Clustering and Emergent Features of the Regional Economics of the Kemerovo Region

Bereznev Sergey V. ¹, Kumaneeva Maria K. ², Makin Maksim A. ³
T. F. Gorbachev Kuzbass State Technical University
Kemerovo, Russian Federation
¹kuznii@mail.ru, ²mashkn@mail.ru, ³kmk.fk@kuzstu.ru

Abstract — The subject matter of this research is the processes of clustering in the regional economics. Currently, clustering is the most efficient form of conducting the innovative activity. For industrial regions, such as the Kemerovo region, the benefits of clustering comprise the creation of an efficient production scale rise. The purpose of this article is to study the ways to create the integrated tools formations in the industrial region. In addition, clustering advantages are imposing a qualitatively new impetus onto the development of the economics as a result of a mutually beneficial relationship emerged between industry and research organizations, universities, innovative businesses and the public sector. The paper concludes that development in the region of several cluster formations can provide the effect of the emergence of functioning of the entire regional economics. The effect in question is caused by the fact that the sum of potentials of the individual elements of the regional economics is less than the total capacity of a cluster in which these elements interact with each other. This feature provides for a number of advantages of regional economies considered in this article. In addition, the authors have identified problems that have a negative impact on the development of the innovation sphere of an industrial region.

Keywords — underground coal gasification; methane; mine; gas utilization; degasification; energy potential.

I. INTRODUCTION

Currently, a mechanism that ensures a successful economic development acquires a sharp innovation context. Nowadays regions play a specific role in a new production industrialization which becomes an acute task of the day. The industrial production segment is a main driving force helping to fulfill those tasks, as well as some others, said segment regional localization being of an importance due to its fundamental scientific cognitive methods for study of complex social-economic systems – a systematic and comparative analysis, economic and statistic methods.

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III. RESULTS AND DISCUSSIONS

The following results and conclusions have been drawn out of the research:

1. The problems that unfavourably affect the development of the innovative area of the industrial region have been identified, including: lack of competence potential in the independent creation of innovations and their commercialization due to the action of a number of factors considered, chronic and long-term lack of funding for research and development (R & D), low effectiveness of regional policy to stimulate innovation and create conditions for their commercialization; low motivation of business entities both in generation of innovations and their financing.

2. The arguments have been given proving the need of the strategic development of the regional clusters in the form of a cluster networking model of the Kemerovo region economic area organization with a broad organizational and administrative infrastructure which ensure achievement of emergent effects and economics result gains.

3. It has been stated, that the current state of the innovative system of the Kemerovo region does not create prerequisites for a priority investment in new technologies, formation of the innovative reproduction basis, which is of a paramount importance for the implementation of cluster initiatives. Only 5% of Kemerovo region enterprises uses a part of their capital investments for technological innovations. These and other factors reduce the total capacity of the region in the formation of a competitive innovation potential.

4. Practical recommendations have been suggested in the form of a set of complex organizational and management arrangements for the formation and implementation of long-term development strategy of cluster formation and innovation system of the Kemerovo region.

Best practices of developed countries have shown a tendency to strengthen the role of regional industrial agglomerations, using its economic potential in order to achieve economies of scale, especially in the sphere of innovations. The increasing relevance within the western territorial industrial policy acquires the so-called Smart Specialisation, the essence of which boils down to the need for differentiation of the regional policy instruments, based on the specifics of a particular territory. This approach allows us to solve one of the most serious problems of our time - the fragmentation of innovative research combined with the increased competition for investment resources. [3].

Foreign researchers suggest three typological region groups to be considered within the framework of Strategies for Smart Specialisation: knowledge-regions, where economics of knowledge and break-through technologies are actively developed; industrial production zones specialising in the implementation of basic technologies applicable to already existing technological processes; and the so-called “non-S&T-driven regions” which are lagging regions that do not have the capacity in science and technology [4, p. 1298].

Identification of regional specialization is becoming the key to the formation of regional industrial agglomerations, built on the principle of cluster formations - a special form of organization of the regional industry involving pooling within a single production and technological network of interconnected business entities.

The term "cluster" in its classical meaning, proposed by M. Porter, means "a group of geographically adjacent interconnected companies and associated organizations operating in a certain area and characterized by common activities and complementary to each other" [5]. Clustering of the economy was studied in a large number of scientific papers reviewing the impact of clusters on socio-economic development of the territory [6-8] and the factors of successful development of the cluster forms of companies organization [9] as well as clustering problems in regional economies [10-13].

As of today, separate cluster development centres have already been formed in the world economy: the North American, Western European and Asian [14]. The cluster approach to regional industrial policy organisation is still a comparatively new instrument for Russia. The Concept of a long term social and economic development for the Russian Federation up to 2020 has become a basic document to firstly touch on clustering aspects. Since 2010, the Russian Ministry of Economic Development has started a subsidiary support to the regions implementing pilot projects of innovative territorial clusters. Among the regions, implementing similar projects, there is the Kemerovo region with its cluster development program "Complex processing of coal and industrial waste." Currently, a number of emerging clusters can be identified in the territorial and economic space of the Kemerovo region, which are at different stages of development from embryonic or potentially possible (cluster building industry, Yurga) to the growth stage (coal chemical industrial cluster) (Fig.1).

Kuzbass is characterized by the leading role of large-scale industrial production, therefore, the coal – chemistry cluster has become a priority project, the main purpose of which is to organize the deep processing of coal and coal waste products using modern technologies to produce a variety of coal chemical products: up to 130 kinds of chemical products and over 5000 types of products in related industries.

Implementation of technological innovations directly into the coal mining industry is of a paramount importance for the Kemerovo Region, as a big industrial and raw resources region [15]. Organisation of cluster production of knowledge-based coal chemical products is a way to solve the problem. It is the coal mining industry that can become not only a springboard, but the driver of innovative development of regional economy. The introduction of advanced technologies of deep processing of raw materials allows to go beyond mining of thermal coal and use to the so-called "coal by-product" for the production of a wide range of marketable coal chemical products with high added value. Of course, this way of development is quite capital-intensive, which can be a serious limitation in modern conditions: consolidation of efforts of the owners of coal mining enterprises, the state, and the scientific community is required. According to our estimates, based on the Ministry of Economic Development
data, the ratio of budget and non-budget (including private) investment in the financing of the approved program of the development of coal chemical industrial cluster is 1:5, i.e. per each ruble of private funds the state planned 4.7 rubles of the budget funds.

The share of organisations involved in technological, organisational, marketing innovations in the Kemerovo region during 2009 – 2012 was 5.8% (the average value for industrialised regions for the similar period was 9.4%) [16].

2) The chronic and long-term lack of funding of research and development programs: the ratio of R & D expenditures to the gross regional product of the Kemerovo region remains stable at 0.1% in the period of 2007-2012 (the average for the industrial regions in the same period was 0.9 %, and in the Russian Federation – 1.4%) [16];

3) Low efficiency of the regional policy in encouraging innovations and creating conditions for their commercialisation;

4) Low motivation of economic entities both in generation of innovations and their funding: the lack of interest in the implementation of innovations due to not debugged system of planning, coordination and design of innovative infrastructure.

The current state of the regional innovative system of the Kemerovo region combined with low degree of production innovation performs as a negative factor reducing the overall opportunities of the region to forming of a competitive innovative potential.

At the heart of any regional cluster there is the activity of the company as the primary link of the economy. It was M. Porter who expressed his opinion on the need of rigid specialisation of resources, taking into consideration the existing and emerging clusters in the region, and the primary link of the regional economy - the company - is the main factor of competitiveness [5].

Having a diverse potential (P1, P2, … Pn), enterprises of the region are “bonded” by functional connections in the form of productive, competitive, organisational, investment, financing and other types of interaction. And the cluster as the system of given elements acquires the feature of emergence which manifests itself through the formation of new features of this regional system which are not characteristic for other separate elements (Fig.2).

In other words, if we express a regional cluster (RCI – regional cluster) as a set of potentials of separate enterprises which form it, then, a general cluster potential will possess the property of emergence:

$$RCl(P_1, P_2, ..., P_n) \geq \sum P_n$$

(Fig.2)
A regional cluster system, with its emergence, gets an opportunity not just to generate innovation, but also to find mechanisms for the spread of these “dot” innovations in a rather uniform branch and territorial scale. This is achieved by a network cooperation of all participants of the cluster, i.e. through forming of both vertical (i.e. Supply – Buyer) and horizontal connections which appear in cooperation with competitors (exchange of marketing researches, investment activity, participation in a partner’s activity on a mutually beneficial basis, implementation of studies). As the analysis of research work on clustering shows, its network characteristics are expressed in existence of common purposes of its participants, mutually beneficial information exchange, developed business behaviour rules, lack of hierarchical subordination among the participants [17 – 19].

In the Kemerovo region an innovative "core" which acts as a generator of new ideas is the central link of the cluster. The innovative "core" concentrates the organisation, whose main objective is the creation of new knowledge in the implementation of research projects (Regional Research Institutes engaged in R & D, small innovative enterprises at universities, engineering laboratories, etc.). These organizations are called upon to provide the main impetus to the implementation of research projects (Regional Research Institutes engaged in R & D, small innovative enterprises at universities, engineering laboratories, etc.). These organizations are called upon to provide the main impetus to the development of innovation, but they also have a high resource consumption, consuming a large amount of investment resources. In the Kemerovo region, the innovative "core" is based on the activities of institutions of academic and industrial sciences shown in Fig. 3.

Two “core shells” facilitate distribution of new knowledge in the area. The first one (marked as “I” in Fig. 3) presents transformation, an adaptation of new knowledge received to possibilities of its practical application in production with the help of business incubators, venture funds, and technology transference centres. In the Kemerovo region, the units of the first shell are as follows: the Student Business Incubator of the Siberian State Industrial University; Centre for Technology Transfer of the Siberian Federal District; Student innovative business incubator.

The second shell (marked as “II” in Fig. 3) presents the process of a large-scale introduction, distribution (diffusion) of the innovations in practice which implies an increase in the demand for innovative products. This process involves Techno parks, Techno polis of the region, as well as enterprises of the innovative-implementation type. The objects of this area of the innovative infrastructure include, primarily, the Kuzbass Techno park, a number of its structural subdivisions (Site # 1, Lab and Production Building “Ecology and Environmental Management”; Centre for Innovations Implementation) implement introduction of the innovative products to the market.

The clusters of the region such as an operating coal chemistry cluster and a number of emerging clusters can potentially conclude joint projects on the basis of existing infrastructure support belts in the networking environment, namely – the centres of technological audit and expertise, the centres of commercialisation and intellectual property management. Therefore, there is a possibility to create a structural integration-cluster model in the region, and its development will ensure emergence of new properties and qualities of the regional innovative system (Fig. 4).

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**Fig. 3.** The scheme of cluster-network organisation of economic area of the Kemerovo region

**Fig. 4.** The effect of the emergence of the regional economic area
IV. CONCLUSION

The function of an integration-cluster model allows forming of qualitatively new features of regional economies, which are expressed in:

- intensification of innovative processes;
- diversification of the economy;
- forming a higher marketability of production;
- additional advantages for the cluster resident enterprises due to inner specialisation, minimisation of innovations implementation costs;
- costs reduction, e.g., by a cheaper access to different production factors (equipment, spare parts, qualified personnel, etc.) in comparison to other variants of enterprises integration (vertical, alliances forming);
- flexibility of production organisation combined with a high level of specialisation allowing to respond quickly and timely to the changing needs of the market and consumers.

Since innovative and investment factors are the driving force of an active clustering process, under modern conditions the measures are required to improve efficiency of the region innovative system. The authors consider it useful to implement the system of “production innovation identification” in order to support innovation-active enterprises regionally which could become cluster residents, i.e. to establish an expert degree and scale of new goods, or services in order to support those enterprises which already implement innovations, not just novelties (already implemented traditional technologies). The implementation of the system is possible by establishing an authorized evaluation body on the basis of the Federal Budget Entity “State Regional Centre for Standardisation, Metrology and Testing for the Kemerovo Region”.

Monitoring of the effectiveness of the clusters in the region, especially in terms of the innovation component, is possible through the introduction of a uniform methodology for evaluating innovative activity in the region over the final results, taking into account the typological features of the industrial regions to manage the trend of the level of innovativeness of basic sectors of the Kemerovo region economy.

Identification of the best innovators by using the suggested measures will allow implementing the targeted encouragement of the directions of innovative development investments that are of a priority for Kemerovo region, namely:

- subsidy of credit interest rates for innovative development;
- assistance in certification (international included) of innovative goods, work, and services;
- introduction of “innovative vouchers” - certificates issued by regional authorities which will be a monetary equivalent to pay for different services (consulting, engineering, certifying) to encourage the demand for innovation and increase the innovation component in the companies’ activities.

These and other measures will allow a positive influence on the intensity of clustering processes and formation of emergent features of the regional economy in the priority innovation-oriented areas.

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