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WP4

Investigating the possibilities of emerging industry development through cross regional cluster cooperation

Common proposal for the promotion of cross-regional cluster cooperation in emerging and new industries

July 2013



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I. Introduction

This document is a core output of the ClusterCOOP project presenting the common proposals of the partnership for the promotion of cross regional cluster cooperation in emerging and new industries.

The ClusterCOOP project aims at enhancing framework conditions for effective transnational cluster cooperation in Central European countries. The project started out on 2 April 2011 and finishes on 31 March 2014.

The partnership consists of 10 partners, as follows:

- Ministry for National Economy Hungary, LP
- Ministry of Industry and Trade of the Czech Republic, PP3
- Investment and Business Development Agency, CzechInvest, PP4
- Ministry of Economy of the Slovak Republic, PP5
- Slovak Innovation and Energy Agency, PP6
- Piemonte Region, PP8
- University of Ljubljana, Slovenia, PP9
- The City Office of Rzeszów, PP10
- MAG – Hungarian Economic Development Centre, PP11
- inno AG, PP12.

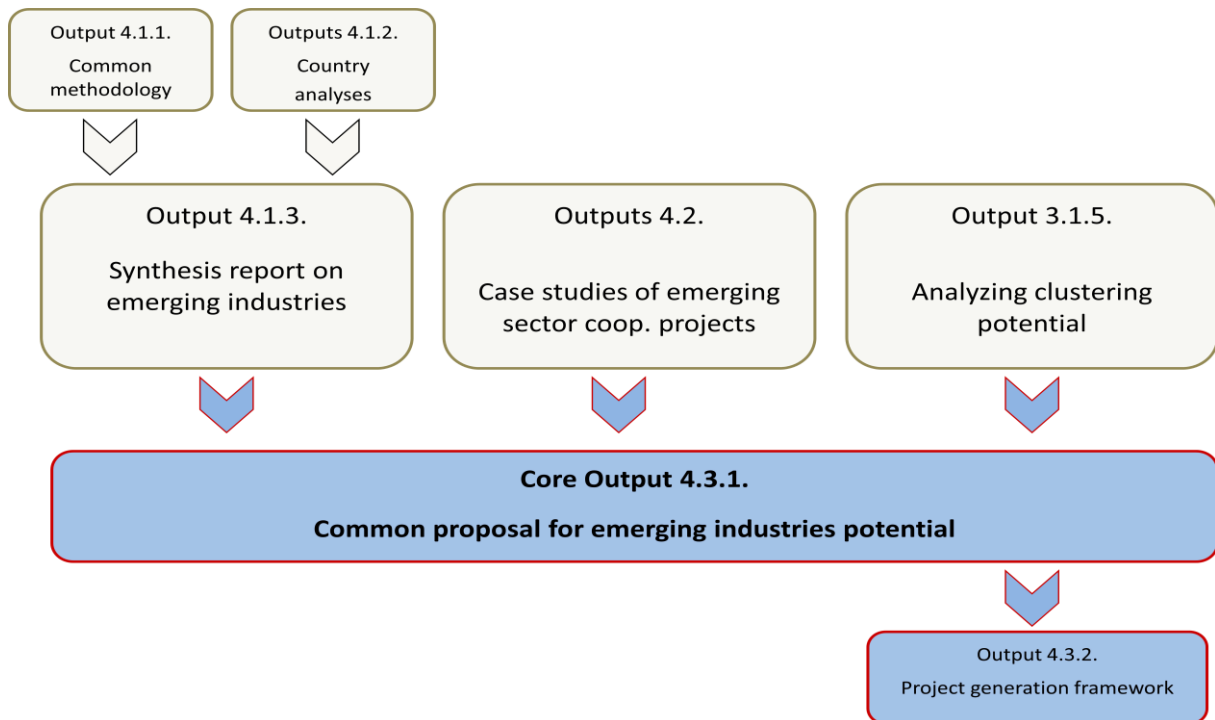
Project activities focus on the following three areas:

1. Enhance existing and create new synergies among national/regional cluster policies and funding frameworks (Work Package 3);
2. Facilitate emerging industry development (Work Package 4);
3. Promote flow of information between, and provide a common knowledge base for clusters of CE to facilitate their networking and cooperation (Work Packages 5).

The Work Package 4 *“Investigating the possibilities of emerging industry development through cross regional cluster cooperation”* contributes to identification of opportunities for emerging industry development in Central Europe through cross regional cluster cooperation. As part of WP4 the following activities have been carried out (as shown in Figure 1). For identifying emerging sectors relevant to the regions of partner countries, common methodology was prepared (Output 4.1.1) on the basis of which country analyses were performed (Output 4.1.2). The synthesis report (Output 4.1.3) sums up the results. It includes data from 5 countries or regions: Czech Republic, Hungary, Piemonte region, Slovakia and Slovenia. On the basis of the conclusions of this report, together with findings from pilot case studies on industry development projects in selected sectors from Piemonte region, Slovakia and Rzeszów region (Output 4.2) and analysis of clustering potential (Output 3.1.5), a common proposal of the ClusterCOOP partnership for the promotion of cross cluster cooperation in the field of emerging industries (Core Output 4.3.1) was elaborated.



Figure 1 Positioning of core output 4.3.1 in the ClusterCOOP project



The proposals in this document are the basis for the elaboration of project generation framework (Output 4.3.2) that could support clusters cooperation in the field of emerging industries. Current proposal also feeds into the proposal for optimisation and harmonisation of national regulatory frameworks with regards to transnational cluster cooperation (WP3, Action 3.1.6).

The proposals target regional, national and local policy makers designing measures to strengthen competitive position of a national economy by promoting the development of emerging industries and provide information where to target the support for research and innovation in order to maximize the knowledge based development potential.

This document was drafted by University of Ljubljana (PP9) in July 2013. Partners commented on the draft in August 2013, based on comments the document was finalised in the same month and the final version was approved in September 2013.



II. Summary of results of previous outputs

1. Synthesis report on emerging industries – Output 4.1.3

The synthesis report is based on the country/region analyses that were prepared by the project partners using a common methodology.¹ The nature of emerging industries itself indicates the complexities involved in trying to capture and measure them. Not only is industrial emergence an evolutionary process and therefore difficult to capture until after the industry develops successfully. It also depends on activities of a number of individual and organizational actors and often arises at the intersection of industries as defined by standard classification codes which makes it difficult to capture with the available statistical data. All of this needed to be taken into account when setting up a methodology to identify emerging industries in partner countries and regions which could develop as a result of international cooperation.

In order to identify emerging industries we looked for *adaptive clusters* which are a source of new industries.² Adaptive clusters are characterized by critical mass of firms and support institutions which have the collective capability to develop new products and processes to take advantage of changes in markets and new technologies. Successful new products can trigger processes by which a sector is transformed or a sector new to a region takes shape. In most cases the new sectors will draw upon and recombine skills and capabilities already existent in the region. It is not only the adaptive clusters that are of interest but the entrepreneurial firms within them. *Entrepreneurial firms* are those which seek to develop competitive advantage by developing new products, processes, technologies, and organizational practices. This enables them to enter into emerging industry markets and to create new market opportunities. They are engaged in the long term partnering relationships with suppliers of inputs and services, customers, technology development partners, financial and research funding agencies, and education and training institutions. Networking is their business model of innovation: they focus on core capabilities and partner for complementary capabilities. The stronger the presence of entrepreneurial firms in the cluster, the greater is adaptability of a cluster to the latest technological advances and to emerging market opportunities, therefore the greater cluster's dynamics and the potential to enter into emerging industries markets.

In order to identify adaptive clusters and entrepreneurial firms within project partners' countries and regions, we have developed a methodology that included quantitative as well as qualitative analysis. The aim of the former was to identify clusters with adaptive properties and entrepreneurial firms within them. Once they were identified, interviews were carried out on a limited sample of entrepreneurial firms. This does not exclude the possibility that non-entrepreneurial firms behave in a similar manner.

¹ *The conceptual framework and the description of methodology in greater detail can be found in a separate document (Output 4.1.1): "Common methodology for the identification of emerging industry sectors of the partner regions/countries" (Best & Kotnik, 2012).*

² *We define clusters of firms as agglomerations of firms from the same industry that are relevant for regions' employment or number of firms. They do not necessarily correspond to formally organized clusters by companies or government initiatives.*



Let us first summarize the findings on **networking as part of a business model of innovation of firms** and on **firms' view of cross-border cooperation**. Based on the interviews of entrepreneurial firms we can conclude the following:

- Entrepreneurial firms engage in formal as well as informal networks. Most of them strongly emphasize the importance of cooperation in informal networks, such as links with suppliers and customers. High importance is also given to cooperation with universities, research institutes and knowledge providers in general. Some entrepreneurial firms even regard cross border cooperation with knowledge providers as a key tool for improving their innovation potential and market success.
- The most usually listed benefits from networking are: joint research, use of common research infrastructure, sharing experience, know-how and information relevant to new product development and on market trends, access to technology, multidisciplinary knowledge and complementary skills, access to different resources and new materials.
- Cross border networks of entrepreneurial firms are basically built on the core technologies of the industry that the entrepreneurial firms belong to. For example, entrepreneurial firms in automotive industry will be engaged in cross border cooperation with others in automotive industry in the area of core technologies typical of automotive industry. However, cross-technological links are becoming more and more important. For example EFs from automotive industry see possibilities for cross border technological links with transport equipment, energy, and new materials (as presented in more detail in the Synthesis report, pp. 17). Cross border partnering arrangements are also becoming increasingly important for diversification of firms' product portfolios into products of future growing demand.
- Cross border cooperation is an important factor for new industry development.
- In most cases the existing cooperation patterns of firms already have an international dimension. Most of entrepreneurial firms are guided by an open-system business model that stretches across borders. Also, entrepreneurial firms agree that there are many possibilities for CEE cross border cooperation. However, we did not find evidence of existing cooperation with partners from other project partners' countries or regions that would lead to new industry development based on the cross technological links as a result of CEE cooperation

The research performed for Output 4.1.3 allows us not only to draw some general conclusions on the views of firms on networking and cross-border cooperation, but also allows us to identify specific possibilities for cooperation between industries and new industry emergence in project partners. Through the *quantitative analysis*, the industries which could show signs of being adaptive clusters were identified using available secondary data. Possibilities for cross-border cooperation between project partners' countries and regions can be indicated by looking at a cross-section of these industries. Their distribution is shown in Table 1. The identification of **cross border cooperation possibilities is based on the cross-section of technologies** that are or can be used in production of products and services in each industry.

Columns in the table show the situation for each country. Industries (or groups of industries) marked with caps and in italics are those which were identified by project partners as clusters with adaptive properties, thus having the potential to branch into emerging industries. The table should be read horizontally to see the possibilities for cross border cooperation that could lead to emergence of new industries. For example, New materials cluster from Piemonte could cooperate with Slovenian firms

from transport equipment industry, with Automation Technologies and Robotic industry from Slovakia, and with Czech nanotechnology firms. The potential for cooperation of Czech nanotechnology firms exists with firms from Slovene Medical device industry. In case of Slovenian Medical device industry there is a potential for cross border cooperation with Biotechnology and Biomedicine cluster from Piemonte, with Slovak Automation Technologies and Robotic industry, and with Czech Nanotechnology industry.

Table 1 Possibilities for cross-border cooperation of industries identified as possibly adaptive clusters

	Slovenia	Piemonte	Slovakia	Czech R.	Hungary
New materials	Transport Equipment	<i>NEW MATERIALS</i>	Automation tech. and Robotics	Nanotechnology	
Nanotechnology	Medical devices			<i>NANOTECHNOLOGY</i>	
Plastic products		New materials	Automation tech. and Robotics	<i>PLASTIC PRODUCTS</i>	
Allum. metalurgy and processing			<i>ALLUM. METALURGY AND PROCESSING</i>		Tools and special machinery
Biotech& Biomedicine	Medical devices	<i>BIOTECH& BIOMEDICINE</i>	Automation tech. and Robotics	Nanotechnology	Dairy products
Medical devices	<i>MEDICAL DEVICES</i>	Biotech& Biomedicine	Automation tech. and Robotics	Nanotechnology	
Basic pharm. products	Medical devices	Biotech& Biomedicine	Automation tech. and Robotics	<i>BASIC PHARM. PRODUCTS</i>	
ICT		<i>ICT</i>	<i>ICT</i>		Electrical installation
El. motors, generators, transformers	<i>EL. MOTORS, GENERATORS, TRANSFORMERS</i>	New materials	Automation tech. and Robotics	Nanotechnology	Electrical installation
Automotive industry	Electronic components&boards; El. motors, generators, transformers; Transport Equipment	New materials	<i>AUTOMOTIVE INDUSTRY</i>	Plastic products	Tools and special machinery
Automation Technology and Robotics	Electronic components&boards	ICT	<i>AUTOMATION TECH. AND ROBOTICS</i>		
Transport Equipment	<i>TRANSPORT EQUIPMENT</i>	New materials	Automation tech. and Robotics	Nanotechnology	
Electronic components& boards	<i>ELECTRONIC COMPONENTS& BOARDS</i>	New materials	Automation tech. and Robotics	Nanotechnology	Electrical installation
Energy	El. motors, generators, transformers; Waste collection	<i>ENERGY</i>	ICT		
Waste collection				<i>WASTE COLLECTION</i>	

It needs to be noted that this overview does not present an exhaustive survey of adaptive clusters in these countries and thus of all possibilities for cross-border cooperation. The research performed within this project output was limited to a smaller number of industries (mainly due to the differences in availability of statistical data between countries). However, the analysis still produces results that indicate some possibilities for cross-border cluster cooperation.

Further insights into possibilities for cross-border cooperation and emergence of new industries can be gained by analysis of qualitative research results. Through *interviews* the entrepreneurial firms have provided their opinion on production and service fields where they see the potential for CEE cross-border cooperation. Also, they have offered their views on where they see the potential for emerging industries. Again, this does not present a survey of all possibilities available for cooperation and emergence of new industries since due to restrictions in resources available in project partners for performing qualitative research only a limited number of firms were interviewed. However, the results still point to a number of possibilities and illustrate the usefulness of bottom-up approach in designing economic policy.

We can summarize the potential for cross-border cooperation and emergence of new industries that we have identified by our analysis as seen in **Table 2 and 3**. EF's from the clusters in Czech Republic, Slovenia and Slovakia identified the **key technologies and services as having potential for emergence of new industries, based on cross-technological and cross-sectoral cooperation. They are presented in Table 2 as follows:** advanced materials, optics and electronics, nanotechnology and micro technologies, production and process control technologies, ICT and engineering. Fields of common interest that were highlighted by the most EFs from partner countries were three: manufacturing process technologies³, ICT and advanced materials.

In **Table 3** we present a summary of potential **for emerging industries arising from the latest technological advances, changes in the regional economic structure and global (societal) challenges**. Global (societal) challenges where market demand is growing are the following: health care, energy efficiency, sustainable transport, sustainable technologies, and sustainable construction). The fields where new industries could emerge in relation to global challenges are presented for each country's clusters, showing the potential for cross-sectoral and cross-technological cooperation.

³ Some examples of process technologies: computer numerically controlled machine tools (CNC), robotics, automated guided vehicles (AGVs), Flexible manufacturing systems (FMS), and computer integrated manufacturing (CIM). Each of these process technologies is used to create and deliver products and services. This distinguishes them from product technology which is the technology embedded within a product (for example: a technology that made video cassette recorder to distinguish it from the technology within the recorder itself).

Table 2 Potential for emerging industries based on cross-technological and cross-sectoral cooperation

Technology and Service Fields	Slovenia	Slovakia	Czech R.
Advanced Materials	Man. of Other Transport Equipment Electronic Components	Aluminium Metallurgy and Processing Automotive Industry	Nanotechnology Production of Plastic Products Man. of Basic Pharmaceutical Products
Optics, Electronics	Medical Devices Electric Motors, Generators, Transformers Man. of Other Transport Equipment Electronic Components	Automotive Industry Automation Technology and Robotics	
Nano/Micro Technology	Medical Devices Man. of Other Transport Equipment		Nanotechnology Man. of Basic Pharmaceutical Products
Process Technologies	Electric Motors, Generators, Transformers Man. of Other Transport Equipment Electronic Components	Aluminium Metallurgy and Processing Automotive Industry Automation Technology and Robotics	Man. of Basic Pharmaceutical Products Waste Collection Production of Plastic Products Nanotechnology
ICT, Embedded Systems	Medical Devices Electric Motors, Generators, Transformers Electronic Components	Automotive Industry Automation Technology and Robotics Aluminium Metallurgy and Processing ICT	Man. of Basic Pharmaceutical Products Waste Collection Nanotechnology
Design and Engineering	Medical Devices Man. of Other Transport Equipment Electronic Components	Automotive Industry Automation Technology and Robotics ICT	Production of Plastic Products

Table 3 Potential for emerging industries at the cross-section of different sectors and technologies in relation to market trends and global challenges

Clusters\Global market challenges	Health Care	Energy Efficiency	Sustainable Transport	Sustainable Technologies	Sustainable Construction
Nanotechnology (CZ)	Medical treatment Medical devices	Energy production Energy efficiency	Transport equipment		Construction materials
Production of Plastic Products (CZ)	Medical devices		Transport equipment	Production of renewable resources	Construction materials
Aluminium Metallurgy and Processing (SK)		Energy production	Transport equipment	Purification systems	Construction materials
Medical Devices (SI)	Medical devices			Bioengineering	
Man. of Basic Pharmaceutical Products (CZ)	Medical treatment Production systems			Bio-based materials	
Information Communication Technologies (SK)	Production systems	Energy distribution system Management Systems	Transportation systems Management systems	Control and management systems	Production systems Management systems
Electric Motors, Generators Transformers (SI)	Production systems	Energy distribution systems Power generation systems	Fuel efficiency	Power generation systems	
Automotive Industry (SK)		Production systems Energy efficiency	Production systems Fuel efficiency	Renewable resources	
Automotive Technologies and Robotics (SK)	Production systems	Energy efficiency	Production systems Management systems		
Man. of Other Transport Equipment (SI)		Energy efficiency	Fuel efficiency Production systems	Renewable resources	
Electronic Components (SI)	Medical devices Medical treatment	Energy distribution system Management systems	Transport equipment Transportation systems	Bio-based materials	Production systems Management systems
Waste Collection (CZ)		Energy production	Fuel efficiency	Waste treatment Recycling	Construction materials

The qualitative analysis also gave two important insights. First, entrepreneurial firms of adaptive clusters can be found where technological changes or changes in global demand address regions' or firms' production and organizational capabilities or strategic opportunities. These production and organizational capabilities are built on the legacy skills, capabilities, knowledge bases, and the infrastructure of the regions in which the entrepreneurial firms are embedded. Second, the regional industrial specialization between CEE project countries shows a high degree of complementarity, as indicated in Table 1 and 2 indicate. Therefore it is possible to foresee that many technology fields and sectors included in this analysis could be considered as a fruitful ground for CEE cross-border cooperation that could also lead to emerging industries.

Given the importance the firms assign to networking and especially cross-border cooperation, it is relevant to understand the **obstacles that prevent the firms in engaging in cooperation** with partners from other CEE countries. The most often stated ones were lack of funds for financing the exploitation of emerging technologies, for the development of new ideas, for pre-investment proof of concept, and to fund the research and transfer of results to industry. These issues are even more relevant for early-stage development processes of start-up companies. Other factors mentioned were: high marketing cost to enter into new markets, high cost of searching for potential partners, the lack of skills needed to find and estimate disruptive ideas, insufficient innovation skills of employees in general, bureaucratic obstacles, the lack of political support, the lack of innovation culture, difficulties to access new markets, the lack of possibilities for experimental development and testing, distrust in new materials and products. Some entrepreneurial firms mentioned also weak cooperation between firms and academic institutions, patents and licences, other legal obstacles and high administrative barriers. **More specifically relating to cooperation with other CEE partners**, entrepreneurial firms mentioned the lack of trust, lack of interest on the companies side which are most often also competitors, the lack of networking culture, the lack of awareness of the potential for cooperation between firms across borders, lack of knowledge about firms in the CEE region, and the lack of information on the best practices of cross border cooperation between CEE companies. Some obstacles were also reported to exist on EU level, such as: bureaucratic procedures of EC tenders and (only) declarative nature of EU support.



2. Case studies of emerging sector cooperation projects - Output 4.2.

Three case studies of the transnational cluster cooperation projects were selected that are related to the emerging industry sectors, identified by activity 4.1:

- CARE, Clean Aerospace Region Project (PP Rzeszów Poland, presented by the Aviation Valley Poland), performed by the consortium of nine aviation clusters and a consulting company within the EACP (European Aerospace Cluster Partnership) from France, Germany, Poland, Italy, Turkey, Spain, Portugal and Belgium;
- AvtoNet Project within the CE Programme (PP Slovakia, presented by the Automobilový klaster Západne Slovensko), performed by the nine partners, representing business support actors of automotive industries from seven regions (Slovakia, Italy, Germany, Poland, Turkey, Ukraine and Russia);
- ALPlastics Project (PP Piemonte Region, presented by the Piemonte Innovation Cluster "Proplast"), a network of clusters and private/public actors from 5 Alpine regions - Italy, Austria, France, Germany and Switzerland.

A common methodology for case studies presentation was developed. Regional clusters were interviewed to describe the projects, their aims and objectives, partners, activities and impact. Their views on cross-border cooperation as the potential for development of cluster organizations and their members were addressed in greater detail.

These case studies give additional insights, relevant for the Common proposal on promotion of cross-regional cluster cooperation:

- Importance of cross-border cluster cooperation is recognized in all cases. They stress importance of technology transfer, supplier chain development and market development. Traditionally, cross-border cooperation exists with clusters and companies from the same sector or technology field.
- The aim of the projects studied in the case studies is cooperation in R&D, knowledge and technology transfer. The challenges identified are to support cluster members in accessing knowledge and new technologies, thus achieving critical mass required for investment in R&D and innovation along the value chain. Cooperation between industry and education/research institutions is important both at national and regional level. What is missing is vertical cooperation across different sectors and technology domains that could lead to development of new value chains.
- Clusters have long lasting experiences with cross-border cooperation; they have developed several joint development projects. But at the same time there is general recognition that cluster members do not consider international cooperation as their top priority. Cluster organizations' emphasis on transnational cooperation is not yet met with considerable interest by the firms, especially in the field of R&D and technology transfer. Firms' expectations regarding support for internationalization are mainly related with the establishment of business contacts and access to (new) markets.



- Case studies outline that clusters present favourable environment for emerging industries, stimulating interactions among different actors. Cross-border cooperation brings additional value when stimulating inter-cluster cooperation, involving more actors from different sectors and different technology fields. Case studies' projects are considered to contribute to development of new and promising growth areas while catalysing on the potential synergies in investment in R&D and innovation to develop new knowledge for radical innovation or transformation of existing economic activities.
- Case studies indicate barriers to more successful cross-border cooperation. Lack of the awareness and active involvement of cluster members is an important weakness. The impact of the existing cross-border cooperation on the improvement of the cluster organisations themselves is strong but less so on the cluster members. Especially SME's are less involved and active. Lack of focused internationalization strategies is also defined as a weakness, hindering the potential for cross-border cluster cooperation. Access to finance and support for cross-border innovation activities is another one. In order to facilitate cross-border cooperation in R&D and innovation, case studies' projects are focused on development of the following activities:
 - Stimulating awareness of the potential of cooperation among cluster members, developing information database and cooperation platforms (Open Innovation Platform in case of ALPlastic Project, Directory Database of R&D Actors in case of CARE Project, AutoNet MatchMaking Database);
 - Improving cooperation among clusters, setting up transnational networking and facilitation platforms (case of Cluster Facilitation Programme of ALPlastic project);
 - Ensuring policy support for cross-border cluster cooperation in R&D and innovation, influencing policy programs and measures (Policy and Innovation Programme in case of ALPlastic), participation in international programs and initiatives (case of CARE Project).

The case studies did not directly address the topic on potential for emerging and new industries, but some conclusions on the cross-border cluster cooperation give additional support to the findings of the *Synthesis report on emerging industries* (Output 4.1.3):

- Enlargement of the market, access to new markets and knowledge and technology transfer are defined as the most important fields of cross-border cooperation for the clusters and cluster members.
- Cross-border cluster cooperation is mainly developed with clusters and firms from the same sector or technology field. It is recognized that strategic innovation requires development of new value chains and vertical cooperation across different sectors and technology domains which is not yet explored.
- Obstacles for cross-border cooperation in R&D and innovation and thus also for exploiting knowledge and technologies as a seed for emerging industries are identified in lack of awareness of the potential among the cluster members and lack of effective policy support. The need for action is recognized both at the level of clusters and national and international policies.



3. Analyses of cluster potential (inside the ClusterCOOP area) – Output

3.1.5

The analysis of the cluster potential was carried out for five countries/regions of the partnership, covering the Czech Republic, Hungary, Poland, Slovakia and Slovenia. In total sixteen clusters from partner countries took part in the analysis. The main objective was to identify the emerging industry development through cross regional cluster cooperation. Partners used a common methodology to carry out the analysis. The summary of all results is presented in the Core Output 3.1.6 “Common Proposal for optimization and harmonization of national regulatory frameworks”. Here we concentrate on findings related to the cross-border cooperation and on some other findings which affect CEE clusters’ potential for entering into emerging industries. The main findings are:

- Clusters view cross-regional cooperation as an important factor for clusters to attain sustainable growth due to new opportunities, exchange of competences, and joint projects that such cooperation can facilitate.
- Most clusters expect the main value of cross-regional cooperation to be derived from: adaptation of new technologies, new product development and from accessing the larger market which in turn could lead to smarter specialization and more intensive cross-border collaboration.
- The benefits of cross-border cooperation are expected to come from the transfer of know-how, technology and information exchange. Further, cluster companies expect benefits due to new markets potential and possibilities to attract new capital.
- Most clusters also reported having experience with cross-border clustering. What is not clear from the report is whether they only have cross-border contacts or a real cooperation.

Regarding the measures that can enhance regional cross-border cooperation, most clusters assign the highest importance to the following: measures to facilitate networking between firms and clusters, to provide direct financial support to cluster projects, to facilitate transfer of technology, marketing activities, exchange of information, and cooperation with universities. These findings very much support the findings of the country/regional analyses presented in the *Synthesis report on emerging industries* (Output 4.1.3), but not in all aspects. Cluster managers and cluster companies have put great emphasis on the lack of financial assistance – i.e. direct financial support to cluster initiatives and to clusters’ development of R&D capacities. They consider this as the second most important obstacle to clusters’ development. *Contrary to this*, entrepreneurial firms interviewed within the work on Output 4.1.3 did not discuss this issue. Two of them even expressed the opinion that government financial assistance to cluster development is more of a hindering rather than a fostering factor (since it creates dependence on government financing).

Findings of analysis of cluster potential that give additional insight on the CEE emerging industries potential are the following:

- Most respondents stated the following factors as the ones hindering cluster development: problems related either to risk or bank financing, the lack of human resources - young



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engineers and qualified technicians, the inadequate availability of qualified workforce, the lack of skilled manpower, the lack of high quality infrastructure, specifically R&D institutions, the underdeveloped domestic markets and the low competitiveness of the national economy.

- Half of the regional cluster companies belong to one industry, only few to horizontally related industries and only two reported belonging to multiple industries.
- The vast majority of regional clusters have only a few steps in the vertical production chain.
- Most of the surveyed clusters declared to be technology adapters (followers) and technology generators (leaders) at the same time and only two declared to be technology generators.

The last three statements indicate that the surveyed CEE regional clusters (cluster initiatives) encounter quite serious impediments in view of their capacities to enter into emerging industries. The first statement (concerning the hindering factors for cluster development) corresponds again to the views of entrepreneurial firms obtained through country/region analyses of the obstacles for exploiting technologies as a seed for new industry development presented in Section 1. If partnership countries are truly committed to promote cross-regional cluster cooperation in emerging industries, effective national policies and measures should be designed to alleviate these impediments.

III. Proposals

Proposal No. 1

Promote cross regional cluster cooperation in emerging and new industries.

Identify their particular niche in European value chains with regard to KETs development and deployment.

As presented in the *Synthesis report on emerging industries*, the possibilities for cross border cooperation between project partner countries and regions were identified. These possibilities lie at the cross section of industries that show signs of having a critical mass of firms and support institutions with a collective capability to develop new products and processes, are competitive on global markets, and are based on high degree of specialization. These clusters of firms have emerged naturally; their capabilities have been historically shaped, leading to the development of both special skills and regional specialization.

In these industries the following key technologies and services were identified as having potential for cross border cooperation between different clusters and industries: advanced materials, optics and electronics, nanotechnology and micro technologies, process technologies, ICT and engineering. Fields of common interest that were highlighted most often by interviewed firms in partner countries are three: process technologies, ICT and advanced materials. In addition to this, the possibilities for emerging industries arising from the latest technological advances, changes in the regional economic structure and global (societal) challenges were identified. They include the fields of health care, energy efficiency, sustainable transport, sustainable construction and environment/sustainable technologies.

These technology and services fields offer a fertile ground for emerging industries and are appropriate to be considered by partner countries in designing national innovation strategy for smart specialization. It should be noted however that the identified possibilities for cross border cooperation between partner countries do not reflect all the possibilities for cooperation that may exist in partner countries. To identify them and to come to consistent results with those presented in this document, it is recommended to apply this methodology in an exhaustive manner, including in research all clusters/industries in project partner countries that show such potential. Common methodology used in this study proved to be a powerful analytical tool for such identification.

Proposal No. 1 corresponds to the Commission's recommendations to member states and regions to develop national and/or regional research and innovation strategies for smart specialization based on identifying their unique assets and competitive advantages. Since the technologies we have identified correspond to technologies that have been identified as the EU's Key enabling technologies (KET) this proposal also calls for partner countries to identify their particular niche in European value chains with regard to KETs development and deployment.



Proposal No. 2

Remove obstacles for exploiting possibilities for emerging industry development on firm and national level.

Industrial emergence is an evolutionary process and it is difficult to capture it until after the industry develops successfully. It depends on activities of a number of individual actors, not only firms and their collaborative actions but also on the institutional set up in which national policies and strategies have an important role to play.

Partners' country/regional analyses on emerging industries as well as analysis of clustering potential and case studies unveiled many hindering factors on both firm and national (policy and institutional) level to emerging industry development. The most often stated ones from a firm perspective were the lack of funds: for financing the exploitation of emerging technologies, for the development of new ideas, for pre-investment proof of concept, for funding the research and transfer of its results to industry, and for supporting early-stage development process of start-up companies. Other hindering factors are associated with the labour market, such as insufficient innovation skills of employees in general, lack of innovation culture and trustful environment, and with the administrative procedures and bureaucracy as well as insufficient political support.

On the national level: inefficient innovation policies were singled out as an obstacle – due to too little financial support and inefficient grant system, too cumbersome assessment procedures and tenders specification, and due to the lack of direction in national strategic framework on development (the lack of focus and prioritization and its link to education policy assuring up-to-date knowledge inputs). Some partner countries were critical towards current administrations as lacking the understanding of characteristics of high technology in different applications, especially those that designate trends and lead evolution, a necessary knowledge to design an effective innovation policy.

To remove some of the obstacles partner countries suggested that national policies should support companies in entering international value chains and channels that would enable them to acquire information about the market needs and trends. It was also suggested that national policies should promote open innovation models, cooperation values and regional market development initiatives for demonstration and deployment of new technologies.

To address these obstacles it is suggested to put appropriate focus on strong framework conditions to address weaknesses in the business environment for innovation in CEE partner countries by well defined and effective national policies targeting the emerging areas of expertise. More specifically, demand-side policies should be addressed to increase investment into new market development and specific measures should be developed to stimulate cross-technological cooperation. Also, financing mechanisms should be adjusted to meet the needs of emerging industries, for example through providing support for experimentation and through developing financial instruments that

provide easier and quicker access to smaller grants. The effectiveness of these measures will depend on the level of coordination of all different policy instruments that may affect firms, clusters and industries' potential to engage in new industry development. This is in line with the recommendations pertaining to emerging industries given in the ECPG document "Consolidated Set of Policy Recommendations on Four Themes". Identified obstacles on the firm as well on the national level as results of all three outputs (Output 4.1.3, 4.2 and 3.1.5) demonstrate the complexity of obstacles which cannot be removed by separate policy measures in un-coordinated manner.

Proposal No. 3

Promote the development of trustful networking culture with effective and efficient measures.

Tacit and disembodied knowledge seem especially important for emergent high-tech industries and personal contacts are of significant value for transfer of this kind of knowledge. Therefore, networking and collaboration is crucial for firms in emerging industries to enable the access to resources and to search for knowledge inputs that are used to develop new technologies and products.

Networking and cross border cooperation was singled out by partner countries' entrepreneurial firms, cluster managers/organizations and by cluster case studies as an important facilitating factor for acquiring knowledge and information important for new products, technologies and markets. However, the analyses revealed that in spite of being aware of the benefits and importance of networking for business growth and success, the companies are not actively pursuing these options. We found no evidence of existing networking within and across clusters leading to formation of collective capabilities necessary to develop new products, processes or technologies. The analyses showed the lack of trust and networking culture to be one of the main hindering factors to further development of companies' relationships based on cross cutting of companies capabilities. Companies in a cluster or across clusters are not willing to share their tacit knowledge, therefore the generation and accumulation of new knowledge to be transformed into new products and processes that would create gains to all in the networks is missing. In turn this hinders companies' motivation for cross border cooperation that could lead to the development of emerging industries.

To a large degree, trust is a history-dependent phenomenon. To create trustful culture it is important that on all society levels values on which trust is built – such as integrity, reliability, fairness, open communication, competences and loyalty – are promoted and be accepted as a national defining feature. The above results suggest that the openness to cross border cooperation will depend not only on the proximity in technological specialization between partnership countries but also on the cultural proximity, in which values creating trust are an important part in determining this dynamics. Therefore, it is suggested that policy makers and other opinion makers vigorously promote values on which trust in a society is built upon, such as integrity, reliability,

fairness, open communication, competences and loyalty in order to help creating a business culture conducive to innovation cross border cooperation in the field of emerging industries.

Proposal No. 4

Build up industrial innovative capabilities - strengthen and inter-link activities around the knowledge triangle between research, education and innovation.

For companies in emerging industries the access to knowledge inputs that are used to develop new technologies and products is of critical importance. High tech firms search for knowledge in universities and other knowledge providers. This explains why current high tech clusters around the world are located in proximity of excellent universities and/or research institutes. The studies have also shown that training of personnel is one of the important determinants of absorptive capacity of firms which is crucial for their innovative outputs.

Analyses of the national/regional studies on emerging industries and on clustering potential revealed a rather unsatisfactory situation in all partner countries in respect to availability of innovation capabilities for branching into emerging industries. There is a significant gap in terms of demand and supply in science, technology, and engineering education. Interviewed firms were specifically critical about educational system and university training as being inadequate. It lacks interdisciplinary training and generation of applied knowledge, resulting in an inadequate supply of people with skills to find and estimate disruptive ideas. Partners are missing excellent research universities and motivation on the side of researchers to transform new knowledge into new business opportunities, partly also due to a lack of entrepreneurial education at technical and science faculties and to the shortage of entrepreneurs in general. Not only higher education institutions but also R&D institutes were pointed out as lacking in quality and thus hindering cluster development.

This leads to a conclusion that there is an urgent need to update formal education system in accordance to the needs of technological change and to support training activities aimed at improving technical, entrepreneurial and business skills in partner countries.

These results and the proposal are in line with the Commission's view on the need to upgrade European skills and to strengthen knowledge triangle to maintain growth and jobs.



Proposal No. 5

Remove obstacles for exploiting possibilities for emerging industry development on the EU level.

European single market should in principle be fertile ground for cross-border, trans-regional cooperation. However, as our analyses show, this is not the case.

Factors limiting trans-regional and particularly CEE cluster cross-border cooperation pertain to companies themselves, their capabilities, willingness and ability to engage in the cross-border cooperation for emerging industry development, while some of them were directed to European Commission and Member States.

In explaining why companies themselves are reluctant to enter into cross-regional cooperation in emerging industries, entrepreneurial firms stated the obstacles that were discussed in the Proposal No. 2. The case studies findings also support their statements. In addition the following conclusions can be pointed out based on various results, all specific to cooperation within the CEE: cross-border cooperation is hindered by the lack of companies' interest to cooperate with companies from CEE countries which is also connected to a fact that some of them are their competitors, the lack of complementary skills (due to similar industrial structure and similar level of industrial development), the lack of awareness of potential for cross border cooperation, the lack of knowledge about firms in the CEE region, and the lack of information on the best practice of cross border cooperation between CEE companies.

Some of the obstacles to CEE cross-border cooperation seem to be connected to the lack of information on other firms with potential for fruitful cooperation in the region. Identification of potential partners in the case of emerging industry development is made more difficult by the fact that partners need to be found from other industries and technology domains and not within the core industry about which successful firms usually have an in-depth knowledge. Our research has shown that existing cross-border links of firms in partner countries indeed do not extend outside their core industry. Therefore it is to be recommended that policy measures aim at facilitating the search for information on partners (firms and knowledge providers) from the CEE region.

The most often stated obstacles to cross-border cooperation at the EU level were the following. Bureaucratic procedures of EC tenders were especially noted in the analysis of clustering potential, resulting in administrative burden especially large for SMEs which many times prevent them to take full advantage of the existing programmes. At the same time SMEs cannot be leading partners in the EU projects due to their size, thus becoming minority partners which in turn means that the project usually is not related to their core production capabilities. EU projects are currently designed in such a way that they do not lead to a long lasting cooperation between partners engaged in the project, thus preventing the development of trust that is necessary to engage in finding new solutions based on collective capabilities of project partners. In short, general opinion was that EU programmes as they are currently designed are not friendly to SMEs. The example of EU financing of the EU Technology platform for photonics presented by a partner country illustrates this statement. Most

of photonic clusters and platforms are concentrated in the Western EU countries. Domination of large western companies in the EU technology platform for photonics will no doubt result in the marginalization of the presence of smaller firms. Benefits of cross border exchange, accumulation and deployment of knowledge and skills as well as EU financial support will again, as so many times before, bypass small firms also in this case.