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## **DETERMINANTS FOR DEVELOPMENT OF CLUSTER INITIATIVES IN POLAND AND UKRAINE**

### **Abstract**

The article analyses the problems of cluster development in Poland and Ukraine in order to identify directions for possible cooperation between the countries. Specificity and priorities of the national policies of clusters development, regional systems of support and examples of good practices of clustering in the both countries were considered. The comparative analyses of prospects for clusters development in Poland and Ukraine were conducted, the basic determinants influencing the cluster development were identified and evaluated. There were recognized the areas and direction of Polish-Ukrainian clusters cooperation including: the opportunities to projects conducting within the European Funds, the possibilities of bilateral cooperation of cluster members with the support of cluster coordinators, the feasibility of joint Polish-Ukrainian projects run in third countries markets.

### **Key words**

Cluster, cluster initiative, national policy of cluster development, regional development, Polish-Ukrainian cooperation of clusters

### **Introduction**

At present time the use of the cluster approach is regarded as one of the most effective mechanisms for the development of both economies of countries as a whole and their regions, as well as of individual companies. Cluster structures provide a significant impetus to the development of countries, allowing them to mobilise network resources of the territory organisation, and present one of the tools to ensure the competitiveness of countries in the world economy. Thus, according to the European Commission, 24% of the existing clusters are the world leaders, 37% — national leaders and another 24% — economic entities with strong competitiveness.

European clusters that are compatible with the most important EU documents play the role of organisations supporting regional development and ensuring the growth of innovation of the European Union. The same approach can be observed in Ukraine, where clusters play important role in developing scientific and technical potential of industry.

The precondition to achieve the economic growth both in Poland and Ukraine is an increase of the innovativeness of enterprises. Networking, sharing experience, cooperation, and collaboration support the process of innovations. Cluster is one of the most effective platform to run those processes.

The advantages of the processes of clustering for participating countries are also as follows: a more efficient use of the potential of individual regions, diversification of the regional economy, growth in the number of taxpayers and expansion of the tax base, activation of the partnership dialogue “business — authorities”, reduction of the budget dependency on some monopolistic business units.

The basis for effective cooperation in the implementation of initiatives on cluster creation is analysis of conditions, assumptions and perspective directions of cooperation in participating countries.

The aim of this article is to analyse the main determinants of the cluster initiatives development in Poland and Ukraine. The result of the analysis is to identify the factors that allow for the effective cooperation between clusters from Poland and Ukraine. Two research hypotheses are stated:

- Regarding the current level of development of cluster initiatives in Poland and Ukraine, there are moderate chances for the expanding the Polish-Ukrainian cluster cooperation.
- The European Union support programs are the basis for initiating cooperation between Polish and Ukrainian Clusters.

Using the secondary research methods such as analysis of existing (data desk research) and comparative analysis the hypotheses above have been proven.

The main purpose of the analysis of existing data was to outline the background for the formulation of the main determinants of clusters development in Poland and Ukraine. Particular attention was paid to national and regional policies of cluster development in both countries. The important element of desk research was also screening of financial support schemes occurring or being formed in Poland and Ukraine. Presentation of good practices helped to illustrate the current stage of clusters development.

On the basis of information collected at the stage of analysis of existing data, the comparative analysis was carried out. The following determinants – comparative criteria – for cluster development were formulated:

- Political situation
- Economic conditions
- Financial policy of supported clusters
- Availability of technical facilities
- Social capital
- International cooperation
- Readiness of entrepreneurs to cooperate in clusters
- Readiness of R&D institutions to cooperate in clusters.

For the purpose of the analysis "the scale of the positive impact of the determinant" was adopted with the scale of points from 0 to 5, where 0 - mean no impact and 5 - an excellent positive impact.

As a result of studies we proposed areas and directions of Polish-Ukraine cluster cooperation in the following scope:

- Possibilities of cooperation within the European projects
- Possibilities of bilateral cooperation of clusters' members with the support of cluster coordinator
- Possibilities of creating joint projects of Polish and Ukrainian clusters in third countries markets.

### **Analytics framework**

Taking into account the urgency of the problem of cluster structures in economy, currently there also increases the amount of research concerning its various aspects: from the peculiarities of interpretation of the concept of “cluster” to choosing approaches to their identification and building, determination of directions and conditions of their effective functioning.

At present time in theory and practice there distinguished three main directions of defining the cluster, each of them highlights the main feature of their operation:

- regionally limited forms of economic activity within the related sectors usually attached to particular scientific institutions;

- vertical production chains, narrowly defined sectors, in which adjacent stages of the production process form the core of the cluster (the chain: supplier-producer-distributor-client), this category also includes the network formed around the major companies;
- industries identified at a high level of clustering (e.g. chemical cluster) or the aggregate of sectors at a higher level of clustering (e.g. agricultural cluster).

Therefore, it should be noted that the term “cluster” has different interpretations of scientists and practitioners and different meaning. One of the most common interpretations of the concept of “cluster” is offered by M. Porter. According to him, the cluster is a geographic concentration of interrelated companies, specialised suppliers, service providers, companies which operate in the same field and associated institutions (for example universities, supervisory units, trade associations and financial institutions) in their respective fields, competing but also cooperating. Clusters reaching critical mass (the necessary number of companies and other institutions making up the agglomeration effect) and achieving competitive success in the fields of their interest, are a remarkable feature of almost every national economy, regional, state, even the metropolitan, mostly in economically developed countries [1].

Scientists and practitioners distinguish various types of cluster structures in the economy. These cluster structures differ in the dimension of the following classification criteria: structure model, geographical location, organisational excellence, cluster structure, type of integration, model and stage of development, industry dependence, characteristic of relationships, orientation [2].

Recently so-called innovation clusters have gained a particular importance as drivers of the modern economic development. The innovation cluster, as the most effective form of achieving a high level of competitiveness, is an association of different organisations (research centres, industrial enterprises, individual entrepreneurs, bodies of state administration, public organisations, universities, etc.), which forms a system of dissemination of new knowledge, technologies, and innovations through networks of stable relations between all members of the cluster.

The aim of its operation is efficient transformation of inventions into innovations and innovations - in specific products and competitive advantages.

There is also a need to define cluster initiatives. In the literature there is a significant difference between clusters as the processes taking place in the economy and cluster initiatives. In practice, both in Poland and Ukraine, the terms cluster and cluster initiative are often used interchangeably to mean the actual initiative or even cluster organisations. O. Sölvell defines cluster initiatives as – “an organised effort aiming at intensifying growth and competitiveness of clusters in the region, which involves cluster companies, the government and/or research circles” [3].

European Commission defines the innovative clusters as a concentration of independent businesses – newly founded innovative companies, small, medium and large enterprises, and research organizations – operating in a particular sector, region, and founded to stimulate innovative activity by promoting intensive connections, sharing background facilities and exchange of knowledge, and expertise, and by contributing effectively to technology transfer, networking and sharing of information among companies within the cluster. Member countries should aim to achieve a proper balance between SMEs and large companies in the cluster to achieve certain critical mass, especially by specialisation in a certain area of research and development and innovation (R&D&I) and taking into account the existing clusters in the Member States and at Community level [4].

Currently, the EU policy and Europe 2020 Strategy are aimed at development of enterprises operating in networks or clusters, in which the R&D institutions are the important participant [5].

We can distinguish different types of clusters, but for accelerating the economic development the most desirable ones are clusters based on knowledge. The main added value of these clusters is to support innovative companies, using and implementing achievements of R&D institutions and benefits of networking.

The most effective and expansive regional innovation systems are not limited to sector or territory. On the contrary, the effective eco-innovation systems acting in line with the paradigm of Open Innovation, integrate different economical branches, interdisciplinary knowledge and various stakeholders. H. Chesbrough indicates

that the process of innovation is constantly increasing the role of the external partners of the company. Nowadays the company cannot conduct all research and development independently. It must be open to knowledge from outside, undertaking the cooperation with partner institutions, distributors, consumers (in the framework of market research) and other companies offering licenses and patents. The Open Innovation model assumes that the process of developing innovation by companies is based on both the external and the internal ideas. Due to it, companies share their knowledge in the form of licenses or patents, widen access to knowledge and reduce the cost of new technology and solutions [6].

The best form for the cooperation in scope of open innovation system is clustering. Companies operating in the cluster are independent – they compete with each other but at the same time in certain areas they cooperate or collaborate. The platform of cluster is also an important place for establishing links between companies and R&D institutions like universities, research institutes, educational institutions, science and technology parks, and certifying authorities or public administration as well.

Clusters, being at the same time specialised and interdisciplinary, with the network of functional and logistics interactions can create so-called “agglomeration effects”. They are able to play a key role in building regional specialisations and raising innovation and competitiveness of the region.

Clusters grow thanks to sharing knowledge between their members, the best adjustment to local potential and use of the all types of resources available in a given region. This is due to the intense interaction and cooperation, dialogue and coordination that take place parallel with the natural economic competition between members. Competition contributes and optimises the use of internal strengths and resources of companies and other members of the clusters in order to stimulate innovations. Cooperation within the cluster enables the effective usage of complementary internal resources and accelerates the development of innovation, thanks to a new combination of different resources.

#### **The importance of clusters initiatives for regional development in Poland and Ukraine: National policy of clusters development in Poland**

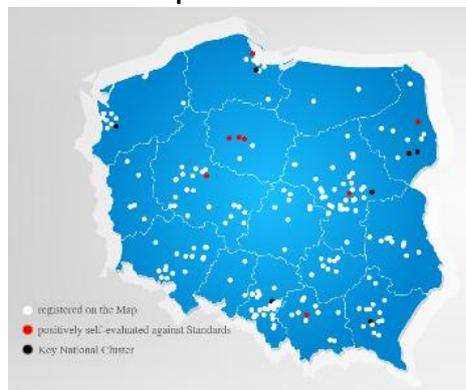


Fig. 1. Map of clusters in Poland,  
Source: [8]

The shape of the cluster system in Poland stems from the Mid-term National Development Strategy 2020, which implies an increase in the use of innovative solutions through clusters. According to the Strategy, the role of clusters on the macroeconomic level is to increase the competitiveness of Polish enterprises and lead to: combining companies, academic institutions and their resources, in order to bring knowledge faster to the market and on the microeconomic level they are: “modern instrument strengthening regional or local specialisations” [7].

The document "Strategy for Innovation and Economic Efficiency «Dynamic Poland 2020»" refers to clusters as an instrument of implementation smart specialisation in Poland. According to this document, clusters constitute an effective mechanism to concentrate resources and means and are one of the most diagnosed ways of stimulating innovation and horizontal cooperation in the economy.

The reference to the cluster is also found in the Programme for the Development of Enterprise 2020 in the context of cooperation between enterprises of the sector of scientific research and development of new products and services better tailored to the needs of consumers. According to the document, an important factor in making research and innovation by enterprises can be of service offered by professional organizations acting managing clusters.

A similar approach to the importance of clusters presented the Polish Cluster Policy Group, which has produced a document entitled “Directions and policy guidelines cluster 2020”. The Group presented recommendations

on cluster policy measures and instruments for the period 2014-2020. These recommendations can be summarised as follows:

- Development of existing clusters and founding new ones should be implemented by supporting cluster initiatives and cluster coordinators;
- Clusters that are the most important for Polish economy and competitive on international scale (world-class clusters) should be nominated and named as Key National Clusters;
- Development of key national and regional clusters should be stimulated by support granted not only to cluster coordinators but also directly to cluster actors, i.e. enterprises, research organisations and business support institutions;
- Support for basic coordination functions should be available on regional level;
- Dedicated support for internationalisation should be available for coordinators of Key National Clusters;
- Key National Clusters would be appointed throughout the entire financial perspective on a competitive call basis after validation against precisely defined criteria and requirements;
- In order to ensure credibility and transparency, it is necessary to establish an Evaluation Committee composed of representatives of ministries and government agencies and complemented by independent experts with different backgrounds;
- Key National Clusters would receive wide public support for R&D, production infrastructures, development of human capital, promotion and internationalisation;
- Regions should also establish priorities of their own development policies by pointing to key regional clusters that would define their smart specialisations;
- Public support should be offered for collaborative projects undertaken by entities operating in key clusters [9].

According to the goals of cluster policy outlined by the Polish Cluster Policy Group, the profile of a National Key Cluster (NKC) was created. It resulted from combination of expectations towards the best clusters in different states, especially European, and the actual performance of Polish clusters. However, after the first round of selection of NKCs, which was conducted in mid-2015, aroused a huge debate over the selection criteria and the result of the choice of the 7 National Key Clusters:

- Association West Pomeranian Chemistry Cluster “Green Chemistry”,
- INTERIZON - Polish ICT Cluster,
- Metal Cluster,
- Eastern Construction Cluster,
- Mazovia Cluster ICT,
- Polish Aluminium Cluster,
- Aviation Valley.

The above presented selection of National Key Clusters indicates a kind of decisive chaos in the Polish authorities in terms of defining the national specialisation which should be developed in clusters and which is worthy to be supported with public funds. There is the weak association of the NKC specialisation and regional specializations.

It is not clear up today what kind of support for NKCs and other clusters the Polish government presumes.

In 2015, Polish Agency for Enterprise Development (PARP) has conducted an inventory of clusters in Poland, as a result 134 clusters were identified, which were created between 2003 and 2015, with the majority (over 60%) are young clusters, i.e. those which arose between 2011 and 2015. The oldest clusters are 12 years old and the average age is over 4 years.

### **The importance of clusters initiatives for regional development in Poland and Ukraine: National policy of cluster development in Ukraine**

For modern Ukraine the formation of innovative clusters is an opportunity for effective restructuring of the economy for reaching a new level of international relations in the economic sphere. The need for the clustering of Ukraine’s economy is considered periodically in the Cabinet of Ministers of Ukraine since 2003. However, presently the legal basis of their formation practically is not defined in the country. The official interpretation of the term “cluster” is missing in the basic legal acts adopted in Ukraine, but there can be found quite various

word-combinations concerning the concept: “innovative structures”, “innovation cluster”, “cluster model of development”, “territorial scientific and industrial clusters”, etc.

Since the legal status of clusters is undefined at the official level in Ukraine, their state registration and accounting is not carried out, and in this respect it is quite difficult to determine their actual number in Ukraine. According to various sources, about 35 clusters have been created and up to 100 of cluster initiatives, including transborder ones, have been found in Ukraine [10]. At the same time it can be argued that a large number of enterprises in the country operate according to the cluster approach. Table 1 presents some of the cluster formations operating in economic regions of Ukraine.

Table 1. Cluster formations operating in economic regions of Ukraine

Economic region	Priority directions of cluster development	Currently operating cluster structures
<b>Podilskyi:</b> - Vinnytsia region - Ternopil region - Khmelnytsky region	Mechanical engineering, support of the existing clusters (garment, construction, food, tourism)	- the Khmelnytsky construction cluster, the Khmelnytsky garment cluster - the Kamianets-Podilskyi tourism cluster - the agri-tourism cluster “Oberigh” (“Amulet”) (Grytsiv village, Khmelnytsky region) - the innovation-investment cluster (Ternopil) - the Vinnytsia food processing cluster
<b>Karpatsky:</b> - Zakarpattia region - Lviv region - Ivano-Frankivsk region - Chernivtsi region	Chemical, food, recreation and tourism, wood processing, crafts, garment, construction, automobile industry	- the souvenir production cluster “Suziria” (“Constellation”) - the transport and logistics cluster of Zakarpattia region - the tourism cluster (“Seven Wonders of Ukraine”) - the Lviv cluster of IT and business services - the biotechnology cluster
<b>Prychornomorsky (Black Sea region):</b> - Mykolayiv region - Odessa region - Kherson region	High technologies, shipbuilding, microelectronics, agriculture, fishing, logistics, recreation and tourism	- the transport and logistics cluster “Southern Gates of Ukraine” (Kherson) - the cluster “Transit Potential of Ukraine” (Odessa) - 3 clusters in Prydnavia (Danube region), - 5 clusters in Mykolaiv region
<b>Polisky:</b> - Volyn region - Zhytomyr region - Rivne Region - Chernihiv region	Agriculture, food, eco-tourism, wood and granite processing	- the wood processing cluster (Rokytno district, Rivne region) - forest clusters - tourism and recreation clusters
<b>Donetsky:</b> - Donetsk region - Luhansk region	Mechanical engineering, chemical, mining, metallurgy, food, processing industry	- the national innovation cluster “New Technologies for Management of Natural Resources” - transborder nanoclusters
<b>Prydniprovsky (Dnieper region):</b> - Dnipropetrovsk region - Zaporizhzhya region - Kirovograd region	High-tech (aero, electronics, biotechnology), mechanical engineering, metallurgical, chemical, food and processing industry	- the national innovation cluster “New Machines” and construction cluster (Dnipropetrovsk) - the innovative technology cluster “AhroBUM” and the honey cluster “Bees Know No Borders” (Melitopol) - the food cluster “Buy Zaporizhzhya Products, Choose yours” (Zaporizhzhya)
<b>Eastern:</b> - Poltava region - Sumy region - Kharkiv region	High technologies, chemical, mechanical engineering, metallurgy, metalworking, electricity, food, fuel industry, agriculture, tourism	- the regional cluster of ecologically clean agricultural production (Poltava region) - the Sumy cluster of ecologically clean agricultural products - the Sumy construction cluster

Economic region	Priority directions of cluster development	Currently operating cluster structures
		- the Kharkiv technology park "Technopolis" - a cluster of alternative energy and scientific and educational cluster Also - aviation, space sphere, power engineering, pharmaceutical, nanobiotechnologies, health care, armored vehicles, agriculture and mechanical engineering
<b>Central:</b> - Kiev region - Cherkasy region	High-tech (new material), construction, mechanical engineering, food, agriculture, tourism	- the national innovation cluster "Energy for Sustainable Development" (Kiev, Polytechnic Institute) - the national Innovation cluster "Technologies of Innovative Society" (Kiev, Polytechnic Institute) - the national innovation cluster "Innovation Culture of Society" (Kiev, T. Shevchenko KNU) - the national innovation cluster "New Food Products" (Kiev region)

Source: [11]

In order to implement the legislatively defined priorities of innovation activity, and taking into consideration the existing potential and regional initiatives, the State Agency of Ukraine for Investments and Innovations is working on the creation of 10 national innovation clusters, namely: "New Machines" (Zaporizhzhya), "New Materials" (Kharkiv), "Biotechnologies" (Lviv), "New Food Products" (Kiev and Kiev region), "New Technologies for Management of Natural Resources" (Donetsk), "Innovation Culture of Society" (Kiev), "New Power Plants and Movers" (Zaporizhzhya), "Energy for Sustainable Development" (Kiev), "Transit Potential of Ukraine" (Odessa), "Information Society Technologies" (Kiev), "Agricultural Engineering" (Melitopol), "Rocket Engineering" (Dnipropetrovsk), "Mining Engineering" (Kryvyi Rih), "Instrument Engineering" (Zhovti Vody, Dnipropetrovsk region), "Metallurgical Engineering" (Dnipropetrovsk) (The State Agency of Ukraine for Investment and Development) [12, 13].

Innovative clusters of power engineering (the core of the cluster is JSC "Turboatom"), pharmaceutical production, nano- and biotechnologies in Kharkiv region can become promising national clusters in Ukraine. Thus, the role of a high-tech knowledge-intensive cluster of power engineering for Ukraine can be estimated by the number of Kharkiv enterprises cooperating with 40 world countries.

The first six clusters in Ukraine were formed in Khmelnytsky region in 1998-2000 with the assistance of the Association "Podillia Pershy" and international programs of economic recovery of Podilsky region with appropriate financial assistance of the United States Agency for International Development. In this period the garment, construction, food, tourism clusters and cluster of agri-tourism were created [14].

Three different by size and geographic location territorial units — the city of Khmelnytsky (regional centre), the city of Kamenets (district centre), Grytsiv village of Shepetivka district (rural centre) became the centres of joining business structures into clusters. In order to disseminate the cluster experience to other regions of Ukraine, Association "Podillia Pershy", along with the Institute for Competitiveness (Kiev) have developed a project of creating in Ukraine training centers, which could spread the experience of clustering in their regions and introduce it into practice by establishing cluster associations in priority for each region areas.

The first centre was established in the city of Khmelnytsky with the support of the Khmelnytsky Regional State Administration, Khmelnytsky National University and the Association "Podillia Pershy". The Association Executive Board, together with the Institute for Competitiveness, have started realising a new project "Clustering of the Industrial Sector as an Effective Way of Regional Development", which implementation actively began in late September 2003. The project aim is to help local governments and public organizations to implement the programs of joining enterprises into clusters in other regions of Ukraine.

However, not all of the formed clusters developed successfully. Some clusters in Khmelnytsky region showed a relatively high viability (construction and garment clusters, the cluster of agri-tourism), but vital activity of the others proved to be impossible.

The reasons why the clusters are successful whether not are analyzed in [14]. The construction cluster in the city of Khmelnytsky succeeded indeed. In 1998 it gathered about 30 enterprises of the construction industry in the region. For the period of its operation thousands of new jobs have been created, the cluster has occupied leading positions in a difficult and competitive housing market, providing mobility, flexibility, innovation and high quality of work at making commissions from the population.

The Khmelnytsky garment cluster was the first association of business structures of this type in Ukraine. It began developing in 1997 with the participation of Technological University of Podillia (now Khmelnytsky National University), Chamber of Commerce, Main Department of Economy of Regional State Administration, a number of banks and enterprises of the garment industry. The students' Fashion House became the cluster innovation center. Due to the design developments, modeling and creation of new products, teaching and training of students and entrepreneurs in the cluster structures in Poland and Italy, the cluster participants managed to reach the production and commercial success [15].

Potential possibilities of Podilskyi region of Ukraine, which has enormous cultural and historical traditions, unique natural resources and favourable geographic location, contributed to the efficient functioning of the tourism cluster in the city of Kamianets-Podilskyi and successful development of the agri-tourism cluster in Grytsiv village of Shepetivka region, which became well-known not only in Ukraine but also abroad.

However, despite considerable efforts, the dairy cluster in Khmelnytsky was not created. The food clusters in Kamianets-Podilskyi and Khmelnytsky, which successfully started their activities in 1999-2000, could not withstand competition in the food products market and at losing some of their participants (due to bankruptcy of some enterprises) faced serious problems in their operation.

However, in 2005 in Khmelnytsky region there began a new phase of clustering in economic sectors attractive in terms of innovation and investment, namely: in the manufacturing of construction materials, organic farming, horticultural farming, information and education sector, in the field of commercial use of historical and cultural heritage, and others [15].

In Ivano-Frankivsk region there were created crafts clusters, which began functioning in 2000 [16]. The initiative of their formation came from scientists of Carpathian National University, who brought together dozens of craftsmen, individual manufacturers, entrepreneurs, intermediaries, representatives of science and public institutions on a voluntary basis. The purpose of the association is to support the development and protection from competitors of a typical for the area industrial activity, in particular, manufacturing of various products from sheep wool.

A wood processing cluster was created in Rivne region on the initiative of Chamber of Commerce with an active support of the region's business circles and financial assistance of the "Eurasia" fund. The clustering of over 30 private sawmills and wood processing enterprises, design and research institutions, design centers allows to achieve more efficient use of local forest resources, to move from making simple and primitive products (sawn timber, pallets) to producing more complex ones with a larger share of added value, such as furniture for homes and offices, souvenirs and other products [16]. Three clusters — in agricultural production, mechanical engineering and construction have been formed in Zhytomyr region [13].

Forming a cluster of green tourism has been stated and a project on creating a regional cluster of ecologically clean production manufacturers is being implemented in Poltava region. The regional organization of employers has developed a pilot project on forming the agricultural products cluster in Odessa region [15].

An innovative industrial cluster in agricultural engineering is being formed in Zaporizhzhya region as well. The founders of the industrial cluster is the Dnipro Regional Center of Innovation Development, the Pridniprovsky Scientific Center under NAS and MES of Ukraine, Taurian State Agrotechnical University, the public organisation "Technology Park «Mechanical Engineering Technology»", the public organisation "Innovation and Technology

Cluster «AhroBUM»” [15]. The creation of such a cluster is aimed to boost the manufacturing of competitive innovative products in the field of agricultural engineering which will be consumed not only in the country but beyond its borders as well.

#### **National and regional support systems of clusters in Poland**

Polish cluster policy is implemented in the following areas:

- research and development (R&D),
- support of the international expansion of companies operating in clusters,
- development of human capital in enterprises – members of the clusters,
- stimulation of the scientific-industrial collaboration within the clusters,
- creation of new enterprises.

So far, public support for cluster development in Poland was carried out indirectly through the financing of cluster coordinators and their services for the members of the cluster, but mainly financial support was dedicated to investment in common infrastructure.

New approach for supporting clusters through the National Key Clusters (NKC) and the Regional Key Clusters (RKC) was formulated in 2015. NKC will be supported from the funds of the national level and RKC will be financed from regional funds.

According to the present Polish cluster policy, the choice of NKC and RKC will result in a concentration of public national and regional funds, including funds from the European Union. NKC and RKC will be supported in a targeted manner with public funds available at national level, especially dedicated to the expenditure on R&D and establishment the cooperation of R&D and companies. Taking into account the independence of the regional decision-making processes, different methods of selecting Regional Key Clusters can be observed - accreditation, competition or processes of analysis, public consultancy, etc., related to the regional smart specialization strategies. It should be noted that regardless of the status of the cluster - National Key Cluster or Regional Key Cluster - clusters are usually regional in nature.

The new cluster policy maintains support for the cluster coordinators, but forms a more comprehensive model of cluster-based development policy. It assumes the coordination and concentration of various instruments of public policy for cluster development areas as arising innovation, science and technology progress, human resource development etc. In practice - the applications of NKC will be awarded by additional, extra points in the system of evaluation of projects. In this way, a new cluster policy responds to the shortcomings of the coordination of the activities of government (government failure) and the complexity and disintegration of the support system (systemic failure).

Proposed trends and assumptions for the Polish cluster policy include mechanisms to support the development of cooperation and coordination, including incentives for stimulation of the new cluster initiatives in regions of a significant potential for economic, scientific and technological input. The special economic zones seem to be a promising area for establishing the new clusters. It is also prospective to stimulate the creation of new interdisciplinary clusters and cluster initiatives at the interface between different sectors and industries in order to solve major socio-economic problems. Clusters could be the answer to the problem of market imperfections (market failure), associated with the existing constraints in Poland in the establishment and development of cooperation between businesses, and between industry, R&D institutions and administration as well.

The cluster policy is also a response to the diagnosis of the current state of development of clusters and cluster initiatives in Poland. The reports and analyses show that cluster initiatives do not always arise there where statistical diagnoses indicate the existence of significant appropriate conditions for clusters development.

The cluster policy does not assume, however, creating a top-down cluster initiatives, but constructs a system of incentives, mobilising their grassroots with bottom-up relations of generation and, more importantly, engaging cluster's stakeholders in the processes, strategic development planning and defining common ventures. The main actors appealing in these processes will be companies and business environment institutions. It is also assumed that the main determinant of the development of clusters should be private investment carried out

by the cluster members. Public support for clusters should be regressive and limited in its duration. It should be gradually discontinued.

These assumptions for the Polish policy to support clusters are in line with the EU 2020 Strategy and the concept of smart specialization on the national and regional levels as well, postulated by the European Commission.

EC assumes that each European country and region should concentrate efforts and resources on specific, small number of priorities, or economic specialisation of significant innovative potential, which has a real expertise and resources and can achieve excellence and competitiveness on a global scale. Preparation of smart specialisation strategies at national and regional level is subject to the granting of EU funds for investments in research, development and innovation in 2014-2020.

### **National and regional support system of clusters in Ukraine**

The policy of clusterisation of Ukrainian economy has been considered by the government of the country since 2003 [17]. Thus, the Resolution of the Cabinet of Ministers of Ukraine (CMU) of 28.07.2003 №1174 "On approval of the State program of industrial development for 2003-2011" provided for the formation of technological clusters primarily in the most knowledge-intensive and high-tech sectors and manufactures which can radically change the economic, as well as scientific and technical potential of the industry, ensure optimization of regional industrial complexes and production facilities. In 2008 the CMU Resolution of 14.05.2008 "On approval of the State Target Economic Program «Creation of innovation infrastructure in Ukraine for 2009-2013»" made provisions for creation with the assistance of local authorities of innovation and technology clusters in the structure of research organizations, small and medium enterprises, technology transfer centers, etc. At the same time, the CMU Resolution №389 of 02.02.2011 approved "The program of investment and innovation activity in Ukraine", which pointed out the innovation infrastructure underdevelopment, lack of innovative enterprises (innovation centres, technology parks, technopolises, innovative business incubators), science parks, technology transfer centres and industrial clusters. Finally, in 2011 there was adopted the Law of Ukraine "On priority directions of innovation activity in Ukraine" №3715-VI of 08.09.2011, which specifies that for the implementation of medium-term priority directions the state will introduce measures concerning the development of the innovative infrastructure (innovation centres, technological parks, scientific parks, technopolises, innovative business incubators, technology transfer centers, innovation clusters, venture capital funds).

Along with the general regulations on the creation of clusters, the practice of adopting special regulations is widely spread in recent years. Thus, by the Ordinance of the CMU №165-p of 27.01.2010 there was approved the "Action Plan for 2010-2011 on Creating innovation and technological cluster "Sorochyntsi Fair" and the Ordinance of the CMU №145-p of January 27, 2010 "On introduction of cluster model for development of folk artistic crafts" was adopted.

The need to promote cluster initiatives is mentioned in some elaborated by the regions and approved strategies of socio-economic development, but these projects did not receive efficient support.

A particular importance in recent years is attached by the Government of Ukraine to the creation of transborder clusters. This is justified by the Ordinance of the CMU of 10.09.2008 №1214 "On approval of the plan of measures on realization of National Security Strategy of Ukraine for 2008", which provides for development of the strategy for creation of regional transborder clusters.

The concept of the State Program of developing transborder cooperation for 2007-2010 considers transborder cooperation as "a complex of joint activities aimed at establishing and deepening economic, social, scientific, technical, environmental, cultural and other relations between territorial communities, their representative bodies, local executive authorities and territorial communities, corresponding authorities of other countries under agreements concluded between such entities of transborder cooperation.

Thus, the laws of the Verkhovna Rada of Ukraine, resolutions and ordinances of the Cabinet of Ministers provide for the establishment of territorial and sectoral clusters. However, it should be noted that besides the recognition of clusters as instruments for implementation of programs aimed at innovations in normative and

legal acts of Ukraine, real mechanisms to create the conditions for successful implementation of the policy of the economy clusterisation have not been suggested and these processes occur somewhat spontaneously, without proper organisation of the process by the state.

In general, it should be noted that there are conditions for cluster-based economic development in Ukraine. At the moment, individual strategies for development of clusters and cluster initiatives have been approved, but there are no corresponding recommendations on their formation and support.

Thus, the main problems of clustering in Ukraine are the following [11, 18-21]:

- The lack of an adopted at the state level concept of industrial policy, neither of cluster policy.
- The imperfect legal framework for the establishment and development of cluster formations in the country. None of the articles of the Commercial Code regulates such type of enterprise associations as clusters indicating the corresponding conditions for carrying out their economic activity.
- The inadequate programme-targeted framework for ensuring the implementation of cluster strategies. The existing programmes are mostly oriented to individual branches of the national economy instead of manufacturing the high-tech products.
- The lack of proper communication between science, business and authorities. This problem is caused by inefficient public-private partnership in the field of development, testing and implementation of innovative decisions in activities of economic entities, which complicates the possibility of adapting new technologies at domestic enterprises.
- However, today there is quite a wide range of existing institutions whose activity is aimed at facilitating the implementation of transfer exchange with innovations, namely: Ukrainian Center of Innovations and Patent Information Services, European Network of Innovation Relay Centres (IRC-network), National Information Centre for EU Cooperation in Science and Technology, Ukrainian Technology Transfer Network (UTTN), Public Network for the Transfer of Ideas in Technologies (“TIT network” or Web TIT), etc. [19], but these processes are hardly implemented.
- The low level of institutional environment for supporting implementation of innovations and business development caused by the lack of government incentives and funding of science and academic entrepreneurship (type of economic activity based on creation of new technologies and processes, the main purpose of implementation of which is to optimize production and management processes at enterprises).
- The unsatisfactory level of the infrastructure development (primarily technical) constraining the development of research activities and therefore innovations.
- The prevalence of corruption mechanisms in government warranties, special-purpose funding, public financing and tendering, which contributes to the development of money laundering schemes and does not ensure the implementation of national investment and innovation programmes.
- The insufficient interest of small and medium businesses in association into major production systems through the lack of preferences related to venture activities and technological upgrading of fixed assets.
- The non-availability of credit resources required to implement innovation projects for participants of cluster formations.
- The lack of skilled innovation managers, whose function is to monitor market innovations, substantiation of expediency and integration of innovative approaches in economic activity at all levels.
- The low level of transparency and trust among potential members of clusters, including extremely low confidence in the government.
- The lack of experience in public-private partnerships and legal problems with its implementation.
- The lack of experience of companies CEOs and R&D institutions in participating in international projects and programs as well as the appropriate consulting support of these processes by experts.
- The ineffective government policies on establishing and maintaining international cooperation of Ukrainian producers with foreign partners.

Thus, unfortunately, the formation and development of clusters in Ukraine is progressing slowly. A very small number of clusters created in different regions of Ukraine can be attributed to the export-oriented innovation cluster structures. With concern for the future of the country we can assume that Ukraine, being in permanent complex crisis, has not developed a clear program of the economic development and principles of building partnerships between business entities and for this reason is still far behind its European neighbours.

Under these conditions, the most important tasks include: carrying out administrative-territorial reforms, reducing bureaucracy of the state apparatus, combating corruption and lobbying by authorities the interests of oligarchs, as well as supporting business development, assisting the establishment of small and medium businesses, and every other support of cluster initiatives.

### Examples of good practice of clustering in central Poland

Innovative clusters are not only high technology clusters, but also clusters of low- and medium-technology, such as cooperative network – Bioenergy for the Region Cluster (B4R). This cluster is a cooperation platform of companies, research institutions, local administration and business support institutions. The main aim of the B4R is sustainable energy development in Central Poland. In the context of climate change the cluster promotes innovative solutions in renewable power engineering in local and regional dimensions.

Cluster aims to achieve its purposes through:

- Complex solution of issues concerning the regulation of the biomass market in Central Poland, in particular the methods of collection, processing and use as a renewable energy source (RES);
- Integration of members of the Cluster - businesses, researchers and local authorities in order to increase the share of solar and wind energy in the energy balance of the region;
- Educational and information activities, promoting the use of renewable energy and energy efficiency.

Renewable energy sources industry is not only one of the most dynamically developing areas of business, but it may be regarded that is one of the most ground-breaking, positive and remarkable achievements of the global economy the last few years. The processes of transition to a low-carbon economy, free from fossil fuels, are partially the result of the obligation imposed on governments and national economies by international organizations, primarily the United Nations Framework Convention on Climate Change - UNFCCC or FCCC and the Kyoto Protocol, but, most of all, they are the result of environmental-friendly social trends all over the world.

Development of RES effects introducing to the market of new climate-friendly technologies and innovative energy production solutions [22].



Bioenergy for the Region Cluster came into being in April 2007 and is an open initiative of the cooperative network, which, at the end of 2015, consisted of 67 companies, 9 R&D institutions, 10 local administrations and 11 business environment institutions, plus regional TV and radio. In July 2014 the Renewable Energy Sources Technology Transfer Centre (RES TTC) was opened as the research facilities for companies and other stakeholders of the B4R cluster. In 2012, the cluster was recognized by the Polish Agency for Enterprise Development as a cluster of supra-regional importance for Polish economy. Cluster members are, for example, Veolia Lodz, Polish Energy Group, Technical University of Lodz, University of Lodz, Lodz Regional Science & Technology Park, and many other institutions working together for sustainable energy development in Central Poland.

The heart of the cluster beats in RES TTC, located in Konstancynów Łódzki, neighboring Lodz – the third largest city in Poland. RES TTC is an interdisciplinary research center equipped with state-of-the-art research and technical facilities, conducive to the transfer of knowledge and technology as well as increasing the innovation potential of enterprises participating in the „Bioenergy for the Region” Cluster. RES TTC supports the integration of the business and scientific community in the sector of sustainable energy in Central Poland, as well as tying bilateral and multilateral scientific and industrial consortia, particularly at international level. It consists of 8 interdependent laboratories:

- Biomass Lab
- BioProcess Lab
- Solar Lab
- Wind Energy Lab
- Energy Efficiency Lab
- E-Mobility Lab
- Textronics Lab
- Circular Economy Lab.

Bioenergy for the Region Cluster distinguishes among others mainly due to undertaking intensive international cooperation.

Another good practice of cluster initiative in Central Poland is Mazovian ICT Cluster, which was established by Market Consumption and Business Institute in 2007, currently it has more than 140 committed participants - 5 Research Institutions, 6 Universities and plenty of other entities including SMEs, NGOs, investment funds and large companies. The mission of the Mazovian ICT Cluster is to bridge the gap between the action and conditions for SME's development in the metropolitan area and the rest of the Voivodship. Cluster accomplishes this mission by establishing and developing cooperation between sector of computer science enterprises, telecommunication and electronic media R&D units, universities and business institutions and local authorities in the area of Warsaw and outside metropolitan areas.

The competence areas of the Mazovian ICT Cluster are: telecommunication, IT, industrial automatics, power engineering, GIS, Business System Solutions, Creative Industry, Smart City, Smart Grid, eHealth, Decision Support System. In each area has a front runner with the associated entrepreneurs, who cooperate closely in the new projects and the technological solutions. In 2015, Mazovian ICT Cluster obtained a status of National Key Cluster as one of seven entities in the country. Next year the cluster also received Silver Label of Cluster Excellence, certified by European Secretariat for Cluster Analysis (ESCA).

Similarly to B4R, Mazovian ICT Cluster implements international projects. One of them - Cluster Excellence for Creative Industries Leadership unites European clusters to drive cluster excellence and provide top professional support services in the digital cultural and creative industries. In its scope the first European Strategic Cluster Partnership (ESCP) on digital cultural and creative industries is being created [23]. The common feature linking clusters, which can be named as good practices, is conducting numerous projects, especially the ones in multinational partnership. This type of projects provides models, standards and examples of solutions, which are then implemented within a cluster.

#### Examples of good practice of clustering in Ukraine

Clusters and cluster initiatives in the transborder space are implemented most actively in Ukraine. Six Euroregions – “Bug”, “Upper Prut”, “Lower Danube”, “Carpathia”, “Dnieper” and “Slobozhanshchyna”, in the operation of which such regions as Volyn, Zakarpattya, Ivano-Frankivsk, Lviv, Odessa, Chernivtsi, Chernihiv and Kharkiv are involved, were established at the state border of Ukraine.

On the basis of the provisions of “European Convention on Transfrontier Cooperation between Territorial Communities or Authorities” and “European Charter of Local Self-Government”, Lutsk, Chernivtsi, Zakarpattya, Odessa, Ivano-Frankivsk and Lviv regions of Ukraine together with administrative and territorial communities of Poland, Belarus, Romania, Slovakia, Hungary, Moldova, Austria, Germany and France moved to the practical application of their transborder business opportunities. Namely, the neighbourhood programs “Poland – Belarus – Ukraine”, “Hungary – Slovakia – Ukraine” and “Romania – Ukraine” aimed at improving the socio-economic situation in border regions has been launched. Table 2 shows the clusters and cluster initiatives currently operating in the transborder space of Ukraine.

Table 2. Clusters and cluster initiatives in the transborder space of Ukraine

Cluster / cluster initiative	Characteristics
<b>Clusters</b>	
Transborder logistics cluster ( <i>Zakarpattya region</i> )	It was planned according to the Programme of creation of transborder transport and logistics centres as a structural unit of innovation clusters in Zakarpattya region for 2009-2011
Scientific information and statistical cluster “Infostat–Ukraine–Poland” ( <i>Ukrainian–Polish transborder region, Lviv region</i> )	The cluster has been functioning since 2013. The participants of the cluster from Ukrainian side are: SI “M. I. Dolishny Institute of Regional Studies of NAS of Ukraine”, Main Department of Statistics in Lviv region, Ivan Franko Lviv National University, Lviv Regional Association of Economists of Ukraine, from Polish side: Department of Statistics of

Cluster / cluster initiative	Characteristics
<b>Clusters</b>	
	Subcarpathian Voivodeship, Rzeszów University; Centre for Statistical Research and Education, Central Statistical Office of Poland
Transborder tourism and recreation cluster <i>(Ukrainian-Polish transborder region)</i>	It was created within framework of the Neighbourhood Programme "Poland-Belarus-Ukraine" for 2007-2013
Lublin Eco Energy Cluster	It began functioning as a transborder cluster by attracting participants from the Ukrainian side, namely, the "Centre for Introduction of Alternative and Renewable Energy Sources". The cluster also includes a holding structure, which has a unit in Ukraine - JV "LLC ComEcoLviv"
Polish-Belarusian-Ukrainian Transborder Tourism Cluster <i>(Volyn region)</i>	The agreement on the establishment of the cluster was signed on 31.10.2014. The parties to the Agreement are: Lublin Regional Tourism Organisation, Volyn tourism cluster and Brest tourism cluster. It was created within framework of the Neighbourhood Programme "Poland-Belarus-Ukraine" for 2007-2013
<b>Cluster initiatives</b>	
According to the project "National Strategies of Creation and Maintenance of Transborder Clusters" there were presented two transborder cluster initiatives: 1) the transborder forest cluster (as part of border Carpathian regions of Ukraine and neighbouring countries); 2) the transborder tourism and recreation cluster (also as part of Carpathian border part of Ukraine and neighbouring countries) <i>(Ivano-Frankivsk region)</i>	As in 2016, these cluster initiatives have not been implemented yet, but they have a considerable potential of functioning
The agreement on the establishment of "Transborder Innovation Cluster" between Chełm Chamber of Commerce, Ltd and East European Ukrainian University <i>(Ivano-Frankivsk region)</i>	The agreement was signed on 19.02.2015. The aim of the cluster is to organise professional practices in Poland for students of Eastern University in the scope provided by the university curricula
According to the Concept of the State program of transborder cooperation for 2011-2015, there considered a possibility of establishment of transborder tourism cluster based on the network of regions-winners of the all-Ukrainian contest "Seven Wonders of Ukraine" <i>(Chernivtsi region)</i>	The activity concerning the cluster development is expected to be performed using the potential of the Euroregion "Upper Prut" (Ukraine, Moldova, Romania)
A declared cluster initiative - Ukrainian-Romanian "First Agrarian Cluster", which was launched in 2009 in Chernivtsi region. The planned cluster area: Chernivtsi region, neighbouring areas of Khmelnytsky, Ternopil, Ivano-Frankivsk regions (Ukraine); Botosani and Suceava County (Romania); Moldova	The cluster activity is aimed at: increasing the innovation level of agricultural activities; improving the investment climate for the industries belonging to the cluster; developing the mechanism for supporting innovation activities of enterprises by regional authorities and local self-government bodies; creating the system of training specialized personnel for agribusiness of the region; providing Ukrainian fruit and vegetable market with organic products; selling berries and mushrooms to the countries of Western Europe. The objectives contribute to the development of interaction between enterprises, producers, certification inspectors, transporters and consumers of the products. All the entities included in the cluster interact on the basis of the conducted agreements.

Source: [24]

Moreover, at the border with Belarus there was established transborder agri-tourism cluster "Dnipro" (2010), which combines six neighbouring border areas of Gomel and Chernihiv regions, namely Dobrush, Gomel, Loyev,

Gorodnya, Chernihiv, and Ripky districts. The main objective of functioning of this transborder cluster is promoting ideas and principles of sustainable development of agri-tourism as a direction of sustainable socio-economic development of rural areas of Gomel and Chernihiv regions, and, in the future, of Bryansk region. This, in turn, will allow to implement this tourism project in the foreign market for tourism services with a joint tourism brand. By the end of 2010 the transborder agri-tourism cluster of Euroregion “Dnipro” included more than 300 natural, historical and cultural and archaeological sites. A number of “green” rings and radial routes — hiking, cycling, and horse-riding, which run through the territory of the cluster localisation, have been developed [9].

Thus, main efforts towards transborder cooperation between the countries are aimed at developing social, information and border infrastructure; development of transport networks; scientific and cultural cooperation; exchange of experience between the local executive authorities; environmental protection, etc. However, a cluster form of cooperation in the transborder space has not received a proper extension in Ukraine, and is only a stage of development.

Since formation of clusters reflects the “economic profile” of the territory and is an objective result of the development of a particular business in a given territory, each region is characterised by its directions in implementing cluster initiatives.

Strategy of the socio-economic development of Kharkiv region [25] defines the following scientific and industrial clusters in the regional economy (Table 3).

Table 3. Scientific and industrial clusters in the economy of Kharkiv region

No.	Name of the cluster	Measures to implement the project of the cluster creation
1	Cluster of power engineering	Restructuring and reorganisation of individual enterprises participating in the cluster. The state order for part of the cluster final product.
2	Innovation cluster of the aircraft industry	Restructuring and reorganisation of individual enterprises participating in the cluster. The state order for part of the cluster final product.
3	Scientific and production innovation cluster of the rocket and space complex	Creation of an associated structure of the cluster participants. Restructuring and reorganisation of individual enterprises. Implementation of the results of new research and developments.
4	Research and production innovation cluster of military (armoured) vehicles	Creation of a vertically integrated structure. Restructuring and reorganisation of enterprises. The state order for the cluster product.
5	Research and production cluster of agricultural engineering	Creation of an associated structure of the cluster participants. Restructuring and reorganisation of individual enterprises. Conclusion of interregional cooperation agreements.

Source: [25]

One of the priority clusters in the economy of Kharkiv region is a cluster of power engineering. On 02.05.2015 Kharkiv Regional Center for Investment and Development initiated the founding meeting of the Coordinating Council of the cluster of Power Engineering, where the draft Strategy of its development was adopted, which the following priorities were defined in:

- renewal of fixed assets of enterprises;
- creation of competitive new equipment and technologies;
- introduction of a system of personnel training and skills development;
- creation of a network of engineering centres;
- networking — development of international cooperation [26].

On 02.12.2009 the ICT cluster “Kharkiv-IT” was formed and has been effectively functioning since then. It is not a legal entity and the organization of its work is carried out by the working group under the leadership of the cluster Coordinating Council. Fig. 2 presents the group of the cluster participants.

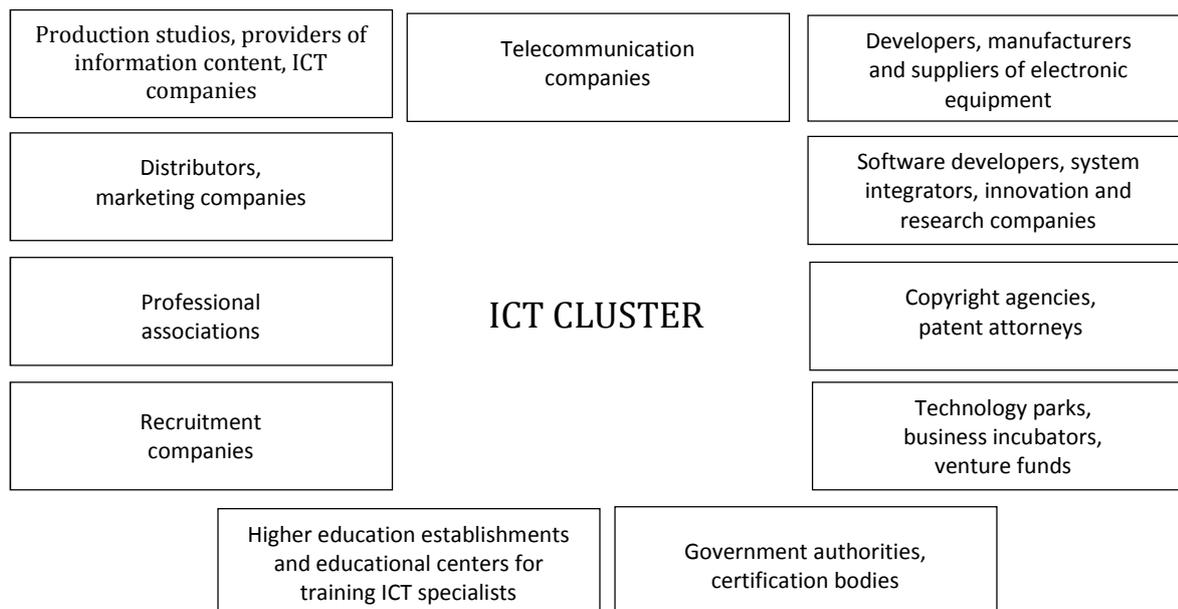


Fig. 2. Types of enterprises and organizations belonging to the ICT cluster "Kharkiv-IT"  
Source: [27]

In 2012 the importance of the cluster was confirmed by the decision of the Council of Domestic and Foreign Investors at Kharkiv Region State Administration, according to which the cluster of information and communication technologies "Kharkiv-IT" was included in the list of priority clusters defining the prospects of the region development.

The practice of implementing cluster initiatives in Ukraine shows that in most cases the initiators of clustering are heads of enterprises and organisations working in the relevant field of economic activity, as well as territorial and central executive authorities interested in cluster development. The formed clusters are intended to contribute to: attraction of investments, encouragement of research activity, development of small business through use of the advanced technologies, entrance of products to international markets and enterprises and entering the strategic cooperation network.

#### **Comparative analysis of prospects for development of clusters in Poland and Ukraine**

The main determinants of the cluster development in Poland and Ukraine as well as their evaluation are presented in Table 4, while the results of comparative analysis of perspectives for development of clusters in Poland and Ukraine are presented in Table 5.

Table 4. The main determinants of the cluster development in Poland and Ukraine. Scale of the positive impact of the determinant: 0 – no impact; 1 – an appreciable but little impact; 2 – a modest impact; 3 – a significant, positive impact; 4 – a major positive impact; 5 – an excellent positive impact

Determinants	Perspectives for development of clusters in Poland	Impact	Perspectives for development of clusters in Ukraine	Impact
Political	Presently, the political situation in Poland is not stable enough to promote the cluster initiatives. Analysts of the Polish political scene predict a retreat of pro-market towards centralisation of decision-making process. There are serious reasons for concern that the current government, formed by Law and Justice (PiS), can launch the political model where there is no place for regional cooperative relations. Greater importance is given to the so-called national values versus values of the European Union, centralisation of power in the hands of one party and restoring control of regional policy from the level of central administration.	1	The political situation in Ukraine is very unstable at the moment, which is aggravated by the military aggression on the part of Russia. The present government does not take necessary measures in the direction of preparation and adoption of normative legal acts on stimulating the development of cluster structures in Ukraine.	0
Economical	Economic conditions for the implementation of the cluster policy are unclear. Polish government, except declarations, does not create real economic conditions enabling the development of cluster initiatives. The only promotion for clusters are promises that the National Key Clusters will receive extra points in competitions for funding. There are no preferences for cluster coordinators, nor for the cluster members. There is a lack of economic incentives, such as tax cuts for activities contributing to the development of the cluster, or discounts of state-related labor costs. However, there is a strong pressure of companies to facilitate the tax system and remove barriers for entrepreneurship.	2	On the one hand, the economic conditions for realisation of the national cluster policy are extremely unfavorable at the moment because of the deep complex crisis in Ukraine. On the other hand, there is no alternative to the development of cluster structures in the country regions, because only such an approach can provide an effective restructuring of the economy. This discrepancy leads to the fact that the processes of cluster formation in the country occur spontaneously, without their proper organisation by the state and in absence of any support and economic incentives of their development. Perspectives for the development of the economic situation in Ukraine and, in particular, the conditions of the cluster policy development, are difficult to predict, because they are greatly affected by the political situation in the country.	1
Financial	The EU's financing policy of supporting cooperation between science and	4	The state policy of funding science in the country does not contribute	1

Determinants	Perspectives for development of clusters in Poland	Impact	Perspectives for development of clusters in Ukraine	Impact
	<p>industry has a positive effect, indirectly, on the cluster funding mechanisms in Poland. Most calls for proposals prefer the projects prepared by consortia of the enterprises and R&amp;D institutions. However, the promotion of cooperation of science and industry does not mean preferences for clusters. Any consortia of R&amp;D institutions and companies can apply for the grants, and the clusters do not receive any respectful privileges. Although Poland has not created any national sources for development of clusters, the impact of the EU funds on the development of consortia of industrial and academic partners will significantly contribute to the development of clusters.</p>		<p>to the development of cluster structures. Moreover, the policy of reducing scientific research funding pursued by the government breeds up concern. The high level of monopolisation of the Ukrainian economy and the presence of oligarchs in the national government leads to the fact that the financial and economic policy pursued by them does not contribute to cooperation between science and industry because of the lack of interest in such processes.</p>	
Technological	<p>Clusters in Poland have been just equipped with modern technological infrastructure, including ICT facilities, enabling their development and expansion.</p> <p>This applies to modern buildings, technology lines, laboratory equipment, tools and devices, enabling the applied scientific research useful for business.</p>	5	<p>Clusters in Ukraine are very poorly equipped with modern technical infrastructure. This is particularly true in terms of modern laboratories, industrial machinery, tools and equipment, which adversely affects the conduct of applied research.</p>	1
Societal	<p>Cooperation within the cluster requires a high social capital, which means the social acceptance of building partnerships, trust, dissent and tolerance, respect for partners and skills for tasks' division and creation of a joint development prospects for the cluster as a whole.</p> <p>Level of social capital in Poland is low and unfortunately in recent months has decreased even more. Polish society is characterised by mutual mistrust, which is not conducive to building a broad cooperative relations.</p>	2	<p>Public recognition of partnerships within the clusters is at a low level. The level of social capital in Ukraine is low as well.</p> <p>In general a low level of transparency and trust between potential participants in the cluster, and, in particular, a very low confidence in the authorities can be noticed.</p>	1
International	<p>EU policy offers many incentives for building international cooperations of clusters as the whole and for cooperation of cluster members, especially there are many facilitations and incentives for consortia of industry and R&amp;D. At most EU competitions reward the international cooperation,</p>	4	<p>The state policy on establishing international cooperation of Ukrainian clusters with foreign partners does not contribute to this process. Cooperation between domestic cluster structures and foreign partners on the basis of personal</p>	1

Determinants	Perspectives for development of clusters in Poland	Impact	Perspectives for development of clusters in Ukraine	Impact
	<p>if not just clusters as main actors, but also the projects of collaboration of companies and research institutions (e.g. within the Horizon 2020 Programme), or cooperation of local government administration, R&amp;D, enterprises and non-governmental organisations (e.g. within the InterReg Programmes).</p> <p>The European Commission expects cooperation of partners from at least three countries, including partners from non-EU countries as well. This means that the impact of the strategy of Europe 2020 and European incentives for building international cooperation significantly contributes to the development of clusters in Poland.</p>		efforts and contacts is possible.	
Readiness of entrepreneurs to cooperate in clusters	Polish entrepreneurs are very interested in joining cooperative networks. They recognise in clusters chances to extend the network of subcontractors, including R&D institutions, increase knowledge and develop technology on the basis of international contacts.	5	Ukrainian entrepreneurs are interested in joining the cluster structure and are willing to participate in them.	3
Readiness of R&D institutions to cooperate in clusters	Readiness of the Polish R&D institutions to engage in cluster activities is modest. The system of incentives for R&D institutions to stimulate their participation in cluster initiatives is insufficient. The unsatisfactory incentives are also in relation to foreign cooperation, joint consortia of industry and scientific research institutions and to take part in projects financed from European sources.	3	The readiness of Ukrainian R&D institutions to be engaged in the cluster activities is not high. The system of incentives for R&D institutions to stimulate their participation in cluster initiatives is insufficient. Also for today there has not been attained enough experience in such participation. It is possible to speak only about individual R&D institutions in Ukraine capable of participating in joint projects.	1

Source: Authors'

Table 5. Comparative analysis of perspectives for development of clusters in Poland and Ukraine

Determinants	Perspectives for development of clusters in Poland					Perspectives for development of clusters in Ukraine				
	5	4	3	2	1	1	2	3	4	5
Political										
Economical										
Financial										
Technological										
Societal										
International										
Readiness of entrepreneurs to cooperate in clusters										
Readiness of R&D institutions to cooperate in clusters										
Weight	5	4	3	2	1	1	2	3	4	5

Source: Authors'

Conclusions: the factor that is most conducive to the development of cooperation between Polish and Ukrainian clusters is readiness and determination of entrepreneurs of both countries. According to the authors of this article, members of clusters in Poland and Ukraine cannot count on the political support of their governments, despite the many empty declarations of cooperation of politicians.

#### Summary: Areas and direction of Polish-Ukrainian cooperation of clusters.

*The possibilities of cooperation within the European projects*

##### Horizon2020 Programme

Ukraine is one of the 13 Associated Countries with the privilege to participate in Horizon 2020 Programme, which is governed by Article 7 of the Horizon 2020 Regulation. Legal entities from Associated Countries can participate under the same conditions as legal entities from the Member States. Association to Horizon 2020 takes place through the conclusion of an International Agreement.

As of 1 December 2015, the following countries are associated to Horizon 2020:

- Iceland
- Norway
- Albania
- Bosnia and Herzegovina
- the former Yugoslav Republic of Macedonia
- Montenegro
- Serbia
- Turkey
- Israel
- Moldova
- Switzerland
- Faroe Islands
- Ukraine.

Given that the EU does not recognise the illegal annexation of Autonomous Republic of Crimea and the City of Sevastopol, under the terms of the Horizon 2020 Association Agreement with Ukraine, legal persons established in the Autonomous Republic of Crimea or the city of Sevastopol are not eligible to participate. Should the illegal annexation of the Autonomous Republic of Crimea and the City of Sevastopol end, the Agreement will be revised accordingly.

General clarifications and up-date on signature of the Horizon 2020 Association Agreement with Ukraine were made on 22.04.2015.

Case study: EcoDesign Exploring New Value Chains (EDEN), project of H2020. The EDEN project will connect four different clusters and an industrial federation from different parts of Europe, disposing of different resources, tools and instruments. Groups of SMEs will be supported to collaborate and create international, cross-cluster networks. The separate value chains already existing in each industry are aimed to be integrated under cross-sectoral collaboration paradigm. This closer cooperation will let them create the comparative advantage on the intersections between existing industries. The development of industrial areas, increasing amounts of produced garbage and shrinkage of natural resources are among major problems EDEN tackles, so does it with a challenge of people's growing demand for creative new products. All the planned actions are intended to be replicable so that the potential large-scale solutions could be created and its future impact could be enhanced ad infinitum. As the whole concept will be based on a joint innovation support standard, all of these activities will have a significant positive influence on the European SMEs innovative potential and the environment.

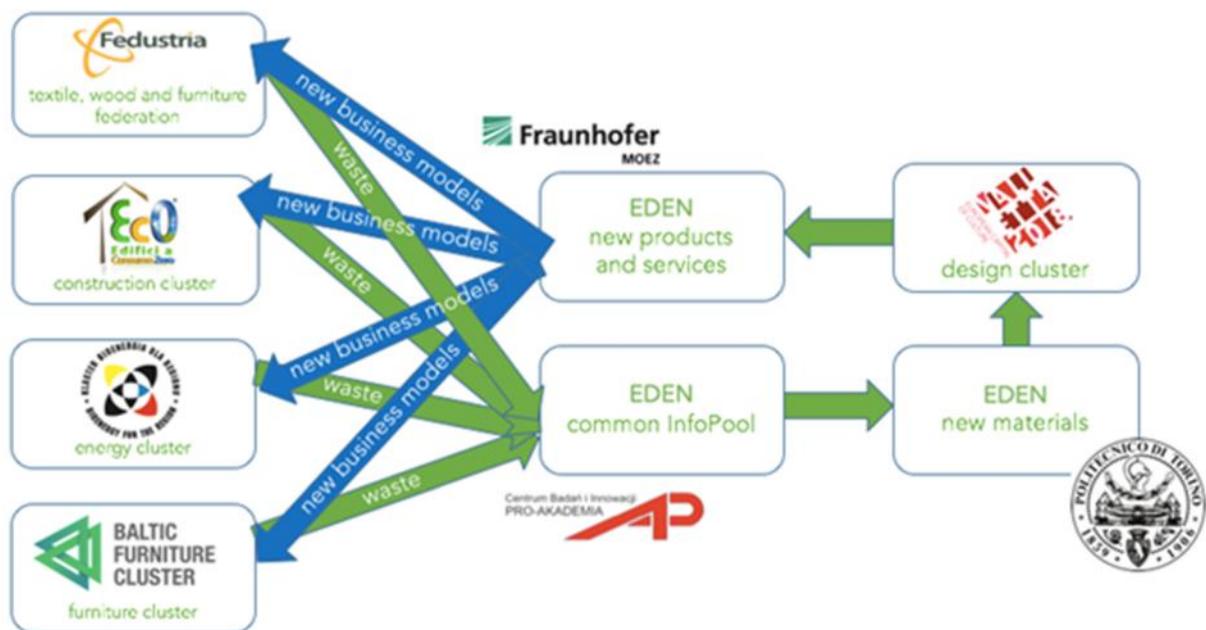


Fig. 3. EDEN concept for new value chain generation as the result of European clusters' cooperation  
Source: Authors'

EDEN main focus lies on exploring the existing circular economy potentials at the level of over 2000 SMEs participating in the EDEN member clusters. Its overriding idea was to use the eco-design as an accelerating and propelling centerpiece, predominantly due to its representatives' extraordinary capability of creating new applications for any materials. As presented in Fig. 3, the coordinators of textile, wood, furniture, energy and construction clusters will collect information on all forms of waste resulting from operations of SMEs in their networks using a standardized, common approach. Information collected will concern for instance waste type, monthly mass and volume flows, real non-product output costs, elementary composition, ignitability, corrosiveness, reactivity, toxicity. All these data will be collected and processed in the online EDEN common InfoPool, which will be the main source of information on the existing potentials of participating enterprises. The outcomes will be examined by the waste recycling specialists from the academic field who will present the ideas on utilising them to the design cluster. In some cases it will be even possible to turn raw waste directly into new products, avoiding costly recycling processes. The designers will propose new products that will be applied with new business models to suitable cluster, propelling intra-cluster and cross-cluster waste-as-a-feedstock exchange. The Fig. 4 shows the concept of design of new composite material, useful in different kind of manufacturing, properly to clusters specific.

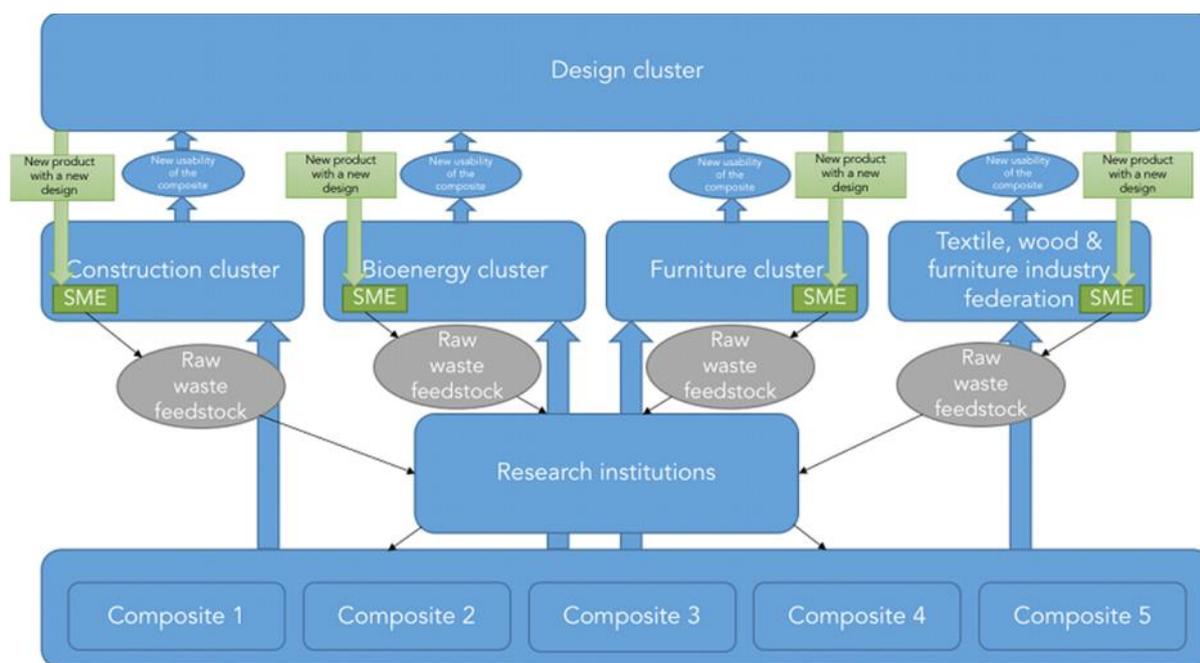


Fig. 4. EDEN concept for design of new composite materials and products based on raw waste feedstock  
Source: Authors'

As the clusters and SMEs will collaborate within the EDEN project, all of the tasks carried out are practical and have a specific, concrete business dimension. Thanks to the international cooperation of clusters from different sectors of the economy, the new products based on recycling and processing their own waste will be created.

The above described H2020 project EDEN with participation of clusters from EU countries can be an good practice and a "light-house" for Polish-Ukrainian clusters cooperation.

#### Europe-Aid Programmes

Interesting example of Europe-Aid Programmes can be DCFTA SME Direct Support Facility Programme, addressed to the private sector in Georgia, Moldova and Ukraine, particularly through lending to small and medium-sized enterprises (SMEs). Timeframe of the programme: 2014-2026; budget: EUR 10.22 million. The project aims to blend funds from the EU and the European Bank for Reconstruction and Development in order to provide financing and technical assistance to the SME sector and to improve conditions for SMEs lending.

The DCFTA SME Direct Support Facility aims to achieve the following:

- To improve access to finance for local SMEs in the region.
- To mitigate the shortage of long-term financing.
- To provide quasi-equity financing that is not available at all in most target countries
- To provide long-term local currency financing.
- To help SMEs identify quality capital investment projects, assist in successful implementation.
- To improve governance structure of SMEs and introduce SMEs to best practices.
- To help strengthen the ability of financial intermediaries to finance SMEs through co-financing.
- To help develop local financial markets in view of sustainable and market-based principles.

#### Eastern Partnership Programme

One of the programmes worth of attention is EBRD Women in Business, which aims to raise the issue of women's entrepreneurship in broader development plans, addressed to the following countries: Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine. Timeframe of the programme: 2015-2022; budget: EUR 5.035 million.

Women entrepreneurs are concentrated in lower value-added sectors of the economy (typically in services), and women-led small and medium-sized enterprises (SMEs) in Eastern Partnership countries are often confined

to the informal sector of the economy. Consequently, access to finance through formal institutions is a key challenge for women-led businesses in the region. The programme aims to improve access to finance for women-led SMEs as well as business development know-how.

The objective of the programme is to promote women's entrepreneurship and, more broadly, women's participation in business by supporting women-led enterprises with access to funding, particularly:

- Supporting women's SMEs in accessing finance for their sustainable growth and job creation
- Developing sustainable financial products suitable specifically for women-led SMEs
- Assisting women's SMEs to access advice and know-how.

Although the programs outlined above are not addressed precisely for Polish or Ukrainian clusters, but in the framework of each of them Clusters can develop a project that will fit into the general objectives of the programmes.

An interesting example of stimulation of international clusters' cooperation can be the TREC Danube – Transnational Renewable Energy Cluster Danube, funded by German Federal Ministry for Education and Research. TREC Danube is a transnational network of regional clusters in the field of renewable energy, energy systems and bioeconomy. The clusters from Ukraine and Poland participate in the initiative. The TREC is a platform for R&D driven innovations in energy and environmental technology markets and it tries to build up strong consortia for EU-Horizon 2020 calls basing on interlinking and focusing our profound competencies from the regions.

#### *Possibilities of bilateral cooperation of cluster members, with the support of cluster coordinator*

It seems that the bilateral cooperation between the Polish and Ukrainian clusters has little chances for development in the near future. Polish clusters are in the phase of consolidating the national and regional networks and strengthening the internal structure in order to be a part of EU eco-innovation system. On the other hand, the clusters of Ukraine have just begun the processes of building the national eco-innovation system. There is no strong external incentives to go beyond their own cooperative relation and to start looking for bilateral partners in Poland or in Ukraine. At the present stage of development, Polish and Ukrainian clusters do not notice the benefits of economic cooperation with the other side of the border.

As shown in the Table 5, the strongest determinant for cooperation between clusters is the interest of entrepreneurs themselves, but it is not enough for clusters as a whole. Cluster is a network of companies, research institutes, local administration and business environment institutions and all these partners should have their particular reasons for international cooperation. The Table 5 shows as well that there is an imbalance in readiness to cooperate: the potential of bilateral cooperation between Polish and Ukrainian clusters is determined by the state of development of Ukrainian clusters.

#### *Possibilities of creating joint projects of Polish and Ukrainian clusters in third countries markets*

The analysis of the practice of creating cluster structures in Poland and Ukraine shows that both countries can take the initiative of establishing joint cluster projects in third countries in the following fields of economy:

- renewable energy sources and alternative power engineering;
- information and communication technologies;
- aircraft industry;
- production and processing of agricultural products and food production.

The Bioenergy for the Region Cluster (B4R) (Research and Innovation Center Pro-Akademia is the managing institution of the B4R Cluster) was created in the field of renewable and alternative power engineering in Lodz (Poland). A cluster for alternative fuels production, including the hydrogen, (the managing institutions are SE "GIPROKOKS" and Research Centre of Industrial Problems of Development of NAS of Ukraine) operates in Kharkiv (Ukraine). In addition to the above mentioned, the following clusters could take part in the given cluster project in third countries (Bulgaria, Kazakhstan, Belarus, Moldova, Azerbaijan, Georgia, Armenia): Lower Silesian Eco-Energetic Cluster EEI (managed by Foundation CEDRES), Lublin Eco Energy Cluster (managed by Lublin Development Foundation), Subcarpathian Renewable Energy Cluster (managed by the Association "Subcarpathian Ecoenergetics") (Poland).

Since 2009 in Kharkiv (Ukraine) the ICT cluster “Kharkiv-IT” (managed by Kharkiv National University of Radioelectronics) comprising 25 members, among which are IT-companies, higher educational establishments and research institutions of the city, has been functioning in the domain of information and communication technologies. A number of clusters operate in the given field in Poland as well, namely: Interizon Pomeranian ICT Cluster (Gdańsk University of Technology), ICT West Pomerania Cluster (managed by the Association of ICT West Pomerania Cluster), Mazovian ICT Cluster (managed by the Association of Economic and Social Development “Wiedza”). The above mentioned Ukrainian and Polish ICT clusters can initiate the creation of joint cluster projects in third countries (Bulgaria, Slovakia, Slovenia, the Czech Republic, Kazakhstan, Belarus).

The aircraft industry cluster “Aviation Valley” (managed by the Association of the Group of Entrepreneurs of the Aviation Industry “Aviation Valley”) is situated in the South-Eastern part of Poland. The ICT cluster “Subcarpathian Aviation Cluster” (managing institution — Association B-4), which operates in the sector of light and ultra-light aircraft, is also located in Poland. In Kharkiv (Ukraine) there was also created a cluster of the aircraft industry, which comprises industrial enterprises, the main of which is “Kharkiv State Aircraft Enterprise” (managing institution), educational establishments (e.g. National Aerospace University “Kharkiv Aviation Institute”) and institutions for applied sciences. The mentioned Ukrainian and Polish clusters can take the initiative of creating specialised cluster projects in third countries (Czech Republic, Slovakia, Slovenia).

A cluster for production and processing of agricultural products and the production of food has been created in Kharkiv (Ukraine). It includes enterprises of agricultural, food and processing industry of the region, establishments of agricultural science and education — V. Dokuchaev Kharkiv National Agrarian University (managing institution), Kharkiv State Academy of Zooveterinary Medicine of NAS of Ukraine, Institute of Animal Science and others. The Organic Food Valley Cluster (the coordinator is Institute of Soil Science and Plant Cultivation — State Research Institute) functions in Puławy (Poland). The members of the cluster are companies that have the potential and experience in ecological production. These Ukrainian and Polish clusters can also initiate the establishment of joint projects in third countries (Bulgaria, Moldova, Kazakhstan).

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