European Secretariat for Cluster Analysis (ESCA). Clusters implemented two-year projects, and given the ratio of existing clusters to supported clusters, it can be stated that there was significant interest from clusters in these calls

Table 3: Calls for Grant Applications for Cluster Support from ERDF

Year	Call	Budget (EUR)	No. of applications	No. of approved projects	Total value (EUR)
2020	OPII-MH/DP/2020/9.5-28	2,700,000	17	14	2,397,583
2020	OPII-MH/DP/2020/10.3-29	2,300,000	7	7	1,264,992

For emerging clusters not older than three years, a Call for Proposals for grants to support industrial cluster organizations within the Minimum Aid Scheme DM 6/2022 was announced in July 2022. Grants totaling EUR 234,263.49 were approved for clusters.

Cluster performance assessment has become an essential tool to enhance the credibility and competitiveness of the cluster. It encompasses various aspects such as the quality of cluster management, membership base, internationalization, collaboration, and more. However, funding and assessment are not isolated processes; they can mutually influence each other.

Here are some key aspects of the relationship between cluster performance assessment and public financial support:

- **Funding for the ESCA Certification for Silver and Gold certificate**

ESCA cluster certification, especially at the highest level, can be a costly process requiring specialized knowledge and resources. Financial support can be utilized to cover the costs associated with the certification process, including the implementation of recommendations from the certification institution. This funding can assist the cluster in achieving certification more quickly and efficiently.

- **Increased Credibility, Trustworthiness, and Access to Financial Resources**
When a cluster undergoes certification, it demonstrates a commitment to quality, proven practices, and professionalism. It can thus represent a more reliable entity in terms of public funding support.
- **Contribution to regional (national) development**
Clusters that contribute to achieving regional or national strategic goals through their activities aligned with their cluster strategy are more likely to obtain public funding.
- **Sustainability**
Public financial support can help assessed clusters maintain their activities and continue to meet the standards necessary to maintain or improve their ratings.

Certification from the Perspective of Cluster Managers

Since a publication about clusters without inputs from the clusters themselves, represented by their managers, may lack sufficient informative value, we posed three questions to cluster managers:

- Q1: How have the results of the European Cluster Analysis Secretariat (ESCA) certification influenced the activities of your cluster and what benefits do they bring to you?**
- Q2: In which areas have you managed to significantly improve during the certification process?**
- Q3: How do you evaluate the cooperation of your cluster with SIEA in the area of cluster development?**



IT Valley Košice

Ing. Miriama Hučková

Executive Director

How have the results of the ESCA certification influenced the activities of your cluster and what benefits do they bring to you?

Thanks to ESCA certification, we found ourselves in the ‘prestigious company’ of the best European clusters, providing us with the opportunity to be partners in very interesting projects. We particularly value the sharing of experiences and information during events with representatives of foreign clusters. It is through these inspirations from abroad that we subsequently initiated our own projects.

In which areas have you managed to significantly improve during the certification process?

I appreciate that SIEA strives to support clusters not only in practical terms but also by creating policies to enhance cluster performance and innovation activities. Many do not perceive the potential hidden in clusters. Therefore, I am pleased that we have a reliable partner in SIEA, which increases awareness of the importance of clusters and provides access to information.



SLOVAK PLASTIC CLUSTER (SPK)

PhDr. Katarína Ikrényiová

Director

How have the results of the ESCA certification influenced the activities of your cluster and what benefits do they bring to you?

The certification process provided valuable feedback. The silver certification, along with written and graphical evaluations, significantly benefited from direct personal contact with the evaluator. This interaction not only addressed specific explanations from the cluster office but also shared experiences from other countries, providing interesting information and recommendations. This advisory moment during the evaluation process significantly propelled the organization forward in almost all areas.

In which areas have you managed to significantly improve during the certification process?

Certainly, the area of communication with members, interconnecting members with each other, and strengthening cooperation among members at the regional level. Progress was also made in the PR activities of the cluster, presentations, and the preparation of various print and electronic materials. The cluster became more open to collaboration with other sectors, and personnel stability was achieved. Independently or in collaboration with partners, various tools were developed to address issues in the plastics processing sector. Certainly, there was progress in cluster financial management.

How do you evaluate the cooperation of your cluster with SIEA in the area of cluster development?

From an establishment perspective, SPK is a matured cluster, so we appreciate that after years of unfavorable or neutral situations regarding cluster organizations in Slovakia, SIEA has taken on the role of providing information and coordination. Recently, SIEA has created favorable conditions for announcing the first call to support the functioning of cluster organizations. Through various actions, it has facilitated the exchange of experiences among clusters. Additionally, as part of a national project overseen by SIEA, financial support has been provided for bronze certifications, and in the case of SPK, even silver certification. SPK, as a stakeholder, has also been involved in an international project where SIEA was a partner. Recently, SIEA has prepared, tested, and implemented the National Cluster Performance Assessment System, which SPK has successfully completed.



INOVATO CLUSTER

Ing. Anna Čaplovičová

Executive Director

How have the results of the ESCA certification influenced the activities of your cluster and what benefits do they bring to you?

The results of the ESCA certification and, especially, the Benchmark report, which was the output of the evaluation, helped us gain valuable advice and recommendations for optimal cluster management. The evaluation inspired us in fulfilling and updating the cluster strategy, helping us better define key themes, activities, and indicators. The process, overall, helped professionalize our management and activities.



INDUSTRY INNOVATION CLUSTER SLOVAKIA

Martina Le Gall Maláková

President

How have the results of the ESCA certification influenced the activities of your cluster and what benefits do they bring to you?

ESCA certification positively influenced our functioning, as it pointed out our strengths and weaknesses, motivating us to continually improve our operations and services for members and the entire innovation ecosystem. The entire process was very beneficial, especially since it is a European certification, providing a mirror for our cluster on a European scale. This was very valuable.



Slovak Association of the Photovoltaic Industry and RES

Ing. Ján Karaba

Director

How do you evaluate the cooperation of your cluster with SIEA in the area of cluster development?

We highly value the cooperation between SAPI and SIEA, considering it to be at a very high professional level. We are especially pleased with the Green Households II program, which, thanks to our collaboration, is now ideally configured and provides maximum assistance to residents interested in renewable energy. I cannot forget to mention the Svetlo v Obciach a Budovách conference, where I had the opportunity to address the topic of Efficient Utilization of Photovoltaic Systems in municipalities. I believe that our collaboration will continue to deepen, benefiting primarily the Slovak renewable energy sector.



Slovak Electric Vehicle Association (SEVA)

Patrik Križanský

Director

How have the results of the ESCA certification influenced the activities of your cluster and what benefits do they bring to you?

Certification helped us identify some gaps that are important to address in our organization. It is always useful to know where we stand in general according to objectively set criteria and where the market benchmark is. Certifications are worthwhile due to such findings.



Energy Cluster of the Prešov Region

Ing. Rudolf Pojezdala

Director

How have the results of the ESCA certification influenced the activities of your cluster and what benefits do they bring to you?

ESCA certification helped our organization precisely define goals, deepen intra-cluster cooperation, and systematically collect outputs from our activities. Certification also served as a mirror reflecting the cluster's efficiency compared to similar organizations on a broader European scale.

How do you evaluate the cooperation of your cluster with SIEA in the area of cluster development?

In the field of cluster development, SIEA holds an irreplaceable position. I would like to emphasize the highly professional and client-oriented approach of SIEA employees, both project managers and senior staff.



Council of Slovak Exporters

Mgr. Lukáš Parížek

Chairman

How have the results of the ESCA certification influenced the activities of your cluster and what benefits do they bring to you?

Certification has enhanced the credibility and visibility of our cluster both domestically and internationally. Simultaneously, it has become easier for us to establish partnerships and collaborations with other clusters and organizations.

In which areas have you managed to significantly improve during the certification process?

During the certification process, we focused on improving several key areas of our operations. One of the significant enhancements was management and strategic planning.



Slovak Battery Alliance

doc. RNDr. Andrea Straková Fedorková, PhD.

Chairwoman

How have the results of the ESCA certification influenced the activities of your cluster and what benefits do they bring to you?

The certification results highlighted our weaknesses, especially in internal cluster management, prompting us to strategically plan financial resources, particularly for cluster personnel capacities. Certification was a clear contribution to our strategies and orienting the cluster's activities towards international partnerships and joint projects, which are essential for our alliance.

In which areas have you managed to significantly improve during the certification process?

The certification process helped us align the internal functioning of our cluster and improve relationships and communication with members. In repeated certifications, we changed several internal processes, ensured personnel capacities for individual activities, and introduced an internal communication system for projects.



Food Chamber of Slovakia (PKS)

JUDr. Jana Venhartová LL.M.

Director

In which areas have you managed to significantly improve during the certification process?

The certification audit results showed significant improvement in the internationalization area, especially in Europe and Asia. This is closely related to more intensive business development, support for cluster policy development, and the implementation of its strategy. There was also an increase in management members, engagement in foreign institutions (e.g., FoodDrinkEurope), and the creation of networking activities (e.g., cluster's own conference "Food Law") and publications (e.g., the book "Food Law"). PKS significantly increased the number of educational activities in collaboration with Slovak universities.



Bioeconomy Cluster

Ing. Katarína Blicklingová

Director

How have the results of the ESCA certification influenced the activities of your cluster and what benefits do they bring to you?

Thanks to certification, Bioeconomy Cluster became more visible internationally, especially in projects such as Horizon 2020 and Horizon Europe. It opened doors for collaboration with significant European clusters, with whom we currently implement projects aimed at supporting the export of small and medium-sized enterprises to third countries.

How do you evaluate the cooperation of your cluster with SIEA in the area of cluster development?

Thanks to the collaboration of the Ministry of Economy of the Slovak Republic (MH SR), SIEA, and clusters, a pilot scheme to support clusters in Slovakia was launched. This significantly contributed to stabilizing clusters and developing their activities on a national and international level. Intensive collaboration has also led to the organization of the 1st National Cluster Conference, raising awareness of clusters among policymakers and creating inter-industry synergies between clusters. We believe that such successful collaboration between SIEA and clusters will continue.



HEMP CLUSTER
Dušan Knezovič
Director

In which areas have you managed to significantly improve during the certification process?

HEMP CLUSTER, since its establishment, has created a network of relationships, where members collaborate with partners on specific projects, forming an intersectoral network with innovative and transformative potential of hemp. As a startup cluster in the domestic developmental and grant environment, it implements economic, ecological, and social innovation mainly in Slovakia and for Slovakia.

HEMP CLUSTER introduces hemp-based biocircular economy to the awareness of stakeholders, capable of transforming not only agriculture and industrial structure but also rural areas. The intersectoral potential of industrial hemp for the green transformation of Slovakia represents a significant part of economic lobbying and simultaneously a challenge for creators of development strategies



Cluster BITERAP
Ing. Peter Linhardt, PhD.
Chairman of the Supervisory Board

How do you evaluate the cooperation of your cluster with SIEA in the area of cluster development?

Cluster BITERAP, founded in 2004, was first certified in 2014, receiving a bronze award and becoming the first certified cluster in Slovakia. Through recertification, it consistently obtained a bronze certificate in 2018 and 2021. Certification significantly helped the cluster identify reserves in member involvement and formulate cluster goals for the next period.

The cluster management relies on SIEA's knowledge and assistance in setting goals and procedures for project preparation and certification. The cooperation with SIEA is crucial and essentially irreplaceable because SIEA has experience and knowledge from dozens of projects and collaborations with numerous clusters, which it readily shares.



Cluster of Regional Development

JUDr. Marek Turanský, MBA

Executive Director

How have the results of the ESCA certification influenced the activities of your cluster and what benefits do they bring to you?

We started recording our activities more systematically. Certification showed us that many of the activities we undertake are not adequately presented, which is detrimental. Therefore, we improved our website, added an English version, began posting updates, and archived more systematically. We also started paying more attention to evaluating completed activities and adopting new forms of communication with our membership base and partners.



Cassovia New Industry Cluster

prof. RNDr. Pavol Miškovský, DrSc.

Chairman of the Board

How have the results of the ESCA certification influenced the activities of your cluster and what benefits do they bring to you?

Thanks to obtaining the 'Cluster Management Excellence' bronze medal from ESCA, the visibility of the cluster increased at the national and international levels. As a result of certification, we received two grants to participate in events organized by ECCP in Marrakech and South Africa. We also established new collaborations with partners from Slovakia and abroad.



House of Events Innovation

Ing. Viliam Bošiak, MBA

Executive Director

How have the results of the ESCA certification influenced the activities of your cluster and what benefits do they bring to you?

The introduction of a system for categorizing all cluster activities, crucial for further development, was a significant benefit.

All evaluated parameters are systematically organized, and when you revisit them after some time, you immediately realize what can be done better and where it is ideal to direct efforts.

In which areas have you managed to significantly improve during the certification process?

We primarily progressed in the involvement in international structures. Although we have not yet succeeded in implementing joint international projects, we have established contacts with ten other clusters from various European countries operating in a similar field, and we aim to transform our collaboration into joint innovative activities in projects.



Circular Slovakia

Denisa Rášová

Chairperson

How have the results of the ESCA certification influenced the activities of your cluster and what benefits do they bring to you?

Our association initiated cooperation with SIEA in cluster development recently, during the summer of 2023, with the aim of obtaining a certificate of National Cluster Performance Assessment. Thanks to productive collaboration and coordination from SIEA representatives, we successfully obtained the certificate. We are pleased that the assessment conditions are set ambitiously, motivating clusters to achieve increasingly better results. At the same time, we look forward to further opportunities that SIEA offers in cluster networking and sharing information.



National Energy Cluster – NEK

Ing. Tomáš Novotný, PhD., DBA, MBA

General Secretary

How have the results of the ESCA certification influenced the activities of your cluster and what benefits do they bring to you?

A highly detailed and exemplary Cluster Organization Strategy for the period from 2020 to 2030 has been developed, specifying problem areas and ways to improve them. The unequivocal benefit is that the ESCA system objectively monitors cluster results and provides recommendations, serving as an excellent management tool for the cluster's future. Moreover, it allows our cluster to compare not only its leadership position among industrial clusters domestically but also to observe the development and situation in the EU and tailor networking accordingly.

How do you evaluate the cooperation of your cluster with SIEA in the area of cluster development?

Excellent, long-standing, and stable cooperation and communication, based not only on participation in joint events and stakeholder involvement but also on participation in international presentations and conferences. Particularly noteworthy is the communication between the cluster management and SIEA as the main driver of the National Cluster Platform for energy and environmental clusters when preparing specific cluster policy documents, specialized calls within the Operational Program, and de minimis programs for clusters, among others.



Fig. 9: Cluster Stakeholder Meeting Group, the Last Meeting in 2023 (23th November 2023, Hotel ASTON Bratislava)



Fig. 10: Cluster Stakeholder Working Group (30th May 2023, SIEA)

Slovak Clusters in Comparison with Europe

Clusters in Slovakia – a Comparison with the Visegrád Group (V4) and the EU

Since a crucial factor in the development of cluster organizations is their focus on a specific region, noticeable regional differences have emerged over time between Slovak and other European organizations. For the purpose of comparing Slovak and European cluster organizations, ESCA has provided a dataset covering the period from January 2020 to August 2023. The dataset offers insights into the situation before and after the COVID-19 pandemic. If multiple datasets were assessed during this period, only the latest ones are used in the presented analysis.

Portfolio of analyzed cluster organizations:

- Slovakia: 24 organizations
- V4 countries excluding Slovakia: 32 organizations
- European Union excluding Slovakia and V4 countries: 233 organizations
- Excellence Portfolio⁹: 96 organizations from all the aforementioned groups

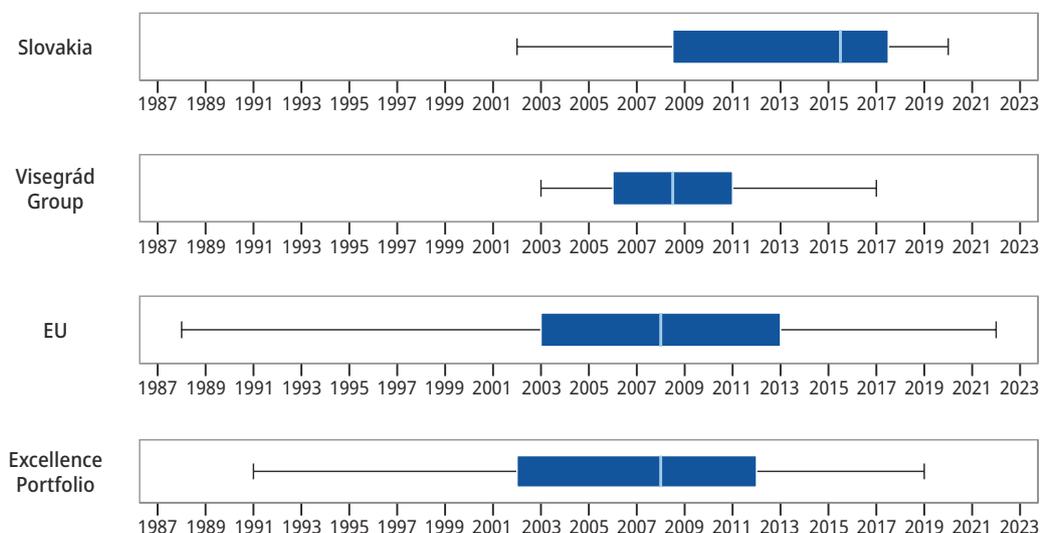


Fig. 11: Age of Clusters

⁹ The Excellence Portfolio consists of the best-rated cluster organizations, with the “score” based on the ESCA algorithm, determined for each cluster organization based on data from reference comparisons. The composition of the Excellence Portfolio changes over time, but these changes do not affect the characteristics and values of cluster excellence. The composition of the portfolio is not publicly disclosed.

The first indicator – the age of cluster organizations – highlights the generally young clusters operating in Slovakia compared to organizations in other regions of Europe. Approximately 70% of Slovak organizations started their activities around 2009 or later, with the oldest Slovak cluster established in 2004. For comparison, the first cluster in the EU was registered as early as 1989. An interesting fact is that clusters selected for the Excellence Portfolio are, on average, even older than organizations from the other monitored groups.

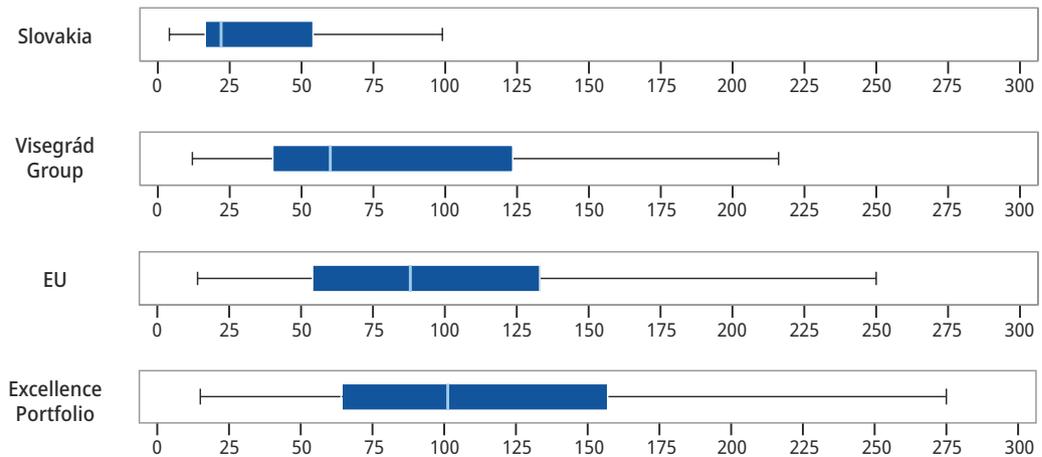


Fig. 12: Total Number of Cluster Members

The second area under observation is the size of the cluster organization measured by the total number of regular members. In this case, Slovakia also lags behind, as around 70% of cluster organizations operating in the country have fewer than 50 regular members. However, more than 50% of Slovak organizations have more than 25 regular members. On the other hand, the Excellence Portfolio category includes an organization with 275 regular members.

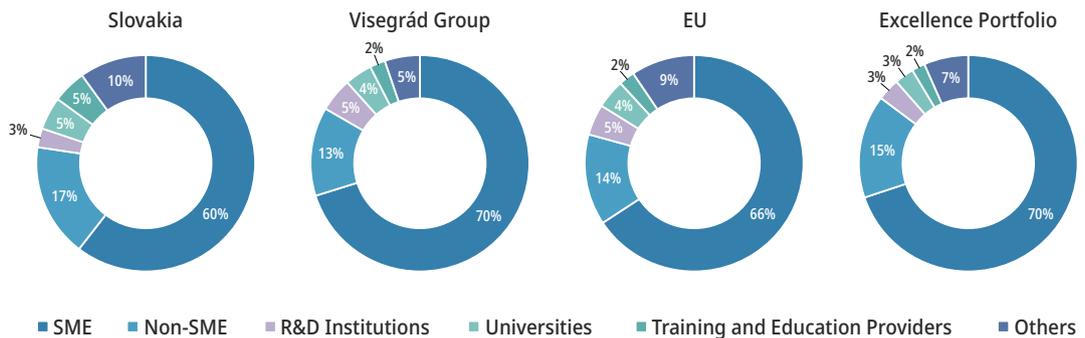


Fig. 13: Composition of Cluster Members

When we break down the membership bases of cluster organizations in the observed groups, there are no significant differences apparent. While in Slovakia, organizations include slightly larger companies, educational institutions that are not focused on research and development, or other types of organizations (such as non-profit organizations, consulting firms, etc.), organizations from other V4 countries and the Excellence Portfolio have a higher number of small and medium-sized enterprises.

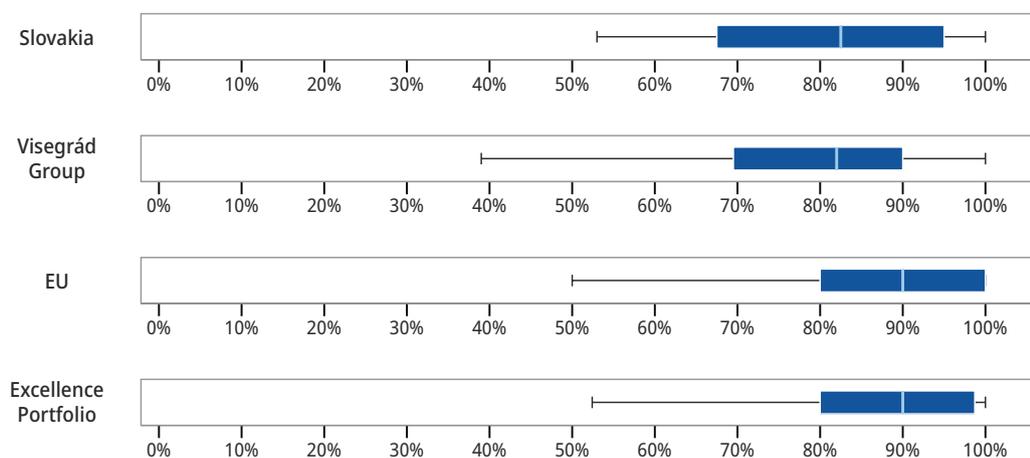


Fig. 14: Geographical Concentration of the Cluster Members

ESCA measures the geographic concentration of cluster organization members as the percentage of members located within a distance of 150 km (or within two hours) from the organization’s headquarters. Slovak cluster organizations achieve slightly better results than organizations from V4 countries but perform worse compared to EU countries and organizations from the Excellence Portfolio. On average, Slovak organizations have approximately 82% of members located within the specified distance from the headquarters. It is worth noting that many Slovak clusters are nationally oriented, reflecting the size of Slovakia compared to other EU countries.

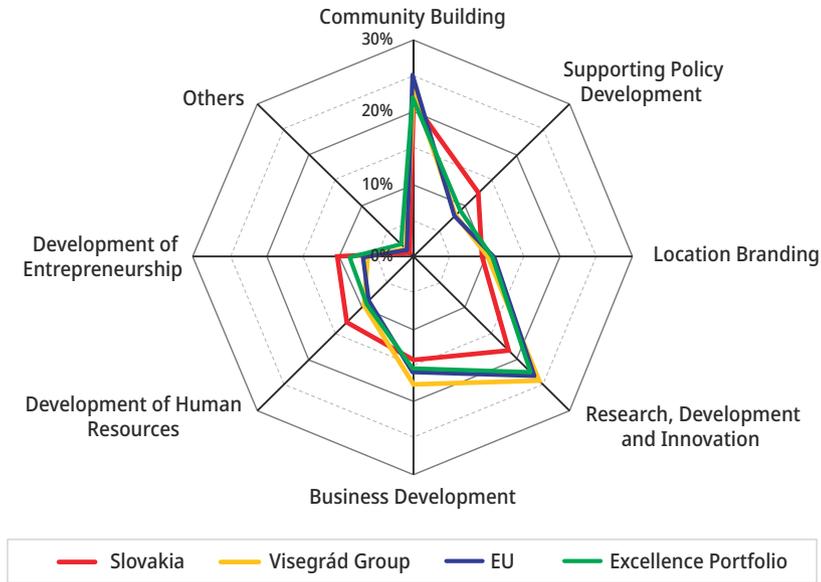


Fig. 15: Priorities of the Clusters

In the case of thematic priorities in the strategies of cluster organizations, ESCA has observed very similar developmental trends in all monitored groups. Although Slovak clusters strategically focus a bit more on developing business capabilities, human resources, and supportive policies, and less on research, development, and innovation, community development is significant in all regions. The most significant research and development trends were noted in V4 countries, but EU countries and cluster organizations from the Excellence Portfolio are very close in this regard.

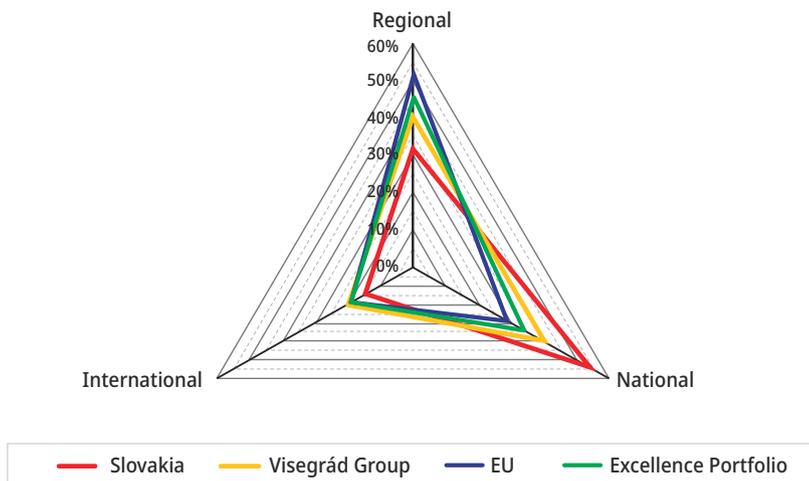


Fig. 16: Geographical Focus of Clusters

As mentioned earlier, Slovak clusters are defined more as national, given that Slovakia is a small country in terms of size, and clusters emerge more from the need to support specific sectors of the economy. This is further confirmed by the geographic priorities outlined in cluster strategies, where Slovak clusters focus on national priorities, while in the EU and the Excellence Portfolio, the emphasis is more on regional priorities. In the case of V4 clusters, there is a combination of national and regional priorities.

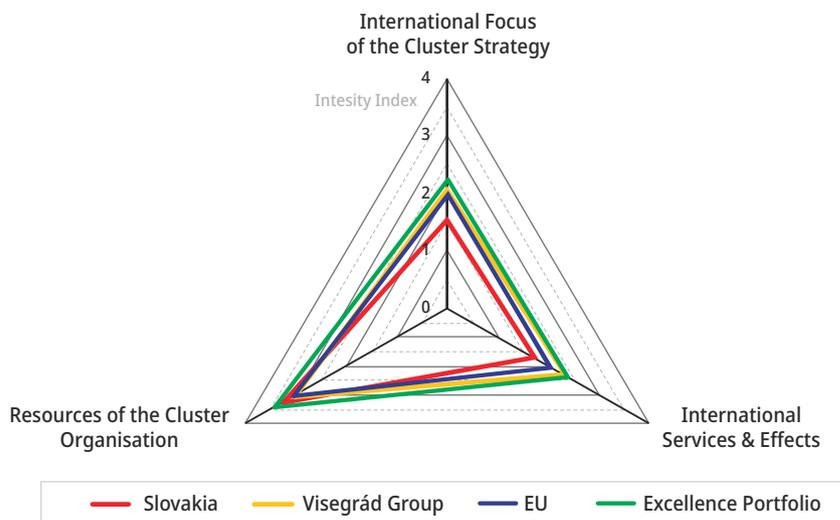


Fig. 17: Readiness for Internationalization

Another interesting statistic is the readiness of cluster organizations for internationalization. While Slovak organizations are not lagging behind in terms of resources for this activity, the international orientation of their strategies, as well as international services and effects, falls slightly short compared to other regions. According to expectations, organizations from the Excellence Portfolio achieve the best results in all three categories.

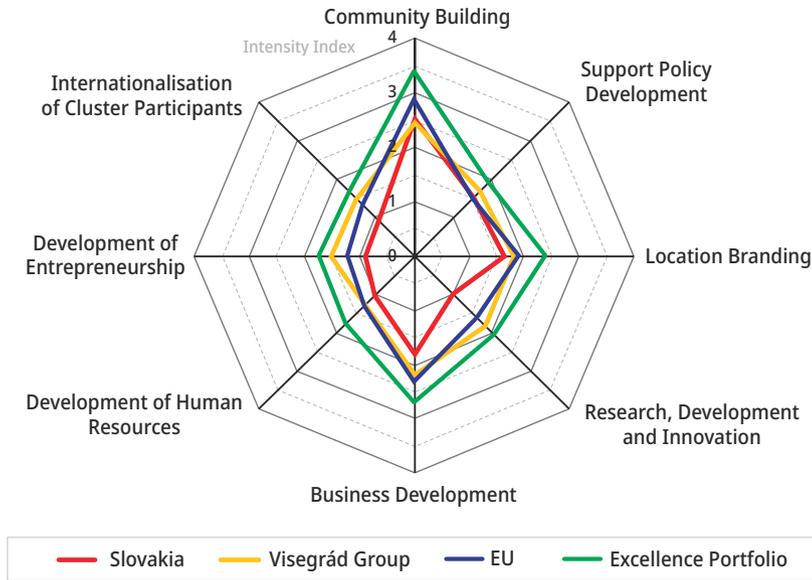


Fig. 18: Supported Cluster Activities

Similar results are reflected in statistics about the actual activities of clusters. In Slovakia clusters primarily focus on providing services and activities related to building the cluster community. Activities in the areas of research, development, innovation, and entrepreneurship are less developed compared to other actors. In this case, however, the category of internationalization is added to the observed statistics. For internationalization, as well as for other items, ESCA has recorded the best results for clusters from the Excellence Portfolio. V4 countries are more oriented towards the development of business capabilities and research/development/innovation, while EU countries focus more on community and business development.

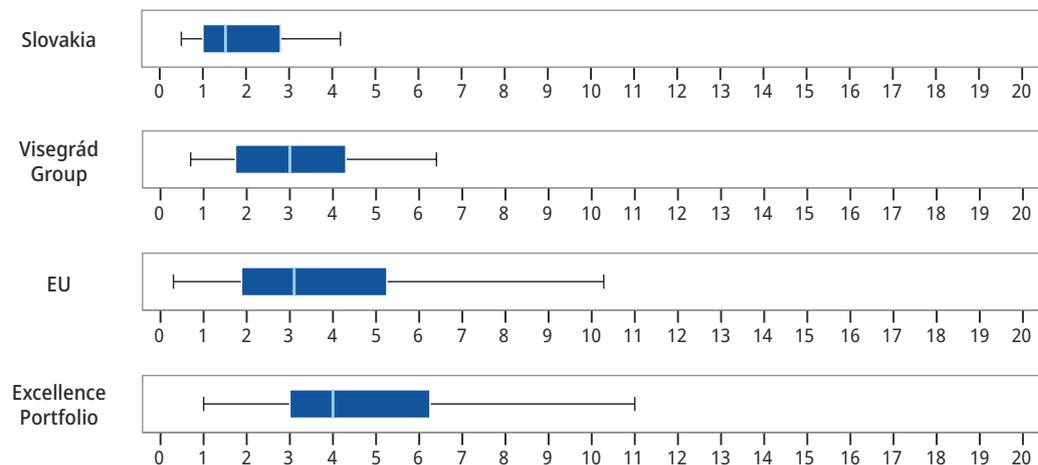


Fig. 19: Number of Cluster FTE Employees

The first monitored managerial indicator is the number of full-time employees in the cluster. Once again, the graph illustrates the lagging position of Slovak clusters compared to clusters from other regions. In this case, a cluster in Slovakia was recorded with a maximum of four employees, with an average ranging from one to two employees. Conversely, in the case of the Excellence Portfolio, the maximum was 11 employees, with an average of four employees per cluster.

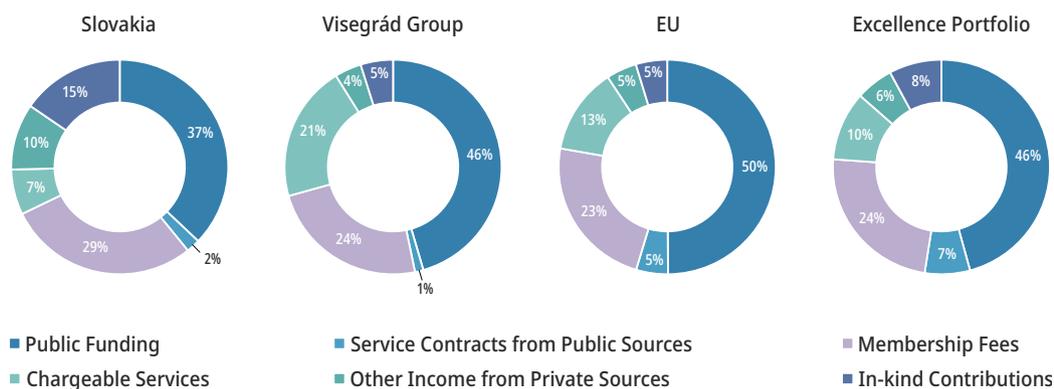


Fig. 20: Funding Sources

From a financing perspective, it is possible to observe a higher orientation of Slovak cluster organizations towards in-kind¹⁰ contributions (15%). In Slovakia, cluster organizations also more frequently fund their activities through membership fees (29%) compared to other regions (V4 and Excellence Portfolio 24% and EU countries 23%). Public funding dominates in all observed groups, but in Slovakia, it lags slightly behind (37%).

10 In-kind refers to a non-financial contribution in the form of goods or services. These can be provided either for free or at a lower amount than the usual market price. Similarly, if an individual or entity pays for services on behalf of an organization, the payment is also considered a non-financial contribution. Services and non-financial contributions are evaluated based on their standard market value or actual costs. In other words, they are assessed based on what you would have paid for them if they were not donated. For clusters, providers of non-financial contributions are typically partners or external organizations.

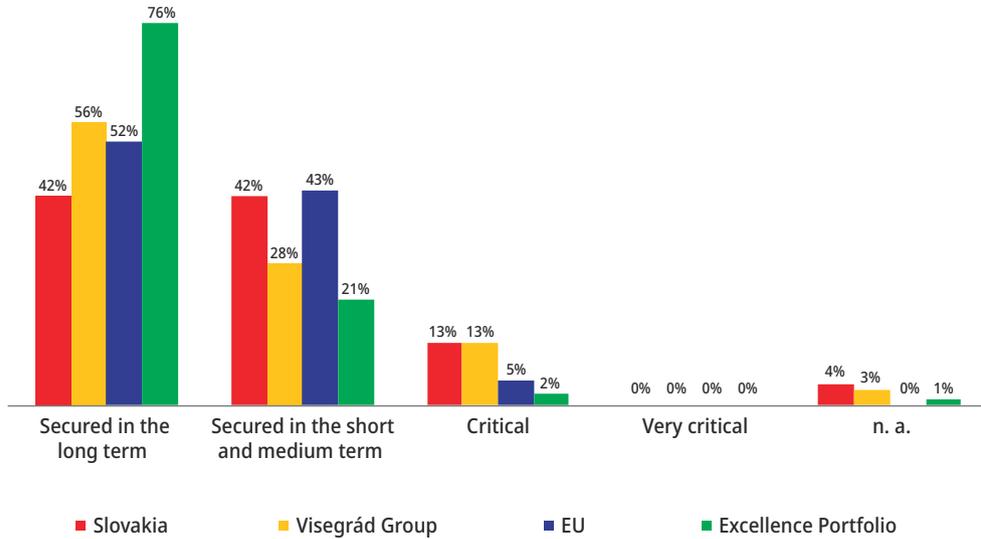


Fig. 21: Financial Sustainability of Clusters' Operations

The last statistic for mutual comparison is the financial stability of clusters. Slovak organizations, as well as organizations from V4 countries, show a slightly less stable financial situation, with the best situation recorded in the Excellence Portfolio. However, none of the observed groups exhibited a critical financial stability situation.

Evolution of Clusters over time in Slovakia

The second part of the data analysis focuses on comparing the development of Slovak clusters over time. The monitored portfolio includes 16 Slovak organizations, and the presented characteristics are based on comparing their progress through benchmarking in the periods 2018–2020 and 2020–2023.

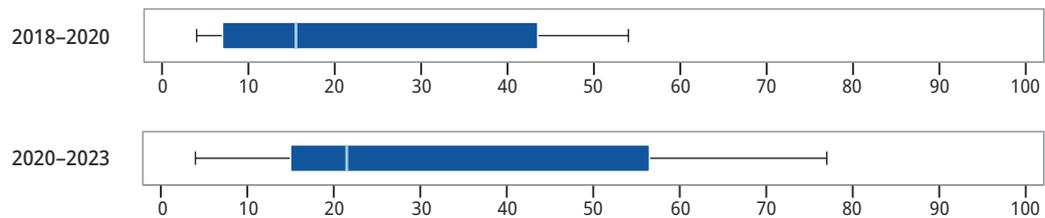


Fig. 22: Total Number of Cluster Members

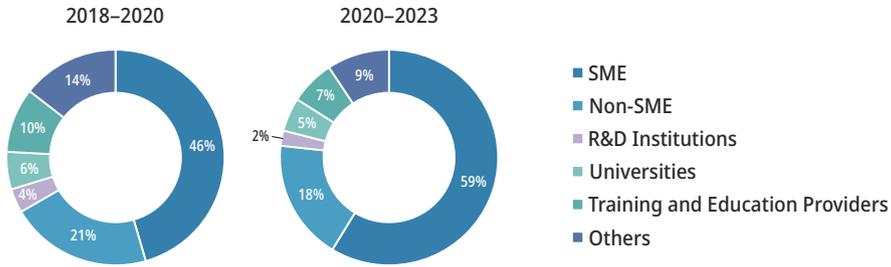


Fig. 23: Cluster Membership Composition

At the beginning, we can see how the total number of regular members and their structure changed over time. Cluster organizations in Slovakia “grew” on average by 30% over 2.5 years, particularly strengthening their ranks from small and medium-sized businesses. While in the first observed period (2018–2020), 46% of organizations belonged to this category, in the second period (2020–2023), it increased to 59%.

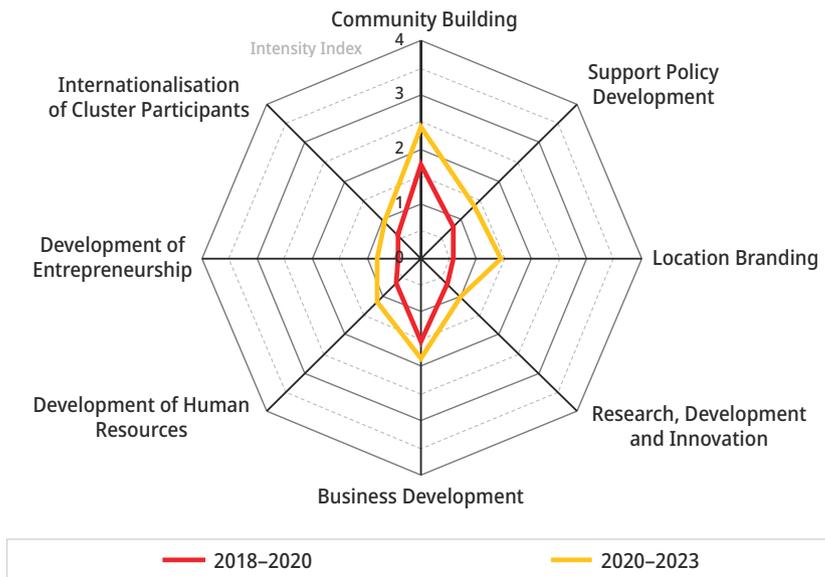


Fig. 24: Diversification of the Portfolio of Cluster Activities

From the perspective of the portfolio of conducted activities, an increase in intensity is observable in all monitored categories. The most significant growth was noted in the category of location labeling. It is evident that Slovak clusters have the potential for overall growth in activities and services.

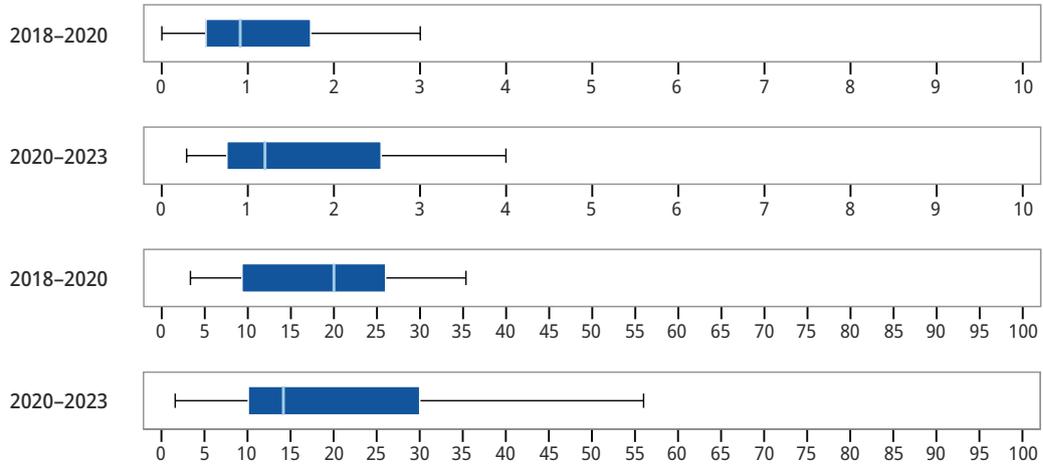


Fig. 25: Number of the FTE Employees in Clusters

During the observed period, there is also a visible improvement in the number of full-time employees. In the years 2018–2020, the portfolio included 20 members per full-time employee, while in the years 2020–2023, it decreased to 14 members.

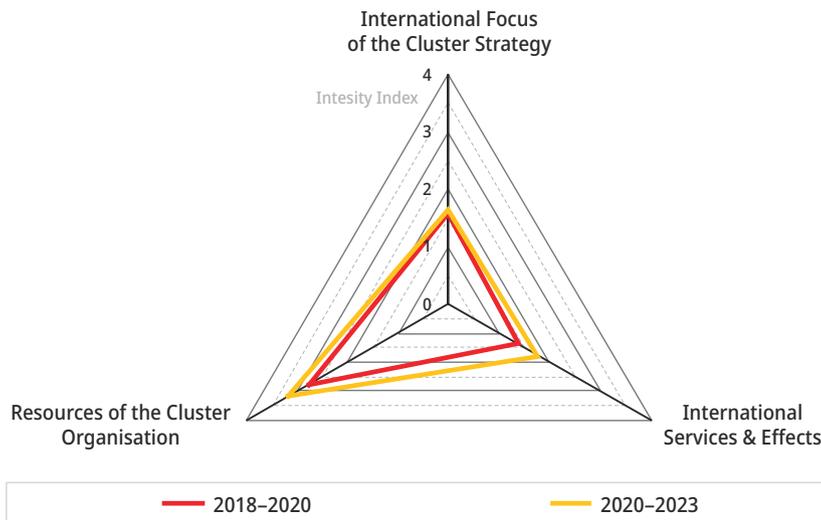


Fig. 26: Readiness for Internationalization

From the perspective of resources used for internationalization, there is indeed an increase, but over the observed period, the international focus of strategies of Slovak cluster organizations has slightly worsened. It is therefore possible to point out the need to improve the state of overall management resources and simultaneously increase activities towards internationalization.

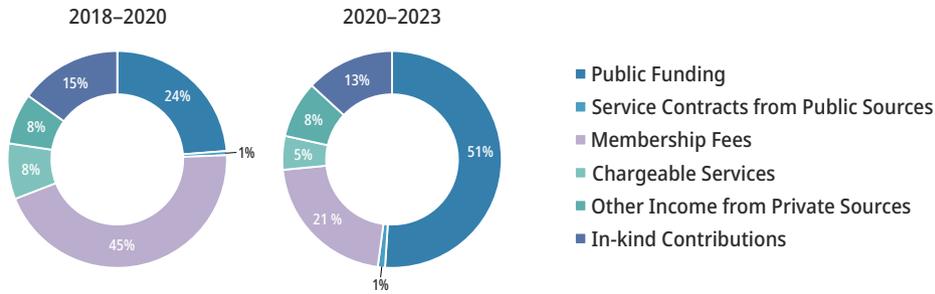


Fig. 27: Funding Sources

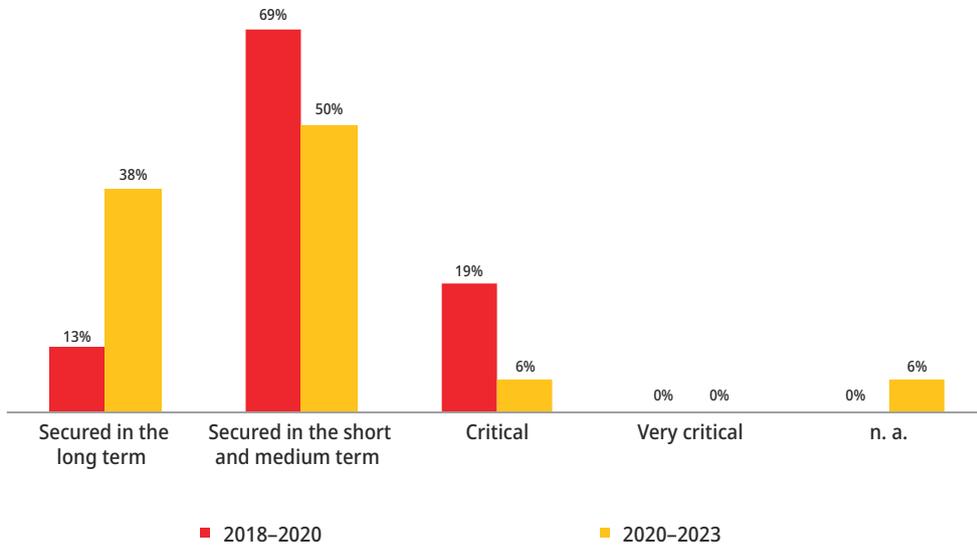


Fig. 28: Financial Sustainability

The last two graphs track the origin of income and the financial sustainability of cluster organizations. While over the observed period, the funding of Slovak organizations through public sources increased (mainly due to calls from the European Structural and Investment Funds), rising from 24% to 51%, there was a slight decrease in dependence on membership fees. Financial sustainability improved in each indicator over the observed period.

**Strategy for the
Development of Clusters
in Slovakia in the Context
of the National RDI
Strategy (2023)**

In the final section, let's take a look at the future of networking (clustering) in Slovakia. The entire concept of the triple or quadruple helix has become an extremely attractive principle for the creation and development of regional policies not only in Europe but also in Slovakia, which had not considered these principles much for a long time. It was only during the preparation of the Operational Programme Slovakia that it became apparent that some initiatives would be much more successful if built on this foundation, connecting the business world with the academic, civic, and political worlds. An example is the effort to establish so-called Interdepartmental Innovation Partnerships in 25 regions of Slovakia. There is a great interest in participating in this initiative. It is a positive fact that cluster organizations, which have been functioning on this principle for many years, also have the opportunity to join this initiative.

In the search for ways to achieve higher performance of clusters and their ability to effectively engage in international cooperation and obtain resources from European programs, the direction to support the excellence of cluster organizations was chosen based on discussions with cluster organizations. We consider it extremely important to create conditions for achieving the highest performance and competitiveness in an open and small economy like Slovakia. This can only be achieved by much greater involvement in the innovation cycle, bringing in new solutions. And this can be accomplished only by those aiming for excellence. As we see similar efforts in the cluster ecosystem, our goal is to support as many as possible who are striving to build excellence. Thus, future challenges to support clusters will be set, and support within the national project inovujme2.sk will be directed accordingly.

The strategy itself focuses on a series of activities that we expect to finance from the resources of the national project. In addition to the certification itself for clusters aspiring to obtain a silver or gold certificate, we will provide strategic advisory services, organize annual conferences, and maintain the operation of the established working group Cluster Stakeholder Working Group, under the innovated name Cluster Excellence Accelerator.

We believe that the ten years since 2013 have laid a good foundation and an important prerequisite for Slovak clusters to reach a higher level in terms of functionality and contribution to their members and regions. We will have seven years to confirm whether our ambitions were not too modest to achieve the goals of the strategy. Because the only way forward is the path toward excellence.

Conclusion

As the retrospective view of the ongoing development and its detailed assessment on the preceding pages has shown, clusters have been present with us for over 20 years, and for nearly 15 years, SIEA has been dedicated to supporting them. Over this time, the perception of the significance of clusters in the Slovak economy, in innovation development, and their role in shaping policies at various levels of state organization has gradually changed.

During this period, in addition to initial efforts to support, various tools have been successfully developed, which complement and combine with each other. They range widely from financial (European and national) to non-financial (various forms of counseling and service activities), spanning various dimensions from individual to regional, national, and even international (both within and outside the EU).

We consider the introduction of standardized assessment of cluster organizations as particularly important. This forms the basis for creating current overviews and statistics, tracking trends in performance, and ensuring the fair distribution of supportive financial resources. We combine the European ESCA system (European Secretariat for Cluster Analysis) with the relatively “fresh” National Cluster Performance Assessment.

Equally important is the extensive awareness-raising activity during regular cluster events, which, among other things, provide a platform for discussing the needs of clusters with representatives of regions and the state. There are also events aimed at the general public, where we strive to showcase the potential and added value of clusters in various aspects of our daily lives.

Among the newest and most interesting activities are the comparison and search for new incentives to support clusters and networking of actors in the innovation ecosystem with innovative countries and foreign associations, currently with South Korea and the V4.

The stimuli for improving the environment from cluster organizations and our efforts for the strategic anchoring of clusters and cluster organizations materialized in 2023 into the “Strategy for the Development of Clusters in Slovakia for the years 2023–2028 in the context of the development of networking of actors in the innovation ecosystem.” This strategy is currently in the approval process at the Ministry of Economy of the Slovak Republic. Its main implementation tool in the coming years will be the national project inovujme2.sk, funded by the Slovakia Program, which will cover various forms of direct and indirect assistance for cluster organizations.

Our journey with clusters has been dynamic. Often, we were forced to find new and simpler paths of collaboration, but despite (or perhaps thanks to) this, we have collectively succeeded in creating an ecosystem with natural functional connections that is growing and becoming more visible not only domestically but also internationally. At the same time, our past activities have helped us collectively build a foundation on which an efficient and sustainable system of regional and innovative development can be built, where clusters will have their deserved place.

This book is also a thank you to our colleagues, cluster managers, professional staff, as well as researchers, academics, and others who contribute with their work to the added value for the development of the cluster ecosystem in Slovakia.

Authors



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Ing. Artur Bobovnický, CSc. is a manager for new projects in the Innovation and International Cooperation Section of the Slovak Innovation and Energy Agency. His professional focus is on smart specialization (RIS3), support for cluster development, and evidence-based decision-making. He is responsible for acquiring new international projects funded by H2020 and Interreg programs. Prior SIEA assignment, he served as a director in the FMCG sector (2013–2016), the first mobile operator in Slovakia (1994–1999), as a partner in international consulting firms in the field of management and innovation (1991–1994, 2004–2013), and also as the first CEO of national investment promotion agency SARIO (2002–2003). Besides his professional activities in the commercial sphere, he shared his experience as a university lecturer at UCM FMK in Trnava, focusing on global and strategic marketing. He is a graduate of the Slovak University of Technology in Bratislava (1984), majoring in Thermal and Nuclear Power Engineering, where he also completed postgraduate studies and defended his dissertation (1989).



RNDr. Vladimír Borza is a graduate of the Faculty of Natural Sciences at Comenius University in Bratislava. Currently, he works as a project manager in the Competitiveness Department at SIEA. He contributes to the preparation and implementation of tools to support innovation and the development of cluster organizations. He participated in the international ACE project – “Achieving Cluster Excellence” and was the coordinator of the “ClusterFY” project for the Slovak side. He is part of the project team UnicornQuest focused on supporting start-ups. He holds international certificates: “Associate Trainer in Cluster Management Excellence” (Fundació Clusters i Competitivitat), “ESCA Cluster Benchmarking Expert,” and “ESCA Cluster GOLD Expert” (European Secretariat for Cluster Analysis). He completed several expert training sessions in the field of cluster issues in Germany, Austria, Spain, Portugal, and Israel.



Mgr. Martin Svoboda is the director of the Innovation Section at the Slovak Innovation and Energy Agency. In the past, he contributed to the creation of cluster development policies in Slovakia, including the financing of “soft” cluster activities through the support mechanism of the Ministry of Economy of the Slovak Republic. He participated in the creation of several strategic documents in the field of innovation policy, supporting mechanisms, as well as documents related to setting the programming periods of ESI Funds for research, development, and innovation.



Ing. Vladimír Tanistrák graduated from the Faculty of Commerce at the University of Economics in Bratislava. He has been working at the Ministry of Economy since 2011, focusing on cluster support and cluster policy for an extended period. In the Innovation Department, he is involved in setting up and implementing support programs from the state budget, innovation policy, and supporting small and medium-sized enterprises. He represents Slovakia in several working groups and committees in the European Commission and the OECD. He was part of cross-border projects funded through the Interreg Europe and Central Europe programs.

Contributors

Helmut Kergel completed his studies at the Technical University in Berlin in 1986 (Diplom-Ingenieur) with a degree in precision engineering. As a senior consultant with extensive experience at VD/VDE-Inovatiam + Technik GmbH (VDI/VDE-IT, www.vdivde-it.de), he serves as the director of the “European Secretariat for Cluster Analysis.

Since 2007, he has significantly contributed to the development of indicators and processes for the development and assessment of cluster management quality (cluster excellence) and related benchmarking methodologies within various national and European projects. Since the end of 2011, he has been appointed as the director of ESCA, an international network with over 200 experts, managed by VDI/VDE-IT, which provides various assessment and labeling tools for cluster management to the broad international cluster community, individual cluster management organizations, and policymakers.

ESCA organizes and conducts assessments of cluster management organizations, leading to the award of the “gold, silver, and bronze marks of cluster management excellence,” accepted by cluster organizations and policymakers in many countries worldwide.

In addition to coordinating ESCA’s overall activities and conducting assessments for performance and cluster management comparison purposes, Helmut Kergel also develops and implements professional training measures for new ESCA experts.

Michael Negerer specializes in market research and social relations, holding a bachelor’s degree in business psychology and business administration. He has been working at VDI/VDE-IT since 2007. Since 2010, he has been working for ESCA, primarily responsible for the technical implementation of indicators and tool development within the processes of awarding BRONZE, SILVER, and GOLD labels, as well as for further development and maintenance of the technical framework. In addition to advisory and evaluative activities, as a GOLD label expert, he focuses primarily on the analysis, evaluation, and visualization of cluster data.

References

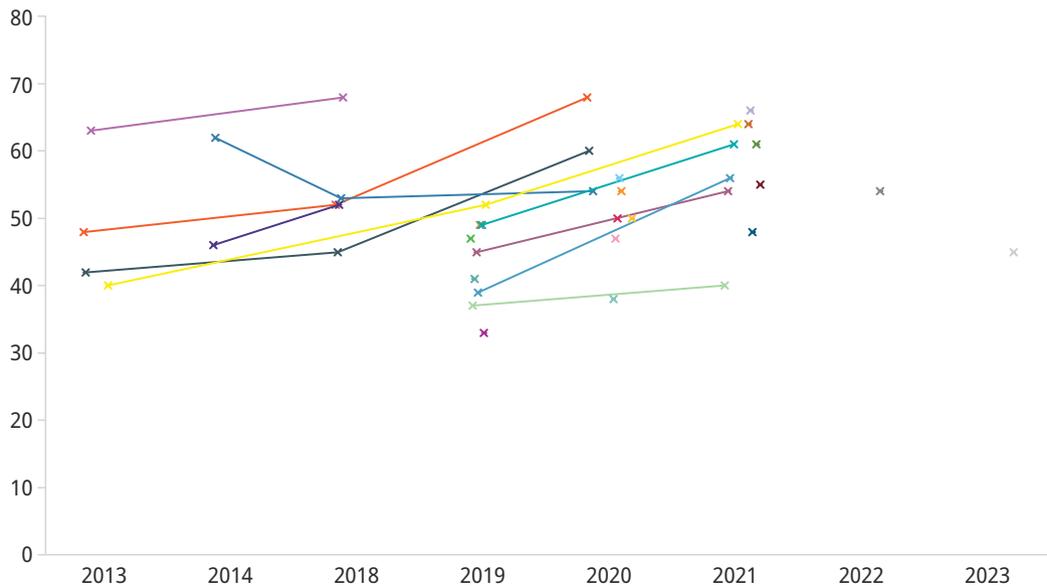
- Balog, M. et al. (2013): *Inovatívne Slovensko. Analýzy a štúdie SIEA*. 157 p., ISBN: 978-80-88823-55-1.
- Balog, M. (2015): *Klastrová politika v podmienkach Slovenska. Analýzy a štúdie SIEA*. 99 p., ISBN: 978-80-88823-61.
- Balog, M. et al. (2015): *Možnosti rozvoja kreatívneho priemyslu na Slovensku. Analýzy a štúdie SIEA*. 66 p., ISBN 978-80-88823-57-5.
- Bobovnický, A. – Borza, V. – Duman, P. – Vavrdová, A. (2018a): *Medzinárodná certifikácia klastrov na Slovensku*. Vydav. SIEA, 34 p., ISBN: 978-80-88823-70-4.
- Bobovnický, A. – Borza, V. – Ružičková, K. (2018b): *Nástroje internacionalizácie klastrov (Slovenská republika)*. Zborník konferencie „Marketing Identity 2018“, Vydav. FMK, 302 – 312 p., ISBN: 978-80-8105-986-5.
- Bobovnický, A. – Vavrdová, A. (2018): *Dobré príklady praxe v oblasti klastrov*. Zborník konferencie „Marketing Identity 2018“, Vydav. FMK, 313 – 318 p., ISBN: 978-80-8105-986-5.
- Borza, V. – Ács, D. (2020): *Úloha Európskeho sekretariátu pre klastrové analýzy v hodnotiacom procese klastrov, klastrové platformy a ich význam*. <https://www.inovujme.sk/sk/>
- Borza, V. – Magulová, R. (2022): *ESCA Certification in Slovakia. INNO INDUSTRY online study visit Slovakia*. <https://www.npc.sk>.
- Borza, V. – Magulová, R. – Ružičková (2022): *Klastre – dva modely hodnotenia*. Zborník prezentácií a abstraktov úspešných inovácií. Národný energetický klaster, ISBN 978-80-973571-3-9, pp. 334 – 341.
- Burger, P. – Brašková, M. – Spišáková, E. D. – Klasová, S. – Korobaničová, I. – Kováč, V. – Pálfyová, J. (2015): *Súčasný stav financovania klastrov vo svete*. TUKE, 403 p., ISBN: 978-80-553-2200-1.

- d'Aveni, R. (1994): *Managing the Dynamics of Strategic Maneuvering*. The Free Press
- d'Aveni, R. (2018): *The Pan-Industrial Revolution: How New Manufacturing Titans Will Transform the World*. Houghton Mifflin Harcourt
- European Commission (2021): *European Expert Group on Clusters – Recommendation Report*. Brussels: EC Directorate General for Internal Market, Industry, Entrepreneurship and SMEs, ISBN 978-92-76-30280-3.
- Koporová, K. – Novotný, T. – Marcin, J. – Kati, R. (2021): *Niektoré špecifiká projektovania inovačných nástrojov pre tvorbu stratégie a procesného riadenia priemyselných klastrov*. Recenzovaný zborník príspevků interdisciplinární mezinárodní vědecké konference doktorandů a odborných asistentů. Hradec Králové, ISBN: 978-80-87952-34-4.
- Magulová, R. – Harnišová, E. – Borza, V. (2018): *Súčasný stav rozvoja klastrov*. Zborník konferencie „Marketing Identity 2018“, Vydav. FMK, 319 – 326 p., ISBN: 978-80-88823-59-9.
- Novotný, T. – Hrabovský, G. – Marcin, J. (2020): *Koncipovanie inovačných nástrojov energetických a environmentálnych klastrových habitatov*. MH SR, NEK, 2020. ISBN 978-80-973571-0-8.
- Novotný, T. (2022): *Klastre ako moderný a úspešný nástroj inovácií a upevňovania konkurencieschopnosti Slovenska*. Zborník prezentácií a abstraktov úspešných inovácií. Národný energetický klaster NEK, ISBN 978-80-973571-3-9, pp. 119 – 121.
- Ružičková, K. – Harnišová, E. (2018): *Slovenská inovačná a energetická agentúra buduje externé kapacity v oblasti posudzovania klastrov a vzdelávania*. Zborník konferencie „Marketing Identity 2018“, Vydav. FMK, 319 – 326 p., ISBN: 978-80-8105-986-5.
- Rybovič, A. (2021): *Klastre akcelerátor inovácií*. Zborník COINTT, CVTI Bratislava, ISBN 978-80-89965-181-6.
- Slušná, L. – Balog, M. et al. (2015): *Automobilový priemysel na Slovensku a globálne hodnotové reťazce*. Analýzy a štúdie SIEA, 93 p., ISBN: 978-80-88823-61.

Annex 1

Statistical Outputs – Charts and Comments

Chart 1: Evolution of the ESCA Assessment Results over Time



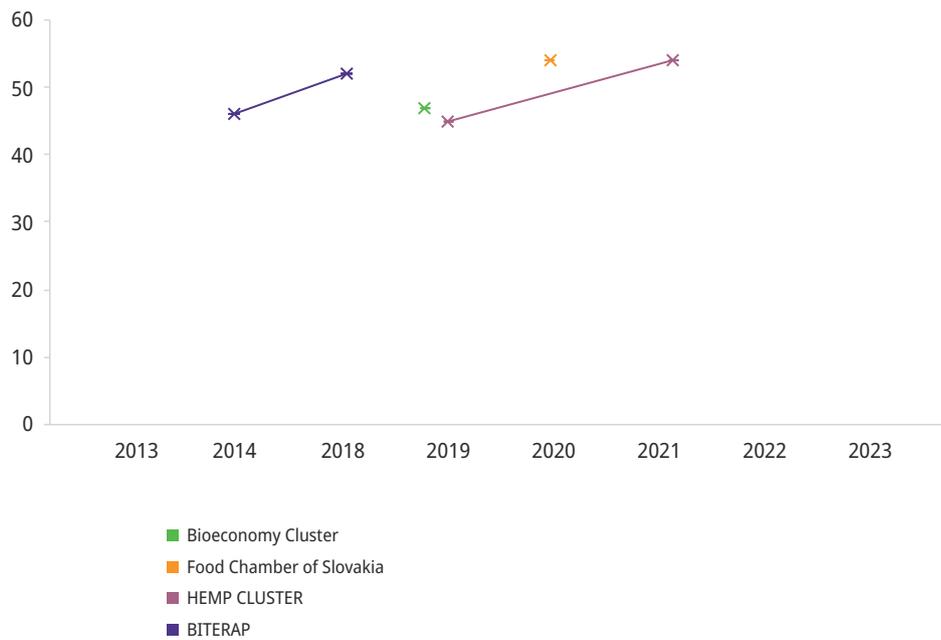
- Klaster AT+R
- BITERAP
- Košice IT Valley
- Regional Development Cluster – West Slovakia
- HEMP CLUSTER
- Industry Innovation Cluster
- Slovak Battery Alliance
- Cybersecurity Cluster
- Slovak National Hydrogen Association – Cluster
- Food Chamber of Slovakia
- SME Booster & Innovation Cluster
- FINAS
- Slovak Smart City Cluster
- Cassovia New Industry Cluster
- National Energy Cluster – NEK
- ZAIT (Z@ict)
- Bioeconomy Cluster
- Energy Cluster of the Prešov Region
- House of Events Innovation
- Industry4UM
- Slovak Plastic Cluster
- Slovak Association of the Photovoltaic Industry and RES
- Ipel Energy & Environment Cluster
- Exporters
- INOVATO
- Slovak Electric Vehicle Association
- REPRIK

With the exception of one cluster, we can see continuous improvement in the assessment results for the sample of 27 Slovak clusters.

In the next charts, we will split clusters into several groups based on the dominant field of activities.

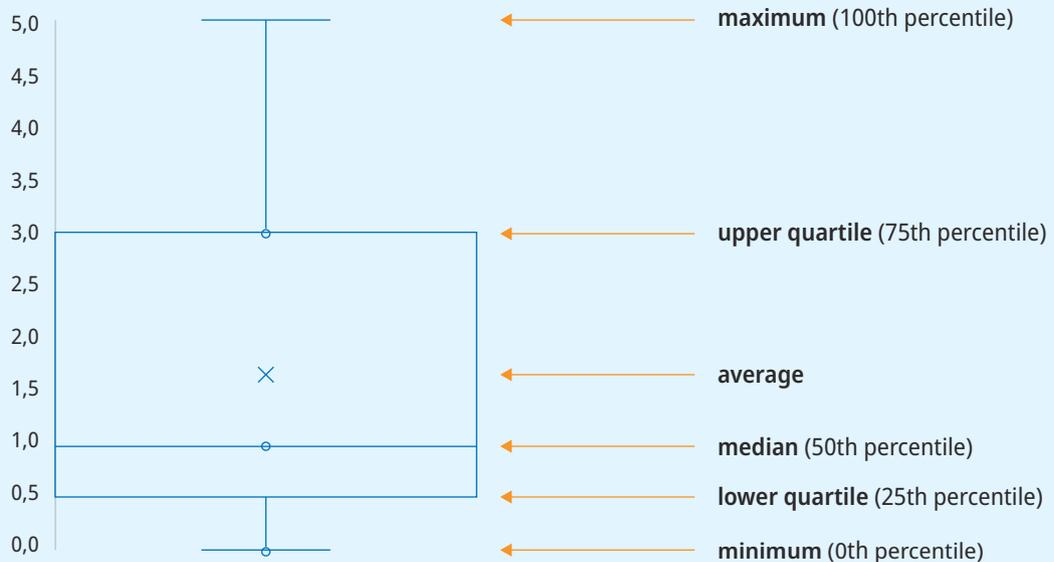
Group: Bioeconomy (included clusters: Bioeconomy Cluster, Food Chamber of Slovakia, HEMP CLUSTER, BITERAP)

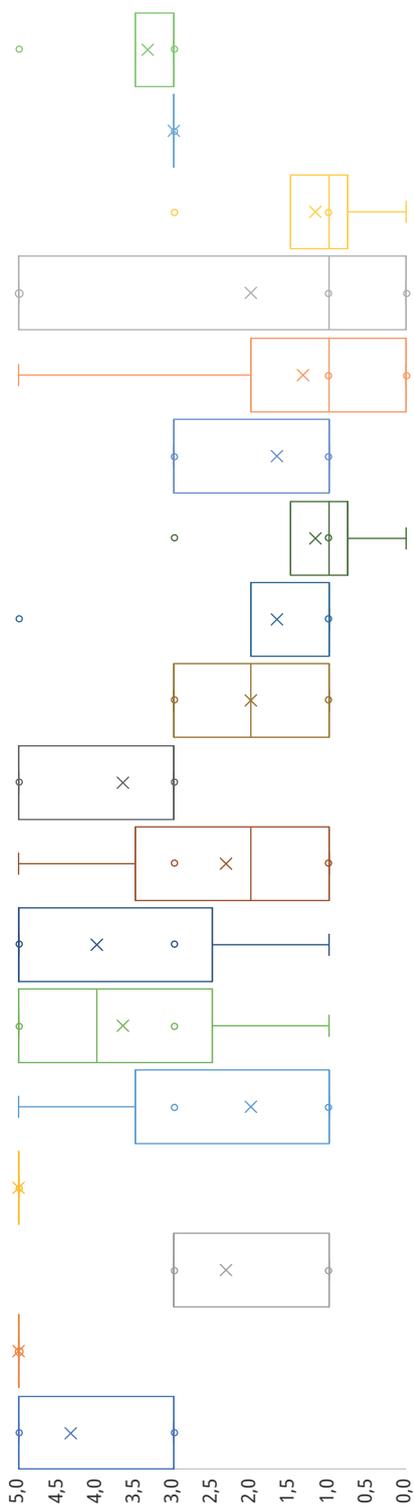
Chart 2: Evolution over Time – Bioeconomy Clusters



We use box plots for some data presentation. How to Read Box Plots? A box plot illustrates the distribution of data into quartiles and highlights the mean and deviations through a structure called the “box”. The top of the box represents the upper quartile (75th percentile), the bottom of the box represents the lower quartile (25th percentile), the line inside the box represents the median (50th percentile), and the cross inside the box represents the mean. Lines outside the box are called “whiskers” and represent the maximum (100th percentile) and minimum (0th percentile) if these extremes are not at the level of the upper or lower quartile simultaneously. Circles outside the box or whiskers represent statistical outliers. In our case, 18 categories of ESCA assessments are evaluated, with each category having its own box depicted in the column.

Example: The results in this criterion show that the assessment ranges between 0.5 and 3 points for 25–75% of clusters, with 50% of clusters (median rating) achieving 1 point, and the average rating is 1.75 points. The maximum achievable rating is 5, and the minimum is 0 points.



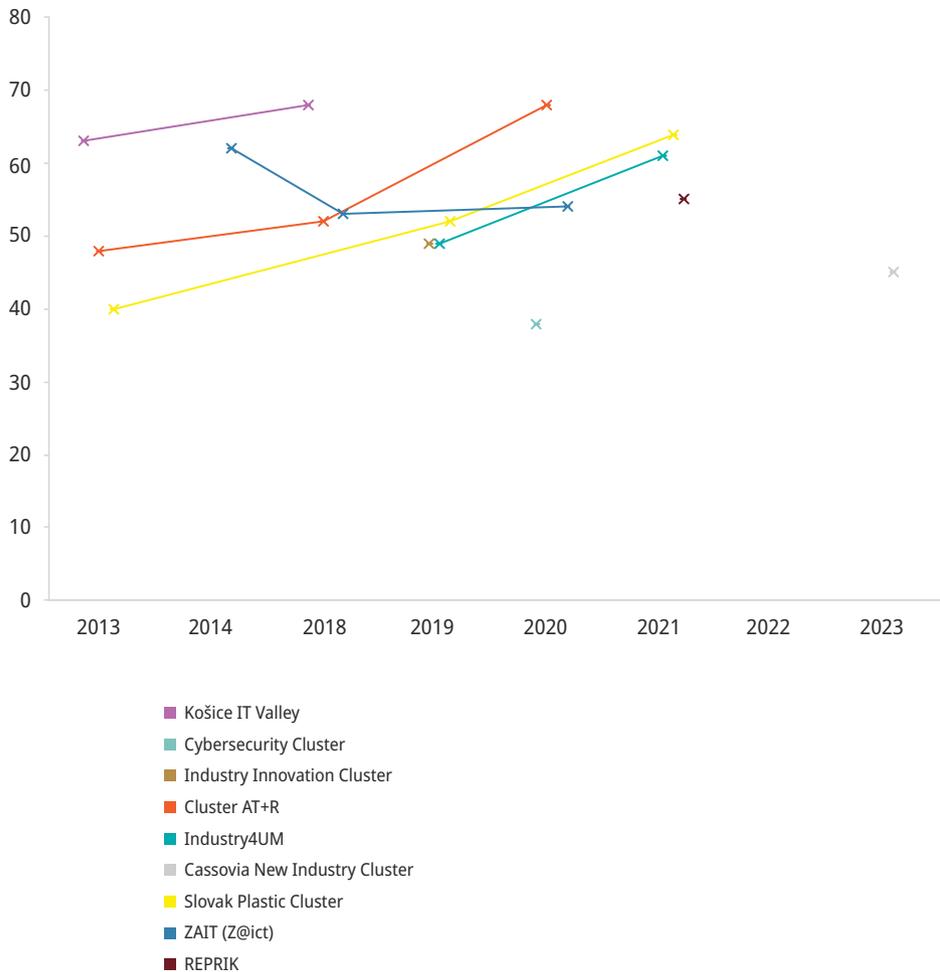


- Age of the cluster organisation
- Legal form of the cluster organisation
- Composition of the cluster membership (Committed participants)
- Geographical concentration of the cluster participants (Committed participants)
- Utilisation of regional growth potential
- Clear definition of the roles of the cluster manager/Implementation of a governing body/Degree of involvement of the cluster participants in the decision making
- Number of cluster participants per employee (FTE) of the cluster organisation
- Human resource competences and development in the cluster organisation
- Strategic planning and implementation processes
- Financial sustainability of the cluster organisation
- Collaborative technology develop-ment, technology transfer, or R&D
- Information, matchmaking and exchange of experience among participants
- Development of human resources
- Development of entrepreneurship
- Matchmaking and networking with external partners/promotion of cluster location
- Internationalisation of cluster participants
- Number of general external requests for cooperation received by the cluster organisation
- Visibility in the press

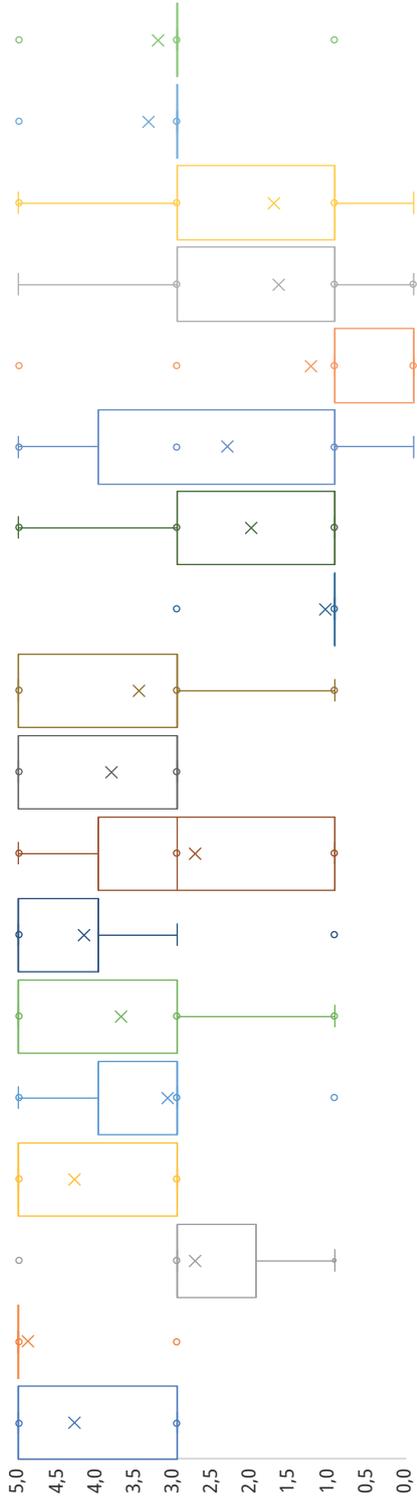
Chart 3: Details of ESCA Assessment of Bioeconomy Clusters

Group: Manufacturing and IT (included clusters: Košice IT Valley, Cybersecurity Cluster, Industry Innovation Cluster, Cluster AT+R, Industry4UM, Cassovia New Industry Cluster, Slovak Plastic Cluster, ZAIT (Z@ict), REPRİK)

Chart 4: Evolution over Time – Manufacturing and IT Clusters



Results from clusters in this field confirm the advanced position of IT and manufacturing in Slovakia. Some newly established clusters are starting from a relatively higher level than clusters with a long track record. It appears that clusters in this field are more prepared to utilize verified project management methods and, consequently, are more adaptable to achieving a higher level of cluster management quality.

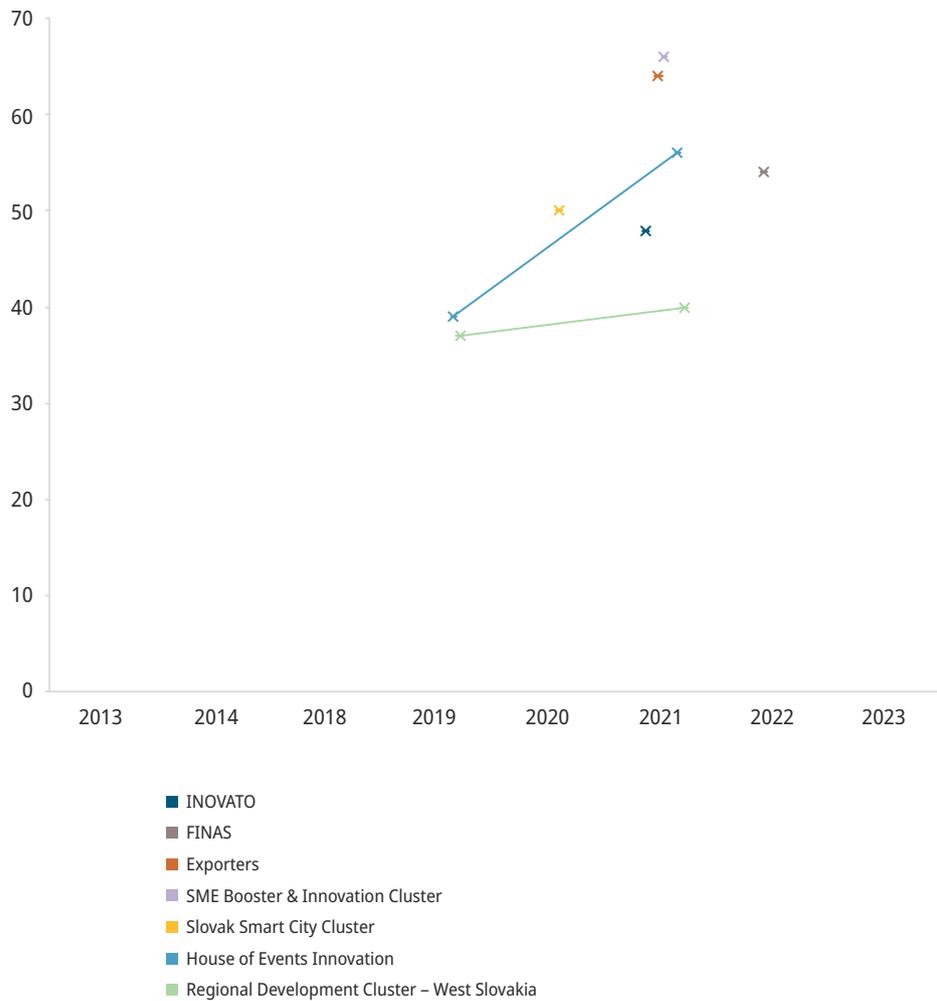


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- Visibility in the press

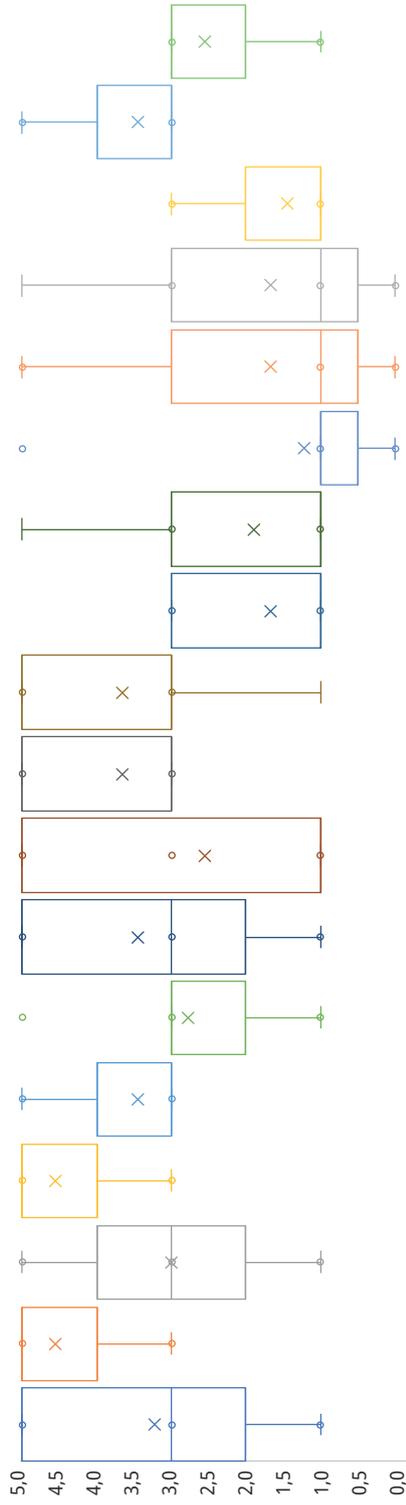
Chart 5: Details of ESCA Assessment of Manufacturing and IT Clusters

Group: Services (included clusters: INOVATO, FINAS, Exporters, SME Booster & Innovation Cluster, Slovak Smart City Cluster, House of Events Innovation, Regional Development Cluster – West Slovakia)

Chart 6: Evolution over Time – Service Focused Clusters



The group of clusters with a relatively short history lacks relevant data that could be analyzed over the elapsed time.

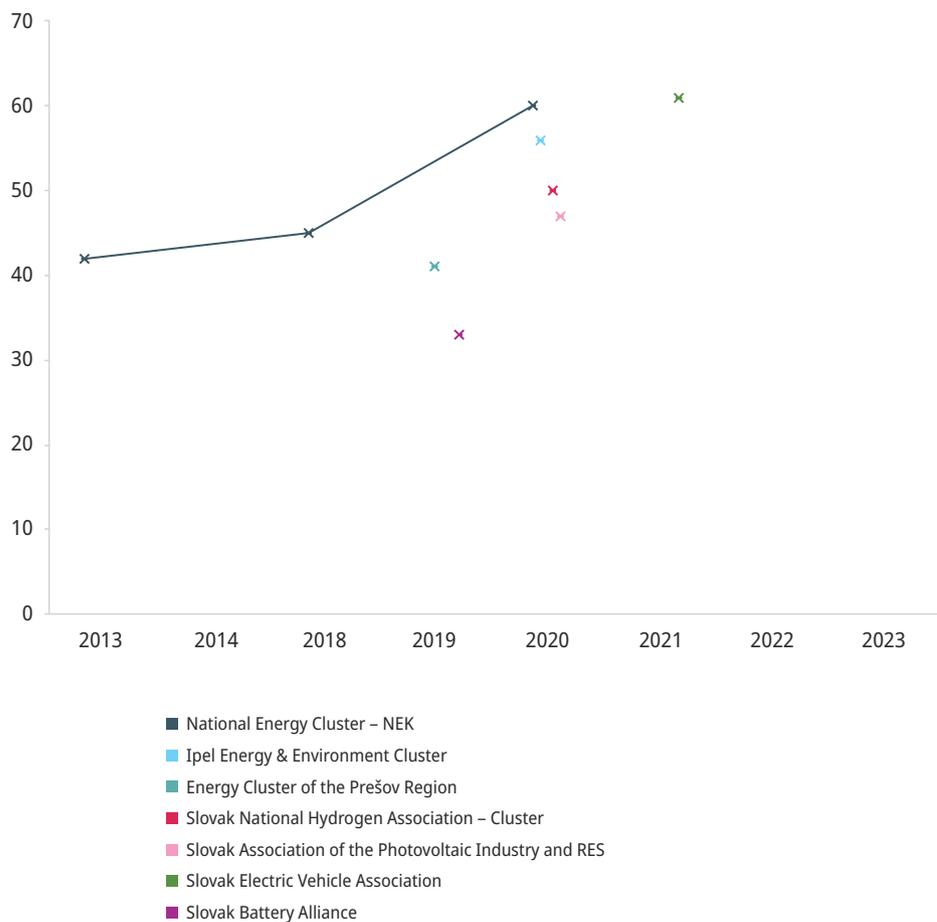


- Age of the cluster organisation
- Legal form of the cluster organisation
- Composition of the cluster membership (Committed participants)
- Geographical concentration of the cluster participants (Committed participants)
- Utilisation of regional growth potential
- Clear definition of the roles of the cluster manager/Implementation of a governing body/Degree of involvement of the cluster participants in the decision making
- Number of cluster participants per employee (FTE) of the cluster organisation
- Human resource competences and development in the cluster organisation
- Strategic planning and implementation processes
- Financial sustainability of the cluster organisation
- Collaborative technology develop-ment, technology transfer, or R&D
- Information, matchmaking and exchange of experience among participants
- Development of human resources
- Development of entrepreneurship
- Matchmaking and networking with external partners/promotion of cluster location
- Internationalisation of cluster participants
- Number of general external requests for cooperation received by the cluster organisation
- Visibility in the press

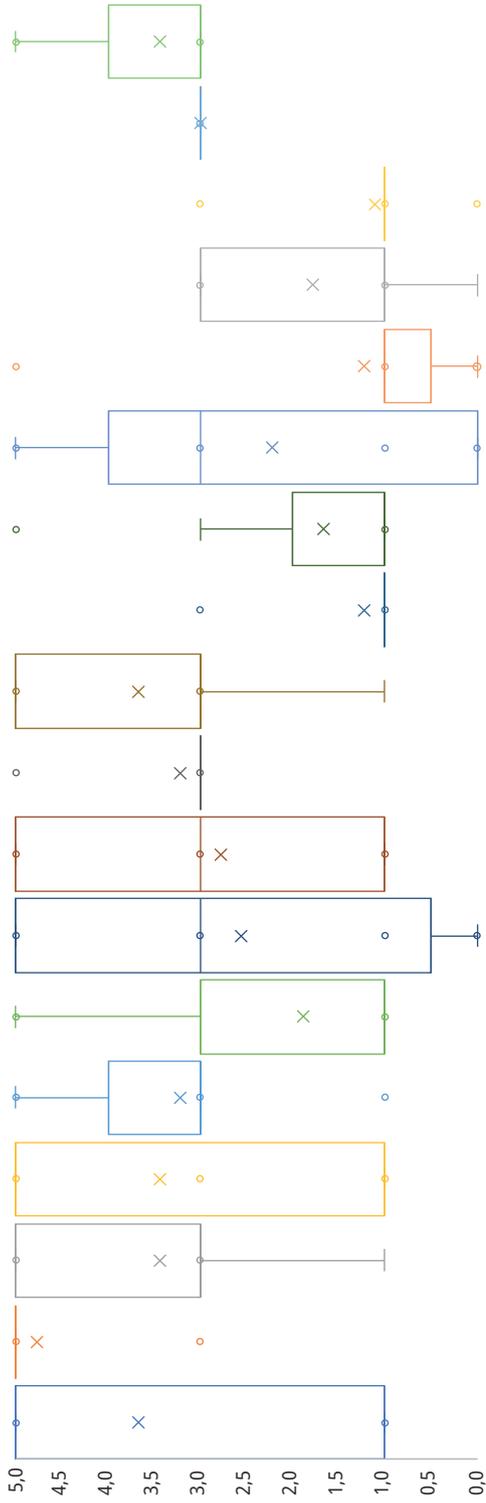
Chart 7: Details of ESCA assessment of Service Focused Clusters

Group: Energy and Renewable Energy Sources (RES) (included clusters: National Energy Cluster, Ipel Energy & Environment Cluster, Energy Cluster of the Prešov Region, Slovak National Hydrogen Association – Cluster, Slovak Association of the Photovoltaic Industry and RES, Slovak Electric Vehicle Association, Slovak Battery Alliance)

Chart 8: Evolution over Time – Energy and RES Clusters



The group of clusters with a relatively short history (the only exemption is one of the oldest clusters in Slovakia – NEK) lacks relevant data that could be analyzed over the elapsed time.



- Age of the cluster organisation
- Legal form of the cluster organisation
- Composition of the cluster membership (Committed participants)
- Geographical concentration of the cluster participants (Committed participants)
- Utilisation of regional growth potential
- Clear definition of the roles of the cluster manager/Implementation of a governing body/Degree of involvement of the cluster participants in the decision making
- Number of cluster participants per employee (FTE) of the cluster organisation team
- Human resource competences and development in the cluster organisation
- Strategic planning and implementation processes
- Financial sustainability of the cluster organisation
- Collaborative technology development, technology transfer, or R&D
- Information, matchmaking and exchange of experience among participants
- Development of human resources
- Development of entrepreneurship
- Matchmaking and networking with external partners/promotion of cluster location
- Internationalisation of cluster participants
- Number of general external requests for cooperation received by the cluster organisation
- Visibility in the press

Chart 9: Details of ESCA Assessment of Energy and RES Focused Clusters

Annex 2

National Cluster Performance Assessment Criteria

Basic (Eligibility) Criteria:

Does the organization meet the cluster definition?

(A cluster is considered a network of companies and research institutions (including universities) with a thematic focus, regional concentration, institutional organization, and management by a cluster manager. The cluster may also include other actors, such as public agencies.)

Is it stipulated in the statutes/articles of association/founding charter that one of the main activities is the support and/or implementation of innovations, increasing regional/national competitiveness, or export activities?

Is there an adopted strategy for the cluster organization, including a clearly defined focus, goals, management, financial sustainability (with a plan for at least two years), and thematic focus on a specific domain of smart specialization?

At least one person performing activities on behalf of the cluster organization is employed at a minimum of 20% of FTE, or performs these activities in the form of an in kind contribution from the cluster member(s), or management is ensured in another form (e.g., management service provision).

Extended Criteria:

Cluster Structure

1.1.	Duration of cluster organization operation (length of official cooperation among cluster members within the cluster in years)
1.2.	Number of cluster members (companies, public administration organizations, educational institutions, research and development institutions). Public administration and academic organizations may not be regular members but can participate through associated/affiliated membership, which must be documented, e.g., through MoU or another form (specify the numbers for each type of organization, and for companies, break down by size)
1.3.	At least one person performing activities on behalf of the cluster organization (or a tangible contribution from the cluster member(s), self-employed, or another form of provision) (specify the numbers of persons and percentage expressions of their workloads)

1.4.	The cluster has its own facilities and technical support or in the form of a tangible contribution from the cluster member(s) (if yes, specify whether it is in-house or an in kind contribution)
1.5.	The cluster possesses a valid ESCA certificate (if yes, specify the type of ESCA certificate)
Communication and Activities (Internal & External)	
2.1.	The cluster has established a form of meetings among its members and has it defined in the statutes (e.g., general meetings, working meetings, meetings of working groups, and others) (if yes, specify whether these are undocumented meetings, meetings with documentation; if regular meetings, confirm with the relevant documentation)
2.2.	Existence of a common communication platform and internal communication (if yes, specify the name and type of the platform – external provider or a platform created for the cluster’s needs; if regularly used, confirm it with the relevant documentation)
2.3.	Organization of cluster events or events by its members – professional events: workshops, domestic or international conferences/B2B events in the last two years (list all events and their forms)
2.4.	External communication of the cluster organization (web, LinkedIn, other social networks, press) (the cluster has an established and regularly updated website, including information about its organization and activities – two language variants, Slovak + e.g., English; + communication through social media or press)
2.5.	Professional events – the percentage of cluster members actively participating in events such as scientific conferences, workshops, exhibitions, fairs focused on supporting cooperation, research and development, technology transfer, or another area advantageous for the cluster in the last two years (specify the percentage)
2.6.	Training, workshops, or other educational forms – the percentage of cluster members actively participating in training, workshops, or other forms of education in the last two years (specify the percentage)
Innovation Focused Activities	
3.1.	<p>Achievements of the cluster or its members in research and development and innovation activities only for the period of the cluster’s existence:</p> <ul style="list-style-type: none"> • Collaboration resulting in joint research or the solution of a technical or social problem used/ implemented by at least three cluster members. • Solution of complex research and development and innovation projects with achieved results in the form of a patent (at least a filed patent application), utility model, industrial design, verified technology, prototype, functional sample, certified methodology, or software. • Application of the results of research and development and innovation projects in practice - granted licenses, issued patent documents, etc. <p>(specify all cases)</p>

3.2.	Number of realized outputs of intellectual property in practice in the last five years – the cluster or cluster members (publications/copyright, industrial property rights – patents, design, utility model, trademarks, copyright publications/analyses, and others) (specify all cases)
3.3.	Joint research and development and innovation projects where the cluster organization or its members act as a grant recipient or partner in the last two years (specify all cases)
3.4.	Percentage of cluster members with their research and development and innovation projects out of the total number of companies in the cluster (specify the percentage)
3.5	Number of cluster members from the R&DI environment (universities, research and development institutions, innovation centers, business hubs, technology transfer centers, competency centers, innovation forums, and other actors) (specify the total number)
3.6	Participation of clusters or its members in working groups – professional working groups at individual central government bodies (e.g., ministries, authorities), local government bodies (municipalities, cities, self-governing regions), or sectoral or cross-sectoral councils (specify the total number)
International Activities	
4.1.	Joint projects other than R&D&I, where the cluster organization acts as a grant recipient or partner in the last two years (specify all cases)
4.2.	Percentage of companies with their projects focused on topics other than R&D&I in the total number of companies in the cluster specify the percentage)
4.3.	Export potential – the percentage of export-oriented companies in the total number of companies in the cluster (specify the percentage)
4.4.	Participation in projects focused on RIS3 (specify all cases)

Annex 3

Strategy for the Development of Industrial Cluster Organizations in Slovakia for the Years 2023–2028 in the Context of Developing the Networking of Actors in the Innovation Ecosystem

Introduction

The Strategy for the Development of Industrial Cluster Organizations in the Slovak Republic for the years 2023–2028 is a key document for creating a strategic framework – setting the vision, goals, and measures in the area of long-term development of cluster organizations in the Slovak Republic (SR) to support the enhancement of the country’s innovative performance. The document fills a void in this area, as no similar strategy has been prepared and implemented in Slovakia to date.

In addition to raising awareness of the topic and aligning policies correctly, the preparation of the strategy is based on the currently valid Research and Innovation **Strategy for Smart Specialization of the Slovak Republic 2021–2027 (SK RIS3 2021+)** and its measure *“Support for Research and Innovation Activities in Clusters”*¹¹. According to this measure, the strategy aims to connect the performance of clusters with the operation and maintenance of innovative infrastructure, orient policy towards existing successful clusters serving as models, foster their mutual national and international cooperation, support the development of knowledge and skills useful in establishing and managing clusters, and anchor the position of clusters within Slovak legislation.

The basis for creating this strategy was an in-depth analysis of cluster policy in Slovakia conducted based on the experiences of the Slovak Innovation and Energy Agency (SIEA), the European Cluster Collaboration Platform (ECCP), the Ministry of Economy of the SR (MH SR), the Ministry of Investment, Regional Development and Informatization of the SR (MIRRI SR), the Union of Slovak Clusters (UKS), the clusters themselves operating in Slovakia, and other institutions relevant to the topic. Additionally, the strategy covers needs derived from other strategic materials, plans, and thematic documents.

11 MIRRI SR (2021). Stratégia výskumu a inovácií pre inteligentnú špecializáciu Slovenskej republiky 2021 – 2027. Bratislava: MIRRI SR. Dostupné na: <https://www.mirri.gov.sk/sekcie/investicie/strategia-vyskumu-a-inovacii-pre-inteligentnu-specializaciu-sr/>

Initial State and Development of Cluster Topics in Slovakia

According to the **cluster** definition, a cluster can be characterized as a “geographical concentration of interconnected companies and institutions in a specific area”¹², where individual actors may differ, collaborate, or compete with each other. Another definition describes it as a “way of organizing a production system characterized by the geographical concentration of economic actors and other organizations, specialized in the same area of activity, developing internal relationships of market and non-market character, contributing to the innovation and competitiveness of its members and territory”¹³. Clusters may include heterogeneous business entities from various sectors or supply chains, universities and other research organizations, government and public institutions, non-governmental organizations, associations, and more. In this form, clusters influence the competitiveness of firms and regions and are also considered accelerators of innovations, driving economic growth.

Collaboration in clusters, based on the principle of the quadruple helix, facilitates knowledge sharing, eliminates high costs associated with internal research, development, and innovation (R&D), and ensures ease and speed of innovation¹⁴. Thus, locally formed clusters are now considered one of the best tools for developing innovative ecosystems, regional economies, as well as countries and multinational integration groupings. Cluster activities are typically managed by cluster organizations, which can take various forms, from non-profit organizations and associations to business entities (LLCs, corporations, etc.). Currently, it is widely accepted by experts that the existence and functioning of cluster organizations are crucial for the development of clusters¹⁵.

In terms of basic statistics, there are currently over 1500 clusters registered in the European Union (EU), employing over 50 million people, representing one in four jobs in Europe¹⁶. Half of them fall under the category of the export industry. Clusters achieve

12 Porter, M.E. (2000). Location, Competition, and Economic Development: Local Clusters in Global Economy. *Economic Development Quarterly*, 14, No.1, pp.13 – 34. <https://doi.org/10.1177/089124240001400105>

13 EC (2013). *European Trend Chart on Innovation. Thematic Report Cluster Policies*. Brussels: EC Directorate General for Internal Market, Industry, Entrepreneurship and SMEs.

14 Adamovský (2022). *Efekty štvoritej špirály v realite: empirický výskum vplyvu kooperácie na inováciu v krajinách strednej a severovýchodnej Európy*. Bratislava: SIEA. ISBN 978-80-8261-008-9

15 EC (2008). *The concept of clusters in the EU: Implementing the broad based strategy*. COM 652, Brussels: European Commission. <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0652:REV1:en:pdf>

16 EC (2021). *European Expert Group on Clusters – Recommendation Report*. Brussels: EC Directorate General for Internal Market, Industry, Entrepreneurship and SMEs. ISBN 978-92-76-30280-3

labor productivity 25% higher than the average of all employers. According to updated profiles within the EU-27 on the ECCP website, these clusters unite approximately 73,000¹⁷ members as of January 2023. Of this number, 70.4% are small and medium-sized enterprises (SMEs), 10.2% are large companies, and 8.1% are research organizations. The “other” category is represented at the level of 11.2%. Almost 60% of European clusters within the EU-27 average less than 100 members. In Slovakia, there are currently more than 30 active industrial cluster organizations. Almost 30% of them have existed for less than 3 years. Slovak cluster organizations represent a significant economic force, bringing together companies and organizations with over 100,000 employees and a total annual turnover of almost EUR 23 billion. As of October 2023, 24 Slovak clusters¹⁸ are registered on the ECCP, accounting for 66% of the total number of entities operating in the country according to the internal records of the SIEA. According to SIEA data, these organizations unite more than 930 members.

Cluster activities gained more prominence in Slovakia in the first decade of the 21st century. The beginnings of active cluster support, including creating conditions for their development, date back to 2007 and are associated with the first international thematic projects implemented by SIEA¹⁹ – CENTRAMO, ClusterCOOP, and ACE. In the following period, the development of clusters also entered strategic documents such as *The National Strategic Reference Framework 2007–2013*²⁰, *The Innovation Strategy of the Slovak Republic for the Years 2007 to 2013*²¹, and *The Insights for Prosperity – Research and Innovation Strategy for Smart Specialization of the Slovak Republic*²². As part of internationalization, Slovak clusters were involved in projects such as ClusterFY and INNO INDUSTRY from 2017 to 2022, belonging to the EU Interreg Europe cooperation program, and projects CluStrat (Central Europe program) and ClusterPoliSEE (South East Europe program). A significant contribution to the Slovak cluster ecosystem was the development and implementation of

17 ECCP (2023). ECCP Cluster Mapping – Number of Cluster Organisations. Brussels: European Cluster Collaboration Platform. <https://reporting.clustercollaboration.eu/region>

18 ECCP (2023). ECCP Cluster Mapping – Number of Cluster Organisations. Brussels: European Cluster Collaboration Platform. <https://reporting.clustercollaboration.eu/region>

19 SIEA (2023b). Klastrové iniciatívy pôsobiace na Slovensku. Bratislava: SIEA. <https://www.siea.sk/inovacie/klastre-na-slovensku/>

20 Úrad vlády SR (2008). Národný strategický referenčný rámec 2007 - 2013. Bratislava: ÚV SR. <https://www.nsrr.sk/narodny-strategicky-referencny-ramec-2007-2013/>

21 MH SR (2007). Návrh inovačnej stratégie SR na roky 2007 až 2013. Bratislava: MH SR. https://www.siea.sk/wp-content/uploads/inovacie/dokumenty/navrh_inovacna_strategia_2008_2013.pdf

22 MH SR (2013). Poznatkami k prosperite - Stratégia výskumu a inovácií pre inteligentnú špecializáciu Slovenskej republiky. Bratislava: MH SR. <https://www.opvai.sk/media/98825/poznatkami-k-prosperite-strat%C3%A9gia-v%C3%BDskumu-a-inov%C3%A1ci%C3%AD-pre-inteligen%C3%BA-%C5%A1pecializ%C3%A1ciu-sr.pdf>

the *Action Plan to Improve the Policy Support for Cluster Organizations in Slovakia*²³ within the ClusterFY project. The collaboration of cluster actors was reflected in the results of the Cluster Stakeholder Working Group (CSWG; originally established as a working group within the ClusterFY project) with responsibilities across the Ministry of Economy of the SR, which participates in preparing methodological and other position documents and initiated the establishment of a working group for applied research.

Currently, Slovak industrial cluster organizations can be assessed in terms of management quality (international assessment by the European Cluster Analysis Secretariat – ESCA²⁴) and performance (National Cluster Performance Assessment – NCPA carried out as part of SIEA activities). Cluster benchmarking by ESCA represents the assessment process of cluster management quality based on personal interviews using 28 indicators that evaluate structure and management, financing, services and activities, achievements and recognition, as well as management capabilities. The assessment results lead to the awarding of a bronze, silver, or gold ESCA certificate. As of January 2023, Slovakia has only two cluster organizations registered in the highest categories within ESCA (Slovak Plastic Cluster – silver and Košice IT Valley – gold), while in the process specified below, NCPA SIEA identified the potential to achieve a gold or silver ESCA certificate for at least three other Slovak industrial cluster organizations. Since 2011, 47 bronze ESCA certificates have been awarded in Slovakia (including re-certifications). NCPA represents the assessment of the performance of cluster organizations and their classification based on the point evaluation into three groups – moderately advanced, advanced, and developed cluster. The NCPA methodology was prepared in coordination with SIEA and the Competitiveness Section of the Ministry of Economy of the SR. Its aim is to contribute to increasing the performance of clusters and direct the support of cluster organizations toward achieving parameters comparable to international organizations. The National Assessment is designed broader than ESCA, focuses on cluster performance, is independent, objective, and conducted at three-year intervals, with a cluster organization able to request a reassessment every 12 months from the last assessment. Legal form is not considered in the assessment; however, based on established approaches, it is recommended to choose the form of an association of legal entities. National assessment criteria also consider whether cluster organizations have a valid ESCA certification and the type of excellence degree obtained (bronze/silver/gold). When evaluating cluster performance through NCPA, ten cluster organizations were

23 SIEA (2019). Akčný plán na zlepšenie politiky podpory klastrových organizácií na Slovensku. Bratislava: SIEA. https://projects2014-2020.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1588060757.pdf

24 ESCA (2023). The European Secretariat for Cluster Analysis (ESCA). Berlin: European Secretariat for Cluster Analysis. <https://www.cluster-analysis.org/>

assessed in 2022, which were classified into one of the categories: moderately advanced (10%), advanced (70%), or developed cluster (20%).

Assessments of management quality and cluster organization performance are used, among other things, to determine relevant beneficiaries of support from public sources. In the field of support for cluster organizations, two calls from the European Structural and Investment Funds (ESIF) were announced in 2020 to support business networking. From the Integrated Infrastructure Operational Program, EUR 2.3 million was allocated for cluster organizations in the Bratislava self-governing region, and EUR 2.7 million for cluster organizations in other regions of Slovakia. **As of October 2023, 20 applications for non-repayable financial contributions have been contracted.** For starting cluster organizations (no older than three years), a call for applications for grants to support industrial cluster organizations was announced in July 2022 under Scheme DM 6/2022. For successful projects within this call, subsidies were approved in the approximate amount of EUR 235,000. Indirect support for cluster organizations in Slovakia is also addressed by the national project **Increasing the Innovation Performance of the Slovak Economy**²⁵ (ZIVSE – inovujme.sk; 2017–2023), is a national project focused on increasing innovation awareness and supporting innovations in business entities operating in Slovakia. Within its scope, support is provided to cluster organizations through ESCA. As part of the project, a communication platform, SIEA – **Slovak Cluster Monitor**²⁶, was established for the transfer and sharing of information among clusters and other actors in the cluster ecosystem, as well as for disseminating outputs from international projects.

Characteristics of Slovak Clusters

The development of cluster policy in Slovakia over the past two decades is reflected in the current state of Slovak clusters. Currently, these groupings of diverse actors cover a wide range of sectors in the Slovak economy and address current development trends such as digitization, automation, renewable energy production, transmission and storage, smart technologies, and new materials. They also engage with issues related to environmental sustainability and food self-sufficiency.

Each cluster has its specificities and contributions to the area in which it operates. While it's not possible to completely generalize the characteristics of Slovak clusters,

25 SIEA (2023a). Národný projekt Zvýšenie inovačnej výkonnosti slovenskej ekonomiky – o projekte. Bratislava: SIEA. <https://www.inovujme.sk/sk/o-projekte>

26 SIEA (2023c). Slovenský klastrový monitor. Bratislava: SIEA. <https://www.inovujme.sk/sk/slovensky-klastrový-monitor>

a comprehensive SWOT analysis (see *Table 4*) is essential for defining the vision, goals, and tools within the proposed strategy. Among the strengths of Slovak clusters are tendencies to achieve a better economic position for their members, quick responses to sectoral changes in the economy, mutual competitiveness, and efforts for maximum visibility. This is particularly true for clusters that have been in existence for several years and have a well-established sustainability strategy. On the flip side, Slovak clusters lag in mutual cooperation and communication, project management, internationalization, and the development of cluster management itself. A significant drawback is the not entirely clear boundary between the cluster's competencies and the most active cluster member. However, most of the mentioned negatives can be eliminated by seizing opportunities, such as high demand for innovation, new areas for cluster formation in connection with RIS3, numerous research and non-research international projects suitable for cluster organizations, new funding opportunities for cluster activities, hiring competent individuals from Slovakia, or educating current employees.

Organizations, however, need to be aware of threats in their activities, such as a shortage of qualified labor and brain drain, the unpredictability of economic development, the emergence of crises and other international events with negative impacts, competition, and weak connections between policy-makers, businesses, and the academic sector. On the other hand, several recent initiatives suggest that cluster organizations are approaching these issues very proactively. This includes networking of clusters with similar programmatic and professional industry focus (e.g., the establishment of the National Platform of Energy and Environmental Clusters and Associations of Slovakia) or involvement in creating modern solutions for Slovakia within other initiatives (Regional Circular Economy Centers, REUSE centers, etc.).

SWOT Analysis of the Slovak Cluster Ecosystem

Table 4: SWOT Analysis of the Slovak Cluster Ecosystem

	Strengths (S)	Weaknesses (W)
Internal Assessment	<ul style="list-style-type: none"> • Relative increase in the number of active clusters over the last three years. • Ability of clusters to respond/adjust to new conditions, new challenges, and mutual competitiveness. • Cluster memberships include the most significant Slovak R&D organizations. • Efforts towards visibility, dissemination of results, and progress in both domestic and international cluster evaluations. • Interest in communication with supporting organizations + the existence of the Cluster Stakeholder Working Group. • Good sustainability due to the broad availability of funding resources. 	<ul style="list-style-type: none"> • Insufficient sharing of information, knowledge, and cooperative activities among themselves. • Weaker technological and business competencies and their development through educational activities. • Suboptimal cluster management (employee of the cluster /non-monetary contribution). • Excessive dependence of clusters on public funding. • Low interest in international projects, internationalization, and public-private partnerships. • Often unclear boundary between the cluster and its members. • Unattractive and outdated websites, often lacking a bilingual version. • Unsystematic development policies not acknowledging existing clusters in the regions.
External Assessment	<ul style="list-style-type: none"> • Availability of a workforce with basic digital skills. • Policies and cluster development strategies are appropriately interconnected, and there are evaluation mechanisms ensuring an objective assessment of cluster performance and management. • New areas for the emergence of clusters in line with RIS3 – batteries, hydrogen, blockchain, artificial intelligence, smart technologies, big data, etc. • New funding opportunities for cluster activities – Horizon Europe projects, Operational Program Slovakia, Recovery and Resilience Plan, calls within DM, etc. • Open opportunities for exploring new markets/ventures + a higher form of internationalization (international projects, consortia, platforms, etc.). • High demand for innovation and intellectual property. • Opportunities for educational activities for employees of member organizations in clusters. 	<ul style="list-style-type: none"> • Continuously decreasing number of graduates from technical universities suitable for members of industrial clusters. • Shortage of a workforce with advanced digital skills + the looming threat of brain drain. • Unpredictability – in terms of financial volume, time horizon, focus of challenges, and subsidies. • Insufficient coordination of knowledge transfer within the q-helix = low connectivity between policymakers, companies, and academic institutions. • The role of clusters in developing the country's competitiveness and existing regional disparities continue to be underestimated. • Disruption of supply chains (supplier-buyer, market loss, production decline, job security, etc.). • Vulnerability and challenging predictability in responding to the impacts of crises, military conflicts, pandemics, international events (e.g., Brexit), etc. • Relatively complex processes of applying intellectual property.

Source: Own processing based on ESCA certification processes, NCPA, and SWOT analyses of the Slovak cluster ecosystem prepared for the Interreg Europe INNO Industry project (Bobovnický, 2019; 2022).

Clusters and Smart Specialization

The specification of the state and development of industrial clusters in Slovakia, their characteristics, and SWOT analysis have revealed the need to define a vision and strategy for cluster policy that would lead to the development of the issue in the medium term. The defined task also arises from the measure of the currently valid strategy of smart specialization **SK RIS3 2021+ “Support for research and innovation activities in clusters.”**

The cornerstones of the proposed cluster strategy are the domains of smart specialization; therefore, in this section, we specify the relevance of SK RIS3 2021+ and its domains to cluster policy in Slovakia:

Domain 1: Innovative Industry for the 21st Century

Supporting the transformation of industrial production in Slovakia based on innovations through six priority areas: (1) Automation and robotization of industrial production, Industry 4.0, resilience to external influences; (2) Processing of raw materials and semi-finished products into higher value-added products; (3) Progressive technologies and materials; (4) Increasing energy efficiency in the economy; (5) Efficient waste management; (6) Energy security of Slovakia. Industrial clusters provide fertile ground for the dissemination of knowledge and good examples of practice within Domain 1 of SK RIS3 2021+. Positive examples of performance clusters covering this domain include the Slovak Plastic Cluster, Industrial Innovation Cluster, National Energy Cluster, and the Association of Intelligent Industry (Industry4UM).

Domain 2: Mobility for the 21st Century

Activities within the domain focus on the development of ecological, safe, accessible, and sustainable mobility based on the interoperability of a multimodal chain of connected intelligent transport systems. The three priority areas are: (1) Connected and autonomous mobility; (2) Intelligent mobility services and intelligent transport systems; (3) Decarbonization and sustainability of mobility. In Slovakia, clusters such as the Slovak Electric Vehicle Association (SEVA), the Slovak Battery Alliance (SBaA), and the Slovak National Hydrogen Association – Cluster significantly address this issue.

Domain 3: Digital Transformation of Slovakia

The third domain addresses the digital transformation of all societal areas with the aim of improving citizens' quality of life, enhancing the competitiveness of the industry and the entire economy, and ensuring the effective performance of state administration. Within the domain, four priority areas were identified: (1) Smart and connected sensors and devices; (2) Increasing the utility value of all kinds of data and databases; (3) Smart energy systems; (4) Cybersecurity and cryptography. The domain has one of the greatest

potentials in terms of clusters operating in Slovakia. One of the best examples is the multiple gold-certified ESCA holder, the Eastern Slovak Cluster Košice IT Valley. Other developing clusters in this area include INOVATO and the Cybersecurity Cluster.

Domain 4: Healthy Society

The domain works with the vision of changing the perspective on health to ensure an effective response to current and future requirements in the field of prevention, diagnosis, and treatment of serious diseases and related subsequent care in relation to the expected quality of life. It includes three priority areas: (1) Personalized/precision medicine; (2) Innovative products (including bio materials and biotechnologies), processes, and procedures in healthcare; (3) Breakthrough technologies in healthcare. In terms of this domain, emphasis can be placed on clusters such as Bioeconomy Cluster, HEMP CLUSTER, and the Slovak Sports Innovation Center.

Domain 5: Healthy Food and Environment

The last domain focuses on creating long-term economically, environmentally, socially sustainable, and epidemiologically resilient soil production systems in Slovakia. It focuses on four priority areas: (1) Resilient and healthy local food systems; (2) Circular production systems based on biomass; (3) Society within the environment; (4) Sustainable natural resources (soil, water, air, biodiversity, ecosystems). Organizations within this domain are primarily addressed by the Slovak Chamber of Commerce, the Bioeconomy Cluster, and the HEMP CLUSTER.

Vision and Strategic Direction for Slovak Industrial Clusters for the Period 2023–2028

Vision

“Clusters are an accepted and active component of the innovation ecosystem at the international, national, and regional levels, reflecting the needs of the Slovak economy in terms of digital and green transformation and contributing to building the image of a successful, innovative, and resilient country.”

Strategic Goals and Partial Tasks

Clusters, in most cases, emerge based on the bottom-up principle to address regional or sectoral issues. Therefore, the strategic goals of clusters differ depending on the sectors in which these clusters operate, the orientation and specifics of cluster members, and the context of their activities. When defining goals, it is also essential to reflect on sustainable development goals, global megatrends, innovation and economic trends, the needs of the

economy and value chains, and societal requirements. In response to the six-year strategic goals in the field of innovation defined for Slovakia in SK RIS3 2021+ and the priority areas of the 2030 Agenda for Sustainable Development, the emphasis of Slovak cluster policy should be on the areas (strategic goals and partial tasks) specified in *Table 5*. Key indicators for achieving strategic goals are also specified in *Table 6*.

Table 5: Strategic Goals and Tasks to Be Completed

Strategic goal (SG)	Tasks (T)	Support Tools (ST)
<p>1. Development of industrial clusters in line with identified domains of smart specialization, priority areas of the Agenda 2030 for sustainable development, and prevailing trends in economic development.</p> <p><i>Relevant smart specialization domains:</i> Innovative Industry for the 21st Century; Mobility for the 21st Century; Digital Transformation of Slovakia; Healthy Society; Healthy Food and Environment</p> <p><i>Relevant Agenda 2030 priorities:</i> Education for a Dignified Life; Towards a Knowledgeable and Environmentally Sustainable Economy amid Demographic Changes and a Changing Global Environment; Poverty Reduction and Social Inclusion; Sustainable Settlements, Regions, and Country in the Context of Climate Change; Rule of Law, Democracy, and Security; Good Health</p> <p><i>Dominant trends:</i> digitization, automation, the development of industrial artificial intelligence and smart technologies, personalization, sustainability, and efficient resource utilization in industrial production, green economy, and environmental protection</p>	<p>a) Foster knowledge sharing within the domains of smart specialization, Agenda 2030 priorities, and prevailing trends among industrial clusters and their members to ensure growth in productivity, competitiveness, value-added creation, and sustainability.</p>	<ul style="list-style-type: none"> • inovujme2.sk • Call within OP Slovakia for Cluster development (2x within 6 years)
	<p>b) Connect industrial clusters with activities of European Digital Innovation Hubs (EDIH; e.g., Expandi 4.0, Hopero, etc.) in the area of collaboration on digital transition, resilient transformation, and in the green economy. This could be achieved through sharing services/ advisory services and best practice examples.</p>	<ul style="list-style-type: none"> • EDIHs • inovujme2.sk
	<p>c) Support the integration of industrial clusters with related activities within the same domain of smart specialization, aiming to streamline the processes of innovation and support.</p>	<ul style="list-style-type: none"> • inovujme2.sk
	<p>d) Reflect in the action plans of the strategy implementation the current regional trends, analyses, and investment opportunities, ensuring that the supported industrial cluster organizations are relevant for the development of specific regions in line with the priority areas of Agenda 2030.</p>	<ul style="list-style-type: none"> • inovujme2.sk

Strategic goal (SG)	Tasks (T)	Support Tools (ST)
<p>2. Improving the generation of proprietary innovations and the implementation of existing innovations within the structures of industrial clusters and their members.</p> <p><i>Relevant smart specialization domains:</i> Innovative Industry for the 21st Century; Digital Transformation of Slovakia</p> <p><i>Relevant Agenda 2030 priorities:</i> Education for a Dignified Life; Transition to a Knowledgeable and Environmentally Sustainable Economy Amid Demographic Changes and a Changing Global Environment</p>	<p>a) Foster knowledge sharing within the domains of smart specialization, Agenda 2030 priorities, and prevailing trends among industrial clusters and their members to enhance innovation potential/capabilities in individual regions/sectors.</p>	<ul style="list-style-type: none"> • inovujme2.sk
	<p>b) Support pro-export activities with the aim of increasing the competitiveness of industrial clusters and their members, as well as disseminating know-how and positive examples from abroad.</p>	<ul style="list-style-type: none"> • inovujme2.sk • Inovation vouchers • Strategic advisory
	<p>c) Provide support to regional structures in creating background materials for the development of innovations in Slovak regions.</p>	<ul style="list-style-type: none"> • inovujme2.sk • Inovation vouchers • Strategic advisory

Strategic goal (SG)	Tasks (T)	Support Tools (ST)
<p>3. Stimulation of internationalization activities for industrial clusters and increased interest of clusters and their members in engaging in international activities/projects.</p> <p><i>Relevant smart specialization domains:</i> Innovative Industry for the 21st Century; Mobility for the 21st Century; Digital Transformation of Slovakia; Healthy Society; Healthy Food and Environment</p> <p><i>Relevant Agenda 2030 priorities:</i> Education for a Dignified Life; Transition to a Knowledgeable and Environmentally Sustainable Economy Amid Demographic Changes and a Changing Global Environment</p>	a) Develop international relations with similar industrial clusters and their members abroad, promote international exchange of cultural and work-related know-how, and establish and expand a network of business partners and investors for clusters on an international level.	<ul style="list-style-type: none"> • inovujme2.sk • National cluster conferences
	b) Support and stimulate the creation of cross-border industrial clusters. Utilize best practices from neighboring countries (e.g., Czech Nanoprogress).	<ul style="list-style-type: none"> • inovujme2.sk • National cluster conferences
	c) Support the participation of Slovak industrial clusters in international trade fairs and conferences and develop programs for entrepreneurs and startups within the clusters.	<ul style="list-style-type: none"> • inovujme2.sk • Innovation vouchers • Strategic advisory for clusters
	d) Utilize and expand digital platforms for international communication and commerce.	<ul style="list-style-type: none"> • RRF • Digital vouchers
	e) Support the transfer of innovative know-how to and from abroad through international projects.	<ul style="list-style-type: none"> • inovujme2.sk • Strategic advisory

Strategic goal (SG)	Tasks (T)	Support Tools (ST)
<p>4. Stimulated knowledge base and activated role of industrial clusters and their members in regional labor markets through the establishment of capacities for qualification and requalification.</p> <p><i>Relevant smart specialization domains:</i> Innovative Industry for the 21st Century; Mobility for the 21st Century; Digital Transformation of Slovakia; Healthy Society; Healthy Food and Environment</p> <p><i>Relevant Agenda 2030 priorities:</i> Education for a Dignified Life; Transition to a Knowledgeable and Environmentally Sustainable Economy Amid Demographic Changes and a Changing Global Environment; Poverty Reduction and Social Inclusion</p>	<p>a) Enhance the knowledge of cluster managers and members of cluster organizations through training, workshops, and networking activities.</p>	<ul style="list-style-type: none"> • inovujme2.sk • Cluster Excellence Accelerator
	<p>b) Utilize international tools such as the Interreg Policy Learning Platform and Cluster Booster Academy.</p>	<ul style="list-style-type: none"> • inovujme2.sk • Cluster Excellence Accelerator
<p>5. Utilizing the knowledge of domestic and foreign industrial clusters, companies, organizations, and institutions to enhance the resilience of value/supply chains and ensure sustainability and responsiveness capabilities of industrial clusters in the face of unexpected global and local challenges.</p> <p><i>Relevant smart specialization domains:</i> Innovative Industry for the 21st Century; Mobility for the 21st Century; Digital Transformation of Slovakia; Healthy Society; Healthy Food and Environment</p> <p><i>Relevant Agenda 2030 priorities:</i> Education for a Dignified Life; Transition to a Knowledgeable and Environmentally Sustainable Economy Amid Demographic Changes and a Changing Global Environment; Poverty Reduction and Social Inclusion; Sustainable Settlements, Regions, and Country in the Context of Climate Change</p>	<p>a) Engage Slovak industrial clusters and their members in local and international networks to enhance the dissemination of knowledge, data exchange, capital flow, and skilled human resources. Support the development of cross-border clusters.</p>	<ul style="list-style-type: none"> • SIEA/industrial clusters – participation in the Interreg calls etc.
	<p>b) Develop cooperative activities not only within industrial clusters, sectors, and regions but also with SMEs and other businesses, R&D institutions, the public sector, and employer associations/organizations (RÚZ, AZZZ, Klub 500, and others) that can contribute to the growth of innovation potential. Conduct regular meetings at the local, regional, and national levels.</p>	<ul style="list-style-type: none"> • inovujme2.sk • EXPANDI 4.0 and other Slovak EDIHs
	<p>c) Regularly evaluate data from industrial cluster organizations and their members to identify their status, progress, and sustainability, reflecting the principle of “data-driven decision-making.”</p>	<ul style="list-style-type: none"> • inovujme2.sk • Cluster Excellence Accelerator

Source: Based on SK RIS3 2021+, SWOT analysis of cluster ecosystem and Vision and Strategy of Slovakia 2030

Key Performance Indicators

Table 6: KPI for Strategic Goals

Area	Period	
	2023–2025	2026–2028
NCPA	Minimum of 50% of registered industrial cluster organizations achieving the Advanced Cluster level <i>(SG1)</i>	Minimum of 50% of registered industrial cluster organizations achieving the Advanced Cluster level <i>(SG1)</i>
ESCA	Minimum 1 Gold Cluster Organization <i>(SG3)</i> Minimum 2 Silver Cluster Organizations <i>(SG3)</i>	Minimum 2 Gold Cluster Organizations <i>(SG3)</i> Minimum 3 Silver Cluster Organizations <i>(SG3)</i> 1 cross-border cluster (based on a good example from the Czech Republic) <i>(SG3 – Tb; SG5 – Ta)</i>
Visibility	Minimum 70% of clusters registered on ECCP (European Cluster Collaboration Platform) <i>(SG3; SG5)</i>	Minimum 70% of clusters registered on ECCP (European Cluster Collaboration Platform) <i>(SG3; SG5)</i>
Structure of cluster – R&D members	Minimum 7.5% R&D organizations <i>(SG2)</i>	Minimum 10% R&D organizations <i>(SG2)</i>
Pro-export focus	Minimum 50% of clusters with 51% and more export-oriented companies <i>(SG2 – Tb; SG3; SC5)</i>	
Cluster focus	Integration of all clusters with the same focus <i>(SG1 – Tc)</i>	
International projects	At least 30% of cluster organizations involved in international projects (at least as consortium members) <i>(SG3 – Ta)</i>	At least 40% of cluster organizations involved in international projects (at least as consortium members) <i>(SG3 – Ta)</i>
International trade fairs and conferences	A total of 30 participations of Slovak clusters in international trade fairs and conferences <i>(SG3 – Ta)</i>	A total of 45 participations of Slovak clusters in international trade fairs and conferences <i>(SG3 – Ta)</i>
National networking development	A total of 30 cooperative activities within clusters, sectors, and regions, including with SMEs and other companies, R&D institutions, the public sector, and employers' associations/organizations (employers' unions, AZZZ, Klub 500, etc.) <i>(SG5 – Ta)</i>	A total of 45 cooperative activities within clusters, sectors, and regions, including with SMEs and other companies, R&D institutions, the public sector, and employers' associations/organizations (employers' unions, AZZZ, Klub 500, etc.) <i>(SG5 – Ta)</i>

Area	Period	
	2023–2025	2026–2028
Core competencies and skills of cluster managers	A total of 6 events focused on knowledge sharing within the domains of smart specialization, Agenda 2030 priorities, and prevailing trends among clusters and their members to ensure growth in productivity, competitiveness, value-added creation, and sustainability. (SG1 – Ta; SG2 – Ta; SG4)	A total of 9 events focused on knowledge sharing within the domains of smart specialization, Agenda 2030 priorities, and prevailing trends among clusters and their members to ensure growth in productivity, competitiveness, value-added creation, and sustainability. (SG1 – Ta; SG2 – Ta; SG4)
Digital transition	A total of 3 interconnections between clusters and Digital Innovation Hubs (EDIHs) leading to increased collaboration in digital transition, resilient transformation, and in the green economy (SG1 – Tb; SG3 – Td)	A total of 12 interconnections between clusters and Digital Innovation Hubs (EDIHs) leading to increased collaboration in digital transition, resilient transformation, and in the green economy (SG1 – Tb; SG3 – Td)
Analysis of the progress and sustainability of clusters	A total of 2 analyses of the state, progress, and sustainability of clusters (1 per year) (SG5 – Tc)	A total of 3 analyses of the state, progress, and sustainability of clusters (1 per year) (SG5 – Tc)

Source: Own work

Targeted Strategic Tools

National Project inovujme2.sk (2024–2029)

The national project inovujme2.sk (NP inovujme2.sk) builds on the NP ZIVSE through selected tools supporting the competitiveness of business entities. In addition to direct financing through ongoing thematic innovation vouchers, the project also covers networking of actors in the innovation ecosystem through support for industrial clusters. The fundamental tools of this support include the performance assessment of cluster organizations, non-financial assistance by covering fees associated with certification at the highest level of assessment in the ESCA system, and support for networking through the Cluster Excellence Center (CEK).

Cluster Excellence Accelerator (CEA)

The Cluster Excellence Accelerator represents a platform enabling regular meetings, discussions, the creation of working groups to address current needs/problems of cluster organizations, ongoing advice on mega and macro trends, and the creation of a background for the continuous improvement of all cluster organizations. The platform aims to provide

inputs for correct and timely strategic decision-making for the Ministry of Economy of the Slovak Republic (MH SR), the Ministry of Investments, Regional Development, and Informatization of the Slovak Republic (MIRRI SR), and the Office of the Government of the Slovak Republic in creating supportive programs and policies. It also aims to identify new opportunities for clusters, provide strategic advice to cluster organizations, and engage clusters in sharing examples of best practices. It is a direct transformation of the existing CSWG platform, which was established as part of the international ClusterFY project in 2018. In addition to the above-mentioned tasks, CEA also serves as an opportunity to regularly meet with so-called policymakers (MH SR, MIRRI SR, Office of the Government of the SR) and supporting organizations (Slovak Business Agency, Center for Scientific and Technical Information, and SIEA) as well as self-governments (public institutions creating their innovation centers, which are clusters). The platform continues to create and share content for the Slovak Cluster Monitor, which was created as part of the national project inovujme.sk.

Innovation Vouchers and Digital Vouchers

Innovation vouchers within NP inovujme2.sk will not directly support cluster organizations but will provide additional financial resources to cluster members for specific innovation processes. This support aims to apply knowledge and technologies to practice, provide access to professional skills/services or knowledge, assist in the development of new or improvement of existing products, and implement research and development and innovation activities at academic institutions for companies that do not have such opportunities within internal resources. The purpose of Digital Vouchers is to support businesses in the digitization of processes and services through a digital audit of selected applicant processes, focusing on developing an individualized investment solution, evaluating the current level of digitization and automation, and assessing the possibilities of deploying a wide range of innovative technologies that increase digitization and process automation.

Other Supporting Tools with State Budget, ERDF, or EU Support

- Direct support for cluster organizations through MH SR calls
- Banking and hybrid financing, financial instruments, connecting with investors
- Excellent Cluster of the Year – regular annual competition
- Programs managed by the European Commission, such as Euroclusters

